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Fixing a Hole: a retrospective cohort study evaluating HAV, HBV, tetanus screening, and vaccination during hospitalization in persons who use substances

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Abstract

Background: Rates of serious injection-related infections in persons who use drugs have increased. Resulting admissions are an opportunity for screening and vaccination of preventable infections such as hepatitis A virus (HAV), hepatitis B virus (HBV), and tetanus.

Design and methods: We conducted a retrospective review of adults with documented substance use admitted for bacterial infection between July 2015 and March 2020. We evaluated HAV, HBV, and tetanus vaccination status at admission, along with screening for HAV and HBV infection and immunity. We identified the proportion of patients at risk for infection who received HAV, HBV, and tetanus vaccines during admission and patient-level factors associated with vaccination.

Results: We identified 280 patients who met our inclusion criteria. Of the 198 (70.7%) patients at risk for HAV, infectious disease providers recommended vaccination for 21 (10.6%) and 15 (7.6%) received HAV vaccine. Of the 174 (62.1%) patients at risk for HBV, infectious disease providers recommended vaccination for 32 (18.3%) and 25 (14.4%) received HBV vaccine. A large proportion of patients (31.4%, 88) had no documentation of prior tetanus vaccination, and infectious disease providers recommended tetanus vaccination for three (1.1%) and five patients (1.8%) received a tetanus booster. Infectious disease consult vaccine recommendations were statistically significantly associated with HAV or HBV vaccination prior to discharge.

Conclusion: Over 70% of our population is at risk for one or more of these preventable infections. Efforts are needed to maximize inpatient screening and vaccination for HAV, HBV, and tetanus in patients with barriers to care.

Keywords: hepatitis A, hepatitis B, substance-related disorder, tetanus, vaccination

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Introduction

People with substance use disorders (SUD) are at risk for serious bacterial infections.[1,2] The association between serious injection-related infections and SUD is increasingly recognized in the literature.[1,2] In Oregon, hospitalizations for serious infections related to injection drug use have increased during the last two decades with high costs to healthcare systems.[3] Furthermore, patients with SUD have higher rates of unstable

housing, are more commonly members of vulnerable groups, and are less likely to have access to health insurance or primary care providers (PCPs).[4,5]

Centers for Disease Control and Prevention (CDC) guidelines recommend hepatitis A virus (HAV) immunization for adults at risk, which includes persons who inject drugs (PWID), persons who use non-injectable drugs, and persons who experience homelessness (PEH).[6] The recommendation for vaccination in persons at increased risk for HAV infection was instituted in 1996, and current rates for HAV vaccination range between 35% and 56%.[6,7] The incidence of HAV infection decreased following the 2006 recommendation to vaccinate children aged 12–23 months.[6] Since 2016, several outbreaks have been reported, with PWID or PEH at the highest risk. The outbreaks have resulted in 44,209 infections, including 27,018 (61%) hospitalizations and 420 deaths as of April of 2022.[8] There are ongoing outbreaks in eight states in the United States (US), with Georgia and Indiana reporting the highest number of cases (2118 and 2657, respectively), with 14% of this population experiencing homelessness.[7] Homelessness was added to the recommendations for HAV vaccination in 2019, intending to increase herd immunity over time, as gaps in vaccination have been identified.[9,10]

In 2018, there were 3322 hepatitis B virus (HBV) cases reported to the CDC, with an overall incidence of 1.0 cases per 100,000 population and between 880,000 and 1.89 million people living with HBV infection in the US.[11] Current American Association for the Study of Liver Diseases guidelines for HBV recommend screening for high-risk populations, which include persons who have ever injected drugs, men who have sex with men, persons with human immunodeficiency virus (HIV), and persons who are seeking treatment for a sexually transmitted infection (STI).[12] Of these groups, the most common risk behavior reported is injection drug use.[6] Despite this known risk, people who use substances (PWUS) currently exhibit low rates of HBV immunity (<40%) with a significant increase in HBV infections in this population over the last two decades.[5,13] Importantly, in 2022, the Advisory Committee on Immunization Practices (ACIP) expanded recommendations to include universal HBV vaccination of adults aged 19–59 years,[14] supported by significant cost-utility data.[15]

The CDC recommendation for tetanus vaccination includes a single dose of diphtheria, tetanus, and acellular pertussis vaccine (DTap) from birth to 15 months, tetanus toxoid, reduced diphtheria toxoid acellular pertussis vaccine (Tdap) ideally at age 11–12 years, and then tetanus toxoid (Td) with booster doses of either Td or Tdap every 10 years or when indicated for wound management. For wound management, which is common in PWID, a second dose of Td or Tdap is safe at least at 5-year intervals.[16] The incidence of tetanus has declined significantly, surveillance data from 2011 reported 233 cases from 2001 to 2008, and injection substance use reported in 27 (15.3%). Previous studies have suggested that the risk of fatal disease in people who have received at least three doses of Tdap is low, suggesting that vaccination programs should target vulnerable populations of unvaccinated/undervaccinated individuals.

This study aims to evaluate the screening for viral hepatitis immunity along with HAV, HBV, and Tdap/Td vaccination status on admission and vaccine administration during the inpatient stay.

Methods

We performed a retrospective review of patients 18 years or older admitted to our hospital and inclusion criteria consisted of patients admitted for a severe bacterial infection requiring ⩾2 weeks of antibiotics, a SUD diagnosis (confirmed by chart review), consultation by infectious diseases (ID), and addiction medicine between July 2015 (when addiction medicine consult service was established) and March 2020 [beginning of coronavirus disease 2019 (COVID-19) stay at home measures in Oregon], to identify patients who are high risk for co-infections and received consultative services from two groups who focus on prevention and screening in PWUS. All patients meeting these criteria were included in our study, and no additional exclusion criteria were applied. A descriptive cohort study was performed to evaluate screening for HAV and HBV, vaccination status at admission, and administration of HAV,

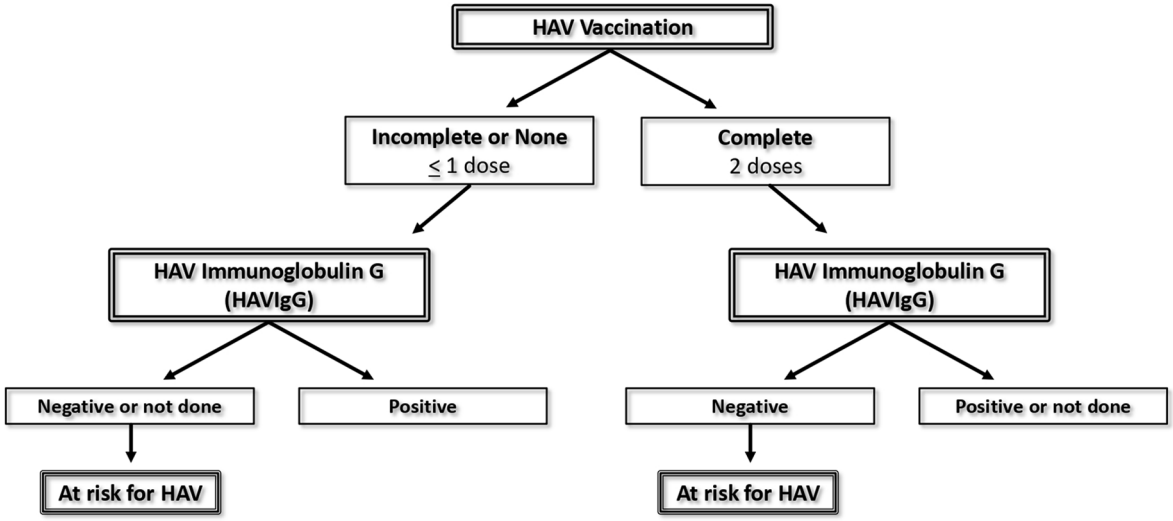

Figure 1. Determining HAV at risk population.
HAV, hepatitis A virus.

HBV, and tetanus vaccines during admission, followed by univariable case–control analyses to determine patient-level factors associated with vaccinations during their initial admission in the study time-period. We performed a chart review to collect variables of interest, including demographics, housing status, type of insurance, details on their primary infection, admitting team, access to a PCP, vaccination history, and ID consult team recommendations regarding hepatitis screening and vaccination during hospital admission, as in our related study.[4] Vaccination history available in our electronic medical record (EMR) connects to our statewide database (ALERT Immunization Information System), allowing us to capture all vaccines given throughout Oregon since 1996 for childhood vaccinations, which expanded in 2008 to include all adult vaccinations.[17] Laboratory tests, results, and immunizations performed during admission were collected from the EMR *via* SAP BusinessObjects Enterprise Business Intelligence Platform 4.2 (SAP America, Inc., PA, USA). Patients were determined eligible for the HAV vaccine if they had no prior or incomplete vaccination, no prior positive HAV Immunoglobulin G (HAVIgG), or a missing or negative HAVIgG result (Figure 1). We defined eligibility for HBV vaccine as no or incomplete prior vaccination, completed vaccination series with negative HBV surface antibody (HBVsAb), no prior or current positive HBVsAb, or no positive HBV viral load (VL) or HBV surface antigen (HBVsAg) (Figure 2). We defined tetanus vaccine eligibility based on the duration of time since the last tetanus vaccination being $\geqslant$5 years, given high risk.

Statistical analyses

We used SAS version 9.4 (SAS Institute Inc., Cary, NC, USA) to perform descriptive analyses of patient characteristics, completed and recommended HAV, HBV screening tests, and administered vaccines. We compared categorical variables by univariable analysis using chi-square or Fisher exact tests. We performed nested case–control analyses to identify potential exposures associated with HAV and HBV vaccine administration during admission. We calculated odds ratios (ORs) and 95% confidence intervals (CIs) of cases (vaccine administered) with each exposure variable compared to the proportion of controls (no vaccine administered) out of vaccine-eligible patients with the exposure variables for the first admission during our study time period. Low numbers of vaccinations precluded multivariable analyses for vaccine administration and univariable analysis for tetanus vaccination. This study was reviewed and approved by the Oregon Health & Science University Institutional Review Board (IRB00003522). The reporting of this study conforms to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[18]

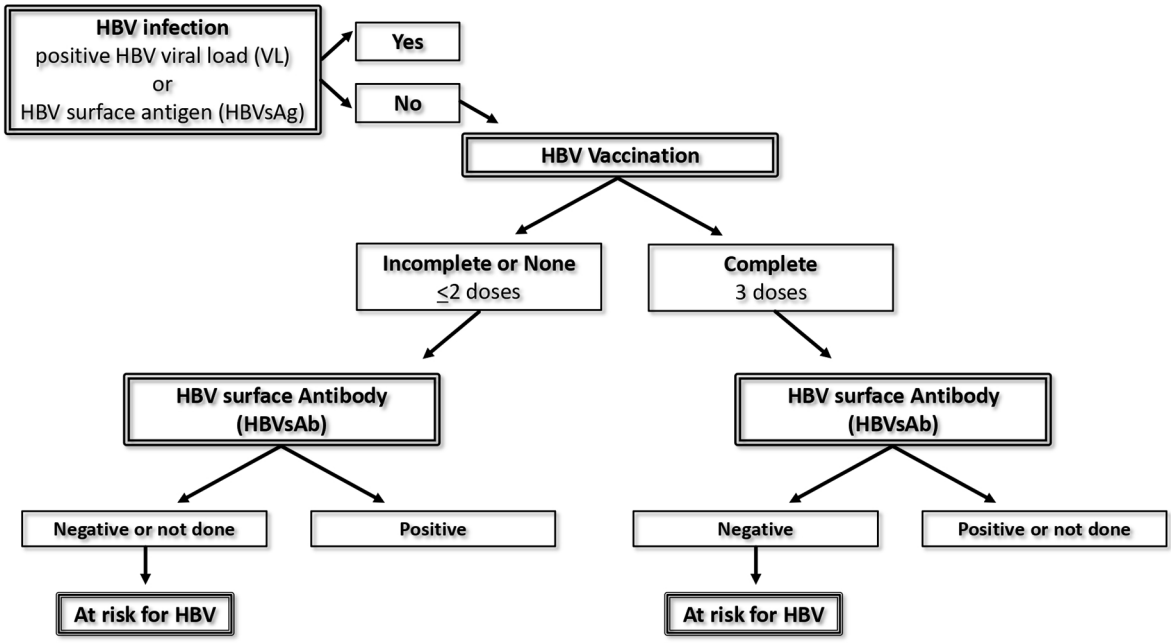

Figure 2. Determining HBV at risk population.
HBV, hepatitis B virus.

Results

Patient demographics

We identified 280 patients who met the study criteria. The majority identified as male (181; 64.6%) and white (260; 92.9%) (Table 1). Most patients were insured by Medicaid (227; 81.1%) and over half reported unstable housing (161; 57.5%). The most commonly reported substances used were opioids and methamphetamines, with 199 (71.0%) reporting use of two or more substances. 80.7% (226) reported injection drug use and 70.0% (196) reported use within the last 7 days (*via* any route) with 67.1% having laboratory evidence of exposure to hepatitis C virus (HCV) [HCV antibody (Ab) or VL positive]. Less than a quarter (67; 23.9%) had an established primary care physician at the time of admission.

Hepatitis A screening and vaccination

A total of 209 (74.6%) patients had no prior vaccination against HAV and 24 had received one dose of HAV vaccine without completing the series (Table 2).

For those who had completed a HAV vaccine series, 13 (27.7%) had an HAVIgG sent, all of which were positive. ID recommended HAVIgG in five patients, all of which were completed. For those with incomplete vaccination, ID recommended screening in 2 (8.3%) of this group. For patients with no prior HAV vaccine, ID recommended screening with HAVIgG specifically in 30 (14.4%), and a total of 47 HAVIgG were sent.

A total of 38 (18.2%) patients had a HAVIgM done, 14 (36.8%) of whom had normal liver function tests (LFTs), and another 17 (44.7%) who had LFTs or total bilirubin above the upper limit of normal but less than three times the upper limit of normal. IgM was sent for seven patients who had LFTs greater than three times the upper limit of normal or total bilirubin greater than 2.5 mg/dL.

Of the patients at risk for HAV and eligible for vaccination (198; 70.7%), ID made recommendations to vaccinate 21 (10.6%), and 15 (7.6%) patients ultimately received HAV vaccine during the admission.

Table 1. Baseline characteristics and univariable nested case–control analyses for HAV and HBV vaccination.

Characteristic	Cohort distribution		Nested case–control analyses	
	n = 280	(Percent)	HAV vaccine administration OR (95% CI) *n* eligible = 198 (70.7%)	HBV vaccine administration OR (95% CI) *n* eligible = 174 (62.1%)
Age: median (range)	38.5	(19–74)	0.8 (0.3–2.0)	1.2 (0.6–2.3)
Male	181	(64.6)	1.9 (0.7–5.5)	1.0 (0.4–2.4)
Non-Hispanic*	106	(37.9)		
White*	260	(92.9)		
Insurance				
Medicaid^	227	(81.1)	0.6 (0.1–2.9)	0.9 (0.3–2.5)
Medicare	35	(12.5)		
Other	18	(6.4)		
Unstable housing	161	(57.5)	0.8 (0.3–2.2)	1.1 (0.5–2.6)
Primary care provider	67	(23.9)	1.5 (0.5–4.6)	0.7 (0.3–2.1)
Reported substance use				
Opioid	215	(76.8)	0.8 (0.2–2.8)	0.9 (0.3–2.5)
Methamphetamine	194	(69.3)	1.3 (0.4–4.2)	1.1 (0.4–2.9)
Alcohol	57	(20.4)	2.0 (0.4–9.2)	2.1 (0.7–6.4)
Cannabis	79	(28.2)	1.7 (0.5–6.2)	0.8 (0.3–2.0)
Number of substances used				
1	72	(25.7)		
2	123	(43.9)		
>2#	76	(27.1)	1.0 (0.3–3.3)	1.1 (0.4–2.7)
Most recent use of any substance other than Marijuana				
Greater than 90 days	16	(5.7)		
Within 90 days	8	(2.9)		
Within 30 days	23	(8.2)		
Within 7 days	196	(70.0)		
Data not available	37	(13.2)		
Injection drug use reported	226	(80.7)	1.6 (0.4–7.6)	1.9 (0.5–6.9)
Injection methamphetamine use	108	(38.7)	1.2 (0.4–3.6)	**2.6 (1.1–6.3)**
Medication for SUD started or restarted in inpatient	194	(69.3)	1.4 (0.4–4.7)	0.9 (0.4–2.2)

(Continued)

Table 1. (Continued)

Characteristic	Cohort distribution		Nested case–control analyses	
	n = 280	(Percent)	HAV vaccine administration OR (95% CI) *n* eligible = 198 (70.7%)	HBV vaccine administration OR (95% CI) *n* eligible = 174 (62.1%)
HCV status at admission or during hospitalization				
Comorbidities				
History of any psychiatric disorder	116	(41.2)	1.4 (0.4–4.6)	**0.4 (0.2–0.9)**
Cirrhosis	26	(9.3)	0.7 (0.1–5.6)	1.2 (0.3–4.6)
HCV status at admission or during hospitalization				
HCV antibody or viral load positive	188	(67.1)	1.2 (0.4–3.7)	0.8 (0.4–2.0)
Primary infection site				
Bacteremia	182	(65.0)		
Endocarditis	85	(30.4)		
Bone/joint infection	86	(30.7)		
Spinal infection	67	(23.9)		
Infectious disease recommendation for HAV or HBV vaccination	48	(17.1)	**142.2 (27.3–739.4)**	**18.9 (7.0–51.4)**

Bold values denote statistically significant at $p < 0.05$.
*Small numbers of individuals from racial and ethnic groups prohibited stratified analyses, our population included those who identified as Black or African American, American Indian, Alaskan Native, and Pacific Islander.
^Reference Medicare plus other insurance.
#Reference ⩽ two substances.
HAV, hepatitis A virus; HBV, hepatitis B virus; SUD, substance use disorders; HCV, hepatitis C virus.

Hepatitis B screening and vaccination

A total of 174 (62.1%) patients had no prior vaccination against HBV and another 30 (10.7%) had an incomplete series documented. A total of 76 (27.1%) patients had completed a 3-dose HBV series and 35 of these were screened with HBVsAb. ID recommended screening for 17 patients and it was completed for 16. Of those with incomplete HBV vaccination, ID recommended screening in 9 (30%) and HBVsAb was completed for 12 (40%). Six patients had a negative result, resulting in ID recommendation to vaccinate five. For the 174 (62.1%) patients who had no prior HBV vaccine, ID recommended screening with HBVsAb in 49 (28.2%). A total of 73 HBVsAb were completed, 16 before the ID consult. Of these, 52 were negative resulting in recommendations to vaccinate 22 patients. In addition, 19 patients had an HBV core immunoglobulin M (HBVcIgM) sent, only two of which had LFTs greater than three times the upper limit of normal or a bilirubin greater than 2.5 mg/dL. A total of 107 patients had an HBV core immunoglobulin G (HBVcIgG) sent, of which 19 (17.8%) were positive.

Of the patients at risk for HBV and eligible for vaccination (174; 62.1%), ID recommended

Table 2. Vaccination and screening outcomes.

Hepatitis A screening	**No prior vaccination (209)**	**Incomplete vaccination (24)**	**Completed vaccination (47)**
Prior positive IgG result	16 (7.6)	1 (4.2)	5 (10.6)
Recommendation made to screen with IgG	30 (14.3)	2 (8.4)	5 (10.6)
IgM completed	25 (12.0)	3 (12.5)	10 (21.3)
IgG completed	47 (22.5)	6 (25)	13 (27.7)
Hepatitis B screening	**No prior vaccination (174)**	**Incomplete vaccination (30)**	**Completed vaccination (76)**
Prior positive HBVsAb	2 (1.1)	0	3 (3.9)
Recommendation made to screen with HBVsAb	49 (28.2)	9 (30.0)	17 (22.4)
HBVsAb completed	73 (42.0)	12 (40.0)	35 (46.1)
HBVcIgM completed	13 (7.5)	1 (3.3)	5 (6.6)
HBVcIgG completed	67 (38.5)	11 (36.7)	29 (38.2)
Tetanus vaccine screening	**Documented vaccine in last 5 years**	**Documented vaccine in the last 10 years**	**No documented vaccine**
	106 (37.9)	160 (57.1)	88 (31.4)
Vaccination recommendations and rates	**Hepatitis A *n* (%)**	**Hepatitis B *n* (%)**	**Tetanus *n* (%)**
Eligible for vaccine	198 (70.7)	174 (62.1)	248 (88.5)
Recommendations	21 (10.6)	32 (18.3)	3 (1.1)
Vaccines administered to eligible patients[a]	15 (7.6)	25 (14.4)	3 (1.2)

[a]Two patients received HBV vaccination and Two patients received tetanus vaccination when vaccinations were not indicated.
HBV, hepatitis B virus; HBVcIgG, HBV core immunoglobulin M; HBVcIgM, HBV core immunoglobulin M; HBVsAb, HBV surface antibody; IgG, Immunoglobulin G; IgM, Immunoglobulin M.

vaccinating 32 (18.3%), and 25 (14.4%) received at least one dose of HBV vaccine before hospital discharge.

A total of 17 (48.6%) patients with vaccine recommendations for HAV, HBV, or both were not vaccinated.

Tetanus vaccination

A total of 106 (37.9%) patients had a documented tetanus vaccine in the last 5 years, 160 (57.1%) had a tetanus vaccine documented in the last 10 years, and 88 (31.4%) had no documentation of tetanus vaccination. ID recommended tetanus vaccine for 3 (1.1%) patients. Five (1.8%) patients received a tetanus vaccination during their admission, three of whom had received one in the last 5 years. Four of these five patients were vaccinated in response to wounds and/or trauma. The remaining patient was noted to be asplenic and vaccination was completed prior to hospital discharge, despite the patient being up to date on tetanus vaccination at that time.

Nested case–control analysis

In univariable analysis of HAV vaccination, recommendation for vaccine by the ID consult service was significantly associated with vaccination

during admission (OR 142.19, 95% CI: 27.34–739.44). The other factors analyzed, such as age, housing status, discharge location, HIV or HCV status, history of cirrhosis, or other comorbidities, were not significantly associated with HAV vaccination (p-value > 0.05). Univariable analysis for HBV vaccination resulted in a significant association between ID consult recommendations for HBV vaccination and vaccination prior to hospital discharge (OR 18.98, 95% CI: 7.02–51.37) and reported injection methamphetamine use (OR 2.64; 95% CI: 1.11–6.28). In addition, a history of any psychiatric disorder was negatively associated with vaccination prior to discharge (OR 0.40, 95% CI: 0.17–0.94). Similar to those evaluated for association with HAV vaccination, the remaining factors showed no significant association with HBV vaccination prior to discharge. All HAV and HBV vaccine administrations occurred after ID involvement. Univariable analysis was not conducted for tetanus vaccination, as the number of vaccinations was minimal.

Discussion

Summary of findings and interpretation

Over 70% of our population were at risk for at least one vaccine-preventable infection and vaccinations during hospital admission at our institution for HAV, HBV, and tetanus were low despite a high proportion of our population experiencing unstable housing, injection drug use, and HCV. Despite guideline recommendations for screening for HBV and HAV immunity, many of those with negative antibody testing, unfortunately, did not have vaccine recommendations, suggesting a lack of action to a clinical result. A univariable analysis primarily identified that recommendations to vaccinate from the ID consult service were positively associated with vaccination prior to discharge, indicating the benefit of ID physicians recommending additional preventive measures. Although further education among ID providers is warranted, vaccine recommendations were not provided for all eligible patients. For HBV vaccination, a history of any psychiatric diagnosis in patients with documented substance use had a negative association with vaccination prior to discharge. This may be a result of providers addressing acute issues in more complex patients and delaying preventive measures, but the association is concerning and warrants further investigation as these patients often have greater barriers to accessing primary care.[19] More than 75% of these patients were not established with a PCP, highlighting the need for providing this traditional outpatient care during inpatient admission.

A number of screening laboratories were sent inappropriately resulting in unnecessary costs. While HAV screening including IgG was sent for 66 patients, IgM was inappropriately sent for 38, 31 (82%) of whom had normal or only mildly elevated LFTs. HAVIgM is less helpful in the setting of screening for immunity as these antibodies are a product of acute infection and are commonly undetectable 6 months following infection. However, HAVIgG is present following prior infection or vaccination if an immune response has been mounted.[8] Pre-vaccination screening for HBV also varied and HBVcIgM was sent for 17 patients without indications. This represents unnecessary cost and warrants diagnostic stewardship efforts and education for providers.

HAV, HBV, and tetanus risk and infection in PWUS

HAV vaccination is safe and effective, as well as reducing healthcare utilization and resulting costs.[20] Despite ACIP recommending HAV vaccination in PWID since 1996,[21] recent seroprevalence studies have demonstrated that significant portions of this population remain susceptible to HAV and HBV. HAV susceptibility in PWID aged 18–40 is reported at 56–63% in recent studies; HBV susceptibility in this age group ranges from 28 to 52%. Both studies found that younger patients were more likely to be susceptible to both HAV and HBV.[22,23] In addition, a large proportion of our patients had unstable housing, which was newly added to HAV vaccination recommendations in 2019 following multiple large outbreaks in the US.[11,24]

Tetanus in the US is relatively rare[25] due to childhood vaccination strategies; however, for PWID without updated vaccination, it poses a significant risk. Cases of tetanus associated with injection drug use have been published for over 100 years and continue to be reported in the current day, specifically tied to black tar heroin injection.[26–28] ACIP has identified injection drug use as a risk factor for tetanus for decades.[29]

Benefits of screening and vaccination

There are significant implications for PWUS remaining susceptible to these infections. In a

HAV outbreak reported from West Virginia in 2018, direct clinical costs for more than 1300 Medicaid beneficiaries with identified SUD were estimated at 1–4.4 million dollars over an 18-month study period.[30] Furthermore, based on an HAV outbreak in Kentucky, it was estimated that a vaccination rate of at least 77% in PEH or PWUS would confer herd immunity in this population. Vaccination in this outbreak was estimated to have averted 30 hospitalizations and reduced costs by almost 500,000 dollars.[31]

A cost-effectiveness study evaluating various screening and treatment strategies found that both screening and treating for active disease as well as vaccinating those PWID that remained susceptible to HBV were cost-effective.[32] More recently, universal vaccination of all adults for HBV is cost-effective.[15]

Given the risk of tetanus with injection of certain substances and the resulting mortality, it is important to ensure patients are vaccinated every 5–10 years. Data in this space are limited due to the relatively low incidence of tetanus because of mass vaccination.[25]

Barriers to care and potential solutions

A number of barriers exist for PWUS seeking primary or preventive care, as is evident in only 24% of our population having established a PCP at the time of admission. In qualitative interviews, conducted with patients from both urban and non-urban communities, patients identified a perceived lack of need as well as difficulty attending appointments due to competing priorities (finding shelter and obtaining and using drugs to prevent opioid withdrawal, for example).[33,34] Systemic failures related to difficulty navigating the US healthcare system, unreliable transportation, and long wait times were also commonly identified[33,34] In another survey of PWID, patients identified avoiding stigma in healthcare by delaying presentation, not disclosing drug use, and downplaying pain. These patients did report having more positive experiences at community-based organizations like syringe service programs (SSP).[34,35]

While coordinating vaccination services through SSP appears to be an obvious strategy to increase vaccination rates in PWID, several barriers have been identified by these programs including a lack of sufficient physical space and staffing, especially for licensed vaccination providers as well as addressing patients' immediate needs often taking precedence over preventive care measures.[36]

Other strategies to improve vaccination rates in PWUS in community settings include vaccination at outpatient drug treatment services[37] and contingency management programs at similar facilities with financial incentives for attending appointments.[38,39] While all these strategies have resulted in an increase in HBV vaccination, they were all conducted outside of the US where resources are likely allocated differently and with a greater focus on preventive and primary care.

Given the rate of hospitalization for PWUS with bacterial infections has increased in recent years,[1] hospitalization represents a significant opportunity to provide preventive care while patients are being treated in the hospital. HAV vaccination has been shown to result in sufficient antibody response even when just the first dose is completed, with an increase or anamnestic response with the administration of a booster dose out to 10 years after the initial dose.[40] This indicates initiation of the HAV vaccine series while inpatient is beneficial even when outpatient follow-up for subsequent doses cannot be confirmed. This population would greatly benefit from national vaccine registries so that vaccination history could be more easily and reliably obtained, although there are barriers to building EMRs of this scale.[41] In a study attempting to increase HAV vaccination in hospitalized patients with pre-existing cirrhosis, a two-step approach involving a note template and education session for providers resulted in higher rates of vaccination in the post-intervention group.[42] A significant proportion of our patients had exposure to HCV (188; 67.1%) or are at high risk for HCV acquisition. Given the increased risk of morbidity and mortality in patients with HCV and either HAV or HBV co-infections,[43,44] vaccination is especially important to prevent morbidity and mortality from co-infection.

Harm reduction plays an important role in reducing the spread of transmissible diseases in PWID. Approaches including SSP and supplies and education on safer injection methods have been shown to significantly decrease transmission of HIV and HCV.[45,46] Less data are available for the effect on the transmission of HAV and HBV, but

given that these viruses remain on drug use equipment for 1–10 weeks,[47,48] harm reduction around injection practices should be employed, especially during inpatient admissions as access to preventive care and services are often limited for outpatient.

Limitations

Our study has a number of limitations. The retrospective nature of this study limits our ability to collect data on all ID recommendations made to those documented in chart notes and will not capture those made verbally to the primary team. This also limits our ability to accurately assess why certain patients with vaccine recommendations were not vaccinated. This study was conducted at a single academic center with a majority of patients identifying as white which limits generalizability to more diverse populations. Our vaccination rates were low, limiting our ability to assess multiple and rare risk factors. All included patients had the benefit of both addiction medicine and ID consult, where we would expect vaccination recommendations to be higher.

Future research/recommendations

The inpatient setting represents a significant missed opportunity to vaccinate these at-risk patients who are less likely to obtain preventive care in the outpatient setting. Future efforts to increase screening and vaccinations during hospital admission in PWUS should include easy-to-use protocols and order sets within the EMR to simplify screening and guide primary teams, as well as training to educate inpatient providers on consideration of traditionally outpatient preventive measures. Harm reduction education during an inpatient stay should also be used to guide PWID on safer injection practices to reduce bloodborne pathogen transmission.

Conclusion

Though the CDC has recommended HAV and HBV vaccination in PWID for more than two decades, screening and vaccination are still remarkably low in the inpatient setting with a large proportion of our population at risk for these infections. Increased vaccination is important to reduce outbreaks and complications in PWUS and results in significant cost reduction. Furthermore, the rate at which HAV and HBVcIgM were ordered in patients without laboratory results consistent with acute hepatitis indicates the need for education among providers and diagnostic stewardship efforts.

The limited access to healthcare in this vulnerable population leaves a substantial gap in preventive care, putting these patients at increased risk of complications due to HAV, HBV, and tetanus. It is time to improve rates of screening and vaccination and to incorporate harm reduction strategies during hospital admission to fix this hole, but also to dedicate more resources to vaccination administration opportunities in non-traditional outpatient settings.

Declarations

Ethics approval and consent to participate

This retrospective chart review involving human participants was in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The Human Investigation Committee (IRB) of Oregon Health and Science University approved this study (ethics approval ID: IRB00003522). Consent to participate was waived by OHSUIRB under an approved Waiver of Health Insurance Portability and Accountability Act Authorization Requirement due to the retrospective and minimal risk nature of the study.

Consent for publication

Not applicable.

Author contributions

Amber C. Streifel: Conceptualization; Data curation; Investigation; Methodology; Project administration; Writing – original draft; Writing – review & editing.

Jose Eduardo Rivera Sarti: Data curation; Writing – original draft.

Monica K. Sikka: Conceptualization; Methodology; Project administration; Visualization; Writing – review & editing.

Michael Conte: Data curation; Writing – review & editing.

Bradie Winders: Data curation; Writing – review & editing.

Cara D. Varley: Conceptualization; Data curation; Formal analysis; Methodology; Project administration; Visualization; Writing – review & editing.

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Competing interests
The authors declare that there is no conflict of interest.

Availability of data and materials
The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Supplemental material

Supplemental material for this article is available online.

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