

FIB-4 TO ASSESS PREVALENCE OF ADVANCED FIBROSIS IN HOMELESS ADULTS WITH HEPATITIS C IN BOSTON

Beiser ME¹ Cardoso L¹ Leon C¹ Gaeta JM^{1,2}

¹ Boston Health Care for the Homeless Program

²Section of General Internal Medicine, Boston Medical Center, Boston, MA



Background

- Boston Health Care for the Homeless Program (BHCHP) observes a high prevalence of HCV and excess mortality from liver disease in its population of homeless and marginally-housed patients^{1,2}
- Barriers to HCV treatment and specialty liver care in marginalized populations are numerous³⁻⁶
- The FIB-4 is a low-cost, easily-calculated tool with high specificity to identify advanced liver fibrosis and expedite HCV treatment^{7,8}
- A benchmark study utilizing the FIB-4 to assess advanced fibrosis in a US national sample of housed individuals with HCV found a 16% prevalence of advanced fibrosis⁹

Objectives

- Utilize the FIB-4 fibrosis assessment tool to characterize the prevalence of advanced liver fibrosis (F3-F4) among individuals with HCV seen at BHCHP
- Compare fibrosis levels of BHCHP cohort to housed sample described by NHANES
- Examine differences within BHCHP cohort, separating individuals born before 1965 (“baby-boomers”) from a younger subgroup, to highlight the population of focus for US HCV efforts

Methods

- Extracted the following variables from the BHCHP EHR for all individuals with HCV seen at BHCHP from 9/1/15-9/1/16:
 - Demographic: age, sex, race, ethnicity, housing status
 - Hepatic parameters: HCV antibody, HCV viral load, ALT, AST, platelets
 - Comorbid conditions associated with cirrhosis: body mass index (BMI), diabetes mellitus, alcohol use disorder (AUD)
- FIB-4 was calculated and interpreted using standard scoring
 - FIB-4 <1.45 High probability of low-level fibrosis (F0-F1)
 - 1.45 ≤ FIB-4 ≤ 3.25 Indeterminate
 - FIB-4 >3.25 High probability of advanced fibrosis (F3-F4)
- Univariate logistic regression used to identify variables associated with advanced fibrosis

Individuals seen at BHCHP 9/1/15-9/1/16
9,586

Individuals with a diagnosis of HCV
1,115 (11.6%)

HCV VL Detectable
864 (77.4%)

HCV VL Not Detected
251 (22.5%)

Available FIB-4 data points
832

No available FIB-4 data points
32

Age <50
354

Age ≥ 50
478

Results

Table 1. Demographic characteristics and comorbid conditions of individuals with HCV seen at BHCHP 9/1/15-9/1/16, overall and by baby-boomer status

Characteristic	All (N=832)	Non baby-boomers, <50 (N=354)	Baby-boomers, ≥50 (N=478)	P value
Age, mean	49.8	38.8	57.9	<0.0001
Sex, N (% female)	180 (21.6)	101 (28.5)	79 (16.5)	<0.0001
Race, N (%)				<0.0001
White/Caucasian	475 (57.2)	233 (65.8)	242 (50.7)	
Black/African American	204 (24.5)	33 (9.3)	171 (35.8)	
More than one race	53 (6.4)	26 (7.3)	27 (5.7)	
Other	11 (1.3)	8 (2.3)	3 (0.6)	
Unreported/missing	88 (10.6)	54 (15.3)	34 (7.1)	
Hispanic ethnicity, N (%)	157 (18.9)	92 (26.0)	65 (13.6)	<0.0001
Housing Status, N (%)				<0.0001
Housed	79 (9.5)	21 (5.9)	58 (12.1)	
Street	58 (7.0)	20 (5.6)	38 (7.9)	
Shelter	396 (47.6)	147 (41.5)	249 (52.1)	
Doubled Up	53 (6.4)	15 (4.2)	38 (7.9)	
Transitional/residential	202 (24.3)	128 (36.2)	74 (15.5)	
Other	21 (2.5)	10 (2.8)	11 (2.3)	
Unknown	23 (2.8)	13 (3.7)	10 (2.1)	
Alcohol use disorder, N (%)	308 (37.0)	86 (24.3)	222 (46.4)	<0.0001
BMI category, N (%)				0.607
≥ 30 (obese)	205 (25.1)	89 (25.6)	116 (24.7)	
25-29.9 (overweight)	332 (40.7)	146 (42.1)	186 (39.7)	
< 25 (lean)	279 (34.2)	112 (32.3)	167 (35.6)	
Diabetes mellitus, N (%)	193 (23.2)	44 (12.4)	149 (31.2)	<0.0001

Table 2. Hepatic parameters and FIB-4 values for the BHCHP cohort, overall and by baby-boomer status, and for the NHANES sample (2007-2012)

Value	All (N=832)	Non baby-boomers, <50 (N=354)	Baby-boomers, ≥50 (N=478)	P value	NHANES 2007-2012 ⁹ (N=215)
Age (y), mean	49.8	38.8	57.9	<0.0001	50.5
ALT (U/L), mean	70	89.3	55.7	<0.0001	70
AST (U/L), mean	60.3	66	56.1	0.068	63.4
Platelets (10 ³ /uL), mean	213.1	223.6	205.3	0.001	221.3
FIB-4, mean	2.2	1.7	2.7	<0.0001	2.21 ± 0.17
FIB-4 category, N (%)				<0.0001	
F3-F4 (>3.25)	131 (15.7)	23 (6.5)	108 (22.6)		(16.0)
Indeterminate	304 (36.5)	79 (22.3)	225 (47.1)		(36.9)
F0-F1 (<1.45)	397 (47.7)	252 (71.2)	145 (30.3)		(47.2)

Prevalence of FIB-4 classification by cohort

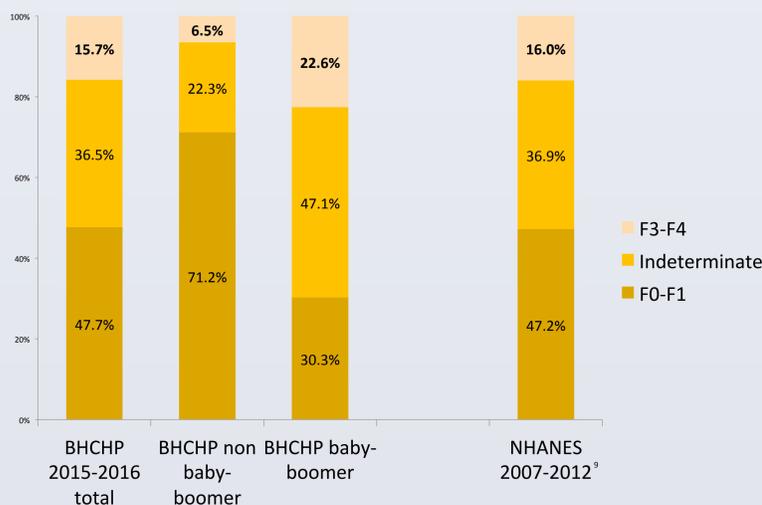


Table 3. Univariate analysis of factors associated with advanced fibrosis score (FIB-4 >3.25)

Factor	Odds ratio (95% CI)
Baby-boomer status	4.20 (2.66-6.90)
Age, per year	1.08 (1.05-1.10)
Alcohol use disorder	2.80 (1.91-4.10)
Housing Status	—
Housed	reference level
Transitional/Res Tx	0.36 (0.17-0.76)

Conclusions

- Homeless and marginally-housed individuals with HCV in Boston have equivalent rates of advanced fibrosis compared to a national housed sample of people with HCV infection
- Analysis of age-stratified BHCHP subgroups demonstrates stark differences in advanced fibrosis as well as in demographic and comorbid characteristics
 - Possibly reflecting shifting HCV epidemiology in Boston related to the opioid epidemic?¹⁰
 - Underscores heterogeneity of population and possibility of distinct treatment needs
- In univariate (unadjusted) analysis:
 - Alcohol use disorder was associated with a 2.8-fold higher odds of advanced fibrosis.
 - Residing in transitional housing or residential treatment programs was associated with a reduced risk of advanced fibrosis. Multivariate analysis will attempt to confirm this finding.
 - Obesity, diabetes, race, and ethnicity were not associated with advanced fibrosis.
- The FIB-4 can be readily applied in a homeless healthcare setting, recorded in the EHR, and incorporated into the population management efforts aimed at:
 - Recruiting individuals who may not otherwise present for HCV treatment assessment
 - Identifying individuals who would benefit from screening for the sequelae of advanced fibrosis (e.g. liver cancer, esophageal varices)
 - Emphasizing the importance of screening for and treating AUD in patients with HCV

References

¹Bharell M, Lin WC, Zhang J, O'Connell E, Tauber R, Clark RE. Health care utilization patterns of homeless individuals in Boston: preparing for Medicaid expansion under the Affordable Care Act. *Am J Public Health*. 2013;103 Suppl 2:S311-317.
²Baggett TP, Chang Y, Porneala BC, Bharel M, Singer DE, Rigotti NA. Disparities in Cancer Incidence, Stage, and Mortality at Boston Health Care for the Homeless Program. *Am J Prev Med*. 2015;49(5):694-702.
³Martino RJ, Barreira DP, Hepatitis C, stigma and cure. *World J Gastroenterol*. 2013;19(40):6703-6709.
⁴Frederic C, Rane J, Backmund M. Understanding barriers to hepatitis C virus care and stigmatization from a social perspective. *Clin Infect Dis*. 2013;57 Suppl 2:S51-55.
⁵Beiser M, Leon C, Gaeta JM. Needs Assessment of HCV-Infected Individuals Experiencing Homelessness and Implications. *J Health Care Poor Underserved*. 2017;28(1):596-606.
⁶Zeremski M, Zibbell JE, Martinez AD, Kriz S, Smith BD, Talal AH. Hepatitis C virus control among persons who inject drugs requires overcoming barriers to care. *World J Gastroenterol*. 2013;19(44):7846-7851.
⁷Sterling RK, Lissen E, Clumeck N, et al. Development of a simple noninvasive index to predict significant fibrosis in patients with HIV/HCV coinfection. *Hepatology*. 2006;43(6):1317-1325.
⁸Vallet-Pichard A, Mahler V, Nalpas B, et al. FIB-4: an inexpensive and accurate marker of fibrosis in HCV infection. *Hepatology*. 2007;46(1):32-36.
⁹Singh P, Mamalithara A, Heo NY, Kim D, Kim WB. Increasing prevalence of cirrhosis among U.S. adults aware or unaware of their chronic hepatitis C virus infection. *J Hepatol*. 2016;64(5):1027-1032.
¹⁰Suryaprasad 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(10):1411-1419.