NASTAD Health Systems Data Technical Resource: Toolkit for Querying Claim Databases for HCV Testing and Treatment

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Background

Health systems data sources have become increasingly important for public health programs in recent years, both because of insurance coverage expansion under the Affordable Care Act (ACA) and because of incentive programs and federal investments that help providers and programs build their data and informatics capacity. Increasingly, there are opportunities for public health programs to leverage health systems data – including Medicaid claims, All Payer Claims Databases, and Electronic Health Records(EHRs)/Health Information Exchanges (HIEs) – to augment public health surveillance and ultimately outcomes for a number of health issues, including hepatitis C (HCV).

To support health department programs to use health systems data, NASTAD has partnered with the University of Massachusetts Medical School to create a series of technical resources. These resources are intended to help health department hepatitis programs assess opportunities for using health systems data to augment surveillance and assess HCV prevention and treatment access and utilization.

All of NASTAD's health systems data resources can be found on the Health Systems Integration Informatics page. For questions or more information about this work, please contact Amy Killelea or Alyssa Kitlas.

Objective of This Toolkit

This toolkit provides a list of diagnosis, procedure, and prescription drug codes to help health departments develop claims data queries to monitor HCV testing, identify individuals diagnosed with HCV, and examine their services and treatment utilization. Most people living with HCV do not know they are infected, and for individuals who are diagnosed with HCV infection, they often do not get linked to appropriate care for their HCV infection. Chronic hepatitis C can lead to serious complications such as cirrhosis, liver cancer, and liver failure. These complications can be prevented through early detection and treatment.

Analysis of claims data can provide health departments with a broader understanding of screening and treatment of HCV and help inform public health planning and resource allocation.

Medical claims data from various sources is the most comprehensive source of diagnosis, procedure, and prescription drug information from public and private health insurance payers and can be utilized for exploratory cross-sectional analysis as well as longitudinal analysis. Health care providers submit medical claims to insurance companies or carriers for reimbursement. These claims data include diagnosis codes, procedure codes, and prescription drug codes, as well as dates of service for services they provide to patients and associated medical expenditures. Insurance companies or carriers also keep member enrollment information that include enrollees' basic demographics, eligibility determination, and benefit coverage. Additional reference files are available for linking with medical claims data. An example is the provider file which includes information regarding provider specialty and practice location.

Claims data files are available from public health insurance (e.g., Medicare and Medicaid), and private health insurance (e.g., employer sponsored insurance). Many states have also established all-payer claims databases (APCDs) which is a repository of these data sets from both public and private sources. Based on the information recorded on enrollment data, claims data, and reference files, we can examine screening for HCV, monitor HCV testing and treatment utilization, examine health care expenditures, analyze changes in HCV screening over time, and analyze gaps between screening, confirmation, and treatment.

According to the HCV care cascade model, we organize this toolkit as the following:

1. Procedure codes for HCV testing
2. Diagnosis codes for HCV infection
3. Diagnosis codes for risk factors for HCV infection
4. Prescription drug codes for HCV treatment

Considerations for claims data analysis are also discussed in this toolkit.

HCV Care Cascade

The HCV Care Cascade (Figure 1) shows how health professionals can identify and follow people living with chronic HCV through sequential steps or stages of medical care. It includes:

1. Initial testing
2. Confirmation and diagnosis
3. Linkage to care and assessment
4. Treatment
5. Follow-up HCV testing
6. Achieving sustained virologic response (SVR) and cure

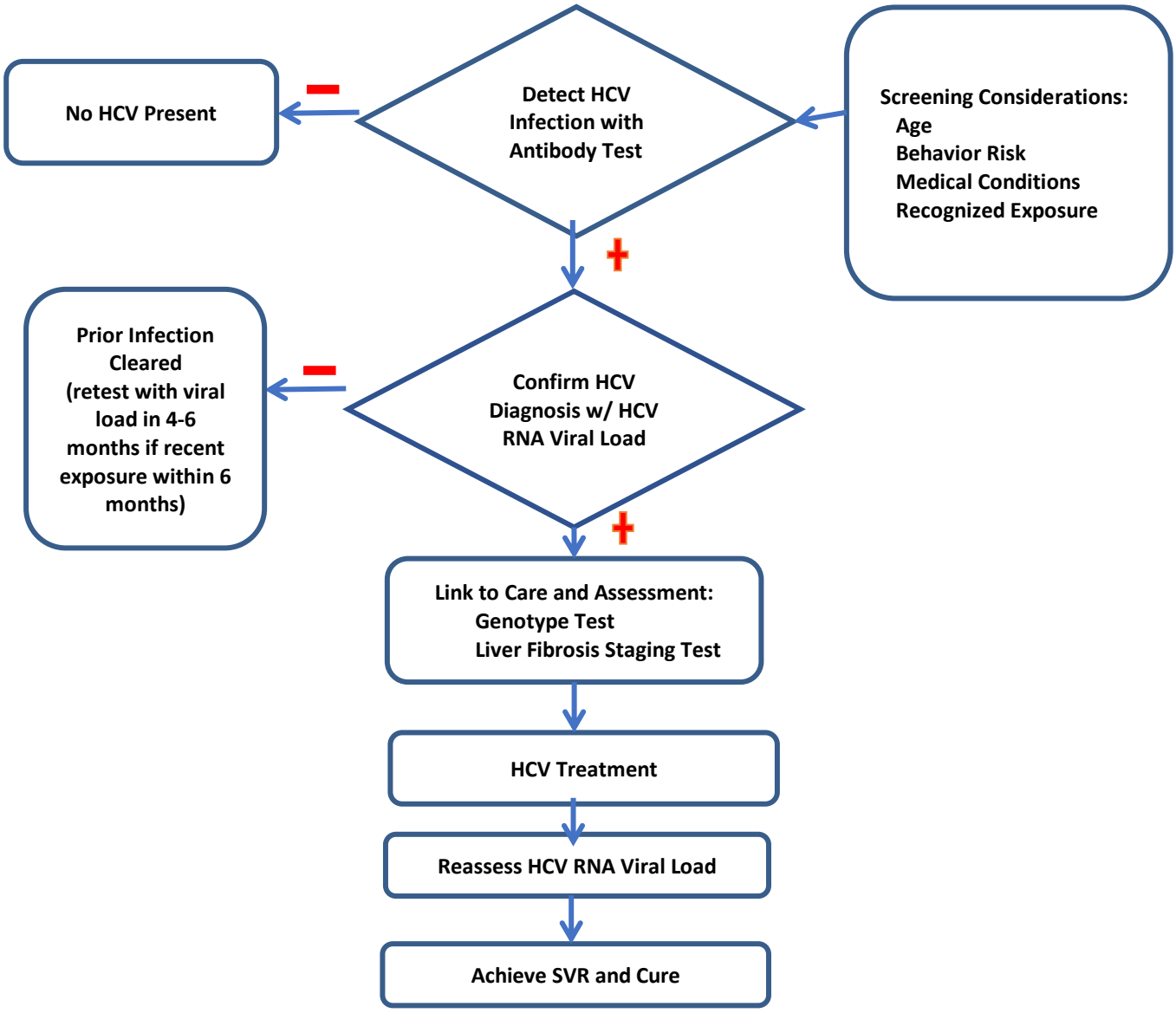

Figure 1: HCV Care Cascade

Diagnostic testing for HCV includes serologic assay that measure human antibodies generated in response to HCV infection. CDC recommends conducting an initial HCV antibody test (either rapid or laboratory-conducted assay) followed by an HCV RNA assay for all positive antibody tests.

Once an individual is diagnosed/confirmed and aware of an HCV infection, genotyping and liver fibrosis staging test will be performed to tailor dose and duration of treatment.

After completing the treatment, follow-up HCV RNA testing will help determine whether a SVR, or cure, has been achieved.

HCV Testing and Diagnosis

Testing recommendations for HCV infection

The U.S. Centers for Disease Control and Prevention (CDC) recommends that

- Adults born from 1945 through 1965 should be tested once (without prior ascertainment of HCV risk factors).[1]

HCV testing is also recommended for those who:

- Currently inject drugs, or ever injected drugs, including those who injected once or a few times many years ago
- Have certain medical conditions, including persons:
    - Who received clotting factor concentrates produced before 1987
    - Who were ever on long-term hemodialysis
    - With persistently abnormal alanine aminotransferase levels(ALT)
    - Who have HIV infection
- Were prior recipients of transfusions or organ transplants; including persons who:
    - Were notified that they received blood from a donor who later tested positive for HCV infection
    - Received a transfusion, blood components, or an organ transplant before July 1992
- HCV testing based on a recognized exposure is recommended for:
    - Healthcare, emergency medical, and public safety workers after needle sticks, sharps, or mucosal exposures to HCV-positive blood
    - Children born to HCV-positive women

Additionally, for persons who might have been exposed to HCV within the past 6 months, testing for HCV RNA or follow-up testing for HCV antibody is recommended.

Procedure codes for HCV testing

Health care providers record HCV testing through the Current Procedural Terminology (CPT®) codes or the Healthcare Common Procedure Coding System (HCPCS) codes. In addition to recording services being provided, these procedure codes are reported in medical claims data for health insurance reimbursement. Table 1 provides a list of

[1] https://www.cdc.gov/hepatitis/hcv/guidelinesc.htm

procedure codes as a reference for studying the degree to which HCV testing recommendations are being followed. These procedure codes are organized according to the stages shown in Figure 1 (HCV Care Cascade).

Table 1: Procedure Codes for HCV Testing

HCV CARE CASCADE	DESCRIPTION	CPT/HCPCS CODES
DETECT INFECTION	HCV screening with antibody test ▪ HCV antibody screening test HCV antibody positive	86803 86804 (rapid test) G0472
CONFIRM DIAGNOSIS	Chronic HCV diagnosis ▪ HCV RNA test (viral load)	87520 87521 87522
LINK TO CARE & ASSESSMENT (GENOTYPE, STAGE)	Engagement in HCV care ▪ Genotype test ▪ Liver fibrosis staging test	87902 3266F 82172 82247 82977 83010 83883 84460
CURE*	HCV Cure ▪ Follow-up HCV RNA test ▪ Achieve SVR	87520 87521 87522

* Claims data cannot directly identify HCV cure because of lack of laboratory results. However, if there is no evidence in the medical claims that someone has an HCV diagnosis over a specified period of time, we might consider them to be cured although underreporting of HCV or a patient not being engaged in care are limitations to this approach.

Diagnosis codes for HCV infection

Physicians and other healthcare professionals in the U.S. assign diagnoses associated with health care utilization according to the International Classification of Disease, Clinical Modification (ICD-CM) codes. These diagnosis codes, along with dates of service, are submitted to insurance carriers as part of medical claims file for reimbursements. The ICD-CM codes have been revised periodically and the U.S. health care industry replaced the version 9 (ICD-9-CM) with version 10 (ICD-10-CM) on October 1, 2015 to

incorporate changes in the medical field. The following diagnosis codes (Table 2) are commonly used to identify individuals with an HCV diagnosis. Using these diagnosis codes will help identify people living with HCV who can serve as the denominator for monitoring the HCV prevalence and studying the level of care engagement and retention. Both ICD-9-CM and ICD-10-CM are presented. In response to the recent change in the version of the ICD-CM codes, medical claims data usually include an "ICD-CM version" variable which indicates the version of ICD-CM that the claim record is using.

Table 2: Diagnosis Codes for HCV Infection

DESCRIPTION	ICD-9-CM	ICD-10-CM
HEPATITIS C, ACUTE, WITH HEPATIC COMA	070.41	B17.11
CHRONIC HEPATITIS C, WITH HEPATIC COMA	070.44	B18.2
HEPATITIS C, ACUTE, W/O HEPATIC COMA	070.51	B17.10
CHRONIC HEPATITIS C, W/O HEPATIC COMA	070.54	B18.2
UNSPECIFIED VIRAL HEPATITIS C WITHOUT HEPATIC COMA	070.70	B19.20
UNSPECIFIED VIRAL HEPATITIS C WITH HEPATIC COMA	070.71	B19.21
HISTORY OF HEPATITIS C	V12.09	Z86.19
HEPATITIS UNSPECIFIED* **CHRONIC HEPATITIS, NOT ELSEWHERE CLASSIFIED***	573.3	K73

* Not specific for hepatitis C

Diagnosis codes for selected risk factors for HCV infection

Additionally, Table 3 provides a list of diagnosis codes that could help identify individuals who are at an increased risk for contracting HCV. Studies can examine HCV screening among these subgroups to inform planning for outreaching and related activities.

Table 3: Diagnosis Codes for Selected Risk Factors for HCV Infection

DESCRIPTION	ICD-9-CM	ICD-10-CM
DRUG DEPENDENCE **NONDEPENDENT ABUSE OF DRUGS**	304 305	F11 to F19
CONTACT WITH OR EXPOSURE TO VENEREAL DISEASE **CONTACT WITH AND (SUSPECTED) EXPOSURE TO INFECTION WITH A PREDOMINANTLY SEXUAL MODEL OF TRANSMISSION**	V01.6	Z20.2
HIV INFECTION	042 079.53 795.71 V08 279.10 279.19	B20 B97.35 R75 Z21 D84.8
SCREENING EXAMINATION FOR VIRAL DISEASE **ENCOUNTER FOR SCREENING FOR OTHER VIRAL DISEASE**	V73.89	Z11.59
CONTACT WITH OR EXPOSURE TO COMMUNICABLE DISEASES, OTHER VIRAL DISEASES	V01.79	
CONTACT WITH AND (SUSPECTED) EXPOSURE. TO VIRAL HEPATITIS		Z20.5
EXPOSURE TO VIRAL DISEASE NOT ELSEWHERE CLASSIFIED (NEC)		Z20.828
HIGH-RISK SEXUAL BEHAVIOR	V69.2	
HIGH-RISK SEXUAL BEHAVIOR, HETEROSEXUAL		Z72.51
HIGH-RISK SEXUAL BEHAVIOR, HOMOSEXUAL		Z72.52
HIGH-RISK SEXUAL BEHAVIOR, BISEXUAL		Z72.53
OTHER DYSCHROMIA (E.G., TATTOOING) **OTHER SPECIFIED DISORDERS OF PIGMENTATION**	709.09	L81.8
OTHER PROBLEMS RELATED TO LIFESTYLE	V69.8	Z72.89

HCV Treatment

HCV treatment now cures HCV infection and long-term health complications (such as cirrhosis, liver failure, and hepatocellular carcinoma) can be effectively prevented through antiviral treatment. Pharmacy claims data provides National Drug Codes (NDC) to examine HCV treatment. Information on drug prescription date, the number of days supplied, and payment amount are also available in pharmacy claims data.

Prescription drug codes for HCV treatment

A list of commonly used direct acting antiviral drugs (DAAs) to treat HCV is provided in Table 4. In combination, using the NDCs, prescription filled date, and quantity filled, we can study the HCV treatment rate among people with confirmed HCV diagnosis as shown in the HCV Care Cascade (Figure 1). Furthermore, people receiving HCV treatment as identified above can serve as the study population to investigate the time gap between HCV diagnosis and beginning treatment and to examine treatment adherence through their prescription refills.

Table 14: National Drug Codes for HCV Treatment

DRUG NAME	NATIONAL DRUG CODE
LEDIPASVIR/SOFOSBUVIR	61958-1801-1
OMBITASVIR/PARITAPREVIR/RITONAVIR + DASABUVIR	0074-0063-01 0074-0063-28 0074-3093-01 0074-3093-28
SIMEPREVIR	59676-225-07 59676-225-28
SOFOSBUVIR	61958-1501-1
OMBITASVIR/PARITAPREVIR/RITONAVIR	0074-3082-28
DACLATASVIR	0003-0213-01 0003-0215-01
SOFOSBUVIR/VELPATASVIR	61958-2201-1
ELBASVIR+ GRAZOPREVIR	0006-3074-02
MAVYRET (GLECAPREVIR/PIBRENTASVIR)	0074-2625-01 0074-2625-28 0074-2625-56

Note: Treatment duration is 12 weeks for most patients, but 8 weeks for some genotype 1a patients and 24 weeks for certain patients with cirrhosis, prior treatment, and/or resistance associated mutations.

Considerations for Claims Data Analysis

Analysis of claims data can help health departments monitor the HCV care cascade to inform public health planning and actions. Procedure codes, diagnosis codes, and NDCs described in previous sections form the basis for developing claims data queries for this purpose. Considerations for utilizing the information for analysis are provided below.

Step One: Identify Parameters of Claims Data sources

Database structure varies substantially across health departments and state agencies. Some databases have integrated multiple data files and allow users to submit queries directly without using any additional software packages, e.g., SAS and SQL. In these query-able databases, users only have to submit diagnosis, procedure, drug codes of interest or to select their filters in the user interface to get results.

However, when an integrated and query-able database is not available, users will need to merge multiple data files to retrieve required information for the analysis. In addition to medical and pharmacy claims data, we often need demographic and coverage information from enrollment and beneficiary files. If the analysis is interested in including providers and practices, a provider file with specialty and practice locations is needed. Unique identification numbers for beneficiaries (usually encrypted) and provider numbers are required for the data linkage.

Step Two: Determine the Study Population

The identification of the study population depends on the inclusion and exclusion criteria for the analysis. This will form the denominator for deriving any rates that might be of interest to the analysis. These inclusion and exclusion criteria can be constructed from data elements in enrollment, claims, provider, and other data files. For example, one analysis might be only interested in adults born between 1945 and 1965, and another analysis might be interested in people with increased risk of HCV infection more broadly. The former would only require age or date of birth from the enrollment file alone and the latter would require developing a list of risk factors (e.g., age, gender, diagnosis) to identify individuals from the linked data files.

Step Three: Identify Measures

Using claims data to identify people with target diagnoses, procedures, and medications will form the numerators for deriving any rates of interest to the analysis. Depending on the study question, one or multiple types of these codes can be used.

Diagnosis codes will be used in studies that require identifying people with confirmed HCV diagnosis (Table 2) or those who are at risk of HCV infection (Table 3) to form the study population or to derive the denominator for rate calculations; procedure codes (Table 1) will help identify people who receive specific testing to derive the numerators for studying how HCV testing recommendations are being followed; drug codes (Table 4) provide the basis for studying HCV treatment rate, gap in treatment, and adherence.

Most claim lines have more than one field for diagnosis codes and usually have another variable to distinguish different versions of diagnosis codes (i.e., ICD-9-CM vs. ICD-10-CM). The principal diagnosis for the claim line could be listed separately or it could appear in the first diagnosis field. Secondary diagnoses are often retrieved and included for the analysis. Each clinical encounter could involve one or many procedures. Usually, all procedure codes are retained to identify the laboratory tests of interest. Pharmacy claims provide NDCs for prescriptions filled and quantity filled. Corresponding dates of service for diagnosis, procedure, and prescription filled are available in each claim line.

Step Four: Choose an Analytical Approach

Rates at each stage of the care cascade can be calculated based on numerators derived in the Measures section above and the denominator in the Study population section. With unique beneficiary identifiers and dates of service, the sequence of events can be constructed for analysis. When multiple years of data are available, cross-sectional analyses by year can be conducted to examine and monitor the change of rates over years. Also, cohort or longitudinal analyses can be designed to follow selected groups over time which would be useful for examining outcomes and evaluating programs.

Step Five: Structure the Analysis

An example is provided below to illustrate how we can structure the analysis with considerations described above when a query-able database is not available. Additional inclusion and exclusion criteria for the study population and further considerations for the overall study design can be incorporated to strengthen the analysis.

Analysis Example: HCV Screening Rate among Adult Medicaid Members Living with HIV			
Data Sources	**STUDY POPULATION**	**MEASURES**	**ANALYTICAL APPROACH**
Medicaid enrollment data for 2015 and 2016 **Medicaid medical claims data for 2015 and 2016** ***Unique beneficiary identifiers are required to link these two sets of data***	Medicaid members with HIV diagnosis in 2015 ▪ Use age or date of birth in enrollment data to select adult Medicaid members, e.g., aged 19 and older ▪ Consider excluding adult Medicaid member without continuous Medicaid enrollment in 2015 and 2016 by using enrollment from and through dates in enrollment data to calculate the enrollment length for each year; retain individuals who meet the threshold of enrollment length ▪ Identify individuals with HIV diagnosis (Table 3) in any diagnosis fields in Medicaid medical claims data	HCV screening test in 2016 ▪ Within the study population established above, identify individuals with procedure codes for HCV screening (Table 1, Detect Infection) in 2016	Use two years of Medicaid data Identify the study population (denominator; adult Medicaid members living with HIV) from the first year Identify individuals with the measure (numerator; HCV screening) from data in the second year Calculate the HCV screening rate among adult Medicaid members living with HIV by dividing the number of people with HCV screening from the Measures section by the number of adult Medicaid members from the Study Population section
Limitations: If people receive HCV screening tests in health care settings without using their Medicaid coverage, e.g., free clinics, they will not be included in the numerator for the calculation			

This analytical framework can be modified to derive the HCV prevalence in a single year or over a defined period for the general population or for a subgroup of population of interest. The Measures section will be replaced with diagnosis codes for HCV (Table 2) to derive the prevalence. The Measures section can also be expanded to include procedure codes for HCV confirmation, genotype test, and liver fibrosis staging test (Table 1) and drug codes for HCV treatment (Table 4) to derive each stage in the HCV Care Cascade (Figure 1). However, several limitations warrant special attention which will be discussed in the next section.

Strengths and Limitations

Medical claims data provide a comprehensive claims history for covered and paid health care utilization and associated expenditures across a broad array of health care settings. With appropriate approvals, people can access a large volume of data with costs that are relatively lower than primary data collection. Users can access and analyze a rich set of information about diagnoses and procedures for a cross-sectional study. With multiple years of claims data, users can also conduct cohort or longitudinal studies.

Nevertheless, several limitations for using medical claims are worthy of caution. Unless real-time access to data is available, users need to consider the time for claims data to be fully adjudicated and prepared for release. The time lag for release of "clean" data varies by agency that receives and processes the data. Although claims data come from all health care settings, they only record insurance-reimbursable health care services. Therefore, data for services that are provided through special grants or free clinics would not be included and would need to be acquired separately for analysis. While testing and procedures are recorded in claims data, laboratory results are not part of the medical claim process. Additionally, medical claims data only capture limited social and behavioral health risks.

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