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Evaluating the Impact of a Community Health Worker on Hepatitis C Care in an Urban Emergency Department

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Abstract

Background: Hepatitis C virus (HCV) remains a significant source of liver-related morbidity and mortality in the US and many are unaware of their infection. Emergency departments (ED) represent a valuable resource to improve the HCV care continuum by offering HCV testing and linkage to care. Community health workers have been utilized in diverse healthcare settings to promote engagement of patients in care. We postulated that the addition of a community health worker (CHW) to an urban ED HCV initiative would improve patient care outcomes.

Methods: A cross-sectional retrospective study was conducted from May 1st, 2016 to July 30th, 2018 among 780 HCV antibody positive ED patients. HCV linkage to care (LTC) and confirmatory RNA test status were recorded for one calendar year before and after the CHW was introduced on May 1st, 2017. Summary statistics followed by Pearson Chi-square analyses were conducted to understand the impact of the CHW on linkage and confirmation of RNA status. Multivariate logistic regression was then conducted to identify factors associated with RNA testing and linkage to care.

Results: In the ED testing program, 780 patients tested HCV Ab positive between 5/1/2016 and 5/1/2018. The mean age was 47.8 ± 13.3, 65.4% were male, 67.8% identified as white, and 28.5% identified as Black. RNA testing rates increased from 33.6% to 49.5% after the CHW was integrated (X^2 (2, N=780) = 20.22, p<.01). Linkage to care rates among confirmed HCV RNA positive patients increased from 19.4% to 33.9% after the CHW was integrated (X^2 (2, N=196) = 4.6, p<.05). Self-identified Hispanic patients were more likely to be linked (OR=8.7, p<.05), while previously identified HCV positive and cirrhotic patients were more likely to receive RNA testing (OR=1.5, p<.05; OR=2.2, p<.05).

Conclusions: The integration of a community health worker into the ED HCV program was associated with significant increases in follow-up testing and linkage to care for HCV. The community health worker incorporated a comprehensive approach to patient healthcare, suggesting that this approach is more successful when engaging ED patients who may represent vulnerable populations.

Keywords: Hepatitis C; HIV; Community health worker; Emergency department, Public health, Infectious Disease, Intravenous drug use

Introduction

Hepatitis C virus (HCV) is a significant public health concern in the United States. The Centers for Disease Control and Prevention estimates that approximately 2.7 million people are infected with chronic HCV putting them at risk of liver fibrosis, cirrhosis and cancer and this may cost society as much as $10 billion annually [1-4]. Injection drug use (IDU) remains the most common route of HCV transmission, with the CDC estimating that 53.1% of people who inject drugs being infected [3-5]. Recent data suggests that mortality related to HCV infection has surpassed that of 60 other infectious diseases including HIV [6]. Given that the disease may be asymptomatic, many of the individuals with HCV infection are unaware of their status and so routine screening for all adults including those at elevated risk of infection such as people who inject drugs is recommended [1]. In light of this, identifying points of contact with often marginalized populations is critical to devising a strategy to identify and link patients to appropriate care [7,8].

Emergency departments (EDs) act as a safety net for many individuals, including persons with a history of IDU, making them a valuable location for HCV testing and linkage to care (LTC) [7]. ED based programs utilize varying screening strategies (universal versus targeted screening), and begin with antibody testing followed by confirmatory RNA testing to make a diagnosis of chronic HCV infection [9-11]. Emergency department screening efforts have been successful and demonstrated prevalence rates as high as 14.4% [8]. Despite the high prevalence of disease identified in ED based populations, getting individuals diagnosed and then linked to care to discuss treatment options has been less effective with linkage rates ranging from 13.8 to 22.6% of RNA+ patients [9-11]. Moving patients along this care continuum is essential in order to achieve HCV elimination.

One reason for the wide range in LTC rates is that patients screened in the ED for HCV may have difficulty in navigating the continuum to treatment, due to both patient and system-level barriers such as ongoing drug use, homelessness, poor health literacy, lack of insurance, and limited treatment providers [8-11]. Additionally, many of the patients are navigating complex medical and social situations and may not understand the sense of urgency in following up for HCV treatment, particularly if they are asymptomatic. Community health workers (CHWs) have been utilized in diverse healthcare settings in order to promote engagement of patients in care and address social determinants that may affect the process of linkage to care [12].

We postulate that the addition of a CHW to an urban ED can be utilized as a mechanism to improve patient progression along the HCV care continuum. Here, we seek to establish the impact of the integration

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of a community health worker in the ED on linkage to HCV care with program data from one calendar year prior to the addition of the community health position and one calendar year post. Additionally, we seek to identify risk factors associated with failure to access HCV care among ED patients.

Methods

This was a retrospective cross sectional study conducted at the Johns Hopkins Bayview Emergency Department (JHBMC ED), an academic teaching hospital in Baltimore MD that serves as regional burn center and level two trauma center. The JHBMC ED implemented an integrated HCV testing program for all eligible patients presenting to the emergency department. JHBMC ED patients were eligible to receive a venipuncture HCV antibody test if they had no documented HCV result on their medical record, were age ≥18 years at the time of the visit at which they were screened, had bloodwork ordered during their ED visit, and were able to assent at the time of ED triage. All patients incoming to the JHBMC ED were screened for HCV antibody test eligibility using an automated algorithm built into the Electronic Medical Record (EMR). At ED triage, JHBMC ED nursing staff use the EMR to document medical complaints, assess vital signs and assign a triage acuity level for the patient's visit. For eligible patients, nursing staff was prompted via a pop-up window during triage to offer the patient a free HCV antibody test using opt-out language. This study was approved by the Johns Hopkins School of Medicine Institutional Review Board.

ED research staff counseled and ordered RNA tests for patients still in the ED at the time of a reactive HCV antibody test result. ED research staff reached out via telephone to patients who left the ED prior to receipt of a reactive HCV antibody result to disclose test results and schedule confirmatory RNA tests and follow up appointments. Patients who could not be reached or who were reached but did not attend scheduled appointments were referred to their respective county's health department for continued engagement and follow up.

Potential CHWs were recruited from community partners that had an interest in engaging patients and community members around HIV and HCV. CHWs attended the Maryland Department of Health's HIV 101 counseling training, and were trained in HCV and HIV patient education via a partnership between Johns Hopkins Division of Infectious Diseases, Sisters Together and Reaching, and Generation Tomorrow, a program focused on HIV and HCV education [13]. CHWs were matched with the ED locations based on their interests in helping HIV and HCV patients, previous experience helping/advocating family and friends to access care, and the particular needs of the department. A CHW was formally introduced to the JHBMC ED's workflow on May 1st, 2017. The CHW spent a brief period of approximately two weeks at the end of April familiarizing themselves with the JHBMC ED's layout and the HIV/HCV team's personnel and workflow, thereby minimizing any time spent adjusting to the program's procedures and the ED's organization.

In the JHBMC ED, the CHW supported providers and HIV/HCV program coordinators via an integrated approach to care management and community outreach. The CHW called patients, educated and informed the patients about their HCV diagnosis, and traveled with patients to and from appointments. Additionally, the CHW provided social support, informal counseling, and advocated for individuals and community health needs.

Analysis

Descriptive statistics were used to characterize individuals with a positive HCV antibody test over the duration of the study. We compared RNA testing and LTC status data for the calendar year prior to the CHW's introduction (5/1/16-4/30/17) and the year after the CHW's introduction (5/1/2017- 4/30/2018). RNA testing and LTC status data were measured at the end of each calendar year to normalize time available for LTC efforts. Patients in the cohort were coded as RNA tested or not RNA tested, RNA Positive or RNA Negative, and finally linked to Care or not Linked To Care (Figure 1). Patients were determined to be linked to Care if they had a confirmed RNA Positive

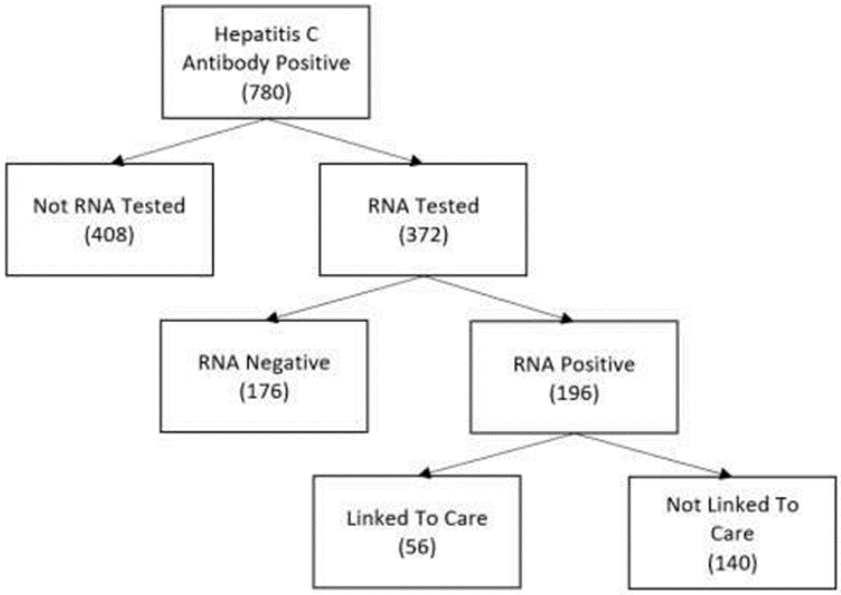

Figure 1: Hepatitis C Care Cascade Visualization, Full Study Sample.

test result on the EMR and a medical appointment on record at which HCV treatment was discussed or initiated.

We compared both HCV RNA test rates and LTC rates pre and post incorporation of the CHW using Chi-Square analysis. Only RNA positive patients were considered for the analysis of LTC rates, as RNA negative and RNA untested patients are ineligible for LTC services. We also conducted multivariate logistic regression models to determine factors associated with successful receipt of HCV RNA testing as well as successful LTC after controlling for risk and demographic factors. Demographic data included age at time of HCV Ab test, gender, race, ethnicity, and HIV status. Risk factors included history of injection drug use, history of alcohol abuse, history of other (non-alcohol, non-injection) drug use, history of incarceration, sexually transmitted infection diagnosis, cirrhosis, and hepatocellular carcinoma. All demographic and risk factor data was pulled directly from the EMR at the time of the positive antibody test result. Patients with missing data were removed from this analysis. All analyses were conducted using STATA 15.1.

Results

In the ED testing program, 780 patients tested HCV Ab positive between 5/1/2016 and 5/1/2018. The mean age was 7.8±13.3, 65.4% were male, 67.8% identified as white, 28.5% identified as Black, and 3.3% identified as other (Table 1). In the calendar year prior to the introduction of the CHW, the JHBMC ED recorded 372 HCV antibody positive patients, of which 125 (33.6%) were RNA tested. In the calendar year after the introduction of the CHW, the JHBMC ED recorded 408 antibody positive patients, of which 202 (49.5%) were RNA tested, a statistically significant increase in the year after adding the CHW ($p<.01$). Statistically significant increases in linkage to care were also noted after introducing a CHW. In the calendar year prior to the introduction of the CHW, the JHBMC ED recorded 72 HCV antibody positive, HCV RNA positive patients, of which 14 (19.4%) were linked to care, whereas in the calendar year after the introduction of the CHW, the JHBMC ED recorded 124 HCV RNA positive patients, of which 42 (33.9%) were linked to care ($p<.05$).

Logistic regression analysis to assess the relationship between RNA testing and HCV risk factors and demographics within all HCV antibody positive patients were conducted. After removing 7 patients for incomplete data, 773 patients were used for this analysis. Both a prior positive antibody test on the medical record and a diagnosis of cirrhosis were associated with increased odds of being HCV RNA tested (n=773, OR=1.49, $p<.05$; OR=2.24, $p<.05$, respectively) (Table 2). An additional logistic regression analysis of linkage to care was performed for risk factors and demographics within HCV RNA positive patients (Table 2). Among patients who were RNA positive, self-identified Hispanic patients were more likely to be linked (OR=8.71, $p<.05$). Age was also associated with a small, but significant increase in linkage odds (OR=1.04, $p<.05$).

Characteristic	Total N=780 n (%)	HCV Ab+ Year Prior to CHW N=372 n (%)	HCV Ab+ Year Post CHW N=408 n (%)	p-value
Age, median years (IQR)	50 (36, 58)	51 (38.5, 58)	49.5 (35, 57)	0.046
Sex				
Female	269 (34)	130 (35)	139 (34)	0.617
Male	510 (65)	242 (65)	268 (66)	
Transsexual	1 (<1)	0 (0)	1 (0)	
Race				
Black	222 (28)	99 (27)	123 (30)	0.378
Other	29 (4)	14 (3)	15 (4)	
White	529 (68)	259 (70)	270 (66)	
Ethnicity				
Hispanic	24 (3)	11 (3)	13 (3)	0.61
Non-Hispanic	756 (97)	361 (97)	395 (97)	
Previous HCV Antibody				
Negative	17 (2)	13 (3)	4 (1)	0.005
No previous test	486 (62)	224 (60)	262 (64)	
Positive - Medical Record	185 (24)	80 (22)	105 (26)	
Positive - Self Report	92 (12)	55 (15)	37 (9)	
HIV Status				
HIV Negative	751 (96)	360 (97)	391 (96)	0.064
HIV Positive	21 (3)	6 (2)	15 (4)	
Not HIV Tested	8 (1)	6 (2)	2 (0)	
History of Homelessness	135 (17)	56 (19)	79 (26)	0.028
History of Incarceration	170 (22)	71 (19)	99 (24)	0.08
History of Alcohol Abuse	356 (46)	189 (51)	167 (41)	0.006
History of STI Infection	81 (10)	26 (7)	55 (13)	0.003
History of Injection Drug Use	490 (63)	222 (60)	268 (66)	0.083
Cirrhosis Diagnosis	52 (7)	22 (6)	30 (7)	0.421
Hepatocellular Carcinoma Diagnosis	4 (1)	1 (0)	3 (1)	0.362
HCV RNA Tested	327 (42)	125 (34)	202 (50)	<0.001
HCV RNA Positive	196 (25)	72 (58)	124 (61)	0.497
Linked to Care	56 (7)	14 (19)	42 (34)	0.031

Table 1: Study Sample Demographics, HCV Antibody Test History, Risk Factors, and Comorbidities.

Characteristic	RNA Testing		Linkage within RNA+	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Constant	0.46 (0.23, 0.96)	0.038	0.09 (0.01, 0.69)	0.02
Black	0.82 (0.58, 1.15)	0.25	1.85 (0.82, 4.18)	0.138
Hispanic	2.02 (0.74, 5.50)	0.168	8.71 (1.56, 48.78)	0.014
Other	2.12 (0.85, 5.30)	0.105	0.48 (0.08, 2.78)	0.415
Female	1.25 (0.91, 1.71)	0.176	0.96 (0.44, 2.1)	0.919
Age	1.01 (1.00, 1.02)	0.182	1.04 (1.00, 1.07)	0.033
Prev. Negative HCV Ab	1.20 (0.43, 3.32)	0.729	-	-
Prev. Positive HCV Ab - Medical Record	1.49 (1.03, 2.15)	0.035	0.50 (0.20, 1.27)	0.144
Prev. Positive HCV Ab - Self Report	0.93 (0.58, 1.51)	0.78	0.77 (0.27, 2.22)	0.627
History of Injection Drug Use	0.84 (0.59, 1.19)	0.328	1.20 (0.51, 2.82)	0.682
History of Alcohol Abuse	0.86 (0.62, 1.19)	0.372	0.61 (0.28, 1.32)	0.211
History of other Drug Use	0.94 (0.66, 1.34)	0.727	0.78 (0.33, 1.85)	0.57
HIV Infection	2.02 (0.82, 4.97)	0.127	-	-
STI Diagnosis	1.04 (0.63, 1.71)	0.881	0.14 (0.02, 1.26)	0.079
History of Homelessness	1.01 (0.70, 1.45)	0.973	0.52 (0.20, 1.33)	0.17
History of Incarceration	1.02 (0.69, 1.50)	0.933	2.27 (0.83, 6.21)	0.11
Cirrhosis Diagnosis	2.24 (1.21, 4.14)	0.01	1.71 (0.57, 5.14)	0.335
HCC Diagnosis	-	-	1.69 (0.19, 14.98)	0.637

Table 2: Multivariate Logistic Regression Model for RNA Testing and Linkage to Care within RNA Positive.

Discussion

In this ED HCV testing and linkage to care program, we found support for our hypothesis that the introduction of a community health worker specializing in HCV LTC procedures could improve progression through the HCV care continuum for HCV Ab+ patients. Both RNA testing and linkage to care rates increased significantly after the introduction of the CHW. These findings highlight the value of the CHW not only in terms of this specific ED testing program, but also in terms of ED-based HCV testing programs in general. Relative to similar ED-based HCV testing programs, we observed higher linkage rates after the introduction of the CHW than seen in literature [9-11].

We found additionally that a previous, EMR-confirmed positive HCV antibody test and prior diagnosis of cirrhosis were associated with an increase in the likelihood of being RNA tested. This makes sense in the ED setting where the main barrier to receiving RNA testing in the ED was the delay in resulting the HCV antibody test, which often occurred after the patient's discharge from the ED. As patients with cirrhosis and previous positive antibody tests are understood to be of potential concern for chronic HCV infection and morbidity, RNA tests for these patients could be ordered and blood could be drawn early into their stay in the ED. This finding underscores the value of widespread HCV testing and the ED's unique role in the HCV epidemic; for individuals that do not regularly interact with the healthcare system, the ED represents a rare opportunity to receive HCV follow up care.

In HCV RNA positive patients, identifying as Hispanic and older age was associated with increased odds of linkage. The association between age and LTC is consistent with other ED-based studies on HCV care, and may be due to older patients having more engagement with and positive perceptions of the health care sector and greater access to health insurance programs such as Medicare [11-14]. The association between Hispanic ethnicity and higher LTC may be a result of the culturally-competent focused care of the CHW but further research is necessary to fully understand this association. Regardless, EDs will need to continue to develop ways to reach marginalized populations, younger populations, and populations with substance use that have historically difficult to engage. Indeed, this program has been effective at reaching many high risk and hard to reach patients; specifically, patients who struggle with homelessness, drug use, and low levels of engagement with healthcare. 56 of 196 (28.6%) RNA positive ED patients were successfully linked between the two years, and linkage attempts are ongoing for the remainder of RNA positive patients. It is also important to note that frequently, patients are unaware of their HCV status when they are tested, and that 453 of the 773 (58.6%) patients considered in this study had a history of IDU notated in the EMR. These unlinked patients who continue to engage in IDU represent a significant potential source of continued HCV transmission. These findings underscore not only the value of the ED as a general safety net for underserved, high-risk populations, but more specifically the extent to which HCV-infected individuals at high risk for HCV transmission can be identified within the ED setting.

Several limitations exists in this study and dataset. One significant concern is the inability of staff to identify and document when patients engaged in external healthcare appointments. Appointments that could not be confirmed were not considered for linkage, and a number of patients endorsed attending appointments of which no documentation could be obtained. Similarly, many patients could not be reached following their ED visit, and were therefore coded as not linked as there was no record of a linkage appointment. Of these patients who were coded as not linked, it is unclear what proportion, if any, sought or received care in an external health system. It is therefore possible that our data underrepresents the actual rates of linkage and RNA testing to some degree. Additionally, abstracted EMR data was used for this analysis. EMR data can be heavily reliant on the patient willingness to provide information about themselves. For individuals who are not inclined to disclose drug use, homelessness, mental health diagnoses, or prior criminal history to ED staff, the EMR may not be accurate.

Despite these limitations, our data suggests that the incorporation of a CHW into our testing program was helpful in increasing patient engagement and linkage to care. Prior to the introduction of the CHW into the ED LTC team, LTC attempts focused almost exclusively on HCV status disclosure, appointment scheduling, and patient education. The CHW took a less rigidly HCV-focused approach to follow-up, instead engaging patients more broadly on a spectrum of healthcare concerns. The CHW assisted in issues with substance abuse,

mental health, familial and relationship conflicts, referrals to outside healthcare systems, and occasionally issues with insurance or other financial barriers. This change in LTC approach seemed to positively affect the way patients perceived the LTC process, with patients being generally more amenable to appointments and more responsive to requests for follow up on their part, as evidenced by the corresponding increase in LTC success between the year before and after the CHW's presence. Future research into patient response to different types of outreach in the context of HCV infection could help clarify exactly which procedures are most successful, and which patients could be most amenable to HCV treatment in specific healthcare settings.

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