Moving More People with a Hepatitis C Diagnosis to Treatment: Alerts in CHORUS, a Clinical Decision Support System

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Background

- Hepatitis C virus (HCV) is one of the most common bloodborne pathogens in the United States (US) and the rate of incident HCV infections has increased in recent years
- Despite the availability of effective treatment with direct-acting antivirals (DAAs), too many people with HCV infection progress to liver cirrhosis and failure

Objective

To assess whether providing alerts through CHORUS™, a clinical decision support system (CDSS), increases the prescription of treatment for diagnosed, untreated individuals with HCV

Methods

Study Population

- OPERA® observational cohort
  - Prospectively captured, routine clinical data from electronic health records (EHR) in the US
- CHORUS
  - A web-based CDSS that translates, transforms, and organizes EHR data into useful reports for healthcare providers
- Inclusion criteria
  - 18 years of age or older
  - Active, untreated HCV infection

Study Design

- Before and after study
  - **Before period:** 16JAN2022-16AUG2022
  - **After period:** 16JAN2023-16AUG2023
- No alerts were disseminated in the ***before*** period
- Alerts identifying individuals with diagnosed, untreated HCV were disseminated to clinics in the ***after*** period
  - Alerts included an individual's:
    - Date of HCV diagnosis
    - Date of last detectable HCV viral load or genotype
    - Prescriptions for prior HCV treatment

Analyses

- Among individuals who completed a visit with a healthcare provider, the proportions of individuals prescribed HCV treatment over follow-up (through 17OCT2022 in the ***before*** period or 17OCT2023 in the ***after*** period) were described
- Incidence rates (IR) and 95% confidence intervals (CI) of prescriptions for HCV treatment over follow-up were estimated via univariate Poisson regression

Results

Figure 1. Individuals with (dark) and without (light) ≥1 visit over follow-up

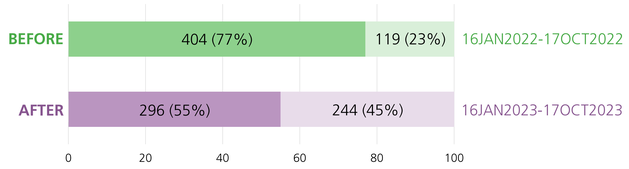


Table 1. Baseline demographic characteristics

	BEFORE N = 404	AFTER N = 296
Age, median years (IQR)	48 (37, 57)	47 (37, 58)
Female sex, n (%)	69 (17)	60 (20)
Black race, n (%)	172 (43)	130 (44)
Hispanic ethnicity, n (%)	88 (22)	73 (25)
Care received in Southern US, n (%)	245 (61)	186 (63)
Men who have sex with men, n (%)	262 (65)	173 (58)
People who inject drugs	94 (23)	64 (22)
Payer[a], n (%)	---	---
Medicaid	145 (36)	127 (43)
Medicare	50 (12)	77 (26)
Commercial insurance	165 (41)	164 (55)
Cash	26 (6)	11 (4)
ADAP/Ryan White	142 (35)	110 (37)
Other	29 (7)	89 (30)

ADAP, AIDS Drug Assistance Program; HIV, human immunodeficiency virus; IQR, interquartile range; n, number; US, United States

[a] Categories are not mutually exclusive

Table 2. Baseline clinical characteristics

	BEFORE N = 404	AFTER N = 296
HCV infection		
Months since last HCV antibody test, median (IQR)	13 (5, 35)	12 (4, 28)
Months since last HCV VL test, median (IQR)	9 (3, 31)	6 (2, 17)
Individuals with prior HCV genotype test, n (%)	170 (42)	146 (49)
HIV co-infection, n (%)	388 (96)	285 (96)
Last HIV VL measurement (copies/mL), median (IQR)	20 (19, 180)	20 (19, 110)
Last CD4 cell count measurement (cells/μL), median (IQR)	544 (312, 735)	528 (338, 764)
Other clinical characteristics		
HBV co-infection, n (%)	40 (10)	30 (10)
Any comorbid condition[a], n (%)	321 (79)	241 (81)
Number of visits in the last 12 months, median (IQR)	4 (2, 7)	4 (2, 6)

HBV, hepatitis B virus; HCV, hepatitis C virus; HIV, human immunodeficiency virus; IQR, interquartile range; mL, milliliter; n, number; μL, microliter; VL, viral load

[a] At least one condition in any of the following categories (ever): cardiovascular disease, invasive cancer, endocrine disorder, mental health condition, bone disorder, renal disease, hypertension, rheumatoid arthritis, or substance use

Table 3. Description of HCV treatment

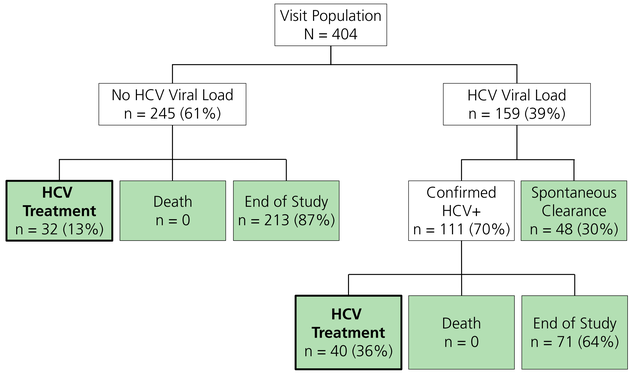
	BEFORE N = 404	AFTER N = 296
Received prescription for HCV treatment, n (%)	72 (18)	96 (32)
Specific DAA combination therapy		
Mavyret (glecaprevir/pibrentasvir), n (%)	35 (49)	47 (49)
Epclusa (sofosbuvir/velpatasvir), n (%)	27 (38)[a]	39 (41)
Harvoni (ledipasvir/sofosbuvir), n (%)	8 (11)	8 (8)
Vosevi (sofosbuvir/velspatasvir/voxilaprevir), n (%)	≤5[b]	≤5[b]
Zepatier (elbasvir/grazoprevir), n (%)	≤5[b]	0
Weeks from visit to prescription, median (IQR)	4 (1, 17)	7 (<1, 19)

DAA, direct-acting antiviral; HCV, hepatitis C virus; IQR, interquartile range; n, number

[a] ≤5 individuals also received a prescription for ribavirin

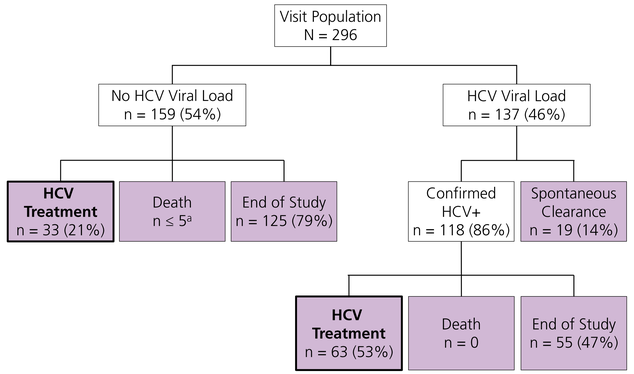
[b] HIPAA regulations require the masking of cells with 1 to 5 individuals

Figure 2. Events over follow-up among the visit population: BEFORE period



HCV, hepatitis C virus; n, number

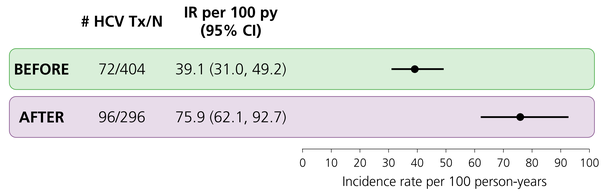
Figure 3. Events over follow-up among the visit population: AFTER period



HCV, hepatitis C virus; n, number

[a] HIPAA regulations require the masking of cells with 1 to 5 individuals

Figure 4. Incidence rates of HCV prescriptions over follow-up



CI, confidence interval; HCV, hepatitis C virus; IR, incidence rate; N, number; py, person-years; Tx, treatment

Discussion

- There were 523 and 540 individuals with diagnosed, untreated HCV infection in the ***before*** and ***after*** periods, respectively (**Figure 1**)
  - 404 (77%) and 296 (55%), respectively, had ≥1 visit at a clinic over follow-up
- Baseline characteristics were comparable between individuals in the ***before*** and ***after*** periods (**Tables 1 & 2**)
- A greater proportion of individuals in the ***after*** period (32%) than the ***before*** period (18%) received a prescription for HCV treatment over follow-up (**Table 3**)
  - Among 168 individuals prescribed HCV treatment:
    - All prescriptions were for DAA combination therapy
    - Most (88%) received Mavyret or Epclusa
- Referrals for HCV management outside of the study sites, which are primary- and HIV-care focused, were not easily identified in the EHR
- Confirmatory HCV viral load testing over follow-up did not occur among all individuals (**Figures 2 & 3**)
  - A greater proportion of individuals in the ***after*** period (46%) than the ***before*** period (39%) received ≥1 HCV viral load test over follow-up
  - Spontaneous clearance was identified in a greater proportion of individuals in the ***before*** period (30%) than in the ***after*** period (14%); the reason for this difference between periods is unclear
  - Among 229 individuals with confirmed (still) active HCV infection, a greater proportion of individuals in the ***after*** period (53%) received a prescription for HCV treatment than those in the ***before*** period (36%)
- From the first visit over follow-up, the rate of HCV prescription was statistically significantly higher in the ***after*** period than in the ***before*** period (**Figure 4**)

Key Findings

- Though the incidence rate of HCV treatment nearly doubled when alerts identified individuals with untreated HCV infection, the proportion of individuals receiving treatment remains suboptimal
- Continued reminders in the CDSS over a longer period and a better understanding of referrals for HCV management outside of primary care-focused clinics may be the next steps toward successful elimination of HCV infection and transmission

Acknowledgements

This research would not be possible without the generosity of people living with HCV and their OPERA caregivers. Additionally, we are grateful for the following individuals: Kelly Oh (SAS programming), Lito Torres (QA), Bernie Stooks & Stephen Connellee (Data architecture), Lisa Lutzi & Nicole Shaw (Data management and quality), and Judy Johnson (Clinical data categorization).

Support
Gilead Sciences, Inc.

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