Table 1. General Characteristics

| Characteristics                        | Patients N (%) |
|----------------------------------------|----------------|
| Number of patients                     | 24             |
| Age, median (interquartile range)      | 61 (57–66)     |
| Male sex                               | 18 (75)        |
| Black race                             | 19 (81)        |
| Obesity (body mass index >30)          | 10 (42)        |
| HCV genotype                           |                |
| 1a                                     | 17 (71)        |
| 1b                                     | 5 (21)         |
| 2                                      | 2 (8)          |
| Type of cancer                         |                |
| Hematologic                            | 6 (25)         |
| Solid                                  | 18 (75)        |

*a* Multiple myeloma (2), acute myeloid leukemia (2), non-Hodgkin lymphoma (2).

*b* Prostate (3), head and neck (2), lung (2), renal (2), anal (2), ovarian (2), breast (1), thyroid (1), gastrointestinal stromal tumor (1).

Disclosures. H. Torres, Gilead Sciences, Merck & Co., Inc., Grant Investigator, Grant recipient. Vertex Pharmaceuticals: Grant Investigator, Grant recipient.

2228. Late Viral Relapse After Direct-Acting Antiviral Treatment in Hepatitis C Virus-Infected Cancer Patients

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Background. According to professional societies, the endpoint to consider hepatitis C virus (HCV) infection cured is the achievement of a sustained virologic response 12 weeks after treatment completion (SVR12). Late recurrences (beyond SVR12) are rare. Herein, we report two cases of HCV-infected cancer patients with late relapses post direct-acting antivirals (DAAs).

Methods. Patients with any type of chronic cancer and HCV treated with DAAs between January 2014 and March 2018 at MD Anderson Cancer Center were prospectively followed. All patients had HCV RNA levels at baseline; 2 and 4 weeks after initiation of DAAs; at end of treatment (EOT); and 12 weeks after completion of DAAs. No phylogenetic analyses were available for samples collected.

Results. Among 196 HCV-infected cancer patients treated with DAAs, 20 developed viral relapse, 2 (10%) of them with late relapse (Figure 1). Both patients denied behaviors, exposures, and conditions associated with HCV reinfection. Case 1: Fifty-six-year-old male with hepatocellular carcinoma (HCC), HCV genotype 1a, interferon-experienced, with compensated cirrhosis received in 2017 ledipasvir/sofosbuvir for 12 weeks, followed by systemic chemotherapy and sorafenib. He achieved an SVR12 but developed HCV relapse 12 weeks later (24 weeks after EOT). Patient remained infected with HCV 1a. He did not receive retreatment due to HCC not amenable for curative treatment. Case 2: 57-year-old male with multiple myeloma, HCV genotype 1a, interferon-experienced without cirrhosis. He received sofosbuvir and simeprevir in 2015 for 12 weeks. Post DAAs, he received chemotherapy with carfilzomib, lenalidomide, dexamethasone, and ixazomib followed by autologous hematopoietic cell transplant pre-conditioned with melphalan. He achieved both an SVR12 and SVR 24 but had HCV relapse detected during the one year follow-up visit. Patient remained infected with HCV 1a. He has retreated with sofosbuvir, velpatasvir, voxilaprevir and ribavirin and currently with HCV RNA level at EOT.

Conclusion. Late HCV relapses can occur in HCV-infected cancer patients. Long-term monitoring of HCV RNA and easy-to-use tests to differentiate relapses from reinfection in real-world practice are warranted in this population.

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2229. Low Hepatitis C Virus Reinfection Rates After Sustained Viral Response in HIV Co-infected Patients in Houston, Texas

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Background. Hepatitis C Virus (HCV) infection is a significant public health problem associated with a high morbidity and mortality. HCV recurrence is a particular concern in patients with ongoing high-risk behaviors. Previous studies have shown a wide variation in HCV reinfection rates, but have considered small selected populations. The aim of our study was to estimate the HCV reinfection rates in a representative real-world cohort of HCV/HIV co-infected patients in Houston, Texas and to compare it with what was published.

Methods. Retrospective cohort study of HCV/HIV co-infected patients treated between January 2004 to July 2016 at a freestanding HIV clinic that serves indigent and minority patients. HCV reinfection was defined as a single detectable HCV RNA level after achieving SVR 12. We reviewed demographic data, risk behaviors, laboratory tests and treatment outcomes. Cox proportional hazards regression was used to estimate reinfection rates. A meta-analysis was performed to calculate the reinfection rates reported in the literature in different patient populations.

Results. Of 288 patients treated, 187 (65%) achieved SVR12 by the end of the study: Follow-up data were available in 151 (81%) patients. Median follow-up time after SVR12 was 1.26 (0.66, 2.13) years. About 0.9% (2/211) of patients became reinfected, with a reinfection rate of 10.8 (1.3–39.1) per 1,000 PYFU. Our meta analysis demonstrated higher reinfection rates in different populations (87.8 (60.9–127) per 1,000 PYFU in MSM; 65.6 (34.1–126) per 1,000 PYFU in IVDU and 13.3 (10.4–17.5) per 1,000 PYFU in non-IVDU). For our patient population, the mean time to SVR12 reinfection was 52.5 weeks, and reinfection was with the same HCV genotype. Both patients were MSM and reported high-risk sexual behavior; one patient also developed syphilis. Both patients have been retreated. One has achieved SVR12 and the other has successfully completed treatment and is awaiting SVR12 check-up in the following weeks.

Conclusion. The reinfection rate in our diverse cohort of HIV/HCV treated patients is very low compared with others studies. Efforts to reduce risk behaviors are important if HCV elimination is to be achieved.

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2230. Treatment Outcomes for Hepatitis C Patients from Two Federally Qualified Community Health Centers in South Carolina

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Background. Approximately 3.9 million Americans live with chronic Hepatitis C virus (CHCV). Major advances have been made in the treatment of CHCV, with the availability of oral directly acting antiviral (DAA) regimens. However, significant barriers to treatment remain for patients accessing safety net providers for care. In 2011, 61,294 Community Health Center (CHC) patients had Hepatitis C as their primary diagnosis. This study provides insight into unique CHC patient characteristics and outcomes of care at two federally qualified health centers (FQHC). To understand if differences in patient outcomes is associated with a high morbidity and mortality. HCV recurrence is a particular concern in patients with ongoing high-risk behaviors. Previous studies have shown a wide variation in HCV reinfection rates, but have considered small selected populations. The aim of our study was to estimate the HCV reinfection rates in a representative real-world cohort of HCV/HIV co-infected patients in Houston, Texas and to compare it with what was published.

Methods. We queried electronic health records (EHR) from Q4 2014 to Q1 2018 for Hep C patients attending two FQHCs in South Carolina (n = 223). Data from both practices were aggregated to capture sustained virologic (SVR) rates at 12 weeks post treatment. Patient demographic factors, including age, gender; race/ethnicity, insurance status and people who inject drugs (PWID) were extracted. Clinical measures such as baseline and post treatment viral loads, Fibrosure, AST to Platelet Ratio Index (APRI) measures, pre treatment and post treatment liver ultrasound screening, HCV genotype, and HIV co-infection are reported. Patient outcomes were monitored using SVR viral load values (detectable or nondetectable) at 12 weeks and 1 year from treatment onset.

Results. Mean age was 57.03 SD ± 0.65 with 71.7% of the population treated aged 55 or older. Most patients were males (63.2%), African American (68.2%) and uninsured (31.4%). Median baseline HCV viral load was 1,950,000 IU/mL. About 95.9% of the patients were naive to Hepatitis C treatment. Majority of Fibrosure stages (F0–F2 48.9%; and F3–F4 32.7%) and APRI scores both showed about half of patients presented with little likelihood of liver cirrhosis. Post-liver ultrasound occurred in 37.2% of the population. Top three genotypes were 1a (67.3%), 1b (17.5%) and 2b (9.8%). The proportion of PWID among those responding was 23.4%.HIV coinfection in the population sample was 29.1%, while the SVR VL was nondetectable for 97.6%.
223. Long-Term Immunogenicity of Four Doses and Four Double Doses vs. Standard Doses of Hepatitis B Vaccination in HIV-Infected Adults: An Extension of a Randomized Controlled Trial

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Background. Previous studies showed that the response rate to standard hepatitis B (HepB) vaccination schedule among HIV-infected patients ranged between 33.3 and 65% due to an impaired response. However, we have reported that the response rate was not different from four doses and four double doses schedule. This study followed those patients for at least 3 years to evaluate the efficacy of the three regimens.

Methods. From February 4, 2011 to May 4, 2012, 132 HIV-infected adults who had ever received HepB vaccination were enrolled. A total of 79 patients were randomly assigned to receive either four doses or four double doses of HepB vaccine and n = 44, 40 μg IM at Months 0, 1, 2, 4 (four double doses group, n = 44). Between January 2015 and January 2016, 126 participants were evaluated; 42 in the “standard doses group”, 43 in the “four doses group”, and 41 in the “four double doses group”.

Results. At a median duration of 49.6 months (range 40.6, 53.7) after vaccine regimen completion, the percentages of responders with anti-HBs ≥20 mIU/mL were 57.1% (95% CI, 41.5–72.8%) in the Standard doses group; 76.7% (95% CI 63.6–89.9%) in the Four doses group (P = 0.007); and 80.5% (95% CI 76.8–93.2%) in the Four double doses group (P = 0.033 vs. the standard vaccine group). Factor associated with a responder was vaccination schedule (either four standard doses or four double doses) and younger age.

Conclusion. Despite highly effective standard HBV vaccination schedule at 6 months after completion of vaccine regimen, long-term immunogenicity was lower than the four double doses regimen among HIV-infected adults with CD4+ cell counts >200 cells/mm³ and undetectable plasma HIV-1 RNA.

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2232. Zinc deficiency and advanced liver fibrosis among HIV/HCV co-infected persons in Russia

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Background. Liver disease in people living with HIV (PLWH) co-infected with hepatitis C virus (HCV) is a common cause of non-AIDS-related death in Russia. HIV accelerates liver fibrosis in the setting of HCV co-infection thus PLWH have increased risk of hepatic carcinoma, hepatocellular carcinoma, and liver-related mortality. Injection drug use is common among Russian PLWH and zinc deficiency is common among PLWH and people who inject drugs. We hypothesize that zinc deficiency facilitates the underlying mechanisms of liver fibrosis. We investigated the association between zinc deficiency and advanced liver fibrosis (ALF) in a cohort of HIV/HCV co-infected persons in Russia.

Methods. Anti-retroviral naive HIV-infected Russians with a recent history of heavy drinking were recruited into a clinical trial of zinc supplementation. A subset of participants (N = 204) were HIV co-infected (qualitative HCV RNA positive) at baseline. The primary dependent variable in this cross-sectional study was advanced liver fibrosis defined as either (1) FIB-4 >3.25, (2) FIB-4 ≥2.17 or ≥1.5 with elastography suggestive of ALF ≥205.0 kPa, or (3) APRI ≥2.15. Zinc deficiency, the main independent variable, measured at baseline, was defined as <0.75 mg/L for the primary analysis. In secondary analyses, zinc level was categorized into tertiles. Analyses were conducted using multivariable logistic regression adjusted for potential confounders: demographics including BMI, HCV-related factors, and substance use including alcohol and cocaine.

Results. Participant characteristics were: 33 years [median age]; 25% female; 25% with ALF, and 42% injection drug use in the past 30 days. Among those with zinc deficiency (N = 65) compared with those with normal zinc levels (n = 139), the prevalence of ALF was similar (27.7% vs. 23.0%, respectively). We did not detect an association between zinc deficiency and ALF in the adjusted regression model (aOR: 1.28, 95% CI: 0.62-2.61, P = 0.51). No significant interaction with HCV infection was found in secondary analyses. Of the covariates, CD4 count <350 cells/μL was significantly associated with ALF (aOR: 2.2, 95% CI: 1.05-4.62, P = 0.04).

Conclusion. In this cohort of HIV/HCV co-infected Russians, we did not detect an association between zinc deficiency or zinc levels and advanced liver fibrosis.

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2233. Hepatitis C Eradication: Who Is Being Left Behind in the HIV Population?

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Background. HCV treatment has increased since direct-acting antivirals became available. HCV clinics are scaling up treatment to eradicate HCV. Little is known about HIV patients and access to HCV treatment.

Methods. We retrospectively analyzed all HIV/HCV co-infected patients within our safety-net hospital system who received outpatient care in our HIV clinics from November 1, 2015 to October 31, 2017. Data were abstracted on demographics, insurance, HIV RNA, drug use, homelessness, and number of visits. No visits for >1 year was lost to care and missed visits was missing >1 primary care visit. We examined the association of these variables to risk of having a detectable HCV RNA (surrogate marker for HCV treatment) through multivariate logistic regression.

Results. We identified 914 with HIV/HCV (72% male, 53% Black, 39% Medicaid, 29% Medicare, 6% Ryan White, 2% homeless) of which 47% were heterosexual, 36% MSM, and 14% IDU. HIV was undetectable in 74%, 69% were between age 46 and 65, 17% had active alcohol use and 33% had drug use. HCV RNA was available for 868 and was detected in 57%. Whites and Hispanics compared with Blacks were less likely to have detectable HCV RNA. Detectable HCV RNA was more likely in those >50 years of age compared with <40 years, with detectable HIV viral load, >1 missed visit, and lost to care.

Conclusion. We found that those at risk for not being treated for HCV were HIV older patients and those not engaged in HIV care or not suppressed on HIV treatment. To achieve HCV eradication will require efforts to engage older patients, Blacks, those noncompliant with ART, and not engaged in HIV care.