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MAJOR ARTICLE

Impact of an Electronic Medical Record-Based System to Promote Human Immunodeficiency Virus/Hepatitis C Virus Screening in Public Hospital Primary Care Clinics

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Background. United States guidelines recommend that all adolescents and adults be tested for human immunodeficiency virus (HIV) and that persons born between 1945 and 1965 be tested for hepatitis C virus (HCV).

Methods. We used electronic medical record (EMR) data to identify patients in 3 primary care clinics in Seattle, Washington who met national criteria for routine HCV or HIV testing and had no documented history of prior testing. Clinic staff received daily lists of untested patients with scheduled appointments. We used generalized linear models to compare the percentage of patients tested and newly diagnosed with HIV and HCV in the 18 months before and during the intervention.

Results. A total of 16 784 patients aged 18–64 and 9370 patients born between 1945 and 1965 received care from January 2011 to December 2015. Comparing the preintervention and intervention periods, the percentage of previously untested patients tested for HIV and HCV increased from 14.9% to 30.8% and from 18.0% to 35.5%, respectively ($P < .0001$ for both). Despite this increase in testing, there was no change in the percentage of patients newly diagnosed with HIV (0.7% in both periods, $P = .96$) or HCV (3.6% vs 3.7%, $P = .81$). We estimate that 1.2%–15% of HCV-infected primary care patients in our medical center are undiagnosed.

Conclusions. EMR-based HCV/HIV testing promotion increased testing but not case finding among primary care patients in our medical center. In our institution, most HCV-infected patients are already diagnosed, primarily through risk-based and clinical screening, highlighting the need to concentrate future efforts on increasing HCV treatment.

Keywords. hepatitis C; HIV; electronic medical record; screening; quality improvement.

Human immunodeficiency virus (HIV) and hepatitis C virus (HCV) infections are both treatable, and the United States has established goals for increasing the proportions of infected persons who know their HCV and HIV statuses and who receive treatment [1, 2]. However, an estimated 50% of persons infected with HCV and 14% of persons infected with HIV are unaware of their infections [3–6]. Although the morbidity associated with HIV infection has dramatically declined over the last 2 decades, the rate of new infections has dropped only slightly [7]. Meanwhile, in the absence of a much more aggressive and successful approach to diagnosis and treatment, the morbidity and mortality associated with HCV infection is projected to rise dramatically over the next 2 decades [8]. Identifying persons with HIV and HCV is the critical first step in clinical and public health efforts to minimize the morbidity and mortality associated with these infections and avert their ongoing transmission. With those objectives in mind, the US Centers for Disease Control and Prevention (CDC) and the US Preventive Services Task Force (USPSTF) have developed recommendations to promote HIV and HCV screening as part of routine medical care [9–12].

Starting in 2011, our group at Harborview Medical Center (HMC) in Seattle began developing a program to increase HIV and HCV testing in patients seen in primary care clinics affiliated with our hospital. Initial work demonstrated (1) that patients were supportive of widespread HIV and HCV testing and (2) that HCV screening would be cost effective [13, 14]. We subsequently initiated a program that uses the electronic medical record (EMR) to promote HIV and HCV testing in accordance with USPSTF recommendations. In this study, we present a description and evaluation of that program as well as data suggesting that a very low proportion of HCV-infected patients in our center are undiagnosed. These findings demonstrate that EMR-based interventions can effectively promote HIV and HCV testing, but they also highlight the need to focus greater attention on more distal steps in the HIV and HCV care continuums.

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METHODS

Study Population

The study population included patients who received primary medical care between June 1, 2011 and July 31, 2015 at 1 of 3 primary care clinics affiliated with HMC. HMC is a public hospital owned by King County and managed by the University of Washington. The clinics included the HMC Adult Medicine Clinic, the HMC Family Medicine Clinic, and the HMC Pioneer Square Clinic. All HMC clinics serve mostly low-income patients. The Adult Medicine and Family Medicine clinics are on the HMC campus, whereas the Pioneer Square Clinic is located off the HMC campus in downtown Seattle and serves a population that includes a number of persons who are homeless. Because USPSTF and CDC recommendations for HIV and HCV testing affect different groups of patients, the populations in which we evaluated testing varied for the 2 infections. For HCV, we evaluated testing uptake in patients born between 1945 and 1965, whereas for HIV we assessed testing uptake among persons age 18–65.

Data

All data were collected as part of routine clinical care and were electronically abstracted from the HMC EMR. HMC has used 3 different EMR systems since 1995, and for much of this time laboratory data were stored in a separate database. As a result, no single data system includes laboratory and clinical information for patient visits extending over the entire study period. To surmount this obstacle, we used the Caradigm Intelligence Platform (CIP) (Bellevue, WA) to aggregate medical information from diverse data systems into a single database. Aggregated data included laboratory test results for all HCV antibody tests, HCV ribonucleic acid (RNA) tests, and HCV genotypes. Our database also included *International Classification of Diseases, Ninth Revision* (ICD-9) codes associated with HCV diagnoses (070.41, 070.44, 070.51, 070.54, 070.070.70, 070.71). In evaluating these codes, we found (1) that 82% of persons with one of these codes had laboratory evidence of HCV infection (HCV antibody or RNA positive) and (2) that 92% of persons with laboratory evidence of infection had an ICD-9 code associated with HCV. However, among 20 randomly selected persons with an ICD-9 code suggestive of HCV but no laboratory evidence of HCV, 10 (50%) had negative antibody tests for HCV, 6 (30%) had documentation indicating a prior HCV infection, and 4 had no documentation related to HCV infection. Based on this finding, we elected not to use ICD-9 codes alone as evidence of prior HCV testing or infection.

Testing Intervention

Our intervention sought to increase both HCV and HIV testing in 3 HMC primary care clinics. To do this, beginning in July 2013 we used a CIP database to identify patients with scheduled clinic visits who met at least one of the following criteria: (1) born between 1945 and 1965 and had no record of HCV testing based on HMC laboratory records; or (2) age 18–65 and had no record of HIV testing based on HMC laboratory records. A list of these persons was sent to a designated person in each clinic, usually a clinic nurse, every weekday morning. The project sought to have medical assistants pre-enter orders into the EMR for HCV and HIV testing for each patient who met the above criteria for testing. Medical providers were required to electronically sign these orders before laboratory testing could be completed. For HIV, this also required providers to mark affirmative responses to 2 questions indicating that the patient had agreed to HIV testing and that the provider had answered any questions the patient had about the test; HMC risk management interprets Washington State law to require this documentation.

Outcomes and Analytic Approach

To evaluate the impact of our intervention on HIV and HCV testing and case finding (ie, HIV and HCV diagnoses), we compared the preintervention period (January 1, 2011–June 30, 2013) with the intervention period (July 1, 2013–December 31, 2015), classifying each eligible patient into 1 of the following 5, mutually exclusive groups: (1) prior positive test (including any positive antibody or HCV RNA test), (2) prior negative antibody test, (3) new positive antibody test, (4) new negative antibody test, and (5) not tested. We classified all patients as tested (positive or negative) based on the results of their first test for HCV or HIV at any time since 1995 (ie, the date laboratory results were first captured within our dataset). Patients in the preintervention and intervention periods were classified as never tested only if they never tested before the end of each respective period. Among persons with positive tests for HCV antibody, we further assessed whether patients had an HCV RNA test that was positive, negative, or never performed. Because HIV infection is relatively rare and enzyme immunoassays can result in false-positive tests, we reviewed the medical records of each patient thought to have newly diagnosed HIV infection to confirm their diagnosis, the fact that they were not previously HIV diagnosed, and their reason for HIV testing (ie, clinical evaluation for HIV vs screening); we did not review the medical records for each person with a new positive test for HCV infection. We evaluated changes in the percentage of eligible patients tested, test positivity, and HIV/HCV case finding using generalized linear models with a binomial distribution, log link, and random effects for each primary care clinic.

We created 2 estimates for the number of HMC patients born between 1945 and 1965 with undiagnosed HCV. First, we created an upper bound estimate by multiplying the number of HCV untested persons seen in the clinics during the study period by test positivity observed among all tested persons during the intervention period. Second, we created a lower bound estimate by assuming that, in the absence of our intervention, testing during the intervention period would have been similar to that observed during the preintervention period. This estimate assumes that testing in the preintervention period likely included more persons with risk factors or clinical indications for testing, that such testing would have continued to occur in the absence of our intervention, and persons with risks or clinical indications would likely have a higher test positivity than persons screening without risks or clinical indications. We estimated HCV test positivity among persons tested as a consequence of the intervention based on the following formula: $Ptest_I \times Pos_I = (Ptest_{PreI} \times Pos_{PreI}) + ((Ptest_I - Ptest_{PreI}) \times Pos_{NewlyTested})$, where $Ptest_I$ = proportion of patients tested in the intervention period, Pos_I = test positivity among patients tested in the intervention period, $Ptest_{PreI}$ = proportion of patients tested in the preintervention period, Pos_{PreI} = test positivity among patients tested in the intervention period, and $Pos_{NewlyTested}$ = estimated test positivity among patients tested as a consequence of the intervention.

The proportion of undiagnosed cases was calculated as the estimated number of undiagnosed cases divided by the sum of diagnosed and undiagnosed cases. We defined diagnosed HCV cases as persons with positive antibody tests regardless of HCV RNA test results.

The described project was undertaken as a public health program and quality assurance activity and was defined by the University of Washington Institutional Review Board as not being human subjects research.

RESULTS

From January 1, 2011 to December 31, 2015, the 3 participating clinics provided care to 16 784 patients aged 18–64 and 9370 patients born between 1945 and 1965. (The 2 populations were not mutually exclusive.) The testing-eligible populations were approximately two-thirds male and racially and ethnically diverse (Table 1). The clinics had approximately 20% fewer visits by testing-eligible persons in the intervention period than in the preintervention period.

The percentage of eligible patients tested for HIV and HCV increased concurrent with implementation of the intervention (Table 2). Comparing the preintervention and intervention periods, the percentage of previously untested, eligible patients tested for HIV and HCV testing increased from 14.9% to 30.8% and 18.0% to 35.5%, respectively ($P < .0001$ for both). Despite this, the intervention had no impact on either HCV or HIV case finding. Among persons born between 1945 and 1965 who had never been previously tested for HCV, 3.6% of patients in the preintervention period and 3.7% in the intervention period had a new HCV diagnosis based on a positive HCV antibody ($P = .81$), whereas HCV test positivity among tested persons declined from 19.8% to 10.4% ($P < .0001$). Among 135 and 123 persons who newly tested positive for HCV antibody in the preintervention and intervention periods, 97 (71%) and 85 (69%), respectively, were HCV RNA positive. One person in the preintervention period and 1 in the intervention period did not have an HCV RNA test performed. The percentage of all eligible patients who were newly diagnosed with HIV infection in the preintervention and intervention periods remained stable at 0.07%, whereas HIV test positivity declined slightly from 0.46% to 0.23% ($P = .26$). Only 10 patients with no history of prior HIV testing were newly diagnosed with HIV during the entire 3-year period of observation, 5 of whom had clinical indications for testing (ie, opportunistic infections or HIV-associated clinical manifestations that prompted testing) and an additional 4 had HIV risk factors recorded in the medical record at the time of testing (eg, man or transgender woman who had sex with men or birth in sub-Saharan Africa).

Table 1. Characteristics of HMC Primary Care Clinic Patients January 2011–December 2015

Patient Characteristics	HIV Testing Eligible Population[a] (n = 16 784)	HCV Testing Eligible Population[a] (n = 9370)
Male	10 486 (62)	6040 (63)
Female	6298 (38)	3330 (36)
Age		
18–29	2149 (13)	0
30–39	2922 (18)	0
40–49	4128 (25)	1256 (13)
50–59	5280 (32)	5281 (56)
60–70	2305 (14)	2833 (30)
Race		
Non-Hispanic White	6819 (41)	3929 (42)
Non-Hispanic Black	5397 (32)	3205 (34)
Hispanic	2240 (13)	970 (10)
Asian	1218 (7)	698 (7)
Pacific Islander	210 (1)	116 (1)
American Indian/Alaska Native	280 (2)	175 (2)
Other, refused or missing	620 (4)	277 (3)
Clinic		
Adult Medicine	6669 (40)	4341 (46)
Family Medicine	4245 (25)	1849 (20)
Pioneer Square	5870 (35)	3180 (34)
Visits		
Preintervention period	81 613	61 683
Intervention period	65 465	48 677

Abbreviations: HCV, hepatitis C virus; HIV, human immunodeficiency virus; HMC, Harborview Medical Center.

[a]Populations are not mutually exclusive.

Figure 1 shows the percentages of patients in the preintervention and intervention periods who ever tested positive or negative for HCV during or before each period. The percentage of patients who were never tested for HCV declined, whereas the percentage with a new HCV negative test or prior HCV negative test increased, and the percentage of patients with new or prior HCV positive test remained stable. Assuming that HCV test positivity among the HCV untested patients was the same as among all patients tested during the intervention period (10.4%), 224 patients, or 15% of all HCV-infected persons, were undiagnosed at the

Table 2. Percentage of Eligible Patients Tested and Testing Positive for HIV and HCV in the Preintervention and Intervention Periods

Measured Testing Outcome	HIV Testing			HCV Testing		
	Preintervention	Intervention	*P* Value	Preintervention	Intervention	*P* Value
Tested among eligible, previously untested persons	1094 of 7331 (14.9)	2193 of 7112 (30.8)	*P* < .0001	681 of 3773 (18.0)	1185 of 3336 (35.5)	*P* < .0001
Ever tested	4877 of 11 118 (43.9)	6555 of 11 481 (57.1)	*P* < .0001	3859 of 6951 (55.5)	4563 of 6714 (68.0)	*P* < .0001
New positive tests among eligible, previously untested persons	5 of 7332 (.07)	5 of 7112 (.07)	*P* = .96	135 of 3773 (3.6)	123 of 3336 (3.7)	*P* = .81
Positivity among tested[a]	5 of 1097 (0.46)	5 of 2193 (0.23)	*P* = .26	135 of 681 (19.8)	123 of 1185 (10.4)	*P* < .0001

Abbreviations: HCV, hepatitis C virus; HIV, human immunodeficiency virus;

[a]Five of the 10 persons testing newly HIV positive had clinical indications for testing (ie, testing was not screening), and 4 of the other 5 persons who tested positive had evidence in the medical record that their provider had identified an HIV risk factor before HIV testing (eg, man or transgender women) who had sex with men or birth in sub-Saharan Africa.

end of the intervention period. Adopting a more conservative assumption, that test positivity among untested persons was equal to the estimated positivity among persons tested as a result of the intervention (0.75%), only 16 persons, or 1.2% of all HCV-infected patients, born between 1945 and 1965 were undiagnosed.

DISCUSSION

We found that an EMR-based intervention that promoted HIV and HCV testing in accordance with CDC and USPSTF guidelines increased testing, but this had no clear impact on HIV or HCV diagnoses. Of note, even before our intervention, 44% of all eligible patients had tested for HIV and 55.5% had tested for HCV. Approximately 20% of patients in the 3 primary care clinics we evaluated were infected with HCV, although only 1.2%–15% of infected patients were undiagnosed. These findings suggest that although efforts to increase routine HIV and HCV testing did not increase case finding, risk-based and clinical testing in our center has been quite successful, highlighting the need to focus most future efforts on more distal steps in the HIV/HCV care continuum.

Numerous prior studies evaluating routine HIV and HCV testing initiatives in primary care settings have found that such efforts increase testing and can lead to large numbers of persons being screened [15–20]. However, data evaluating the impact of routine testing on HIV and HCV case finding, the outcome of greater importance, are more limited. A multicomponent intervention that included EMR prompts and laboratory orders by medical assistants in community health centers in Philadelphia observed 44% and 225% increases in HCV and HIV case finding, respectively, relative to an historical control period [18]. Likewise, a study of HIV testing in community health centers in the Bronx and Queens observed an almost 700% annual increase in HIV testing and an approximately 200% annual increase in HIV positive tests concurrent with the institution of routine testing [19]. Although these results suggest that routine testing can increase HIV/HCV testing and case finding, these studies did not attempt to use HIV surveillance data to

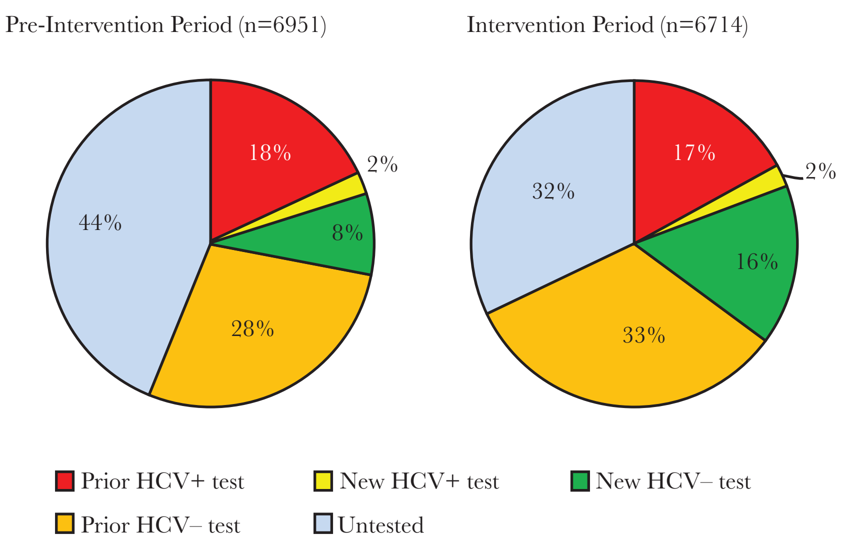

Figure 1. Percentage of primary care patients with prior and new hepatitis C virus (HCV) tests during preintervention and intervention period.

confirm that positive tests were, in fact, new HIV diagnoses; other studies have found that many persons with HIV who test positive for HIV and report no prior HIV diagnosis have prior positive tests reported to public health surveillance [21]. Efforts to promote routine testing within the Veterans Administration have met with less definitive success, dramatically increasing HIV testing, but with an uncertain impact on case finding [22]. Likewise, a study of routine HCV screening among military retirees born between 1945 and 1965 observed very low levels of HCV case finding, with only 0.4% of tested patients having HCV RNA positive infections [23]. Thus, data to date suggest that routine testing in primary care settings can be an important means of identifying persons with undiagnosed HIV and HCV, but that the success of such efforts are variable based on the populations served and the effectiveness of prior and ongoing risk-based screening.

Our findings are at odds with previous studies suggesting that approximately half of HCV-infected persons are undiagnosed [5]. This national estimate is primarily based on 2 sources. Data from the National Health and Nutrition Examination Study (NHANES) collected between 2001 and 2008 found that only 50% of persons testing positive for HCV reported knowing about their infection [24]. Investigators in the Chronic Hepatitis Cohort Study (CHeCS) produced a similar estimate by comparing the number of persons with diagnosed HCV infection among enrollees in 4 health maintenance organizations between 2006 and 2008 to the estimated number of infections in that population based on the age- and race-specific prevalences observed in NHANES [4]. The difference between national estimates and our findings could reflect increases in HCV diagnoses over the last decade or differences between HMC patient population and the larger population infected with HCV. HMC is a university-affiliated public hospital that serves large numbers of persons who use injection drugs, and HMC medical providers may be particularly inclined to test their patients; the large proportion of patients tested for HCV even before our intervention supports this idea. On the other hand, some of the observed difference may reflect imprecision in prior estimates of the undiagnosed fraction of HCV cases. As indicated above, many persons with previously diagnosed HIV infection misreport their status to study interviewers [21], and the same misreporting may have affected the NHANES HCV results. In addition, the true prevalence of HCV infection among persons participating in the CHeCS, all of whom had health insurance, may have been lower than the population enrolled in NHANES. Hepatitis C virus infection is associated with low income and low educational attainment [25], and adjustment for age and race may not have adequately accounted for differences between the CHeCS and NHANES populations, leading to an overestimate of the proportion of HCV-infected persons who were undiagnosed.

Our study has a number of strengths. Our ability to aggregate data from numerous clinical databases used by our institution over 20 years allowed us to estimate the percentage of patients ever tested for HIV or HCV within the University of Washington system, a fact that likely contributed to the high estimate of testing we found. In addition, by performing chart reviews on patients testing positive for HIV, we were able to avoid misclassifying clinical testing as screening. Our study also has important limitations. First and foremost, this was a single center study and our findings may not be generalizable. King County's HIV epidemic is highly concentrated among men who have sex with men, and our health department estimates that only 6% of MSM in our area are undiagnosed, compared with 14% of all HIV infections in the United States as a whole [6, 26]. As a result, routine HIV screening may be a relatively ineffective intervention in King County where the reservoir of undiagnosed infection is small and highly concentrated. Because our hospital serves many patients with a history of injection drug use, the percentage of HCV-infected persons with such a history may be higher than in many other medical settings, leading to greater success of risk-based testing. Finally, our estimate of the percentage of patients who previously tested for HIV and HCV is certainly an underestimate, because many patients likely tested somewhere outside of the University of Washington system, events that would not have been identified using our EMR.

CONCLUSIONS

In conclusion, we found that a system that uses the EMR to identify persons requiring HIV or HCV testing increased screening in primary care clinics, but did not significantly increase HIV or HCV case-finding. Medical providers in our system had already tested many patients for whom screening is recommended, and the vast majority of HCV infected persons had already been diagnosed. Although the extent to which our findings are widely generalizable is uncertain, and it seems unlikely that HMC is truly unique. Our results highlight that success in identifying persons infected with HIV and HCV in different institutions is heterogeneous, and that additional efforts to promote routine testing may have relatively little impact. In contrast, in virtually all clinical settings, large numbers of infected patients remain untreated, a fact that should prompt greater emphasis on improving more distal steps in the HCV care continuum.

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References

1. U.S. Department of Health and Human Services. Action Plan for the Prevention, Care, and Treatment of Viral Hepatitis; **2014**. Available at: https://www.aids.gov/pdf/viral-hepatitis-action-plan.pdf. Accessed 14 May 2017.
2. White House Office on National AIDS Policy. National HIV/AIDS Strategy for the United States. Washington D.C.: White House Office on National AIDS Policy; **2010**. Available at: https://www.whitehouse.gov/sites/whitehouse.gov/files/images/nhas-2016-progress-report.pdf. Accessed 14 May 2017.
3. Younossi ZM, Stepanova M, Afendy M, et al. Knowledge about infection is the only predictor of treatment in patients with chronic hepatitis C. J Viral Hepat **2013**; 20:550–5.
4. Spradling PR, Rupp L, Moorman AC, et al. Hepatitis B and C virus infection among 1.2 million persons with access to care: factors associated with testing and infection prevalence. Clin Infect Dis **2012**; 55:1047–55.
5. Holmberg SD, Spradling PR, Moorman AC, Denniston MM. Hepatitis C in the United States. N Engl J Med **2013**; 368:1859–61.
6. Bradley H, Hall HI, Wolitski RJ, et al. Vital signs: HIV diagnosis, care, and treatment among persons living with HIV—United States, 2011. MMWR Morb Mortal Wkly Rep **2014**; 63:1113–7.
7. Johnson AS, Hall HI, Hu X, et al. Trends in diagnoses of HIV infection in the United States, 2002–2011. JAMA **2014**; 312:432–4.
8. Rein DB, Wittenborn JS, Weinbaum CM, et al. Forecasting the morbidity and mortality associated with prevalent cases of pre-cirrhotic chronic hepatitis C in the United States. Dig Liver Dis **2011**; 43:66–72.
9. Smith BD, Jorgensen C, Zibbell JE, Beckett GA. Centers for Disease Control and Prevention initiatives to prevent hepatitis C virus infection: a selective update. Clin Infect Dis **2012**; 55(Suppl 1):S49–53.
10. Moyer VA; U.S. Preventive Services Task Force. Screening for hepatitis C virus infection in adults: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med **2013**; 159:349–57.
11. Branson BM, Handsfield HH, Lampe MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. MMWR Recomm Rep **2006**; 55:1–17; quiz CE1–4.
12. Moyer VA; U.S. Preventive Services Task Force. Screening for HIV: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med **2013**; 159:51–60.
13. Coffin PO, Stevens AM, Scott JD, et al. Patient acceptance of universal screening for hepatitis C virus infection. BMC Infect Dis **2011**; 11:160.
14. Coffin PO, Scott JD, Golden MR, Sullivan SD. Cost-effectiveness and population outcomes of general population screening for hepatitis C. Clin Infect Dis **2012**; 54:1259–71.
15. Jonas MC, Rodriguez CV, Redd J, et al. Streamlining screening to treatment: the hepatitis C cascade of care at Kaiser Permanente Mid-Atlantic States. Clin Infect Dis **2016**; 62:1290–6.
16. Buzi RS, Madanay FL, Smith PB. Integrating routine HIV testing into family planning clinics that treat adolescents and young adults. Public Health Rep **2016**; 131(Suppl 1):130–8.
17. Futterman D, Stafford S, Meissner P, et al. Ten sites, 10 years, 10 lessons: scale-up of routine HIV Testing at Community Health Centers in the Bronx, New York. Public Health Rep **2016**; 131(Suppl 1):53–62.
18. Coyle C, Kwakwa H. Dual-routine HCV/HIV testing: seroprevalence and linkage to care in Four Community Health Centers in Philadelphia, Pennsylvania. Public Health Rep **2016**; 131(Suppl 1):41–52.
19. Rodriguez V, Lester D, Connelly-Flores A, et al. Integrating routine HIV screening in the New York City Community Health Center Collaborative. Public Health Rep **2016**; 131(Suppl 1):11–20.
20. Patel RC, Vellozzi C, Smith BD. Results of hepatitis C birth-cohort testing and linkage to care in selected U.S. sites, 2012–2014. Public Health Rep **2016**; 131(Suppl 2):12–9.
21. Sanchez TH, Kelley CF, Rosenberg E, et al. Lack of awareness of human immunodeficiency virus (HIV) infection: problems and solutions with self-reported HIV serostatus of men who have sex with men. Open Forum Infect Dis **2014**; 1:ofu084.
22. Goetz MB, Hoang T, Kan VL, et al. Rates and predictors of newly diagnosed HIV infection among veterans receiving routine once-per-lifetime HIV testing in the veterans health administration. J Acquir Immune Defic Syndr **2015**; 69:544–50.
23. Laufer CB, Carroll MB. Hepatitis C virus in the US military retiree population: to screen, or not to screen? J Clin Med Res **2015**; 7:757–61.
24. Denniston MM, Klevens RM, McQuillan GM, Jiles RB. Awareness of infection, knowledge of hepatitis C, and medical follow-up among individuals testing positive for hepatitis C: National Health and Nutrition Examination Survey 2001–2008. Hepatology **2012**; 55:1652–61.
25. Denniston MM, Jiles RB, Drobeniuc J, et al. Chronic hepatitis C virus infection in the United States, National Health and Nutrition Examination Survey 2003 to 2010. Ann Intern Med **2014**; 160:293–300.
26. Fellows IE, Morris M, Birnbaum JK, et al. A new method for estimating the number of undiagnosed HIV infected based on HIV testing history, with an application to men who have sex with men in Seattle/King County, WA. PLoS One **2015**; 10:e0129551.