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Andrew Blix

Barbara B. Little

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Hepatitis C Screening Practices in a Local County Health Department: A Gap Analysis

Andrew Blix, DNP, ARNP, FNP-BC
Barbara B. Little, DNP, MPH, RN, APHN-BC

ABSTRACT

Hepatitis C virus (HCV) infection is a growing problem in the United States and most patients remain undiagnosed. CDC guidelines from 2012 recommend one-time screening of everyone born from 1945-1965. The penetration of this guideline is relatively unknown and the literature reveals that most efforts for improvement are poorly sustained. The purpose of this study was to compare a Florida county health department's screening practices to national guidelines. In addition, provider-level barriers to screening were assessed in order to develop tailored recommendations for improvement. Using a serial cross-sectional design, data was examined to determine HCV screening prevalence for patients born from 1945-1965. Providers were also interviewed to identify barriers to screening. Results indicated HCV screening prevalence improved from 14.3% in 2011 to 25.9% in 2014 but remained well below the 100% birth cohort guideline. Notable barriers included provider confusion over and lack of familiarity with the guideline, an attitude that current practices were adequate, treatment cost concerns, and a perceived lack of referral sources. Other clinics likely have similar suboptimal screening. Health care clinics should assess their HCV screening rates, then evaluate provider-level knowledge, attitude, and external barriers in order to choose locally relevant strategies for sustainable improvement.

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BACKGROUND

Approximately 45% to 85% of the 3.2 to 4.8 million of residents in the United States (U.S.) with chronic hepatitis C virus (HCV) infection are unaware of their status and are increasingly at risk for cirrhosis and liver cancer (Gish et al., 2015; Holmberg et al., 2013). Therapies are now available that offer cure rates of more than 90% with relatively few adverse effects compared to older treatments (Afdhal et al., 2013). Because of the growing burden of HCV infection and improvements in treatments, policymakers have prioritized identifying infected individuals and efficiently providing treatment (CMS, 2014). To this end, the U.S. Centers for Disease Control and Prevention (CDC) augmented risk-based screening guidelines in 2012 with a recommendation to screen all "baby boomers" born between 1945 and 1965, the cohort with the highest prevalence of infection (Smith et al., 2012). It is unclear how well these guidelines are working and whether clinicians are adhering to them, but there is evidence of suboptimal adherence in the past due to multiple provider-level factors (Southern et al., 2014). Lack of identification of infected patients

persists as the major bottleneck to treating those with HCV infection (Holmberg et al., 2013).

Chronic HCV infection is a major cause of chronic hepatitis, the leading cause of cirrhosis and liver cancer, and a tremendous socioeconomic burden in the U.S. (Davis, Alter, El-Serag, Poynard, & Jennigs, 2010). There are approximately 3.2 to 4.8 million U.S. residents with chronic HCV infection, and 40%-85% of those remain undiagnosed (Denniston et al., 2014; Gish et al., 2015). The majority of those infected were born between 1945 and 1965 and have long-standing infection which slowly causes liver damage over decades (Coffin & Reynolds, 2014). Without treatment, 60% of those with chronic HCV infection will eventually develop cirrhosis, and 37% will die from HCV-related complications (Rein et al., 2011). HCV has surpassed HIV as a cause of mortality in the U.S. and is now responsible for more than 15,000 deaths annually (Ly et al., 2012). If identification and treatment does not improve, it is estimated that 35,000 will die in the U.S. annually by 2030 (Rein et al., 2012).

There are now highly effective HCV treatments, but many of the benefits to individual patients and

society cannot be realized unless more patients are identified. The long, difficult, and often ineffective treatment regimens of years past have largely been replaced with direct-acting antiviral regimens that can cure more than 90% of HCV infections relatively quickly and with few side effects (Afdhal et al., 2013). Because of these advances, the U.S. Department of Health and Human Services (HHS) created a goal that 60% of infected individuals become aware of their status by 2020 (2014b). The Patient Protection and Affordable Care Act extended insurance to more Americans, CMS announced that it will reimburse for screening according to guidelines, and Florida Medicaid announced that it will reimburse for the treatments with these highly effective but expensive drugs (CMS, 2014; Gentry, 2014; Talwalkar, 2014). Given the advances in treatment and funding, regional public health clinics and primary care providers must analyze practices and optimize systems to progress individuals through screening, diagnosis, and treatment.

Researchers and public health officials are increasingly using a treatment cascade model borrowed from HIV programs to analyze the complex HCV care pathway and to identify barriers to completion (Linac et al., 2014; U.S. HHS, 2014a; Yehia, Schranz, Umscheid, & Re, 2014). The steps include diagnosis, linkage to care, confirmatory testing and fibrosis staging, initiation of treatment, and achievement of sustained virologic response (SVR) (Yehia et al., 2014). Whereas patients drop off at each of these steps yielding a final SVR rate of only 5%-6%, the major bottleneck is the first step, screening, where more than 50% of potential patients are missed (Holmberg et al., 2013). Indeed, knowledge of HCV infection is the only known predictor of future treatment (Younossi, Stepanova, Afendy, Lam, & Mishra, 2013). Thus, improving screening has become a priority.

Screening Strategies to Improve Identification

Until 2012, CDC screening guidelines recommended only testing patients based on risk factors—history of injection drug use, long-term hemodialysis, HIV infection, blood transfusion before 1992, or persistently elevated liver enzymes (Smith et al., 2012). However, those guidelines, even if fully implemented, are estimated to miss nearly 50% of infections and a majority of those diagnosed report no risk factors (Smith et al., 2012). After finding that 81% of HCV infections occur among those born between 1945 and 1965, in 2012-2013 the CDC and the U.S. Preventive Services Task Force augmented the risk-based strategy with a recommendation for a one-time screening of everyone within this birth cohort, regardless of risk factors (Chou, Cottrell, Wasson, Rahman, & Guise, 2013; Rein et al., 2012; Smith et al., 2012).

It is unclear how birth cohort screening guidelines will impact identification of HCV infections, but it is predicted to dramatically improve identification at a more cost-effective rate than risk-based screening alone (Asrani & Davis, 2014). Modeling shows that the birth cohort strategy would identify at least 1 million more people with a sensitivity of 76.6%, and combined birth cohort and risk-based screening would identify more than 87% of infections (Smith & Yartel, 2014). However, there is a dearth of research regarding the actual effect, the implementation, and adherence with expanded screening guidelines. Past studies have demonstrated actual screening rates of only 1%-12% of appropriate adults and early research on the birth cohort guideline demonstrates only 12% overall screening prevalence after 3 years (Jemal & Fedewa, 2015; Roblin et al., 2011). Translating guidelines into practice at the local level has proven to be difficult.

Local strategies have attempted to increase adherence to national screening guidelines. For patients, strategies have included outreach and education. Although patient knowledge regarding HCV is low, the desire for screening is high with more than 90% wanting testing even if treatment were unavailable (Norton et al., 2014). Barriers are more significant at the healthcare provider level. Strategies to address provider barriers have included educational sessions regarding screening guidelines, reminder stickers on charts, risk screening questionnaires, and targeting screening to high risk populations (Litwin et al., 2012; Perumalswami et al., 2013; Zucker, Choi, & Gallagher, 2012). These approaches have generated short-lived increases in screening that have faded over time. In one study, short educational sessions, screening tools, and reminder stickers resulted in screening protocol adherence of 59.1%, compared to overall adherence of 36.1% (Southern et al., 2014). In another study, researchers increased the odds of HCV screening with risk-based screeners (aOR = 2.37, 95% CI [2.10, 2.67]) and birth cohort reminder stickers (aOR = 1.70, 95% CI [1.50, 1.92]) (Litwin et al., 2012). Other studies have demonstrated similar increases (Drainoni et al., 2012; Zuure et al., 2014). These increases waned quickly; the early increases in screening found by Southern et al. (2014) fell from 59.1% protocol adherence rate in week 1 to 13.7% adherence rate in week 15. Others have expressed similar concerns with sustainability (Litwin et al., 2012). This suggests that lack of adherence to guidelines is more complex than simply reflecting a lack of knowledge.

Barriers to Screening

Despite the evidence that a birth-cohort screening strategy could greatly improve identification of HCV patients, significant provider level barriers to its

implementation remain. Provider nonadherence with clinical guidelines has been a vexing problem for some time, and researchers have devised models to explain provider behavior. In their seminal work, Cabana et al. (1999) theorized that provider compliance with guidelines is dependent on three interrelated barrier categories: knowledge, attitudes, and external factors. Overall, physicians have a low level of knowledge regarding HCV screening guidelines (Jewett et al., 2015; McGowan et al., 2012). Indeed, the birth cohort screening guideline was in part issued due to the confusion over risk factors associated with HCV. Prevailing attitudes include that screening is often fruitless due to unavailability of medications, high costs of therapies, and patient difficulty adhering to treatment, despite that funding for treatment is expanding rapidly and cost-effectiveness of screening has been demonstrated (McGowan et al., 2012; Rein et al., 2015; Rice, 2014). Providers generally perceive patient-level factors like treatment nonadherence as the most significant barriers, although patients are increasingly completing therapy (Afdhal et al., 2013; McGowan et al., 2012). Also, healthcare providers have expressed reluctance to screen due to being uncomfortable discussing risk factors with patients (Jewett et al., 2015). External barriers are also significant and include lack of time, difficulty with insurance, and inefficient processes for referring patients for treatment (Jewett et al., 2015; Reilley, Leston, Redd, & Geiger, 2014; Southern et al., 2014).

Addressing all factors including knowledge, attitudinal, and external barriers is essential to improve screening overall (Cabana et al., 1999; Southern et al., 2014). Knowledge barriers include confusion over screening guidelines, treatment options and treatment eligibility, and how to link patients to care (Jewett et al., 2015; Reilley et al., 2014). Targeting knowledge barriers with interventions such as educational sessions has proven effective in the short-term but may have failed in the long-term due to unaddressed attitudinal and external factors. Attitudinal barriers should be considered and myths dispelled such as that patients do not or should not want to know their status if treatment is not immediately feasible, that non-pharmacological interventions are not beneficial, that most patients will be unable to successfully complete treatment, and that screening or treatment are not cost-effective locally or nationally (Nobili, Carter-Kent, & Feldstein, 2011; Norton et al., 2014; Rein et al., 2012; Rein et al., 2015). External barriers, including provider time shortages and difficulty navigating the treatment process, must also be addressed. Integrating screening reminders into the electronic medical record may improve screening (Damiani et al., 2010). Standing protocols for screening may also save time and improve screening rates (Reilley et al.,

2014). Applying lessons from HIV care including the use of patient navigators or case managers could also improve provider perceptions of patients' ability to complete treatment, contributing to increased adherence to screening guidelines (Linas et al., 2014). If providers believe patients can receive and complete care, they are more likely to screen their patients (Jewett et al., 2015).

Theoretical Framework

A hybrid of gap analysis and Cabana et al.'s (1999) theory of nonadherence with clinical guidelines was used to guide this study. Gap analysis is a framework used in quality improvement projects that provides a means to identify gaps between actual and desired practice while also incorporating key stakeholder perspectives on the problem (Davis-Ajami et al., 2014). It helps to identify discrepancies between actual performance and evidence-based practice standards and to yield locally relevant information regarding barriers to improvement (Davis-Ajami et al., 2014). For this study, the desired level of practice was defined as screening according to the clinical practice guidelines issued by the CDC. The actual level of practice was determined, and this gap was analyzed.

Cabana et al.'s (1999) theoretical model was incorporated into the gap analysis in order to analyze stakeholder perspectives and create recommendations. It postulates that barriers to adherence with clinical guidelines can be grouped into knowledge factors, attitude factors, and external factors. This theory has been widely used as a basis to explain behavior and to create interventions to address behavior (Southern et al., 2014; Tapper & Lai, 2014; Zheng, Suneja, Chou, & Arya, 2014). Cabana et al. (1999) posited that the all three types of barriers must be carefully assessed at the specific site because blanket strategies to improve compliance that are not tailored to the local situation are likely to fail.

PURPOSE

The purpose of this study was to evaluate and compare a Florida Local County Health Department's (LCHD) HCV screening practices to CDC national guidelines. In addition, healthcare provider-level barriers to screening were assessed in order to develop tailored recommendations to improve screening. The specific aims of the study at the LCHD were to:

- Assess HCV screening prevalence for individuals born 1945-1965 compared to the guideline for one-time screening of everyone in this birth cohort;
- Explore provider-level barriers to screening; and

- Make recommendations to improve screening and identification of HCV patients.

METHODS

Design

For this study, we used a non-experimental design with mixed methods in two phases. The study was conducted in two adult health clinics of a LCHD located in Florida. In Phase I, a serial cross-sectional design was used to evaluate the HCV screening prevalence for individuals within the 1945-1965 birth cohort at a LCHD for years 2011-2014. The gap between actual screening prevalence and the 2012 CDC guideline of one-time screening for everyone within this birth cohort was established. If the facility is following guidelines, the expected trend would be that of increasing screening prevalence year over year. In Phase II, interviews were conducted with providers and medical administrators to identify perceived and actual barriers to screening and to identify common themes. Institutional Review Board approval was obtained for the study.

Phase I Setting and Participants

For Phase I, the participants were “baby boomers” seen at a LCHD. Inclusion criteria were: (1) date of birth 1945-1965 and (2) a clinic visit at any of the county adult health clinics during any of the 12 months of each respective calendar years 2011-2014. Exclusion criteria were being born outside 1945-1965 and not having a visit within the respective year. All gender, racial, and ethnic groups were included. The population was analyzed using de-identified aggregate data from the state health management system. There were 4,003 unique patients that met criteria in 2011, 3,755 in 2012, 3,595 in 2013, and 3,322 for 2014. Some of these individuals may have been counted in multiple years.

Data collection took place over an 8 week period from May 2015 through June 2015. For Phase I, de-identified screening prevalence and HCV infection prevalence data was obtained from the LCHD health management system. For each year 2011 to 2014, queries were run to determine the number within the cohort who (1) were HCV positive or (2) had an HCV antibody test that year or previously. HCV positivity was determined by whether patients had one or more HCV diagnosis codes. HCV antibody tests are highly sensitive and specific, and are the recommended screening test (AASLD, 2017; Colin et al., 2003).

Phase II Participants and Tools

For Phase II, following informed consent, a convenience sample of LCHD providers was

interviewed (adult health physicians, nurse practitioners (NPs), and the medical director). Inclusion criteria included being a current physician, NP, or the medical director. Exclusion criteria included not providing or overseeing services to patients born from 1945-1965.

An interview tool was developed for Phase II based on Cabana et al.’s theory of nonadherence with clinical guidelines (Cabana et al., 1999). Questions addressed perceived knowledge, attitude and external barriers. Reliability of the instrument was not established, although Cabana’s framework has been extensively used since 1999 (Southern et al, 2014; Tapper & Lai, 2014; Zheng et al., 2014). The interview questions were independently evaluated by two content experts. The audio-taped interviews took 20-40 minutes and were guided by the interview tool.

Data Analysis

Data were analyzed using Microsoft Excel to establish descriptive parameters, screening prevalence, and infection prevalence at year end for years 2011-2014. For Phase II, the interviews were transcribed and analyzed for common themes using content analysis. The content analysis was independently evaluated by two content experts.

RESULTS

Phase I: Screening and Disease Prevalence

The demographic characteristics of the birth cohort populations overall and by year are shown in Table 1. There were an average of 3,669 patients in the cohort seen each year; some were likely seen in multiple years. HCV screening prevalence of the birth cohort increased every year, from 14.3% in 2011 to 25.9% in 2014 (Figure 1). HCV disease prevalence increased from 7.8% in 2013 to 8.5% in 2014. HCV disease prevalence data was not available before December 2012.

HCV screening and infection prevalence varied considerably by subgroup, with those born from 1955-1959 and after 1960 having 21.5% and 21.3% screening versus 16.6% and 16.2% screening for those born 1945-1949 and 1950-1954, respectively (Figure 2). Screening prevalence was higher in males compared to females, with 22.1% screened versus 18.0%, respectively. In addition, non-Hispanics had higher screening prevalence compared to Hispanics with 20.9% screened versus 14.5%, respectively. White patients had higher screening prevalence compared to black/African-American, Asian, and other with 20.7% screened versus 17.5%, 10.4%, and 15.4%, respectively. Infection prevalence was generally directly proportional to screening prevalence.

Table 1

Demographics of Population of Interest by Year

	2011 <i>N</i> = 4,003	2012 <i>N</i> = 3,755	2013 <i>N</i> = 3,595	2014 <i>N</i> = 3,322	Mean
Date of Birth					
Born 1945-1949	456 (11.4%)	405 (10.8%)	317 (8.8%)	263 (7.9%)	9.7%
Born 1950-1954	787 (19.7%)	713 (19.0%)	715 (19.9%)	657 (19.8%)	19.6%
Born 1955-1959	1,082 (27.0%)	1,071 (28.5%)	1,058 (29.4%)	991 (29.8%)	28.7%
Born 1960-1965	1,678 (41.9%)	1,566 (41.7%)	1,505 (41.9%)	1,411 (42.5%)	42.0%
Age					
Mean	53.7	54.6	55.5	56.4	55.0
Median	53	54	55	55	
Mode	50	50	54	55	
Gender					
Male	1,887 (47.1%)	1,721 (45.8%)	1,696 (47.2%)	1,575 (47.4%)	46.9%
Female	2,116 (52.9%)	2,034 (54.2%)	1,898 (52.8%)	1,747 (52.6%)	53.1%
Ethnicity					
Non-Hispanic	3,370 (84.2%)	3,199 (85.2%)	3,074 (85.5%)	2,840 (85.5%)	85.1%
Hispanic	589 (14.7%)	514 (13.7%)	470 (13.1%)	454 (13.7%)	13.8%
Unknown	44 (1.1%)	42 (1.1%)	51 (1.4%)	28 (0.8%)	1.1%
Race					
White	3,254 (81.3%)	3,064 (81.6%)	2,936 (81.7%)	2,674 (80.5%)	81.3%
Black	572 (14.3%)	533 (14.2%)	525 (14.6%)	491 (14.8%)	14.5%
Asian	64 (1.6%)	61 (1.6%)	49 (1.4%)	55 (1.7%)	1.6%
Other	113 (2.8%)	97 (2.6%)	85 (2.4%)	101 (3.0%)	2.7%

Figure 1.

Overall prevalence of HCV screening at the LCHD in the birth cohort by year

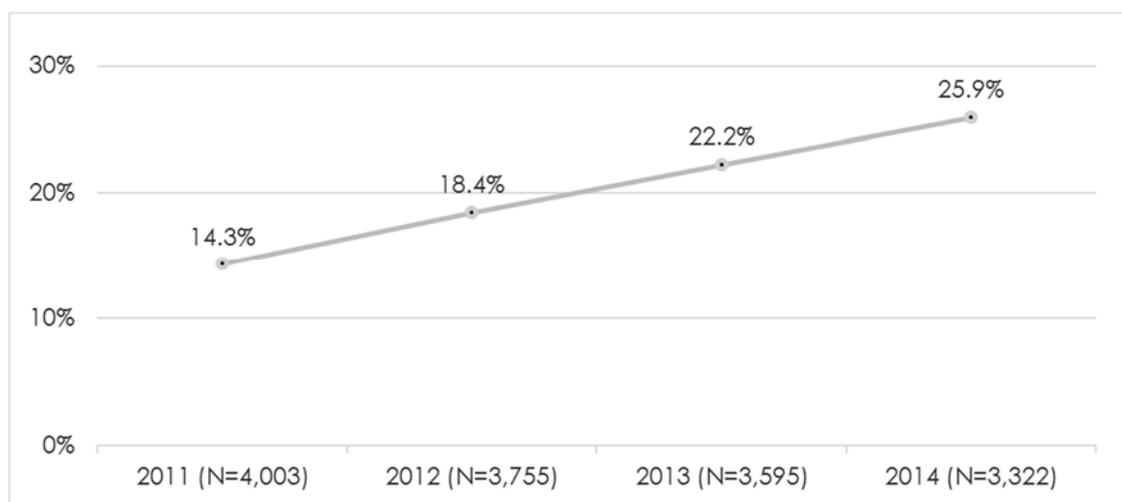
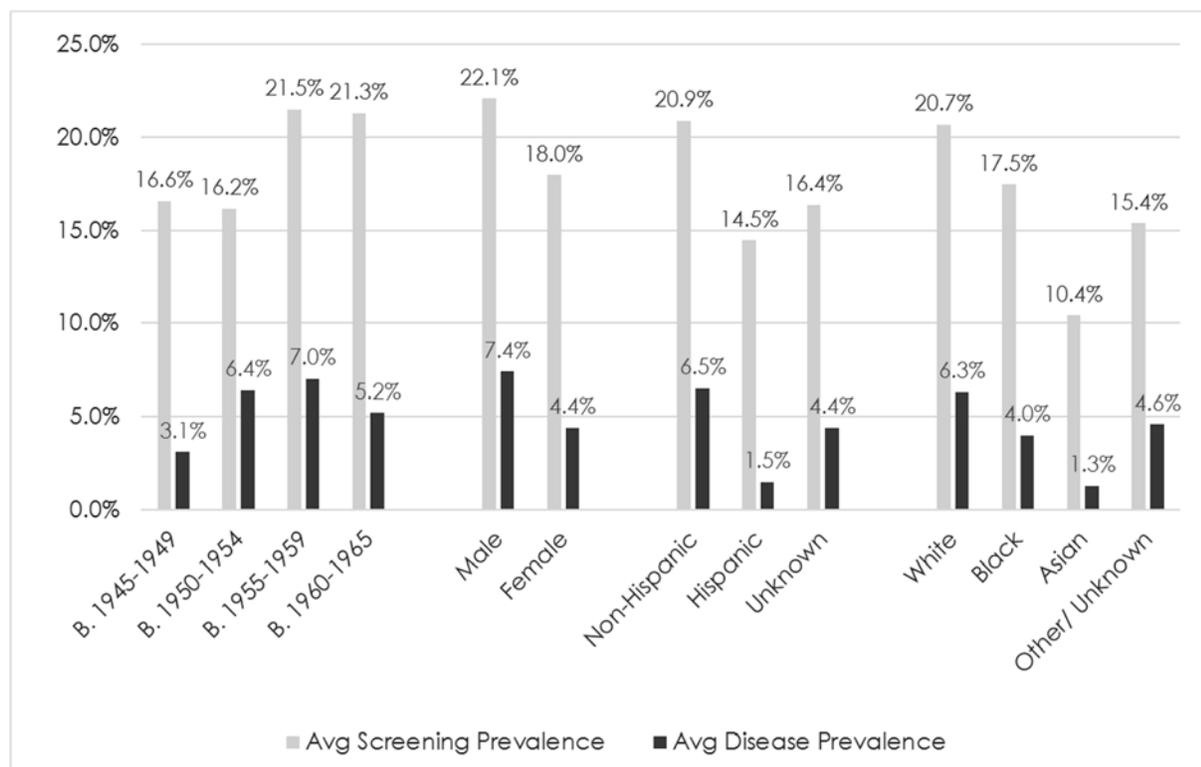


Figure 2.

Weighted average of HCV screening prevalence for 2011-2014 and weighted average of HCV disease prevalence for 2013-14 by subgroup



Phase II: Provider Interviews

Following informed consent, interviews were conducted with five LCHD providers (two adult health physicians, two nurse practitioners (NPs), and the medical director). After completing five provider interviews, which represents a large proportion of the total number of providers at the LCHD, theoretical saturation was achieved.

General questions. Initial interview questions were aimed at establishing that interviewees directly cared for those in the birth cohort and determining perceptions of the quality of HCV screening in the LCHD. Most providers (four of five) indicated that they care for adult patients within the birth cohort, with duration in their position ranging from one to seven years. Interviewees held widely varying views of how well the LCHD was screening for hepatitis C. Two out of five believed that the LCHD was doing well, two believed the department was doing adequately but could improve, and one believed it was doing poorly in screening for HCV.

Knowledge barriers: common themes. Following clinical guidelines regarding hepatitis C screening presupposes *awareness* and *familiarity* with recommendations. Most interviewees (four of five)

were *aware* of the CDC's 2012 birth cohort screening guideline, but the majority were only vaguely *familiar* with the guidelines. Specifically, there was uncertainty regarding the definition of the birth cohort and confusion over whether only those in this cohort with risk factors should be screened, as illustrated by the statement:

In my practice a baby boomer is anyone between ages 40 and 65, a little broader than the birth cohort. But whenever you really talk to these individuals, you know way back when, there was drug use. And then you had the Vietnam veterans that shared a lot of personal hygiene items; of course that's a heavy hepatitis population to start with.

In fact, the CDC recommends that all within the 1945-1965 birth cohort ("baby boomers") should be screened regardless of risk factors and asserts that most of those infected with HCV cannot identify any risk factor (Smith et al., 2012). Therefore, while there was broad awareness of the guideline, there was confusion over who falls into the birth cohort and

whether birth cohort screening should also incorporate the presence of risk factors.

Attitude barriers: common themes. Cabana et al. (1999) suggest that attitudes regarding the usefulness and effectiveness of clinical guidelines, in general and specifically, have an important impact on whether guidelines are followed. Other important theoretical attitudinal barriers include lack of self-efficacy, lack of belief in positive outcomes, and resistance to change. All of those interviewed believed that clinical guidelines in general are helpful tools and are not burdensome. However, while three of five believed the birth cohort guideline was helpful because of increased identification, benefits of cure, positive cost-benefit, and its evidence based foundation, one had reservations and one thought it was not helpful because it was too difficult to implement and treatment was not usually available. Likewise, most had a sense of self-efficacy regarding this guideline, believing that it could be followed while one said that it was not possible because there was insufficient funding for screenings and treatment:

Because of the cost. If you were in a regular office setting, sure, with people that had insurance. But here, it's just not feasible. We can't treat them. It's so sad.

All interviewees suggested that in theory, screening baby boomers could improve identification. The theme that this guideline could decrease the burden of disease arose from a majority of those interviewed. When discussing current personal screening practices, the responses were varied. Three interviewees did not believe their current practices needed to change. Two of five providers believed their screening was already good enough and no changes were necessary while two others believed their screening was acceptable but could be improved. A major theme to emerge in this portion was that while providers believed screening practices overall needed improvement, many believed that their personal practices did not.

External barriers: common themes. Real or perceived external factors can become barriers to guideline compliance. This can include guideline-specific factors (time required, difficulty in implementation), patient factors (patients not interested), and external factors (lack of funding for tests, lack of referral sources, lack of staffing) (Cabana et al., 1999). The interviews suggest that providers did not see patient-related barriers as a major hindrance to incorporating guidelines. Providers universally believed that patients would be willing to be tested per the guideline if there were provider recommendations. However, themes of lack of time, poor linkages-to-care, cost concerns, and

work-flow disruptions were noted. When discussing resource limitations specifically, two common themes emerged: all five interviewees expressed concern for a lack of referral sources and four out of five interviewees discussed costs issues, both for screening and treating. This statement illustrates the concern:

Access is really a problem. Not only in this area, in every area. It's an insurance issue. Not everybody will accept Medicaid. It's a huge issue. You know, they tell you do this, do that--screening. We need resources. We need support.

When discussing strategies for improving the screening process, the most common themes that emerged were nurse or staff-initiated HCV screening with four of five discussing this followed by putting reminders in the electronic record with three of five mentions. Suggestions within this theme of staff-initiated screening included training staff to bring the issue up with patients and having nursing protocols for initiating screening of those in the cohort.

DISCUSSION

The first research aim sought to establish the gap between actual HCV screening at the LCHD and the CDC recommendation to screen 100% within the 1945-1965 birth cohort. The data revealed that while the LCHD's HCV birth cohort screening prevalence increased from 14.3% in 2011 to 25.9% in 2014, it was still significantly below the CDC recommendation for universal screening. This screening prevalence was better than the national average of 12% within the birth cohort, but practices could be improved and likely many HCV diagnoses are being missed (Jemal & Fedewa, 2015). Improved screening practices would likely lead to better identification of HCV infection. It is estimated that were the LCHD to have increased their screening in 2014 from 25.9% to 75%, 42 additional patients would have been identified. Unexpectedly, HCV screening prevalence within the birth cohort varied with male, non-Hispanic, Caucasian, and younger individuals being screened more often than others, implying that there are unknown factors contributing to patient selection for screening.

The LCHD's HCV infection prevalence of 8.5% of baby boomers in 2014 is significantly higher than the CDC's estimate of 3.25% for HCV infection prevalence in the national birth cohort (Smith et al., 2012). The high prevalence may be attributable to: (1) having better than average screening practices, (2) targeting screening to those with higher risk, and/or (3) having a disproportionately affected patient population. The HCV infection prevalence increasing from 7.8% in 2013 to 8.5% in 2014 supports the

finding that screening is improving year over year. Among the subgroups, HCV infection prevalence increased in line with HCV screening prevalence, suggesting that HCV identification is directly proportional to HCV screening.

Other data corroborate that birth cohort screening is suboptimal. Provider interviews revealed broad confusion over the definition of a baby boomer as well as the distinction between risk factor and birth cohort screening recommendations. Furthermore, variability in screening among subgroups indicates that certain groups are being preferentially screened. These trends suggest that the current screening at the LCHD aligns more with the older risk-based screening strategy rather than the newer birth cohort screening strategy. The CDC's universal birth cohort screening recommendation seeks to move screening away from strictly risk-based strategies, as research has indicated that risk-based screening misses nearly 50% of cases and those diagnosed usually cannot identify any specific risk factor (Smith et al., 2012). The finding that birth cohort screening prevalence at the LCHD is suboptimal echoes other studies that show low birth cohort screening (Jemal & Fedawa, 2015).

The second research aim sought to identify provider-level barriers to following the birth cohort screening guideline. Providers commonly misunderstood the exact definition of the birth cohort and also believed that risk-factor assessment was still an important part of the screening process for baby boomers. This was also reflected in the data from Phase I which suggested that providers were still screening largely according to risk-factors, a practice which the new guidelines seek to change. Additionally, while providers felt that screening at the LCHD overall could improve, many believed that their personal screening practices were adequate and did not need to change. In accordance with Cabana et al.'s theory regarding compliance with guidelines, this resistance to change and attitude that change is not needed represents a significant barrier to successfully adopting recommendations (Cabana et al., 1999). Regarding external barriers, interview analysis revealed that providers were primarily concerned about lack of time, high costs, work-flow disruptions, and lack of referral sources.

The third aim was to provide tailored recommendations to improve screening practices and identification of HCV patients chosen from among numerous evidence-based interventions found in the literature, which can be seen in Table 2. Providers should be educated on the identified knowledge gaps as well as some of the attitudinal and external barriers. Administration should emphasize that guideline-based screening is feasible with current funding, that treatment options are currently available, and simplify the referral process. Other

recommended strategies include changes to the electronic medical record (screening reminder and completion notification) and nurse initiated screening protocols.

Limitations and Future Research

The screening prevalence estimates were based on the available data and it is possible that some patients may have been tested outside of the LCHD. However, the data collected approximated the actual screening prevalence, which was sufficient to determine the performance gap. Study findings are specific to this LCHD and not necessarily generalizable to other clinics or areas which may have different practices, barriers, demographics, and disease distributions. Future research should include diverse practice settings.

IMPLICATIONS FOR PUBLIC HEALTH

Whereas this study represented an analysis of screening practices at a specific public health department in Florida, there are broader implications. Likely many of these barriers are common to other clinics and localities. Healthcare clinics should assess their actual HCV screening rates to determine the extent of a gap with the CDC recommendations. Then, knowledge, attitude and external barriers should be evaluated in order to design strategies that specifically address local factors. There are many interventions described in the literature that have been successful in the short-term in increasing provider screening; these interventions should be chosen and applied after a careful analysis of locally relevant barriers in order to maximize their effectiveness and long-term sustainability. It is crucial to have administration support and provider buy-in, which can be facilitated by utilizing proven change management strategies.

Conclusion

The hepatitis C treatment and funding landscape has improved dramatically, but the benefits cannot be realized without continuing to improve screening and identification of infected patients. Lack of identification of those infected with HCV remains as the most significant bottleneck in the treatment continuum. Despite efforts, screening prevalence nationally remains low, and continued work is needed both nationally and locally to improve identification. Broader clinical guidelines were released to this end but barriers to optimal practice must be addressed at the local level to ensure guideline implementation and effectiveness. Addressing provider-level barriers comprehensively including knowledge, attitudinal, and external factors shows promise to enable sustainable increases in screening and identification.

Table 2. Evidence-based interventions to address barriers*Knowledge Barriers*

Educate providers on the following:

Definition of the birth cohort (Southern et al., 2014)

Baby boomers should be screened *regardless* of risk factors (Smith et al., 2012)

Risks for HCV infection (Drainoni et al., 2012)

Availability of funding for screening (Jewett et al., 2015)

Attitudinal Barriers

Measure actual screening and communicate any gap in performance

Educate about availability of funding for screening tests and treatment (Rein et al., 2015)

Educate that patients almost universally desire screening (Norton et al., 2014)

Reinforce that even if not treated, lifestyle changes improve outcomes (Nobili et al., 2011)

Administration should emphasize high-level interest in improvements

Education regarding specific referral sources (McGowan, et al., 2012; Reilley et al., 2014)

External Barriers

Integrate opt-out screening into EMR and/or clinic routine (Southern et al., 2014)

Add reminder stickers or integrate reminders into medical record (Damiani et al., 2010; Gemelas et al., 2016; Sidlow & Msaouel, 2015)

Empower nurses and staff to initiate screening according to protocols (Gemelas et al., 2016; Reilley et al., 2014; Sonstein et al., 2014)

Bundle screening with other guidelines like colonoscopies (Southern et al., 2014)

Incorporate case management for HCV patients (Linas et al., 2014)

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Andrew Blix (corresponding author) is an infectious diseases nurse practitioner specializing in hepatitis and HIV management at Infectious Diseases Associates, Sarasota, FL. Email at: andrewblix@gmail.com. Barbara B. Little is a Senior Teaching Faculty and Sarasota Program Coordinator at Florida State University College of Nursing, Tallahassee, FL. Email at: blittle@fsu.edu.

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