



## **USER GUIDE:**

# **ELIXHAUSER COMORBIDITY SOFTWARE REFINED FOR ICD-10-CM DIAGNOSES, v2021.1**

**Issued October 2020**

Agency for Healthcare Research and Quality  
Healthcare Cost and Utilization Project (HCUP)

Phone: (866) 290-HCUP (4287)

Email: [hcup@ahrq.gov](mailto:hcup@ahrq.gov)

Website: [www.hcup-us.ahrq.gov](http://www.hcup-us.ahrq.gov)

## TABLE OF CONTENTS

What's New in the Elixhauser Comorbidity Software Refined for ICD-10-CM? .....	1
Introduction .....	2
Description of the Elixhauser Comorbidity Software Refined for ICD-10-CM.....	3
Comorbidity Measures.....	3
Comorbidity Measures that Require Indicators that the Diagnosis was Present on Admission (POA) .....	7
Comorbidity Measures That Do Not Require POA Indicators .....	7
Mapping of ICD-10-CM Diagnosis Codes into More Than One Comorbidity Measure .....	8
Handling of Clinically Similar Comorbidity Measures .....	8
ICD-10-CM Coding Guidelines that May Impact the Identification of Comorbidities .....	9
The Reporting of Diagnoses in Inpatient and Outpatient Data.....	9
Pre-Coordinated ICD-10-CM Codes .....	10
Comorbid Conditions Reported as a Principal Diagnosis .....	10
Changes in Coding Instructions .....	11
Using the Downloadable Elixhauser Comorbidity Software Refined for ICD-10-CM Files.....	12
System Requirements .....	12
Downloadable Files .....	12
Running the SAS Programs to Add Comorbidity Measures to Data.....	14
Appendix A: Background on the Elixhauser Comorbidity Software Refined for ICD-10-CM.....	16
Modifications to the Number of Comorbidity Measures .....	16
Modifications to the Clinical Criteria Used to Identify Comorbidities .....	18
Review of ICD-10-CM Diagnosis Coding .....	18
Criteria Used to Identify Secondary Diagnoses as a Comorbidity.....	23
Appendix B: Diagnosis Codes That Are Included in More Than One Comorbidity Measure .....	26

## ACKNOWLEDGEMENTS

This work was funded by the Agency for Healthcare Research and Quality (AHRQ) under contract HHSA-290-2018-00001-C. AHRQ gratefully acknowledges the contributions of clinical experts at University of California, Davis, and the technical team at IBM Watson Health. The Healthcare Cost and Utilization Project (HCUP) is a family of healthcare databases and related software tools and products developed through a Federal-State-Industry partnership and sponsored by AHRQ. HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

**Alaska** Department of Health and Social Services

**Alaska** State Hospital and Nursing Home Association

**Arizona** Department of Health Services

**Arkansas** Department of Health

**California** Office of Statewide Health Planning and Development

**Colorado** Hospital Association

**Connecticut** Hospital Association

**Delaware** Division of Public Health

**District of Columbia** Hospital Association

**Florida** Agency for Health Care Administration

**Georgia** Hospital Association

**Hawaii** Lauima Data Alliance

**Illinois** Department of Public Health

**Indiana** Hospital Association

**Iowa** Hospital Association

**Kansas** Hospital Association

**Kentucky** Cabinet for Health and Family Services

**Louisiana** Department of Health

**Maine** Health Data Organization

**Maryland** Health Services Cost Review Commission

**Massachusetts** Center for Health Information and Analysis

**Michigan** Health & Hospital Association

**Minnesota** Hospital Association (provides data for Minnesota and North Dakota)

**Mississippi** State Department of Health

**Missouri** Hospital Industry Data Institute

**Montana** Hospital Association

**Nebraska** Hospital Association

**Nevada** Department of Health and Human Services

**New Hampshire** Department of Health & Human Services

**New Jersey** Department of Health

**New Mexico** Department of Health

**New York** State Department of Health

**North Carolina** Department of Health and Human Services

**North Dakota** (data provided by the Minnesota Hospital Association)

**Ohio** Hospital Association

**Oklahoma** State Department of Health

**Oregon** Association of Hospitals and Health Systems

**Oregon** Office of Health Analytics

**Pennsylvania** Health Care Cost Containment Council

**Rhode Island** Department of Health

**South Carolina** Revenue and Fiscal Affairs Office

**South Dakota** Association of Healthcare Organizations

**Tennessee** Hospital Association

**Texas** Department of State Health Services

**Utah** Department of Health

**Vermont** Association of Hospitals and Health Systems

**Virginia** Health Information

**Washington** State Department of Health

**West Virginia** Department of Health and Human Resources, West Virginia Health Care Authority

**Wisconsin** Department of Health Services

**Wyoming** Hospital Association

## WHAT'S NEW IN THE ELIXHAUSER COMORBIDITY SOFTWARE REFINED FOR ICD-10-CM?

- The number of comorbidity measures increases from 29 to 38 in v2021.1 with the following additions and changes:
  - Three comorbidity measures have been added:
    - Cerebrovascular disease
    - Leukemia
    - Other thyroid disorders
  - Five comorbidity measures have been modified to create 12 more specific measures:
    - Uncomplicated and complicated hypertension
    - Mild and moderate/severe liver disease
    - Moderate and severe renal failure
    - Malignant and in situ solid tumors without metastasis
    - Dementia, seizures and epilepsy, neurological disorders affecting movement, and other neurological disorders.
  - One comorbidity measure (fluid and electrolyte disorders) has been discontinued.
- Changes to the comorbidity measures include the following:
  - The ICD-10-CM coding criteria for all comorbidity measures has been clinically reviewed with diagnosis codes added and removed.
  - Some diagnoses are mapped to more than one comorbidity measure.
  - The identification of the secondary diagnosis as a comorbidity has changed:
    - Medicare Severity-diagnosis related groups (MS-DRGs) are no longer being used to exclude secondary diagnoses related to the principal diagnosis.
    - For some comorbidity measures, indicators that the secondary diagnosis was present on admission (POA) are used to identify pre-existing conditions, as opposed to medical conditions that arise during the hospital stay.

## INTRODUCTION

This report provides technical documentation for the Healthcare Cost and Utilization Project (HCUP) Elixhauser Comorbidity Software Refined for International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)-coded diagnoses. Starting on October 1, 2015, diagnoses for hospital inpatient stays and outpatient encounters in the United States are reported using the ICD-10-CM coding system. The Elixhauser Comorbidity Software Refined for ICD-10-CM assigns data elements that identify different pre-existing conditions based on secondary diagnoses (i.e., comorbidities) listed on hospital administrative data. In health services research, it is often important to control for comorbidities that are not directly related to the reason for the inpatient stay or outpatient encounter as they can impact resource allocation (e.g., length of stay or charges), as well as possibly affect outcomes used to assess the quality of care, such as in-hospital mortality.

The Elixhauser Comorbidity Software was originally developed using ICD-9-CM diagnosis codes.<sup>1</sup> The software was translated into ICD-10-CM prior to the availability of ICD-10-CM-coded data and released as a beta version. Once ICD-10-CM-coded data became available, the beta version of the Elixhauser Comorbidity Software was evaluated by clinical experts. The recommended modifications (implemented in v2021.1) transition the software tool out of its beta status and into the Elixhauser Comorbidity Software Refined for ICD-10-CM.

The v2021.1 release of the Elixhauser Comorbidity Software Refined for ICD-10-CM retains the same clinical intent of defining a comprehensive list of comorbidity measures for use with large administrative databases, however refinements were made to the clinical criteria used for identification of comorbidities and also with some of the comorbidity measures themselves. The number of comorbidity measures increases from 29 to 38 in v2021.1 with three measures added, five measures modified to create 12 more specific measures, and one measure discontinued. Additional information on the clinical review and rationale for modifications implemented in v2021.1 is provided in [Appendix A](#).

The Elixhauser Comorbidity Software Refined for ICD-10-CM is updated annually to coincide with fiscal year updates to the ICD-10-CM diagnosis coding system and retains diagnosis codes valid from the start of ICD-10-CM in October 2015. For this reason, it is advisable to always use the most recent version of the tool.

---

<sup>1</sup> Elixhauser, Anne, et al. Comorbidity Measures for Use with Administrative Data. *Medical Care*, vol. 36, no. 1, 1998, pp. 8-27 JSTOR, <https://www.jstor.org/stable/3766985>. Accessed 5 Sept. 2020.

## DESCRIPTION OF THE ELIXHAUSER COMORBIDITY SOFTWARE REFINED FOR ICD-10-CM

### Comorbidity Measures

The Elixhauser Comorbidity Software Refined for ICD-10-CM creates comorbidity measures that identify pre-existing medical conditions that are not directly related to the main reason for the hospital encounter and that, if present on admission, would be associated with a substantial impact on certain outcomes, such as an increase in length of stay, charges, or in-hospital mortality.

The following changes to the comorbidity measures were made with the v2021.1 release of the tool:

- The ICD-10-CM coding criteria for all comorbidity measures has been clinically reviewed with diagnosis codes added and removed.
- Some diagnoses are mapped to more than one comorbidity measure.
- The identification of the secondary diagnosis as a comorbidity has changed:
  - Medicare Severity-diagnosis related groups (MS-DRGs) are no longer being used to exclude secondary diagnoses related to the principal diagnosis.
  - For some comorbidity measures, indicators that the secondary diagnosis was present on admission (POA) are used to identify pre-existing conditions, as opposed to medical conditions that arise during the hospital stay.
- Three comorbidity measures have been added:
  - Cerebrovascular disease
  - Leukemia
  - Other thyroid disorders
- Five comorbidity measures have been modified to create 12 more specific measures:
  - Uncomplicated and complicated hypertension
  - Mild and moderate/severe liver disease
  - Moderate and severe renal failure
  - Malignant and in situ solid tumors without metastasis
  - Dementia, seizures and epilepsy, neurological disorders affecting movement, and other neurological disorders.
- One comorbidity measure (fluid and electrolyte disorders) has been discontinued.

The 38 comorbidity measures are identified using secondary ICD-10-CM diagnoses on an inpatient discharge or outpatient record. Starting with v2021.1, indicators that the secondary diagnosis was present on admission (POA) are used for a subset of the comorbidity measures where the condition could have arisen either prior to or during the hospital stay.<sup>2</sup> The remaining

---

<sup>2</sup> POA indicators are only used for diagnoses that are not exempt from POA reporting.

comorbidity measures do not use POA indicators because the condition can be assumed to be pre-existing and not the result of hospital care (e.g., diabetes, AIDS). In contrast, the Elixhauser Comorbidity Software for ICD-9-CM and the beta versions of the Elixhauser Comorbidity Software for ICD-10-CM used the MS-DRGs to exclude secondary diagnoses related to the principal diagnosis for the inpatient stay. Additional information on the changes implemented with the v2021.1 release, including background on why the changes were made, is included in [Appendix A](#).

Table 1 provides a list of the 38 comorbidity measures, associated abbreviations used for data element names in the accompanying SAS program, and an indication of whether POA indicators are used. The comorbidity measures are alphabetized based on the comorbidity measure's abbreviation.

**Table 1. List of the 38 Comorbidity Measures and Indication of Use of POA**

Abbreviation (SAS Data Element Name)	Comorbidity Measure	Uses POA?
AIDS	Acquired immune deficiency syndrome	No
ALCOHOL	Alcohol abuse	No
ANEMDF	Deficiency anemias	Yes
ARTH	Arthropathies (Revised measure description starting with v2021.1. Prior description was Rheumatoid arthritis/collagen vascular diseases.)	No
BLDLOSS	Chronic blood loss anemia	Yes
CANCER_LEUK	Leukemia (New comorbidity measure, starting with v2021.1)	No
CANCER_LYMPH	Lymphoma	No
CANCER_METS	Metastatic cancer	No
CANCER_NSITU	Solid tumor without metastasis, in situ (The prior comorbidity measure for Solid tumor without metastasis has been modified to identify malignant tumors separate from in situ tumors, starting with v2021.1)	No
CANCER_SOLID	Solid tumor without metastasis, malignant (The prior comorbidity measure for Solid tumor without metastasis has been modified to identify malignant tumors separate from in situ tumors, starting with v2021.1)	No
CBVD	Cerebrovascular disease (New comorbidity measure, starting with v2021.1)	Yes

Abbreviation (SAS Data Element Name)	Comorbidity Measure	Uses POA?
CHF	Congestive heart failure	Yes
COAG	Coagulopathy	Yes
DEMENTIA	Dementia <i>(The prior comorbidity measure Neurological disorders has been modified to identify separate conditions for dementia, seizures and epilepsy, neurological disorders affecting movement, and other neurological disorders, starting with v2021.1)</i>	No
DEPRESS	Depression	No
DIAB_CX	Diabetes with chronic complications	No
DIAB_UNCX	Diabetes without chronic complications	No
DRUG_ABUSE	Drug abuse	No
HTN_CX	Hypertension, complicated <i>(The prior comorbidity measure for Hypertension has been modified to separate uncomplicated and complicated hypertension, starting with v2021.1)</i>	No
HTN_UNCX	Hypertension, uncomplicated <i>(The prior comorbidity measure for Hypertension has been modified to separate uncomplicated and complicated hypertension, starting with v2021.1)</i>	No
LIVER_MLD	Liver disease, mild <i>(The prior comorbidity measure for Liver disease has been modified to separate mild and moderate to severe liver disease, starting with v2021.1)</i>	Yes
LIVER_SEV	Liver disease, moderate to severe <i>(The prior comorbidity measure for Liver disease has been modified to separate mild and moderate to severe liver disease, starting with v2021.1)</i>	Yes
LUNG_CHRONIC	Chronic pulmonary disease	No
NEURO_MOVT	Neurological disorders affecting movement <i>(The prior comorbidity measure Neurological disorders has been modified to identify separate conditions for dementia, seizures and epilepsy, neurological disorders affecting movement, and other neurological disorders, starting with v2021.1)</i>	Yes



Abbreviation (SAS Data Element Name)	Comorbidity Measure	Uses POA?
NEURO_OTH	Other neurological disorders <i>(The prior comorbidity measure Neurological disorders has been modified to identify separate conditions for dementia, seizures and epilepsy, neurological disorders affecting movement, and other neurological disorders, starting with v2021.1)</i>	Yes
NEURO_SEIZ	Seizures and epilepsy <i>(The prior comorbidity measure Neurological disorders has been modified to identify separate conditions for dementia, seizures and epilepsy, neurological disorders affecting movement, and other neurological disorders, starting with v2021.1)</i>	Yes
OBESE	Obesity	No
PARALYSIS	Paralysis	Yes
PERIVASC	Peripheral vascular disease	No
PSYCHOSES	Psychoses	Yes
PULMCIRC	Pulmonary circulation disease	Yes
RENFLF_MOD	Renal failure, moderate <i>(The prior comorbidity measure for Renal failure has been modified to separate moderate and renal failure, starting with v2021.1)</i>	Yes
RENFLF_SEV	Renal failure, severe <i>(The prior comorbidity measure for Renal failure has been modified to separate moderate and renal failure, starting with v2021.1)</i>	Yes
THYROID_HYPO	Hypothyroidism	No
THYROID_OTH	Other thyroid disorders <i>(New comorbidity measure, starting with v2021.1)</i>	No
ULCER_PEPTIC	Peptic ulcer with bleeding	Yes
VALVE	Valvular disease	Yes
WGHTLOSS	Weight loss	Yes

### Comorbidity Measures that Require Indicators that the Diagnosis was Present on Admission (POA)

Starting with v2021.1 of the Elixhauser Comorbidity Software Refined for ICD-10-CM, POA indicators are required to assign 18 of the 38 comorbidity measures. As an example, POA indicators would be needed to identify if coagulopathy complications were present on admission (e.g., the result of treatment at the transferring hospital) or if they occurred during the hospital stay.

For all 18 of the comorbidity measures that use POA information, the secondary diagnosis of interest must be present on admission, identified using the following values of POA:

- Y indicating the diagnosis was present at the time of admission
- W indicating provider is unable to clinically determine whether condition was present on admission or not.

For the cerebrovascular comorbidity measure, there is also criteria that certain diagnoses are not present on admission, identified using the following values of POA:

- N indicating the diagnosis was *not* present at the time of admission
- U indicating that documentation was insufficient to determine if the condition was present on admission.

Some ICD-10-CM diagnosis codes are exempt from POA reporting because they are for circumstances regarding the healthcare encounter or factors influencing health status that do not represent a current disease or injury or that describe conditions that are always present on admission. When exempt codes are included in clinical criteria for a measure that uses POA, the POA value of the code is not considered.

Starting with v2021.1, the Elixhauser Comorbidity Software Refined for ICD-10-CM will not assign the 18 comorbidity measures if the input data to the software does not include POA indicators. POA information is often reported in inpatient data and less frequently in outpatient data. Per the ICD-10-CM Coding Guidelines, the reporting of POA information is required for “all claims involving inpatient admissions to general acute care hospitals or other facilities that are subject to a law or regulation mandating collection of present on admission information.”<sup>3</sup>

### Comorbidity Measures That Do Not Require POA Indicators

Twenty of the 38 comorbidity measures do not require the use of POA indicators because the condition can be assumed to be pre-existing and not the result of hospital care (e.g., diabetes,

---

<sup>3</sup> ICD-10-CM Official Guidelines for Coding and Reporting FY 2020, Appendix I (<https://www.cms.gov/Medicare/Coding/ICD10/Downloads/2020-Coding-Guidelines.pdf>). Accessed 5 Sept. 2020.

AIDS). It should be noted that the ICD-10-CM diagnosis codes used to identify comorbidities may capture conditions that occurred immediately prior to the inpatient stay or outpatient encounter (that also meet the criteria above). Examples include alcohol diagnoses that might indicate a condition that is the result of recent, excessive binge-drinking rather than chronic alcohol abuse.

### **Mapping of ICD-10-CM Diagnosis Codes into More Than One Comorbidity Measure**

Beginning with v2021.1 of the Elixhauser Comorbidity Software Refined for ICD-10-CM, individual diagnosis codes may be assigned to more than one comorbidity measure. For example, ICD-10-CM diagnosis code I13.2 (Hypertensive heart and chronic kidney disease with heart failure and with stage 5 chronic kidney disease, or end stage renal disease) is included in three comorbidity measures:

- Congestive heart failure (CHF)
- Hypertension complicated (HTN\_CX)
- Renal failure, severe (RENLFL\_SEV)

Cross-classification of ICD-10-CM diagnoses is deemed necessary to identify all conditions specified within a given code description.

**WARNING:** Some analyses using the comorbidity measures group patients by the number of comorbidities. For this application, the measures with cross-classified codes would need to be adjusted to remove the duplication. See [Appendix B](#) for a list of codes that are cross-classified.

### **Handling of Clinically Similar Comorbidity Measures**

There are some comorbidity measures that are clinically similar but differentiated by severity. It is possible for an input record to include an ICD-10-CM diagnosis code that triggers both the less severe and the more severe comorbidity measure. In these cases, the SAS analysis program will only assign the input record to the more severe comorbidity measure:

- Diabetes, complicated, is assigned over Diabetes, uncomplicated
- Hypertension, complicated, is assigned over Hypertension, uncomplicated
- Liver disease, moderate to severe, is assigned over Liver disease, mild
- Renal failure, severe, is assigned over Renal failure, moderate
- Metastatic cancer is assigned over Solid tumor without metastasis, malignant and in situ
- Solid tumor without metastasis, malignant, is assigned over Solid tumor without metastasis, in situ.

## ICD-10-CM Coding Guidelines that May Impact the Identification of Comorbidities

The following ICD-10-CM coding guidelines may impact the identification of comorbidities in inpatient and outpatient data:

- The different coding guidelines for reporting diagnosis in inpatient and outpatient data
- The use of pre-coordinated ICD-10-CM codes
- Changes over in coding instructions for which diagnosis should be coded first on a record.

Further details are described in the sections that follow.

### The Reporting of Diagnoses in Inpatient and Outpatient Data

Starting with v2021.1, the Elixhauser Comorbidity Software Refined for ICD-10-CM can be applied to both inpatient and outpatient data.<sup>4</sup> However, there are some key differences in the ICD-10-CM Coding Guidelines<sup>5</sup> between these two settings of care that are important to note:

- Principal or first-listed diagnosis
  - In inpatient data, the term principal diagnosis is used (Section II). The principal diagnosis is defined as “that condition established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care (Section II).”
  - In outpatient data, the term first-listed diagnosis is used in lieu of principal diagnosis (Section IV.A). The instructions specify to list first the ICD-10-CM code for the diagnosis, condition, problem, or other reason for encounter/visit shown in the medical record to be chiefly responsible for the services provided. In some cases, the first-listed diagnosis may be a symptom when a diagnosis has not been established (confirmed) by the provider (Section IV.G). For ambulatory surgery, code the diagnosis for which the surgery was performed (Section IV.N).
- Secondary diagnoses
  - Secondary diagnoses should indicate additional conditions that affect patient care in terms of requiring clinical evaluation, therapeutic treatment, diagnostic procedures, extended length of stay or increased nursing care and/or monitoring (Section III).

---

<sup>4</sup> Prior to v2021.1, the Elixhauser Comorbidity Software was only applicable to inpatient data because of the use of DRGs to identify comorbidities.

<sup>5</sup> ICD-10-CM Official Guidelines for Coding and Reporting FY 2020

(<https://www.cms.gov/Medicare/Coding/ICD10/Downloads/2020-Coding-Guidelines.pdf>). Accessed 5 Sept. 2020.

- In inpatient data, if the secondary diagnosis documented at the time of discharge is qualified as “probable,” “suspected,” or other similar terms indicating uncertainty, code the condition as if it existed or was established (Section III.C).
- In outpatient data, instructions indicate that uncertain diagnoses should not be coded. Rather, code the condition(s) to the highest degree of certainty for that encounter/visit, such as symptoms, signs, abnormal test results, or other reason for the visit (Section IV.H).

A larger number of secondary diagnoses are often reported in inpatient data than outpatient data. For example, in the 2017 HCUP National Inpatient Sample (NIS), the average number of secondary diagnoses is 10.3. In the 2017 HCUP Nationwide Ambulatory Surgery Sample (NASS), the average number of secondary diagnoses is 4.0. The limited reporting of secondary diagnoses will limit the ability of the software to identify comorbidities.

### Pre-Coordinated ICD-10-CM Codes

Included in the ICD-10-CM coding system are pre-coordinated codes, which are ICD-10-CM diagnosis codes that wrap together both an acute manifestation and the underlying cause. For example, ICD-10-CM diagnosis code K25.4 (Chronic or unspecified gastric ulcer with hemorrhage) includes the acute manifestation, which in this case is the hemorrhage, and the pre-existing condition, which is the chronic or unspecified gastric ulcer. The comorbidity software will not always identify the pre-existing condition in a pre-coordinated code as a comorbidity for the following reasons:

- If the pre-coordinated ICD-10-CM diagnosis code is reported as a *principal or first-listed diagnosis*, the software will not identify the comorbidity because the software only considers secondary diagnoses.
- If the pre-coordinated ICD-10-CM diagnosis code is reported as *secondary diagnosis*, the identification will depend on POA indicator. The ICD-10-CM coding guidelines specify that the POA indicator should be assigned as not present on admission if any of the clinical concepts included in the code was not present on admission. If a secondary diagnosis code of K25.4 is not present on admission because the hemorrhaging occurred after the patient was in the hospital, the diagnosis will not trigger the comorbidity measure for peptic ulcer with bleeding (ULCER\_PEPTIC). The software requires the condition be present on admission.

### Comorbid Conditions Reported as a Principal Diagnosis

If the underlying comorbidity is the reason for the inpatient stay and, therefore, coded as a principal diagnosis instead of a secondary, the Elixhauser Comorbidity Software Refined for ICD-10-CM may not flag the comorbid condition because it only considers secondary diagnoses. Consider the following two different scenarios for which identification of the comorbidity would be dependent on ICD-10-CM Coding Guidelines:

- Example 1 Obesity: If a patient is going to the hospital for bariatric surgery, the principal diagnosis might be *Morbid (severe) obesity due to excess calories* (diagnosis code E66.01). This code will only trigger the obesity comorbidity if reported as a secondary diagnosis. If the record happens to include a secondary diagnosis indicating a large body mass index (BMI) (diagnosis codes Z68.30-Z68.54), then the obesity comorbidity will be triggered by the Z68 code. Some insurance companies require that the large BMI be reported, but that is not a requirement specified in the ICD-10-CM coding conventions.
- Example 2: Kidney failure: Suppose a patient has the principal diagnosis of *Hypertensive heart and chronic kidney disease with heart failure and with stage 5 chronic kidney disease, or end stage renal* (diagnosis codes I13.2). The ICD-10-CM Coding Guidelines specify that the corresponding stage of the chronic kidney disease be reported as a secondary diagnosis (diagnosis codes N18).<sup>6</sup> In this case, the renal failure will always be a comorbidity because of the coding requirement to include the staging as a secondary diagnosis.

### Changes in Coding Instructions

Changes in coding instructions may impact the identification of comorbidities within and across data years. For example, effective October 1, 2017, the coding instructions for patients with chronic obstructive pulmonary disease (COPD) and pneumonia was revised to indicate that the J44.0 code for COPD should be coded as the principal diagnosis with the type of pneumonia reported as a secondary diagnosis. This causes a large increase in inpatient stays with a principal diagnosis of COPD and corresponding decrease in stays with a secondary diagnosis of COPD and the comorbidity measure for the chronic pulmonary disease (LUNG\_CHRONIC) beginning October 2017. The coding note was modified a year later (effective October 1, 2018) to leave the order of the COPD and pneumonia diagnosis codes as the discretion of the coder. The code reported as the principal diagnosis should be the condition principally responsible for the inpatient stays and could be either COPD or pneumonia.

---

<sup>6</sup> Section I.C.9.a.2 [ICD-10-CM Official Guidelines for Coding and Reporting FY 2021](#) (Accessed on 9/24/2020).

## USING THE DOWNLOADABLE ELIXHAUSER COMORBIDITY SOFTWARE REFINED FOR ICD-10-CM FILES

### System Requirements

Using the Elixhauser Comorbidity Software Refined for ICD-10-CM requires a program to decompress or “unzip” files.<sup>7</sup> Approximately 4 megabytes of disk space available on one’s hard drive also will be needed to accommodate all the tool’s files. Additional space is necessary for saving the tool’s output files.

### Downloadable Files

The Elixhauser Comorbidity Software Refined for ICD-10-CM zip file contains the following:

1. SAS format library, which includes formats for the mapping of ICD-10-CM diagnosis codes into the comorbidity measures, as well as formats that identify ICD-10-CM diagnoses exempt from POA reporting.
2. SAS program to apply the SAS formats to the user’s data.
3. Elixhauser Comorbidity Software Refined for ICD-10-CM User Guide (PDF).
4. Change log detailing changes between v2021.1 and v2020.1 (beta version).

Table 2 includes detail on the names and purposes of each file contained in the Elixhauser Comorbidity Software Refined for ICD-10-CM zip file.

---

<sup>7</sup> Third-party zip utilities are available from the following reputable vendors on their official websites: ZIP Reader (Windows) (free download offered by PKWARE, Inc.), SecureZIP® for Mac or Windows (free evaluation and licensed/fee software offered by PKWARE, Inc.), WinZip (Windows) (evaluation and fee versions offered by the Corel Corporation), Stuffit Expander® (Mac) (free evaluation and licensed/fee software offered by Smith Micro Software Inc.).

**Table 2. Contents of the Elixhauser Comorbidity Software Refined for ICD-10-CM Zip File**

<b>File Name</b>	<b>Purpose</b>
Comorb_ICD10CM_Format_vyyyy-r.sas where yyyy represents calendar year and r represents a release number within the year <sup>a</sup>	SAS format program that includes the format needed to identify ICD-10-CM diagnosis codes in each of the comorbidity measures. Also included are formats that identify which ICD-10-CM diagnosis codes are exempt from POA reporting.
Comorb_ICD10CM_Analy_vyyyy-r.sas where yyyy represents calendar year and r represents a release number within the year <sup>a</sup>	SAS analysis program that applies the formats defined in the above file to the user-provided input data and creates SAS data elements for each of the comorbidity measures. POA-sensitive comorbidity measures will not be assigned if the input data does not include POA information.
Com-ICD10CM-User-Guide-vyyyy-r.pdf where yyyy represents calendar year and r represents a release number within the year <sup>a</sup>	This document (i.e., User Guide for the Elixhauser Comorbidity Software Refined for ICD-10-CM in PDF format).
Com-ICD10CM-ReferncFile-vyyyyr.xlsx where yyyy represents calendar year and r represents a release number within the year <sup>a</sup>	A reference file (Microsoft Excel) includes three tabs: (1) The first tab is a table of contents with links to the other tabs. (2) The second tab includes a list of comorbidity measures with abbreviations and indication whether POA is required for assignment. (3) The third tab lists the ICD-10-CM diagnosis codes with descriptions included in the software and the associated comorbidity (or comorbidities).
Com-ICD10CMChgLg-vyyyyr-vyyyyr.xlsx where yyyy represents calendar year and r represents a release number within the year <sup>a</sup>	A log (Microsoft Excel) between two versions of the Elixhauser Comorbidity Software Refined for ICD-10-CM software including list of changes.

Abbreviations: Analy, analysis; Com/Comorb, Elixhauser Comorbidity Software Refined for ICD-10-CM; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification

<sup>a</sup>For example, the first format file release to include codes valid through fiscal year 2021 is named Comorb\_ICD10CM\_Format\_v2021-1.txt.



## Running the SAS Programs to Add Comorbidity Measures to Data

To download, modify, and run the software to apply the Elixhauser Comorbidity Software Refined for ICD-10-CM to an input dataset, follow these steps:

1. Users should download and extract the contents of the zip file containing the Elixhauser Comorbidity Software Refined for ICD-10-CM tool to a saved location on their computer. Files included in the zip file are described in Table 2 and referenced below.
2. Users must set up the SAS programs (Comorb\_ICD10CM\_Format\_vyyyy-r.sas and Comorb\_ICD10CM\_Analy\_vyyyy-r.sas) to run on their data. Users must specify or modify where applicable:
  - a. Change the paths in the SAS programs to point to the computer location(s) of:
    - i. The SAS program (Comorb\_ICD10CM\_Format\_vyyyy-r.sas or Comorb\_ICD10CM\_Analy\_vyyyy-r.sas)
    - ii. The input dataset
    - iii. The output dataset
  - b. Set the macro variables in the SAS analysis program (Comorb\_ICD10CM\_Analy\_vyyyy-r.sas) to match the data element names and file structure of the input dataset.

Table 3 provides the modifiable macro variables and directory paths within the SAS Analysis Program. A description of each macro variable or directory path is provided along with the corresponding SAS program syntax. Within the table and the SAS Analysis Program, these macro variables or directory paths are organized into three sections: File Locations, Input Characteristics, and File Names.

**Table 3. Modifiable Macro Variables and Directory Paths in SAS Analysis Program**

Description of Macro Variables and Directory Paths	SAS Program Syntax
<b>File Locations</b>	
Location of the SAS format library	LIBNAME LIBRARY
Specify the location of the input dataset	LIBNAME IN1
Specify the location of the output dataset(s)	LIBNAME OUT1
<b>File Names</b>	
Specify the file name of the input dataset	%LET CORE=YOUR_SAS_FILE
Specify the file name of the output dataset	%LET OUT1=OUTPUT_SAS_FILE

Description of Macro Variables and Directory Paths	SAS Program Syntax
<b>Input Characteristics</b>	
Specify the maximum number of ICD-10-CM diagnosis codes on any record in the input file. In this example the maximum number of ICD-10-CM diagnosis codes on any record is 15. The value of NUMDX must be numeric and greater than or equal to 1; otherwise, the program will not read in any ICD-10-CM diagnosis codes for comorbidity measure assignment.	%LET NUMDX=15
Set to 1 if indicators that diagnoses are present on admission (POA) are available in the input data; set to 0 otherwise.	%LET POA=1

Abbreviation: ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification

## APPENDIX A: BACKGROUND ON THE ELIXHAUSER COMORBIDITY SOFTWARE REFINED FOR ICD-10-CM

The Elixhauser Comorbidity Software was originally developed using ICD-9-CM diagnosis codes.<sup>8,9</sup> The software was translated into ICD-10-CM prior to the availability of ICD-10-CM-coded data and released as a beta version. Once ICD-10-CM-coded data became available, the beta version of the Elixhauser Comorbidity Software was evaluated by clinical experts. The recommended modifications (implemented in v2021.1) transition the software tool out of its beta status and into the Elixhauser Comorbidity Software Refined for ICD-10-CM.

The v2021.1 modifications of the Elixhauser Comorbidity Software Refined for ICD-10-CM strived to retain the clinical intent of prior versions of the software and focused on two types of changes:

- Modifications to the comorbidity measures included in the software tool
- Modifications to the clinical criteria used to identify comorbidities.

Further details on the two types of changes are described in the sections that follow.

### Modifications to the Number of Comorbidity Measures

This process began with a literature review to understand how the Elixhauser Comorbidity Software had been used in health services research. Specifically, the team was interested in learning of any recommendations from researchers in terms of comorbidity measures to add or drop. Articles of interest included the following (in alphabetic order):

- Charlson ME, Pompei P, Ales KL, MacKenzie CR. A New Method of Classifying Prognostic Comorbidity in Longitudinal Studies: Development and Validation. 1987; J Chron Dis. 40(5): 373-383.
- Coleman CI, Kohn CG, Crivera C, Schein JR, Peacock WF. Validation of the multivariable In-hospital Mortality for Pulmonary embolism using Claims data (IMPACT) prediction rule within an all-payer inpatient administrative claims database. BMJ Open. 2015 Oct 28;5(10):e009251.
- Epstein RH, Dexter F. Development and validation of a structured query language implementation of the Elixhauser comorbidity index. J Am Med Inform Assoc. 2017 Jul 1;24(4):845-850.
- Fortin Y, Crispo JA, Cohen D, McNair DS, Mattison DR, Krewski D. External validation and comparison of two variants of the Elixhauser comorbidity measures for all-cause mortality. PLoS One. 2017 Mar 28;12(3):e0174379.

---

<sup>8</sup> Elixhauser, Anne, et al. Comorbidity Measures for Use with Administrative Data. *Medical Care*, vol. 36, no. 1, 1998, pp. 8-27 JSTOR, <https://www.jstor.org/stable/3766985>. Accessed 5 Sept. 2020.

<sup>9</sup> Romano PS, Roos LL, Jollis JG. Adapting a clinical comorbidity index for use with ICD-9-CM administrative data: differing perspectives. J Clin Epidemiol. 1993 Oct;46(10):1075-9; discussion 1081-90. HCUP (10/23/20)

- Glasheen WP, Cordier T, Gumpina R, Haugh G, Davis J, Renda A. Charlson Comorbidity Index: *ICD-9* Update and *ICD-10* Translation. *Am Health Drug Benefits*. 2019 Jun-Jul;12(4):188-197.
- Newman WC, Kubitlis PS, Hoh BL. Validation of a neurovascular comorbidities index for retrospective database analysis. *J Neurosurg*. 2018 Jan 26;130(1):273-277.
- Quan H, Sundararajan V, Halfon P, Fong A, Burnand B, Luthi JC, Saunders LD, Beck CA, Feasby TE, Ghali WA. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Med Care*. 2005 Nov;43(11):1130-9.

After reviewing results from the literature search, the team decided to modify the original comorbidity measures as follows:

- Four measures were modified to account for disease severity:
  - Hypertension – uncomplicated and complicated
  - Liver disease – mild and moderate to severe
  - Renal failure – moderate and severe
  - Solid tumor without metastasis – malignant and in situ.
- The heterogeneous category of neurological disorders was divided into four more specific categories:
  - Dementia
  - Seizures and epilepsy
  - Neurological disorders affecting movement
  - Other neurological disorders.
- Three comorbidity measures were added:
  - Cerebrovascular disease because of a significant increase (48%) from 2006 to 2014 in comorbid cerebrovascular events for patients aged 35 to 64 years old.<sup>10</sup>
  - Leukemia to make the reporting of cancer-related comorbidities more complete.
  - Other thyroid as a compliment to hypothyroidism in order to capture hyperthyroidism and other thyroid disorders.
- One measure, Fluid and electrolyte disorders, was discontinued because the diagnoses included in this comorbidity measure are typically considered acute and secondary to an underlying problem or comorbidity.

Cerebrovascular disease, dementia, and leukemia were considered for the original ICD-9-CM list of comorbidity measures but were excluded because the analysis did not show their presence was related length of stay, total charges, or in-hospital mortality. The original study was based on 1992 data from 439 hospitals in the California.<sup>11</sup> The clinical review team decided that these comorbidities were important to include for current data.

---

<sup>10</sup> Tong X, Yang Q, Ritchey MD, George MG, Jackson SL, Gillespie C, et al. The Burden of Cerebrovascular Disease in the United States. *Prev Chronic Dis* 2019;16:180411.

<sup>11</sup> Elixhauser, Anne, et al. Comorbidity Measures for Use with Administrative Data. *Medical Care*, vol. 36, no. 1, 1998, pp. 8-27 JSTOR, <https://www.jstor.org/stable/3766985>. Accessed 5 Sept. 2020.

## Modifications to the Clinical Criteria Used to Identify Comorbidities

The clinical criteria used to identify comorbidities were modified in two ways:

- The ICD-10-CM diagnosis codes included in each comorbidity measure
- The criteria used to identify secondary diagnoses as a comorbidity.

### Review of ICD-10-CM Diagnosis Coding

The ICD-10-CM coding for each of the 38 comorbidity measures was reviewed by clinical experts. The review compared the diagnosis codes included in the beta version of the Elixhauser Comorbidity Software for ICD-10-CM with three other sources of information: (1) codes included in similar categories of the Clinical Classifications Software Refined (CCSR) for ICD-10-CM diagnosis, (2) codes identified as chronic in the beta version of the Chronic Condition Indicator for ICD-10-CM, and (3) coding criteria specified in articles in the literature search. Also considered was information on the frequency of codes reported as principal and secondary diagnoses with the corresponding counts by the different values of the POA indicators. Frequency counts were based on the 2017 HCUP State Inpatient Databases (SID) from 43 States with POA indicators. The coding review was also applicable to the newly added comorbidity measures. Included in Table A.1 is a summary of the decisions for the individual comorbidity measures in terms of included ICD-10-CM diagnosis codes.

**Table A.1 Summary of Clinical Coding Changes by Comorbidity Measure**

Comorbidity Measure	ICD-10-CM Coding Decisions
AIDS: Acquired immune deficiency syndrome	<ul style="list-style-type: none"><li>• Added O98 codes for <i>Human immunodeficiency virus [HIV] disease complicating pregnancy, childbirth and the puerperium</i> to ensure that pregnancy-related conditions are captured.</li><li>• Added Z21, <i>Asymptomatic human immunodeficiency virus [HIV] infection status</i>. Z21 is coded on the hospital record if the physician documents that the patient is “HIV positive,” “known HIV,” “HIV test positive,” or similar terminology.</li></ul>
ALCOHOL: Alcohol abuse	<ul style="list-style-type: none"><li>• Alcohol use codes are only included if the code is (1) complicating pregnancy or (2) in combination with a psychiatric disorder recognized under <i>Diagnostic and Statistical Manual of Mental Disorders (DSM)</i>.<ul style="list-style-type: none"><li>◦ Added O99.3 codes for <i>Alcohol use complicating pregnancy, childbirth, and the puerperium</i> to ensure that pregnancy-related conditions are captured.</li></ul></li><li>• Added codes indicative of serious conditions complicating alcohol abuse or dependence (e.g., alcoholic hepatitis, alcoholic gastritis)</li></ul>

Comorbidity Measure	ICD-10-CM Coding Decisions
ANEMDEF: Deficiency anemias	<ul style="list-style-type: none"> <li>Added 099.01 codes for <i>Anemia complicating pregnancy in the first, second or third trimester</i>. Not added were O99 codes for Anemia complicating childbirth and the puerperium as these anemias are considered more frequently due to blood loss.</li> </ul>
ARTH: Arthroplasties	<ul style="list-style-type: none"> <li>Added codes indicative of inflammatory and reactive arthritis and spondylopathies.</li> <li>Added codes indicative of vasculitis and systemic lupus erythematosus (SLE)-related disorders.</li> <li>Removed codes indicative of other specified spondylopathies as these appear inconsistent of the comorbidity measure, which is more often related to degenerative disorders as opposed to inflammatory.</li> </ul>
BLDLOSS: Chronic blood loss anemia	<ul style="list-style-type: none"> <li>Moved O99.01 codes for <i>Anemia complicating pregnancy</i> to the comorbidity measure, Deficiency anemias.</li> </ul>
CANCER_LEUK: Leukemia	<ul style="list-style-type: none"> <li>This is a new comorbidity measure added with the v2021.1 release of this tool.</li> </ul>
CANCER_LYMPH: Lymphoma	<ul style="list-style-type: none"> <li>Moved diagnosis codes indicative of leukemia to the newly added Leukemia comorbidity measure.</li> </ul>
CANCER_METS: Metastatic cancer	<ul style="list-style-type: none"> <li>Removed C80.1, <i>Malignant (primary) neoplasm, unspecified</i> and R180, <i>Malignant ascites</i> as these are not indicative of metastatic cancer.</li> </ul>
CANCER_SOLID: Solid tumor without metastasis, malignant	<ul style="list-style-type: none"> <li>Focused this measure on solid malignant tumors without metastasis, starting with v2021.1.</li> <li>Added diagnosis codes that align with the National Cancer Institute's classification of cancer, such as myelodysplastic syndrome. Additionally, added diagnosis codes indicative of cancers of the skin.</li> </ul>
CANCER_NSITU: Solid tumor without metastasis, in situ	<ul style="list-style-type: none"> <li>New comorbidity measure focused on cancer in situ, starting with the v2021.1.</li> <li>Included D00-D09 codes related to carcinoma and melanoma in situ.</li> </ul>
CBVD: Cerebrovascular disease	<ul style="list-style-type: none"> <li>Diagnosis codes indicating a cerebral infarction and other cerebrovascular diseases must be present on admission.</li> <li>Sequela codes for cerebral infarction and other cerebrovascular diseases are used if and only if there is no indication of cerebrovascular disease present on admission or occurring during the hospital stay.</li> </ul>

Comorbidity Measure	ICD-10-CM Coding Decisions
CHF: Congestive heart failure	<ul style="list-style-type: none"> <li>Added I51.81, <i>Takotsubo Syndrome</i> (syndrome characterized by transient regional systolic dysfunction of the left ventricle) and R57.0, <i>Cardiogenic shock</i>.</li> <li>Added diagnosis codes indicative of other heart failures including those following surgery, anesthesia; and other status codes that reasonably demonstrate ongoing heart failure (e.g., Presence of heart assist devices).</li> <li>Added O29.12 codes for <i>Cardiac failure due to anesthesia during pregnancy</i>.</li> <li>Added Z95.81 codes for <i>Presence of heart assist device and fully implantable artificial heart</i>.</li> </ul>
COAG: Coagulopathy	<ul style="list-style-type: none"> <li>Added D61 codes for <i>Other aplastic anemias and other bone marrow failure syndromes</i> related to thrombocytopenia (e.g., idiopathic aplastic anemia).</li> </ul>
DEMENTIA: Dementia	<ul style="list-style-type: none"> <li>New comorbidity measure starting in v2021.1 with diagnosis codes for Alzheimer's disease, Pick's disease, Alpers disease, vascular dementia, and other indications of dementia. Many of these diagnoses were included under the original neurological comorbidity measure.</li> </ul>
DEPRESS: Depression	<ul style="list-style-type: none"> <li>Added F06.3 codes indicative of mood disorders with depressive features.</li> <li>Removed code R43.21 <i>Adjustment disorder with depressed mood</i> as it does not meet the clinical criteria as a form of classic depression.</li> </ul>
DIAB_CX: Diabetes with chronic complications	<ul style="list-style-type: none"> <li>Removed code P70.2, <i>Neonatal diabetes mellitus</i> as it does not specify a diabetes mellitus complication.</li> </ul>
DIAB_UNCX: Diabetes without chronic complications	<ul style="list-style-type: none"> <li>Added O24.4 codes related to <i>Gestational diabetes mellitus complication pregnancy, childbirth, and the puerperium</i>.</li> </ul>
DRUG_ABUSE: Drug abuse	<ul style="list-style-type: none"> <li>Removed F55 codes related to the abuse of non-psychoactive substances, antacids, herbal remedies, laxatives, vitamins, and hormones.</li> <li>Drug "use" codes (new under ICD-10-CM) were not added to the clinical criteria for this comorbidity measure. Unless a patient has been diagnosed by a psychiatrist, physicians may be reluctant to report drug dependence. This makes it hard to say whether the drug use codes indicate a comorbidity. Additional analysis on the reporting of these codes is needed before they are included in the drug abuse measure.</li> </ul>

Comorbidity Measure	ICD-10-CM Coding Decisions
HTN_CX: Hypertension, complicated	<ul style="list-style-type: none"> <li>The original Hypertension measure was modified to separate complicated versus uncomplicated hypertension, starting with v2021.1.</li> <li>Added H35.03 codes related to <i>Hypertensive retinopathy</i>.</li> </ul>
HTN_UNCX: Hypertension, uncomplicated	<ul style="list-style-type: none"> <li>The original Hypertension measure was modified to separate complicated versus uncomplicated hypertension, starting with v2021.1.</li> </ul>
LIVER_MLD: Liver disease, mild	<ul style="list-style-type: none"> <li>The original Liver disease measure was modified to separate mild versus moderate to severe liver disease, starting with v2021.1.</li> <li>Added diagnosis codes related to alcoholic hepatitis.</li> <li>Added O98.4 codes for <i>Viral hepatitis complicating pregnancy, childbirth, and the puerperium</i>.</li> </ul>
LIVER_SEV: Liver disease, moderate to severe	<ul style="list-style-type: none"> <li>The original Liver disease measure was modified to separate mild versus moderate to severe liver disease, starting with v2021.1.</li> <li>Added diagnosis codes for hepatorenal syndrome and gastric varices.</li> </ul>
LUNG_CHRONIC: Chronic pulmonary disease	<ul style="list-style-type: none"> <li>Added diagnosis codes indicative of chronic lung disorders (e.g., pneumoconiosis associated with tuberculosis).</li> </ul>
NEURO_MOVT: Neurological disorders affecting movement	<ul style="list-style-type: none"> <li>New comorbidity measure starting in v2021.1 with diagnosis codes related to Huntington's disease, hereditary ataxia, spinal muscular atrophy and related syndromes, and other neurological conditions affecting movement. Many of these diagnoses were included under the original neurological comorbidity measure.</li> </ul>
NEURO_SEIZ: Seizures and epilepsy	<ul style="list-style-type: none"> <li>New comorbidity measure starting in v2021.1 with diagnosis codes G40 for <i>Epilepsy and recurrent seizures</i>, R56.1 for <i>Post traumatic seizures</i>, and R569, <i>Unspecified convulsions</i>. All of these diagnoses were included under the original neurological comorbidity measure.</li> </ul>
NEURO_OTH: Other neurological disorders	<ul style="list-style-type: none"> <li>New comorbidity measure starting in v2021.1 with neurological disorders unrelated to dementia, movement, and seizures such as multiple sclerosis, hydrocephalus, Tay-Sachs disease, and narcolepsy.</li> <li>The included diagnoses were those in the original neurological comorbidity measure that were not moved to the three new measures for dementia, neurological disorders affecting movement, and seizures/epilepsy.</li> <li>Codes for the following were removed: unspecified disorientation, unspecified altered mental status, aphasia, and febrile convulsions.</li> </ul>
OBESE: Obesity	<ul style="list-style-type: none"> <li>No changes were made to the coding for this comorbidity measure.</li> </ul>
PARALYSIS: Paralysis	<ul style="list-style-type: none"> <li>Removed code G804, <i>Ataxic cerebral palsy</i></li> </ul>



Comorbidity Measure	ICD-10-CM Coding Decisions
PERIVASC: Peripheral vascular disease	<ul style="list-style-type: none"> <li>Added diagnosis codes for conditions affecting peripheral vasculature, such as cardiovascular syphilis and atheroembolism of extremities.</li> </ul>
PSYCHOSES: Psychoses	<ul style="list-style-type: none"> <li>Added diagnosis codes indicative of psychotic disorders, including those due to substance use, abuse or dependence.</li> </ul>
PUMLCIRC: Pulmonary circulation disease	<ul style="list-style-type: none"> <li>Added diagnosis codes for conditions affecting pulmonary circulation such as pulmonary hypertension and arteriovenous fistula of pulmonary vessels.</li> </ul>
RENFL_MOD: Renal failure, moderate	<ul style="list-style-type: none"> <li>The original Renal failure measure was modified to separate codes identifying moderate versus severe renal failure, starting with v2021.1.</li> </ul>
RENFL_SEV: Renal failure, severe	<ul style="list-style-type: none"> <li>The original Renal failure measure was modified to separate codes identifying moderate versus severe renal failure, starting with v2021.1.</li> </ul>
THYROID_HYPO: Hypothyroidism	<ul style="list-style-type: none"> <li>Added diagnosis codes indicative of iodine-deficiency goiters, thyroid atrophy and myxedema coma.</li> </ul>
THYROID_OTH: Other thyroid disorders	<ul style="list-style-type: none"> <li>This is a new comorbidity measure added with the v2021.1 release of this tool.</li> </ul>
ULCER_PEPATIC: Peptic ulcer with bleeding	<ul style="list-style-type: none"> <li>Added K25-K28 codes for Gastric ulcer; Duodenal ulcer; Peptic ulcer, site unspecified; and Gastrojejunal ulcer.</li> </ul>
VALVE: Valvular disease	<ul style="list-style-type: none"> <li>Added diagnosis codes indicative of conditions that significantly affect the valves (e.g. endocarditis); and status codes where a diseased heart valve is implied (e.g. presence of heart valve prosthesis).</li> <li>Additionally, added diagnosis codes for congenital valve malformations.</li> </ul>
WGHTLOSS: Weight loss	<ul style="list-style-type: none"> <li>Added diagnosis code R64, <i>Cachexia</i> and O25 codes for <i>Malnutrition in pregnancy, childbirth, and the puerperium</i>.</li> <li>Removed diagnosis code R63.6, <i>Underweight</i>.</li> </ul>

## Criteria Used to Identify Secondary Diagnoses as a Comorbidity

The Elixhauser Comorbidity Software was initially developed for ICD-9-CM and used DRGs to identify secondary diagnoses directly related to the principal diagnosis. The software was developed based on 1992 data from 439 hospitals in the California.<sup>12</sup> For example, if a secondary diagnosis indicated unspecified heart failure, it was only counted as the comorbidity for Congestive heart failure if that record was not assigned a cardiac-related DRG. The decision to use the DRG exclusion was made because, at the time, information on diagnoses being present (or not present) on admission was rarely reported on administrative data.

Beginning October 1, 2007, the Centers for Medicare and Medicaid Services (CMS) required Inpatient Prospective Payment System (IPPS) hospitals to submit POA information on inpatient claims for both principal and secondary diagnoses. Per the ICD-10-CM Coding Guidelines, the reporting of POA information is now required for “all claims involving inpatient admissions to general acute care hospitals or other facilities that are subject to a law or regulation mandating collection of present on admission information.”<sup>13</sup> The importance of POA has prompted integration into software algorithms for hospital claims and discharge data, as seen with the MS-DRGs and the AHRQ Quality Indicators (QIs). POA indicators are now widely available on inpatient data and some outpatient data.

Beginning with v2021.1 of the Elixhauser Comorbidity Software Refined for ICD-10-CM, POA indicators are used for 18 of the 38 comorbidity measures. POA information is used to identify secondary diagnoses that were present on admission and, therefore, identify pre-existing conditions, as opposed to medical conditions that arise during the hospital stay. This change increases the number of records considered for inclusion in the comorbidity measure. Table A.2 shows the number of records that would be identified for each comorbidity measures using the beta version v2020.1 software (with and without the DRG exclusion) and with the v2021.1 software based on the 2017 SID from 43 States with POA indicators.

---

<sup>12</sup> Elixhauser, Anne, et al. Comorbidity Measures for Use with Administrative Data. *Medical Care*, vol. 36, no. 1, 1998, pp. 8-27 JSTOR, <https://www.jstor.org/stable/3766985>. Accessed 5 Sept. 2020.

<sup>13</sup> ICD-10-CM Official Guidelines for Coding and Reporting FY 2020, Appendix I (<https://www.cms.gov/Medicare/Coding/ICD10/Downloads/2020-Coding-Guidelines.pdf>). Accessed 5 Sept. 2020.

**Table A.2 Comparison of the Number of Discharges Identified by the Beta Version of the Elixhauser Comorbidity Software for ICD-10-CM (v2020.1) and the Elixhauser Comorbidity Software Refined for ICD-10-CM (v2021.1), HCUP State Inpatient Databases for 43 States, 2017**

<b>Comorbidity Measure</b>	<b>N, v2020.1 (beta version) using DRG exclusion</b>	<b>N, v2020.1 (beta version) with no DRG exclusion</b>	<b>N, v2021.1</b>
AIDS: Acquired immune deficiency syndrome	74,471	95,624	183,722
ALCOHOL: Alcohol abuse	1,335,728	1,431,046	1,470,271
ANEMDEF: Deficiency anemias	5,188,557	5,237,486	4,916,307
ARTH: Arthroplasties	851,012	857,617	929,163
BLDLOSS: Chronic blood loss anemia	827,104	832,194	564,223
CANCER_LEUK: Leukemia (new in v2021.1)	NA	NA	213,098
CANCER_LYMPH: Lymphoma	216,864	271,457	270,848
CANCER_METS: Metastatic cancer	667,408	885,240	862,016
CANCER_SOLID: Solid tumor without metastasis, malignant (Included under TUMOR in v2020.1)	628,054	698,108	776,913
CANCER_NSITU: Solid tumor without metastasis, in situ (Included under TUMOR in v2020.1)	Included in the count above	Included in the count above	8,893
CBVD: Cerebrovascular disease (new in v2021.1)	NA	NA	1,144,909
CHF: Congestive heart failure	2,927,779	4,685,117	4,627,929
COAG: Coagulopathy	1,745,127	1,749,638	1,778,501
DEPRESS: Depression	3,597,195	3,603,282	3,563,110
DIAB_CX: Diabetes with chronic complications	4,246,308	4,427,084	4,426,261
DIAB_UNCX: Diabetes without chronic complications	3,051,050	3,056,267	3,223,752
DRUG_ABUSE: Drug abuse	1,360,701	1,494,404	1,491,899
HTN_CX: Hypertension, complicated (Included under HTN_C in v2020.1)	13,827,150	15,072,883	5,681,730
HTN_UNCX: Hypertension, uncomplicated (Included under HTN_C in v2020.1)	Included in the count above	Included in the count above	9,391,842

<b>Comorbidity Measure</b>	<b>N, v2020.1 (beta version) using DRG exclusion</b>	<b>N, v2020.1 (beta version) with no DRG exclusion</b>	<b>N, v2021.1</b>
LIVER_MLD: Liver disease, mild (Included under LIVER in v2020.1)	1,240,031	1,429,189	1,366,020
LIVER_SEV: Liver disease, moderate to severe (Included under LIVER in v2020.1)	Included in the count above	Included in the count above	428,601
LUNG_CHRONIC: Chronic pulmonary disease	5,751,843	6,101,979	6,034,669
NEURO_MOVT: Neurological disorders affecting movement (Included under NEURO in v2020.1)	2,507,863	3,078,792	674,993
NEURO_SEIZ: Seizures and epilepsy (Included under NEURO in v2020.1)	Included in the count above	Included in the count above	1,666,118
NEURO_OTH: Other neurological disorders (Included under NEURO in v2020.1)	Included in the count above	Included in the count above	1,123,519
DEMENTIA: Dementia (Included under NEURO in v2020.1)	Included in the count above	Included in the count above	1,859,260
OBESE: Obesity	4,558,242	4,762,238	4,762,238
PARALYSIS: Paralysis	978,665	1,246,567	1,204,762
PERIVASC: Peripheral vascular disease	1,583,027	1,606,317	1,716,275
PSYCHOSES: Psychoses	1,114,623	1,237,675	1,238,299
PUMLCIRC: Pulmonary circulation disease	204,450	271,739	1,058,539
RENFL_MOD: Renal failure, moderate (Included under RENLFAIL in v2020.1)	4,207,562	4,207,562	2,850,371
RENFL_SEV: Renal failure, severe (Included under RENLFAIL in v2020.1)	Included in the count above	Included in the count above	1,658,886
THYROID_HYPO: Hypothyroidism	3,566,909	3,584,334	3,599,635
THYROID_OTH: Other thyroid disorders (new in v2021.1)	NA	NA	305,051
ULCER_PEPTIC: Peptic ulcer with bleeding	226,956	282,260	282,471
VALVE: Valvular disease	1,107,831	1,836,953	1,864,954
WGHTLOSS: Weight loss	1,768,471	1,819,992	1,800,443

Abbreviations: NA, not applicable.

## APPENDIX B: DIAGNOSIS CODES THAT ARE INCLUDED IN MORE THAN ONE COMORBIDITY MEASURE

There are 118 ICD-10-CM diagnosis codes (out of 4,495 diagnosis codes in the software) that are included in more than one comorbidity measure:

- Two codes included in alcohol abuse (ALCOHOL) and mild liver disease (LIVER\_MLD)
- Forty-eight codes included in drug abuse (DRUG\_ABUSE) and psychoses (PSYCHOSES)
- Sixty-three codes included in cerebrovascular disease (CBVD) and paralysis (PARALYSIS)
- Two codes included in congestive heart failure (CHF) and complicated hypertension (HTN\_CX)
- Two codes included in hypertension (HTN\_CX) and moderate to severe renal failure (RENFL\_SEV)
- One code included in congestive heart failure (CHF), complicated hypertension (HTN\_CX), moderate to severe renal failure (RENFL\_SEV).

The specific codes are detailed in Table B.1. The value 1 indicates the diagnosis code is included in the criteria for the comorbidity measure; the value 0 indicates it is not included.

**Table B.1 Diagnosis Codes Included in More Than One Comorbidity Measure**

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
F11150: Opioid abuse with opioid-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F11151: Opioid abuse with opioid-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F11159: Opioid abuse with opioid-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F11250: Opioid dependence with opioid-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F11251: Opioid dependence with opioid-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F11259: Opioid dependence with opioid-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
F12150: Cannabis abuse with psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F12151: Cannabis abuse with psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F12159: Cannabis abuse with psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F12250: Cannabis dependence with psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F12251: Cannabis dependence with psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F12259: Cannabis dependence with psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F13150: Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F13151: Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F13159: Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F13250: Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F13251: Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F13259: Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
F14150: Cocaine abuse with cocaine-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F14151: Cocaine abuse with cocaine-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F14159: Cocaine abuse with cocaine-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F14250: Cocaine dependence with cocaine-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F14251: Cocaine dependence with cocaine-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F14259: Cocaine dependence with cocaine-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F15150: Other stimulant abuse with stimulant-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F15151: Other stimulant abuse with stimulant-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F15159: Other stimulant abuse with stimulant-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F15250: Other stimulant dependence with stimulant-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F15251: Other stimulant dependence with stimulant-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F15259: Other stimulant dependence with stimulant-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F16150: Hallucinogen abuse with hallucinogen-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
F16151: Hallucinogen abuse with hallucinogen-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F16159: Hallucinogen abuse with hallucinogen-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F16250: Hallucinogen dependence with hallucinogen-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F16251: Hallucinogen dependence with hallucinogen-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F16259: Hallucinogen dependence with hallucinogen-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F18150: Inhalant abuse with inhalant-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F18151: Inhalant abuse with inhalant-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F18159: Inhalant abuse with inhalant-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F18250: Inhalant dependence with inhalant-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F18251: Inhalant dependence with inhalant-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F18259: Inhalant dependence with inhalant-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F19150: Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0



ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
F19151: Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F19159: Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
F19250: Other psychoactive substance dependence with psychoactive substance-induced psychotic disorder with delusions	2	0	0	0	1	0	0	0	1	0
F19251: Other psychoactive substance dependence with psychoactive substance-induced psychotic disorder with hallucinations	2	0	0	0	1	0	0	0	1	0
F19259: Other psychoactive substance dependence with psychoactive substance-induced psychotic disorder, unspecified	2	0	0	0	1	0	0	0	1	0
I110: Hypertensive heart disease with heart failure	2	0	1	0	0	1	0	0	0	0
I130: Hypertensive heart and chronic kidney disease with heart failure and stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease	2	0	1	0	0	1	0	0	0	0
I120: Hypertensive chronic kidney disease with stage 5 chronic kidney disease or end stage renal disease	2	0	0	0	0	1	0	0	0	1
I1311: Hypertensive heart and chronic kidney disease without heart failure, with stage 5 chronic kidney disease, or end stage renal disease	2	0	0	0	0	1	0	0	0	1
I132: Hypertensive heart and chronic kidney disease with heart failure and with stage 5 chronic kidney disease, or end stage renal disease	3	0	1	0	0	1	0	0	0	1

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
I69331: Monoplegia of upper limb following cerebral infarction affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69332: Monoplegia of upper limb following cerebral infarction affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69333: Monoplegia of upper limb following cerebral infarction affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69334: Monoplegia of upper limb following cerebral infarction affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69339: Monoplegia of upper limb following cerebral infarction affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69341: Monoplegia of lower limb following cerebral infarction affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69342: Monoplegia of lower limb following cerebral infarction affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69343: Monoplegia of lower limb following cerebral infarction affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69344: Monoplegia of lower limb following cerebral infarction affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69349: Monoplegia of lower limb following cerebral infarction affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69351: Hemiplegia and hemiparesis following cerebral infarction affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69352: Hemiplegia and hemiparesis following cerebral infarction affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69353: Hemiplegia and hemiparesis following cerebral infarction affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
I69354: Hemiplegia and hemiparesis following cerebral infarction affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69359: Hemiplegia and hemiparesis following cerebral infarction affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69361: Other paralytic syndrome following cerebral infarction affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69362: Other paralytic syndrome following cerebral infarction affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69363: Other paralytic syndrome following cerebral infarction affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69364: Other paralytic syndrome following cerebral infarction affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69365: Other paralytic syndrome following cerebral infarction, bilateral	2	0	0	1	0	0	0	1	0	0
I69369: Other paralytic syndrome following cerebral infarction affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69831: Monoplegia of upper limb following other cerebrovascular disease affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69832: Monoplegia of upper limb following other cerebrovascular disease affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69833: Monoplegia of upper limb following other cerebrovascular disease affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69834: Monoplegia of upper limb following other cerebrovascular disease affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69839: Monoplegia of upper limb following other cerebrovascular disease affecting unspecified side	2	0	0	1	0	0	0	1	0	0

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
I69841: Monoplegia of lower limb following other cerebrovascular disease affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69842: Monoplegia of lower limb following other cerebrovascular disease affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69843: Monoplegia of lower limb following other cerebrovascular disease affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69844: Monoplegia of lower limb following other cerebrovascular disease affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69849: Monoplegia of lower limb following other cerebrovascular disease affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69851: Hemiplegia and hemiparesis following other cerebrovascular disease affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69852: Hemiplegia and hemiparesis following other cerebrovascular disease affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69853: Hemiplegia and hemiparesis following other cerebrovascular disease affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69854: Hemiplegia and hemiparesis following other cerebrovascular disease affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69859: Hemiplegia and hemiparesis following other cerebrovascular disease affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69861: Other paralytic syndrome following other cerebrovascular disease affecting right dominant side	2	0	0	1	0	0	0	1	0	0

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
I69862: Other paralytic syndrome following other cerebrovascular disease affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69863: Other paralytic syndrome following other cerebrovascular disease affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69864: Other paralytic syndrome following other cerebrovascular disease affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69865: Other paralytic syndrome following other cerebrovascular disease, bilateral	2	0	0	1	0	0	0	1	0	0
I69869: Other paralytic syndrome following other cerebrovascular disease affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69931: Monoplegia of upper limb following unspecified cerebrovascular disease affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69932: Monoplegia of upper limb following unspecified cerebrovascular disease affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69933: Monoplegia of upper limb following unspecified cerebrovascular disease affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69934: Monoplegia of upper limb following unspecified cerebrovascular disease affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69939: Monoplegia of upper limb following unspecified cerebrovascular disease affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69941: Monoplegia of lower limb following unspecified cerebrovascular disease affecting right dominant side	2	0	0	1	0	0	0	1	0	0

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
I69942: Monoplegia of lower limb following unspecified cerebrovascular disease affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69943: Monoplegia of lower limb following unspecified cerebrovascular disease affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69944: Monoplegia of lower limb following unspecified cerebrovascular disease affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69949: Monoplegia of lower limb following unspecified cerebrovascular disease affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69951: Hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69952: Hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting left dominant side	2	0	0	1	0	0	0	1	0	0
I69953: Hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69954: Hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69959: Hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting unspecified side	2	0	0	1	0	0	0	1	0	0
I69961: Other paralytic syndrome following unspecified cerebrovascular disease affecting right dominant side	2	0	0	1	0	0	0	1	0	0
I69962: Other paralytic syndrome following unspecified cerebrovascular disease affecting left dominant side	2	0	0	1	0	0	0	1	0	0

ICD-10-CM Diagnosis Code	# Comorbidities	ALCOHOL	CHF	CBVD	DRUG	HTN_CX	LIVER_MLD	PARALYSIS	PSYCHOSES	RENFL_SEV
I69963: Other paralytic syndrome following unspecified cerebrovascular disease affecting right non-dominant side	2	0	0	1	0	0	0	1	0	0
I69964: Other paralytic syndrome following unspecified cerebrovascular disease affecting left non-dominant side	2	0	0	1	0	0	0	1	0	0
I69965: Other paralytic syndrome following unspecified cerebrovascular disease, bilateral	2	0	0	1	0	0	0	1	0	0
I69969: Other paralytic syndrome following unspecified cerebrovascular disease affecting unspecified side	2	0	0	1	0	0	0	1	0	0
K7010: Alcoholic hepatitis without ascites	2	1	0	0	0	0	1	0	0	0
K7011: Alcoholic hepatitis with ascites	2	1	0	0	0	0	1	0	0	0