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2000 Galloping Hill Road

Kenilworth, NJ 07033

**TITLE:**

Estimating Diabetes-Related Disparities in Health Care Use Trends with Healthcare

Cost and Utilization Project and Medical Expenditure

Panel Survey Data

# Summary of Changes (Optional)

|  |  |
| --- | --- |
| ***Protocol Section*** | ***Change*** |
| *List of*  *Abbreviations* | *Added BRFSS to list of abbreviations* |
| *Protocol Summary* | *Removed rural/urban designation from Objective 3/MEPS analysis, as variable only available through research data center* |
| *2* | *Removed rural/urban designation from Objective 3/MEPS analysis as variable only available through research data center* |
| *4* | *Specified number of discharge diagnoses to be used in identifying diabetes disease state and comorbid conditions* |
| *4* | *Added criteria for determining Adult population without diabetes-disease state* |
| *4* | *Removed rural/urban designation from Objective 3/MEPS analysis, as variable only available through research data center* |
| *4.2* | *Added diabetes-status to list of stratifications* |
| *4.2* | *Removed rural/urban designation from Objective 3/MEPS analysis, as variable only available through research data center* |
| *5.1* | *Added information about BRFSS informed consent procedure* |
| *7.0* | *Replaced NHIS with BRFSS to analysis design to generate state-level demographic data and rate estimates* |
| *7.1* | *Added analysis by diabetes-status to objectives 1 and 2. Added rate standardization to rate calculation, fixed grammatical error at end of objective 2, removed rural/urban from objective 3* |
| *7.2.3* | *Added limitation to using discharge diagnoses to identify patient population without diabetes, fixed grammatical error in limitation 3* |
| *Appendix 5.* | *Reformatted tables, replaced NHIS with BRFSS* |
| *Appendix 5.* | *Added table 7 for analysis with and without diabetes* |
| *Appendix 5.* | *Reformatted tables, updated age groups and regions* |
| *Appendix 6.* | *Reformatted tables, updated age groups and regions, renamed tables to account for new table* |
| *Appendix 7.* | *Updated race (reflecting sample size limitations) and region category, and removed rural/urban as data is not available in MEPS* |

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# List of Abbreviations

NIS National Inpatient Sample

NEDS National Emergency Department Sample

SID State Inpatient Databases

SEDD State Emergency Department Databases

ICD-9 International Classification of Disease, 9th Modification

ICD-10 International Classification of Disease, 10th Modification

IRB Institutional Review Board

ED Emergency Department

PQI Prevention Quality Indicators

AHRQ US Agency for Health Research and Quality

BRFSS Behavioral Risk Factor Surveillance System

# List of Definitions

Health Care Service Use The utilization of the following healthcare services/products: Hospital Inpatient Stays/Hospitalizations, Emergency Department Visits, and Prescription Drugs,

cascade of care diagnosis, linkage to care, achievement of individual treatment targets, and a

composite of all individual targets

# Protocol summary

|  |  |
| --- | --- |
| Title | Estimating Diabetes-Related Disparities in Health Care Use Trends with Healthcare Cost and Utilization Project Data and Medical Expenditure Panel Survey Data |
| Vendor/Collaborator | Emory Healthcare |
| Rationale | There exists limited data on the healthcare service utilization trends among people with diabetes by sociodemographic group. Identifying contributors to disparities in diabetes management will shed light on possible intervention targets to reduce these disparities and improve outcomes. |
| Primary Objective(s) | Objective 1. To describe trends in ED visit rates and inpatient use rates among adults with diabetes in the United States from 2005-2016 by age, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and health insurance coverage.  Objective 2. To describe trends in the rates of potentially preventable hospitalizations, as defined by, among adults with diabetes in the United States from 2005-2016 by age, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and health insurance coverage.  Objective 3. To describe trends of prescription drug usage  (antihyperglycemic agents, antihyperlipidemic agents, antihypertensive agents, antiplatelet agents, and antidepressant/anxiolytic agents) among adults with diabetes in the United States from 2005-2016 by age, sex, race/ethnicity, , presence of comorbidities, geographic region, and health insurance coverage. |
| Study Design | Retrospective serial cross-sectional design using data from the AHRQ’s  Healthcare Cost and Utilization Project and Medical Expenditure Panel Survey |
| Study Population | U.S. non-institutionalized population aged 18+, diagnosed with diabetes |
| Study Duration | 10 Years |
| Outcomes | Number and Rates of Hospital Stays and ED visits across  sociodemographic groups, 2008-2016  Number and Rates of Potentially Preventable Hospitalizations across sociodemographic groups, 2008-2016  Number and rates of People with Diabetes Prescribed Cardiovascular  Modifying Agents across sociodemographic groups, 2008-2016 |
| Statistical Methods | Descriptive Statistics of Survey and Administrative Claims Data. Survey weights, calculation of mean and standard deviation, frequency tables, Taylor-Series linearization, and Jack-Knife methods will be used to generate estimates. |
| Limitations | 1. Generalizability issues arising from state selection and National Inpatient Sample sampling methods. 2. Reliance on administrative claims data and clinician billing to identify diabetes-related claims. 3. Generation of encounter-level estimates, rather than patient-level estimates 4. Reliance on ICD codes provided by the AHRQ’s Prevention Quality Indicators to define Potentially Preventable Hospitalizations |

# 1 Background and Rationale

## 1.1 Background

From 1990 to 2010, the number of people with a diabetes diagnosis more than tripled, from 6.5 million to 20.7 million.1 As of 2015, approximately 9.4% of the United States population have diabetes.2 The increased burden of diabetes bears large costs to society; the American Diabetes Association estimates the direct cost of diabetes at $237 billion in 2017, or approximately 1 in 4 health care dollars spent in the United States.3

There exist wide-ranging disparities in diabetes prevalence,4,5 quality of care,6,7 and outcomes8–10 in the United States. In terms of race, American Indians, Black, and Hispanic patients account for a disproportionate share of diabetes complications and worse disease-related outcomes,11,12 whereas Whites have a higher risk of all-cause mortality and cardiovascular disease compared to ethnic minorities. Prevalence of diabetes has significantly increased in both White and Black residents of the southeastern Stroke Belt states, indicating regional variation.5 Further, diabetes is more prevalent and inadequately managed in rural areas.13,14 Recent cost-saving trends towards high deductible health insurance plans disproportionately impact lower-income individuals, who may forego necessary care until the disease progresses.15

Although studies reported an improvement in population achievement of diabetes treatment goals from 1990-2010 - recent data indicate there has not been an improvement from 2005 to 2016.16,17 Currently, only an estimated 23% of those with diabetes engaged in health care and met four major care goals: blood pressure, cholesterol, lipoprotein cholesterol target, and smoking abstinence.17 Clinicians may fail to escalate treatment to achieve treatment goals - even though patients are not reaching glycemic targets.18 Termed clinical inertia, this inefficient care delivery may also be influenced by a patient’s sociodemographic factors. Research suggests that older and White patients are more likely to have treatment intensified at lower HbA1c compared to younger and Black patients.19

Given the progressive nature of diabetes, quality care delivery along the care cascade— the process of diagnosis, linkage to care, and the achievement of treatment targets—is necessary to prevent the development of severe complications and comorbidities. Disparities exist along the diabetes care cascade, as young adults, women, non-Hispanic Blacks, and patients that were covered by Medicaid or uninsured are less likely to meet

care goals.17,20

Although interventions have been conducted to address clinical inertia and improve provider behavior,21 there still remains gaps in the literature in describing how health care use varies among those with diabetes. This project seeks to understand those utilization patterns and identify whether trends in health care use vary by sociodemographic groups. These data will serve to guide future research efforts and interventions towards improving the quality and equity along the diabetes care cascade.

## 1.2 Rationale

Although trends in outpatient use, ED visits, and hospital discharges have been examined by race, age group, sex, complication type, and health insurance coverage, there has been no data published on trends by geographic region, rural/urban location.22,23 Further, the aforementioned data describe trends until 2011. This provides an opportunity to both update and further describe healthcare utilization trends among people with diabetes

Further, existing data show distributions of healthcare use, but there are no data examining the same people linked across datasets and how they use health care in a given year. Using data that link individuals throughout the continuum of care, we can examine what differentiates individuals that are readmitted and those that are not.

Potentially preventable hospitalizations are defined as conditions for which good outpatient care can prevent the need for hospitalization, or for which early intervention can prevent complications or more serious disease.24 Recent research on trends in potentially preventable hospitalizations among people with diabetes has been stratified in terms of age, sex, health insurance coverage, income, region, conditions, and race.25–27

This analysis will use criteria defined by the AHRQ’s diabetes-related PQIs to define potentially preventable hospitalizations, with the expanded composite proposed by Tseng et al. functioning as parameters for a sensitivity analysis.28 Using an expanded composite with HCUP data will test their validity at the national scale, whereas the original analysis was limited to Veteran’s Administration data. We will also examine potentially preventable hospitalization trends stratified by geographic regions and rural/urban location, addressing the remaining gap in the literature.

No literature has been published which describes the trends in medications commonly prescribed (antihyperglycemic agents, antihyperlipidemic agents, antihypertensive agents, antiplatelet agents, and antidepressant/anxiolytic agents) among people with diabetes. We will fill this gap in the literature and determine if these patterns of use vary by age, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, or health insurance coverage. Identifying contributors to disparities in diabetes management will shed light on possible intervention targets to reduce these disparities and improve outcomes.

# 2 Objectives and Hypotheses

## 2.1 Primary Objective(s) & Hypothesis(es)

Objective 1. To describe trends in ED visit rates and inpatient use rates among adults with diabetes in the United States from 2005-2016.

Trends will be stratified by age, sex, race/ethnicity, rural/urban designation (as defined by the National

Center for Health Statistics and described in Section 4: Variables), presence of comorbidities (microvascular, macrovascular, and depression/anxiety), geographic region, and health insurance coverage.

Objective 2. To describe trends in the rates of potentially preventable diabetes-related hospitalizations, as defined by ICD-9 and ICD-10 codes for Prevention Quality Indicators 1, 3, 14, and 16 published by the AHRQ’s Preventable Quality Indicators (described in Section 4: Variables) among adults with diabetes in the United States from 2005-2016.

Trends will be stratified by age, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and health insurance coverage.

Objective 3. To describe trends of prescription drug usage (antihyperglycemic agents, antihyperlipidemic agents, antihypertensive agents, antiplatelet agents, and antidepressant/anxiolytic agents) among adults with diabetes in the United States from 2005-2016.

Trends will be stratified by age, sex, race/ethnicity, , presence of comorbidities, geographic region, and health insurance coverage.

# 3 METHODOLOGY

## 3.1 Summary of Study Design

The analysis will be conducted using a retrospective serial cross-sectional design using data from the AHRQ’s Healthcare Cost and Utilization Project. Specifically, data from the National Inpatient Sample, the Nationwide Emergency Department Sample, the State Inpatient Database, and the State Emergency Department Database, and the Medical Expenditure Panel Survey will be used for the analysis.

The AHRQ’s Healthcare Cost and Utilization Project (HCUP) is the “largest collection of all payer, encounterlevel hospital care data in the United States.” There are multiple HCUP datasets: The National Inpatient Sample

(NIS), the Nationwide Emergency Department Sample (NEDS), the State Inpatient Database (SID), and the State Emergency Department Database (SEDD). Each dataset contains hospital-level claims data. MEPS provides data from self-reported survey responses, physician claims data, hospital claims data, and pharmaceutical claims data.

NIS: The NIS contains a record of every non-psychiatric, non-federal hospital discharge from a nationally representative sample over a single year.

NEDD: The NEDD contains a record of every non-psychiatric, non-federal hospital emergency department discharge from a nationally representative sample over a single year.

SID: The SID contains a record of every non-psychiatric, non-federal hospital discharge in an individual state over a single year.

SEDD: The SEDD contains a record of ED visits at hospital-affiliated EDs that do not result in a hospital admission.

The National Inpatient Sample is a database of hospital inpatient stays derived from billing data by U.S community hospitals. Data are systematically sampled from the State Inpatient Databases.

Each year of the NIS includes over 7 million inpatient stays. The Nationwide Emergency Department Sample contains data from approximately 31 million ED visits per year and estimates roughly 143 million ED visits. These datasets are available for purchase through the HCUP website. The HCUP data use agreement requires that researchers do not attempt to discover the individual identity of anyone in the database. A powerful tool within these datasets is the “revisit variable,” a unique code applied to a patient that allows him or her to be followed throughout one year of data. Importantly, revisit variables reset each year, so the same patient may have different revisit variables in different years of the data, thereby preventing tracking of patients between years of the dataset. The revisit variable also allows for analysis of a patient’s healthcare use across datasets (i.e.

a patient’s use of emergency departments and inpatient stays over the course of a year).

There are 11 states with State Inpatient and State Emergency Department datasets for the years of interest (2016,

2014, 2011, and 2008): Arizona, Florida, Iowa, Kentucky, Maryland, Nebraska, New York, New Jersey, North Carolina, Vermont, and Utah (Figure 1). Four of these states carry the revisit variable that allows for linkage across datasets and the tracking of a single patient’s health care use: Florida, Nebraska, New York, and Utah. These states have data available since 2006.

Table 1. Census Geographic Region and Medicaid Expansion Status for States Considered

State Census Geographic Region Medicaid Expansion

Status

Kentucky South Full Expansion

|  |  |  |
| --- | --- | --- |
| Arizona | South | Full Expansion |
| Iowa | Midwest | Full Expansion |
| Maryland | South | Full Expansion |
| New Jersey | Northeast | Full Expansion |
| New York | Northeast | Full Expansion |
| Vermont | Northeast | Full Expansion |
| Nebraska | Midwest | Full Expansion |
| Utah | West | Partial Expansion |

Florida

South

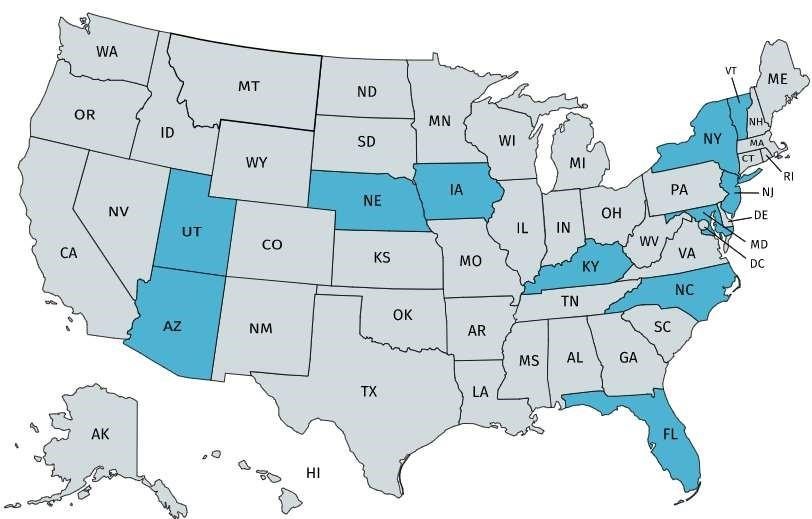
No Expansion

North Carolina

South

No Expansion

Figure 1. State distribution to be used in analysis



Patients with diabetes will be identified by the presence of a diabetes-specific ICD-9 or ICD-10 code. Variables for age, race/ethnicity, geographic region, urban/rural location, and insurance type are each included in the SID, SED, NIS, and NEDD.

MEPS: Large scale survey of families and individuals, their medical providers (doctors, hospitals pharmacies, etc.) and employers across the United States.

In addition, annually, the AHRQ recruits a nationally-representative sample of households and collects data regarding their health expenditures, payment sources, and healthcare use in the Medical Expenditure Panel Survey (MEPS). The data include use of health services, cost of health services, frequency of service use, sociodemographic characteristics, and insurance coverage. The MEPS also has a restricted access component that involves data collection from physicians and health systems about prescriptions, as well as a component from pharmacies. The work conducted with the MEPS data will be exploratory in nature, but will develop the platform for a variety of other questions of importance regarding disparities in diabetes care nationally.

## 3.2 Study Population

Aims 1 and 2: U.S. non-institutionalized population aged 18+, diagnosed with diabetes as indicated by presence of a diabetes-specific ICD-9 or ICD-10 codes which visited hospital inpatient and emergency department settings from years 2005-2016.

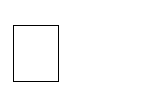
Aim 3: U.S. non-institutionalized population aged 18+, diagnosed with diabetes as indicated by presence of a diabetes-specific ICD-9 or ICD-10 codes, presence of self-reported diabetes, or prescription of 1+ diabetes medication in past 2 years.

## 3.3 Inclusion Criteria

Aim 1:

* Observation has presence of ICD-9 codes indicative of diabetes disease state (Appendix 1)

Or

* Observation has presence of ICD-10 indicative of diabetes disease state (Appendix 1)  Patient is age 18+

Aim 2:

* Observation has presence of ICD-9 codes indicative of diabetes disease state (Appendix 1)

Or

* Observation has presence of ICD-10 codes indicative of diabetes disease state (Appendix 1) • Patient is age 18+
* Observation has presence of ICD-9 codes indicative of a potentially preventable hospitalization (Appendix 2)

Aim 3:

* Patient has indicated presence of self-reported diabetes

Or

* Patient has been diagnosed 1+ diabetes medication in past two years

Or

* Patient inpatient, outpatient, or emergency department visit has presence of ICD-9 codes indicative of diabetes disease state (Appendix 1) Or
* Patient inpatient, outpatient, or emergency department visit has presence of ICD-10 codes indicative of diabetes disease state (Appendix 1) • Patient is age 18+

## 3.4 Exclusion Criteria

Patient is <18 years old.

## 3.5 Stratification

Stratified according to the following factors:

1. Age
2. Race/ethnic group
3. Sex
4. Health Insurance Coverage
5. Geographic Region
6. Urban/Rural designation
7. Presence of comorbidities

# 4 Variables and Epidemiological Measurements

#### 4.1 Variables

All variables are gathered from cross-sectional snapshots from 2008-2016. No follow up or pre-index period is defined as there is no longitudinal aspect of this study. Variables for analysis are listed below, with relevant information supplied by the AHRQ’s documentation for data elements. Each variable will be used for the purpose of quantitative descriptive analyses. We will start by taking the sum total of all-cause health care use and outcomes. From there, we will have to try to disaggregate the health care use that was “diabetes-related” based on the billing claim.

|  |  |  |
| --- | --- | --- |
| Variable | Definition | Unit |

|  |  |  |
| --- | --- | --- |
| Age | NIS/NEDD/SID/SEDD  AGE  Age in years (AGE) is calculated from the birth date  (DOB) and the admission date (ADATE) in the HCUP State databases with the few exceptions listed below. Ages over 89 are aggregated into a single category of 90 years or older in the HCUP nationwide databases starting in data year 2012.    Age will be grouped into 18-44, 45-64, and 65+ for purpose of analysis    MEPS | Mean years  (SD),  Range |
| AGELAST  Person’s Age Last Time Eligible  When date of birth was not provided but age was provided (either from the MEPS interviews or the 2008-2009 NHIS data), the month and year of birth were assigned randomly from among the possible valid options. For any cases still not accounted for, age was imputed using:   1. the mean age difference between MEPS participants with certain family relationships   (where available) or   1. the mean age value for MEPS participants.   Age will be grouped into 18-44, 45-64, and 65+ for purpose of analysis |
| Sex | NIS/NEDD/SID/SEDD |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | FEMALE  Indicator of sex  Categories: Male, Female, Missing, Invalid, Inconsistent    MEPS | | | Number and  % female/male | | |
| SEX  Data on the sex of each RU member (SEX) were initially determined from the 2008 NHIS for Panel 14 and from the 2009 NHIS for Panel 15. The SEX variable was verified and, if necessary, corrected during each MEPS interview. | | |
| Race/Ethnicity | | | NIS/NEDS/SID/SEDD | | Number and % of the cohort | |
| RACE  Categories: White, Black, Hispanic, Asian or Pacific Islander, Native American, Other    MEPS | |
| FY PUFS 2002–2011  RACEX  Categories: White, Black, American Indian/Alaska Native, Asian,  Native Hawaiian/Pacific Islander, Multiple Races  RACETHNX  Categories: Hispanic, Black – No other race reported,  Asian – No other race reported, Other race/Not Hispanic | |
|  | | NIS/NEDS/SID/SEDD | | | |  |

|  |  |  |
| --- | --- | --- |
| Diabetes  Disease State  (Generated Variable) | DXn  In the HCUP databases, ICD-9-CM diagnoses are represented as 3- to 5-character alphanumeric codes with implicit decimals (i.e., decimals not included).  I10\_DXn  In the HCUP databases, ICD-10-CM diagnoses are represented by alphanumeric codes with a maximum length of 7 characters and implicit decimals (i.e., decimals not included). The HCUP data elements for ICD-10-CM diagnoses are length 7.    NDX  NDX indicates the total number of ICD-9-CM diagnoses (valid and invalid) coded on the discharge record. In assigning NDX, the first listed diagnosis is included in the count, even if it is blank, so long as there is a secondary diagnosis present.  I10\_NDX ‘  For data beginning in the fourth quarter of 2015, the count of the number of diagnoses is stored in the data element I10\_NDX to indicate the implementation of the ICD-10-CM/PCS coding system.    MEPS | Number in the cohort |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | DIABDX | | Diabetes Diagnosis (>17) | |  |
|  | DSDIA53 | | DCS: Diabetes Diagnosis by Health Prof | |  |
|  | RXNAME | | Medicine name | |  |
|  | RXDRGNAM | | Multum medicine name | |  |
|  | ICD9CODX | | ICD-9-CM Code for Condition – Edited | |  |
|  | ICD10CODX | | ICD-10-CM Code for Condition – Edited | |  |
|  | Aims 1&2:  Hospital Discharges with presence of ICD-9 or ICD-10 codes indicative of diabetes in first 5 discharge diagnoses (Appendix 1). Gestational diabetes is not included.    Statistical measures of validation:29  Sensitivity: 95.6%,  Specificity: 92.8%,  PPV: 54.0%  NPV: 99.6%    Aim 3:  Presence of self-reported diabetes  Statistical measures of validation:30  Sensitivity: (58.5%-70.8%)  Specificity: (95.6%-96.8%)  PPV: (92.7%-95.4%) NPV: (85.4% - 90.6%) or patient has been prescribed 1+ diabetes medication in past  two years or | | | |  |
|  | | Physical Claims or Hospital Discharges with presence of any of ICD-  9 or ICD-10 codes indicative of diabetes (Appendix 1)  Statistical measures of validation:29  Sensitivity: 95.6%,  Specificity: 92.8%,  PPV: 54.0%  NPV: 99.6%    The combined algorithm has not been validated. | |  | |

|  |  |  |  |
| --- | --- | --- | --- |
| Indicator for nondiabetes (Generated  Variable) | Aims 1 and 2:  Lack of presence of any ICD-9 or ICD-10 codes indicative of diabetes (Appendix 1) in any available discharge diagnoses.    Aim 3:  Lack of any positive indicator of diabetes:  No self-report of diabetes,  No diabetes medication script filled over two years, No Physical Claims or Hospital Discharges with presence of any of ICD- 9 or ICD-10 codes indicative of diabetes (Appendix 1) | Number in the cohort | |
| Geographic location/Region | NIS, NEDS, SID, SEDD | Number and % of the cohort | |
| HOSP\_REGION: Region of Hospital  Categories: Northeast, Midwest, South, West    MEPS |
| REGION  Categories: Northeast, Midwest, South, and West |
| Rural/ Urban | NIS, NEDS, SID, SEDD | | Number  and % of the cohort |
| PL\_NCHS: Patient Location  Categories: “Central” counties of metro areas, “Fringe” counties of metro areas”, Counties in metro areas of  250,000-999,999, Counties in metro areas of 50,000249,999, Micropolitan counties, and Not metropolitan or micropolitan counties. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | The analyses will use Urban/Rural definitions based on the National  Center for Health Statistics 2013 Urban-Rural Classification Scheme.31 Urban:  Large central metro counties in metropolitan statistical area (MSA) of 1 million population that: (1) contain the entire population of the largest principal city of the MSA, or (2) are completely contained within the largest principal city of the MSA, or (3) contain at least 250,000 residents of any principal city in the MSA.  Large fringe metro counties in MSA of 1 million or more population that do not qualify as large central.  Medium metro counties in MSA of 250,000-999,999 population. Small metro counties in MSAs of less than 250,000 population. Rural:  Micropolitan: Urban cluster population 10,000-49,999. Noncore: Nonmetropolitan counties that did not qualify as micropolitan. | | |  |
| Insurance Coverage | NIS/NEDS/SID/SEDD | | | Number and % of the cohort | |
| PAY1  Indicates the expected primary payer (Medicare, Medicaid, private insurance, etc.). To ensure uniformity of coding across data sources, PAY1 combines detailed categories in the more general groups.  Categories: Medicare, Medicaid, Private Insurance, Self-Pay, No charge, Other, Missing, Invalid    MEPS | | |
| PRVEVXX  TRIEVXX  MCREVXX  MCDEVXX  OPAEVXX  OPBEVXX  UNINSXX  INSCOVXX  INSURCXX | | ct An insurance coverage variable using responses for t the following binary variables (XX indicates year)  Ever Have Private Insurance during XX  Ever Have TRICARE/CHAMPVA during XX Ever Have Medicare during XX  Ever Have Medicaid/SCHIP during  XX |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Ever Have Other Public A Ins during XX  Ever Have Other Public B Ins during XX Uninsured All of XX    Health Insurance Coverage Indicator XX  Full Year Insurance Coverage Status XX | |  | |
|  | |
| Co-morbidities |  | |  | |
| Micro-vascular  Complications    Macro-vascular  Complications    Depression/Anxiety | | NIS, NEDS, SID, SEDD | | Number  and % of the cohort |
| DXn  In the HCUP databases, ICD-9-CM diagnoses are represented as 3- to 5-character alphanumeric codes with implicit decimals (i.e., decimals not included).  I10\_DXn  In the HCUP databases, ICD-10-CM diagnoses are represented by alphanumeric codes with a maximum length of 7 characters and implicit decimals (i.e., decimals not included). The HCUP data elements for ICD-10-CM diagnoses are length 7. MEPS | |
| ICD9CODX ICD-9-CM Code for Condition – Edited    Micro-Vascular Complications | |
| * Diabetic Retinopathy * Nephropathy * Neuropathy     Macro-vascular Complications | |

|  |  |  |
| --- | --- | --- |
|  | * Acute Coronary Syndrome * Acute Myocardial Infarction * Angina * Arrhythmia * CABG Revascularization/Carotid Revascularization/ Claudication /   Surgical Revascularization   * Heart Failure * Peripheral Arterial Disease or Vascular Disease * Stroke/TIA     Depression/Anxiety |  |
| Inclusion criteria includes ICD-09 and ICD-10 codes that indicate presence of suicidal behavior, anxiety disorders, and depression disorders. All individuals with psychoses or other bipolar disorders will be excluded.    ICD-9 and ICD-10 codes for above comorbidities/complications are listed in Appendix 4. The codes for retinopathy, nephropathy, neuropathy, and peripheral arterial disease or vascular disease were adapted from the criteria used for the Adjusted Diabetes  Complication Severity Index.32 and adapted to ICD-10 by Glasheen et.al.33. The codes for the remaining complications were identified in the literature, or published by the AHRQ for health services research purposes and adapted to ICD-10 using the online resources cited by  Glasheen et. al., ICD9Data.com and ICD10Data.com.34–40    Existence of comorbidities will be identified using ICD-9 and ICD-10 codes with flagged variables to allow for analyses by comorbidity status. |

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| --- | --- | --- | --- |
| Potentially preventable hospitalizations | | NIS/NEDS/SID/SEDD | Number  and % of the cohort |
|  | DX\_Visit\_Reasonn and DXn  In the HCUP databases, ICD-9-CM diagnoses are represented as 3- to 5character alphanumeric codes with implicit decimals (i.e., decimals not included).    I10\_DXn  In the HCUP databases, ICD-10-CM diagnoses are represented by alphanumeric codes with a maximum length of 7 characters and implicit decimals (i.e., decimals not included). The HCUP data elements for ICD-10CM diagnoses are length 7.  The original value of the first listed diagnosis (DX1), whether blank or coded, is retained in the first position of the diagnosis vector. Starting at the first secondary diagnosis (DX2), the diagnoses are shifted during HCUP processing to eliminate blank secondary diagnoses. For example, if DX2 and DX4 contain non-missing diagnoses and DX3 is blank, then the value of DX4 is shifted into DX3. Secondary diagnoses are never shifted into the first listed position (DX1).  DXPOAn  Indicates whether each diagnosis (DXn) was present at admission. This provides an indicator of complications arising during a hospitalization  The Prevention Quality Indicators are surveillance tools which can be used with hospital inpatient discharge data to identify potentially preventable hospitalizations.24 | |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Criteria for a potentially preventable hospitalization are any hospitalization events that include a diagnosis included in the AHRQ’s Prevention Quality Indicators for Diabetes. ICD-9 and ICD10 codes for Lower Extremity Ulcers and Hypoglycemia, to be used for sensitivity analysis, are also included in Appendix 2. The coding algorithms for the Prevention Quality Indicators are not available.    These codes were selected by the AHRQ’s Evidence-Based Practice Center at the University of California at San Francisco and Stanford University, using comprehensive literature reviews and empirical evaluations.41    Hypoglycemia 42  Sensitivity: 97%,  Specificity: 99%,  PPV: 93%%  NPV: 88% | | | | | | |  | |
| Hospital inpatient  & emergency department services | |  | NIS/ /SID/SEDD | | | Number and % of discharges | | | |
|  | | HCUP\_ED  Indicates records that have evidence of emergency department (ED) services reported on the HCUP record. A value of 1 or more indicates that there is evidence of ED services, per HCUP criteria. A value of 0 marks records that do not include evidence of ED services.  HCUP\_OS  Indicates records that have evidence of observation stay (OS) services reported on the HCUP record. A value of 1 or greater indicates that there is evidence of OS. A value of 0 marks records that do not include evidence of OS. It is possible that records with HCUP\_OS=0 did in fact have OS services, but that information was not captured on the HCUP record.  LOS  Length of stay (LOS) is calculated by subtracting the admission date (ADATE) from the discharge date (DDATE). Same-day stays are therefore coded as 0. Leave days are not subtracted.    NEDS | | | |  |  | | |
|  | | NCPT  NCPT indicates the total number of CPT or HCPCS procedures (valid and invalid) coded on the discharge record.    Identifying diabetes-related inpatient stays and emergency department visits will be through filtering the datasets for diabetes disease state indicators. Each independent observation in the NIS and NEDS are an inpatient stay or emergency visit. For state datasets with revisit variables, multiple utilization events over the course of a year are linked, allowing for a per-patient analysis. Use of the Emergency Department Services and Observation stay variables are for the purpose of characterizing inpatient stays only.    MEPS | | | | |  | | |
| XX indicates year    Full Year  Consolidated  File  OPTOTVXX  OPDRVXX  ERTOTXX  IPDISXX  IPNGTDXX IPZEROXX    ER Visits File  ERDATEYR  ERDATEMM  SURGPROC  MEDPRESC | | | Hospital Outpatient Visits  Physician Outpatient Visits  Total Emergency Room Visits  Total Inpatient Stays  Total Inpatient Stays Including Zero Night Stays Zero Night Stays    Event date – year  Event date – month  Was surg proc performed on p this visit  Any medicine prescribed for p this visit | |
|  | | | | Medical  Conditions  File  IPNUM | # Inpatient Events Assoc. w/ Condition | | | |  |
|  | | | | OPNUM | # Outpatient Events Assoc. w/ Condition | | | |  |
|  | | | | OBNUM | # Office-Based Events Assoc. w/ Condition | | | |  |
|  | | | | ERNUM | # ER Events Assoc. w/ Condition | | | |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Medication   * Antihyperglycemic agents • Antihyperlipedemic agents * Antihypertensive agents * Antiplatelet agents * Antidepressant/anxiolytic agents | MEPS |  | Number  (% of cohort)    No. reporting  of actual drug or drug  class will be in scope  for this study |
| DRUGIDX  RXNAME  RXDRGNAM  RXQUANTY  RXFORM  RXFRMUNT  RXSTRENG  RXSTRUNT  RXDAYSUP  RXNAME:  TC1:  TC1S1:  TC1S1\_1:  TC1S1\_2:  TC1S2:  TC1S2\_1:  TC1S3:  TC1S3\_1:  TC2:  TC2S1:  TC2S1\_1:  TC2S1\_2:  TC2S2:  TC3:  TC3S1:  TCS3S1\_1:      Antihyperglycemic a | Drug ID  Medicine name Multum medicine name Quantity of Rx/prescribed medicine  Dosage form  Quantity unit of medication Quantity unit of medication  Unit of medication Days supplied of prescribed med  Medicine name Multum therapeutic class #1 Multum therapeutic sub-sub-class for TC1S1 Multum therapeutic sub-sub-class for TC1S1 Multum therapeutic sub-sub-class  for TC1S1  Multum  therapeutic sub-class #2 for TC1 Multum therapeutic sub-sub-class for TC1S2 |

|  |  |  |
| --- | --- | --- |
|  | Multum  therapeutic sub-class #3 for TC1 Multum therapeutic sub-sub-class for TC1S3 Multum therapeutic class #2 Multum therapeutic sub-class #1 for TC2 Multum therapeutic sub-sub-class for TC2S1 Multum therapeutic sub-sub-class for TC2S1  Multum therapeutic sub-class #2 for TC2 Multum therapeutic class #3 Multum therapeutic sub-class #1 for TC3 Multum therapeutic sub-sub-class for TC3S1 |  |
| * Meglitinides * Biguanides * Sulphonylureas * Alpha-glucosidase inhibitors * Glitazones * Thiazolidinediones * DPP-4 inhibitors * GLP-1 receptor agonists * SGLT-2 inhibitors * Long-acting insulin * Intermediate acting insulin * Rapid-Acting insulin |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| * Antihypertensive agents * Anti-hypertensive Diuretics * Calcium channel blocking agents * Angiotensin converting enzyme inhibitors * Angiotensin II receptor antagonists * Alpha-1 adrenergic receptor agonists |
|  | * Alpha-2 adrenergic receptor agonists * Beta-adrenergic blocking agents * Vasodilators * Renin Inhibitors * Aldosterone receptor antagonists * Endothelium receptor antagonists * Antihypertensive combinations     Antiplatelet agents |  |
| * Glycoprotein platelet inhibitors * Platelet aggregation inhibitors * Protease-activated receptor-1 antagonists     Antihyperlipidemic agents |
| * Statins * Fibrates     Antidepressant/anxiolytic agents |
|  | * SSRI antidepressants * Tricyclic antidepressants * Monoamine oxidase inhibitors * Phenylpiperazine antidepressants * Tetracyclic antidepressants * SSNR antidepressants * Barbiturates * Benzodiazepines |  |

## 4.2 Outcomes

Objective 1: To describe trends in ED visit rates and inpatient use rates among adults with diabetes in the United States from 2005-2016 by age, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and health insurance coverage.

* Number of Hospital Inpatient Stays for years 2008, 2011, 2014, and 2016.
* Absolute and percentage change in number of Hospital Inpatient Stays from 2008 to 2016.
* Number of Hospital Inpatient Stays for years 2008, 2011, 2014, and 2016.
* Absolute and percentage change in number of Hospital Inpatient Stays from 2008 to 2016.
* Rate of Hospital Inpatient Stays per 1000 people with diabetes for years 2008, 2011, 2014, and 2016.
* Absolute and percentage change in rate of Hospital Inpatient Stays from 2008 to 2016.
* Rate of Emergency Department Visits per 1000 people for years 2008, 2011, 2014, and 2016.
* Absolute and percentage change in rate of Emergency Department Visits from 2008 to 2016.
* Stratification of findings by age, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and health insurance coverage, and diabetes status.

Objective 2: To describe trends in the rates of potentially preventable hospitalizations among adults with diabetes in the United States from 2005-2016 by age, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and health insurance coverage.

* Number of Potentially Preventable Hospitalizations among people with diabetes for years 2008, 2011, 2014, and 2016.
* Rates of Potentially Preventable Hospitalizations per 1000 persons with diabetes for years 2008, 2011, 2014, and 2016.
* Absolute and percent change in number of Potentially Preventable Hospitalizations from 2008 to 2016.
* Absolute and percent change in rates of Potentially Preventable Hospitalizations from 2008 to 2016.
* Stratification of percent change in rates of Potentially Preventable Hospitalizations by age, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and health insurance coverage, and diabetes status.

Objective 3: To describe trends of prescription drug (specifically, antihyperglycemic agents, antihyperlipidemic agents, antihypertensive agents, antiplatelet agents, and antidepressant/anxiolytic agents) usage among adults with diabetes in the United States from 2005-2016 by age, sex, race/ethnicity, , presence of comorbidities, geographic region, and health insurance coverage.

* Number of people with diabetes prescribed medications in drug classes listed above in the years 2008, 2011, 2014, and 2016.
* Absolute and percent change in number of people receiving prescriptions in drug classes listed above from 2008-2016.
* Percent change in number of people with diabetes prescribed in drug classes listed above from 2008-2016.
* Stratification of findings by age, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and health insurance coverage.

# 5 STUDY PROCEDURES

## 5.1 General Informed Consent

The State Inpatient Database, State Emergency Department Database, National Inpatient Sample, and National Emergency Department Databases each collect data on hospital-level claims and discharges from state governments and private data agencies with statewide inpatient data systems. Dissemination of the State Inpatient Database is controlled by the original data source, with measures taken to protect the identity of individual patients and physicians.43

Individuals that participate in the Medical Expenditure Panel Survey are sampled from the National Health Interview Survey (NHIS). When the interviewer arrives at the household address, he/she provides a copy of an advance letter which contains information about the purpose of the NHIS and amount of time the interview will require, as well as verbal consent for survey participation.44 The Medical Expenditure Panel Survey keeps the identity of each individual household member who participates confidential. No information that may identify an individual is released to the public without prior consent. All personal identifying information is removed before data publication.45

Individuals that participated in the Behavioral Risk Factor Surveillance System were asked to provide informed consent during the phone interview. No personal information was collected, and individual data is kept confidential.52 The Behavioral Risk Factor Surveillance System interview is not being conducted for the purposes of this study.

This research is not considered to meet the definition of human subject research. As such, Emory does not require IRB review.

# 6 Safety and Product Quality Complaint Reporting and Related Procedures

## Adverse Event (AE) and Product Quality Complaint (PQC) Reporting Language for Non-Interventional

## Study Protocols

Adverse Event and Product Quality Complaint Reporting

This is a non-interventional database study based on secondary use of data collected for other purposes. No administration of any therapeutic or prophylactic agent is required in this protocol. No reporting of individual adverse events or product quality complaints to regulatory agencies is planned for this database study because there is no access to individual patient/subject records and it is not possible to assess the causality of individual cases. Study-specific health outcomes of interest, including any that qualify as adverse events, will be summarized as part of any interim analysis (including safety analysis, if required) and in the final study report, which will be provided to regulatory agencies by the sponsor as required.

Any relevant safety information will be summarized in the appropriate Periodic Safety Update Report

(PSUR)/Periodic Benefit Risk Evaluation Report (PBRER) and/or Development Safety Update Reports (DSUR) if required.

If an investigator elects to spontaneously report any suspected adverse reactions or product quality complaints, they should be reported via fax to Local DPOC *[fax number: 215-616-5677]*, in English using an AE and PQC report form (see section 12 for form) for reporting to worldwide regulatory agencies as appropriate.

# 7 Statistical Analysis Plan

## 7.1 Statistical Methods

Descriptive analyses will be conducted pertaining to each aim in order to describe the trends in 1)

Inpatient and ED care utilization rates, 2) Potentially preventable Hospitalization rates, and 3) Cardiovascular-modifying medication usage. Data from 4 different years will be used to conduct these analyses: 2008, 2011, 2014, and 2016.

Validation of the data will be run alongside the descriptive analysis, and data that are missing or incorrect will be corrected if possible and otherwise excluded. If analysis indicates that the missing data are missing completely at random, case deletion will be used to progress the analysis. Otherwise, multiple imputation methods will be used to impute values. The specific imputation model used will depend on the type of data element in the analysis that require imputation.

During 1988 to 2011, the NIS was constructed annually by including 100% of the discharges from 20% of US hospitals. Starting in 2012, the AHRQ redesigned the NIS as a 20% national patient-level sample in 2012, with nonrepresentative sampling across hospitals.46 This change will be addressed through the use of trend weights which allow for trend analysis prior to and post sampling change.47

These trend weights will be used for NIS data from 2008 and 2011 in order to make estimates comparable to the data from 2014 and 2016. For data from 2012 on, discharge weights will be used which will allow extrapolation of NIS sample discharges to produce nationwide estimates. The discharge weights are constant for all discharges within a stratum as defined by hospital characteristics.48 Discharge weights will also be applied to the NEDS dataset in order to allow for the generation of nationwide estimates. These weights will address the complex survey design of the NIS and NEDS and account for clustering, stratification, and sampling bias.

The MEPS sample design includes stratification, clustering, multiple stages of selection, and disproportionate sampling. In order to obtain accurate descriptive statistics, the analysis will account for survey design complexities by applying MEPS survey weights to produce estimates. The sampling weights also reflect adjustments for survey nonresponse and adjustments to population control totals.49

The analysis will use the Taylor-series linearization and/or the jack-knife methods to estimate the standard errors associated with weighted estimates.

Rate estimates will be calculated as follows:

𝑇𝑜𝑡𝑎𝑙 𝐻𝑒𝑎𝑙𝑡ℎ𝑐𝑎𝑟𝑒 𝑆𝑒𝑟𝑣𝑖𝑐𝑒 𝑈𝑠𝑒∗ 𝑖𝑛 𝑋𝑋 𝑦𝑒𝑎𝑟 × 1000

𝑁𝑢𝑚𝑏𝑒𝑟 𝑜𝑓 𝑃𝑒𝑜𝑝𝑙𝑒 𝑤𝑖𝑡ℎ 𝐷𝑖𝑎𝑏𝑒𝑡𝑒𝑠 𝑖𝑛 𝑋𝑋 𝑦𝑒𝑎𝑟

\*Where Healthcare Service Use is defined as number of Hospital Inpatient Stays, ED visits, Potentially Preventable Hospitalizations, and Drugs Prescribed

In order to create a denominator for use in estimating rates per 1000 persons with diabetes Behavioral Risk Factor Surveillance Survey (BRFSS) data will be used to determine the population of people with diabetes. The population estimates generated will use self-reported diabetes diagnosis to indicate presence of diabetes disease state. BRFSS data will be also be used to estimate the population of people with diabetes by sex, race/ethnicity, rural/urban designation, geographic region, and health insurance coverage status. These estimates will be used to generate rates per stratification of interest. Rates will be standardized using available demographic data to allow for comparison over years.

Overall rates of service use will be calculated by diabetes and non-diabetes status and compared using rate ratios for both within-group and between-group comparisons for each year of data available. Within-group rate ratios will be calculated using 2008 as the reference year. Approximate confidence intervals for standardized rate ratios will be calculated using the log-normal distribution.

Absolute change estimates will be calculated as follows:

𝐸𝑠𝑡𝑖𝑚𝑎𝑡𝑒 𝑓𝑜𝑟 𝐻𝑒𝑎𝑙𝑡ℎ𝑐𝑎𝑟𝑒 𝑆𝑒𝑟𝑣𝑖𝑐𝑒 𝑢𝑠𝑒 𝑖𝑛 2016

− 𝐸𝑠𝑡𝑖𝑚𝑎𝑡𝑒 𝑓𝑜𝑟 𝐻𝑒𝑎𝑙𝑡ℎ𝑐𝑎𝑟𝑒 𝑆𝑒𝑟𝑣𝑖𝑐𝑒 𝑢𝑠𝑒 𝑖𝑛 2008

Percent change estimates will be calculated as follows:

𝐴𝑏𝑠𝑜𝑙𝑢𝑡𝑒 𝐶ℎ𝑎𝑛𝑔𝑒 𝑓𝑟𝑜𝑚 2008 − 2016

× 100

𝐸𝑠𝑡𝑖𝑚𝑎𝑡𝑒 𝑓𝑜𝑟 𝐻𝑒𝑎𝑙𝑡ℎ𝑐𝑎𝑟𝑒 𝑆𝑒𝑟𝑣𝑖𝑐𝑒 𝑢𝑠𝑒 𝑖𝑛 2008

Self-reported diabetes diagnosis will be used to indicate presence of diabetes disease state. In order to account for the complex survey design of the Behavioral Risk Factor Surveillance Survey, a sample weight will be applied to generate these estimates.

Each analytic procedure/code will first be conducted and validated with one year of data, and then applied and adjusted for use with prior years after confirmation of validity.

For Objectives 1 and 2, we will conduct revisit analyses. For states with revisit variables available (Florida, New York, Utah, and Nebraska), we will create variables to indicate the number of potentially preventable hospitalization each individual patient had. The analysis will be repeated among these states in order to generate patient-level health care use estimates, rather than encounterlevel use estimates. No revisit analyses will be completed with NIS data, as the revisit variable is unavailable.

We will repeat the analyses for Objectives 1 and 2 using nationally-representative NIS and NEDS data. These estimates will be used for the purposes of a sensitivity analysis and determine whether the estimates generated using SID and SEDD data are nationally representative. We will use MEPS to generate additional estimates for comparison when possible, specifically for total number of inpatient stays and ED visits.

Continuous variables will be expressed as the mean ± standard deviation. Categorical variables will be presented in terms of expected count and frequency in the dataset. Rates will be expressed per 1000 persons with diabetes.

No statistical testing of differences will be performed as the analysis was designed as a descriptive study.

All statistical analysis will be performed using R (R Core Team (2013). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.

www.R-project.org/).51

Shell tables are provided in the Appendix, as items 5, 6, 7. Variables to be reported in the course of the analysis are provided in the appendices.

Objective 1:

First, the total number of claims in the SID and SEDD will be estimated. The datasets will then be filtered to select for observations consistent with a diabetes disease state, using variables that indicate ICD-9 and ICD-10 codes (Appendix 1). The mean age will be calculated and reported along with range for each year. A frequency distribution will then be generated in terms of sex, rural/urban designation, race, and insurance coverage, which will be reported as the estimated count and percent of observations represented (Appendix 5, Table 2).

After describing the dataset, both unweighted and weighted estimates for the count of hospital inpatient stays and ED visits for each year will be calculated. A variable for age group will be created, with categories as follows: 18-44, 45-64, and 65+. The estimates will be reported by age group, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and insurance coverage, alongside the percentage of observations represented. Absolute change and percent change from 2008 to 2016 will then be estimated and reported (Appendix 5, Tables 3 and 4).

The estimates generated by the previous analyses will be divided by the estimates generated in the Behavioral Risk Factor Surveillance Survey, specific to the stratifications of interest to generate rates of health care use per 1000 persons with diabetes (Appendix 5, Tables 5 and 6).

Objective 2

Of the filtered dataset generated for our first objective, we will then filter observations for presence of ICD-9 or ICD-10 codes indicative of a potentially preventable hospitalization (Appendix 2).

Two variables will be created:

1. a binary variable that flags whether or not an inpatient stay was potentially preventable

1. a variable to indicate what type of potentially preventable hospitalization is present (Short-Term Diabetes Complications, Long-Term Diabetes

Complications, Uncontrolled Diabetes without Complications, Diabetes-related Lower-Extremity Amputations, Lower Extremity Ulcers/inflammation/infections, or Hypoglycemia).

The dataset will then be filtered for observations flagged for potentially preventable hospitalizations. The counts of potentially preventable hospitalizations by age group, sex, race/ethnicity, rural/urban designation, presence of comorbidities, geographic region, and insurance coverage, alongside the percentage of observations represented will then be estimated. Rates of potentially preventable hospitalizations per 1000 persons with diabetes will be estimated using BRFSS estimates as the denominator (Appendix 6, Table 7). Absolute change and percent change in potentially preventable hospitalizations from 2008 to 2016 will then be estimated and reported (Appendix 6, Table 8).

This analysis will be conducted again using the conditions suggested by Tseng et al., hypoglycemia and lower extremity ulcers.28 The results of this analysis will be compared to the initial estimates and will serve as a sensitivity analysis.

Objective 3

For the MEPS analysis, survey weights will be applied to the dataset to account for stratification, clustering, multiple stages of selection, and disproportionate sampling. First, the total database population will be estimated. The datasets will then be filtered to select for observations consistent with a diabetes disease state, using variables that indicate ICD-9 and ICD-10 codes, presence of selfreported diabetes, or the prescription of a diabetes medication in the past year (Appendix 1).

The mean age will be calculated and reported along with range for each year. A frequency distribution will then be generated in terms of age group, sex, race/ethnicity, , presence of comorbidities, geographic region, and insurance coverage, which will be reported as the estimated count and percent of observations represented (Appendix 7, Table 9).

After describing the dataset, variables will be created which indicate whether an individual was prescribed antihyperglycemic agents, antihyperlipidemic agents, antihypertensive agents, antiplatelet agents, and/or antidepressant/anxiolytic agents. Drugs will be described and reported and analyzed by category of drug and not by class or name.

We will then estimate and report the weighted count and % of people with diabetes prescribed antihyperglycemic agents, antihyperlipidemic agents, antihypertensive agents, antiplatelet agents, and antidepressant/anxiolytic agents each year, as well as the absolute and percent change from 2008 to 2016 (Appendix 7. Table 10).

Weighted estimates will then be calculated by age group, sex, race/ethnicity, presence of comorbidities, geographic region, and insurance coverage. Absolute change and percent change in prescriptions for medications from 2008 to 2016 will then be estimated and reported (Appendix 7. Table 11).

## 7.2 Bias

Selection of state inpatient databases to be used in the analysis was limited by budget and data availability issues. Each state provides different variables, and data availability varies by state. This may result in a bias towards the health service utilization characteristics present in higher-resource states which have greater data availability. Although the analysis uses data from geographically distributed states, it may not be a representative national sample. However, no national datasets contain the patient-level and health care use details that HCUP’s state databases do.

### 7.2.1 Methods to Minimize Bias

The analysis will use weights as necessary in order to eliminate possible sampling bias.

For the NIS, the analysis will use trend weights prior to 2011 and discharge weights after 2011 to allow for comparison of estimates. For the NEDS, the analysis will use discharge weights to generate nationally representative estimates. As the NEDS does not have a variable indicating state, we will compare NEDS estimates with SEDD estimates by region.

To address possible bias stemming from variations in state characteristics, the analysis will use 11 states which are widely distributed terms of geographic location and political leaning. In order to test whether our sample is providing nationally representative findings, we will use NIS data, which contains a 20% sample of all discharges across the US (46 states and D.C.). We will then perform sensitivity analyses for objectives 1 and 2 to determine if the results using the 11 states are generally similar (provide a good reflection of national sample results) or dissimilar (suggesting presence of bias).

However, because not all states provide data to the National Inpatient Sample there may be some bias in national estimates that occur if omitted states have substantially different hospitalization patterns than states that do provide data.50

The analysis will also validate findings, when possible, with MEPS data. For example, MEPS includes a variable which provides the total number of inpatients stays a patient had over the course of the past two years – this variable could be used to compare estimates of health service utilization generated with NIS or SID data.

The MEPS sample design includes stratification, clustering, multiple stages of selection, and disproportionate sampling. In order to obtain accurate statistics, the analysis will account for survey design complexities by applying MEPS survey weights to produce estimates. The sampling weights also reflect adjustments for survey non-response and adjustments to population control totals.49

### 7.2.2 Limitations

1. As it pertains to Aims 1 and 2, the use of state databases leads to generalizability issues. Although we have selected states that vary in terms of geographic and political distribution, the results from analyses that use state databases will not be nationally representative.

1. The NIS, NEDS, SID, and SEDD all provide hospital-level health care claims data. We will disaggregate the health care use that was “diabetes-related” but this might be subject to clinician billing. Relying on ICD-9 and ICD-10 codes may result in misclassifications, as claims data is originally intended for administrative purposes, and not health services research. Additionally, using claims data to identify diagnoses may result in inaccurate estimates for certain conditions, as algorithms may vary in validity.34,35

1. For analyses conducted using National Inpatient Sample data, there is no method to identify individual patients, so recurrent hospitalizations are all considered as distinct observations. To address this limitation, we will conduct analyses using pooled state inpatient data and apply an adjustment factor to the results found in the National Inpatient Sample to produce Nationwide estimates. These estimates will be presented with the acknowledgement that the pooled states used to produce the adjustment factor may not be nationally representative. Further, outpatient encounters observation-only stays are not included within the sample. Conditions and procedures that occur across multiple healthcare settings may be underrepresented.46

1. Relying on the Prevention Quality Indicators to define potentially preventable hospitalizations may result in some necessary hospitalizations being categorized as potentially preventable. One could only determine whether or not a hospitalization was potentially preventable by examining each individual case.41

1. Both the NIS and MEPS are designed so as to not support state-level analysis. This limits the use of the NIS and MEPS in generating health care utilization estimates at the state level. Although we may be able to calculate the effect of the revisit variable on health care use estimates, we will not be able to apply the effect as an adjustment factor to estimate nationwide rates of service use.

1. Relying on ICD-codes to identify non-diabetes status in individual events or patients may result in mis-identifying some patients, i.e., a patient may have diabetes, but the condition was not relevant to the patient encounter, and was excluded from the coding of the event. To address this limitation, we will use all discharges diagnoses (up to 30 diagnoses) available on each record to exclude records with diabetes diagnoses present

# 8 ADMINISTRATIVE AND REGULATORY DETAILS

## 8.1 Confidentiality

### 8.1.1 Confidentiality of Data

By signing this protocol, the investigator affirms to the Sponsor that information furnished to the investigator by the Sponsor will be maintained in confidence, and such information will be divulged to the Institutional Review Board, Ethics Review Committee or similar or expert committee; affiliated institution and employees, only under an appropriate understanding of confidentiality with such board or committee, affiliated institution and employees. Data generated by this study will be considered confidential by the investigator, except to the extent that it is included in a publication as provided in the Publications section of this protocol.

### 8.1.2 Confidentiality of Subject Records

By signing this protocol, the investigator agrees that the Sponsor (or Sponsor representative), Institutional Review Board/Independent Ethics Committee (IRB/IEC), or Regulatory Agency representatives may consult and/or copy study documents in order to verify worksheet/case report form data. By signing the consent form, the subject agrees to this process. If study documents will be photocopied during the process of verifying worksheet/case report form information, the subject will be identified by unique code only; full names/initials will be masked prior to transmission to the Sponsor.

By signing this protocol, the investigator agrees to treat all subject data used and disclosed in connection with this study in accordance with all applicable privacy laws, rules and regulations.

### 8.1.3 Confidentiality of Investigator Information

By signing this protocol, the investigator recognizes that certain personal identifying information with respect to the investigator, and all subinvestigators and study site personnel, may be used and disclosed for study management purposes, as part of a regulatory submissions, and as required by law. This information may include:

* name, address, telephone number and e-mail address;
* hospital or clinic address and telephone number;
* curriculum vitae or other summary of qualifications and credentials; and
* other professional documentation.

Consistent with the purposes described above, this information may be transmitted to the Sponsor, and subsidiaries, affiliates and agents of the Sponsor, in your country and other countries, including countries that do not have laws protecting such information. Additionally, the investigator’s name and business contact information may be included when reporting certain serious adverse events to regulatory agencies or to other investigators. By signing this protocol, the investigator expressly consents to these uses and disclosures.

If this is a multicenter study, in order to facilitate contact between investigators, the Sponsor may share an

investigator’s name and contact information with other participating investigators upon request.

## 8.2 Compliance with Financial Disclosure Requirements

Financial Disclosure requirements are outlined in the US Food and Drug Administration Regulations, Financial Disclosure by Clinical Investigators (21 CFR Part 54). It is the Sponsor's responsibility to determine, based on these regulations, whether a request for Financial Disclosure information is required. It is the investigator's/subinvestigator's responsibility to comply with any such request.

The investigator/subinvestigator(s) agree, if requested by the Sponsor in accordance with 21 CFR Part 54, to provide his/her financial interests in and/or arrangements with the Sponsor to allow for the submission of complete and accurate certification and disclosure statements. The investigator/subinvestigator(s) further agree to provide this information on a Certification/Disclosure Form, commonly known as a financial disclosure form, provided by the Sponsor or through a secure password-protected electronic portal provided by the Sponsor. The investigator/subinvestigator(s) also consent to the transmission of this information to the Sponsor in the United States for these purposes. This may involve the transmission of information to countries that do not have laws protecting personal data.

## 8.3 Compliance with Law, Audit and Debarment

By signing this protocol, the investigator agrees to conduct the study in an efficient and diligent manner and in conformance with this protocol; generally accepted standards of Good Pharmacoepidemiology Practice and all applicable federal, state and local laws, rules and regulations relating to the conduct of the study.

The investigator also agrees to allow monitoring, audits, Institutional Review Board/Independent Ethics Committee review and regulatory agency inspection of study-related documents and procedures and provide for direct access to all study-related source data and documents.

The investigator agrees not to seek reimbursement from subjects, their insurance providers or from government programs for procedures included as part of the study reimbursed to the investigator by the Sponsor.

The Investigator shall prepare and maintain complete and accurate study documentation in compliance with Good Pharmacoepidemiology Practice, standards and applicable federal, state and local laws, rules and regulations; and, for each subject participating in the study, provide all data, and, upon completion or termination of the study, submit any other reports to the Sponsor as required by this protocol or as otherwise required pursuant to any agreement with the Sponsor.

Study documentation will be promptly and fully disclosed to the Sponsor by the investigator upon request and also shall be made available at the investigator’s site upon request for inspection, copying, review and audit at reasonable times by representatives of the Sponsor or any regulatory agencies. The investigator agrees to promptly take any reasonable steps that are requested by the Sponsor as a result of an audit to cure deficiencies in the study documentation and worksheets/case report forms.

The investigator must maintain copies of all documentation and records relating to the conduct of the study in accordance with their institution’s records retention schedule which is compliant with all applicable regional and national laws and regulatory requirements. If an institution does not have a records retention schedule to manage its records long-term, the investigator must maintain all documentation and records relating to the conduct of the study for 5 years after final report or first publication of study results, whichever comes later, per GPP guidelines. This documentation includes, but is not limited to, the protocol, worksheets/case report forms, advertising for subject participation, adverse event reports, subject source data, correspondence with regulatory authorities and IRBs/ERCs, consent forms, investigator’s curricula vitae, monitor visit logs, laboratory reference ranges, laboratory certification or quality control procedures and laboratory director curriculum vitae. All study documents shall be made available if required by relevant regulatory authorities. The investigator must consult with the Sponsor prior to discarding study and/or subject files.

The investigator will promptly inform the Sponsor of any regulatory agency inspection conducted for this study.

Persons debarred from conducting or working on studies by any court or regulatory agency will not be allowed to conduct or work on this Sponsor’s studies. The investigator will immediately disclose in writing to the Sponsor if any person who is involved in conducting the study is debarred or if any proceeding for debarment is pending or, to the best of the investigator’s knowledge, threatened.

In the event the Sponsor prematurely terminates a particular study site, the Sponsor will promptly notify that

site’s IRB/IEC.

According to European legislation, a Sponsor must designate an overall coordinating investigator for a multicenter study (including multinational). When more than one study site is open in an EU country, Merck, as the Sponsor, will designate, per country, a national principal coordinator (Protocol CI), responsible for coordinating the work of the principal investigators at the different sites in that Member State, according to national regulations. For a single-center study, the Protocol CI is the principal investigator. In addition, the Sponsor must designate a principal or coordinating investigator to review the study report that summarizes the study results and confirm that, to the best of his/her knowledge, the report accurately describes the conduct and results of the study in the study’s final report. The Sponsor may consider one or more factors in the selection of the individual to serve as the Protocol CI and or CSR CI (e.g., availability of the CI during the anticipated review process, thorough understanding of study methods, appropriate enrollment of subject cohort, timely achievement of study milestones). The Protocol CI must be a participating study investigator.

## 8.5 Quality Management System

By signing this protocol, all parties agree to following applicable standard operating procedures (SOPs). All parties also agree to ensuring all existing and new study personnel are appropriately trained to ensure the study is conducted and data are generated, documented, and reported in compliance with the protocol, Good Pharmacoepidemiology Practice (GPP), and all applicable federal, state, and local laws, rules and regulations. All parties should maintain transparency and open communication in order to effectively manage the study and proactively mitigate any risks.

The Sponsor may conduct routine or for-cause audits to ensure oversight and conduct of the study are completed in accordance with the protocol, quality standards (e.g. GPP), and applicable laws and regulations. If a significant quality issue (SQI) is identified at any time during the conduct of the study, it must be escalated to the Sponsor immediately. A SQI is any issue with the potential to negatively impact, either directly or indirectly, the rights, safety and well-being of patients or study participants and/or the integrity of the data. In the event an audit or SQI results in corrective or preventive actions, all parties are expected to appropriately implement the action plan in a timely manner.

## 8.6 Data Management

The investigator or qualified designee is responsible for recording and verifying the accuracy of subject data*.* By signing this protocol, the investigator acknowledges that his/her electronic signature is the legally binding equivalent of a written signature. By entering his/her electronic signature, the investigator confirms that all recorded data have been verified as accurate.

For an outsourced study the institutional policies of the vendor should be followed for development of data management plans. However, the vendor should ensure compliance with Good

Pharmacoepidemiology Practice, and all applicable federal, state, and local laws, rules and regulations relating to the conduct of the study.

# 9 Publications

The Risk Management Subteam (RMST) Lead /Clinical Safety Risk Manager (CSRM) Physician will be notified if any safety data are generated in the final study report or any interim report. The safety and conclusion sections of the final study report or interim report must be reviewed by the RMST Lead/CSRM Physician prior to finalization of the report. The review by the CSRM Physician must occur prior to any release of results to the public domain in the form of abstracts, posters, presentations or manuscripts.

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# 11 Appendices

**Appendix 1.**

#### ICD-9-CM and ICD-10-CM Codes indicating Diabetes Disease State

|  |  |  |  |
| --- | --- | --- | --- |
| ICD-9-CM | | ICD-10-CM | |
| 25000 | Diabetes mellitus without mention of complication, type II or unspecified type, not stated as uncontrolled | E119 | Type 2 diabetes mellitus without complications |
| 25001 | Diabetes mellitus without mention of complication, type I [juvenile type], not stated as uncontrolled | E109 | Type 1 diabetes mellitus without complications |
| 25002 | Diabetes mellitus without mention of complication, type II or unspecified type, uncontrolled | E1165 | Type 2 diabetes mellitus with hyperglycemia |
| 25003 | Diabetes mellitus without mention of complication, type I [juvenile type], uncontrolled | E1065 | Type 1 diabetes mellitus with hyperglycemia |
| 25010 | Diabetes with ketoacidosis, type II or unspecified type, not states as uncontrolled | E1169 | Type 2 diabetes mellitus with other specified complication |
| E1310 | Other specified diabetes mellitus with ketoacidosis without coma |
| 25011 | Diabetes with ketoacidosis, type I [juvenile type], not stated as uncontrolled | E1010 | Type 1 diabetes mellitus with ketoacidosis without coma |
| 25012 | Diabetes with ketoacidosis, type II or unspecified type, uncontrolled | E1165 | Type 2 diabetes mellitus with hyperglycemia |
| E1169 | Type 2 diabetes mellitus with other specified complication |
| E1310 | Other specified diabetes mellitus with ketoacidosis without coma |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 25013 | Diabetes with ketoacidosis, type I [juvenile type], uncontrolled | E1010 | Type 1 diabetes mellitus with ketoacidosis without coma |  |
| E1065 | Type 1 diabetes mellitus with hyperglycemia |  |
| 25020 | Diabetes with hyperosmolarity, type II or unspecified type, not stated as uncontrolled | E1100 | Type 2 diabetes mellitus with hyperosmolarity  without nonketotic hyperglycemic-hyperosmolar coma (NKHHC) |  |
| E1101 | Type 2 diabetes mellitus hyperosmolarity with coma | with |
| 25021 | Diabetes with hyperosmolarity, type I [juvenile type], not stated as uncontrolled | E1069 | Type 1 diabetes mellitus with other specified complication |  |
| 25022 | Diabetes with hyperosmolarity, type II or unspecified type, uncontrolled | E1100 | Type 2 diabetes mellitus with hyperosmolarity  without nonketotic hyperclycemic-hyperosmolar coma (NKHHC) |  |
| E1165 | Type 2 diabetes mellitus with hyperglycemia |  |
| 25023 | Diabetes with hyperosmolarity, type I  [juvenile type], uncontrolled | E1065 | Type 1 diabetes mellitus with hyperglycemia |  |
| E1069 | Type 1 diabetes mellitus with other specified complication |  |
| 25030 | Diabetes with other coma, type II or unspecified type, not states as uncontrolled | E11641 | Type 2 diabetes mellitus with hypoglycemia with coma |  |
| 25031 | Diabetes with other coma, type I [juvenile type], not stated as uncontrolled | E1011 | Type 1 diabetes mellitus with ketoacidosis with coma |  |
| E10641 | Type 1 diabetes mellitus with hypoglycemia with coma |  |
| 25032 | Diabetes with other coma, type II or unspecified type, uncontrolled | E1101 | Type 2 diabetes mellitus hyperosmolarity with coma | with |
| E1165 | Type 2 diabetes mellitus with hyperglycemia |  |
| 25033 | Diabetes with other coma, type I [juvenile type], uncontrolled | E1011 | Type 1 diabetes mellitus with ketoacidosis with coma |  |
| E1065 | Type 1 diabeters mellitus with hyperglycemia |  |

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| --- | --- | --- | --- |
| 25040 | Diabetes with renal manifestations, type II or unspecified type, not stated as uncontrolled | E1129 | Typer 2 diabetes mellitus with other diabetic kidney  complication |
| 25041 | Diabetes with renal manifestations, type I [juvenile type], not stated as uncontrolled | E1029 | Type 1 diabetes mellitus with other diabetic kidney complication |
| 25042 | Diabetes with renal manifestations, type II or unspecified type, uncontrolled | E1121 | Type 2 diabetes mellitus with diabetic nephropathy |
| E1165 | Type 2 diabetes mellitus with hyperglycemia |
| 25043 | Diabetes with renal manifestations, type I [juvenile type], uncontrolled | E1021 | Type 1 diabetes mellitus with diabetic neuropathy |
| E1065 | Type 1 diabetes mellitus with hyperglycemia |
| 25050 | Diabetes with ophthalmic manifestations, type II or unspecified type, not stated as uncontrolled | E11311 | Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema. |
| E11319 | Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema |
| E1136 | Type 2 diabetes mellitus with diabetic cataract |
| E1139 | Type 2 diabetes mellitus with other diabetic ophthalmic complication |
| 25051 | Diabetes with ophthalmic manifestations,  type I [juvenile type], not  states as uncontrolled | E10311 | Type 1 diabetes mellitus with unspecified diabetic retinopathy with macular edema. |
| E10319 | Type 1 diabetes mellitus with unspecified diabetic retinopathy without macular edema |
| E1036 | Type 1 diabetes mellitus with diabetic cataract |
| E1039 | Type 1 diabetes mellitus with other diabetic ophthalmic complication |
| 25052 | Diabetes with ophthalmic manifestations, type II or | E11311 | Type 2 diabetes mellitus with unspecified diabetic |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | unspecified type, uncontrolled |  | | retinopathy with macular edema. | |
| E11319 | | Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema | |
| E1136 | | Type 2 diabetes mellitus with diabetic cataract | |
| E1139 | | Type 2 diabetes mellitus with other diabetic ophthalmic complication | |
| E1165 | | Type 2 diabetes mellitus with hyperglycemia | |
| 25053 | Diabetes with ophthalmic manifestations, type I [juvenile type], uncontrolled) | E10311 | | Type 1 diabetes mellitus with unspecified diabetic retinopathy with macular edema. | |
| E10319 | | Type 1 diabetes mellitus with unspecified diabetic retinopathy without macular edema | |
| E1036 | | Type 1 diabetes mellitus with diabetic cataract | |
| E1039 | | Type 1 diabetes mellitus with other diabetic ophthalmic complication | |
| E1065 | | Type 1 diabetes mellitus with hyperglycemia | |
| 25060 | Diabetes with neurological manifestations, type II or unspecified type, not stated as uncontrolled | E1140 | | Type 2 diabetes mellitus with diabetic neuropathy, unspecified | |
| 25061 | Diabetes with neurological manifestations, type I [juvenile type], not stated as uncontrolled | E1040 | | Type 1 diabetes mellitus with diabetic neuropathy, unspecified | |
| 25062 | Diabetes with neurological manifestations, type II or unspecified type, uncontrolled | E1140 | | Type 2 diabetes mellitus with diabetic neuropathy, unspecified | |
| E1165 | | Type 2 diabetes mellitus with hyperglycemia | |
| 25063 | Diabetes with neurological | | E1040 | | Type 1 diabetes mellitus with diabetic neuropathy, unspecified | |

|  |  |  |  |
| --- | --- | --- | --- |
|  | manifestations, type I [juvenile type], uncontrolled | E1065 | Type 1 diabetes mellitus with hyperglycemia |
| 25070 | Diabetes with peripheral circulatory disorders, type II or unspecified type, not stated as uncontrolled | E1151 | Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene |
| 25071 | Diabetes with peripheral circulatory disorders, type I [juvenile type], not stated as uncontrolled | E1051 | Type 1 diabetes mellitus with diabetic peripheral angiopathy without gangrene |
| 25072 | Diabetes with peripheral circulatory disorders, type II or unspecified type, uncontrolled | E1151 | Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene |
| E1165 | Type 2 diabetes mellitus with hyperglycemia |
| 25073 | Diabetes with peripheral circulatory disorders, type I [juvenile type], uncontrolled | E1051 | Type 1 diabetes mellitus with diabetic peripheral angiopathy without gangrene |
| E1065 | Type 1 diabetes mellitus with hyperglycemia |
| 25080 | Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled | E11618 | Type 2 diabetes mellitus with other diabetic arthropathy |
| E11620 | Type 2  diabetes mellitus with diabetic  dermatitis |
| E11621 | Type 2 diabetes mellitus with foot ulcer |
| E11622 | Type 2 diabetes mellitus with other skin ulcer |
| E11628 | Type 2 diabetes mellitus with other skin complications |
| E11630 | Type 2 diabetes mellitus with periodontal disease |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | | E11638 | | Type 2 diabetes mellitus with other oral complications | |
| E11649 | | Type 2 diabetes mellitus with hypoglycemia without coma | |
| E1165 | | Type 2 diabetes mellitus with hyperglycemia | |
| E1169 | | Type 2 diabetes mellitus with other specified complication | |
| 25081 | | Diabetes with other specified  manifestations, type I [juvenile type], not stated as uncontrolled | | E10618 | | Type 1 diabetes mellitus with other diabetic arthropathy | |
| E10620 | | Type 1 diabetes mellitus with diabetic dermatitis | |
| E10621 | | Type 1 diabetes mellitus with foot ulcer | |
| E10622 | | Type 1 diabetes mellitus with other skin ulcer | |
| E10628 | | Type 1 diabetes mellitus with other skin complications | |
|  |  | |  | |  | |
| E10630 | | Type 1 diabetes mellitus with periodontal disease | |
| E10638 | | Type 1 diabetes mellitus with other oral complications | |
| E10649 | | Type 1 diabetes mellitus with hypoglycemia without coma | |
| E1065 | | Type 1 diabetes mellitus with hyperglycemia | |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | E1069 | Type 1 diabetes mellitus with other specified complication |
| 25082 | Diabetes with other specified manifestations, type II or unspecified type, uncontrolled | E1165 | Type 2 diabetes mellitus with hyperglycemia |
| E1169 | Type 2 diabetes mellitus with other specified complication |
| 25083 | Diabetes with other specified manifestations, type I [juvenile type], uncontrolled | E1065 | Type 1 diabetes mellitus with hyperglycemia |
| E1069 | Type 1 diabetes mellitus with other specified complication |
| 25090 | Diabetes with unspecified complication, type II or unspecified type, not stated as uncontrolled | E118 | Type 2 diabetes mellitus with unspecified complications |
| 25091 | Diabetes with unspecified complication, type I  [juvenile type], not stated as  uncontrolled | E108 | Type 1 diabetes mellitus with unspecified complications |
| 25092 | Diabetes with unspecified complication, type II or unspecified type, uncontrolled | E1165 | Type 2 diabetes mellitus with hyperglycemia |
| E118 | Type 2 diabetes mellitus with unspecified complications |
| 25093 | Diabetes with unspecified complication, type I [juvenile type], uncontrolled | E1065 | Type 1 diabetes mellitus with hyperglycemia |
| E108 | Type 1 diabetes mellitus with unspecified complications |
|  |  | E1100 | Type 2 diabetes mellitus with hyperosmolarity  without nonketotic hyperglycemic‐hyperosmolar coma (NKHHC) |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | E1101 | | Type 2 diabetes mellitus  hyperosmolarity with coma | with |
| E1121 | | Type 2 diabetes mellitus with diabetic nephropathy |  |
| E1122 | | Type 2 diabetes mellitus with diabetic chronic kidney disease |  |
| E1129 | | Type 2 diabetes mellitus with other diabetic kidney complication |  |
|  | E11311 | | Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema | | |
| E11319 | | Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema | | |
| E11321 | | Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema | | |
| E11329 | | Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema | | |
| E11331 | | Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema | | |
| E11339 | | Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema | | |
| E11341 | | Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy  with macular edema | | |
| E11349 | | Type 2 diabetes mellitus with severe nonproliferative  diabetic retinopathy without macular  edema | | |
| E11351 | | Type 2 diabetes mellitus with severe nonproliferative  diabetic retinopathy with macular  edema | | |
| E11359 | | Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema | | |

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|  | | E1136 | | Type 2 diabetes mellitus with diabetic cataract |
| E1139 | | Type 2 diabetes mellitus with other diabetic ophthalmic complication |
| E1140 | | Type 2 diabetes mellitus with diabetic neuropathy, unspecified |
| E1141 | | Type 2 diabetes mellitus with diabetic mononeuropathy |
| E1142 | | Type 2 diabetes mellitus with diabetic polyneuropathy |
| E1143 | | Type 2 diabetes mellitus with diabetic autonomic (poly)neuropathy |
| E1144 | | Type 2 diabetes mellitus with diabetic amyotrophy |
| E1149 | | Type 2 diabetes mellitus with other diabetic neurological complication |
| E1151 | | Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene |
| E1152 | | Type 2 diabetes mellitus with diabetic peripheral angiopathy with gangrene |
| E1159 | | Type 2 diabetes mellitus with other circulatory complications |
| E11610 | | Type 2 diabetes mellitus with diabetic neuropathic arthropathy |
| E11618 | | Type 2 diabetes mellitus with other diabetic arthropathy |
|  | E11620 | | Type 2 diabetes mellitus with diabetic dermatitis | |
| E11621 | | Other specified diabetes mellitus with foot ulcer | |
| E11622 | | Other specified diabetes mellitus with other skin ulcer | |
| E11628 | | Other specified diabetes mellitus with other skin complications | |
| E11630 | | Other specified diabetes mellitus with periodontal disease | |
| E11638 | | Other specified diabetes mellitus with other oral complications | |
| E11641 | | Other specified diabetes mellitus with hypoglycemia with coma | |

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|  | E11649 | Other specified diabetes mellitus with hypoglycemia without coma |
| E1165 | Other specified diabetes mellitus with hyperglycemia |
| E1169 | Type 2 diabetes mellitus with other specified complication |
| E118 | Type 2 diabetes mellitus with unspecified complications |
| E119 | Type 2 diabetes mellitus without complications |
| E1300 | Other specified diabetes mellitus with hyperosmolarity without nonketotic  hyperglycemic‐hyperosmolar coma (NKHHC) |
| E1301 | Other specified diabetes mellitus with hyperosmolarity with coma |
| E1310 | Other specified diabetes mellitus with ketoacidosis without coma |
| E1311 | Other specified diabetes mellitus with ketoacidosis with coma |
| E1321 | Other specified diabetes mellitus with diabetic nephropathy |
| E1322 | Other specified diabetes mellitus with diabetic chronic kidney disease |
| E1329 | Other specified diabetes mellitus with other diabetic kidney complication |
| E13311 | Other specified diabetes mellitus with unspecified diabetic retinopathy with macular edema |
| E13319 | Other specified diabetes mellitus with unspecified diabetic retinopathy without macular edema |
| E13321 | Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema |
| E13329 | Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema |
| E13331 | Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema |
| E13339 | Other specified diabetes mellitus with moderate |

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| --- | --- | --- |
|  |  | nonproliferative diabetic retinopathy  without macular edema |
| E13341 | Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema |
| E13349 | Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema |
| E13351 | Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema |
| E13359 | Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema |
| E1336 | Other specified diabetes mellitus with diabetic cataract |
| E1339 | Other specified diabetes mellitus with other diabetic ophthalmic complication |
| E1340 | Other specified diabetes mellitus with diabetic neuropathy, unspecified |
| E1341 | Other specified diabetes mellitus with diabetic mononeuropathy |
| E1342 | Other specified diabetes mellitus with diabetic polyneuropathy |
| E1343 | Other specified diabetes mellitus with diabetic autonomic (poly)neuropathy |
| E1344 | Other specified diabetes mellitus with diabetic amyotrophy |
| E1349 | Other specified diabetes mellitus with other diabetic neurological complication |
| E1351 | Other specified diabetes mellitus with diabetic peripheral angiopathy without gangrene |
| E1352 | Other specified diabetes mellitus with diabetic peripheral angiopathy with gangrene |
| E1359 | Other specified diabetes mellitus with other circulatory complications |
| E13610 | Other specified diabetes mellitus with diabetic neuropathic arthropathy |
|  | E13618 | Other specified diabetes mellitus with other diabetic arthropathy |
| E13620 | Other specified diabetes mellitus with other diabetic arthropathy |
| E13621 | Other specified diabetes mellitus with other diabetic |
| E13622 | Other specified diabetes mellitus with other skin ulcer |
| E13628 | Other specified diabetes mellitus with other skin complications |
| E13630 | Other specified diabetes mellitus with periodontal disease |
| E13638 | Other specified diabetes mellitus with other oral complications |
| E13641 | Other specified diabetes mellitus with hypoglycemia with coma |
|  | E13649 | Other specified diabetes mellitus with hypoglycemia without coma |
| E1365 | Other specified diabetes mellitus with hyperglycemia |
| E1369 | Other specified diabetes mellitus with other specified complication |
| E138 | Other specified diabetes mellitus with unspecified complications |
| E139 | Other specified diabetes mellitus without complications |

#### Appendix 2. ICD-9 and ICD-10 codes used for Diabetes Prevention Quality Indicators, as described by the Agency for Healthcare Research and Quality 22–25

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ICD-9-CM: | | ICD-10-CM: |  |
| 1) short-term diabetes complications (e.g., diabetic ketoacidosis,  hypersomolarity,  or  coma)\* | 25010 | DM KETO  T2, DM CONT | E1010 | Type 1 diabetes mellitus with ketoacidosis without coma |
| 25011 | DM KETO  T1, DM CONT | E1011 | Type 1 diabetes mellitus with ketoacidosis with coma |
| 25012 | DM KETO  T2, DM  UNCONT | E10641 | Type 1 diabetes mellitus with hypoglycemia with coma |

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| --- | --- | --- | --- | --- |
|  | 25013 | DM KETO  T1, DM  UNCONT | E1065 | Type 1 diabetes mellitus with hyperglycemia |
| 25020 | DM W/  HYPROSM  T2, DM  CONT | E1100 | Type 2 diabetes mellitus with hyperosmolarity without nonketotic  hyperglycemichyperosmolar coma (NKHHC) |
| 25021 | DM W/  HYPROSM  T1, DM  CONT | E1101 | Type 2 diabetes mellitus with hyperosmolarity with coma |
| 25022 | DM W/  HYPROSM  T2, DM  UNCNT | E11641 | Type 2 diabetes mellitus with hypoglycemia with coma |
| 25023 | DM W/  HYPROSM  T1, DM  UNCNT | E1165 | Type 2 diabetes mellitus with hyperglycemia |
| 25030 | DM COMA  NEC TYP II, DM CNT |  |  |
| 25031 | DM COMA  NEC T1, DM CONT |
| 25032 | DM COMA  NEC T2, DM  UNCONT |
| 25033 | DM COMA  NEC T1, DM  UNCONT |
| 2) long-term diabetes  complications  (e.g., renal, ophthalmic, or neurological manifestations and peripheral | ICD-9-CM | | ICD-10-CM |  |
| 25040 | DM RENAL  COMP T2 CONT | E1021 | Type 1 diabetes mellitus with diabetic nephropathy |
| 25041 | DM RENAL  COMP T1 CONT | E1022 | Type 1 diabetes mellitus with diabetic chronic kidney disease |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| circulatory disorders) | | 25042 | DM RENAL  COMP T2 UNCNT | | E1029 | | Type 1 diabetes mellitus with other diabetic kidney |
| 25043 | DM RENAL  COMP T1 UNCNT | | E10311 | | Type 1 diabetes mellitus with unspecified diabetic retinopathy with macular edema |
| 25050 | DM EYE  COMP T2 CONT | | E10319 | | Type 1 diabetes mellitus with unspecified diabetic retinopathy without macular edema |
| 25051 | DM EYE  COMP T1 CONT | | E10321 | | Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema |
|  | 25052 | DM EYE COMP T2 UNCNT | | E10329 | | Type 1 diabetes mellitus with mild nonproliferative | |
| 25053 | DM EYE COMP T1 UNCNT | | E10331 | | Type 1 diabetes mellitus  with moderate nonproliferative diabetic retinopathy with macular edema | |
| 25060 | DM NEURO COMP T2 CONT | | E10339 | | Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema | |
| 25061 | DM NEURO COMP T1 CONT | | E10341 | | Type 1 diabetes mellitus with severe nonproliferative | |
| 25062 | DM NEURO COMP T2 UNCNT | | E10349 | | Type 1 diabetes mellitus with severe nonproliferative | |
| 25063 | DM NEURO COMP T1 UNCNT | | E10351 | | Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema | |
| 25070 | DM CIRCU DIS T2 CONT | | E10359 | | Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema | |

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| --- | --- | --- | --- | --- |
|  | 25071 | DM CIRCU DIS T1 CONT | E1036 | Type 1 diabetes mellitus with diabetic cataract |
| 25072 | DM CIRCU DIS T2 UNCNT | E1039 | Type 1 diabetes mellitus with other diabetic ophthalmic complication |
| 25073 | DM CIRCU DIS T1 UNCNT | E1040 | Type 1 diabetes mellitus with diabetic neuropathy, unspecified |
| 25080 | DM W COMP NEC T2 CONT | E1041 | Type 1 diabetes mellitus with diabetic mononeuropathy |
| 25081 | DM W COMP NEC T1 CONT | E1042 | Type 1 diabetes mellitus with diabetic polyneuropathy |
| 25082 | DM W COMP NEC T2 UNCNT | E1043 | Type 1 diabetes mellitus with diabetic autonomic (poly)neuropathy |
| 25083 | DM W COMP NEC T1 UNCNT | E1044 | Type 1 diabetes mellitus with diabetic amyotrophy |
| 25090 | DM W COMPL NOS T2 CONT | E1049 | Type 1 diabetes mellitus with other diabetic neurological complication |
| 25091 | DM W COMPL NOS T1 CONT | E1051 | Type 1 diabetes mellitus with diabetic peripheral angiopathy without gangrene |
| 25092 | DM W COMPL NOS T2 UNCNT | E1052 | Type 1 diabetes mellitus with diabetic peripheral with gangrene |
| 25093 | DM W COMPL NOS T1 UNCNT | E1059 | Type 1 diabetes mellitus with other circulatory  complications |
|  | | E10610 | Type 1 diabetes mellitus with diabetic neuropathic arthropathy |
| E10618 | Type 1 diabetes mellitus with other diabetic arthropathy |
| E10620 | Type 1 diabetes mellitus with diabetic dermatitis |
| E10621 | Type 1 diabetes mellitus with foot ulcer |
| E10622 | Type 1 diabetes mellitus with other skin ulcer |

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|  |  | | | E10628 | | Type 1 diabetes mellitus with other skin complications |
| E10630 | | Type 1 diabetes mellitus with periodontal disease |
| E10638 | | Type 1 diabetes mellitus with other oral complications |
|  | |  | E1069 | | Type 1 diabetes mellitus with other specified complication | |
| E108 | | Type 1 diabetes mellitus with unspecified complications | |
| E1121 | | Type 2 diabetes mellitus with diabetic nephropathy | |
| E1122 | | Type 2 diabetes mellitus with diabetic chronic kidney | |
| E1129 | | Type 2 diabetes mellitus with other diabetic kidney  complication | |
| E11311 | | Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema | |
| E11319 | | Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema | |
| E11321 | | Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema | |
| E11329 | | Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema | |
| E11331 | | Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema | |
| E11339 | | Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema | |
| E11341 | | Type 2 diabetes mellitus with severe nonproliferative diabetic | |

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| --- | --- | --- | --- | --- | --- | --- |
|  |  | |  | | retinopathy with macular edema | |
| E11349 | | Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema | |
| E11351 | | Type 2 diabetes mellitus with  proliferative diabetic retinopathy with macular edema | |
| E11359 | | Type 2 diabetes mellitus with  proliferative diabetic retinopathy without macular edema | |
| E1136 | | Type 2 diabetes mellitus with diabetic cataract | |
| E1139 | | Type 2 diabetes mellitus with other diabetic ophthalmic complication | |
| E1140 | | Type 2 diabetes mellitus with diabetic neuropathy, unspecified | |
| E1141 | | Type 2 diabetes mellitus with diabetic mononeuropathy | |
| E1142 | | Type 2 diabetes mellitus with diabetic polyneuropathy | |
| E1143 | | Type 2 diabetes mellitus with diabetic autonomic (poly)neuropathy | |
| E1144 | | Type 2 diabetes mellitus with diabetic amyotrophy | |
| E1149 | | Type 2 diabetes mellitus with other diabetic neurological complication | |
| E1151 | | Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene | |
|  | |  | | E1152 | | Type 2 diabetes mellitus with diabetic peripheral |

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| --- | --- | --- | --- |
|  |  |  | angiopathy with gangrene |
| E1159 | Type 2  diabetes mellitus with  other circulatory complications |
| E11610 | Type 2 diabetes mellitus with diabetic neuropathic arthropathy |
| E11618 | Type 2 diabetes mellitus with other diabetic arthropathy |
| E11620 | Type 2 diabetes mellitus with diabetic dermatitis |
| E11622 | Type 2  diabetes  mellitus with other skin  ulcer E11628 |
| E11628 | Type 2 diabetes mellitus with other skin complications |
| E11630 | Type 2 diabetes mellitus with periodontal disease |
| E11638 | Type 2 diabetes mellitus with other oral complications |
| E1169 | Type 2 diabetes mellitus with other specified |

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| --- | --- | --- | --- | --- |
|  |  |  | E118 | Type 2 diabetes mellitus with unspecified complications |
| 3) uncontrolled diabetes without complications (e.g., high glucose concentrations) | ICD-9-CM |  | ICD-10-CM | |
| 25002 | DMII WO CMP UNCTRLD | E1065 | Type 1 diabetes mellitus with hyperglycemia |
| 25003 | DMI WO CMP UNCNTRLD | E1165 | Type 2 diabetes mellitus with hyperglycemia |
|  |  | E10649 | Type 1 diabetes mellitus with hypoglycemia without coma |
| E11649 | Type 2 diabetes mellitus with hypoglycemia without coma |
| 4) diabetesrelated lowerextremity  amputations | ICD-9-PC |  | ICD-10-PC | |
| 8410 | LOWER LIMB  AMPUTATIONOS | 0Y620Z  Z | Detachment at  Right  Hindquarter,  Open  Approach |
| 8412 | AMPUTATION THROUGH FOOT | 0Y630Z  Z | Detachment at  Left  Hindquarter, Open  Approach |
| 8413 | DISARTICULATION OF ANKLE | 0Y640Z  Z | Detachment at  Bilateral  Hindquarter, Open  Approach |
| 8414 | AMPUTAT THROUGH  MALLEOLI | 0Y670Z  Z | Detachment at  Right Femoral  Region, Open  Approach |
| 8415 | BELOW KNEE AMPUTAT NEC | 0Y680Z  Z | Detachment at  Left Femoral  Region, Open  Approach |

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|  | | 8416 | DISARTICULATION OF KNEE | | 0Y6C0  Z1 | | Detachment at Right  Upper Leg, High, Open Approach |
| 8417 | ABOVE KNEE AMPUTATION | | 0Y6C0  Z2 | | Detachment at  Right Upper  Leg, Mid, Open  Approach |
| 8418 | DISARTICULATION OF HIP | | 0Y6C0  Z3 | | Detachment at  Right Upper Leg, Low,  Open  Approach |
| 8419 | HINDQUARTER AMPUTATION | | 0Y6D0  Z1 | | Detachment at  Left Upper  Leg, High, Open  Approach |
|  |  | | 0Y6D0  Z2 | | Detachment at  Left Upper  Leg, Mid, Open  Approach |
| 0Y6D0  Z3 | | Detachment at  Left Upper  Leg, Low, Open  Approach |
|  |  | | | 0Y6F0Z  Z | | Detachment at Right Knee Region, Open  Approach | |
| 0Y6G0  ZZ | | Detachment at Left Knee Region, Open  Approach | |
| 0Y6H0  Z1 | | Detachment at Right Lower Leg, High,  Open Approach | |
| 0Y6H0  Z2 | | Detachment at Right Lower Leg, Mid, Open  Approach | |
| 0Y6H0  Z3 | | Detachment at Right Lower Leg, Low, Open Approach | |
| 0Y6J0Z  1 | | Detachment at Left Lower Leg, High, Open | |

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|  |  |  | Approach |
| 0Y6J0Z  2 | Detachment at Left Lower Leg, Mid, Open  Approach |
| 0Y6J0Z  3 | Detachment at Left Lower Leg, Low, Open  Approach |
| 0Y6M0  Z0 | Detachment at Right Foot, Complete, Open Approach |
| 0Y6M0  Z4 | Detachment at Right Foot, Complete, Open Approach |
| 0Y6M0  Z5 | Detachment at Right Foot, Complete 1st  Ray, Open |
| 0Y6M0  Z6 | Detachment at Right Foot, Complete 2nd Ray, Open |
| 0Y6M0  Z7 | Detachment at Right Foot, Complete 3rd  Ray, Open |
| 0Y6M0  Z8 | Detachment at Right Foot, Complete 4th  Ray, Open |
| 0Y6M0  Z9 | Detachment at Right Foot, Complete 5th  Ray, Open |
| 0Y6M0  ZB | Detachment at Right Foot, Partial 1st Ray, Open |
| 0Y6M0  ZC | Detachment at Right Foot, Partial 2nd Ray, Open |
| 0Y6M0  ZD | Detachment at Right Foot, Partial 3rd Ray, Open |
| 0Y6M0  ZF | Detachment at Right Foot, Partial 4th Ray, Open |
| 0Y6N0  Z0 | Detachment at Right Foot, Partial 5th Ray, Open |

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|  |  | | 0Y6N0  Z4 | Detachment at Left Foot, Complete, Open Approach |
| 0Y6N0  Z5 | Detachment at Left Foot, Complete 1st Ray, Open |
| 0Y6N0  Z6 | Detachment at Left Foot, Complete 2nd Ray, Open |
| 0Y6N0  Z7 | Detachment at Left Foot, Complete 3rd  Ray, Open |
| 0Y6N0  Z8 | Detachment at Left Foot, Complete 4th  Ray, Open |
| 0Y6N0  Z9 | Detachment at Left Foot, Complete 5th  Ray, Open |
| 0Y6N0  ZB | Detachment at Left Foot, Partial  1st Ray, Open |
|  |  | 0Y6N0  ZC | | Detachment at Left Foot, Partial 2nd Ray, Open |
| 0Y6N0  ZD | | Detachment at Left Foot, Partial 3rd Ray, Open |
| 0Y6N0  ZF | | Detachment at Left Foot, Partial 4th Ray, Open |
| 0Y6P0Z  0 | | Detachment at Left Foot, Partial 5th Ray, Open |
| 0Y6P0Z  1 | | Detachment at Right 1st Toe, Complete, Open |
| 0Y6P0Z  2 | | Detachment at Right 1st Toe, High, Open  Approach |
| 0Y6P0Z  3 | | Detachment at Right 1st Toe, Mid, Open  Approach |
| 0Y6Q0  Z0 | | Detachment at Right 1st Toe, Low, Open  Approach |

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|  |  | 0Y6Q0  Z1 | Detachment at Left 1st Toe, Complete,  Open Approach |
| 0Y6Q0  Z2 | Detachment at Left 1st Toe, High, Open Approach |
| 0Y6Q0  Z3 | Detachment at Left 1st Toe, Mid, Open  Approach |
| 0Y6R0  Z0 | Detachment at Left 1st Toe, Low, Open  Approach |
| 0Y6R0  Z1 | Detachment at Right 2nd Toe, Complete, Open |
| 0Y6R0  Z2 | Detachment at Right 2nd Toe, High, Open  Approach |
| 0Y6R0  Z3 | Detachment at Right 2nd Toe, Mid, Open  Approach |
| 0Y6S0Z  0 | Detachment at Right 2nd Toe, Low, Open Approach |
| 0Y6S0Z  1 | Detachment at Left 2nd Toe, Complete, Open |
| 0Y6S0Z  2 | Detachment at Left 2nd Toe, High, Open  Approach |
| 0Y6S0Z  3 | Detachment at Left 2nd Toe, Mid, Open  Approach |
| 0Y6T0  Z0 | Detachment at Left 2nd Toe, Low, Open  Approach |
| 0Y6T0  Z1 | Detachment at Right 3rd Toe, Complete, Open |
| 0Y6T0  Z2 | Detachment at Right 3rd Toe, High, Open  Approach |
| 0Y6T0  Z3 | Detachment at Right 3rd Toe, Mid, Open  Approach |
| 0Y6U0  Z0 | Detachment at Right 3rd Toe, Low, Open |

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| --- | --- | --- | --- | --- |
|  |  |  | | Approach |
| 0Y6U0  Z1 | | Detachment at Left 3rd Toe, Complete, Open |
| 0Y6U0  Z2 | | Detachment at Left 3rd Toe, High, Open  Approach |
| 0Y6U0  Z3 | | Detachment at Left 3rd Toe, Mid, Open Approach |
|  |  | | 0Y6V0  Z0 | Detachment at Left 3rd Toe, Low, Open  Approach |
| 0Y6V0  Z1 | Detachment at Right 4th Toe, Complete, Open |
| 0Y6V0  Z2 | Detachment at Right 4th Toe, High, Open  Approach |
| 0Y6V0  Z3 | Detachment at Right 4th Toe, Mid, Open  Approach |
| 0Y6W0  Z0 | Detachment at Right 4th Toe, Low, Open Approach |
| 0Y6W0  Z1 | Detachment at Left 4th Toe, Complete,  Open Approach |
| 0Y6W0  Z2 | Detachment at Left 4th Toe, High, Open  Approach |
| 0Y6W0  Z3 | Detachment at Left 4th Toe, Mid, Open  Approach |
| 0Y6X0  Z0 | Detachment at Left 4th Toe, Low, Open  Approach |
| 0Y6X0  Z1 | Detachment at Right 5th Toe, Complete, Open |
| 0Y6X0  Z2 | Detachment at Right 5th Toe, High, Open  Approach |
| 0Y6X0  Z3 | Detachment at Right 5th Toe, Mid, Open |

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| --- | --- | --- | --- |
|  |  |  | Approach |
| 0Y6Y0  Z0 | Detachment at Right 5th Toe, Low, Open  Approach |
| 0Y6Y0  Z1 | Detachment at Left 5th Toe, Complete,  Open Approach |
| 0Y6Y0  Z2 | Detachment at Left 5th Toe, High, Open  Approach |
| 0Y6Y0  Z3 | Detachment at Left 5th Toe, Mid, Open Approach |
| 0Y6T0  Z0 | Detachment at Left 5th Toe, Low, Open  Approach |
| 0Y6T0  Z1 | Detachment at Right Hindquarter, Open Approach |
| 0Y6T0  Z2 | Detachment at Left  Hindquarter, Open Approach |
| 0Y6T0  Z3 | Detachment at Bilateral Hindquarter, Open Approach |
| 0Y6U0  Z0 | Detachment at Right Femoral Region, Open Approach |
| 0Y6U0  Z1 | Detachment at Left Femoral Region, Open  Approach |
| 0Y6Y0  Z2 | Detachment at Right Upper Leg, High,  Open Approach |
| 0Y6Y0  Z3 | Detachment at Right Upper Leg, Mid, Open  Approach |
| 0Y6C0  Z1 | Detachment at Right Upper Leg, Low,  Open Approach |
| 0Y6C0  Z2 | Detachment at Right Upper Leg, High,  Open Approach |
| 0Y6C0  Z3 | Detachment at Right Upper Leg, Mid, Open Approach |

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| --- | --- | --- | --- | --- |
|  |  |  | 0Y620Z  Z | Detachment at  Right Upper Leg, Low,  Open  Approach |
| 0Y6J0Z  1 | Detachment at  Right  Hindquarter, Open  Approach |
| 0Y6J0Z  2 | Detachment at  Left Lower  Leg, High, Open  Approach |
| 0Y6J0Z  3 | Detachment at  Left Lower  Leg, Mid, Open  Approach |
| Proposed PQI:  Lower Extremity Ulcers/inflammation/ infections28 | ICD-9-CM |  | ICD-10-CM | |
| 4540 | Varicose  Veins of  lower extremities with ulcer | I83.009 | Varicose veins of unspecified lower extremity with ulcer of  unspecified site |
| I83.019 | Varicose veins of right lower extremity with ulcer of  unspecified site |
| I83.029 | Varicose veins of left lower extremity with ulcer of  unspecified site |

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|  | 707.1 | Ulcer of lower limb, unspecified | L97.909 | Non-pressure chronic ulcer of unspecified part of unspecified lower leg with unspecified severity |
| 680.6 | Carbuncle and furuncle of leg, except foot | L02.429 | Furuncle of limb, unspecified |
| L02.439 | Carbuncle of limb, unspecifie |
| 680.7 | Carbuncle and furuncle of foot | L02.629 | Furuncle of unspecified foot |
| L02.639 | Carbuncle of unspecified foot |
| 681.1 | Cellulitis and abscess of toe,  unspecified | L03.039 | Cellulitis of unspecified toe |
| L03.049 | Acute lymphangitis of unspecified toe |
| 682.6 | Cellulitis and abscess of leg, except foot | L03.129 | Acute lymphangitis of unspecified part of limb |
| L03.119 | Cellulitis of unspecified part of limb |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | 682.7 | Cellulitis and abscess of foot, except toes | | L03.119 | | Cellulitis of unspecified part of limb |
| L03.129 | | Acute lymphangitis of unspecified part of limb |
| 711.05 | Pyogenic arthritis, pelvic region and thigh | | M00.05  9 | | Staphylococcal arthritis, unspecified ankle and foot |
| M00.15  9 | | Pneumococcal arthritis, unspecified hip |
| M00.25  9 | | Other streptococcal arthritis, unspecified hip |
| M00.85  9 | | Arthritis due to other bacteria, unspecified hip |
|  | 711.06 | Pyogenic arthritis, lower leg | | | M00.06  9 | | Pneumococcal arthritis, unspecified hip | |
| M00.16  9 | | Pneumococcal arthritis, unspecified knee | |
| M00.26  9 | | Other streptococcal arthritis, unspecified knee | |
| M00.86  9 | | Arthritis due to other bacteria, unspecified knee | |

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| --- | --- | --- | --- | --- |
|  | 711.07 | Pyogenic arthritis, ankle and foot | M00.07  09 | Staphylococcal arthritis, unspecified ankle and foot |
| M00.17  9 | Pneumococcal arthritis, unspecified ankle and foot |
| M00.27  9 | Other streptococcal arthritis, unspecified ankle and foot |
| M00.87  9 | Arthritis due to other bacteria, unspecified ankle and foot |
| 730.05 | Acute osteomyelitis, pelvic region and thigh | M86.15  9 | Other acute osteomyelitis, unspecified femur |
| M86.25  9 | Subacute osteomyelitis, unspecified femur |
| 730.06 | Acute osteomyelitis, lower leg | M86.16  9 | Other acute osteomyelitis, unspecified tibia and fibula |
| M86.26  9 | Subacute osteomyelitis, unspecified tibia and fibula |
| 730.07 | Acute osteomyelitis, ankle and foot | M86.17  9 | Other acute osteomyelitis, unspecified ankle and foot |
| M86.27  9 | Subacute osteomyelitis, unspecified ankle and foot |
| 730.15 | Chronic osteomyelitis, pelvic region and thigh | M86.65  9 | Other chronic osteomyelitis, unspecified thigh |
| 730.16 | Chronic osteomyelitis, lower  leg | M86.66  9 | Other chronic osteomyelitis, unspecified tibia and fibula |
| 730.17 | Chronic  osteomyelitis, ankle and foot | M86.67  9 | Other chronic osteomyelitis, unspecified ankle and foot |

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|  |  | |  | |  | |  | |
| 730.25 | | Unspecified osteomyelitis, pelvic region and thigh | | M86.9 | | Osteomyelitis, unspecified | |
| 730.26 | | Unspecified osteomyelitis, lower  leg | | M86.9 | | Osteomyelitis, unspecified | |
| 730.27 | | Unspecified osteomyelitis, ankle and foot | | M86.9 | | Osteomyelitis, unspecified | |
|  | | 730.35 | | Periostitis, without mention of osteomyelitis, pelvic region and thigh | | M86.9 | | Osteomyelitis, unspecified |
| 730.36 | | Periostitis, without mention of osteomyelitis, lower leg | | M86.9 | | Osteomyelitis, unspecified |
| 730.37 | | Periostitis, without mention of osteomyelitis, ankle and foot | | M86.9 | | Osteomyelitis, unspecified |
| 730.85 | | Other infections involving bone in diseases classified elsewhere, pelvic region and thigh | | M90.85  9 | | Osteopathy in diseases classified elsewhere, unspecified thigh |
| 730.86 | | Other infections involving bone in diseases classified elsewhere, lower leg | | M90.86  9 | | Osteopathy in diseases  classified elsewhere, unspecified lower leg |
| 730.87 | | Other infections involving bone in diseases classified elsewhere, ankle and foot | | M90.87  9 | | Osteopathy in diseases  classified elsewhere, |

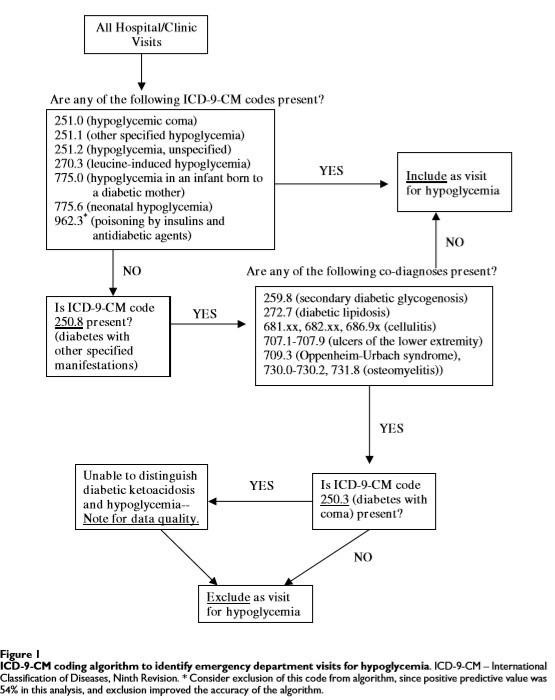
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | unspecified ankle and foot |
| 730.95 | Unspecified infection of bone, pelvic region and thigh | M86.9 | Osteomyelitis, unspecified |
| 730.96 | Unspecified infection of  bone, lower  leg | M86.9 | Osteomyelitis, unspecified |
| 730.97 | Unspecified infection of bone, ankle and foot | M86.9 | Osteomyelitis, unspecified |
| 785.4 | Gangrene | I96 | Gangrene, not elsewhere classified |
| Proposed PQI:  Hypoglycemia28 Algorithm described by Ginde et al.  (Appendix 3) | ICD-9-CM | | ICD-10-CM | |
| 251.0 | Hypoglycemic coma | E15 | Nondiabetic hypoglycemic coma |
| 251.1 | Other specified hypoglycemia | E16.0 | Drug-induced hypoglycemia without coma |
| E16.1 | Other hypoglycemia |
| 251.2 | Hypoglycemia, unspecified | E16.2 | Hypoglycemia, unspecified |
| 270.3 | Leucineinduced hypoglycemia | E71.0 | Maple-syrupurine disease |
| E71.120 | Methylmalonic acidemia |
| E71.19 | Other disorders of branchedchain aminoacid metabolism |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | |  | | E71.2 | | Disorder of branched-chain amino-acid metabolism, unspecified |
| 775.0 | | Hypoglycemia in an infant born to a diabetic mother | | P70.0 | | Syndrome of infant of mother with gestational diabetes |
| P70.1 | | Syndrome of infant of a diabetic mother |
| 775.6 | | Neonatal hypoglycemia | | P70.4 | | Other neonatal hypoglycemia |
| 962.3 | | Poisoning by insulins and antidiabetic agents | | T38.3X  1A | | Poisoning by insulin and oral hypoglycemic [antidiabetic] drugs, accidental (unintentional), initial encounter |
| T38.3X  2A | | Poisoning by insulin and oral hypoglycemic [antidiabetic] drugs, intentional selfharm, initial encounter |
|  |  | |  | | T38.3X  3A | | Poisoning by insulin and oral hypoglycemic [antidiabetic] drugs, assault, initial encounter | |
| T38.3X  4A | | Poisoning by insulin and oral hypoglycemic [antidiabetic] drugs, undetermined, initial  encounter | |
| 250.80 | | Diabetes with other specified  manifestations, type  II or unspecified | | E11.618 | | Type 2 diabetes mellitus with other diabetic arthropathy | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | type, not stated as uncontrolled | E11.620 | Type 2 diabetes mellitus with diabetic dermatitis |
| E11.621 | Type 2 diabetes mellitus with foot ulcer |
| E11.622 | Type 2 diabetes mellitus with other skin ulcer |
| E11.628 | Type 2 diabetes mellitus with other skin complications |
| E11.630 | Type 2 diabetes mellitus with periodontal disease |
| E11.638 | Type 2 diabetes mellitus with other oral complications |
| E11.649 | Type 2 diabetes mellitus with hypoglycemia without coma |
| E11.65 | Type 2 diabetes mellitus with  hyperglycemia |
| E11.69 | Type 2 diabetes mellitus with other specified complication |
| 259.8 | Secondary diabetic glycogenosis | E34.8 | Other specified endocrine disorders |
| 272.7 | Lipidoses | E75.21 | Fabry (-Anderson) disease |
| E75.22 | Gaucher disease |
| E75.249 | Niemann-Pick disease, unspecified |
| E77.0 | Defects in posttranslational modification of |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | lysosomal enzymes |
| E77.1 | Defects in glycoprotein degradation |
| 681.00 | Cellulitis and abscess of finger,  unspecified | L03.019 | Cellulitis of unspecified finger |
| L03.029 | Acute lymphangitis of unspecified finger |
|  | 707.1 | Ulcers of lower extremity | E11.618 | Type 2 diabetes mellitus with other diabetic arthropathy |
| 707.2 | Ulcers of lower extremity | E11.620 | Type 2 diabetes mellitus with diabetic dermatitis |
| 707.3 | Ulcers of lower extremity | E11.621 | Type 2 diabetes mellitus with foot ulcer |
| 707.4 | Ulcers of lower extremity | E11.622 | Type 2 diabetes mellitus with other skin ulcer |
| 707.5 | Ulcers of lower extremity | E11.628 | Type 2 diabetes mellitus with other skin complications |
| 707.6 | Ulcers of lower extremity | E11.630 | Type 2 diabetes mellitus with periodontal disease |
| 707.7 | Ulcers of lower extremity | E11.638 | Type 2 diabetes mellitus with other oral complications |
| 707.8 | Ulcers of lower extremity | E11.649 | Type 2 diabetes mellitus with hypoglycemia without coma |
| 707.9 | Ulcers of lower extremity | E11.65 | Type 2 diabetes mellitus with hyperglycemia |
| 709.3 | Degenerative skin disorders | L92.1 | Necrobiosis lipoidica, not elsewhere classified |
| L94.2 | Calcinosis cutis |
| L98.8 | Other specified disorders of the skin and subcutaneous tissue |
| 730.00 | Acute osteomyelitis, site unspecified | M86.10 | Other acute osteomyelitis, unspecified site |
|  |  |  |  |  |
| M86.20 | Subacute osteomyelitis, unspecified site |
| 730.1 | Chronic osteomyelitis, site unspecified | M86.60 | Other chronic osteomyelitis, unspecified site |
| 730.2 | Unspecified osteomyelitis, site unspecified | M86.9 | Osteomyelitis, unspecified |
| 731.8 | Other bone involvement in  diseases classified  elsewhere | M90.80 | Osteopathy in diseases classified elsewhere, unspecified site |
| 250.3 | Diabetes with other coma, type II or unspecified type, not stated as  uncontrolled | E11.641 | Type 2 diabetes mellitus with hypoglycemia with coma |
|  |  | E10.11 | Type 1 diabetes mellitus with ketoacidosis with coma |
| E10.641 | Type 1 diabetes mellitus with hypoglycemia with coma |
| E11.01 | Type 2 diabetes mellitus with hyperosmolarity with coma |
| E11.65 | Type 2 diabetes mellitus with hyperglycemia |
| E10.11 | Type 1 diabetes mellitus with ketoacidosis with coma |
| E10.65 | Type 1 diabetes mellitus with hyperglycemia |

Appendix 3. Figure describing coding algorithm for hypoglycemic events, published by Ginde et al.42



#### Appendix 4. ICD-9 and ICD-10 codes to describe comorbidities, as described by the Updated Diabetes Severity Index and previously published Literature

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Microvascular complications | | | | |
| Retinopathy32  ,33 | ICD-9-CM: | | ICD-10-CM: | |
| 249.5x | Secondary diabetes with ophthalmic manifestations | Main Codes | |
| 250.5x | Diabetic ophthalmologic disease | E08 | Diabetes Mellitus due to underlying conditions |
| 362.01 | Background diabetic retinopathy | E09 | Drug or chemical induced diabetes mellitus |
| 362.1x | Other background retinopathy and retinal vascular changes | E10 | Type 1 diabetes mellitus |
| 362.0x, excluding 362.02 | Diabetic retinopathy, excluding proliferative diabetic retinopathy | E11 | Type 2 diabetes mellitus |
| 362.81-  362.83 | Retinal hemorrhage, retinal  exudates and  deposits, retinal edema | E13 | Other specified diabetes mellitus |
| 361.x | Retinal detachment | Each main code above, with following relevant subcodes: | |
| 362.02 | Proliferative retinopathy | E\*\*.34x | Severe nonproliferative diabetic retinopathy |
| 369.x | Blindness and low vision | E\*\*.35x | Proliferative diabetic retinopathy |
|  | | Regular codes: | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | H33.x | Retinal detachments and breaks |
| H35.0x | Background retinopathy and retinal vascular changes |
| H35.35x | Cystoid macular degeneration |
| H35.6x | Retinal hemorrhage |
| H35.8x | Other specified retinal disorders |
| H35.9 | Unspecified retinal disorder |
| H43.1x | Vitreous hemorrhage |
| H54.x | Blindness and low vision |
| Nephropathy3  2,33 | ICD-9 |  | ICD-10 | |
| 250.4x | Diabetes with renal manifestations | Main Codes | |
| 249.4x | Secondary diabetes with renal manifestations | E08 | Diabetes mellitus due to underlying condition |
| 580.x | Acute glomerulonephritis | E09 | Drug or chemical induced diabetes mellitus |
| 581.x | Nephrotic syndrome | E10 | Type 1 diabetes mellitus |
| 581.81 | Hypertension, nephrosis1 | E11 | Type 2 diabetes mellitus |
| 582.x | Chronic glomerulonephritis | E13 | Other specified diabetes mellitus |
| 583.x | Nephritis and nephropathy not specified as acute or chronic | Each main code above, with following relevant subcodes: | |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 585.1 | | CKD, Stage 1 | | E\*\*.21 | | With diabetic nephropathy | |
| 585.2 | | CKD, Stage 2 (mild) | | E\*\*.22 | | With diabetic chronic kidney disease | |
| 585.3 | | CKD, Stage 3 (moderate) | | E\*\*.29 | | With other diabetic kidney complication | |
| 585.9 | | CKD, unspecified | | Regular codes: | |  | |
|  | 585.4 | | CKD Stage 4 (severe) | | N00.x | | Acute nephritic syndrome | |
| 585.5 | | CKD Stage 5 | | N04.x | | Nephrotic syndrome | |
| 585.6 | | End stage renal disease | | N03.x | | Chronic nephritic syndrome | |
| 586 | | Renal failure, unspecified | | N05.x | | Unspecified nephritic syndrome | |
| 593.9 | | Unspecified disorder of kidney and ureter | | N18.1 | | CKD, Stage 1 | |
|  | |  | | N18.2 | | CKD, Stage 2 (mild) | |
| N18.3 | | CKD, Stage 3 (moderate) | |
| N18.9 | | CKD, unspecified | |
| N18.4 | | CKD, Stage 4 (severe) | |
| N18.5 | | CKD, Stage 5 | |
| N18.6 | | End stage renal disease | |
| N19 | | Unspecified kidney failure | |
| Neuropathy32,  33 | ICD-9CM | |  | | ICD-10-CM | |  | |
| 249.6x | | Secondary diabetes with neurological manifestations | | Main Codes | |  | |
| 250.6x, | | Diabetes with neurological manifestations, | | E08 | | Diabetes mellitus due to underlying condition | |
| 357.2 | | Polyneuropathy in diabetes | | E09 | | Drug or chemical induced diabetes mellitus | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 337.0x | Idiopathic peripheral autonomic neuropathy | E10 | Type 1 diabetes mellitus |
| 337.1 | Peripheral autonomic neuropathy in disorders classified elsewhere | E11 | Type 2 diabetes mellitus |
| 354.x | Mononeuritis of upper limb  and mononeuritis multiplex | E13 | Other specified diabetes mellitus |
| 355.x | Mononeuritis of lower limb and  unspecified site | Each main code above, with following relevant subcodes: | |
| 356.9 | Unspecified hereditary and idiopathic peripheral neuropathy | E\*\*.4x With neurological complications | |
| 358.1 | Myasthenic syndromes in diseases classified elsewhere | Regular Codes: | |
| 458.0 | Orthostatic hypotension | G90.09 | Other [than carotid sinus syncope] idiopathic peripheral autonomic neuropathy |
| 536.3 | Gastroparesis | G90.8 | Other disorders of autonomic nervous system |
| 564.5 | Functional diarrhea | G90.9 | Disorder of the autonomic nervous system, unspecified; |
| 596.54 | Neurogenic bladder NOS | G99.0 | Autonomic neuropathy in diseases classified  elsewhere |
| 713.5 | Arthropathy associated with neurological disorders | G56.x | Mononeuropathies of upper limb |
| 458.0 | Orthostatic hypotension | G57.x | Mononeuropathies of lower limb |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 536.3 | | Gastroparesis | | G60.9 | | Hereditary and idiopathic neuropathy, unspecified | |
| 564.5 | | Functional diarrhea | | G73.3 | | Myasthenic syndromes in other diseases  classified elsewhere | |
| 713.5 | | Arthropathy associated with neurological disorders | | G90.01 | | Carotid sinus syncope | |
| 951.0 | | Injury to oculomotor nerve | | H49.x | | Paralytic strabismus | |
| 951.1 | | Injury to trochlear nerve | | I95.1 | | Orthostatic hypotension | |
|  | 951.3 | | Injury to abducens nerve | | K31.84 | | Gastroparesis | |
|  | |  | | K59.1 | | Functional diarrhea | |
| N31.9 | | Neuromuscular dysfunction of bladder, unspecified | |
| M14.6x | | Charcôt’s joint | |
| S04.x | | Injury to cranial nerve | |
| Macrovascular complications | | |  | |  | |  | |
| Acute  Coronary  Syndrome34 | ICD-9-CM | |  | | ICD-10-CM | |  | |
| 411.0 | | Postmyocardial infarction syndrome | | I24.0 | | Acute coronary thrombosis not  resulting in myocardial infarction | |
| 411.0 | | Intermediate coronary syndrome | | I24.8 | | Other forms of acute ischemic heart disease | |
| 411.1 | | Intermediate coronary syndrome | | I24.9 | | Acute ischemic heart disease, unspecified | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 411.8 | Other acute and subacute forms of ischemic heart disease |  |  |
| 411.81 | Acute coronary occlusion without myocardial infarction |
| 411.89 | Other acute and subacute forms of ischemic heart disease, other |
| Acute  Myocardial  Infarction40 | ICD-9-CM | | ICD-10-CM |  |
| 410 | Acute myocardial infarction of anterolateral wall, episode of care unspecified | I21 | Acute myocardial infarction |
| 410.01 | Acute myocardial infarction of anterolateral  wall, initial episode of care | I21.0 | Acute transmural myocardial infarction of  anterior wall |
| 410.02 | Acute myocardial infarction of anterolateral  wall,  subsequent episode of care | I21.1 | Acute transmural myocardial  infarction of  inferior wall |
| 410.1 | Acute myocardial infarction of other anterior wall, episode of care unspecified | I21.2 | Acute transmural myocardial infarction of other sites |
| 410.11 | Acute myocardial infarction of other anterior | I21.3 | Acute transmural myocardial |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | | wall, initial episode of care | |  | | infarction of unspecified site |
| 410.12 | | Acute myocardial infarction of other anterior  wall,  subsequent episode of care | | I21.4 | | Acute subendocardial myocardial infarction |
| 410.2 | | Acute myocardial infarction of inferolateral wall, episode of care unspecified | | I21.9 | | Acute myocardial infarction, unspecified |
| 410.21 | | Acute myocardial infarction of inferolateral wall, initial episode of care | | I22 | | Subsequent myocardial infarction |
| 410.22 | | Acute myocardial infarction of inferolateral wall, subsequent episode  of care | | I22.0 | | Subsequent myocardial infarction of anterior  wall |
| 410.3 | | Acute myocardial infarction of inferoposterior wall, episode of care unspecified | | I22.1 | | Subsequent myocardial  infarction of inferior wall |
|  | 410.31 | | Acute myocardial infarction of inferoposterior wall, initial episode of care | | I22.8 | | Subsequent myocardial infarction of other sites | |
| 410.32 | | Acute myocardial infarction of inferoposterior wall, subsequent episode  of care | | I22.9 | | Subsequent myocardial infarction of unspecified site | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 410.4 | Acute myocardial infarction of other inferior wall, episode of care unspecified | I23 | Certain current complications following acute myocardial infarction | |
| 410.41 | Acute myocardial infarction of other inferior wall, initial episode of care | I23.0 | Haemopericardium as current complication following acute myocardial infarction | |
| 410.42 | Acute myocardial infarction of other inferior wall, subsequent episode  of care | I23.1 | Atrial septal defect as current complication following acute myocardial infarction | |
| 410.5 | Acute myocardial infarction of other lateral wall, episode of care unspecified | I23.2 | Ventricular septal defect as current complication following acute myocardial infarction | |
| 410.51 | Acute myocardial infarction of other  lateral wall, initial episode of care | I23.3 | Rupture of cardiac wall without haemopericardium as complication following myocardial | current acute |
| 410.52 | Acute myocardial infarction of other  lateral wall, subsequent episode  of care | I23.4 | Rupture of chordae tendineae as current complication following acute myocardial infarction |  |
| 410.6 | True posterior wall infarction, episode of care unspecified | I23.5 | Rupture of papillary muscle as current complication following acute myocardial infarction |  |
| 410.61 | True posterior wall infarction, initial episode of care | I23.6 | Thrombosis of atrium, auricular appendage, and ventricle as current complications following acute my |  |
| 410.62 | True posterior wall infarction, subsequent episode  of care | I23.8 | Other current complications following acute myocardial infarction |  |
| 410.7 | Subendocardial infarction, episode of care unspecified |  | | |
| 410.71 | Subendocardial  infarction, initial episode of care |
| 410.72 | Subendocardial infarction, |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | subsequent episode of care | |  | | |
| 410.8 | | Acute myocardial infarction of other specified sites, episode of care unspecified | |
| 410.81 | | Acute myocardial infarction of other specified sites, initial episode of care | |
| 410.82 | | Acute myocardial infarction of other specified sites, subsequent episode  of care | |
| 410.9 | | Acute myocardial infarction of unspecified site, episode of care unspecified | |
| 410.91 | | Acute myocardial infarction of unspecified site, initial episode of care | |
|  | | 410.92 | | Acute myocardial infarction of unspecified site, subsequent episode of care | |  |  |
| 411.89 | | Other acute and subacute forms of ischemic heart disease, other | |  |  |
|  | |  | |
| Angina38 | | ICD-9CM | |  | | ICD-10-CM |  |
| 411.1 | | Intermediate coronary syndrome | | I20.0 | Unstable angina |
| 413.1 | | Prinzmetal angina | | I20.1 | Angina pectoris with |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | documented spasm |
| 413.9 | Other and unspecified angina  pectoris | I20.8 | Other forms of angina pectoris |
| 786.5 | Chest pain, unspecified | I20.9 | Angina pectoris, unspecified |
| 786.51 | Precordial pain | R07.1 | Chest pain on breathing |
| 786.52 | Painful respiration | R07.2 | Precordial pain |
| 786.59 | Other chest pain | R07.81 | Pleurodynia |
|  |  | R07.82 | Intercostal pain |
| R07.89 | Other chest pain |
| R07.9 | Chest pain, unspecified |
| Arrythmia38 | ICD-9CM |  | ICD-10-CM | |
| 427.41 | Ventricular fibrillation | I49.01 | Ventricular fibrillation |
| 427.42 | Ventricular flutter | I49.02 | Ventricular flutter |
| 427.60 | Premature beats, unspecified | I49.1 | Atrial premature depolarization |
| 427.61 | Supraventricular premature beats | I49.2 | Junctional premature depolarization |
| 427.69 | Other premature beats | I49.3 | Ventricular premature depolarization |
| 427.81 | Sinoatrial node dysfunction | I49.40 | Unspecified premature depolarization |
| 427.89 | Other specified cardiac  dysrhythmias | I49.49 | Other premature depolarization |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 427.9 | | Cardiac dysrhythmia, unspecified | | I49.5 | | Sick sinus syndrome | |
| 785.0 | | Tachycardia, unspecified | | I49.8 | | Other specified cardiac arrhythmias | |
| 785.1 | | Palpitations | | I49.9 | | Cardiac arrhythmia, unspecified | |
| 785.3 | | Other abnormal heart sounds | | R00.0 | | Tachycardia, unspecified | |
|  | |  | | R00.1 | | Bradycardia, unspecified | |
| R00.2 | | Palpitations | |
| R00.8 | | Other abnormalities of heart beat | |
| R00.9\* | | Unspecified abnormalities of heart beat | |
|  | ICD-9CM | |  | | ICD-10-CM | |  | |
| CABG Revasculariza tion/  Carotid  Revasculariza tion/  Claudication/  Surgical  Revasculariza  tion36,37 | | 433.1 | | Carotid artery occlusion and stenosis without mention of cerebral infarction | | I63.139 | | Carotid artery occlusion and stenosis without mention of cerebral infarction | |
| 433.11 | | Carotid artery occlusion and stenosis with cerebral infarction | | I63.239 | | Cerebral infarction due to unspecified occlusion or stenosis of unspecified carotid artery | |
| 433.3 | | Multiple and bilateral carotid artery occlusion and stenosis without mention of cerebral infarction | | I65.8 | | Occlusion and stenosis of other precerebral arteries | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 433.31 | Multiple and bilateral carotid artery occlusion and stenosis with cerebral infarction | I63.59 | Cerebral infarction due to unspecified occlusion or stenosis of other cerebral artery |
| 435.9 | Transient cerebral ischemia | G45.9 | Transient cerebral ischemic attack, unspecified |
| 362.34 | Amaurosis fugax | I67.848 | Other cerebrovascular vasospasm and vasoconstriction |
| 38.12 | Carotid endarterectomy | H34.00 | Transient retinal artery occlusion, unspecified eye |
| 39.5 | Angioplasty or atherectomy of  noncoronary  vessel | 03CH0Z  Z | Extirpation of  Matter from  Right Common  Carotid Artery,  Open Approach |
| 39.7 | Endovascular repair of vessel | 03CH4Z  Z | Extirpation of  Matter from  Right Common Carotid Artery,  Percutaneous  Endoscopic Approach |
| 39.9 | Insertion of noncoronary artery stent or stents | 03CJ0ZZ | Extirpation of  Matter from Left Common  Carotid Artery,  Open Approach |
| 0.63 | Percutaneous insertion of carotid artery stent | 03CJ4ZZ | Extirpation of  Matter from  Left Common  Carotid Artery,  Percutaneous  Endoscopic Approach |
| 36.1 | Bypass anastomosis for | 03CK0Z  Z | Extirpation of  Matter from  Right Internal |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | heart revascularization |  | Carotid Artery, Open Approach |
| 36.10 | Aortocoronary bypass for heart revascularization, not otherwise specified | 03CK4Z  Z | Extirpation of  Matter from  Right Internal  Carotid Artery,  Percutaneous  Endoscopic Approach |
| 36.11 | (Aorto)coronary  bypass of one  coronary artery | 03CL0Z  Z | Extirpation of  Matter from Left Internal Carotid Artery,  Open Approach |
| 36.12 | (Aorto)coronary  bypass of two  coronary arteries | 03CL4Z  Z | Extirpation of  Matter from  Left Internal  Carotid Artery,  Percutaneous  Endoscopic Approach |
| 36.13 | (Aorto)coronary bypass of three  coronary arteries | 03CM0Z  Z | Extirpation of  Matter from  Right External  Carotid Artery,  Open Approach |
| 36.14 | (Aorto)coronary bypass of four or  more coronary  arteries | 03CM4Z  Z | Extirpation of  Matter from  Right External  Carotid Artery,  Percutaneous  Endoscopic Approach |
| 36.15 | Single internal mammarycoronary  artery bypass | 03CN0Z  Z | Extirpation of  Matter from  Left External  Carotid Artery,  Open Approach |
| 36.16 | Double internal mammarycoronary  artery bypass | 03CN4Z  Z | Extirpation of  Matter from  Left External  Carotid Artery,  Percutaneous  Endoscopic Approach |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | 36.17 | Abdominal - coronary artery bypass | | 03CP0Z  Z | | Extirpation of  Matter from  Right Vertebral  Artery, Open Approach | |
| 36.19 | Other bypass anastomosis for heart  revascularization | | 03CP4Z  Z | | Extirpation of  Matter from  Right Vertebral Artery,  Percutaneous  Endoscopic Approach | |
|  | 36.2 | Heart revascularization by arterial implant | | | 03CQ0Z  Z | | Extirpation of Matter from Left Vertebral  Artery, Open Approach | |
| 34.20 | flaccid hemiplegia | | | 03CQ4Z  Z | | Extirpation of Matter from Left Vertebral  Artery, Percutaneous  Endoscopic Approach | |
| 42.70 | paroxysmal supraventricular tachycardia | | | 03CR0Z  Z | | Extirpation of Matter from Face Artery,  Open Approach | |
| 42.73 | atrial fibrillation and  flutter | | | 03CR3Z  Z | | Extirpation of Matter from Face Artery,  Percutaneous Approach | |
| 42.74 | ventricular fibrillation  and flutter | | | 03CR4Z  Z | | Extirpation of Matter from Face Artery,  Percutaneous Endoscopic  Approach | |
| 42.75 | cardiac arrest | | | 03CS0Z  Z | | Extirpation of Matter from Right Temporal  Artery, Open Approach | |
| 42.78 | other specified  cardiac dysrhythmias | | | 03CS3Z  Z | | Extirpation of Matter from Right Temporal  Artery, Percutaneous Approach | |
| 42.79 | unspecified cardiac  dysrhythmia | | | 03CS4Z  Z | | Extirpation of Matter from Right Temporal Artery, Percutaneous  Endoscopic Approach | |
| 42.80 | congestive heart  failure unspecified | | | 03CT0Z  Z | | Extirpation of Matter from Left Temporal  Artery, Open Approach | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 42.81 | left heart failure | 03CT0Z  Z | Extirpation of Matter from Left Temporal Artery, Open Approach |
| 42.82 | systolic heart failure | 03CT3Z  Z | Extirpation of Matter from Left Temporal  Artery, Percutaneous Approach |
| 42.83 | diastolic heart failure | 03CT4Z  Z | Extirpation of Matter from Left Temporal  Artery, Percutaneous  Endoscopic Approach |
| 42.84 | combined systolic  and diastolic heart failure | 03CU0Z  Z | Extirpation of Matter from Right Thyroid  Artery, Open Approach |
| 42.89 | unspecified heart  failure | 03CU3Z  Z | Extirpation of Matter from Right Thyroid  Artery, Percutaneous Approach |
| 43.40 | cerebral thrombosis | 03CU4Z  Z | Extirpation of Matter from Right Thyroid  Artery, Percutaneous  Endoscopic Approach |
| 43.50 | basilar artery  syndrome | 03CV0Z  Z | Extirpation of Matter from Left Thyroid Artery, Open Approach |
| 51.84 | unspecified acute  edema of lung | 03CV3Z  Z | Extirpation of Matter from Left Thyroid  Artery, Percutaneous Approach |
| 51.85 | pulmonary  insufficiency following trauma&surgery | 03CV4Z  Z | Extirpation of Matter from Left Thyroid  Artery, Percutaneous  Endoscopic Approach |
| 55.70 | acute vascular  insufficiency of intestine | 027x-  037x | Dilation of multiple arteries and veins using various devices |
| 55.79 | unspecified vascular insufficiency of  intestine | 021008  W | Bypass Coronary Artery, One Artery from  Aorta with Zooplastic Tissue, Open  Approach |
| 56.09 | unspecified intestinal  obstruction | 021009  W | Bypass Coronary Artery, One Artery from  Aorta with Autologous Venous Tissue, |

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|  |  |  | | |  | | Open Approach |
| 59.33 | stricture or kinking of  ureter | | | 02100A  W | | Bypass Coronary Artery, One Artery from  Aorta with Autologous Arterial Tissue,  Open Approach |
| 59.39 | unspecified disorder of kidney  and ureter | | | 02100JW | | Bypass Coronary Artery, One Artery from  Aorta with Synthetic  Substitute, Open  Approach |
| 7810 | abnormal involuntary  movements | | | 021048 W | | Bypass Coronary Artery, One Artery from  Aorta with Zooplastic Tissue, Percutaneous  Endoscopic Approach |
|  | 9970 | | nervous system  complications nec | 021049 W | | Bypass Coronary Artery, One Artery from  Aorta with Autologous Venous Tissue,  Percutaneous Endoscopic Approach | |
| 9971 | | cardiac complications  nec | 02104A W | | Bypass Coronary Artery, One Artery from  Aorta with Autologous Arterial Tissue,  Percutaneous Endoscopic Approach | |
| 9973 | | respiratory  complications nec | 02104JW | | Bypass Coronary Artery, One Artery from  Aorta with Synthetic Substitute,  Percutaneous Endoscopic Approach | |
| 9974 | | digestive system  complication nec | 02104K W | | Bypass Coronary Artery, One Artery from  Aorta with Nonautologous Tissue  Substitute, Percutaneous Endoscopic  Approach | |

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|  | 9975 | surg complication  urinary tract | 021108 W | Bypass Coronary Artery, Two Arteries from  Aorta with Zooplastic Tissue, Open  Approach |
| 9985 | postoperative  infection not elsewhere classified | 021109  W | Bypass Coronary Artery, Two Arteries from  Aorta with Autologous Venous Tissue,  Open Approach |
| 59.33 | stricture or kinking of  ureter | 02110A W | Bypass Coronary Artery, Two Arteries from  Aorta with Autologous Arterial Tissue,  Open Approach |
| 59.39 | unspecified disorder of kidney  and ureter | 02110JW | Bypass Coronary Artery, Two Arteries from Aorta with Synthetic Substitute, Open Approach |
| 78.10 | abnormal involuntary  movements | 02110K W | Bypass Coronary Artery, Two Arteries from  Aorta with Nonautologous Tissue  Substitute, Open Approach |
| 99.70 | nervous system  complications nec | 021148 W | Bypass Coronary Artery, Two Arteries from  Aorta with Zooplastic Tissue, Percutaneous  Endoscopic Approach |
| 99.71 | cardiac complications  nec | 021149 W | Bypass Coronary Artery, Two Arteries from  Aorta with Autologous Venous Tissue,  Percutaneous Endoscopic Approach |
| 99.73 | respiratory  complications nec | 02114A W | Bypass Coronary Artery, Two Arteries from  Aorta with Autologous  Arterial Tissue,  Percutaneous Endoscopic  Approach |
| 99.74 | digestive system  complication nec | 02114JW | Bypass Coronary Artery, Two Arteries from  Aorta with Synthetic Substitute,  Percutaneous Endoscopic Approach |

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|  | 99.75 | surg complication  urinary tract | | 02114K W | Bypass Coronary Artery, Two Arteries from  Aorta with Nonautologous Tissue  Substitute, Percutaneous Endoscopic  Approach | |
| 99.85 | postoperative  infection not elsewhere classified | | 021208  W | Bypass Coronary Artery, Three  Arteries from Aorta with Zooplastic Tissue, Open Approach | |
| 342.00 | flacid hemiplegia  affecting unspecified side | | 021209  W | Bypass Coronary Artery, Three Arteries from Aorta with Autologous Venous Tissue, Open Approach | |
| 342.01 | flacid hemiplegia  affecting dominant side | | 02120A  W | Bypass Coronary Artery, Three Arteries from Aorta with Autologous Arterial Tissue, Open Approach | |
|  | 342.02 | | flacid hemiplegia  affecting nondominant side | 02120JW | | Bypass Coronary Artery, Three Arteries from Aorta with Synthetic Substitute, Open Approach |
| 342.10 | | spastic hemiplegia affecting unspecified side | 02120K  W | | Bypass Coronary Artery, Three Arteries from Aorta with Nonautologous Tissue Substitute, Open Approach |
| 342.11 | | spastic hemiplegia  affecting dominant side | 02120K  W | | Bypass Coronary Artery, Three Arteries from Aorta with Nonautologous Tissue Substitute, Open Approach |
| 342.12 | | spastic hemiplegia affecting nondominant side | 002120K  W | | Bypass Coronary Artery, Three Arteries from Aorta with Nonautologous Tissue Substitute, Open Approach |
| 342.80 | | other spec  hemiplegia affecting unspec side | 02124A  W | | Bypass Coronary Artery, Three  Arteries from Aorta with  Autologous Arterial Tissue,  Percutaneous Endoscopic Approach |
| 342.81 | | other spec  hemiplegia affecting dominant side | 02124JW | | Bypass Coronary Artery, Three Arteries from Aorta with Synthetic Substitute,  Percutaneous Endoscopic  Approach |
| 342.82 | | other spec  hemiplegia affecting nondominant side | 02124K  W | | Bypass Coronary Artery, Three Arteries from Aorta with Nonautologous Tissue |

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|  |  |  |  | Substitute, Percutaneous Endoscopic  Approach |
| 342.90 | unspec hemiplegia  affecting unspec side | 021308  W | Bypass Coronary Artery, Four or More  Arteries from Aorta with Zooplastic Tissue,  Open Approach |
| 342.91 | unspecified  hemiplegia affecting dominant side | 021309  W | Bypass Coronary Artery, Four or More  Arteries from Aorta with Autologous  Venous Tissue, Open Approach |
| 342.92 | unspec hemiplegia affecting nondominant side | 02130A  W | Bypass Coronary Artery, Four or More  Arteries from Aorta with Autologous  Arterial Tissue, Open Approach |
| 362.34 | transient arterial  occlusion of retina | 02130JW | Bypass Coronary Artery, Four or More  Arteries from Aorta with Synthetic  Substitute, Open Approach |
| 368.12 | transient visual loss | 02130K W | Bypass Coronary Artery, Four or More  Arteries from Aorta with Nonautologous  Tissue Substitute, Open Approach |
| 427.31 | atrial fibrillation | 021348 W | Bypass Coronary Artery, Four or More  Arteries from Aorta with Zooplastic Tissue,  Percutaneous Endoscopic Approach |
| 427.32 | atrial flutter | 021349 W | Bypass Coronary Artery, Four or More  Arteries from Aorta with Autologous  Venous Tissue,  Percutaneous Endoscopic  Approach |

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|  | | 427.41 | ventricular  fibrillation | 02134A W | | Bypass Coronary Artery,  Four or More Arteries from Aorta with Autologous Arterial Tissue,  Percutaneous Endoscopic  Approach | |
| 427.42 | ventricular flutter | 02134JW | | Bypass Coronary Artery,  Four or More Arteries from Aorta with Synthetic  Substitute, Percutaneous Endoscopic  Approach | |
| 427.81 | sinoatrial node  dysfunction | 02134K W | | Bypass Coronary Artery, Four or More  Arteries from Aorta with Nonautologous | |
|  |  | |  | |  | | Tissue Substitute,  Percutaneous Endoscopic  Approach |
| 427.89 | | other specified  cardiac dysrhythmias | | 0210088 | | Bypass Coronary Artery, One Artery from  Right Internal Mammary with Zooplastic  Tissue, Open Approach |
| 428.20 | | unspecified systolic  heart failure | | 0210089 | | Bypass Coronary Artery, One Artery from Left Internal Mammary with Zooplastic  Tissue, Open Approach |
| 428.21 | | acute systolic heart  failure | | 021008C | | Bypass Coronary Artery, One Artery from  Thoracic Artery with Zooplastic Tissue,  Open Approach |
| 428.22 | | chronic systolic heart  failure | | 0210098 | | Bypass Coronary Artery, One Artery from Right Internal Mammary with Autologous  Venous Tissue, Open Approach |
| 428.23 | | acute on chronic  systolic heart failure | | 0210099 | | Bypass Coronary Artery, One Artery from Left Internal Mammary with Autologous |

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|  |  |  |  | Venous Tissue, Open Approach |
| 428.30 | unspecified diastolic  heart failure | 021009C | Bypass Coronary Artery, One Artery from  Thoracic Artery with Autologous Venous  Tissue, Open Approach |
| 428.31 | acute diastolic heart  failure | 02100A8 | Bypass Coronary Artery, One Artery from Right Internal Mammary with Autologous  Arterial Tissue, Open Approach |
| 428.32 | chronic diastolic  heart failure | 02100A9 | Bypass Coronary Artery, One Artery from Left Internal Mammary with Autologous  Arterial Tissue, Open Approach |
| 428.33 | acute on chronic  diastolic heart failure | 02100A  C | Bypass Coronary Artery, One Artery from  Thoracic Artery with  Autologous Arterial  Tissue, Open Approach |
| 428.40 | unspec combined systolic&diastolic  heart failure | 02100J8 | Bypass Coronary Artery, One Artery from Right Internal Mammary with Synthetic  Substitute, Open Approach |
| 428.41 | acute combined systolic&diastolic  heart failure | 02100J9 | Bypass Coronary Artery, One Artery from Left Internal Mammary with Synthetic  Substitute, Open Approach |
| 428.42 | chronic comb systolic&diastolic heart failure | 02100JC | Bypass Coronary Artery, One Artery from  Thoracic Artery with  Synthetic Substitute,  Open Approach |
| 428.43 | acute chronic comb  systolic&diastolic heart fail | 02100K8 | Bypass Coronary Artery,  One Artery from Right  Internal Mammary with |

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|  |  |  |  | Nonautologous Tissue  Substitute, Open  Approach |
| 433.00 | occlusion&stenos basilar art w/o mention infarct | 02100K9 | Bypass Coronary Artery, One Artery from  Left Internal Mammary with  Nonautologous Tissue  Substitute, Open  Approach |
| 433.01 | occlusion&stenosis  basilar artery w/infarct | 02100K  C | Bypass Coronary Artery, One Artery from  Thoracic Artery with  Nonautologous Tissue  Substitute, Open Approach |
| 433.10 | occlusion&stenos carotid art w/o mention infarct | 02100Z8 | Bypass Coronary Artery,  One Artery from Right  Internal Mammary, Open  Approach |
| 433.11 | occlusion&stenosis  carotid artery w/infarct | 02100Z9 | Bypass Coronary Artery,  One Artery from Left  Internal Mammary, Open  Approach |
|  | 433.20 | occlusion&stenos vert  art w/o mention  infarct | 02100ZC | Bypass Coronary Artery,  One Artery from Thoracic Artery, Open Approach |
| 433.21 | occlusion&stenosis  vertebral artery  w/infarct | 210488 | Bypass Coronary Artery, One Artery from  Right Internal Mammary with Zooplastic  Tissue, Percutaneous  Endoscopic Approach |
| 433.30 | occl&stenos mx&bilat precerbrl art w/o  infarct | 210489 | Bypass Coronary Artery, One Artery from Left Internal Mammary with Zooplastic  Tissue, Percutaneous  Endoscopic Approach |
| 433.31 | occl&stenos mx&bilat precerbrl art  w/infarct | 021048C | Bypass Coronary Artery, One Artery from  Thoracic Artery with Zooplastic Tissue, |

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|  |  |  |  | Percutaneous Endoscopic Approach |
| 433.80 | occl&stenos oth spec  precerbrl art w/o infarct | 210498 | Bypass Coronary Artery, One Artery from Right Internal Mammary with Autologous  Venous Tissue,  Percutaneous Endoscopic  Approach |
| 433.81 | occl&stenos oth spec  precerbrl art w/infarct | 210499 | Bypass Coronary Artery, One Artery from Left Internal Mammary with Autologous  Venous Tissue,  Percutaneous Endoscopic  Approach |
| 433.90 | occl&stenos uns  precerbrl art w/o infarct | 021049C | Bypass Coronary Artery, One Artery from  Thoracic Artery with Autologous Venous  Tissue, Percutaneous  Endoscopic Approach |
| 433.91 | occlusion&stenos  unspec precerbrl art w/infarct | 02104A8 | Bypass Coronary Artery, One Artery from Right Internal Mammary with Autologous  Arterial Tissue,  Percutaneous Endoscopic  Approach |
| 434.00 | cerebral thrombosis without mention  infarct | 02104A9 | Bypass Coronary Artery, One Artery from Left Internal Mammary with Autologous  Arterial Tissue,  Percutaneous Endoscopic  Approach |
| 434.01 | cerebral thrombosis  with cerebral infarction | 02104A  C | Bypass Coronary Artery, One Artery from  Thoracic Artery with  Autologous Arterial  Tissue, Percutaneous  Endoscopic Approach |
| 434.10 | cerebral embolism without mention  infarct | 02104J8 | Bypass Coronary Artery, One Artery from |

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|  |  |  | |  | | Right Internal Mammary with Synthetic  Substitute, Percutaneous Endoscopic  Approach |
| 434.11 | cerebral embolism  with cerebral infarction | | 02104J9 | | Bypass Coronary Artery, One Artery from Left Internal Mammary with Synthetic  Substitute, Percutaneous Endoscopic  Approach |
| 434.90 | unspec cerbrl art occlusion w/o mention infarct | | 02104JC | | Bypass Coronary Artery, One Artery from  Thoracic Artery with  Synthetic Substitute,  Percutaneous Endoscopic Approach |
| 434.91 | unspecified cerebral  artery occlusion w/infarct | | 02104K8 | | Bypass Coronary Artery, One Artery from  Right Internal Mammary with  Nonautologous Tissue Substitute,  Percutaneous Endoscopic Approach |
| 438.10 | unspec spch&lange  deficit due cerebrvasc disease | | 02104K9 | | Bypass Coronary Artery, One Artery from  Left Internal Mammary with  Nonautologous Tissue Substitute,  Percutaneous Endoscopic Approach |
| 438.11 | aphasia due to  cerebrovascular disease | | 02104K  C | | Bypass Coronary Artery, One Artery from  Thoracic Artery with  Nonautologous Tissue |
|  |  |  |  | | Substitute, Percutaneous Endoscopic  Approach | |
| 438.12 | dysphasia due to  cerebrovascular disease | 02104Z8 | | Bypass Coronary Artery, One Artery from  Right Internal Mammary, Percutaneous | |

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|  |  |  |  | Endoscopic Approach |
| 438.13 | dysarthria | 02104Z9 | Bypass Coronary Artery, One Artery from  Left Internal Mammary, Percutaneous  Endoscopic Approach |
| 438.14 | fluency disorder | 02104ZC | Bypass Coronary Artery,  One Artery from Thoracic  Artery, Percutaneous  Endoscopic Approach |
| 438.19 | oth spch&lange  deficits due cerebrvasc disease | 211088 | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Zooplastic Tissue, Open  Approach |
| 438.20 | hemipl affect unspec  side due cerebrvasc disease | 211089 | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with  Zooplastic Tissue, Open  Approach |
| 438.21 | hemipl affct  dominant side due cerebrvasc dz | 021108C | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with  Zooplastic Tissue, Open  Approach |
| 438.22 | hemipl affct nondominant side  due cerebrvasc dz | 211098 | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Autologous Venous Tissue, Open Approach |
| 438.30 | monopleg upper limb uns side  due cerebrvasc dz | 211099 | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with  Autologous Venous Tissue, Open Approach |
| 438.31 | monopleg upper  limb dom side due cerebrvasc dz | 021109C | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with  Autologous Venous  Tissue, Open Approach |
| 438.32 | monopleg up limb nondom side due  cerebrvasc dz | 02110A8 | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Autologous Arterial Tissue, Open Approach |

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|  | 438.40 | monopleg low limb  unspec side due cerebrvasc dz | 02110A9 | | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with  Autologous Arterial Tissue, Open Approach | |
| 438.41 | monopleg low limb  dom side due cerebrvasc dz | 02110A  C | | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with  Autologous Arterial  Tissue, Open Approach | |
| 438.42 | monopleg low limb  nondom side due cerebrvasc dz | 02110J8 | | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Synthetic Substitute, Open  Approach | |
| 438.50 | oth paralyt synd affct  uns sidecerebrvasc dz | 02110J9 | | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with  Synthetic Substitute, Open  Approach | |
| 438.51 | oth paralyt synd affct  dom sidecerebrvasc  dz | 02110JC | | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with  Synthetic Substitute, Open  Approach | |
| 438.52 | oth paralyt synd affct  nondom sidecerebrvasc dz | 02110K8 | | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Nonautologous Tissue  Substitute, Open  Approach | |
| 438.53 | other paralytic syndrome,  bilateral | 02110K9 | | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with | |
|  |  |  | |  | | Nonautologous Tissue Substitute, Open Approach |
| 438.81 | apraxia due to  cerebrovascular disease | | 02110K  C | | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with  Nonautologous Tissue  Substitute, Open  Approach |

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|  | 438.82 | dysphagia due to  cerebrovascular disease | 02110Z8 | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary, Open  Approach |
| 438.83 | facial weakness late  effect cerebrovascular dz | 02110Z9 | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary, Open  Approach |
| 438.84 | ataxia as late effect of  cerebrovascular disease | 02110ZC | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery, Open  Approach |
| 438.85 | vertigo as late effect  cerebrovascular disease | 211488 | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Zooplastic Tissue, Percutaneous  Endoscopic Approach |
| 438.89 | other late effects of  cerebrovascular disease | 211489 | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with  Zooplastic Tissue, Percutaneous  Endoscopic Approach |
| 997.00 | unspecified nervous system complication  nec | 021148C | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with  Zooplastic Tissue,  Percutaneous  Endoscopic Approach |
| 997.01 | central nervous  system complication nec | 211498 | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Autologous Venous Tissue, Percutaneous  Endoscopic Approach |
| 997.02 | iatrogenic  cerebrovascular infarct/hemorrhage ne | 211499 | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with  Autologous Venous Tissue, Percutaneous  Endoscopic Approach |
| 997.09 | other nervous system  complications nec | 021149C | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with  Autologous |

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|  | |  | |  | |  | Venous Tissue,  Percutaneous  Endoscopic Approach | |
| 443.9 | | Peripheral vascular disease, unspecified - intermittent claudication | | 02114A8 | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Autologous Arterial Tissue, Percutaneous  Endoscopic Approach | |
| 39.25 | | Aorto-iliac femoral bypass | | 02114A9 | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with  Autologous Arterial Tissue, Percutaneous  Endoscopic Approach | |
| 39.29 | | Peripheral bypass | | 02114A C | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with Autologous  Arterial Tissue,  Percutaneous  Endoscopic Approach | |
| 38.08 | | Incision of lower limb arteries | | 02114J8 | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Synthetic Substitute, Percutaneous  Endoscopic Approach | |
| 38.16 | | Endarterectomy of abdominal arteries | | 02114J9 | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with  Synthetic | |
|  |  | |  | |  | | | Substitute,  Percutaneous Endoscopic  Approach |
| 38.18 | | Endarterectomy of lower limb arteries | | 02114JC | | | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with  Synthetic  Substitute,  Percutaneous Endoscopic  Approach |

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|  |  | 02114K8 | Bypass Coronary Artery,  Two Arteries from Right  Internal Mammary with  Nonautologous Tissue Substitute,  Percutaneous  Endoscopic Approach |
| 02114K9 | Bypass Coronary Artery,  Two Arteries from Left  Internal Mammary with  Nonautologous Tissue Substitute,  Percutaneous  Endoscopic Approach |
| 02114K  C | Bypass Coronary Artery,  Two Arteries from  Thoracic Artery with Nonautologous  Tissue Substitute,  Percutaneous  Endoscopic Approach |
| I70.51 | Atherosclerosis of nonautologous  biological  bypass graft(s) of the  extremities intermittent claudication |
| PCS  0410x-  041Jx | Bypass Abdominal Aorta - Bypass Left External  Iliac Artery |
| PCS  0312x061V4x | Bypass Innominate  Artery – Bypass Bypass Left Foot Vein |
| 04Bx-  04W4YZ | Excision of Right  Femoral Artery - Revision of Other Device in Lower Artery |
| PCS  045Kx-  045Yx | Destruction of Right  Femoral Artery - Destruction of Lower  Artery |
| 04LK0C  Z -  04LW4Z  Z | Occlusion of Right  Femoral Artery - Occlusion of Left Foot Artery |

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|  |  | | | I70.511 | | Atherosclerosis of nonautologous biological bypass graft(s) of the extremities with intermittent  claudication, right leg |
| I70.512 | | Atherosclerosis of nonautologous biological bypass graft(s) of the extremities with intermittent claudication, left leg |
| I70.518 | | Atherosclerosis of nonautologous biological bypass graft(s) of the extremities with intermittent claudication, other extremity |
| I70.519 | | Atherosclerosis of nonautologous biological bypass graft(s) of the extremities with intermittent claudication, other extremity |
| I70.61A | | Atherosclerosis of nonautologous biological bypass graft(s) of the extremities with intermittent claudication, unspecified extremity |
|  | |  | I70.71 | | therosclerosis of nonbiological bypass graft(s) of the extremities with intermittent claudication | |
| I70.41 | | Atherosclerosis of other type of bypass graft(s) of the extremities with intermittent claudication | |
| I70.31 | | Atherosclerosis of autologous vein bypass graft(s) of the extremities with intermittent claudication | |
| I70.21 | | Atherosclerosis of unspecified type of bypass graft(s) of the extremities with intermittent claudication | |

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|  |  | I87.8 | Atherosclerosis of native arteries of extremities with intermittent claudication |
| I73.9 | Claudicatio venosa intermittens |
| 02114Z8 | Claudication (intermittent) |
| 02114Z9 | Bypass Coronary Artery, Two  Arteries from Right Internal  Mammary, Percutaneous Endoscopic Approach |
| 02114ZC | Bypass Coronary Artery, Two  Arteries from Left Internal  Mammary, Percutaneous Endoscopic Approach |
| 021208C | Bypass Coronary Artery, Two  Arteries from Thoracic Artery,  Percutaneous Endoscopic  Approach |
| 021209C | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Zooplastic Tissue, Open Approach |
| 02120A  C | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Autologous Venous Tissue, Open Approach |
| 02120JC | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Autologous Arterial Tissue, Open Approach |
| 02120K  C | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Synthetic Substitute, Open Approach |
| 02120ZC | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Nonautologous Tissue Substitute, Open Approach |
| 021248C | Bypass Coronary Artery, Three  Arteries from Thoracic Artery, Open Approach |
| 021249C | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Zooplastic Tissue, |

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|  |  |  | Percutaneous Endoscopic Approach |
| 02124A  C | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Autologous  Venous Tissue, Percutaneous Endoscopic Approach |
| 02124JC | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Autologous  Arterial Tissue, Percutaneous Endoscopic Approach |
|  |  | 02124K  C | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Synthetic  Substitute, Percutaneous Endoscopic  Approach |
| 02124ZC | Bypass Coronary Artery, Three Arteries from Thoracic Artery with Nonautologous  Tissue Substitute, Percutaneous Endoscopic Approach |
| 021308C | Bypass Coronary Artery, Three  Arteries from Thoracic Artery,  Percutaneous Endoscopic  Approach |
| 021309C | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Zooplastic Tissue, Open Approach |
| 02130A  C | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Autologous Venous Tissue, Open Approach |
| 02130JC | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Autologous Arterial Tissue, Open Approach |

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|  |  | 02130K  C | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Synthetic Substitute, Open Approach |
| 02130ZC | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Nonautologous Tissue  Substitute, Open Approach |
| 021348C | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery, Open  Approach |
| 021349C | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Zooplastic Tissue, Percutaneous  Endoscopic Approach |
| 02134A  C | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Autologous Venous Tissue, Percutaneous  Endoscopic Approach |
| 02134JC | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Autologous Arterial Tissue, Percutaneous  Endoscopic Approach |
| 02134K  C | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Synthetic Substitute, Percutaneous  Endoscopic Approach |

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|  |  | 02134ZC | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery with  Nonautologous Tissue Substitute,  Percutaneous Endoscopic Approach |
| 021008F | Bypass Coronary Artery, Four or More  Arteries from Thoracic Artery,  Percutaneous Endoscopic Approach |
|  |  | 021009F | Bypass Coronary Artery, One Artery from  Abdominal Artery with Zooplastic Tissue,  Open Approach |
| 02100AF | Bypass Coronary Artery, One Artery from  Abdominal Artery with Autologous Venous  Tissue, Open Approach |
| 02100JF | Bypass Coronary Artery, One Artery from Abdominal Artery with Autologous Arterial  Tissue, Open Approach |
| 02100KF | Bypass Coronary Artery, One Artery from  Abdominal Artery with Synthetic  Substitute, Open Approach |
| 02100ZF | Bypass Coronary Artery, One Artery from  Abdominal Artery with Nonautologous  Tissue Substitute, Open Approach |
| 021048F | Bypass Coronary Artery, One  Artery from Abdominal Artery, Open Approach |
| 021049F | Bypass Coronary Artery, One Artery from  Abdominal Artery with Zooplastic Tissue, |

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|  |  |  | Percutaneous Endoscopic Approach |
| 02104AF | Bypass Coronary Artery, One Artery from  Abdominal Artery with Autologous Venous  Tissue, Percutaneous  Endoscopic Approach |
| 02104JF | Bypass Coronary Artery, One Artery from Abdominal Artery with Autologous Arterial Tissue, Percutaneous  Endoscopic Approach |
| 02104KF | Bypass Coronary Artery, One Artery from  Abdominal Artery with Synthetic  Substitute, Percutaneous Endoscopic  Approach |
| 02104ZF | Bypass Coronary Artery, One Artery from  Abdominal Artery with Nonautologous  Tissue Substitute, Percutaneous Endoscopic Approach |
| 0210083 | Bypass Coronary Artery, One Artery from  Abdominal Artery, Percutaneous  Endoscopic Approach |
| 0210093 | Bypass Coronary Artery, One Artery from  Coronary Artery with Zooplastic Tissue,  Open Approach |
| 02100A3 | Bypass Coronary Artery, One Artery from  Coronary Artery with Autologous Venous  Tissue, Open Approach |
| 02100J3 | Bypass Coronary Artery, One Artery from  Coronary Artery with Autologous Arterial |

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|  |  |  | Tissue, Open Approach |
| 02100K3 | Bypass Coronary Artery, One Artery from Coronary Artery with Synthetic Substitute, Open Approach |
| 02100Z3 | Bypass Coronary Artery, One Artery from  Coronary Artery with Nonautologous  Tissue Substitute, Open Approach |
| 0210483 | Bypass Coronary Artery, One  Artery from Coronary Artery, Open Approach |
|  |  | 0210493 | Bypass Coronary Artery, One Artery from  Coronary Artery with Zooplastic Tissue,  Percutaneous Endoscopic Approach |
| 02104A3 | Bypass Coronary Artery, One Artery from  Coronary Artery with Autologous Venous  Tissue, Percutaneous  Endoscopic Approach |
| 02104J3 | Bypass Coronary Artery, One Artery from  Coronary Artery with Autologous Arterial  Tissue, Percutaneous  Endoscopic Approach |
| 02104K3 | Bypass Coronary Artery, One Artery from Coronary Artery with Synthetic Substitute,  Percutaneous Endoscopic Approach |
| 02104Z3 | Bypass Coronary Artery, One Artery from  Coronary Artery with Nonautologous  Tissue Substitute, Percutaneous Endoscopic Approach |

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|  |  | 021K0Z8 | Bypass Coronary Artery, One Artery from  Coronary Artery, Percutaneous Endoscopic Approach |
| 021K0Z9 | Bypass Right Ventricle to Right  Internal Mammary, Open Approach |
| 021K0Z  C | Bypass Right Ventricle to Left Internal  Mammary, Open Approach |
| 021K0Z  W | Bypass Right Ventricle to Thoracic Artery, Open Approach |
| 021K4Z8 | Bypass Right Ventricle to Aorta, Open Approach |
| 021K4Z9 | Bypass Right Ventricle to Right Internal  Mammary, Percutaneous Endoscopic  Approach |
| 021K4Z  C | Bypass Right Ventricle to Left Internal  Mammary, Percutaneous Endoscopic  Approach |
| 021K4Z  W | Bypass Right Ventricle to  Thoracic Artery, Percutaneous Endoscopic Approach |
| 021L0Z8 | Bypass Right Ventricle to Aorta,  Percutaneous Endoscopic Approach |
| 021L0Z9 | Bypass Left Ventricle to Right  Internal Mammary, Open Approach |
| 021L0Z  C | Bypass Left Ventricle to Left Internal  Mammary, Open Approach |
| 021L4Z8 | Bypass Left Ventricle to  Thoracic Artery, Open Approach |
| 021L4Z9 | Bypass Left Ventricle to Right Internal  Mammary, Percutaneous Endoscopic  Approach |

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|  |  | 021L4Z  C | | | Bypass Left Ventricle to Left Internal  Mammary, Percutaneous Endoscopic  Approach |
| G8190 | | | Bypass Left Ventricle to  Thoracic Artery, Percutaneous Endoscopic Approach |
| G8191 | | | hemiplegia, unspecified  affecting unspecified side |
|  |  | | G8192 | hemiplegia, unspecified affecting right dominant side | |
| G8193 | hemiplegia, unspecified affecting left dominant side | |
| G8194 | hemiplegia, unspecified affecting right nondominant side | |
| G9781 | hemiplegia, unspecified affecting left nondominant side | |
| G9782 | other intraoperative complications of nervous system | |
| I509 | other postprocedural complications and disorders of nervous system | |
| I6359 | heart failure, unspecified | |
| I658 | cerebral infarction due to unspecified occlusion or stenosis of other cerebral artery | |
| I6609 | occlusion and stenosis of other precerebral arteries | |
| I6619 | occlusion and stenosis of unspecified middle cerebral artery | |
| I6629 | occlusion and stenosis of unspecified anterior cerebral artery | |
| I669 | occlusion and stenosis of unspecified posterior cerebral artery | |
| I69928 | occlusion and stenosis of unspecified cerebral artery | |
| I69998 | other speech and language deficits following unspecified cerebrovascular disease | |

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|  |  | | J9589 | other sequelae following unspecified cerebrovascular disease | |
| K550 | other postprocedural complications and disorders of respiratory system, not elsewhere classified | |
| R001 | acute vascular disorders of  intestine | |
| G8100 | vertebro-basilar artery syndrome | |
| G8101 | flaccid hemiplegia affecting unspecified side | |
| G8102 | flaccid hemiplegia affecting right dominant side | |
| G8103 | flaccid hemiplegia affecting left dominant side | |
| G8104 | flaccid hemiplegia affecting right nondominant side | |
| G8110 | flaccid hemiplegia affecting left nondominant side | |
| G8111 | spastic hemiplegia affecting unspecified side | |
| G8112 | spastic hemiplegia affecting right dominant side | |
| G8113 | spastic hemiplegia affecting left dominant side | |
|  |  | G8114 | | | spastic hemiplegia affecting right nondominant side |
| G970 | | | spastic hemiplegia affecting left nondominant side |
| H3400 | | | cerebrospinal fluid leak from spinal puncture |
| H53129 | | | transient retinal artery occlusion, unspecified eye |
| I469 | | | transient visual loss, unspecified  eye |
| I471 | | | cardiac arrest, cause unspecified |
| I4891 | | | supraventricular tachycardia |
| I4892 | | | unspecified atrial fibrillation |
| I4901 | | | unspecified atrial flutter |

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| --- | --- | --- | --- |
|  |  | I4902 | ventricular fibrillation |
| I495 | ventricular flutter |
| I498 | sick sinus syndrome |
| I499 | other specified cardiac  arrhythmias |
| I501 | cardiac arrhythmia, unspecified |
| I5020 | left ventricular failure |
| I5021 | unspecified systolic (congestive) heart failure |
| I5022 | acute systolic (congestive) heart  failure |
| I5023 | chronic systolic (congestive)  heart failure |
| I5030 | acute on chronic systolic  (congestive) heart failure |
| I5031 | unspecified diastolic  (congestive) heart failure |
| I5032 | acute diastolic (congestive)  heart failure |
| I5033 | chronic diastolic (congestive)  heart failure |
| I5040 | acute on chronic diastolic (congestive) heart failure |
| I5041 | unspecified combined systolic  (congestive) and diastolic  (congestive) heart failure |
| I5042 | acute combined systolic (congestive) and diastolic  (congestive) heart failure |
| I5043 | chronic combined systolic (congestive) and diastolic  (congestive) heart failure |
| I63019 | acute on chronic combined systolic  (congestive) and diastolic  (congestive) heart failure |
| I63119 | cerebral infarction due to thrombosis of unspecified  vertebral artery |

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|  |  | I63139 | | cerebral infarction due to embolism of unspecified  vertebral artery |
| I6320 | | cerebral infarction due to embolism of unspecified carotid artery |
|  |  | | I63219 | cerebral infarction due to unspecified occlusion or stenosis of unspecified precerebral arteries |
| I6322 | cerebral infarction due to unspecified occlusion or stenosis of unspecified vertebral arteries |
| I63239 | cerebral infarction due to unspecified occlusion or stenosis of basilar arteries |
| I6330 | cerebral infarction due to unspecified occlusion or stenosis of unspecified carotid arteries |
| I6340 | cerebral infarction due to thrombosis of unspecified cerebral artery |
| I6350 | cerebral infarction due to embolism of unspecified cerebral artery |
| I6509 | cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebral artery |
| I651 | occlusion and stenosis of unspecified vertebral artery |
| I6529 | occlusion and stenosis of basilar  artery |
| I659 | occlusion and stenosis of unspecified carotid artery |
| I69898 | occlusion and stenosis of unspecified precerebral artery |
| I69920 | other sequelae of other cerebrovascular disease |
| I69921 | aphasia following unspecified cerebrovascular disease |
| I69922 | dysphasia following unspecified cerebrovascular disease |

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| --- | --- | --- | --- | --- | --- |
|  |  | | I69923 | dysarthria following unspecified cerebrovascular disease | |
| I69931 | fluency disorder following unspecified cerebrovascular disease | |
| I69932 | monoplegia of upper limb following unspecified cerebrovascular disease affecting right dominant side | |
| I69933 | monoplegia of upper limb following unspecified cerebrovascular disease affecting left dominant side | |
| I69934 | monoplegia of upper limb following unspecified cerebrovascular disease affecting right non-dominant side | |
| I69939 | monoplegia of upper limb following unspecified cerebrovascular disease affecting left non-dominant side | |
| I69941 | monoplegia of upper limb following unspecified cerebrovascular disease affecting unspecified side | |
| I69942 | monoplegia of lower limb following unspecified cerebrovascular disease affecting right dominant side | |
|  |  | I69943 | | | monoplegia of lower limb following unspecified cerebrovascular disease affecting left dominant side |
| I69944 | | | monoplegia of lower limb following unspecified cerebrovascular disease affecting right non-dominant side |
| I69949 | | | monoplegia of lower limb following unspecified cerebrovascular disease affecting left non-dominant side |

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| --- | --- | --- | --- |
|  |  | I69951 | monoplegia of lower limb following unspecified cerebrovascular disease affecting unspecified side |
| I69952 | hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting right dominant side |
| I69953 | hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting left dominant side |
| I69954 | hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting right non-dominant side |
| I69959 | hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting left non-dominant side |
| I69961 | hemiplegia and hemiparesis following unspecified cerebrovascular disease affecting unspecified side |
| I69962 | other paralytic syndrome following unspecified cerebrovascular disease affecting right dominant side |
| I69963 | other paralytic syndrome following unspecified cerebrovascular disease affecting left dominant side |
| I69964 | other paralytic syndrome following unspecified cerebrovascular disease affecting right non-dominant side |
| I69965 | other paralytic syndrome following unspecified cerebrovascular disease affecting left non-dominant side |

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| --- | --- | --- | --- | --- | --- |
|  |  | I69969 | | | other paralytic syndrome following unspecified cerebrovascular disease, bilateral |
| I69990 | | | other paralytic syndrome following unspecified cerebrovascular disease affecting unspecified side |
| I69991 | | | apraxia following unspecified cerebrovascular disease |
| I69992 | | | dysphagia following unspecified cerebrovascular disease |
| I69993 | | | facial weakness following unspecified cerebrovascular disease |
| I97710 | | | ataxia following unspecified cerebrovascular disease |
|  |  | | I97790 | intraoperative cardiac arrest during cardiac surgery | |
| I97811 | other intraoperative cardiac functional disturbances during cardiac surgery | |
| I97821 | intraoperative cerebrovascular infarction during other surgery | |
| I9788 | postprocedural cerebrovascular infarction following other surgery | |
| I9789 | other intraoperative  complications of the circulatory system, not elsewhere  classified | |
| J810 | other postprocedural complications and disorders of the circulatory system, not elsewhere classified | |
| J951 | acute pulmonary edema | |
| J952 | acute pulmonary insufficiency following thoracic surgery | |
| J953 | acute pulmonary insufficiency following nonthoracic surgery | |
| J95821 | chronic pulmonary insufficiency following surgery | |

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| --- | --- | --- | --- |
|  |  | J95822 | acute postprocedural  respiratory failure |
| J95851 | acute and chronic postprocedural respiratory  failure |
| J95859 | ventilator associated  pneumonia |
| J9588 | other complication of respirator [ventilator] |
| J9600 | other intraoperative complications of respiratory  system, not elsewhere  classified |
| J9620 | acute respiratory failure, unspecified whether with  hypoxia or hypercapnia |
| K559 | acute and chronic respiratory failure, unspecified whether with hypoxia or hypercapnia |
| K5660 | vascular disorder of intestine,  unspecified |
| K6811 | unspecified intestinal  obstruction |
| K913 | postprocedural retroperitoneal  abscess |
| K9181 | postprocedural intestinal  obstruction |
| K9182 | other intraoperative complications of digestive system |
| K9183 | postprocedural hepatic failure |
| K9186 | postprocedural hepatorenal  syndrome |
| K9189 | retained cholelithiasis following cholecystectomy |
| N135 | other postprocedural complications and disorders of digestive system |
| N289 | crossing vessel and stricture of ureter without hydronephrosis |
| N9989 | disorder of kidney and ureter,  unspecified |

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|  |  | R250 | other postprocedural complications and disorders of genitourinary system |
| R253 | cramp and spasm |
| R259 | fasciculation |
| R29890 | other symptoms and signs involving the nervous system |
| T81.710  A | complication of mesenteric  artery following a procedure, not elsewhere classified, initial encounter |
| T81.711 A | complication of renal artery following a procedure, not elsewhere classified, initial encounter |
| T81.718  A | complication of other artery following a procedure, not elsewhere classified, initial encounter |
| T8172X  A | complication of vein following a  procedure, not elsewhere classified, initial encounter |
| T81.710 A | complication of mesenteric  artery following a procedure, not elsewhere classified, initial encounter |
| T81.711  A | complication of renal artery following a procedure, not elsewhere classified, initial encounter |
| T81.718  A | complication of other artery following a procedure, not elsewhere classified, initial encounter |
| T81.72X A | complication of vein following a  procedure, not elsewhere classified, initial encounter |
| 34200 | flacid hemiplegia affecting  unspecified side |
| 34201 | flacid hemiplegia affecting  dominant side |
| 34200 | flacid hemiplegia affecting  unspecified side |

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| --- | --- | --- | --- | --- | --- | --- |
|  |  | | 34201 | | flacid hemiplegia affecting  dominant side | |
| 34202 | | flacid hemiplegia affecting nondominant side | |
| 34210 | | spastic hemiplegia affecting unspecified side | |
| 34211 | | spastic hemiplegia affecting  dominant side | |
| 34212 | | spastic hemiplegia affecting nondominant side | |
| 34280 | | other spec hemiplegia affecting  unspec side | |
| 34281 | | other spec hemiplegia affecting dominant side | |
| 34282 | | other spec hemiplegia affecting nondominant side | |
| 34290 | | unspec hemiplegia affecting  unspec side | |
| 34291 | | unspecified hemiplegia affecting dominant side | |
| 34292 | | unspec hemiplegia affecting nondominant side | |
|  | |  | | 36234 | | transient arterial occlusion of  retina |
| 36812 | | transient visual loss |
| 42731 | | atrial fibrillation |
| 42732 | | atrial flutter |
| 42741 | | ventricular fibrillation |
| 42742 | | ventricular flutter |
| 42781 | | sinoatrial node dysfunction |
| 42789 | | other specified cardiac  dysrhythmias |
| 42820 | | unspecified systolic heart  failure |
|  | | 42821 | | acute systolic heart failure |
| 42822 | | chronic systolic heart failure |
| 42823 | | acute on chronic systolic heart  failure |

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| --- | --- | --- | --- | --- | --- | --- |
|  | |  | | 42830 | | unspecified diastolic heart  failure |
| 42831 | | acute diastolic heart failure |
| 42832 | | chronic diastolic heart failure |
| 42833 | | acute on chronic diastolic heart  failure |
| 42840 | | unspec combined  systolic&diastolic heart failure |
| 42841 | | acute combined systolic&diastolic heart failure |
| 42842 | | chronic comb systolic&diastolic heart failure |
| 42843 | | acute chronic comb systolic&diastolic heart fail |
| 43300 | | occlusion&stenos basilar art w/o mention infarct |
| 43301 | | occlusion&stenosis basilar  artery w/infarct |
| 43310 | | occlusion&stenos carotid art w/o mention infarct |
| 43311 | | occlusion&stenosis carotid  artery w/infarct |
| 43320 | | occlusion&stenos vert art w/o mention infarct |
| 43321 | | occlusion&stenosis vertebral artery w/infarct |
| 43330 | | occl&stenos mx&bilat precerbrl art w/o infarct |
| 43331 | | occl&stenos mx&bilat precerbrl art w/infarct |
| 43380 | | occl&stenos oth spec precerbrl art w/o infarct |
| 43381 | | occl&stenos oth spec precerbrl  art w/infarct |
| 43390 | | occl&stenos uns precerbrl art  w/o infarct |
|  |  | | 43391 | | occlusion&stenos unspec precerbrl art w/infarct | |
| 43400 | | cerebral thrombosis without  mention infarct | |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | 43401 | cerebral thrombosis with  cerebral infarction |
| 43410 | cerebral embolism without  mention infarct |
| 43411 | cerebral embolism with cerebral  infarction |
| 43490 | unspec cerbrl art occlusion w/o mention infarct |
| 43491 | unspecified cerebral artery occlusion w/infarct |
| 43810 | unspec spch&lange deficit due cerebrvasc disease |
| 43811 | aphasia due to cerebrovascular  disease |
| 43812 | dysphasia due to  cerebrovascular disease |
| 43813 | dysarthria |
| 43814 | fluency disorder |
| 43819 | oth spch&lange deficits due cerebrvasc disease |
| 43820 | hemipl affect unspec side due cerebrvasc disease |
| 43821 | hemipl affct dominant side due cerebrvasc dz |
| 43822 | hemipl affct nondominant side due cerebrvasc dz |
| 43830 | monopleg upper limb uns side due cerebrvasc dz |
| 43831 | monopleg upper limb dom side due cerebrvasc dz |
| 43832 | monopleg up limb nondom side due cerebrvasc dz |
| 43840 | monopleg low limb unspec side due cerebrvasc dz |
| 43841 | monopleg low limb dom side due cerebrvasc dz |
| 43842 | monopleg low limb nondom side due cerebrvasc dz |
| 43850 | oth paralyt synd affct uns side-cerebrvasc dz |
| 43851 | oth paralyt synd affct dom sidecerebrvasc dz |

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| --- | --- | --- | --- | --- | --- | --- |
|  |  | | 43852 | | oth paralyt synd affct nondom sidecerebrvasc dz | |
| 43853 | | other paralytic syndrome,  bilateral | |
| 43881 | | apraxia due to cerebrovascular  disease | |
| 43882 | | dysphagia due to  cerebrovascular disease | |
| 43883 | | facial weakness late effect cerebrovascular dz | |
|  | |  | | 43884 | | ataxia as late effect of cerebrovascular disease |
| 43885 | | vertigo as late effect cerebrovascular disease |
| 43889 | | other late effects of  cerebrovascular disease |
| 51851 | | ac resp fail post  trauma/surgery |
| 51852 | | ot pulm insuff post  trauma/surg |
| 51853 | | ac/chr resp fail post  trauma/surg |
| 78191 | | loss of height |
| 78192 | | abnormal posture |
| 78193 | | ocular torticollis |
| 78194 | | facial weakness |
| 78199 | | oth symptoms invlv nerv&musculoskeletal systems |
| 99700 | | unspecified nervous system complication nec |
| 99701 | | central nervous system  complication nec |
| 99702 | | iatrogenic cerebrovascular infarct/hemorrhage ne |
| 99709 | | other nervous system  complications nec |
| 99731 | | ventilator associated  pneumonia |

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|  |  | |  | | 99732 | | postprocedural  aspiration pneumonia | |
| 99739 | | other respiratory  complications | |
| 99741 | | retained stone fol  cholecystectomy | |
| 99749 | | ot digestive system  complications | |
| 99771 | | vascular complications  of mesenteric artery | |
| 99772 | | vascular complications  of renal artery | |
| 99779 | | vascular complications  of other vessels | |
| 99851 | | infected postoperative  seroma nec | |
| 99859 | | other postoperative  infection nec | |
| Heart  Failure  40 | ICD-9CM | |  | | ICD-10-CM | |  | |
| 428.0 | | Congestive heart failure, unspecified | | I50.1 | | Left ventricular failure | |
| 428.1 | | Left heart failure | | I50.20 | | Unspecified systolic (congestive) heart failure | |
| 428.20 | | Systolic heart failure | | I50.21 | | Acute systolic  (congestive) heart failure | |
| 428.21 | | Systolic heart failure | | I50.22 | | Chronic systolic  (congestive) heart failure | |
| 428.22 | | Chronic systolic heart failure | | I50.23 | | Acute on chronic systolic (congestive) heart failure | |
| 428.23 | | Acute on chronic systolic heart failure | | I50.30 | | Unspecified diastolic (congestive) heart failure | |
|  | | 428.30 | | Diastolic heart failure, unspecified | | I50.31 | | Acute diastolic  (congestive) heart failure |

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| --- | --- | --- | --- | --- |
|  | 428.31 | Acute diastolic heart failure | I50.32 | Chronic diastolic  (congestive) heart failure |
| 428.32 | Chronic diastolic heart failure | I50.33 | Acute on chronic diastolic (congestive) heart failure |
| 428.33 | Acute on chronic diastolic heart failure | I50.40 | Unspecified combined systolic (congestive) and  diastolic  (congestive) heart failure |
| 428.40 | Combined  systolic and diastolic heart failure, unspecified | I50.41 | Acute combined systolic  (congestive) and  diastolic  (congestive) heart failure |
| 428.41 | Acute combined  systolic and diastolic heart failure | I50.42 | Chronic combined systolic  (congestive) and  diastolic  (congestive) heart failure |
| 428.42 | Chronic combined  systolic and diastolic heart failure | I50.43 | Acute on chronic combined systolic (congestive) and diastolic  (congestive) heart failure |
| 428.43 | Acute on chronic  combined  systolic and diastolic heart failure | I50.9 | Heart failure, unspecified |
| 428.9 | Heart failure, unspecified |  |  |
| Peripheral  Arterial or  Vascular  Disease32,33 | ICD-9-  CM | | ICD-10-CM |  |
| 250.7x | Diabetes with peripheral circulatory disorders | Main Codes |  |

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| --- | --- | --- | --- | --- |
|  | 249.7x | Secondary diabetes with peripheral circulatory disorders | E08 | Diabetes mellitus due to underlying condition |
| 440.21 | Atherosclerosis of native arteries of the extremities with intermittent claudication | E09 | Drug or chemical induced diabetes mellitus |
| 442.3 | Aneurysm of artery of lower extremity | E10 | Type 1 diabetes mellitus |
| 443.81 | Peripheral angiopathy in diseases classified elsewhere (including claudication) | E11 | Type 2 diabetes mellitus |
| 443.9 | Peripheral vascular disease, unspecified | E13 | Other specified diabetes mellitus |
| 892.1 | Open wound of foot except toe(s) alone, complicated | Relevant Subcodes | |
| 040.0 | Gas gangrene | E\*\*.51 | Diabetic peripheral angiopathy, no gangrene |
| 444.22 | Arterial  embolism and thrombosis of lower extremity | E\*\*.52 | Diabetic peripheral angiopathy, with gangrene |
| 707.1x | Ulcer of lower limbs, except decubitus ulcer | E\*\*.59 | Diabetes, other circulatory complications |
| 785.4 | Gangrene | E\*\*.621 | Diabetic foot ulcer |
|  | | Regular Codes: | |

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| --- | --- | --- | --- | --- | --- | --- |
|  | |  | | I72.4 | | Aneurysm of artery of lower extremity |
| I70.21x | | Atherosclerosis of native arteries of extremities with intermittent claudication |
| I73.89 | | Other specified peripheral vascular diseases |
|  |  | |  | I73.9 | Peripheral vascular disease, unspecified | |
| S91.3x | Open wound of foot | |
| A48.0 | Gas gangrene | |
| I74.3 | Embolism and thrombosis of arteries of the lower extremities | |
| L97.x | Embolism and thrombosis of arteries of the lower extremities | |
| L97.x | Non-pressure chronic ulcer of lower limb, not  elsewhere  classified | |
| I96 | Gangrene, not elsewhere  classified | |
| Stroke35,32 | ICD-9CM | |  | ICD-10-CM |  | |
| 430 | | Subarachnoid hemorrhage | I6000 | Nontraumatic subarachnoid hemorrhage from unspecified carotid siphon and bifurcation | |
| 431 | | Intracerebral hemorrhage | I6001 | Nontraumatic subarachnoid | |

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| --- | --- | --- | --- | --- |
|  |  |  |  | hemorrhage from right carotid siphon and bifurcation |
| 432.0 | Nontraum extradural hem | I6002 | Nontraumatic subarachnoid hemorrhage from  left carotid siphon and bifurcation |
| 432.1 | Subdural hemorrhage | I6010 | Nontraumatic subarachnoid hemorrhage from unspecified middle cerebral artery |
| 432.9 | Intracranial hemorr nos | I6011 | Nontraumatic subarachnoid hemorrhage from right middle cerebral artery |
| 433.01 | Basi art occl w/ infarct | I6012 | Nontraumatic subarachnoid hemorrhage from left middle cerebral artery |
| 433.11 | Carotd occl w/ infrct | I6020 | Nontraumatic subarachnoid hemorrhage from unspecified  anterior communicating  artery |
| 433.21 | Vertb art occl w/ infrct | I6021 | Nontraumatic subarachnoid hemorrhage from right anterior  communicating  artery |
| 433.31 | Mult precer occl w/ infrct | I6022 | Nontraumatic subarachnoid hemorrhage from left anterior  communicating  artery |
| 433.81 | Precer occl nec w/ infrct | I6030 | Nontraumatic subarachnoid hemorrhage from unspecified |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | |  | |  | | posterior  communicating  artery |
| 433.91 | | Precer occl nos w/ infrct | | I6031 | | Nontraumatic subarachnoid hemorrhage from right posterior  communicating  artery |
| 434.01 | | Cere thrombosis w/  infrct | | I6032 | | Nontraumatic subarachnoid hemorrhage from left posterior  communicating  artery |
| 434.11 | | Cere embolism w/ infrct | | I604 | | Nontraumatic subarachnoid  hemorrhage from  basilar artery |
|  | 434.91 | | Cereb occl nos w/ infrct | | I6050 | | Nontraumatic subarachnoid hemorrhage from unspecified vertebral artery | |
| 433.91 | | Precer occl nos w/ infrct | | I6051 | | Nontraumatic subarachnoid  hemorrhage from  right vertebral artery | |
| 434.01 | | Cere thrombosis w/ infrct | | I6052 | | Nontraumatic subarachnoid hemorrhage from left vertebral artery | |
| 434.11 | | Cere embolism w/ infrct | | I606 | | Nontraumatic subarachnoid hemorrhage from other intracranial  arteries | |
| 434.91 | | Cereb occl nos w/ infrct | | I607 | | Nontraumatic subarachnoid hemorrhage from unspecified intracranial artery | |
| 436.x | | Acute, but illdefined, | | I67.89 | | Other cerebrovascular disease | |

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|  |  | cerebrovascular disease |  |  |
| V12.54 | Personal history of transient ischemic attack (TIA), and cerebral infarction without residual deficits | I608 | Other nontraumatic subarachnoid hemorrhage |
|  | | I609 | Nontraumatic subarachnoid hemorrhage, unspecified |
| I610 | Nontraumatic intracerebral hemorrhage in hemisphere, subcortical |
| I611 | Nontraumatic intracerebral hemorrhage in hemisphere, cortical |
| I612 | Nontraumatic intracerebral hemorrhage in hemisphere, unspecified |
| I613 | Nontraumatic intracerebral hemorrhage in brain stem |
| I614 | Nontraumatic intracerebral hemorrhage in cerebellum |
| I615 | Nontraumatic intracerebral hemorrhage, intraventricular |
| I616 | Nontraumatic intracerebral hemorrhage, multiple  localized |
| I618 | Other nontraumatic intracerebral hemorrhage |

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|  |  | | | I619 | | Nontraumatic intracerebral hemorrhage, unspecified |
| I6200 | | Nontraumatic subdural hemorrhage, unspecified |
| I6201 | | Nontraumatic acute subdural hemorrhage |
|  | |  | I6202 | | Nontraumatic subacute subdural hemorrhage | |
| I6203 | | Nontraumatic chronic subdural hemorrhage | |
| I621 | | Nontraumatic extradural hemorrhage | |
| I629 | | Nontraumatic intracranial hemorrhage, unspecified | |
| I6300 | | Cerebral infarction due to thrombosis of unspecified  precerebral artery | |
| I63011 | | Cerebral infarction due to thrombosis of right vertebral  artery | |
| I63012 | | Cerebral infarction due to thrombosis of left vertebral  artery | |
| I63019 | | Cerebral infarction due to thrombosis of unspecified  vertebral artery | |
| I6302 | | Cerebral infarction due to thrombosis of basilar artery | |
| I63031 | | Cerebral infarction due to thrombosis of right carotid artery | |
| I63032 | | Cerebral infarction due to thrombosis of left carotid artery | |
| I63039 | | Cerebral infarction due to thrombosis of unspecified carotid artery | |

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|  |  | | I6309 | | Cerebral infarction due to thrombosis of other precerebral artery | |
| I6310 | | Cerebral infarction due to embolism of unspecified precerebral artery | |
| I63111 | | Cerebral infarction due to embolism of right vertebral artery | |
| I63112 | | Cerebral infarction due to embolism of left vertebral artery | |
| I63119 | | Cerebral infarction due to embolism of unspecified  vertebral artery | |
| I6312 | | Cerebral infarction due to embolism of basilar artery | |
| I63131 | | Cerebral infarction due to embolism of right carotid artery | |
| I63132 | | Cerebral infarction due to embolism of left carotid artery | |
|  | |  | | I63139 | | Cerebral infarction due to embolism of unspecified carotid artery |
| I6319 | | Cerebral infarction due to embolism of other precerebral artery |
| I6320 | | Cerebral infarction due to unspecified occlusion or stenosis of unspecified precerebral arteries |
| I63211 | | Cerebral infarction due to unspecified occlusion or stenosis of right vertebral arteries |
| I63212 | | Cerebral infarction due to unspecified occlusion or stenosis of left vertebral arteries |
| I63219 | | Cerebral infarction due to unspecified occlusion or stenosis of unspecified vertebral arteries |

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|  |  | I6322 | Cerebral infarction due to unspecified occlusion or stenosis of basilar arteries |
| I63231 | Cerebral infarction due to unspecified occlusion or stenosis of right carotid arteries |
| I63232 | Cerebral infarction due to unspecified occlusion or stenosis of left carotid arteries |
| I63239 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified carotid arteries |
| I6329 | Cerebral infarction due to unspecified occlusion or stenosis of other precerebral arteries |
|  | I6330 | Cerebral infarction due to thrombosis of unspecified cerebral artery |
| I63311 | Cerebral infarction due to thrombosis of right middle  cerebral artery |
| I63312 | Cerebral infarction due to thrombosis of left middle cerebral artery |
| I63319 | Cerebral infarction due to thrombosis of unspecified middle cerebral artery |
| I63321 | Cerebral infarction due to thrombosis of right anterior cerebral artery |
| I63322 | Cerebral infarction due to thrombosis of left anterior cerebral artery |
| I63329 | Cerebral infarction due to thrombosis of unspecified anterior cerebral artery |
| I63331 | Cerebral infarction due to thrombosis of right posterior cerebral artery |

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|  |  | I63332 | Cerebral infarction due to thrombosis of left posterior cerebral artery |
| I63339 | Cerebral infarction due to thrombosis of unspecified posterior cerebral artery |
| I63341 | Cerebral infarction due to thrombosis of right cerebellar artery |
| I63342 | Cerebral infarction due to thrombosis of left cerebellar artery |
| I63349 | Cerebral infarction due to thrombosis of unspecified cerebellar artery |
| I6339 | Cerebral infarction due to thrombosis of other cerebral artery |
| I6340 | Cerebral infarction due to embolism of unspecified cerebral artery |
| I63411 | Cerebral infarction due to embolism of right middle cerebral artery |
| I63412 | Cerebral infarction due to embolism of left middle cerebral artery |
| I63419 | Cerebral infarction due to embolism of unspecified middle cerebral artery |
| I63421 | Cerebral infarction due to embolism of right anterior cerebral artery |
| I63422 | Cerebral infarction due to embolism of left anterior cerebral artery |
| I63429 | Cerebral infarction due to embolism of unspecified anterior cerebral artery |
| I63431 | Cerebral infarction due to embolism of right posterior cerebral artery |

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|  |  | I63432 | Cerebral infarction due to embolism of left posterior cerebral artery |
| I63439 | Cerebral infarction due to embolism of unspecified posterior cerebral artery |
| I63441 | Cerebral infarction due to embolism of right cerebellar artery |
| I63442 | Cerebral infarction due to embolism of left cerebellar artery |
| I63449 | Cerebral infarction due to embolism of unspecified cerebellar artery |
| I6349 | Cerebral infarction due to embolism of other cerebral artery |
|  |  | I6350 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebral artery |
| I63511 | Cerebral infarction due to unspecified occlusion or stenosis of right middle cerebral artery |
| I63512 | Cerebral infarction due to unspecified occlusion or stenosis of left middle cerebral artery |
| I63519 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified middle cerebral artery |
| I63521 | Cerebral infarction due to unspecified occlusion or stenosis of right anterior cerebral artery |
| I63522 | Cerebral infarction due to unspecified occlusion or stenosis of left anterior cerebral artery |
| I63529 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified anterior cerebral artery |
|  |  | I63531 | Cerebral infarction due to unspecified occlusion or stenosis of right posterior cerebral artery |
| I63532 | Cerebral infarction due to unspecified occlusion or stenosis of left posterior cerebral artery |
| I63539 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified posterior cerebral artery |
| I63541 | Cerebral infarction due to unspecified occlusion or stenosis of right cerebellar artery |
| I63542 | Cerebral infarction due to unspecified occlusion or stenosis of left cerebellar artery |
| I63549 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebellar artery |
| I6359 | Cerebral infarction due to unspecified occlusion or stenosis of other cerebral artery |
| I636 | Cerebral infarction due to cerebral venous thrombosis, nonpyogenic |
| I638 | Other cerebral infarction |
| I639 | Cerebral infarction, unspecified |
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| Depression/A nxiety39 | ICD-9 | ICD-10 |
| Inclusion criteria: Depression, anxiety, stress reaction, and suicidal ideation attempt | |

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|  | 296.20 | Major depressive disorder, single episode –  unspecified | F32.9 | Major depressive disorder, single episode, unspecified |
| 296.22 | Major depressive disorder, single episode –  moderate | F32.1 | Major depressive disorder, single episode, moderate |
| 296.23 | Major depressive disorder, single episode – severe, without mention of psychotic behavior | F32.2 | Major depressive disorder, single episode, severe without psychotic features |
| 296.30 | Major depressive disorder, recurrent episode – unspecified | F33.9 | Major depressive disorder, recurrent, unspecified |
| 296.32 | Major depressive disorder, recurrent episode – moderate | F33.1 | Major depressive disorder, recurrent, moderate |
| 296.33 | Major depressive disorder, recurrent episode – severe, without mention of psychotic behavior | F33.2 | Major depressive disorder, recurrent severe without psychotic features |
| 300.00 | Anxiety state, unspecified | F41.9 | Anxiety disorder, unspecified |
| 300.01 | Panic disorder without  agoraphobia | F41.0 | Panic disorder  [episodic paroxysmal anxiety] without agoraphobia |
| 300.02 | Generalized anxiety disorder | F41.1 | Generalized anxiety disorder |

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|  | | | 300.09 | Other anxiety, dissociative, and  somatoform  disorders | | F41.8 | | Other specified anxiety disorders | |
| 300.21 | Agoraphobia with panic disorder | | F40.01 | | Agoraphobia with panic disorder | |
| 300.22 | Agoraphobia without mention of panic attacks | | F40.02 | | Agoraphobia without panic disorder | |
| 300.23 | Social phobia | | F40.10 | | Social phobia, unspecified | |
| 300.29 | Other isolated or specific phobias | | F40.218 | | Other animal type phobia | |
| F40.240 | | Claustrophobia | |
| F40.241 | | Acrophobia | |
| F40.8 | | Other phobic anxiety disorders | |
| 300.3 | Obsessivecompulsive disorders | | F42 | | Obsessivecompulsive disorder | |
| 300.4 | Dysthymic disorder | | F34.1 | | Dysthymic disorder | |
| 300.6 | Depersonalization disorder | | F48.1 | | Depersonalizationderealization  syndrome | |
| 300.7 | Hypochondriasis | | F45.21 | | Hypochondriasis | |
|  |  |  | | |  | |  | |
| F45.22 | | Body dysmorphic disorder | |

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|  | 300.81 | Somatization disorder | F45.0 | Somatization disorder |
| 300.82 | Undifferentiated somatoform disorder | F45.1 | Undifferentiated somatoform disorder |
| F45.9 | Somatoform disorder, unspecified |
| 300.89 | Other somatoform disorders | F45.8 | Other somatoform disorders |
| F48.8 | Other specified nonpsychotic mental disorders |
| 300.9 | Unspecified nonpsychotic mental disorder | F48.9 | Nonpsychotic mental disorder, unspecified |
| F99 | Mental disorder, not otherwise specified |
| 308.0 | Predominant disturbance of emotions | F43.0 | Acute stress reaction |
| 308.1 | Predominant disturbance of consciousness | F43.0 | Acute stress reaction |
| 308.2 | Predominant psychomotor disturbance | F43.0 | Acute stress reaction |
| 308.3 | Other acute reactions to stress | F43.0 | Acute stress reaction |
| 308.4 | Mixed disorders as reaction to stress | F43.0 | Acute stress reaction |
| 308.9 | Unspecified acute reaction to stress | F43.0 | Acute stress reaction |
| R45.7 | State of emotional shock and stress, unspecified |
| 309.0 | Adjustment disorder with depressed mood | F43.21 | Adjustment disorder with depressed mood |

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|  | 309.1 | Prolonged depressive reaction | F43.21 | Adjustment disorder with depressed mood | |
| 309.24 | Adjustment disorder with anxiety | F43.22 | Adjustment disorder with anxiety | |
| 309.28 | Adjustment disorder with mixed anxiety and depressed mood | F43.23 | Adjustment disorder with mixed  anxiety and depressed  mood | |
| 309.29 | Other adjustment reactions with predominant disturbance of other emotions | F43.29 | Adjustment disorder with other  symptoms | |
| F94.8 | Other childhood disorders of social functioning | |
| 309.3 | Adjustment disorder with disturbance of conduct | F43.24 | Adjustment disorder with disturbance of conduct | |
|  |  |  |  | |  |
| 309.4 | Adjustment disorder with mixed disturbance of emotions and conduct | F43.25 | | Adjustment disorder with mixed  disturbance of emotions  and conduct |
| 309.81 | Posttraumatic stress disorder | F43.10 | | Post-traumatic stress disorder, unspecified |
| F43.12 | | Post-traumatic stress disorder, chronic |
| 309.82 | Adjustment reaction with physical symptoms | F43.8 | | Other reactions to severe stress |
| 309.83 | Adjustment reaction with withdrawal | F43.8 | | Other reactions to severe stress |

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|  | 309.89 | Other specified adjustment reactions | F43.8 | Other reactions to severe stress |
| 309.9 | Unspecified adjustment reaction | F43.20 | Adjustment disorder, unspecified |
| 311 | Depressive disorder, not elsewhere classified | F32.9 | Major depressive disorder, single episode, unspecified |
| V6284 | Suicidal Ideation | R45851 | Suicidal Ideations |
| E950.0 | Suicide and selfinflicted poisoning by analgesics, antipyretics, and antirheumatics |  | |
| E950.1 | Suicide and self-  inflicted poisoning by barbiturates |
| E950.2 | Suicide and selfinflicted poisoning by other sedatives and hypnotics |
| E950.3 | Suicide and selfinflicted poisoning by tranquilizers and other psychotropic agents |
| E950.4 | Suicide and self-inflicted poisoning by other specified drugs and medicinal substances |
| E950.5 | Suicide and selfinflicted poisoning by unspecified drug or medicinal substances |
| E950.6 | Suicide and selfinflicted poisoning by agricultural and horticultural chemical and pharmaceutical preparations other  than plant foods and  fertilizers |

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|  | E950.7 | Suicide and self-inflicted poisoning by corrosive and caustic substances |  |
| E950.8 | Suicide and selfinflicted  poisoning by arsenic  and its  compounds |
| E950.9 | Suicide and selfinflicted poisoning by other and unspecified solid and liquid substances |
|  | E951.0 | Suicide and selfinflicted poisoning by gas disturbed by pipeline |  |
| E951.1 | Suicide and selfinflicted poisoning by liquefied petroleum gas distributed in mobile containers |
| E951.8 | Suicide and self-  inflicted poisoning by other utility gas |
| E952.0 | Suicide and selfinflicted poisoning by motor vehicle exhaust gas |
| E952.1 | Suicide and selfinflicted poisoning by other carbon monoxide |
| E952.8 | Suicide and self-inflicted poisoning by other specified gases and vapors |
| E952.9 | Suicide and selfinflicted poisoning by unspecified gases and vapors |
| E953.0 | Suicide and selfinflicted injury by hanging |

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|  | E953.1 | Suicide and selfinflicted injury by suffocation by plastic bag | |  |  |
| E953.8 | Suicide and selfinflicted injury by other specified means | |
| E953.9 | Suicide and selfinflicted injury by  hanging, strangulation, and suffocation – unspecified means | |
| E954 | Suicide and  inflicted injury submersion [drowning] | selfby | X71.8X XA | Other intentional selfharm by drowning and submersion, initial encounter |
| X71.9X XA | Intentional self-harm by drowning and submersion, unspecified,  initial  encounter |
| E955.0 | Suicide and | self- |  |  |
|  |  | inflicted injury handgun | by |  |  |
| E955.1 | Suicide and  inflicted injury shotgun | selfby | X73.0X  XA | Intentional self-harm by shotgun  discharge, initial  encounter |
| E955.2 | Suicide and  inflicted injury hunting rifle | selfby | X72.XX  XA | Intentional self-harm by handgun discharge, initial  encounter |
| E955.4 | Suicide and selfinflicted injury by other and  unspecified firearms | | X73.9X  XA | Intentional self-harm by unspecified larger firearm discharge, initial  encounter |
| E955.5 | Suicide and selfinflicted injury by explosives | | X75.XX  XA | Intentional self-harm by explosive material, initial encounter |

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|  | E955.6 | Suicide and selfinflicted injury by air gun | | X74.01  XA | | Intentional self-harm by airgun, initial encounter | |
| E955.9 | Suicide and selfinflicted injury by unspecified firearms, air guns, and explosives | | X74.9X  XA | | Intentional self-harm by unspecified firearm  discharge, initial encounter | |
| E956 | Suicide and selfinflicted injury by cutting and piercing instruments | | X78.9X  XA | | Intentional self-harm by unspecified sharp object,  initial encounter | |
| E957.0 | Suicide and selfinjuries by jumping residential premises | inflicted from | X80.XX  XA | | Intentional self-harm by jumping from a high place, initial encounter | |
| Y92.00  9 | | Unspecified place in unspecified noninstitutional (private) residence as the place of occurrence of the external cause | |
| E957.1 | Suicide and selfinflicted injuries by jumping from other man-made structures |  | X80.XX  XA | | Intentional self-harm by jumping from a high place, initial encounter | |
| Y92.89 | | Other specified places as the place of occurrence of the external cause | |
| E957.2 | Suicide and selfinflicted injuries by  jumping from natural  sites |  | X80.XX  XA | | Intentional self-harm by jumping from  a high place, initial  encounter | |
| Y92.82  8 | | Other wilderness area as the place of occurrence of the external cause | |

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|  |  |  | Y92.83  8 | | Other recreation area as the place of occurrence of the external cause | |
| E957.9 | Suicide and selfinflicted injuries by jumping from unspecified high  place | X80.XX  XA | | Intentional self-harm by jumping from  a high place, initial  encounter | |
| Y92.9 | | Unspecified place or not applicable | |
| E958.0 | Suicide and selfinflicted injury by jumping or lying before a moving object | X81.8X  XA | | Intentional self-harm by jumping or lying in front of other moving object, initial encounter | |
| E958.1 | Suicide and selfinflicted injury by  burns, fire | X76.XX  XA | | Intentional self-harm by smoke, fire and flames, initial encounter | |
| E958.2 | Suicide and selfinflicted injury by  scald | X77.2X  XA | | Intentional self-harm by other hot  fluids, initial encounter | |
| E958.3 | Suicide and selfinflicted injury by extremes of cold | X83.2X  XA | | Intentional self-harm by exposure to extremes of cold, initial encounter | |
| E958.4 | Suicide and selfinflicted injury by electrocution | X83.1X XA | | Intentional self-harm by electrocution, initial encounter | |
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| E958.5 | Suicide and selfinflicted injury by crashing of motor  vehicle | | X82.8X  XA | | Other intentional selfharm by crashing of motor vehicle, initial  encounter |
| E958.7 | Suicide and selfinflicted injury by caustic substances, except poisoning | | X83.8X  XA | | Intentional self-harm by other specified means, initial encounter |

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|  | E958.8 | Suicide and selfinflicted injury by other and specified means | X83.8X  XA | Intentional self-harm by other specified means, initial encounter |
| Exclusion Criteria: Psychoses or bipolar disorders | | | |
| 296.00 | Bipolar I disorder, single manic episode  – unspecified | F30.10 | Manic episode without psychotic symptoms,  unspecified |
| 296.03 | Bipolar I disorder, single manic episode – severe, without mention of psychotic behavior | F30.13 | Manic episode, severe, without  psychotic symptoms |
| 296.04 | Bipolar I disorder, single manic episode – severe, specified as with psychotic behavior | F30.2 | Manic episode, severe with psychotic  symptoms |
| 296.10 | Manic disorder, recurrent episode – unspecified | F30.10 | Manic episode without psychotic symptoms,  unspecified |
| 296.13 | Manic disorder, recurrent episode – severe, without mention of psychotic behavior | F30.13 | Manic episode, severe, without  psychotic symptoms |
| 296.14 | Manic disorder, recurrent episode – severe, specified as with psychotic behavior | F30.2 | Manic episode, severe with psychotic  symptoms |
| 296.24 | Major depressive disorder, single episode – severe, specified as with psychotic behavior | F32.3 | Major depressive disorder, single  episode, severe with  psychotic features |
| 296.34 | Major depressive disorder, recurrent episode – severe, specified as with psychotic behavior | F33.3 | Major depressive disorder, recurrent,  severe with psychotic  symptoms |
| 296.40 | Bipolar I disorder; most recent episode | F31.10 | Bipolar disorder, current episode manic without |

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|  |  | (or current) manic – unspecified | |  | psychotic features, unspecified | |
| 296.41 | Bipolar I disorder; most recent episode (or current) manic – mild | | F31.11 | Bipolar disorder, current episode manic without psychotic features, mild | |
| 296.42 | Bipolar I disorder; most recent episode (or current) manic – moderate | | F31.12 | Bipolar disorder, current episode manic without psychotic features, moderate | |
| 296.43 | Bipolar I disorder; most recent episode (or current) manic – severe, without mention of psychotic behavior | | F31.13 | Bipolar disorder, current episode manic without psychotic features, severe | |
| 296.44 | Bipolar I disorder; most recent episode (or current) manic – severe, specified as with psychotic disorder | | F31.2 | Bipolar disorder, current episode manic severe with psychotic features | |
|  | 296.50 | | Bipolar I disorder; most recent episode  (or current) depressed – unspecified | F31.30 | | Bipolar disorder, current episode depressed, mild or moderate severity, unspecified |
| 296.52 | | Bipolar I disorder; most recent episode  (or current) depressed – moderate | F31.32 | | Bipolar disorder, current episode depressed,  moderate |
| 296.53 | | Bipolar I disorder; most recent episode  (or current) depressed – severe, without mention of psychotic behavior | F31.4 | | Bipolar disorder, current episode depressed, severe, without psychotic features |
| 296.54 | | Bipolar I disorder; most recent episode  (or current) depressed – severe, specified as with psychotic disorder | F31.5 | | Bipolar disorder, current episode depressed, severe, with psychotic features |

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|  | 296.60 | Bipolar I disorder; most recent episode (or current) mixed – unspecified | F31.60 | Bipolar disorder, current episode mixed, unspecified |
| 296.62 | Bipolar I disorder; most recent episode (or current) mixed – moderate | F31.62 | Bipolar disorder, current episode  mixed, moderate |
| 296.63 | Bipolar I disorder; most recent episode (or current) mixed – severe, without mention of psychotic behavior | F31.63 | Bipolar disorder, current episode mixed, severe, without psychotic  features |
| 296.64 | Bipolar I disorder; most recent episode (or current) mixed – severe, specified as with psychotic disorder | F31.64 | Bipolar disorder, current episode  mixed, severe, with  psychotic features |
| 296.7 | Bipolar I disorder; most recent episode  (or current) unspecified | F31.9 | Bipolar disorder, unspecified |
| 296.80 | Bipolar disorder, unspecified | F31.9 | Bipolar disorder, unspecified |
| 296.90 | Unspecified episodic mood disorder | F39 | Unspecified mood  [affective] disorder |
| 296.99 | Other specified episodic mood disorder | F34.8 | Other persistent mood  [affective] disorders |
| 295.00 | Simple type schizophrenia – unspecified | F20.89 | Other schizophrenia |
| 295.01 | Simple type schizophrenia – subchronic | F20.89 | Other schizophrenia |
| 295.02 | Simple type schizophrenia – chronic | F20.89 | Other schizophrenia |
| 295.03 | Simple type schizophrenia – | F20.89 | Other schizophrenia |

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|  | |  | | subchronic with  acute |  | |  |
| 295.04 | | exacerbation Simple type schizophrenia – chronic with acute | F20.89 | | Other schizophrenia |
| 295.05 | | exacerbation Simple  type schizophrenia – in remission | F20.89 | | Other schizophrenia |
| 295.10 | | Disorganized type schizophrenia – unspecified | F20.1 | | Disorganized schizophrenia |
|  | 295.11 | | Disorganized type schizophrenia – subchronic | | F20.1 | Disorganized schizophrenia | |
| 295.12 | | Disorganized type schizophrenia – chronic | | F20.1 | Disorganized schizophrenia | |
| 295.13 | | Disorganized type schizophrenia – subchronic with acute exacerbation | | F20.1 | Disorganized schizophrenia | |
| 295.14 | | Disorganized type schizophrenia – chronic with acute exacerbation | | F20.1 | Disorganized schizophrenia | |
| 295.15 | | Disorganized type schizophrenia – in remission | | F20.1 | Disorganized schizophrenia | |
| 295.20 | | Catatonic type schizophrenia – unspecified | | F20.2 | Catatonic schizophrenia | |
| 295.21 | | Catatonic type schizophrenia – subchronic | | F20.2 | Catatonic schizophrenia | |
| 295.22 | | Catatonic type schizophrenia – chronic | | F20.2 | Catatonic schizophrenia | |
| 295.23 | | Catatonic type schizophrenia – subchronic with acute exacerbation | | F20.2 | Catatonic schizophrenia | |

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|  | 295.24 | Catatonic type schizophrenia – chronic with acute exacerbation | F20.2 | Catatonic schizophrenia |
| 295.30 | Paranoid type schizophrenia – unspecified | F20.0 | Paranoid schizophrenia |
| 295.31 | Paranoid type schizophrenia – subchronic | F20.0 | Paranoid schizophrenia |
| 295.32 | Paranoid type schizophrenia – chronic | F20.0 | Paranoid schizophrenia |
| 295.33 | Paranoid type schizophrenia – subchronic with acute exacerbation | F20.0 | Paranoid schizophrenia |
| 295.34 | Paranoid type schizophrenia – chronic with acute exacerbation | F20.0 | Paranoid schizophrenia |
| 295.35 | Paranoid type schizophrenia – in remission | F20.0 | Paranoid schizophrenia |
| 295.40 | Schizophreniform disorder – unspecified | F20.81 | Schizophreniform disorder |
| 295.41 | Schizophreniform disorder – subchronic | F20.81 | Schizophreniform disorder |
| 295.42 | Schizophreniform disorder – chronic | F20.81 | Schizophreniform disorder |
| 295.43 | Schizophreniform disorder – subchronic with acute exacerbation | F20.81 | Schizophreniform disorder |
| 295.44 | Schizophreniform disorder – chronic with acute exacerbation | F20.81 | Schizophreniform disorder |
| 295.45 | Schizophreniform disorder – in remission | F20.81 | Schizophreniform disorder |
| 295.50 | Latent schizophrenia – unspecified | F20.89 | Other schizophrenia |

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|  | 295.53 | Latent schizophrenia – subchronic with acute exacerbation | F20.89 | Other schizophrenia |
| 295.54 | Latent schizophrenia – chronic with acute exacerbation | F20.89 | Other schizophrenia |
|  | 295.60 | Residual type schizophrenia – unspecified | F20.5 | Residual schizophrenia |
| 295.62 | Residual type schizophrenia – chronic | F20.5 | Residual schizophrenia |
| 295.63 | Residual type schizophrenia – subchronic with acute exacerbation | F20.5 | Residual schizophrenia |
| 295.64 | Residual type schizophrenia – chronic with acute exacerbation | F20.5 | Residual schizophrenia |
| 295.65 | Residual type schizophrenia – in remission | F20.5 | Residual schizophrenia |
| 295.70 | Schizoaffective disorder – unspecified | F25.9 | Schizoaffective disorder, unspecified |
| 295.71 | Schizoaffective disorder – subchronic | F25.9 | Schizoaffective disorder, unspecified |
| 295.72 | Schizoaffective disorder – chronic | F25.9 | Schizoaffective disorder, unspecified |
| 295.73 | Schizoaffective disorder – subchronic with acute exacerbation | F25.9 | Schizoaffective disorder, unspecified |
| 295.74 | Schizoaffective disorder – chronic with acute exacerbation | F25.9 | Schizoaffective disorder, unspecified |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 295.75 | Schizoaffective disorder – in remission | F25.9 | Schizoaffective disorder, unspecified |
| 295.80 | Other specified types of schizophrenia – unspecified | F20.89 | Other schizophrenia |
| 295.82 | Other specified types of schizophrenia – chronic | F20.89 | Other schizophrenia |
| 295.83 | Other specified types of schizophrenia – subchronic with acute exacerbation | F20.89 | Other schizophrenia |
| 295.84 | Other specified types of schizophrenia – chronic with acute exacerbation | F20.89 | Other schizophrenia |
| 295.85 | Other specified types of schizophrenia – in remission | F20.89 | Other schizophrenia |
| 295.90 | Unspecified schizophrenia – unspecified | F20.9 | Schizophrenia, unspecified |
| 295.91 | Unspecified schizophrenia – subchronic | F20.9 | Schizophrenia, unspecified |
| 295.92 | Unspecified schizophrenia – chronic | F20.9 | Schizophrenia, unspecified |
| 295.93 | Unspecified schizophrenia – subchronic with acute exacerbation | F20.9 | Schizophrenia, unspecified |
| 295.95 | Unspecified schizophrenia – in remission | F20.9 | Schizophrenia, unspecified |
| 297.0 | Paranoid state, simple | F22 | Delusional disorders |
|  | 297.1 | Delusional disorder | F22 | Delusional disorders |
| 297.2 | Paraphrenia | F22 | Delusional disorders |
|  |  |  |  |  |
| 297.3 | Shared psychotic disorder | F24 | Shared psychotic disorder |
| 297.8 | Other specified paranoid states | F22 | Delusional disorders |
| 297.9 | Unspecified paranoid state | F23 | Brief psychotic disorder |
| 298.0 | Depressive type psychosis | F32.3 | Major depressive disorder, single  episode, severe with  psychotic features |
| F33.3 | Major depressive disorder, recurrent,  severe with psychotic  symptoms |
| 298.1 | Excitative type psychosis | F28 | Other psychotic disorder not due to a substance or known physiological  condition |
| 298.2 | Reactive confusion | F44.89 | Other dissociative and conversion disorders |
| 298.3 | Acute paranoid reaction | F23 | Brief psychotic disorder |
| 298.4 | Psychogenic paranoid psychosis | F23 | Brief psychotic disorder |
| 298.8 | Other and unspecified reactive psychosis | F23 | Brief psychotic disorder |
| 298.9 | Unspecified psychosis | F29 | Unspecified psychosis not due to a substance or known physiological  condition |

\* The character ‘x’ to the right of a decimal point indicates digits must be added to the preceding digits to create a billable code. The use of ‘x’ in ICD-10 codes indicates that all codes falling under the preceding head digits are to be included for the analysis.

#### Appendix 5. Table shells for Aim 1

Table 2. Demographic characteristics of the diabetes population using Hospital Inpatient or Emergency Department settings, years 2008, 2011, 2014, 2016

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Year | Change 2008-2016 | |
| 2008 2011 | 2014 2016 | Absolute Change | % Change |
| Age, years, n (%)  18-29  30-44  45-64  64-74 75+  Sex, n (%)  Female  Male  Race, n (%)  White  Black  Hispanic  Asian or Pacific  Islander  Native American  Region, n (%)  Northeast  Midwest  South  West  Rural/Urban, n (%)  Rural  Urban  Insurance, n (%)  Medicare  Medicaid  Private Insurance  Self-pay  No Charge  Other  Comorbidities, n (%)  Macrovascular  Microvascular  Depression/Anxiety |  |  |  |

Denominators for rates are from the Behavioral Risk Factor Surveillance Survey. Rates have been age-standardized to the U.S.

population in the year 2010

Table 3. Number of Hospital Inpatient Stays among diabetes mellitus population, years 2008, 2011, 2014, 2016

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Year | Change 2008-2016 | |
| 2008 2011 | 2014 2016 | Absolute Change | % Change |
| Age, years, n (%)  18-29  30-44  45-64  64-74  75+  Sex, n (%)  Female  Male  Race, n (%)  White  Black  Hispanic  Asian or Pacific  Islander  Native American Region, n (%)  Northeast  Midwest  South  West  Rural/Urban, n (%)  Rural  Urban  Insurance, n (%)  Medicare  Medicaid  Private Insurance  Self-pay  No Charge  Other  Comorbidities, n (%)  Macrovascular  Microvascular  Depression/Anxiety |  |  |  |

Denominators for rates are from the Behavioral Risk Factor Surveillance Survey. Rates have been age-standardized to the U.S.

population in the year 2010

Table 4. Number of ED Visits among diabetes mellitus population, years 2008, 2011, 2014, 2016

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Year | Change 2008-2016 | |
| 2008 2011 | 2014 2016 | Absolute Change | % Change |
| Age, years, n (%)  18-29  30-44  45-64  64-74  75+  Sex, n (%)  Female  Male  Race, n (%)  White  Black  Hispanic  Asian or Pacific  Islander  Native American  Region, n (%)  Northeast  Midwest  South  West  Rural/Urban, n (%)  Rural  Urban  Insurance, n (%)  Medicare  Medicaid  Private Insurance  Self-pay  No Charge  Other  Comorbidities, n (%)  Macrovascular  Microvascular  Depression/Anxiety |  |  |  |

Denominators for rates are from the Behavioral Risk Factor Surveillance Survey. Rates have been age-standardized to the U.S.

population in the year 2010

Table 5. Rate of Hospital Inpatient Stays per 1000 people with diabetes mellitus, years 2008, 2011, 2014, 2016

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Year | Change 2008-2016 | |
| 2008 2011 | 2014 2016 | Absolute Change | % Change |
| Age, years  18-29  30-44  45-64  64-74 75+  Sex  Female  Male  Race  White  Black  Hispanic  Asian or Pacific  Islander  Native American  Region  Northeast  Midwest  South  West  Rural/Urban  Rural  Urban  Insurance  Medicare  Medicaid  Private Insurance  Self-pay  No Charge  Other  Comorbidities  Macrovascular  Microvascular  Depression/Anxiety |  |  |  |

Denominators for rates are from the Behavioral Risk Factor Surveillance Survey. Rates have been age-standardized to the U.S.

population in the year 2010

Table 6. Rate of ED Visits per 1000 people with diabetes mellitus, years 2008, 2011, 2014, 2016

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Year | Change 2008-2016 | |
| 2008 2011 | 2014 2016 | Absolute Change | % Change |
| Age, years  18-29  30-44  45-64  64-74  75+  Sex  Female  Male  Race  White  Black  Hispanic  Asian or Pacific  Islander  Native American  Region  Northeast  Midwest  South  West  Rural/Urban  Rural  Urban  Insurance  Medicare  Medicaid  Private Insurance  Self-pay  No Charge  Other  Comorbidities  Macrovascular  Microvascular  Depression/Anxiety |  |  |  |

Denominators for rates are from the Behavioral Risk Factor Surveillance Survey. Rates have been age-standardized to the U.S.

population in the year 2010

Table 7. Age- and Sex- Adjusted Rates of Emergency Department Visits and Hospital Inpatient

Use (per 1000 persons) among US Adult Population with and without Diabetes from 2008-2017

|  |  |  |  |
| --- | --- | --- | --- |
| Diabetes  ED Visits  Ratio |  | Rates (95% C.I.) |  |
| 2008\* | 2011 2014 | 2016/2017 |
| X |  |  |
| Inpatient Stays Ratio | X |  |  |
| Non-Diabetes  ED Visits Ratio | X |  |  |
| Inpatient Stays  Ratio    Diabetes/Non-Diabetes  ED Visits  Inpatient Stays | X | Rate Ratio (95% C.I.) |  |
|  |  |  |

All rates are age- and sex-standardized to the 2010 US Adult Population without Diabetes

1. Ratios reflect rate ratios and 95% C.I. using 2008 rates as reference
2. Reflects rate ratios using non-Diabetes health service use rates as reference

##### Appendix 6. Table Shells for Aim 2 Results

Table 8. Age-Standardized Rates of Potentially Preventable Hospitalizations among U.S. Adults with Diagnosed Diabetes

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Year | Change 2008-2016 | |
| 2008 2011 | 2014 2016 | Absolute Change | % Change |
| Short Term Diabetes  Complications  No. of Cases  No./1000 persons with  Diabetes    Long-Term Diabetes  Complications  No./1000 persons with  Diabetes    Uncontrolled Diabetes without  Complications  No./1000 persons with  Diabetes    Diabetes-related Lower-  Extremity Amputations  No./1000 persons with  Diabetes    Lower Extremity  Ulcers/inflammation/infections    No./1000 persons with  Diabetes    Hypoglycemia  No./1000 persons with  Diabetes    Lower Extremity  Ulcers/inflammation/infections    No./1000 persons with  Diabetes  Microvascular  Depression/Anxiety |  |  |  |

Denominators for rates are from the Behavioral Risk Factor Surveillance Survey. Rates have been age-standardized to the U.S.

population in the year 2010

Table 9. % Change in rates of Potentially Preventable Hospitalizations by Sociodemographic Factors from 20082016

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Short-Term  Diabetes  Complications | Long-Term  Diabetes  Complications | Uncontrolled  Diabetes without Complications | Diabetes-related  Lower-Extremity  Amputations |
| Age, years  18-29  30-44  45-64  64-74  75+  Sex  Female  Male  Race  White  Black  Hispanic  Asian or Pacific  Islander  Native American  Region  Northeast  Midwest  South  West  Rural/Urban  Rural  Urban  Insurance  Medicare  Medicaid  Private Insurance  Self-Pay  No Charge  Other  Comorbidities  Macrovascular  Microvascular  Depression/  Anxiety |  |  |  |  |

##### Appendix 7. Table Shells for Aim 3 Results

Table 10. Demographic characteristics of sample, years 2008, 2011, 2014, 2016

|  |  |
| --- | --- |
| Variable | Year |
| 2008 2011 | 2014 2016 |

Total database population

All patients with Diabetes, n

Age, years

Mean (SD)

Range

Sex, n (%) Female

Male

Geographic Region, n (%)

Northeast Midwest South

West

Race, n (%)

White

Black

Other

Insurance, n (%)

Medicare

Medicaid

Private Insurance

Self-Pay

No Charge Other

Comorbidities, n (%)

Macrovascular

Microvascular

Depression/Anxiety

Table 11. Number of People with Diabetes Prescribed Cardiovascular-Modifying and Antidepressant Medications in Years 2008, 2011, 2014, and 2016

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2008 | 2011 | 2014 | 2016 | Absolute Change | %  Change |
| n (%) | n (%) | n (%) | n (%) |  |  |

Antihyperglycemic agents

Antihyperlipidemic agents

Antihypertensive agents

Antiplatelet agents

Antidepressant/

Anxiolytic Agents

Table 12. % Change in Cardiovascular-Modifying Drugs Prescribed to People with Diabetes by Sociodemographic Characteristics from 2008-2016

Antihyperglycemic Hyperlipidemia Hypertension Antiplatelets

Drugs Agents Agents

Age, years

18-44

45-64

65+

Sex

Female

Male

Geographic Region

Northeast Midwest South

West

Race

White

Black

Other

Insurance

Medicare

Medicaid

Private Insurance

Self-Pay

No Charge Other

Comorbidities, n (%)

Macrovascular

Microvascular

Depression/Anxiety

**12 Attachments**

[Link to HCEI Form 2 Template](https://collaboration.merck.com/:w:/r/sites/coredrc/Reference%20Documents/Training%20Materials/HCEI%20%20Form%202%20-%20CORE%20certification%20and%20checklist%20to%20support%20US%20PRT.docx?d=w1811c5a525ae46ab920a98551b957113&csf=1&e=nex0Kh)



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# 13 SIGNATURES

#### 13.1 Sponsor's Representative

|  |  |
| --- | --- |
| PRINTED NAME |  |
| TITLE |  |
| SIGNATURE |  |
| DATE SIGNED |  |

#### 13.2 Investigator

I agree to conduct this study in accordance with the design outlined in this protocol and to abide by all provisions of this protocol (including other manuals and documents referenced from this protocol); changes from the protocol are acceptable only with a mutually agreed upon protocol amendment. I agree to conduct the study in accordance with generally accepted standards of Good Pharmacoepidemiology Practice. I also agree to report all information or data in accordance with the protocol and, in particular, I agree to report any serious adverse experiences as defined in Section 6 – Safety Reporting and Related Procedures. I understand that information that identifies me will be used and disclosed as described in the protocol, and that such information may be transferred to countries that do not have laws protecting such information. Since the information in this protocol is confidential, I understand that its disclosure to any third parties, other than those involved in approval, supervision, or conduct of the study is prohibited. I will ensure that the necessary precautions are taken to protect such information from loss, inadvertent disclosure, or access by third parties.

|  |  |
| --- | --- |
| PRINTED NAME |  |
| TITLE |  |
| SIGNATURE |  |
| DATE SIGNED |  |

#### 13.3 Supplier

I agree to conduct this study in accordance with the design outlined in this protocol and to abide by all provisions of this protocol (including other manuals and documents referenced from this protocol); changes from the protocol are acceptable only with a mutually agreed upon protocol amendment. I agree to conduct the study in accordance with generally accepted standards of Good Pharmacoepidemiology Practice. I also agree to report all information or data in accordance with the protocol and, in particular, I agree to report any serious adverse experiences as defined in Section 6 – Safety and Product Quality Complaint Reporting and Related Procedures. I understand that information that identifies me will be used and disclosed as described in the protocol, and that such information may be transferred to countries that do not have laws protecting such information. Since the information in this protocol is confidential, I understand that its disclosure to any third parties, other than those involved in approval, supervision, or conduct of the study is prohibited. I will ensure that the necessary precautions are taken to protect such information from loss, inadvertent disclosure, or access by third parties.

|  |  |
| --- | --- |
| PRINTED NAME |  |
| TITLE |  |
| SIGNATURE |  |
| DATE SIGNED |  |