

BMJ Open Quality Improving adherence to hepatitis C screening guidelines

Jane Trinh,^{1,2} Nicholas Turner^{1,2}

To cite: Trinh J, Turner N. Improving adherence to hepatitis C screening guidelines. *BMJ Open Quality* 2018;**7**:e000108. doi:10.1136/bmjopen-2017-000108

Received 24 May 2017
Revised 27 October 2017
Accepted 23 April 2018

ABSTRACT

Background Hepatitis C (HCV) is a viral liver disease that can result in cirrhosis, hepatocellular carcinoma, liver transplantation or death. The Centers for Disease Control (CDC) estimates that 2.7–3.9 million Americans are living with HCV, yet the majority are unaware. Starting in 2013, both CDC and US Preventative Services Task Force guidelines agreed in recommending HCV screening for all those born between 1945 and 1965 yet many clinics have been slow to adopt screening.

Objective We designed a quality improvement project seeking to improve HCV screening rates among patients seen for new or annual visits to $\geq 90\%$ over a 3-year period in an academic primary care clinic.

Methods Screening rates were assessed through repeated review of charts (50 per cycle or 300 charts total, roughly 35% of eligible visits) as a series of interventions were executed. Sustainability was assessed by repeating an additional 50-chart analysis 1 year after completion of the study interventions. At the conclusion of the study, a post hoc analysis of socioeconomic factors was undertaken to determine whether gender, income or ethnicity might affect screening rates.

Results Over 6 cycles of interventions, screening rates improved from 24% to $\geq 90\%$. Screening rates remained at 88% 1 year after completion of the interventions. The most effective interventions used reminders built into our electronic medical record and informed providers of their personal HCV screening rates relative to the clinic as a whole. Our post hoc analysis found that lower socioeconomic standing and white race were associated with reduced likelihood of screening.

Conclusions Provider adoption of new HCV screening guidelines can be markedly and sustainably increased with electronic medical record prompts as well as directed feedback informing providers of their personal screening rates compared with colleagues.

PROBLEM

There has been ongoing uncertainty among primary care providers about the new Centers for Disease Control (CDC) and US Preventative Services Task Force (USPSTF) recommendations for hepatitis C virus (HCV) screening. In contrast with many targeted recommendations, the CDC and USPSTF has recommended universal screening based on a birth cohort, patients born between 1945 and 1965. The recommendation for screening despite absence of reported risk factors has posed a particular barrier in primary care settings,

in physician's considering screening, and potentially in patients accepting screening due to stigma surrounding a disease primarily spread via intravenous drug abuse.

This quality improvement (QI) project sought to quantify baseline HCV screening rates in our primary care clinic on release of the guidelines in 2013 and to propose interventions to improve screening rates in our clinic. Our clinic is an academic practice based in Durham, North Carolina, and consists of combined internal medicine and paediatrics physicians. It is a combined faculty-resident primary care clinic, with 23 resident physicians and 4 faculty physicians.

We aimed to increase the proportion of patients born between 1945 and 1965 who are appropriately screened for hepatitis C infection at annual or new patient visits to $>90\%$ over a 3-year period in our combined internal medicine-paediatrics primary care clinic.

BACKGROUND

HCV is an RNA virus which can cause chronic infection leading to hepatic cirrhosis, hepatocellular carcinoma and liver failure requiring transplantation—yet the vast majority of patients are asymptomatic following acute infection.^{1,2} The CDC estimates that 2.7–3.9 million Americans are living with HCV infection, with 45%–85% unaware they were ever infected.³ Traditionally, HCV screening targeted only those patients with documented risk factors for HCV infection, yet data from the National Hepatitis Screening Survey show that targeted screening misses 31%–47% of cases of HCV in the USA.² Screening has become particularly important with the advent of highly effective direct-acting antiviral agents, which can prevent development of cirrhosis, hepatocellular carcinoma or need for transplantation.^{4,5}

Epidemiologists identified a particular birth cohort, those born between 1945 and 1965, which carries the majority of the HCV burden in the USA with 67% of all cases.⁶ As a result, both the CDC and USPSTF recommend HCV



¹Internal Medicine, Duke University Health System, Durham, North Carolina, USA
²Pediatrics, Duke University Health System, Durham, North Carolina, USA

Correspondence to
Dr Jane Trinh;
jane.trinh@duke.edu

screening for all those born between 1945 and 1965, in addition to those at increased risk based on traditional risk factors.⁷⁻⁹ Screening consists of an initial HCV antibody test followed by confirmatory PCR if positive. The release of the updated CDC and USPSTF guidelines on HCV screening presented an opportunity to evaluate the adoption of new guidelines within an academic primary care clinic.

BASELINE MEASUREMENT

Baseline data on HCV screening within the combined internal medicine-paediatrics primary care clinic were obtained through a retrospective chart review of annual or new patient visits between January and April 2013. Records of 51 patients seen for annual or new patient visits in this time frame were examined. Annual or new patient visits were examined alone rather than return visits or acute care visits since these are typically the visits where screening test indications are reviewed. Each patient's complete laboratory records within the institutional electronic medical record (EMR) were reviewed so that HCV testing would be detected even if not discussed at the specified annual clinic visit.

We defined the HCV screening rate as the number of individuals with a laboratory-documented HCV serology divided by the number of individuals seen for annual or new patient visits. Screening rates for HCV were assessed at regular 6 months interval for about 3 years (the duration of the QI project) by direct chart review of approximately 50 consecutive annual or new patient visits for each interval (300 charts total, comprising roughly 35% of eligible clinic visits).

Baseline data on provider knowledge of and comfort with the new screening guidelines were obtained through an online survey.

Baseline HCV screening rates

Among the 51 patients examined, only 12 (23.5%) had received HCV testing in accordance with CDC and USPSTF screening guidelines. Among the 12 patients who had been tested, only 1 was tested for a true screening indication as intended by the CDC and USPSTF.

In a baseline pre-intervention survey conducted, when presented with four screening scenarios, providers only correctly elected to screen in 50%–62.5% of instances in which CDC and USPSTF guidelines would prescribe HCV serologies. Similarly when asked to recall whether they had offered HCV screening to an actual clinic patient within the preceding 6 months, just 62.5% answered yes while very few (12.5%) reported a patient refusing testing if the conversation was initiated by the provider. This suggests providers offering screening likely posed the greatest barrier to screening.

DESIGN

This QI project was conducted in an academic, combined internal medicine and paediatrics (Med-Peds) primary

care clinic in Durham, North Carolina. There are 23 Med-Peds residents and 4 practising Med-Peds faculty members. The study was launched in July 2013, shortly after CDC and USPSTF guidelines came into agreement on universal HCV screening for those born between 1945 and 1965. Patients born between 1945 and 1965 who were seen by one of our clinic providers (either resident or faculty physicians) for either an annual visit or a new patient visit were included in the study. Patients with active or known liver disease were excluded as their HCV screening may not have been obtained for screening purposes. We aimed to develop a QI project in clinic, using the 'plan, do, study, act' (PDSA) Model for Improvement, with a goal of improving HCV screening rates to $\geq 90\%$ over 3 years. Interventions were targeted to first identify provider-related factors responsible for missed screening, to increase provider knowledge of current screening guidelines, to increase documentation of HCV screening discussions and to increase provider comfort with discussing HCV testing with patients, based on preintervention survey results. Within this framework, six total PDSA cycles were executed, with six interventions including: (1) a baseline survey of provider knowledge, (2) distribution of guidance for providers for discussing HCV screening with patients, (3) addition of an EMR prompt in the clinic's annual visit template to remind providers to screen for HCV, (4) a petition to the institution's EMR management board to include HCV as an automatic, age-specific, prompt within the Health Maintenance section and the addition of a modified prompt in the EMR that would 'force' a response to screening, (5) incorporation of HCV screening in the health maintenance section of the EMR and (6) individualised audit of provider's HCV screening rates with rewards for those with the highest screening rates. The project protocol was reviewed by Duke's institutional review board (IRB) and granted exempt status as a QI project.

STRATEGY

The goal of this QI project was to improve the proportion of patients born between 1945 and 1965 who were appropriately screened for HCV infection in a primary care clinic. Many providers were not aware of the new guidelines when they were first published, and resistance to universal screening was evident in the clinic due to provider knowledge and comfort with screening, as well as patient discomfort with universal screening. It was also not part of the standard health maintenance discussion by providers. The PDSA cycles were aimed at improving overall rates of screening in the clinic, thereby improving adherence to CDC and USPSTF guidelines and enhancing preventative health maintenance care.

PDSA cycle 1

The providers in clinic were administered a preimplementation HCV screening knowledge, skills and attitude survey. Data were recollected following administration

of the initial survey, and 50 consecutive annual exams or new patient exams were evaluated for whether or not patients born between 1945 and 1965 were up to date on HCV screening. There was no change from the presurvey data, with only 24% of patients having HCV results available in the EMR. Interestingly, there was an increase in documentation noted in which HCV testing was at least mentioned to be discussed at a future visit (an additional 4% of visits). Efforts at improving knowledge alone helped recognition of the screening recommendation but did not increase screening rates.

PDSA cycle 2

The intervention for this cycle involved providing physicians with scripted text to help guide physicians in counselling patients about the importance of HCV testing. This was based on initial survey results suggesting that in addition to lack of awareness, there is some lack of comfort in understanding the reasons behind the new HCV screening as well as being able to convey these indications to patients. Consequently, the intervention involved the construction of scripted text in the institution EMR outlining the reasons behind the new recommendations with special focus on the reason behind screening by birth cohort, blind to other risk factors. The release of this scripted text that was readily accessible within the EMR to be inserted into patient instructions was announced via e-mail, and was intended to improve awareness and also to encourage discussion of HCV screening with patients. The postintervention screening rates remained essentially unimproved with just 30% screened. Given the absence of any effect by providing discussion assistance tools, it was clear that screening could only be improved by targeting interventions more directly at a provider's decision to screen.

PDSA cycle 3

The next intervention focused on provider prompts in the note template used in clinic for annual and new patient visits. Review of screening rates at this interval showed no real improvement in HCV screening rates at annual visits with just 30% tested. A slight improvement was seen however in documentation with 36% of clinic providers now at least documenting a discussion of HCV screening.

Presuming that improved documentation ought to precede improved screening rates, the second survey was designed to investigate the sources used by providers in selecting appropriate screening tests at each annual visit. The majority of providers (67%) reported relying on the health maintenance section of the EMR (among the remainder, 17% relied on their own reminder system and 17% relied on memory alone), consequently any intervention seeking improved HCV screening rates would best target the health maintenance section of the EMR.

The second survey also included a repeat 'test question' seeking to determine how many providers would correctly screen for HCV according to the new guidelines. Compared with the first iteration in which 60%

of respondents correctly screened according to birth cohort, the rate of correct responses improved to 83%—suggesting awareness of the new guidelines was gradually improving.

PDSA cycle 4

A proposal was drafted to the EMR management board to include HCV screening in the next edition of health maintenance prompts built into this section of the EMR, but there was a time delay in the response and implementation. In the interim, an additional line was added to the annual clinic visit template used in our clinic, listing HCV screening for those born between 1945 and 1965 with choices of 'not indicated', 'declined' or 'complete' to follow. Compared with the last cycle in which 30% of patients were tested and 38% of charts included appropriate documentation of HCV screening discussion, the addition of HCV testing to the annual template correlated with a slight improvement in screening rates to 38% and documentation rates to 40%. Scrutiny of failure to document or screen suggested that in the majority of cases, providers were using their own custom templates which did not include an HCV prompt. In fact, in 83% of cases where HCV status was undocumented, a private template had been used which lacked an HCV prompt phrase. Cases in which an HCV prompt existed in the note accounted for only 17% of failed screenings—in most cases providers listed 'n/a' or 'discussed' without a clear conclusion on why screening was not pursued.

Increased documentation rates revealed a second interesting trend. Among cases in which HCV screening was offered but not pursued, 40% of charts indicated that the patient declined screening.

Based on the above information, there were two clear avenues for further improvement. First was updating the EMR health maintenance section to include HCV screening, which would not depend on the note template the provider chooses to use (private or clinic-wide).

Additionally, the majority of templates import the health maintenance section from EMR. Second, because improved documentation has revealed a trend of patients declining HCV screening, it became necessary to improve education for both providers and patients on the indications and benefits of HCV screening.

PDSA cycle 5

The proposal to incorporate HCV screening in the health maintenance section of our institution's EMR was accepted and implemented by the EMR management board. Following formal addition of the HCV screening task to the health maintenance tool within our institution's EMR, screening rates improved to 60%, documentation rates improved to 64% and patients declining testing accounted for only 3% of missed opportunities to screen according to chart documentation. While addition to the formal health maintenance tab clearly improved screening rates on the whole, missed screening opportunities continued to cluster among providers who relied

on their own privately created templates, accounting for a full 61% of missed screening opportunities.

PDSA cycle 6

As a substantial proportion of failed screening opportunities could be attributed to the use of privately created clinic note templates which did not incorporate the updated HCV screening prompt or the EMR health maintenance section, providers were individually notified of their HCV screening rates relative to the clinic as a whole, and for those with lower screening rates a reminder was given to update their clinic templates. Following individualised email feedback, the per cent of patients screened improved to 74%, and documentation rates improved to 84%.

With significant effect following individualised feedback, it seemed that providers were certainly motivated to make improvements when aware of their own screening rates relative to the rest of the clinic. For the next stage, rewards were offered for the highest screening rates in clinic.

Given the improvements seen after individualised feedback, an announcement was next sent out via email to all

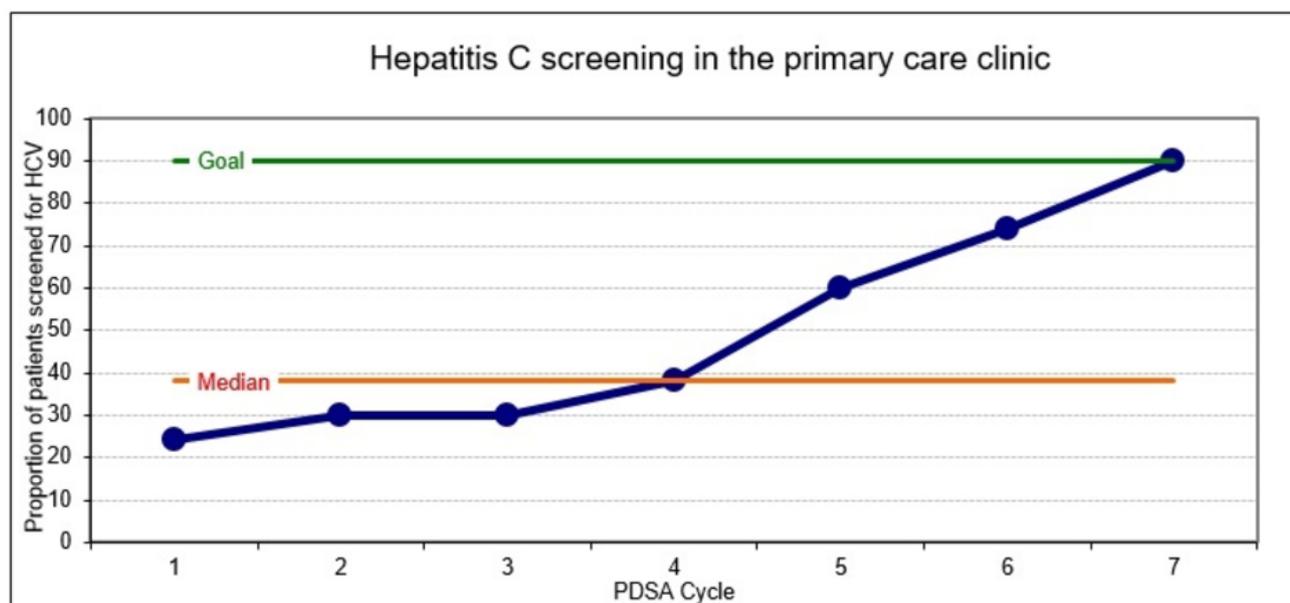
clinic providers noting the overall clinic HCV screening rates along with notification that a reward would be offered for the providers with the highest screening rate for the next intervention cycle.

Using funding from a prior QI project, Sanford Guides and American Academy of Pediatrics Redbooks were obtained as incentives for the providers with the highest screening rates. At one of the residency programme meetings, it was announced that the providers with the top four screening rates were identified and rewarded for their efforts.

Following the offer of rewards, screening rates finally reached 90% and documentation rates surpassed 96%.

RESULTS

At baseline, the prevalence of HCV seropositivity measured within our clinic population as a whole was 3.2%. Initial HCV screening rates were 24% and survey data indicated that 75% of providers were uncomfortable explaining the rationale behind the current CDC and USPSTF guidelines for HCV screening. Over the first few PDSA cycles (directed largely at increasing provider



| Cycle of Intervention | Intervention |
|-----------------------|--|
| 1 | Collection of baseline data; baseline survey of provider knowledge |
| 2 | Distribution of guidance for providers for discussing HCV screening with patients |
| 3 | Addition of an EMR prompt in the clinic's annual visit template to remind providers to screen for HCV |
| 4 | Petition to the institution's EMR management board to include HCV as an automatic, age-specific, prompt within the Health Maintenance section; addition of a modified prompt in the EMR 'forced' a response to screening |
| 5 | Incorporation of HCV screening in the health maintenance section of the EMR |
| 6 | Individualized audit of provider's HCV screening rates with rewards for those with the highest screening rates |

Figure 1 Stepwise improvement in hepatitis C virus (HCV) screening rates with each subsequent quality improvement intervention. A key to interventions is offered corresponding to the cycles of intervention. EMR, electronic medical record; PDSA, plan, do, study, act.

knowledge of HCV screening guidelines), improvements in screening rates were limited. Once interventions were focused on providing EMR-triggered reminders for HCV screening, and providers were given individualised feedback based on audits of their personal HCV screening rates, clinic-wide screening rates exceeded 90% after multiple PDSA cycles (figure 1). Similarly, documentation rates improved from 4% to 96%.

One year after completion of the six cycles of intervention, an additional 50 consecutive charts were reviewed to assess durability of the HCV screening interventions. The screening rate remained at 88% while the documentation rate had decreased slightly to 80%.

To investigate barriers to screening in the remaining 10% of patients, we conducted a post hoc analysis of all patients born between 1945–1965 seen for an annual visit within our Med-Peds clinic from 2013 to 2016 (n=1430) assessing for differences in screening rates based on gender, race and income quartiles. Socioeconomic quartiles were assessed according the definitions used in the Census Bureau American Community Survey. Univariate logistic regression analysis was conducted using the generalised linear model function in the open-source statistical program R (<https://www.r-project.org/>). The OR for HCV screening was calculated for each variable of interest. Although preliminary, our results suggest that screening was more likely to be missed among whites (OR 0.76, 95% CI 0.61 to 0.95) and those with lower socioeconomic standing (OR 0.90, 95% CI 0.81 to 0.99, table 1). Of note, determination of socioeconomic standing could only be obtained for 1277 (89%) of examined patients. For the remaining 153 (11%) patients, income data were not available in our database.

Table 1 Univariate logistic regression analysis of variables affecting HCV screening

| Variable | Adjusted OR (95% CI) |
|-------------------------------|----------------------------|
| Race | |
| African-American | 1.0 |
| White | 0.76 (0.61 to 0.95) |
| Other | 1.14 (0.75 to 1.73) |
| Sex | |
| Female | 1.0 |
| Male | 1.09 (0.88 to 1.35) |
| Socioeconomic quartile | |
| First | 1.0 |
| Per lower quartile | 0.90 (0.81 to 0.99) |

ORs for HCV screening were determined for race, gender and socioeconomic quartile using the open-source statistical program R. Low socioeconomic standing and white race were associated with a lower likelihood of screening (significant variables in bold). HCV, hepatitis C virus.

Lessons and limitations

Through the course of multiple PDSA cycles, screening rates steadily improved from 23% to 90%. The most effective interventions were those that altered clinic note templates or the Maestro Care Health Maintenance tab, followed by efforts to assure that providers had updated their personal clinic templates to incorporate these changes. The most effective motivators for change appeared to include direct feedback offered to providers on their own screening rates, coupled with rewards being offered to the providers with the highest screening rates.

While screening rates met the 90% goal at the close of this QI project, it remains concerning that 10% of patients are still not being offered HCV screening in accordance with CDC and USPSTF guidelines. As the majority of interventions were focused on providers, consideration was next given to the possible effect of patient demographics on HCV screening rates. In a retrospective pilot analysis (with IRB approval), associations between HCV screening and various indicators of socioeconomic standing were sought. Interestingly, there was a trend towards ongoing inadequacy of screening among the poorest quartile, among males, and among Caucasians and Latinos—suggestive that some patient factors may be playing a role in missed screening opportunities as well. This question is being examined in greater details as part of a separate IRB-approved geospatial epidemiology project intended to verify these preliminary concerns that particular socioeconomic groups are consistently being overlooked in HCV screening attempts. This is especially salient given reports of rising HCV rates in new demographics inclusive of economically disadvantaged rural populations.

Although encouraging that screening rates remained at 88% within a 50-patient sample assessed 1 year after completion of the interventions, it is possible that this reflects accrual of screened patients within our clinic population rather than truly sustained screening efforts. Documentation of screening status with each annual or new patient visit may better reflect ongoing screening efforts, which remained similarly high at 80%.

CONCLUSION

Following multiple PDSA cycles, HCV screening rates rose steadily from 24% at the outset to 90% in our combined Med-Peds clinic in <3 years. While interventions targeted solely at increasing provider awareness of HCV screening guidelines had minimal positive effects, interventions targeted at the annual clinic visit templates used by providers, or at the Health Maintenance reminders within our EMR were notably more effective. This can be seen in figure 1, where an initial rise in successful documentation of HCV screening status (between cycles 1 and 2), along with the addition of HCV screening to our clinic visit templates (cycle 3) preceded an eventual rise in actual screening rates (between cycles 3 and 4). Additionally, offering individualised provider feedback as simple as emailing their personalised HCV screening rate from the

preceding 3 months proved highly effective at ensuring adoption of the updated clinic templates and health maintenance section. This may account for the ongoing rise in screening rates observed between cycles 4 and 6.

We were similarly encouraged that rates of HCV screening remained high at 1 year after completion of the interventions, recognising that this might be slightly biased by accrual of screened patients within our clinic population. Perhaps more reflective of ongoing practice, documentation rates remained markedly improved at 80% as well.

Overall, HCV seropositivity within our clinic mirrored national rates based on the NHANES database, with a prevalence of 3.2% locally vs 3.5% nationally among those born between 1945 and 1965. Among seropositive individuals, 60% were also PCR positive suggestive of active infection for which treatment would be indicated.

Despite successfully increasing screening rates to 90%, a subsequent search for patient factors predictive of missed screening suggested that lower socioeconomic standing and white race might be associated with missed screening opportunities. While these trends were noted in a post hoc analysis and the study itself was not designed to answer this question, we are conducting a larger retrospective cohort study to verify these observations. If confirmed, targeting further screening efforts towards these populations may be helpful given rising rates of HCV within these same populations.^{10–12}

QI interventions can dramatically and sustainably improve HCV screening rates in an academic primary care clinic, especially when using EMR templates or offering individualised provider feedback. While most of our interventions focused on provider factors, preliminary findings from our study suggest that several patient factors, including gender, race and economic standing, might be associated with missed screening opportunities, or perhaps that certain individuals are more likely to decline screening. Research is ongoing to confirm these findings.

Contributors JT and NT planned the study, and contributed to content of the manuscript. NT conducted the PDSA cycles and data analysis. JT provided data for analysis.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent Not required.

Ethics approval The intent of this work was to improve the quality of care provided to patients in our primary care clinic, and was not a study on patients. As such, the protocol was reviewed by Duke's Institutional Review Board and granted exempt status.

Provenance and peer review Not commissioned; externally peer reviewed.

Open Access This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

© Published by the BMJ Publishing Group Limited. For permission to use (where not already granted under a licence) please go to <http://www.bmj.com/company/products-services/rights-and-licensing/>

REFERENCES

1. Ray S, Thomas D, Hepatitis C. In: Bennett JE, Dolin R, Blaser MJ, eds. *Principles and Practice of Infectious Diseases*. 8th edn. Philadelphia PA: Elsevier, 2015:1904–27.
2. Webster DP, Klenerman P, Dusheiko GM, et al. Hepatitis C. *Lancet* 2015;385:1124–35.
3. Bornschlegel K, Holtzman D, Klevens M, et al. Evaluating hepatitis C virus infection testing and reporting – eight US sites, 2005–2011. *Cdc Mmwr* 2013;62:18.
4. Liang TJ, Ghany MG. Current and future therapies for hepatitis C virus infection. *N Engl J Med Overseas Ed* 2013;368:1907–17.
5. Rein DB, Smith BD, Wittenborn JS, et al. The cost-effectiveness of birth-cohort screening for hepatitis C antibody in U.S. primary care settings. *Ann Intern Med* 2012;156:263–70.
6. Ward JW. The epidemiology of chronic hepatitis C and one-time hepatitis C virus testing of persons born during 1945 to 1965 in the United States. *Clin Liver Dis* 2013;17:1–11.
7. Chou R, Cottrell EB, Wasson N, et al. Screening for hepatitis C virus infection in adults: a systematic review for the U.S. Preventive Services Task Force. *Ann Intern Med* 2013;158:101–8.
8. Getchell JP, Wroblewski KE, DeMaria A, et al. Testing for HCV infection: an update of guidance for clinicians and laboratorians. *MMWR Morb Mortal Wkly Rep* 2013;62:362–5.
9. 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.
10. Ditah I, Ditah F, Devaki P, et al. The changing epidemiology of hepatitis C virus infection in the United States: NHANES 2001–2010. *J Hepatol* 2014;60:691–8.
11. Klevens RM, Hu DJ, Jiles R, et al. Evolving epidemiology of hepatitis C virus in the United States. *Clin Infect Dis* 2012;55:S3–9.
12. Suryaprasad AG, White JZ, Xu F, et al. Emerging epidemic of hepatitis C virus infections among young nonurban persons who inject drugs in the United States, 2006–2012. *Clin Infect Dis* 2014;59:1411–9.