

## BRIEF REPORTS

## Electronic Health Record Reminder Effect on Hepatitis C Antibody Screening

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**In the United States, national guidelines recommend screening adults born between 1945 and 1965 for hepatitis C, but screening rates in this population continue to be low. We added a hepatitis C screening reminder to the Epic Electronic Health Record and educated physicians on the use of the Health Maintenance section in Epic. We assessed the effect of this intervention on the completion of screening hepatitis C antibody tests. We examined data from 2 years before and after the addition of the reminder. Completed hepatitis C antibody testing increased from 733 to 6502, and the rate of positive testing decreased from 5.9% to 2.0%. Implementing the electronic health record reminder and educating providers on the routine use of the Health Maintenance section increased hepatitis C screening for at risk adults. (J Am Board Fam Med 2020;33:1016–1019.)**

**Keywords:** Electronic Health Records, Hepatitis C, Preventive Health Services

## Introduction

In 2013, the prevalence of chronic hepatitis C virus (HCV) infection in the United States (US) is 2.7–3.9 million cases.<sup>1</sup> HCV was directly responsible for \$4.3 to \$8.4 billion in health care costs, and it is currently the leading diagnosis in liver transplant patients in the United States.<sup>1</sup> Those who were born between 1945 and 1965 in the United States, also known as baby boomers, have 3 times higher prevalence of HCV than the general adult population.<sup>2</sup> In addition, baby boomers infected with HCV represent 76% of people infected with this disease.<sup>2</sup> The United States Preventive Services Taskforce and the Centers for Disease Control and Prevention recommend a 1-time screening of this population for the presence of the hepatitis C antibody.<sup>3,4</sup> Primary care physicians are faced with the task of screening baby boomers to identify this asymptomatic chronic disease

while managing many other screening recommendations. With the expansion of the use of the electronic health record (EHR), this task could be made easier through building reminders and alerts in the EHR. This study aimed to evaluate the effectiveness of the hepatitis C screening reminder added to the Health Maintenance (HM) section of our EHR (Epic) on the number of hepatitis C screening tests ordered by primary care physicians for adults born between 1945 and 1965.

## Methods and Materials

In October 2014, a HCV screening reminder was added to the HM section of Epic EHR in a large health care system in Southeast Michigan. The primary care network included 30 practices. All providers received an e-mail detailing the logic of the new addition and the process for ordering the appropriate screening test to satisfy the reminder. To avoid alert fatigue, we decided not to have pop-ups interfering with physician workflow. Instead we aimed to educate physicians on reviewing HM section at every office visit, and suggested office processes that can assist them in this task, such as training medical assistants to review HM and pend orders for each due topic for the physician's review. This system-wide education for primary care physicians on the importance of using the HM section of Epic was performed on a regular basis in 2015 and 2016. This education effort included e-mails to

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**Table 1. Demographic Information for Patients Who Had a Hepatitis C Screening Test during Study Period, 2013–2016 (n = 7235)**

	Study Population	Period 12013–2014	Period 22015–2016	P-Value
Number of hepatitis C screening tests	7235	733	6502	
Age, years, mean (SD)	61.86 (5.61)	61.94 (5.59)	61.85 (5.62)	.685
Male (%)	2851 (39.4)	241 (32.9)	2610 (40.1)	<.001
Race (%)				<.001
American Indian or Alaska Native	27 (0.4)	4 (0.6)	23 (0.4)	
Asian	411 (5.9)	14 (2.0)	397 (6.4)	
Black or African American	1436 (20.7)	234 (33.8)	1202 (19.3)	
White or Caucasian	4695 (67.7)	429 (61.9)	4266 (68.4)	
Other	362 (5.2)	12 (1.7)	350 (5.6)	

SD, standard deviation.

physicians, reminders and discussions during primary care group meetings, and during office manager meetings. No financial incentive was offered to physicians to meet preventive measures during the study period.

We performed a retrospective study to evaluate the change in HCV screening tests performed for baby boomers after the addition of the screening alert in the EHR. We evaluated the number of HCV screening tests ordered and completed in a large employed primary care physician group, comprised of 30 clinics, in 2 periods of time. Period 1 included 2 years before the addition of the EHR alert (2013, 2014), and Period 2 included 2 years after (2015, 2016). We collected all hepatitis C antibody tests ordered by physicians in the primary care group for patients with a birth year between 1945 and 1965. We excluded tests that were associated with a nonpreventive diagnosis to avoid including

tests conducted on high-risk patients or for diagnostic purposes. The hepatitis C antibody tests included were associated with a preventive diagnosis, such as “wellness examination” or “need for hepatitis C screening.”

### Statistical Analysis

Based on the laboratory records, the HCV screening results for the cohort who had received a 1-time HCV screening were categorized as “positive,” “negative,” and “equivocal.” We defined that Period 1 represents testing performed before the EHR reminder and that Period 2 represents testing performed after the EHR reminder. Baseline data on HCV screening within the health care system was obtained through retrospective chart review of patients between 2013 and 2016. The descriptive statistics of age, gender, and race were generated for the entire sample and separately for patients in Period 1

**Table 2. Overall Results of Screening Hepatitis C Antibody Tests during the 4-Year Study Period, 2013–2016, and by Demographic Groups**

	Overall	Negative (%)	Positive (%)	P-Value
N	7231	7055 (97.6)	176 (2.4)	
Period 1 (%)	733 (10.1)	690 (94.1)	43 (5.9)	<.001
Period 2 (%)	6498 (89.9)	6365 (98.0)	133 (2.0)	<.001
Age, years, Mean (SD)	62.17 (5.62)	62.13 (5.63)	63.76 (5.10)	<.001
Male (%)	2849 (39.4)	2742 (96.2)	107 (3.8)	<.001
Female (%)	4382 (60.6)	4313 (98.4)	69 (1.6)	<.001
Race (%)				<.001
American Indian or Alaska Native	27 (0.4)	25 (92.6)	2 (7.4)	
Asian	411 (5.7)	407 (99.0)	4 (0.9)	
Black or African American	1435 (20.7)	1370 (95.5)	65 (4.5)	
White or Caucasian	4692 (67.7)	4597 (98.0)	95 (2.0)	
Other	362 (5.0)	362 (100.0)	0 (0.0)	

SD, standard deviation.

and patients in Period 2. ANOVA test was conducted for continuous variables, and  $\chi^2$  test was conducted for categorical variables at a significance level of 0.05. All statistical analyses were performed using the RStudio version 1.1.456 (RStudio Team, 2016).

## Results

A total of 9457 hepatitis C antibody tests were completed during the study period, 1464 (15.5%) tests in Period 1 and 7993 (84.5%) tests in Period 2. After including only tests associated with a preventive diagnosis, 7235 hepatitis C screening tests were included in the study analysis. Demographic information for patients who had a hepatitis C screening test are shown in Table 1.

The number of hepatitis C antibody tests performed increased from 733 in Period 1 to 6502 in Period 2, while the rate of positive test results decreased from 5.9% in Period 1 to 2.0% in Period 2 ( $P \leq .001$ ). During Period 1 there were 109039 office visits for the baby boomers and during Period 2 there were 130,431 office visits. Screening test per 1000 office visits were 6/1000 and 49/1000 in P1 and P2, respectively. The number of tests done annually in Period 2 (2015 and 2016) were stable at 3423 and 3193, respectively. Table 2 exhibits the demographic information of the patient in relation to positive ( $n=175$ ) or negative ( $n=7055$ ) test results with exclusion of equivocal test results ( $n=4$ ). More men tested positive for the hepatitis C antibody than women, 3.8% vs 1.6%, respectively ( $P < .001$ ). The highest positive rates were in American Indians or Alaska Natives (7.4%) followed by Black or African Americans (4.5%) ( $P < .001$ ).

## Conclusions

The addition of HCV screening reminder to the HM section in the EHR and training providers on the routine use of the HM section resulted in a significant increase in HCV screening tests ordered for people born between 1945 and 1965. During the study period, 5769 additional people were screened for HCV, and 89 additional people tested positive for the screening test. There was a higher rate of positive testing in P1 than P2 (5.9% vs 2.0%) which may reflect that providers mostly screened high-risk patients in P1 before the addition of the HM reminder. The rate of positive tests in Period 2 is lower than the 3.25% expected positive

rate of HCV in baby boomers.<sup>4</sup> This lower rate may reflect the racial composition of the study population, 68% Caucasians, which has a lower prevalence of positive HCV test than other racial groups in the United States.<sup>4</sup>

Previous research has identified barriers to physician screening as lack of knowledge and awareness of HCV and its complications.<sup>5</sup> We found it feasible and acceptable to train physicians to use EHR reminder functions which offer physicians an objective signal that screening is due based on current guidelines. This may decrease time spent on additional disease-specific education and bypass physician knowledge of the disease course as a barrier to screening.

We can assume that the significant increase in the number of hepatitis C antibody tests associated with a preventive diagnosis reflects a significant increase in the screening rate for the baby boomer population. While we showed a significant increase in HCV screening in our population, nationally the rate of screening in the same age-group showed minimal change between 2013 and 2015, 11.9%, 11.5%, and 12.8% for each year, respectively.<sup>6</sup>

Efforts to increase HCV testing in baby boomers includes new quality improvement projects,<sup>7</sup> using order set in EHR,<sup>7</sup> and passing laws to mandate testing in this age-group. The State of New York mandated testing starting January 1, 2014, resulting in a 51% increase in specimens submitted for HCV testing to laboratories in the year after the law took effect.<sup>8</sup>

Limitations of the study include its retrospective nature, and increases in screening for hepatitis C during the designated time period may be affected by other factors such as the increase in awareness of the screening guidelines for hepatitis C. In addition, the number of office visits for the study population increased by 32% in P2 compared with P1 which could also contribute to the increase in number of hepatitis C antibody tests ordered. This increase can be contributed to the addition on new providers to the primary care network.

Adding a hepatitis C screening reminder to the HM section of EHR, in addition to education of primary care physicians and office managers on the use of the HM section, is effective in increasing hepatitis C screening in the baby boomer population. Health care systems should consider these 2 measures as a first step in the effort to improve hepatitis C screening rates in this population.

To see this article online, please go to: <http://jabfm.org/content/33/6/1016.full>.

## References

1. Razavi H, Elkhoury AC, Elbasha E, Estes C, Pasini K, Poynard T, Kumar R. Chronic hepatitis C virus (HCV) disease burden and cost in the United States. *Hepatology* 2013;57:2164–70.
2. 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.
3. 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.
4. Smith BD, Morgan RL, Beckett GA, Falck-Ytter Y, Holtzman D, Teo CG, et al. Recommendations for the identification of chronic hepatitis C virus infection among persons born during 1945–1965. *MMWR* 2012;61:1–18.
5. McGowan CE, Fried MW. Barriers to hepatitis C treatment. *Liver Int* 2012;32:151–6.
6. Kasting ML, Giuliano AR, Reich RR, et al. Hepatitis C Virus Screening Trends: Serial Cross-Sectional Analysis of the National Health Interview Survey Population, 2013–2015. *Cancer Epidemiol Biomarkers Prev* 2018;27:503–13.
7. Trinh J, Turner N. Improving adherence to hepatitis C screening guidelines. *BMJ Open Qual* 2018;7: e000108.
8. Flanigan CA, Leung SYJ, Rowe KA, et al. Evaluation of the impact of mandating health care providers to offer hepatitis C virus screening to all persons born during 1945–1965—New York, 2014. *MMWR Morb Mortal Wkly Rep* 2017;66:1023–6.