Current PSYCHIATRY

A shot in the arm: Boost your knowledge about immunizations for psychiatric patients

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Use the mnemonic ARM SHOT as a foundation to counsel your patients on their vaccination needs

Patients with chronic, severe mental illness live much shorter lives than the general population. The 25-year loss in life expectancy for people with chronic mental illness has been attributed to higher rates of cardiovascular disease driven by increased smoking, obesity, poverty, and poor nutrition.[1] These individuals also face the added burden of struggling with a psychiatric condition that often interferes with their ability to make optimal preventative health decisions, including staying up to date on vaccinations.[2] A recent review from Toronto, Canada, found that the influenza vaccination rates among homeless adults with mental illness—a population at high risk of respiratory illness—was only 6.7% compared with 31.1% for the general population of Ontario.[3]

Mental health professionals may serve as the only contacts to offer medical care to this vulnerable population, leading some psychiatric leaders to advocate that psychiatrists be considered primary care providers within accountable care organizations. Because most vaccines are easily available, mental health professionals should know about key immunizations to guide their patients accordingly.

In the United States, approximately 45,000 adults die annually from vaccine-preventable diseases, the majority from influenza.[4] When combined with the most recent Adult Immunization Schedule and general recommendations adapted from the CDC,[5,6] the mnemonic **ARM SHOT** allows for a quick assessment of risk factors to guide administration and education about most vaccinations (***Table 1***). **ARM**

Disclosures
The authors report no financial relationships with any company whose products are mentioned in this article or with manufacturers of competing products.

Table 1

ARM SHOT explained

Age is an important determinant for certain vaccinations. For example, human papillomavirus is an important consideration for patients age <26 and pneumococcal vaccines (PCV13 and PPSV23) for patients age ≥65
Risk of exposure to pathogens via blood and bodily fluids among susceptible individuals, such as those who share needles, travel to endemic areas, work as health care professionals, and/or have increased sexual activity, including men who have sex with men, requires consideration of certain vaccines
Medical conditions, such as chronic obstructive pulmonary disease, diabetes, hepatitis, asplenia, end-stage renal disease, cardiac disease, and pregnancy, require special attention, according to CDC immunization algorithms
Substance use, particularly alcohol as well as other recreational or illicit substances, places individuals at greater risk for vaccine-preventable diseases
HIV (or other immunocompromised states) makes live vaccines, such as the varicella-zoster virus (shingles) vaccine, contraindicated
Occupancy in a residential facility or any other communal living situation (including correctional facilities) is an important consideration that requires special attention for immunization
Tobacco use exacerbates cardiovascular and pulmonary disease and is an important variable in the vaccination of patients

SHOT involves assessing the following components of an individual's health status and living arrangements to determine one's risk of contracting communicable diseases:

- **A**ge
- **R**isk of exposure
- **M**edical conditions (comorbidities)
- **S**ubstance use history
- **H**IV status or other immunocompromised states
- **O**ccupancy, or living arrangements
- **T**obacco use.

We recommend keeping a copy of the Adult Immunization Schedule (age ≥19) and/or the immunization schedule for children and adolescents (age ≤18) close for quick reference. Here, we provide a case and then explore how each component of the **ARM SHOT** mnemonic applies in decision-making.

CASE

Evaluating risk, assess needs

Ms. W, age 24, has bipolar I disorder, most recently manic with psychotic features. She presents for follow-up in clinic after a 5-day hospitalization for mania and comorbid alcohol use disorder. Her medical comorbidities include asthma and active tobacco use. She is taking lurasidone, 20 mg/d, and lithium, 900 mg/d. Her case manager is working to place Ms. W in a residential substance use disorder treatment program. Ms. W is on a waiting list to establish care with a primary care physician and has a history of poor engagement with medical services in general; prior attempts to place her with a primary care physician failed.

In advance of Ms. W's transfer to a residential treatment facility, you have been asked to place a Mantoux screening test for tuberculosis (purified protein derivative), which raises the important question about her susceptibility to infectious diseases in general. To protect Ms. W from preventable diseases for which vaccines are available, you review the **ARM SHOT** mnemonic to broadly assess her candidacy for vaccinations.

Age

Age may be the most important determinant of a patient's need for vaccination (***Table 2, page 20***). The CDC immunization schedules account for age-specific risks for diseases, complications, and responses to vaccination (***Figure 1, page 22***).[6]

Influenza vaccination. Adults can have an intramuscular or intradermal inactivated influenza vaccination yearly in the fall or winter, unless they have an allergy to a vaccine component such as egg protein. Those with such an allergy can receive a recom-

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The mnemonic ARM SHOT allows for a quick assessment of risk factors to guide administration and education about most vaccinations

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Adults age ≥60 who are not immunocompromised should receive a single dose of live attenuated VZV to limit the risk of shingles

Table 2

Indications, contraindications, and dosing for select vaccines[2]

Human papillomavirus vaccine
All previously unvaccinated persons (women age <26, men age <21)
Three doses on 0-, 2-, 6-month schedule or 2 doses on 0-, 6-month schedule for children ages 9 to 14
Contraindicated during pregnancy
Influenza vaccination
All adults in fall or winter (unless severely egg-allergic or in the midst of a febrile illness)
Pneumococcal vaccine
One series for all patients age ≥65. (Official recommendation is to obtain the PCV13 vaccine followed by the PPSV23 vaccine at least 1 year later)
Patients age ≤65 with a predisposed risk to pneumonia from a chronic illness (eg, heart disease, lung disease, diabetes, liver disease, kidney disease, nephrotic syndrome, and immunocompromised states)
Active smokers and those who chronically abuse alcohol
Patients living in high-risk settings (eg, long-term care facilities, nursing homes)
Re-vaccination is recommended for patients age ≤65 after 5 years or age 65, whichever comes first
Tetanus-diphtheria (Td) or tetanus, diphtheria, and pertussis (Tdap) vaccine
Td booster every 10 years for adults who have had primary series
Tdap for patients age ≤65 who have not had Tdap before
Varicella-zoster vaccine
All patients age ≥60
Exclude patients with cellular or acquired immunodeficiency (eg, HIV or who are undergoing chemotherapy)

binant influenza vaccine. Until the 2016 to 2017 flu season, an intranasal mist of live, attenuated influenza vaccine was available to healthy, non-pregnant women, ages 2 to 49, without high-risk medical conditions. However, the CDC dropped its recommendation for this vaccine because data showed it did not effectively prevent the flu.[7] Individuals age ≥65 can receive either the standard- or high-dose inactivated influenza vaccination. The latter contains 4 times the amount of antigen with the intention of triggering a stronger immune response in older adults.

Pneumonia immunization. All patients age ≥65 should receive vaccinations for *Streptococcus pneumoniae* and its variants in the form of one 13-valent pneumococcal conjugate vaccine and, at least 1 year later, one 23-valent pneumococcal polysaccharide vaccine (PPSV23). Immunization reduces the morbidity and mortality from pneumococcal illness by decreasing the burden of a pneumonia, bacteremia, or meningitis infection. Adults, ages 19 to 64, with a chronic disease (referred to as "special populations" in CDC tables), such as diabetes, heart or lung disease, alcoholism, or cirrhosis, or those who smoke cigarettes, should receive PPSV23 with a second dose administered at least 5 years after the first. The CDC recommends a 1-time re-vaccination at age 65 for patients if >5 years have passed since the last PPSV23 and if the patient was younger than age 65 at the time of primary vaccine for *S. pneumoniae*. This can be a rather tricky clinical situation; the health care provider should verify a patient's immunization history to ensure that she (he) is receiving only necessary vaccines. However, when the history cannot be verified, err on the side of inclusion, because risks are minimal.

Shingles vaccination. Adults age ≥60 who are not immunocompromised should receive a single dose of live attenuated vaccine from varicella-zoster virus (VZV) to limit the risk of shingles from a prior chick-

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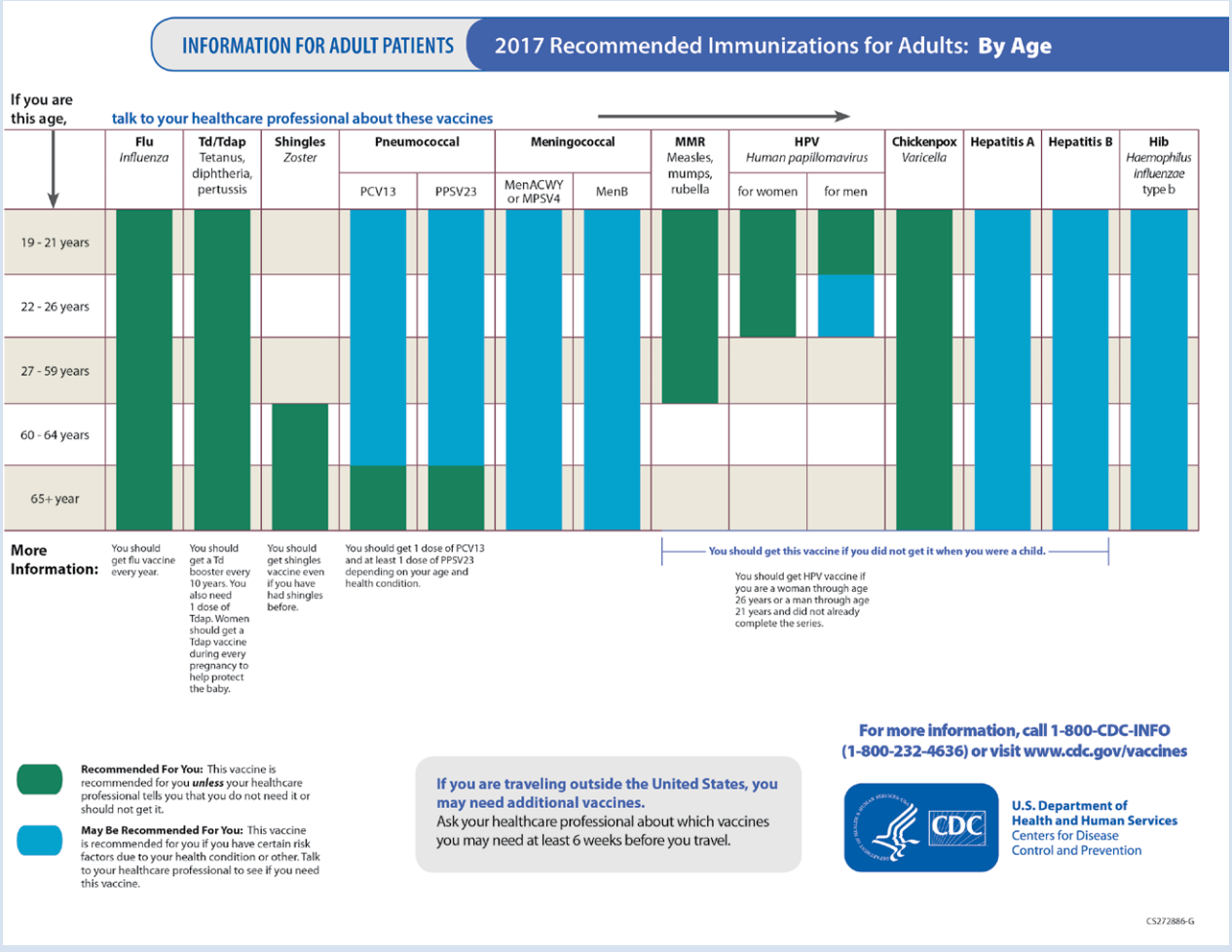
Figure 1

Recommended adult immunization schedule, by vaccine and age group



Source: Centers for Disease Control and Prevention. https://www.cdc.gov/vaccines/schedules/downloads/adult/adult-schedule-easy-read.pdf

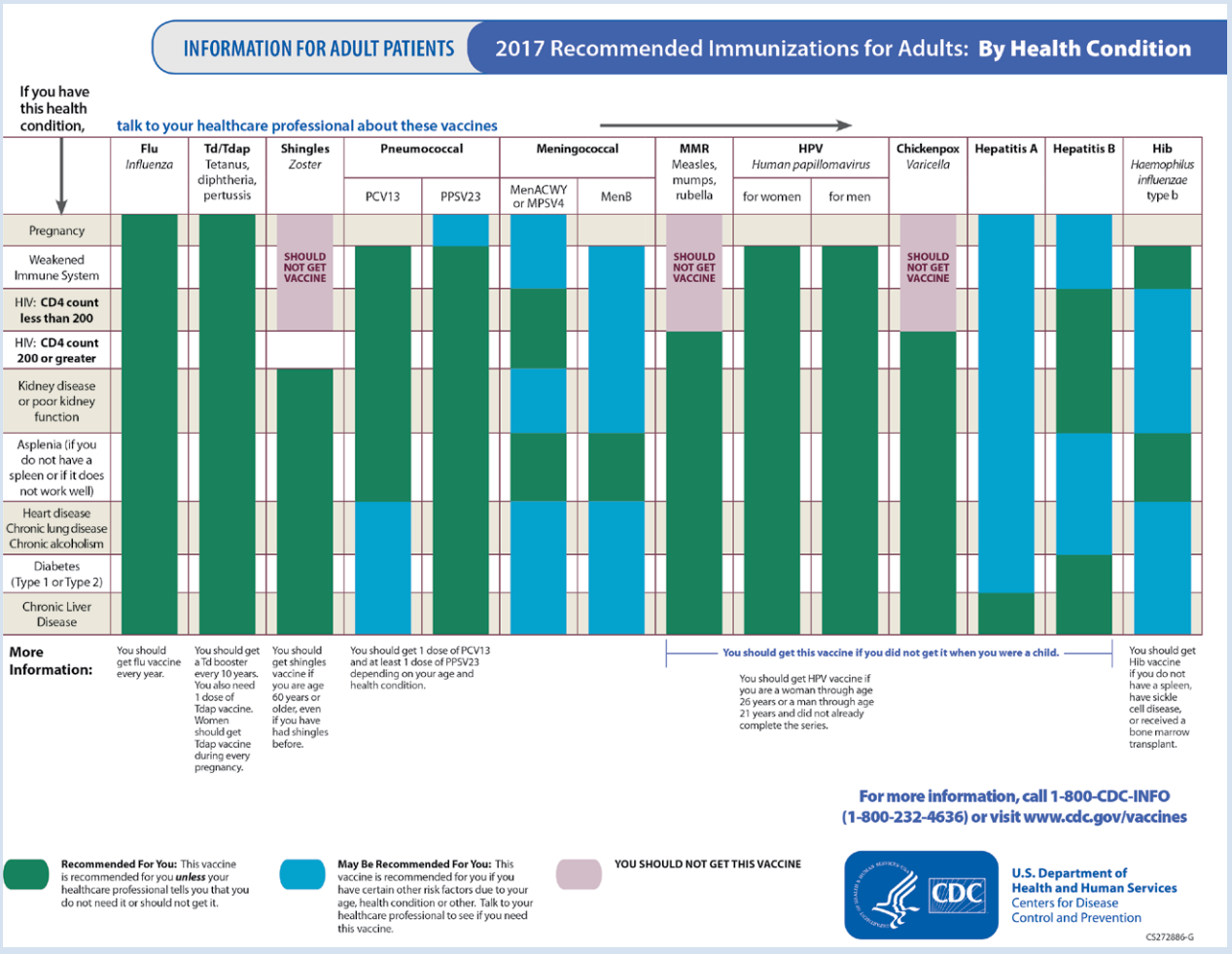
enpox infection. The vaccine is approximately 66.5% effective at preventing postherpetic neuralgia for up to 4.9 years. Individuals as young as age 50 may have the vaccine because the risk of herpes zoster radically increases from then on,[8] although most insurers only cover VZV vaccination after age 60.

Tetanus, diphtheria, and acellular pertussis (Tdap) vaccine. All adults should complete the 3-dose primary vaccination series for tetanus, diphtheria, and pertussis (also known as whooping cough) and this should include 1 dose of Tdap. Administration of the primary series is staged so that the second dose is given 4 weeks after the initial dose and the final dose 6 to 12 months after the first dose. After receiving the primary series, adults should receive a tetanus-diphtheria booster dose every 10 years. For adults ages 19 to 64, the Advisory Committee on Immunization Practices (ACIP) recommends 1 dose of Tdap in place of a booster vaccination to decrease the transmission risk of pertussis to vulnerable persons, especially children.

Human papillomavirus (HPV) immunization. The ACIP recommendation[9] has been for children to receive routine vaccination for the 4 major strains of HPV—strains 6, 11, 16, and 18—starting at ages 11 to 12

Figure 2

Vaccines that might be indicated for adults based on health conditions



Source: Centers for Disease Control and Prevention. https://www.cdc.gov/vaccines/schedules/downloads/adult/adult-schedule-easy-read.pdf

to confer protection from HPV-associated diseases, such as genital warts, oropharyngeal cancer, and anal cancer; cancers of the cervix, vulva, and vagina in women; and penile cancer in men. Ideally, the vaccines are administered prior to HPV exposure from sexual contact. The quadrivalent HPV vaccine is safe and is administered as a 3-dose series, with the second and third doses given 2 and 6 months, respectively, after the initial dose. Adolescent girls also have the option of a bivalent HPV vaccine.

In 2016, the FDA approved a 9-valent HPV vaccine, a simpler 2-dose schedule for children ages 9 to 14 (2 doses at least 6 months apart). Leading cancer centers have endorsed this vaccine based on strong comparative data with the 3-dose regimen.[10] For those not previously vaccinated, the HPV vaccine is available for women ages 13 to 26 and for men ages 13 to 21 (although men ages 22 to 26 can receive the vaccine, and it is recommended for men who have sex with men [MSM]). Women do not require Papanicolaou, serum pregnancy, HPV DNA, or HPV antibody tests prior to vaccination. If a woman becomes pregnant, remaining doses of the vaccine should be postponed until after delivery. Women still need to follow recommendations for cervical cancer screening because the HPV vaccine does not cover all genital strains of the virus. For sexually active individuals who might have HPV or genital

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IV drug use and sexual activity with multiple partners increase the risk of exposure to communicable diseases

Table 3

Medical and behavioral factors that can impact immunization recommendations in psychiatric patients[2]

HIV
Chronic obstructive pulmonary disease
Tobacco use
Alcohol use disorder
Substance use disorder
Residency in facilitated-living or substance use treatment facility
Viral hepatitis
Chronic liver disease
Renal disease
Diabetes
Age and prior immunization status

warts, immunization has no clinical effect except to prevent other HPV strains.

Measles, mumps, and rubella (MMR) vaccine. All adults should receive, at minimum, 1 dose of MMR vaccination unless serological immunity can be verified or if contraindicated. Two doses of the vaccine are recommended for students attending post-high school institutions, health care personnel, and international travelers because they are at higher risk for exposure and transmission of measles and mumps. Individuals born before 1957 are considered immune to measles and mumps. A measles outbreak from December 2014 to February 2015[11] highlighted the importance of maintaining one's immunity status for MMR.

CASE CONTINUED

Based on Ms. W's age, she should be offered vaccinations for influenza and opportunities to receive vaccinations for HPV, Tdap (the primary series, a Tdap or Td booster), and MMR, if appropriate and not completed previously.

Risk of exposure

Certain behaviors will increase the risk of exposure to and transmission of diseases communicable by blood and other bodily fluids (***Table 3***). These behaviors include needle injections (eg, during use of illicit drugs) and sexual activity with multiple partners, including MSM or promiscuity/impulsivity during a manic episode. A common consequence of risky behaviors is comorbid infection of HIV and viral hepatitis for those with substance use disorder or those who engage in high-risk sexual practices.[12,13]

Hepatitis B virus (HBV) immunization. Vaccination is one of the most effective ways to prevent HBV infection, which is why it is offered to all health care workers. HBV immunization is a 3-dose series in which the second and third doses are given 1 and 6 months after the initial doses, respectively. In addition to certain medical risk factors or conditions that indicate HBV vaccination, people should be offered the vaccine if they are in a higher risk occupation, travel, are of Asian or Pacific Islander ethnicity from an endemic area, or have any present or suspected sexually transmitted diseases.

Hepatitis A virus (HAV) vaccination. HAV is transmitted via fecal–oral routes, often from contaminated water or food, or through household or sexual contact with an infected person. Individuals should receive the HAV vaccine if they use illicit drugs by any route of administration, work with primates infected with HAV, travel to countries with unknown or high rates of HAV, or have chronic liver disease (ie, hepatitis, alcohol use disorder, or non-alcoholic fatty liver disease) or clotting deficiencies. The *CDC Health Information for International Travel*, commonly called the "Yellow Book," publishes vaccination recommendations for those who plan travel to specific countries.[14]

CASE CONTINUED

Ms. W's history of mania (if such episodes included increased sexual activity) and substance use would make her a candidate for the HBV and HAV vaccinations and could also strengthen our previous recommendation that she receive the HPV vaccination.

Medical conditions

Patients with certain medical conditions may have difficulty fighting infections or

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become more susceptible to morbidity and mortality from coinfection with vaccine-preventable illnesses. Secondary effects of psychotropic medications that may carry implications for vaccine recommendations (eg, risk of agranulocytosis and impaired cell-medicated immunity with mirtazapine and clozapine or renal impairment from lithium use) are of particular concern in psychiatric patients.[2]

To help care for these patients, the CDC has developed a "medical conditions" schedule (***Figure 2, page 23***). This schedule makes vaccination recommendations for those with a weakened immune system, including patients with HIV, chronic obstructive pulmonary disease (COPD), diabetes, hepatitis, asplenia, end-stage renal disease, cardiac disease, and pregnancy.

Because patients with psychiatric illness face a greater risk of heart disease and diabetes, these conditions may warrant special reference on the schedule. The increased cardiometabolic risk factors in these patients may be due in part to genetics, socioeconomic status, lifestyle behaviors, and medications to treat their mental illness (eg, antipsychotics). Patients with bipolar disorder or schizophrenia in particular tend to have higher rates of COPD (mainly from chronic bronchitis) and asthma than the general population.[12] Pay special attention to the indications schedule for those with chronic lung disease, especially patients who continue to smoke cigarettes.

CASE CONTINUED

Because of Ms. W's asthma, the CDC schedule recommends ensuring she is up to date on her influenza, pneumococcal, and Tdap vaccinations.

Substance use

Patients with combined psychiatric and substance use disorders ("dual diagnosis") have lower rates of receiving preventive care than patients with either condition alone.[15] Substance use can be behaviorally disinhibiting, leading to increased risk of exposures from sexual contact or other risky activities. The use of illicit substances can provide a nidus for infection depending on the route of administration and can result in negative effects on organ systems, compromising one's ability to ward off infection.

Patients who use any illicit drugs, regardless of the method of delivery, should be recommended for HAV vaccination. For those with alcohol use disorder and/or chronic liver disease, and/or seeking treatment for substance use, hepatitis B screening and vaccination is recommended.

CASE CONTINUED

From a substance use perspective, discussion of vaccination status for both hepatitis A and B would be important for Ms. W.

HIV or immunocompromised

Persons with severe mental illness have high rates of HIV, with almost 8 times the risk of exposure, compared with the general population due to myriad reasons, including greater rates of substance abuse, higher risk sexual behavior, and lack of awareness of HIV transmission.[12,13] Patients with mental illness are also at risk of leukopenia and agranulocytosis from certain drugs used to treat their conditions, such as clozapine.

Pregnancy is a challenge for women with mental illness because of the pharmacologic risk and immune-system compromise to the mother and baby. A pregnant woman who has HIV with a CD4 count <200, or has a weakened immune system from an organ transplant or a similar condition, is a candidate for certain vaccines based on the Adult Immunization Schedule (***Figure 2, page 23***). However, these patients should avoid live vaccines, such as the intranasal mist of live influenza, MMR, VZV, and varicella, to avoid illness from these inoculations.

CASE CONTINUED

Ms. W should undergo testing for pregnancy and HIV (and preferably other sexually transmitted infections per general preventive health guidelines) before receiving any live vaccinations.

Occupancy

Aside from direct transmission of bodily fluids, infectious diseases also can spread

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Secondary effects of psychotropics, such as renal impairment from lithium use, may affect vaccine recommendations

Immunizations for psychiatric patients

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Adults smokers should be vaccinated against influenza and pneumococcal-related illness regardless of age

through droplets/secretions from the throat and respiratory tract. Close quarters or lengthy contact enhances communicability by droplets, and therefore people who reside in a communal living space (eg, individuals in substance use treatment facilities or those who reside in a nursing home) are most susceptible.

The bacterial disease *Neisseria meningitidis* (meningococcus) can spread through droplets and can cause pneumonia, bacteremia, and meningitis. Vaccination is indicated, and in some states is mandated, for college students who live in residence halls and missed routine vaccination by age 16. Meningococcus conjugate vaccine is administered in 2 doses; each dose may be given at least 2 months apart for those with HIV, asplenia, or persistent complement-related disorders. A single dose may be recommended for travelers to areas where meningococcal disease is hyperendemic or epidemic, military recruits, or microbiologists. For those age ≥55 and older, meningococcal polysaccharide vaccine is recommended over meningococcal conjugate vaccine.

Influenza, MMR, diphtheria, pertussis, and pneumococcus also spread through droplet contact.

CASE CONTINUED

If Ms. W had not previously received the meningococcus vaccine as part of adolescent immunizations, she could benefit from this vaccine because she plans to enter a residential substance use disorder treatment program.

Tobacco use

Patients with psychiatric illness are twice as likely to smoke compared with the general population.[16] Adult smokers, especially those with chronic lung disease, are at higher risk for influenza and pneumococcal-related illness; they should be vaccinated against these illnesses *regardless of age* (as discussed in the "Age" section).

CASE CONTINUED

Because she smokes, Ms. W should receive counseling on vaccinations, such as influenza and pneumonia, to lessen her risk of respiratory illnesses and downstream sepsis.

Conclusion

Ms. W's case represents an unfortunately all-too-common scenario where her multifaceted biopsychosocial circumstances place her at high risk for vaccine-preventable conditions. Her weight is recorded and laboratory work ordered to evaluate her pregnancy status, blood counts, lipids, complete metabolic panel, lithium level, and HIV status. Fortunately, she had received her series of MMR, meningococcal, and Tdap vaccinations when she was younger. Influenza, HPV, HAV, HBV, and pneumococcal vaccinations were all recommended to her, all of which can be given on the same day (HAV and HBV often are available as a combined vaccine). Ms. W receives a renewal of her psychiatric medications and counseling on healthy living habits (eg, diet and exercise, quitting tobacco and alcohol use, and safe sex practices) and the importance of immunizations.

Vaccination is 1 of the 10 great public health achievements of the 20th century when one considers how immunization of vaccine-preventable diseases has reduced morbidity, mortality, and health-associated costs.[17] As mental health professionals, we can help pass on the direct and indirect benefits of immunizations to an often underserved and undertreated population to help improve their health outcomes and quality of life.

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Immunizations for psychiatric patients

Clinical Point

Vaccination against HAV and HBV often is available as a combined vaccine

Related Resources

- Centers for Disease Control and Prevention. Immunizations schedules. For Health Care Professionals. https://www.cdc.gov/vaccines/schedules/hcp/index.html.
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Drug Brand Names

13-Valent pneumococcal conjugate vaccine • Prevnar 13
23-Valent pneumococcal polysaccharide vaccine • Pneumovax
Hepatitis B vaccine • Recombivai HB
Hepatitis A vaccine • Biovac A, Havrix, Vaqta
Mumps, measles, rubella vaccine • M-M-R II
Quadrivalent influenza vaccine • Fluzone
Tetanus, diphtheria, and pertussis vaccine • Adacel, Boostrix
Trivalent vaccines • Afluria, Fluad
Varicella zoster vaccine • Zostavax

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Bottom Line

Patients who have chronic, severe mental illness are more vulnerable to communicable diseases than the general population and have difficulty keeping up to date with immunizations that can protect them from these diseases. Mental health professionals are often the only contact these patients have with the health care system. The ARM SHOT mnemonic can help mental health professionals determine which immunizations are appropriate for patients with mental illness.