



Hepatitis C Clinical Dashboards: Improving Liver Specialty Care Access and Quality

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Clinical dashboards can improve the health management of the HCV population within the VHA by empowering health care practitioners to deliver wide and effective HCV care.

The VHA cares for over 170,000 patients with chronic hepatitis C virus (HCV) infection, making it the largest single provider of medical care to chronic HCV patients in the U.S.¹ Although HCV treatment rates within the VHA outpace those of the private sector, only half of patients with HCV infection within the VHA have accessed a liver specialist and less than a quarter have received antiviral medication.²⁻⁴

Newer HCV treatment regimens promise treatment sustained virologic response (SVR) rates—a marker of viral clearance posttreatment—of $\geq 90\%$ in most cases but require careful patient selection and management.⁵ In particular, the estimated 24% of patients with HCV infection with advanced liver disease require more rapid consideration for therapy to reduce complications of cirrhosis such as liver failure, hepatocellular carcinoma, and death.⁶ With the advent of promising HCV therapies and rising rates of cirrhosis, there is an urgent need for a population health management approach to deliver HCV care more widely and effectively.^{5,7}

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RATIONALE FOR CLINICAL DASHBOARDS

Although the VHA hosts the largest integrated electronic medical record (EMR) system in the U.S., an EMR on its own does not guarantee improved patient care or access.⁸ EMRs can be used to document health care delivery, but they do not routinely provide information about the burden of disease in a population, nor do they identify patients most in need of care.

Clinical dashboards are tools that are geared to provide clinicians with relevant data to improve patient care. Early clinical dashboard development across the VHA was primary care focused, targeting patients with diabetes, ischemic heart disease, and hypertension. This national primary care dashboard provides clinically relevant, actionable data and enables the clinical provider to track patient progress. In addition, regional data can be aggregated for use by VISN managers. While the impact of dashboards on quality of care is not well investigated, it remains a vital tool with the potential to transform care.⁹

HCV dashboards have been developed by individual VISNs and facilities across the VHA. HCV dashboards serve to identify patients most in need of antiviral therapy, expand outreach to those previously unseen by specialty care, sort patients by severity of liver disease, track treatment status, and calculate SVR.

Current HCV dashboards incorporate elements derived from the VA Corporate Data Warehouse (CDW), a national VA data repository consisting of data from all facilities' electronic medical record systems. Updated infor-

mation from the previous day is made available in VISN data warehouses and is refreshed nightly. The final result is user-friendly clinical data available in near-real time to dashboard users.

VISN 21 HCV DASHBOARD

Purpose and Elements

The VISN 21 HCV dashboard will be discussed as a prototype. Graphics of the VISN 21 dashboard interface are presented in Figure 1 and Figure 2. The VISN 21 HCV dashboard was developed by pharmacists with specialty training in medical informatics, health care analytics, and data management. The dashboard addresses 3 previously unmet needs in HCV care: population management, patient treatment outcome tracking, and administrative planning.

Population management. The VISN 21 HCV dashboard allows for a centralized approach to care across a large geographic area containing multiple facilities. One important function is to identify patients with advanced liver disease as well as those who have not been seen in specialty care within the previous 2 years. It also allows for pretreatment screening through identification of HCV viral characteristics (eg, genotype, viral load) and selected comorbidities (eg, renal function, mental

health conditions) that may influence candidacy for specific antiviral therapies. Individual patient reports can be stratified by facility (eg, clinic or VAMC) to identify the burden of disease within a specific location.

Patient treatment outcome tracking. The HCV dashboard allows tracking of the numbers and characteristics of patients who have previously received antiviral therapy. The number of patients achieving virologic cure may be tracked at the VISN and station levels, or displayed based on user-selected parameters, such as treatment history.

Administrative planning. The high costs of HCV antiviral medication requires careful budgetary planning and close communication with local and regional leadership. The VISN 21 HCV dashboard provides information crucial to assessing future treatment needs. Specifically, it allows administrators to view the number of patients actively being treated. The dashboard also allows for comparison of treatment rates among different facilities and help allocate resources where needed.

Design Architecture

To construct the source data for the dashboards, relevant data elements are pulled into a base table using Structured Query Language (SQL) code. Subsequently, SQL Server Reporting Services (SSRS) (Microsoft, Redmond, WA)

Figure 1. VISN 21 HCV Dashboard Front Page

Hepatitis C - Advanced Liver Disease (Definitions Document)

[Export to Excel Flat \(1 patient = 1 row\)](#)

If the link above does not work, please go to the Flat Report directly and manually export to excel from the Actions button near the top left. [Feedback](#)

This report includes all patients with a positive HCV test ever AND any lab work within the past 2 years. This report is sorted by the following order: Active HCV Medications, Platelet Value, and Service Connected Eligibility. This report helps to identify patients with Advanced Liver Disease and does not provide recommendations for treatment.

[Sofosbuvir Monograph](#); [Sofosbuvir Criteria for Use](#)
[Simeprevir Monograph](#); [Simeprevir Criteria for Use](#)

Test Interpretations (PPV and NPV in predicting significant fibrosis METAVIR F2, F3, and F4)			
	Cutoff Points	Positive Predictive Value (PPV) (%)	Negative Predictive Value (NPV) (%)
APRI	> 1.5	77	75
FIB-4	> 3.25	92	72

Total Number of Patients: 39

Ghany - Risk of Decompensation	
1-50th %	< -7.82
50-75th %	-7.82 < x < -6.91
75-90th %	-6.91 < x < -5.81
> 90th %	> -5.81

MELD - 3 Month Mortality	
> 39	71.3%
30 - 39	52.6%
20 - 29	19.6%
10 - 19	6.0%
< 9	1.9%

Figure 2. VISN 21 HCV Dashboard Patient Page

Patient Name	Medication	Med	Med Last	ALD Scores		Liver Labs	
Last Name, First Name Last4: 0000	IFN			MELD	10.87	PLT	64 10/1/2014
Age: XX (M/F) Eligibility: NSC	Ribavirin			FIB-4	8.9	AST	46 12/1/2014
Treatment Status: Active Tx	Boceprevir			APRI	2.8	ALT	23 12/1/2014
Recent Types of Mental Health/Drug Abuse: 0 of 4	Telaprevir			Ghany	>90th percentile	Total Bill	1.3 12/1/2014
Next HepC Appt: 01/1/15	Simeprevir	10/1/2014	12/1/2014	ESRD	No Dialysis	INR	1.4 10/1/2014
Clinic: GI Liver Followup	Sofosbuvir	10/1/2014	12/1/2014			SCr	0.58 10/1/2014

compiles the dashboard output into an interactive and user-friendly interface that can be tailored to individual end users' needs.

Dashboard development process. Through collaboration and survey of clinical providers, clinical factors necessary to decide patient and treatment readiness were identified. Relevant data elements include HCV genotype, selected medical and psychiatric comorbidities, prior receipt of treatment, and presence of advanced liver disease. While liver disease severity may be determined by invasive means, such as liver biopsy, the dashboard offers a noninvasive assessment using laboratory values (eg, calculated Fibrosis 4 score, Model for End Stage Liver Disease score).^{10,11}

Once dashboard elements were selected, the variables were operationalized using data available in the CDW within the prescription, diagnostic, and laboratory data tables. As code was written, output was validated through chart review to ensure accuracy. Further validation was performed through comparison of the dashboard data with the clinical case registry, a registry of HCV viremic confirmed patients. Throughout dashboard development, the product was presented to end users to solicit requests for modifications. The code was refined over time to incorporate end user input.

Dashboard user interface. SSRS allows users to customize reports based on any variables defined within the data set including facility, severity of disease, HCV genotype, and prior antiviral treatment history among others. Results are displayed with summary information, including the total number of patients in the selected cohort, the number of patients who have been referred to a specialty

liver clinic, and the number of patients who have been determined to achieve SVR. The end user has the option to export the results to excel for further use (eg, patient lists for telephone follow-up).

User recruitment. After piloting, the VISN 21 HCV dashboard was introduced during monthly pharmacy meetings and clinical telehealth encounters with providers. Feedback was solicited during the presentations and through postdevelopment surveys. In particular, providers requested spreadsheet-friendly formatting, additional informational fields consisting of mental health and substance abuse diagnoses, and identification of all patients with HCV regardless of disease severity. A key element of dashboard refinement includes enhancing usability by solicitation of user feedback with subsequent tailoring of the user interface.¹²

CHALLENGES

Many challenges exist in clinical dashboard development, expansion, and implementation including data integrity, workflow, and work culture. Data elements are often variable within a single facility, and this variation increases when identifying the same elements across facilities. For example, a laboratory test name (eg, "serum creatinine") may exist with 2 to 3 different labels (eg, "creat," "SCr," "serum Cr") within a single facility. As the variation increases, potential for inappropriate laboratory tests may be increased. Specialty clinic names also vary within and between facilities.

Local nomenclature for HCV clinic names may include "liver," "infectious disease," "hepatitis c," or some variation, making it crucial for the dashboard developer to work closely with clinical staff to accurately match

HCV Labs		Location Details		Active Mental	
Most Recent Viral Load	<12 12/1/2014	Nearest VA (miles)	8	Risk Factor	Primary DC Dx (High Risk)
Prior Viral Load	979599 06/1/2014	Assigned CBOC	Primary Care Clinic Location	Alcohol Abuse	
Most Recent Qualitative	Positive 12/1/2011	Assigned PCP	Primary Care Provider Name	Drug Abuse	
Most Recent Genotype	1a 12/1/2013	Last Visit (any)	12/19/14 @Clinic Name	Psych Hx	
Last Oncology Visit				Illicit Positive UDS	
Last HCV Visit	12/15/2014	CHRONIC HEPATITIS C W/O MENTION OF HEPATIC COMA			

specialty clinic names being pulled from the data warehouse. Given the complexities of naming nomenclature within VA data, dashboard development requires a substantial investment of code customization and validation.

Ongoing dashboard maintenance is another important challenge due to the need for staff trained in SQL coding and familiarity with VA data warehouse architecture. Consequently, until the VHA dedicates resources to maintain such dashboards, only VISNs with existing technical knowledge and staffing will benefit from dashboards.

Usability, typically defined as "...effectiveness, efficiency and satisfaction with which the intended users can achieve their tasks in the intended context of product use," is an additional consideration as the HCV clinical dashboard disseminates nationally.¹³ Standard clinic workflow is not always conducive to the use of dashboards. VHA providers use the Computerized Patient Record System (CPRS) to review and document patient notes. However, accessing the HCV dashboard involves a site hosted outside of CPRS, thereby requiring the user to take several extra steps. These and other usability factors will need to be considered as the dashboard disseminates more widely.

Finally, data describing the effectiveness of clinical dashboards is very limited. VISN 21 is tracking the number of users accessing the dashboard. However, further study is needed to determine if clinical dashboards improve patient access and quality of care as well as factors to enhance usability.

CONCLUSION

Clinical dashboards have the ability to transform each clinical provider into a population health manager who

can readily identify patients most in need of care within their facility catchment area and beyond. As HCV dashboard development and implementation grows across the VHA, there is a need to pair clinical and technological advancements with greater patient outreach and shared best practices. Understanding the factors that tie improved quality of care with usability as well as investment in dashboard development and related efforts will likely keep the VHA in the forefront of chronic care delivery.

Author disclosures

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