NON-INTERVENTIONAL (NI) STUDY PROTOCOL

Study information

Title	Comparative Clinical and Economic Outcomes among Venous Thromboembolism Patients who Initiated Apixaban or Warfarin in the United States Medicare Population
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Research question and objectives	**Clinical Perspective** **Aim 1:** Compare the demographic and clinical characteristics of patients who were prescribed apixaban or warfarin. **Aim: 2**: Compare both the incidence rates and the risk of major bleeding between patients who received apixaban versus warfarin. **Aim 3:** Compare both the incidence rates and the risk of CRNM between patients who received apixaban versus warfarin. **Aim 4:** Compare both the incidence rates and the risk of recurrent VTE events between patients who received apixaban versus warfarin. **Economic Perspective:** **Aim 1:** Compare major bleeding-related medical costs between patients who received apixaban versus warfarin. **Aim 2:** Compare recurrent VTE-related medical costs between patients who received apixaban versus warfarin.

	Aim 3: Compare all-cause HRU and costs among patients receiving apixaban and warfarin
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LIST OF ABBREVIATIONS

Abbreviation	**Definition**
AE	Adverse Event
BMS	Bristol-Myers Squibb
COPD	Chronic Obstructive Pulmonary Disease
CRNM	Clinically Relevant Non-Major
DOAC	Direct Oral Anticoagulant
DME	Durable Medical Equipment
DVT	Deep Vein Thrombosis
EDB	Enrollment Database
GHP	Group Health Plan
GLM	Generalized Linear Models
GPP	Good Pharmacoepidemiology Practices
HHA	Home Health Agency
HRU	Health Care Resource Utilization
HIPAA	Health Insurance Portability and Accountability Act
ICD-9-CM	International Classification of Disease, 9th Revision, Clinical Modification
ICD-10-CM	International Classification of Disease, 10th Revision, Clinical Modification
ICH	Intracranial Hemorrhage
INR	International Normalized Ratio
ISPE	International Society for Pharmacoepidemiology
IVC	Inferior Vena Cava
NDC	National Drug Codes
OAC	Oral Anticoagulant
PAC	Parenteral Anticoagulant
PE	Pulmonary Embolism
PPPM	Per Patient Per Month
PSM	Propensity Score Matching
SNF	Skilled Nursing Facility
US	United States

VTE	Venous Thromboembolism

1. RESPONSIBLE PARTIES

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ABSTRACT

Title: Comparative Clinical and Economic Outcomes among Venous Thromboembolism Patients Who Initiated Apixaban or Warfarin Therapies in the United States Medicare Population

Version: 1.0
Date of Protocol: June 7, 2018

Rationale and background: Venous thromboembolism (VTE) is a major cause of morbidity and mortality for hospitalized patients. The annual incidence of VTE is 1case per 1000 patients. Each year more than 600,000 hospitalizations and 100,000 deaths are attributed to VTE. The economic burden of VTE ranges between $13.5 and $27.2 billion per year. The prevalence of VTE increases with age, with older adults being more prone to VTE. Vitamin K antagonists (VKAs), such as warfarin, have been the treatment of choice for anticoagulation. New direct oral anticoagulants (DOACs) have emerged to treat VTE with equal efficacy to warfarin and less complex pharmacodynamics with limited need for routine monitoring. Apixaban is an oral factor Xa inhibitor. It eliminates the need for initial parenteral anticoagulant, thus simplifying the treatment of VTE. The AMPLIFY randomized clinical trial program demonstrated that a fixed-dose regimen of apixaban alone was associated with significantly less bleeding compared to the conventional therapy (subcutaneous enoxaparin, followed by warfarin) for VTE. In VTE patients who had completed 6-12 months of anticoagulation therapy, apixaban was found to be as efficacious as warfarin for the prevention of recurrent VTE.

This study will evaluate the patient profiles, current antithrombotic patterns, and real-world clinical & economic outcomes among patients with VTE.

Objectives:

Clinical Perspective:

Aim 1: Compare the demographic and clinical characteristics of patients who were prescribed apixaban or warfarin.

Aim: 2: Compare both the incidence rates and the risk (using Hazard ratios) of major bleeding between patients who received apixaban versus warfarin.

Aim 3: Compare both the incidence rates and the risk of CRNM between patients who received apixaban versus warfarin.

Aim 4: Compare both the incidence rates and the risk of recurrent VTE events between patients who received apixaban versus warfarin.

Economic Perspective:

Aim 1: Compare major bleeding-related medical costs between patients who received apixaban versus warfarin.

Aim 2: Compare recurrent VTE-related medical costs between patients who received apixaban versus warfarin.

Aim 3: Compare all-cause HRU and costs among patients receiving apixaban and warfarin.

Study design: The study will be a longitudinal retrospective cohort analysis using the CMS fee-for-service (FFS) Medicare database. The study period will be from March 1, 2014 through December 31, 2016 or until the last date of the data cut available at the time of execution of the study. The study allows for a 6-month baseline period prior to the index date in the identification period that will be from September 1, 2014 through December 31, 2016 or until the last date of the data cut available at the time of execution of the study. Patients will be required to have a VTE diagnosis in the first position and an apixaban or warfarin prescription claim within 30 days of the VTE event. Patients will be followed from the day after the index date until treatment discontinuation, treatment switch, death, disenrollment, end of study period, or 6-months after index date.

Population: Elderly (≥65 years) patients diagnosed with VTE in the Medicare population, who were prescribed apixaban or warfarin (bridging to warfarin) between September 1, 2014 and December 31, 2016 and had continuous health plan enrolment for 6 months prior to the prescription.

Variables: Demographic and clinical characteristics, clinical treatment patterns, economic outcomes, and clinical outcomes including major bleeding, CRNM, recurrent VTE, all-cause healthcare utilizations and costs will be compared between VTE patients who were prescribed apixaban or warfarin.

Data sources: The study will be conducted using member enrollment as well as medical and pharmacy claims from the Medicare database, a large national FFS claims database.

Study size: All eligible patients available for analysis will be included. Based on the AMPLIFY clinical trial, the rate of major bleeding is 0.6% corresponding to 6 months of follow-up for the apixaban group and 1.8% corresponding to 6 months of follow-up for the warfarin group. A survival analysis of major bleeding would need 1,926 patients in each group. The sample size calculation used the assumptions of an alpha of 0.05, power of 80%, an accrual period (ie, the time period when patients are identified until study end [01SEPT2014-31DEC2016]) of 1.3 years, and a loss of follow-up of 15% for the warfarin cohort and 15% for the apixaban cohort. This calculation assumes a uniform accrual and loss to follow-up during the identification period. To compute adjusted proportional HR in the propensity score matching (PSM) analysis, we will need robust variance estimation to be used; therefore, the sample size presented here may be overestimated.

Data analysis: Means, medians, and standard deviations will be provided for continuous variables. Numbers and percentages will be provided for dichotomous and polychotomous variables. Bivariate comparisons of baseline characteristics and outcomes measures will be provided. Appropriate tests (eg, t-test, chi-square test) will be used based on the distribution of the measure. The cumulative incidence rate for clinical outcomes (major bleeding, CRNM,

and recurrent VTE) will be calculated. Propensity score matching will be used to balance patient characteristics of the cohorts. Cox regression models will be used to evaluate the risk of clinical outcomes. Generalized linear models (GLM) and two-part models will be used to compare health care costs between the apixaban and warfarin cohorts. Data analysis will be executed using statistical software SAS version 9.3/9.4.

2. AMENDMENTS AND UPDATES

Amendment number	Date	Substantial or administrative amendment	Protocol section(s) changed	Summary of amendment(s)	Reason
N/A					

3. MILESTONES

Milestones	Planned Completion Date
Completion of protocol development	
Completion of main analysis for VTE	
Submit abstract	
Manuscript Submission	

4. RATIONALE AND BACKGROUND

Venous thromboembolism (VTE) includes deep vein thrombosis (DVT) and pulmonary embolism (PE) and is a major cause of morbidity and mortality in hospitalized patients.[1,2] Major surgical procedures including hip and knee replacement are the highest risk factors for VTE.[3] VTE is the third most common cause of vascular-related death following myocardial infarction (MI) and stroke.[4]

The annual incidence of VTE is 1 case per 1000 patients.[4]. Each year more than 600,000 hospitalizations and 100,000 deaths are attributed to VTE. **Error! Bookmark not defined.** The total per patient VTE treatment cost exceeds $20,000 during the first year following a VTE event.[5] As a result, the economic burden of VTE ranges between $13.5 and $27.2 billion per year.[6] The prevalence of VTE increases with age, as older adults are more prone to VTE. Patients with comorbid conditions such as extremity trauma, cancer, surgery, prolonged immobilization, and hormone therapy are at a greater risk for VTE.[7,8,9,10,11,12]

Vitamin K antagonists (VKAs), such as warfarin, have been the treatment of choice for anticoagulation. To maximize benefits and minimize complications (such as bleeding), warfarin therapy should be monitored and adjusted within a narrow therapeutic index of INR results.[13,14] The pharmacokinetic profile of warfarin is complex due to several drug-drug and drug-food interaction.[15] It is difficult to achieve long-term stability in warfarin patients due to fluctuating INR values in some patients, which may be caused by diet, seasonal variation, alcohol consumption, etc.[16] The need for regular monitoring, risk of hemorrhage, and poor control of INR levels may lead to medication non-adherence.[17, 18]

According to the American College of Chest Physician (ACCP) guidelines, DVT and PE patients should be initiated on anticoagulation therapy with a non-vitamin K antagonist oral anticoagulant (dabigatran, rivaroxaban, apixaban, or edoxaban) over a vitamin K antagonist (VKA).[19] Direct oral anticoagulants (DOACs) have emerged to treat VTE that have equal efficacy to warfarin and less complex pharmacodynamics with limited need for routine monitoring. DOACs, including dabigatran, apixaban, rivaroxaban, and edoxaban were approved in the Unites States for treatment of VTE and prevention of recurrence among VTE patients.

DOACs have emerged with two main drug classes namely the factor Xa inhibitors and the direct thrombin inhibitors. Apixaban is an oral factor Xa inhibitor. It eliminates the need for an initial parenteral anticoagulant, thus simplifying the treatment of VTE.[20] The AMPLIFY randomized clinical trial program demonstrated that a fixed-dose regimen (after administering 10mg twice daily for 7 days) of apixaban alone was associated with significantly less bleeding compared to the conventional therapy (subcutaneous enoxaparin, followed by warfarin) for VTE.[21] Among VTE patients who completed 6-12 months of anticoagulation therapy, apixaban was found to be efficacious for the prevention of recurrent VTE.**Error! Bookmark not defined.**'[21]

A comparative effectiveness study on VTE patients who were treated with apixaban versus warfarin is important to identify an effective treatment regimen for VTE. This protocol will

examine the rate of major bleeding, clinically non-relevant major bleeding (CRNM), recurrent VTE, corresponding costs associated with each of the events, healthcare resource utilization (HRU), and all-cause costs among Medicare enrollees diagnosed with VTE and prescribed warfarin or apixaban.

5. RESEARCH METHODS

The following aims will be addressed:

Clinical perspective:

Aim 1: Compare the demographic and clinical characteristics of patients who were prescribed apixaban or warfarin.

Aim 2: Compare both the incidence rates and the risk of major bleeding between patients who were prescribed apixaban versus warfarin.

Aim 3: Compare both the incidence rates and the risk of CRNM between patients who were prescribed apixaban versus warfarin.

Aim 4: Compare both the incidence rates and the risk of recurrent VTE events between patients who were prescribed apixaban versus warfarin.

Economic perspective:

Aim 1: Compare major bleeding-related medical costs between patients who were prescribed apixaban versus warfarin.

Aim 2: Compare recurrent VTE-related medical costs between patients who were prescribed apixaban versus warfarin.

Aim 3: Compare all-cause HRU and costs among patients who were prescribed apixaban and warfarin.

5.1. Study design

5.1.1. Key index period definitions

- **Study period:** The study period will range from March 1, 2014 through December 31, 2016 or until the last date of the data cut available at the time of execution of the study.

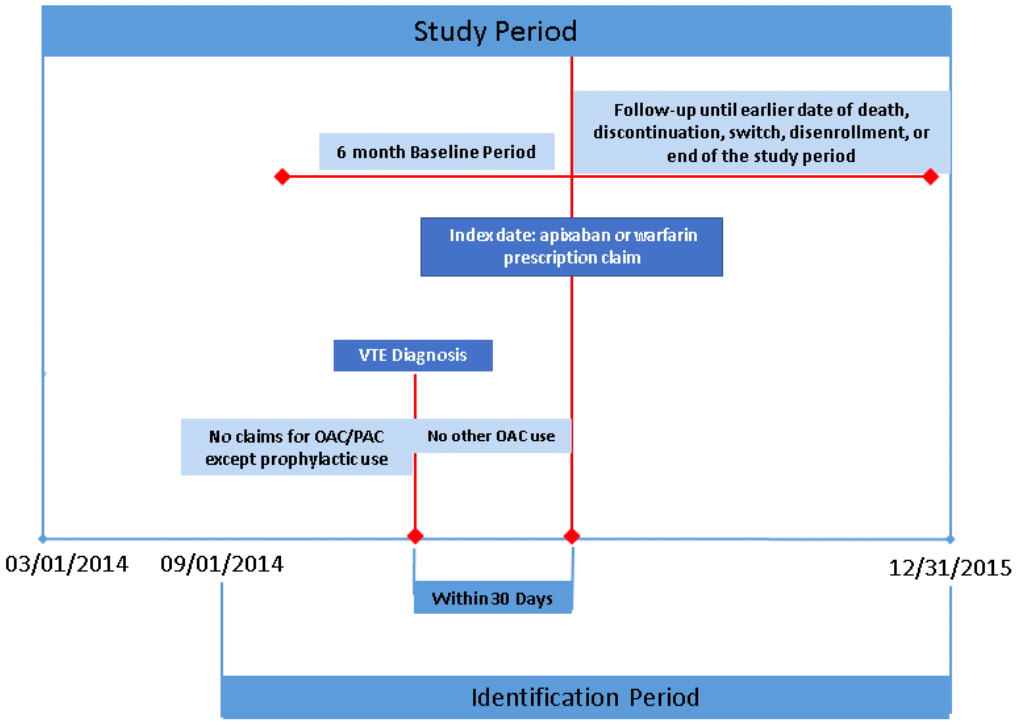
- **Patient identification period:** The identification period will range from September 1, 2014 through December 31, 2016 or until the last date of the data cut available at the time of execution of the study.

- **Baseline period:** The baseline period will be 6 months prior to the index date.
- **Follow-up period:** The follow-up period will be a maximum period of 6 months after the index date or until treatment discontinuation, treatment switch, death, health plan disenrollment, or end of study period, whichever occurred first.

5.1.2. Key index point definitions

- **Index encounter:** The first evidence of a VTE diagnosis in the primary or secondary position during the identification period for each patient will be designated as the index encounter.
- **Index therapy:** The first apixaban or warfarin treatment prescribed within 30 days from the index encounter will be designated as the index therapy.
- **Index date:** The first prescription claim date for the index therapy will be designated as the index date.

Figure 1. Study Design Figure (for illustration purposes, may not be proportionate)



5.2. Setting

Adult patients who were prescribed apixaban or warfarin will be selected from the Medicare database between September 1, 2014 and December 31, 2016 or until the last date available

at the time of study initiation. Patients will be required to have a VTE diagnosis in the primary or secondary position and an apixaban or warfarin prescription claim within 30 days of the VTE event. Patients will be required to have health plan enrollment for 6 months prior to and on the index date to ensure that the patients' complete medical history is available. Patients will be required to be at least 18 years of age on the index date.

Follow-up Period:

The follow-up period will be defined as the period between the day after the index date and end of study period (December 31, 2016) or last date of data available at the time of study initiation. Study outcomes will be assessed from the day after therapy initiation through the earliest of the subsequent 6-month period, health plan disenrollment, death, index therapy discontinuation, switch to another OAC, initiation of (new) parenteral anticoagulant (PAC) treatment, or end of study period.

Discontinuation will be defined as no evidence of index apixaban or warfarin use for 30 days from the last day of days' supply of last filled prescription.[22,] The discontinuation date will be the last day of days' supply of the last filled prescription. The follow-up will be censored at 30 days after the index drug discontinuation date.

VTE patients that receive a prescription for an OAC other than the index therapy during the follow-up period will be considered switchers if this OAC prescription is within ± 30 days of last days' supply. The follow-up will be censored at the switching of the index drug.

Episodes of parental anticoagulant (PAC) treatment will be differentiated based on a gap in therapy ≥2 days that occurs after index date plus 14 days.

5.2.1. Inclusion criteria

Patients will be included in the study if they:

a) had a medical claim with a primary or secondary VTE diagnosis in the inpatient or ambulatory setting during the identification period. If occurring in the outpatient setting, the index encounter date will be defined as the service date; if in the inpatients setting, the discharge date will be designated as the index encounter date. Qualifying outpatient encounters followed by qualifying inpatient encounters within 7 days will be considered an inpatient episode (unless warfarin or apixaban was initiated between encounters, in which case it would be classified as an outpatient encounter);

b) had ≥1 pharmacy claim for apixaban or warfarin during the 30-day period following the index encounter. The first warfarin or apixaban prescription date will be designated as the index date;

c) were aged ≥65 years as of the index date; and

d) had continuous medical and pharmacy health plan enrollment (Part A, B, and D) for at least 6 months prior to the index encounter until index date.

5.2.2. Exclusion criteria

Patients will be excluded from the study if they:

a) had evidence of AF/flutter during the 6-month period preceding the index date. Patients with AF will be excluded to account for OAC use associated with VTE diagnosis;

b) had evidence of mechanical heart valve during the 6-month period preceding the index date;

c) had evidence of chemotherapy/radiation therapy for malignancy (other than non-melanoma skin cancer) during the 6-month period preceding the index date. These patients will be excluded since the guidelines used for treating cancer patients are different than for non-cancer patients;

d) had evidence of receipt of another OAC/PAC on the index date (or during the period between the index encounter and the index date); these patients will be excluded since the study aims to capture and compare patients prescribed single therapy versus combination therapy;

e) had evidence of malignancy (other than non-melanoma skin cancer) during the 90-day period preceding the index date. These patients were excluded since the guidelines used for treating cancer patients are different than for non-cancer patients;

f) had evidence of VTE during the 6-month period preceding the index encounter since the study aims to capture new VTE patients;

g) had evidence of any OAC/ PAC use during the 6-month period preceding the index VTE encounter unless it is determined that such therapy was administered prophylactically (See Appendix 2);

   NOTE: Prophylactic use of OAC/PAC will be determined based on the duration of use and timing of use (eg, relative to knee/hip replacement surgery or medical inpatient admission); the operational algorithm to be employed to differentiate between prophylactic use and therapeutic use of OAC/PAC is set forth in Appendix 2;

h) had evidence of inferior vena cava (IVC) filter at any time during the study period;

i) warfarin patients with an index encounter requiring outpatient care only who did not have evidence of PAC use during the period beginning 14 days before, and ending 14 days after the index date will be excluded. Among warfarin patients who had

evidence of PAC use during this period, the subset who received it beyond the 14-day period following the index date will be excluded.

All codes for the selection criteria are detailed in the Table 1, Appendix 1.

5.2.3. Cohorts

After applying the inclusion and exclusion criteria, eligible patients will be assigned to the following cohorts based on index treatment:

- **Apixaban Cohort:** VTE patients who initiated apixaban on the index date; and
- **Warfarin Cohort:** VTE patients who initiated warfarin on the index date.

5.3. Variables

Baseline variables during the 6 months prior to and on the index date will be measured. Baseline variables will be evaluated using codes in any position (primary or secondary) unless noted otherwise. Outcome variables will be measured from the day after the index date.

Table 1. Baseline Demographic and Clinical Characteristic Variables

Variable	Operational Definition
Age	Age will be defined as of the index date and used to assign patients to the following age groups: 65-74, 75-79, and ≥80 years.
Sex	A flag will be created for female beneficiaries and reported as a percentage.
Race	Flags will be created for patients of different races: White, African American, Hispanic, and Other
US Geographic Region	The United States will be divided into five regions: Northeast, South, North Central, West, and Other. Geographic region will be captured from enrollment data.
Medicare/Medicaid Dual Eligibility	A flag will be created for patients that have Medicare/Medicaid dual eligibility and reported as a percentage
Part D low-income subsidy	A flag will be created for patients that have Part D low-income subsidy and reported as a percentage
Type of Index Encounter	Flags will be created for patients diagnosed with VTE in inpatient or ambulatory settings. Qualifying outpatient encounters followed by qualifying inpatient encounters within 7 days will be considered an inpatient episode (unless warfarin or apixaban was initiated between encounters, in which case it would be classified as an outpatient encounter.)
Position of VTE Diagnosis	Flags will be created for the position of VTE diagnosis including primary (principle diagnosis) or secondary position.
VTE Diagnosis	Flags will be created for the type of VTE diagnosis including DVT only, PE with DVT or PE without DVT.

Variable	Operational Definition
VTE Etiology	Flags will be created for VTE etiology including provoked or unprovoked. Provoked VTE will be defined as events that are preceded during the 3-month pre-index-encounter period by hormone therapy, fracture/trauma involving lower extremities, pelvic/orthopedic surgery, or hospitalization for any reason; unprovoked VTE will be defined as all events not classified as provoked. (See Table 5 Appendix 1 for codes)
AIDS	A flag will be created for patients with claims for AIDS. (See Table 6 Appendix 1 for codes)
Alcohol abuse	A flag will be created for patients with claims for alcohol abuse (See Table 6, Appendix 1 for codes)
Anemia	A flag will be created for patients with claims for anemia (See Table 6, Appendix 1 for codes)
Central venous Catheter	A flag will be created for patients with claims for central venous catheter (See Table 6, Appendix 1 for codes)
Cerebrovascular disease	A flag will be created for patients with claims for cerebrovascular disease. (See Table 6, Appendix 1 for codes)
Coagulopathy	A flag will be created for patients with claims for coagulopathy. (See Table 6, Appendix 1 for codes)
Ischemic heart/ coronary artery disease	A flag will be created for patients with claims for ischemic heart/coronary artery disease. (See Table 6, Appendix 1 for codes)
Dementia	A flag will be created for patients with claims for dementia. (See Table 6, Appendix 1 for codes)
Dyspepsia or stomach discomfort	A flag will be created for patients with claims for dyspepsia or stomach discomfort. (See Table 6 Appendix 1 for codes)
Hemiplegia or Paraplegia	A flag will be created for patients with claims for hemiplegia or paraplegia (See Table 6, Appendix 1 for codes)
Hyperlipidemia	A flag will be created for patients with claims for hyperlipidemia. (See Table 6, Appendix 1 for codes)
Obesity	A flag will be created for patients with claims for obesity (See Table 6, Appendix 1 for codes)
Pneumonia	A flag will be created for patients with claims for pneumonia. (See Table 6, Appendix 1 for codes)
Rheumatologic disease	A flag will be created for patients with claims for rheumatologic disease. (See Table 6, Appendix 1 for codes)
Sleep apnea	A flag will be created for patients with claims for sleep apnea. (See Table 6, Appendix 1 for codes)
Spinal cord injury	A flag will be created for patients with claims for spinal cord injury. (See Table 6, Appendix 1 for codes)
Thrombocytopenia	A flag will be created for patients with claims for thrombocytopenia. (See Table 6, Appendix 1 for codes)
Thrombophilia	A flag will be created for patients with claims for thrombophilia. (See Table 6,

Variable	Operational Definition
	Appendix 1 for codes)
Varicose Veins	A flag will be created for patients with claims for varicose veins. (See Table 6, Appendix 1 for codes)
Congestive Heart Failure	A flag will be created for patients with claims for congestive heart failure. (See Table 7 Appendix 1 for codes)
Diabetes	A flag will be created for patients with claims for diabetes (See Table 6, Appendix 1 for codes)
Hypertension	A flag will be created for patients with claims for hypertension. (See Table 6, Appendix 1 for codes)
Renal Disease	A flag will be created for patients with claims for renal disease A flag for chronic kidney disease stage V, end-stage renal disease, or dialysis will be created (See Table 6, Appendix 1 for codes)
Liver Disease	A flag will be created for patients with claims for liver disease. (See Table 6, Appendix 1 for codes)
COPD	A flag will be created for patients with claims for chronic obstructive pulmonary disease. (See Table 6, Appendix 1 for codes)
Peptic Ulcer Disease	A flag will be created for patients with claims for ulcer disease. (See Table 6, Appendix 1 for codes)
Inflammatory bowel disease	A flag will be created for patients with claims for inflammatory bowel disease. (See Table 6, Appendix 1 for codes)
Peripheral vascular disease	A flag will be created for patients with claims for peripheral vascular disease. (See Table 6, Appendix 1 for codes)
Recent history of falls	A flag will be created for patients having a fall and reported as a percentage (see Table 6, Appendix 1 for codes).
Fracture/trauma involving the lower extremities	A flag will be created for patients having a fracture or a trauma and reported as a percentage (see Table 6, Appendix 1 for codes).
Selected surgeries	A flag will be created for patients having a surgery and reported as a percentage (see Table 8, Appendix 1 for codes).
Baseline Deyo-Charlson Comorbidity Index	The Deyo-Charlson Comorbidity Index will be created (See Table 8, Appendix 1 for codes)
Other Baseline Medications	Flags will be created for patients with prescription fills for antiarrhythmic, statin, antiplatelet, aromatase inhibitors, beta blockers, gastroprotective agents, SERMS, NSAIDs, and hormone therapy (see Table 9, Appendix 1 for codes).
Healthcare Resource Utilization	All-cause utilization variables will be computed for inpatient, outpatient, ER, office, skilled nursing facility (SNF), durable medical equipment (DME), home health agency (HHA), hospice, and part D pharmacy claims.
Healthcare Costs	Health care cost will include total baseline all-cause costs and the components: inpatient, outpatient, ER, office, SNF, DME, HHA, hospice, and part D pharmacy.
Apixaban Index dose	Standard dose (apixaban 5 mg) and lower dose (apixaban 2.5 mg) based on dose of the initial prescription of apixaban.

Table 2. Clinical and Outcome Variables

Variable	Operational Definition
Major Bleeding	A major bleeding event observed during follow-up will be identified as a hospitalization with a major bleeding ICD-9-CM or ICD-10 diagnosis or procedure code as the principle diagnosis Major bleeding event will be a dichotomous variable that equals 1 if there was ≥1 bleeding event during the follow-up period. Time to the first major bleeding event will be calculated. Major bleeding will be stratified by gastrointestinal bleeding, intracranial hemorrhage, and other bleeding (See Table 10, Appendix 1 for codes).

Variable	Operational Definition
CRNM Bleeding	A CRNM bleeding event will be defined as: • An acute-care inpatient admission with a secondary diagnosis code for 'non-critical site' for GI bleeding, ICH bleeding or other selected types/sites of bleeding (without a principal diagnosis code for GI/ICH/other bleeding, or a procedure code for bleeding treatment); or • An ambulatory-care encounter with a diagnosis code for GI bleeding, ICH bleeding or other selected types/sites of bleeding (without a diagnosis code for ICH bleeding). (See Tables 11, Appendix 1 for codes)
Recurrent VTE	A recurrent VTE event will be identified as an acute-care inpatient admission with a corresponding principal diagnosis; admissions occurring within 7 days of the qualifying VTE event-irrespective of care setting- will not be considered in identifying new events. Secondary recurrent VTE: A recurrent VTE event will be identified as an acute-care inpatient admission with a corresponding principal diagnosis for DVT, PE, or atypical DVT (DVT at hepatic, portal, mesenteric, renal, cerebral, and multi-segmental);
Major Bleeding-related Costs	Follow-up major-bleeding medical costs will include the first major-bleeding hospitalization costs in the primary position plus costs related to all major-bleeding events (primary and secondary position) in the inpatient or outpatient setting after the first major bleed
Recurrent VTE-related Costs	Follow-up recurrent VTE medical costs will include the first recurrent VTE hospitalization costs in the primary position plus costs related to all recurrent VTE events (primary and secondary position) in the inpatient or outpatient setting after the recurrent VTE event
Follow-up All-cause Health Care Utilization	All-cause health care utilization in the follow-up period will be computed for inpatient, length of stay (LOS), outpatient, ER, office, SNF, DME, HHA, hospice, and part D pharmacy claims.
Follow-up All-cause Health Care Costs	All-cause health care costs in the follow-up period will be computed for inpatient, outpatient, ER, office, SNF, DME, HHA, hospice, and part D pharmacy costs. Costs will be adjusted to 2016 US dollars using the medical care component of the Consumer Price Index. Total medical and total health care costs will be calculated per patient per month (PPPM).
All-cause Death	All-cause death in the follow-up period will be evaluated. Death is validated by Social Security records that include the date of death.

5.4. Data source

100% CMS Medicare data will be used for the purposes of this analysis. The following files will be made use of in this study:

Medicare Inpatient Data

The inpatient claim file contains final action claims data submitted by inpatient hospital providers for reimbursement of facility costs. Some information contained in this file includes diagnosis (International Classification of Diseases, Ninth and Tenth Revision, Clinical Modification [ICD-9-CM and ICD-10-CM] diagnosis code, procedure (ICD-9 and ICD-10 procedure code), diagnosis-related group (DRG), dates of service, reimbursement amount, hospital provider, and beneficiary demographic information. Each observation in this file is at the claim level.

Medicare Outpatient Data

The outpatient claim file contains final action claims data submitted by institutional outpatient providers. Examples of institutional outpatient providers include hospital outpatient departments, rural health clinics, renal dialysis facilities, outpatient rehabilitation facilities, comprehensive outpatient rehabilitation facilities, and community mental health centers. Some information contained in this file includes diagnosis and procedure (ICD-9-CM diagnosis, ICD-9 procedure, ICD-10 diagnosis, ICD-10 procedure, Centers for Medicare and Medicaid Service [CMS] Healthcare Common Procedure Coding System [HCPCS] codes), dates of service, reimbursement amount, outpatient provider number, revenue center codes, and beneficiary demographic information. Each observation in this file is at the claim level.

Medicare Part D Drug Events (PDE) Data

The PDE data contains prescription drug costs and payment data (including out-of-pocket costs (co-payments and deductibles)) that enable CMS to make payments to the plans and otherwise administer Part D benefits. When a beneficiary fills a prescription under Medicare Part D, a prescription drug plan sponsor must submit a summary record to CMS. The PDE data are not the same as individual drug claim transactions, but are summary extracts using CMS-defined standard fields.

Skilled Nursing Facility (SNF) Research Identifiable File (RIF)

The SNF file contains final action, fee-for-service (FFS) claims data submitted by SNF providers. This file includes: ICD-9-CM and ICD-10-CM diagnosis and procedure codes, dates of service, reimbursement amount, SNF provider number, and beneficiary demographic information.

Home Health Agency (HHA) RIF

The HHA file contains final action, FFS claims submitted by HHA providers. This file includes: number of visits, type of visit (skilled nursing care, home health aides, physical therapy, speech therapy, occupational therapy, and medical social services), diagnosis (ICD-9-CM and ICD-10-CM diagnosis), date of visit, reimbursement amount, HHA provider number, and beneficiary demographic information.

Hospice RIF

The Hospice file contains final action claims submitted by hospice providers. Once a beneficiary elects hospice care, all hospice-related claims will be found in this file, regardless of if the beneficiary is in Medicare FFS or in a Medicare managed care plan. This file includes: level of hospice care received (eg, routine home care, inpatient respite care), terminal diagnosis (ICD-9-CM and ICD-10-CM diagnosis), dates of service, reimbursement amounts, hospice provider number, and beneficiary demographic information.

Durable Medical Equipment (DME) RIF

The DME file contains final action, FFS claims submitted by DME suppliers. This file includes: diagnosis (ICD-9-CM and ICD-10-CM diagnosis), services provided (CMS Common Procedure Coding System [HCPCS] codes), dates of service, reimbursement amounts, DME provider number, and beneficiary demographic information.

Medicare Carrier File

The Carrier file (also known as the Physician/Supplier Part B claims file) contains final action, FFS claims submitted on a CMS-1500 claim form. Most of the claims are from non-institutional providers, such as physicians, physician assistants, clinical social workers, and nurse practitioners. Claims for other providers, such as free-standing facilities, are also found in the Carrier file. Examples include independent clinical laboratories, ambulance providers and free-standing ambulatory surgical centers. This file includes diagnosis and procedure codes, dates of service, reimbursement amounts, provider numbers, and patient demographic information.

Medicare Denominator File

The denominator file contains demographic and enrollment information of Medicare beneficiaries enrolled and/or entitled in a given year. It combines Medicare beneficiary entitlement status information from administrative enrollment records with third-party payer information and group health plan (GHP) enrollment information. It is an abbreviated version of the enrollment database (EDB) (selected data elements).

Some information contained in this file includes the beneficiary's unique identifiers, state and county codes, ZIP codes, dates of birth, dates of death, sex, race, age, monthly entitlement indicators (A/B/both), reasons for entitlement, state buy-in indicators, and monthly managed care indicators (yes/no).

All Medicare files described above can be linked by de-identified patient ID, and will be included in the same CMS access request. Data are collected on an ongoing basis with the files constructed on an annual basis. It does not contain data on all beneficiaries ever entitled to Medicare. The file contains data only for beneficiaries who were entitled during the year of the data. These data are available annually in May of the current year for the previous year.

5.5. Study size

The sample size was calculated for survival analysis comparing the major bleeding rates between apixaban and warfarin patients using an alpha of 0.05, power of 80%, an accrual period (identification period when patients are selected into the study until end of study [01SEPT2014-31DEC2016]) of 1.3 years, and a loss of follow-up of 15% for the warfarin cohort and 15% for the apixaban cohort. This calculation assumes a uniform accrual and loss to follow-up during the identification period. Using the AMPLIFY clinical trial, with a major bleeding rate of 0.6% per year for the apixaban cohort and 1.9% per year in the warfarin group, a Cox proportional hazards analysis of major bleeding would require 1,926 patients in each group. The sample size and event rates will be evaluated prior to proceeding with the analysis to determine if there is sufficient power.

5.6. Data management

This study will use secondary data collected in the Medicare Database. The Medicare database is de-identified and HIPAA compliant.

5.7. Data analysis

Means, medians, and standard deviations will be provided for continuous variables when performing descriptive analysis of continuous data. Numbers and percentages will be provided for dichotomous and polychotomous variables when performing descriptive analysis of categorical data. Bivariate comparisons of baseline characteristics and outcomes measures will be provided. Appropriate tests (eg, t-test, chi-square test) will be used based on the distribution of the measure. The cumulative incidence rate for clinical outcomes (major bleeding, CRNM, recurrent VTE) will be calculated. The incidence rate will be calculated as the number of patients who experience the event divided by the observed time at risk. An unadjusted Kaplan-Meier curve will be drawn to illustrate time-to-event analysis.

The propensity score matching (PSM) technique will be used to control for potential confounders when comparing the cohorts.[23] Covariates to be included in the logistic regression model may include the following variables: age, geographic region, CCI score, comorbidities, and other clinical characteristics such as bleeding history, renal disease etc. The final lists of variables to be used in the model will be discussed and determined during analysis development, after reviewing the pre-matched descriptive tables. Each subject in the reference cohort will be matched to a subject in the comparator cohort with the closest propensity score. The Nearest Neighbor method with or without replacement and with a caliper of 0.01 will be used to select the matched samples. The radius, kernel, and Mahalanobis stratified matching techniques will also be evaluated to find the method that best fits the data. The balance of covariates between treatment groups will be determined using the absolute standardized difference of the mean ≤ 0.10

After PSM, no significant differences are expected among all pre-index measures between the patient cohorts, and the treatment effect calculated based on the matched population is

considered to be the true effect. PSM with a different ratio (1:2 or 1:3) can also be considered if the matched sample size using a ratio of 1:1 is too small.

Cox proportional models will be fit to compare major bleeding, CRNM, recurrent VTE, and other clinical outcomes among the apixaban and warfarin cohorts. This model tests proportional hazards models on survival (or time-to-event) data via maximum likelihood with exponential, Weibull, and Gompertz distributions to be considered.

A generalized linear model (GLM) will be applied for the multivariable analysis of health care costs among the warfarin and apixaban cohorts. Since a large proportion of zeros usually exist in health care cost variables (eg, major-bleeding costs, inpatient or ER costs), two-part models may also be implemented, in which the first part is a logistic regression of any service use, and the second part a GLM regression of cost, conditional on baseline demographics and clinical characteristics. Bootstrapping with the two-part model will be conducted to generate the 95% confidence interval.

All data analysis will be executed using statistical software STATA and SAS version 9.3/9.4

5.8. Subgroup and sensitivity analyses

Subgroup Analyses: Analyses of study measures, as described above, may be repeated focusing alternatively on the following subgroups of interest—sample size permitting—which will be defined on the basis of:

- VTE encounter — inpatient vs. ambulatory
- VTE diagnosis — DVT only vs. PE with or without DVT
- VTE etiology — provoked vs. unprovoked

Sensitivity Analyses: Analyses may be conducted—sample size permitting—to evaluate the robustness of findings with respect to changes in the definitions of the following key variables and assumptions:

- Maximum duration of follow-up (7, 21, and 90 days, respectively, instead of 6 months in base case);
- Maximum interval between the date of the index encounter and the index date (14 and 60 days, respectively, instead of 30 days in base case);
- Including patients with recent malignancy (irrespective of treatment status) and those treated for malignancy during the 6-month pre-index date period;
- Including patients with a VTE event during the 6-month pre-index-encounter period;
- Excluding patients with major/CRNM bleeding event during 6-month period preceding first receipt of index therapy.

Analyses also will be undertaken to describe the use and duration of PAC therapy (based on medical claims with corresponding HCPCS Level II Codes, and pharmacy claims with

corresponding NDC Codes [ie, days supplied]) on an outpatient basis between the index encounter and initiation of index therapy.

5.9. Quality control

Data in Medicare Databases are collected periodically in an electronic format. Medicare employs a number of subsequent quality assurance procedures and undertakes routine audits to ensure the quality of information. The data analysis follows our best data analysis practices which have been demonstrated in many past research studies and publications. The analysis is also inspected with at least two independent researchers for quality control purposes.

5.10. Strengths and limitations of the research methods

A key strength is that retrospective observational analyses provide a better understanding about the study population in real-world clinical practice and offer complimentary information to controlled clinical trials. Retrospective observational studies also allow the evaluation of patients who are often under-represented in clinical trials, such as those with comorbidities and the elderly. Since prescribing patterns in the real-world can be complex, the retrospective analysis provides a comprehensive picture of how medications are used by clinicians in routine practice. In addition, the Medicare claims databases include all medical and pharmacy claims of patients and allow for longitudinal analysis of a nationally representative sample. Many of the medications being studied are relatively new to market and this database captures the utilization of these new drugs. The limitation of this study is that the Medicare databases do not uniformly capture over-the-counter medications, such as aspirin, which have also been used for stroke prevention in AF patients and could have an impact on the treatment outcomes of the anticoagulants being studied. Also, the Medicare database includes only FFS (fee-for-service) patients. Furthermore, while claims data are extremely valuable for the efficient and effective examination of health care outcomes, treatment patterns, HRU, and costs, all claims databases have certain inherent limitations because the claims are collected for the purpose of payment and not research. First, presence of a claim for a filled prescription does not indicate that the medication was consumed or that it was taken as prescribed. Second, medications filled over-the-counter or provided as samples by the physician will not be observed in the claims data. Third, presence of a diagnosis code on a medical claim is not positive presence of disease, as the diagnosis code may be incorrectly coded or included as rule-out criteria rather than actual disease.

5.11. Other aspects

Not Applicable

6. PROTECTION OF HUMAN SUBJECTS

6.1. Patient Information and Consent

As a secondary data collection study using fully anonymized data, informed consent is not required.

6.2. Patient withdrawal

Not Applicable

6.3. Institutional Review Board (IRB)/Independent Ethics Committee (IEC)

IRB/IEC review is not required.

6.4. Ethical conduct of the study

The study will be conducted in accordance with legal and regulatory requirements, as well as with scientific purpose, value, and rigor and will follow generally accepted research practices described in Guidelines for Good Pharmacoepidemiology Practices (GPP) issued by the International Society for Pharmacoepidemiology (ISPE).

7. MANAGEMENT AND REPORTING OF ADVERSE EVENTS/ADVERSE REACTIONS

This study includes unstructured data (eg, narrative fields in the database) that will be converted to structured (ie, coded) data solely by a computer using automated/algorithmic methods and/or data that already exist as structured data in an electronic database. In these data sources, it is not possible to link (ie, identify a potential association between) a particular product and medical event for any individual. Thus, the minimum criteria for reporting an adverse event (AE) (ie, identifiable patient, identifiable reporter, a suspect product, and event) are not available and AEs are not reportable as individual AE reports.

8. PLANS FOR DISSEMINATING AND COMMUNICATING STUDY RESULTS

A final study report detailing the final study protocol and the analysis results will be provided when the study is complete.

9. COMMUNICATION OF ISSUES

In the event of any prohibition or restriction imposed (eg, clinical hold) by an applicable Competent Authority in any area of the world, or if the investigator is aware of any new information which might influence the evaluation of the benefits and risks of a Pfizer/BMS product, Pfizer/BMS should be informed immediately.

In addition, the investigator will inform Pfizer/BMS immediately of any urgent safety measures taken by the investigator to protect the study patients against any immediate hazard, and of any serious breaches of this NI study protocol of which the investigator becomes aware.

10. LIST OF TABLES

11. LIST OF FIGURES

Figure 1. Study Design Figure

12. APPENDIX 1. LIST OF RELEVANT ICD-9-CM DIAGNOSIS, CPT, AND HCPCS CODES

Appendix Table 1. Selection Criteria

Diagnosis	ICD-9 Code	ICD-10 Code
Atrial fibrillation	427.31, 427.32	I480, I482, I481, I483, I484, I4891, I4892
Mechanical Heart Valve	**ICD-9 Procedure Codes:** 35.05-35.09, 35.20-35.28, 35.97	**ICD-10 Procedure Codes:** 02RF07Z, 02RF08Z, 02RF0JZ, 02RF0KZ, 02RF37H, 02RF37Z, 02RF38H, 02RF38Z, 02RF3JH, 02RF3JZ, 02RF3KH, 02RF3KZ, 02RF47Z, 02RF48Z, 02RF4JZ, 02RF4KZ, 02RG07Z, 02RG08Z, 02RG0JZ, 02RG0KZ, 02RG37H, 02RG37Z, 02RG38H, 02RG38Z, 02RG3JH, 02RG3JZ, 02RG3KH, 02RG3KZ, 02RG47Z, 02RG48Z, 02RG4JZ, 02RG4KZ, 02RH07Z, 02RH08Z, 02RH0JZ, 02RH0KZ, 02RH37H, 02RH37Z, 02RH38H, 02RH38Z, 02RH3JH, 02RH3JZ, 02RH3KH, 02RH3KZ, 02RH47Z, 02RH48Z, 02RH4JZ, 02RH4KZ, 02RJ07Z, 02RJ08Z, 02RJ0JZ, 02RJ0KZ, 02RJ47Z, 02RJ48Z, 02RJ4JZ, 02RJ4KZ, 02UG3JZ, X2RF032, X2RF332, X2RF432
VTE	415.11, 415.13, 415.19, 451.2, 451.81, 451.83, 451.84, 451.9, 453.1, 453.2, 453.4, 453.82, 453.83, 453.84, 453.85, 453.86, 453.87, 453.89, 453.9	I2692, I2699, I801, I802, I803, I809, I821, I82210, I82220, I82290, I8240, I8241, I8242, I8243, I8244, I8249, I824Y, I824Z, I8260, I8262, I82A1, I82B1, I82C1, I82890, I8290
Malignant Neoplasm (excluding non-melanoma skin)	140-172, 174-209.3	C01, C07, C12, C19, C20, C23, C33, C37, C55, C58, C52, C61, C73, D45, C000, C001, C003, C004, C005, C006, C008, C002, C009, C020, C021, C022, C023, C028, C024, C029, C080, C081, C089, C030, C031, C039, C040, C041, C048, C049, C060, C061, C050, C051, C052, C058, C059, C062, C069, C098, C099, C090, C091, C100, C101, C108, C102, C103, C104, C109, C110, C111, C112, C113, C118, C119, C130, C131, C132, C138, C139, C140, C142, C148, C153, C154, C155, C158, C159, C160, C164, C163, C161, C162, C165, C166, C168, C169, C170, C171, C172, C173, C178, C179, C183, C184, C186, C187, C180, C181, C182, C185, C188, C189, C211, C210, C212, C218, C220, C222, C223, C224, C227, C228, C221, C229, C240, C241, C248, C249, C250, C251, C252, C253, C254, C257, C258, C259, C480, C451, C481, C488, C482, C260, C261, C269, C300, C301, C310, C311, C312, C313, C318, C319, C320, C321, C322, C323, C328, C329, C342, C384, C450, C380, C452, C381, C382, C388, C383, C390, C399, C410, C411, C412, C413, C414, C419, C470, C490, C473, C493, C474, C494, C475, C495, C476, C496, C478, C498, C479, C499, C430, C434, C438, C439, C460, C461, C462, C464, C463, C467, C469, C530, C531, C538, C539, C541, C542, C543, C549, C540, C548, C561, C562, C569, C573, C574, C510, C511, C512, C519, C518, C577, C578, C579, C600, C601, C602, C609, C632, C608, C637, C638, C639, C670, C671, C672, C673, C674, C675, C676, C677, C678, C679, C641, C642, C649, C651, C652, C659, C661, C662, C669, C680, C681, C688, C689, C710, C711, C712, C713, C714, C715, C716, C717, C718, C719, C700, C709, C720, C721, C701, C729, C750, C751, C752, C753, C754, C755, C758, C759, C760, C761, C762, C763, C457, C768, C770, C771, C772, C773, C774, C775, C778, C779, C781, C782, C784, C785, C786, C787, C792, C799, C800, C459, C801, C802, C884, C865, C866, C96A, C960, C962, C864, C860, C862, C863, C861, C964, C969, C96Z, C882, C883, C888, C889, C7A1, C7A8, C4A0, C4A4, C4A8, C4A9, C0680, C0689, C3400, C3401, C3402, C3410, C3411, C3412, C3430, C3431, C3432, C3480, C3481, C3482, C3490, C3491, C3492, C4000, C4001, C4002, C4010, C4011, C4012, C4020, C4021, C4022, C4030, C4031, C4032, C4080, C4081, C4082, C4090, C4091, C4092, C4710, C4711, C4712, C4910, C4911, C4912, C4720, C4721, C4722,

Diagnosis	ICD-9 Code	ICD-10 Code
		C4920, C4921, C4922, C4310, C4311, C4312, C4320, C4321, C4322, C4330, C4331, C4339, C4351, C4352, C4359, C4360, C4361, C4362, C4370, C4371, C4372, C4650, C4651, C4652, C5700, C5701, C5702, C5710, C5711, C5712, C5720, C5721, C5722, C6200, C6201, C6202, C6210, C6211, C6212, C6290, C6291, C6292, C6300, C6301, C6302, C6310, C6311, C6312, C6940, C6941, C6942, C6960, C6961, C6962, C6950, C6951, C6952, C6900, C6901, C6902, C6910, C6911, C6912, C6920, C6921, C6922, C6930, C6931, C6932, C6980, C6981, C6982, C6990, C6991, C6992, C7220, C7221, C7222, C7230, C7231, C7232, C7240, C7241, C7242, C7250, C7259, C7400, C7401, C7402, C7410, C7411, C7412, C7490, C7491, C7492, C7640, C7641, C7642, C7650, C7651, C7652, C7800, C7801, C7802, C7830, C7839, C7880, C7889, C7900, C7901, C7902, C7910, C7911, C7919, C7931, C7932, C7940, C7949, C7951, C7952, C7960, C7961, C7962, C7970, C7971, C7972, C7981, C7982, C7989, C8330, C8339, C8331, C8332, C8333, C8334, C8335, C8336, C8337, C8338, C8350, C8359, C8351, C8352, C8353, C8354, C8355, C8356, C8357, C8358, C8370, C8379, C8371, C8372, C8373, C8374, C8375, C8376, C8377, C8378, C8380, C8389, C8381, C8382, C8383, C8384, C8385, C8386, C8387, C8388, C8310, C8319, C8311, C8312, C8313, C8314, C8315, C8316, C8317, C8318, C8460, C8469, C8470, C8479, C8461, C8471, C8462, C8472, C8463, C8473, C8464, C8474, C8465, C8475, C8466, C8476, C8467, C8477, C8468, C8478, C8520, C8529, C8521, C8522, C8523, C8524, C8525, C8526, C8527, C8528, C8300, C8309, C8390, C8399, C8301, C8391, C8302, C8392, C8303, C8393, C8304, C8394, C8305, C8395, C8306, C8396, C8307, C8397, C8308, C8398, C8170, C8179, C8171, C8172, C8173, C8174, C8175, C8176, C8177, C8178, C8100, C8109, C8140, C8149, C8101, C8141, C8102, C8142, C8103, C8143, C8104, C8144, C8105, C8145, C8106, C8146, C8107, C8147, C8108, C8148, C8110, C8119, C8111, C8112, C8113, C8114, C8115, C8116, C8117, C8118, C8120, C8129, C8121, C8122, C8123, C8124, C8125, C8126, C8127, C8128, C8130, C8139, C8131, C8132, C8133, C8134, C8135, C8136, C8137, C8138, C8190, C8199, C8191, C8192, C8193, C8194, C8195, C8196, C8197, C8198, C8200, C8209, C8210, C8219, C8220, C8229, C8230, C8239, C8240, C8249, C8260, C8269, C8280, C8289, C8290, C8299, C8201, C8211, C8221, C8231, C8241, C8261, C8281, C8291, C8202, C8212, C8222, C8232, C8242, C8262, C8282, C8292, C8203, C8213, C8223, C8233, C8243, C8263, C8283, C8293, C8204, C8214, C8224, C8234, C8244, C8264, C8284, C8294, C8205, C8215, C8225, C8235, C8245, C8265, C8285, C8295, C8206, C8216, C8226, C8236, C8246, C8266, C8286, C8296, C8207, C8217, C8227, C8237, C8247, C8267, C8287, C8297, C8208, C8218, C8228, C8238, C8248, C8268, C8288, C8298, C8400, C8409, C8401, C8402, C8403, C8404, C8405, C8406, C8407, C8408, C8410, C8419, C8411, C8412, C8413, C8414, C8415, C8416, C8417, C8418, C9140, C9141, C9142, C8440, C8449, C8441, C8442, C8443, C8444, C8445, C8446, C8447, C8448, C8250, C8259, C8490, C8499, C84A0, C84A9, C84Z0, C84Z9, C8510, C8519, C8580, C8589, C8590, C8599, C8251, C8491, C84A1, C84Z1, C8511, C8581, C8591, C8252, C8492, C84A2, C84Z2, C8512, C8582, C8592, C8253, C8493, C84A3, C84Z3, C8513, C8583, C8593, C8254, C8494, C84A4, C84Z4, C8514, C8584, C8594, C8255, C8495, C84A5, C84Z5, C8515, C8585, C8595, C8256, C8496, C84A6, C84Z6, C8516, C8586, C8596, C8257, C8497, C84A7, C84Z7, C8517, C8587, C8597, C8258, C8498, C84A8, C84Z8, C8518, C8588, C8598, C9000, C9001, C9002, C9010, C9011, C9012, C9020, C9030, C9021, C9031, C9022, C9032, C9100, C9101, C9102, C9110, C9111, C9112, C91Z0, C91Z1, C91Z2, C9130, C9150, C9160, C91A0, C9131, C9151, C9161, C91A1, C9132, C9152, C9162, C91A2, C9190, C9191, C9192, C9200, C9240, C9250, C9260, C92A0, C9201, C9241, C9251, C9261, C92A1, C9202, C9242, C9252,

Diagnosis	ICD-9 Code	ICD-10 Code
		C9262, C92A2, C9210, C9211, C9212, C9220, C9221, C9222, C9230, C9231, C9232, C92Z0, C92Z1, C92Z2, C9290, C9291, C9292, C9300, C9301, C9302, C9310, C9311, C9312, C9390, C9391, C9392, C9330, C93Z0, C9331, C93Z1, C9332, C93Z2, C9400, C9401, C9402, C9420, C9421, C9422, C9430, C9480, C9431, C9481, C9432, C9482, C9500, C9501, C9502, C9510, C9511, C9512, C9590, C9591, C9592, C7A00, C4A10, C4A11, C4A12, C4A20, C4A21, C4A22, C4A30, C4A31, C4A39, C4A60, C4A61, C4A62, C4A70, C4A71, C4A72, C4A51, C4A52, C4A59, C50011, C50012, C50019, C50111, C50112, C50119, C50211, C50212, C50219, C50311, C50312, C50319, C50411, C50412, C50419, C50511, C50512, C50519, C50611, C50612, C50619, C50811, C50812, C50819, C50911, C50912, C50919, C50021, C50022, C50029, C50121, C50122, C50129, C50221, C50222, C50229, C50321, C50322, C50329, C50421, C50422, C50429, C50521, C50522, C50529, C50621, C50622, C50629, C50821, C50822, C50829, C50921, C50922, C50929, C7A019, C7A010, C7A011, C7A012, C7A029, C7A020, C7A021, C7A022, C7A023, C7A024, C7A025, C7A026, C7A090, C7A091, C7A092, C7A093, C7A094, C7A095, C7A096, C7A098
IVCF	**ICD-9-PCS Code:** 38.7x CPT Code : 37191, 37192, 37193, 37620	**ICD-10-PCS Codes:** 02HV0DZ, 02HV3DZ, 02HV4DZ, 02LV0CZ, 02LV0DZ, 02LV0ZZ, 02LV3CZ, 02LV3DZ, 02LV3ZZ, 02LV4CZ, 02LV4DZ, 02LV4ZZ, 02VV0CZ, 02VV0DZ, 02VV0ZZ, 02VV3CZ, 02VV3DZ, 02VV3ZZ, 02VV4CZ, 02VV4DZ, 02VV4ZZ, 06H00DZ, 06H03DZ, 06H04DZ, 06L00CZ, 06L00DZ, 06L00ZZ, 06L03CZ, 06L03DZ, 06L03ZZ, 06L04CZ, 06L04DZ, 06L04ZZ, 06V00CZ, 06V00DZ, 06V00ZZ, 06V03CZ, 06V03DZ, 06V03ZZ, 06V04CZ, 06V04DZ, 06V04ZZ

TABLE 2: LIST OF CHEMOTHERAPY AGENTS

Drug	HCPCS Code
Aldesleukin	J9015
Alemtuzumab	C9110, S0087
Arsenic Trioxide	C9012
Asparaginase	J9020
Azacitidine	C9218, J9025
Bendamustine	C9243, J9033
Bevacizumab	J9035, C9214, C9257, Q2024, S0116
Bleomycin	C9417, J9040
Bortezomib	C9207
Brentuximab	C9287, J9042
Busulfan	C1178, J0594, J8510
Cabazitaxel	C9276, J9043
Capecitabine	J8520, J8521
Carboplatin	J9045
Carmustine	C9437, J9050
Cetuximab	C9215, J9055
CHEMO -- Unknown	J9999
Chlorambucil	S0172
Cisplatin	C9418, J9060. J9062
Cladribine	C9419, J9065

Drug	HCPCS Code
Idarubicin	J9211, C9429
Idelalisib	J8999
Ifosfamide	J9208, C9427
Imatinib	S0088
Ipilimumab	J9228, C9284
Irinotecan	J9206
Ixabepilone	J9207, C9240
Kadcyla	C9131, J9354
Leucovorin	J0640
Levoleucovorin	J0641
Lomustine	C9017, S0178
Mechlorethamine	J9230
Melphalan	J9245, J8600
Mercaptopurine	S0108
Methotrexate	J9250, J9260, J8610
Mitomycin	J9280, J9290, J9291, C9432
Mitoxantrone	J9293
Nelarabine	J9261
Ofatumumab	J9302
Oxaliplatin	C9205, J9263

Drug	HCPCS Code
Clofarabine	C9129, J9027
Cyclophosphamide	C9420, C9421, J8530, J9070, J9080, J9090, J9091, J9092, J9093, J9094, J9095, J9096, J9097
Cytarabine	C1166, C9422, J9098, J9100, J9110
Dacarbazine	J9130, J9140, C9423
Dactinomycin	J9120
Daunorubicin	J9150, J951, C9424
Decitabine	C9231, J0894
Denileukin Diftitox	C1084, J9160
Docetaxel	J9170, J9171
Doxorubicin	C9415, J9000
Doxorubicin Liposomal	J9001, J9002, Q2048, Q2049, Q2050
Epirubicin	J9178, C1167, J9180
Eribulin	J9179, C9280
Etoposide	J9181, J9182, C9414, C9425, J8560
Everolimus	J8561
Floxuridine	J9200, C9426
Fludarabine	J9185, C9262, Q2025, J8562
Fluorouracil	J9190
Gefitinib	J8565
Gemcitabine	J9201
Gemtuzumab	C9004, J9300
Hydroxyurea	S0176
Ibritumomab	A9542
Ibrutinib	J8999

Drug	HCPCS Code
Paclitaxel	C9127, C9431, J9264, J9265
Panitumumab	C9235, J9303
Pegaspargase	J9266
Pemetrexed	C9213, J9305
Pentostatin	J9268
Pertuzumab	C9292
Regorafenib	J8999
Rituximab	J9310
Romidepsin	C9265, J9325
Streptozocin	J9320
Temozolomide	C1086, C9253, J9328, J8700
Temsirolimus	C9239, J9330
Teniposide	Q2017
Thiotepa	C9433, J9340
Topotecan	J9350, J9351, J8705
Tositumomab	G3001
Trastuzumab	J9355
Tretinoin	S0117
Valrubicin	J9357
Vinblastine	J9360
Vincristine	J9370, J9375, J9380
Vincristine Liposomal	J9371
Vinorelbine	C9440, J9390
Zaltrap	J9400

TABLE 3: LIST OF CHEMOTHERAPY ADMINISTRATION CODES

HCPCS Codes	36640, 61517, 96401, 96402, 96405, 96406, 96409, 96411, 96413, 96415, 96416, 96417, 96420, 96422, 96423, 96425, 96440, 96445, 96446, 96450, 96542, 96549, 99555, Q0083, Q0084, Q0085, S9329, S9330, S9331

TABLE 4: RADIATION THERAPY CODES

ICD-9 Procedure Codes	77280, 77285, 77290, 77295, 77299, 77300, 77301, 77305, 77310, 77315, 77321, 77326, 77327, 77328, 77331, 77332, 77333, 77334, 77336, 77338, 77371, 77372, 77373, 77399, 77401, 77402, 77403, 77404, 77406, 77407, 77408, 77409, 77411, 77412, 77413, 77414, 77416, 77417, 77418, 77421, 77422, 77423, 77424, 77425, 77427, 77431, 77432, 77435, 77469, 77470, 77499, 77520, 77522, 77523, 77525, 77750, 77761, 77762, 77763, 77776, 77777, 77778, 77785, 77786, 77787, 77789, 77799, 92.20-92.29
ICD-10	3E0B304, 3E0B704, 3E0BX04, 3E0C304, 3E0C704, 3E0CX04, 3E0D304, 3E0D704, 3E0DX04,

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TABLE 5: FACTORS IDENTIFYING PROVOKED VTE

Factors	Identifying Strategies
Hormone Therapy	
Estrogen Therapy	Estradiol Cypionate Estradiol Valerate Estradiol Ethinyl Estradiol Estradiol Benzoate Estradiol Acetate Estradiol Micronized Estrone Estrogens, Conjugated/Meprobam Estrogens, Conjugated Estriol Chlorotrianisene Quinestrol Dienestrol Estrogens, Esterified Estropipate Estrogens, Conj., Synthetic A Estrogens,Conj., Synthetic B Estriol Micronized
Combination E+P	Ethinyl Estradiol/Noreth Ac Norethind Ac/Ethinyl Estradiol Estradiol/Noreth Ac Estradiol/Norgestimate Estradiol/Levonorgestrel Estradiol/Drospirenone Estrogen, Con/M-Progest Acet
Fracture/Trauma involving the Lower Extremities	Refer to Table 8
Pelvic or orthopedic surgery	Refer to Table 9
Any hospitalization	Refer to Table 8

TABLE 6: BASELINE COVARIATES

Condition	ICD-9 Code(s)	ICD-10 Code(s)
AIDS	042, V08	B20, Z21
Alcohol abuse	ICD-9 Diagnosis: 291, 303, 305.0, 357.5, 425.5, 535.3, 571.0, 571.1, 571.2, 571.3, 790.3, E860.0, E860.1 ICD-9 procedure: 94.46, 94.53, 94.61-94.63, 94.67-94.69 CPT: 99408, 99409, G0396, G0397, H0049, H0050	ICD-10 Diagnosis: G621, I426, K700, K702, K709, R780, E8600, E8601, F1026, F1096, F1097, F1027, F1014, F1024, F1019, F1029, F1094, F1099, F1020, F1021, F1010, K2920, K2921, K7010, K7011, K7030, K7031, K7040, F10121, F10221, F10231, F10921, F10151, F10251, F10951, F10920, F10929, F10150, F10250, F10950, F10230, F10232, F10239, F10182, F10282, F10982, F10159, F10180, F10181, F10188, F10259, F10280, F10281, F10288, F10959, F10980, F10981, F10988, F10220, F10229, F10120, F10129 ICD-10 Procedure: HZ2ZZZZ, HZ30ZZZ, HZ31ZZZ, HZ32ZZZ, HZ33ZZZ, HZ34ZZZ, HZ35ZZZ, HZ36ZZZ, HZ37ZZZ, HZ38ZZZ, HZ39ZZZ, HZ3BZZZ, HZ40ZZZ, HZ41ZZZ, HZ42ZZZ, HZ43ZZZ, HZ44ZZZ, HZ45ZZZ, HZ46ZZZ, HZ47ZZZ, HZ48ZZZ, HZ49ZZZ, HZ4BZZZ, HZ50ZZZ, HZ51ZZZ, HZ52ZZZ, HZ53ZZZ, HZ54ZZZ, HZ55ZZZ, HZ56ZZZ, HZ57ZZZ, HZ58ZZZ, HZ59ZZZ, HZ5BZZZ, HZ5CZZZ, HZ5DZZZ, HZ63ZZZ, HZ83ZZZ, HZ86ZZZ, HZ88ZZZ, HZ89ZZZ, HZ93ZZZ, HZ96ZZZ, HZ98ZZZ, HZ99ZZZ
Anemia	280.x-285.x	D500, D508, D501, D509, D510, D511, D512, D513, D518, D519, D520, D521, D528, D529, D531, D530, D532, D538, D539, D580, D581, D550, D551, D552, D553, D558, D559, D569, D560, D561, D562, D563, D565, D568, D573, D571, D564, D582, D588, D589, D590, D591, D594, D593, D592, D595, D596, D598, D599, D600, D601, D608, D609, D611, D612, D613, D619, D640, D641, D642, D643, D631, D630, D638, D644, D649, D5702, D5701, D5740, D5700, D5720, D5780, D6101, D6109, D6182, D6189, D6481, D6489, D57212, D57412, D57211, D57411, D57811, D57812, D57419, D57219, D57819, D61810, D61811, D61818
Central venous catheter	ICD-9 diagnosis: 999.31, 999.32, 999.33 ICD-9 procedure: 38.93, 38.95, 38.97, 89.62 CPT: 36555-36569, S5520, S5522	ICD-10 diagnosis: T80218A, T80219A, T80211A, T80212A ICD-10 procedure: 02HS03Z, 02HS33Z, 02HS43Z, 02HT03Z, 02HT33Z, 02HT43Z, 02HV03Z, 02HV33Z, 02HV43Z, 05H003Z, 05H033Z, 05H043Z, 05H103Z, 05H133Z, 05H143Z, 05H303Z, 05H333Z, 05H343Z, 05H403Z, 05H433Z, 05H443Z, 05H503Z, 05H533Z, 05H543Z, 05H603Z, 05H633Z, 05H643Z, 05H703Z, 05H733Z, 05H743Z, 05H803Z, 05H833Z, 05H843Z, 05H903Z, 05H933Z, 05H943Z, 05HA03Z, 05HA33Z,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		05HA43Z, 05HB03Z, 05HB33Z, 05HB43Z, 05HC03Z, 05HC33Z, 05HC43Z, 05HD03Z, 05HD33Z, 05HD43Z, 05HF03Z, 05HF33Z, 05HF43Z, 05HG03Z, 05HG33Z, 05HG43Z, 05HH03Z, 05HH33Z, 05HH43Z, 05HL03Z, 05HL33Z, 05HL43Z, 05HM03Z, 05HM33Z, 05HM43Z, 05HN03Z, 05HN33Z, 05HN43Z, 05HP03Z, 05HP33Z, 05HP43Z, 05HQ03Z, 05HQ33Z, 05HQ43Z, 05HR03Z, 05HR33Z, 05HR43Z, 05HS03Z, 05HS33Z, 05HS43Z, 05HT03Z, 05HT33Z, 05HT43Z, 05HV03Z, 05HV33Z, 05HV43Z, 05HY03Z, 05HY33Z, 05HY43Z, 06H003Z, 06H033Z, 06H043Z, 06H103Z, 06H133Z, 06H143Z, 06H203Z, 06H233Z, 06H243Z, 06H303Z, 06H333Z, 06H343Z, 06H403Z, 06H433Z, 06H443Z, 06H503Z, 06H533Z, 06H543Z, 06H603Z, 06H633Z, 06H643Z, 06H703Z, 06H733Z, 06H743Z, 06H803Z, 06H833Z, 06H843Z, 06H903Z, 06H933Z, 06H943Z, 06HB03Z, 06HB33Z, 06HB43Z, 06HC03Z, 06HC33Z, 06HC43Z, 06HD03Z, 06HD33Z, 06HD43Z, 06HF03Z, 06HF33Z, 06HF43Z, 06HG03Z, 06HG33Z, 06HG43Z, 06HH03Z, 06HH33Z, 06HH43Z, 06HJ03Z, 06HJ33Z, 06HJ43Z, 06HM03Z, 06HM33Z, 06HM43Z, 06HN03Z, 06HN33Z, 06HN43Z, 06HP03Z, 06HP33Z, 06HP43Z, 06HQ03Z, 06HQ33Z, 06HQ43Z, 06HT03Z, 06HT33Z, 06HT43Z, 06HV03Z, 06HV33Z, 06HV43Z, 06HY03Z, 06HY33Z, 06HY43Z, 0JH60XZ, 0JH63XZ, 0JH80XZ, 0JH83XZ, 0JHD0XZ, 0JHD3XZ, 0JHF0XZ, 0JHF3XZ, 0JHG0XZ, 0JHG3XZ, 0JHH0XZ, 0JHH3XZ, 0JHL0XZ, 0JHL3XZ, 0JHM0XZ, 0JHM3XZ, 0JHN0XZ, 0JHN3XZ, 0JHP0XZ, 0JHP3XZ, 4A02X4A, 4A04XB1, 4A14XB1, B5130ZA, B5131ZA, B513YZA, B513ZZA, B5140ZA, B5141ZA, B514YZA, B514ZZA, B5150ZA, B5151ZA, B515YZA, B515ZZA, B5160ZA, B5161ZA, B516YZA, B516ZZA, B5170ZA, B5171ZA, B517YZA, B517ZZA, B51B0ZA, B51B1ZA, B51BYZA, B51BZZA, B51C0ZA, B51C1ZA, B51CYZA, B51CZZA, B51D0ZA, B51D1ZA, B51DYZA, B51DZZA, B543ZZA, B544ZZA, B546ZZA, B547ZZA, B54BZZA, B54CZZA, B54DZZA
Cerebrovascular disease	ICD-9 Diagnosis: 430, 431, 432.x, 433.xx, 434.xx, 435.x, 436, 437.0, 437.1, 437.8, 437.9, 438.xx, 997.02 CPT: 35390, 37215, 37216 ICD-9 procedure: 38.11, 38.12, 38.42	I602, I604, I606, I607, I608, I609, I610, I611, I612, I613, I614, I615, I616, I618, I619, I621, I629, I651, I658, I659, I663, I636, I669, I668, I638, I639, G450, G458, G451, G452, G460, G461, G462, G459, I672, G463, G464, G465, G466, G467, G468, I680, I688, I679, I6000, I6001, I6002, I6010, I6011, I6012, I6030, I6031,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		I6032, I6050, I6051, I6052, I6200, I6201, I6202, I6203, I6302, I6312, I6322, I6521, I6522, I6523, I6529, I6501, I6502, I6503, I6509, I6359, I6309, I6319, I6300, I6310, I6320, I6329, I6601, I6602, I6603, I6609, I6611, I6612, I6613, I6619, I6621, I6622, I6623, I6629, I6330, I6339, I6340, I6349, I6350, I6789, I6781, I6782, I6901, I6911, I6921, I6931, I6981, I6991, I6900, I6910, I6920, I6930, I6980, I6990, I63031, I63032, I63039, I63131, I63132, I63139, I63231, I63232, I63239, I63011, I63012, I63019, I63111, I63112, I63119, I63211, I63212, I63219, I63311, I63312, I63319, I63321, I63322, I63329, I63331, I63332, I63339, I63341, I63342, I63349, I63411, I63412, I63419, I63421, I63422, I63429, I63431, I63432, I63439, I63441, I63442, I63449, I63511, I63512, I63519, I63521, I63522, I63529, I63531, I63532, I63539, I63541, I63542, I63549, I67841, I67848, I69928, I69020, I69120, I69220, I69320, I69820, I69920, I69021, I69121, I69221, I69321, I69821, I69921, I69022, I69122, I69222, I69322, I69822, I69922, I69023, I69123, I69223, I69323, I69823, I69923, I69028, I69128, I69228, I69328, I69828, I69059, I69159, I69259, I69359, I69859, I69959, I69051, I69052, I69151, I69152, I69251, I69252, I69351, I69352, I69851, I69852, I69951, I69952, I69053, I69054, I69153, I69154, I69253, I69254, I69353, I69354, I69853, I69854, I69953, I69954, I69039, I69139, I69239, I69339, I69839, I69939, I69031, I69032, I69131, I69132, I69231, I69232, I69331, I69332, I69831, I69832, I69931, I69932, I69033, I69034, I69133, I69134, I69233, I69234, I69333, I69334, I69833, I69834, I69933, I69934, I69049, I69149, I69249, I69349, I69849, I69949, I69041, I69042, I69141, I69142, I69241, I69242, I69341, I69342, I69841, I69842, I69941, I69942, I69043, I69044, I69143, I69144, I69243, I69244, I69343, I69344, I69843, I69844, I69943, I69944, I69069, I69169, I69269, I69369, I69869, I69969, I69061, I69062, I69161, I69162, I69261, I69262, I69361, I69362, I69861, I69862, I69961, I69962, I69063, I69064, I69163, I69164, I69263, I69264, I69363, I69364, I69863, I69864, I69963, I69964, I69065, I69165, I69265, I69365, I69865, I69965, I69998, I69090, I69190, I69290, I69390, I69890, I69990, I69091, I69191, I69291, I69391, I69891,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		I69991, I69092, I69192, I69292, I69392, I69892, I69992, I69093, I69193, I69293, I69393, I69893, I69993, I69098, I69198, I69298, I69398, I69898, G9731, G9732, I97810, I97811, I97820, I9782 **ICD-10-Procedure codes:** 03CG0ZZ, 03CG4ZZ, 03CH0ZZ, 03CH4ZZ, 03CJ0ZZ, 03CJ4ZZ, 03CK0ZZ, 03CK4ZZ, 03CL0ZZ, 03CL4ZZ, 03CM0ZZ, 03CM4ZZ, 03CN0ZZ, 03CN4ZZ, 03CP0ZZ, 03CP4ZZ, 03CQ0ZZ, 03CQ4ZZ, 03CR0ZZ, 03CR3ZZ, 03CR4ZZ, 03CS0ZZ, 03CS3ZZ, 03CS4ZZ, 03CT0ZZ, 03CT3ZZ, 03CT4ZZ, 03CU0ZZ, 03CU3ZZ, 03CU4ZZ, 03CV0ZZ, 03CV3ZZ, 03CV4ZZ, 03RH07Z, 03RH0JZ, 03RH0KZ, 03RH47Z, 03RH4JZ, 03RH4KZ, 03RJ07Z, 03RJ0JZ, 03RJ0KZ, 03RJ47Z, 03RJ4JZ, 03RJ4KZ, 03RK07Z, 03RK0JZ, 03RK0KZ, 03RK47Z, 03RK4JZ, 03RK4KZ, 03RL07Z, 03RL0JZ, 03RL0KZ, 03RL47Z, 03RL4JZ, 03RL4KZ, 03RM07Z, 03RM0JZ, 03RM0KZ, 03RM47Z, 03RM4JZ, 03RM4KZ, 03RN07Z, 03RN0JZ, 03RN0KZ, 03RN47Z, 03RN4JZ, 03RN4KZ, 03RP07Z, 03RP0JZ, 03RP0KZ, 03RP47Z, 03RP4JZ, 03RP4KZ, 03RQ07Z, 03RQ0JZ, 03RQ0KZ, 03RQ47Z, 03RQ4JZ, 03RQ4KZ, 03RR07Z, 03RR0JZ, 03RR0KZ, 03RR47Z, 03RR4JZ, 03RR4KZ, 03RS07Z, 03RS0JZ, 03RS0KZ, 03RS47Z, 03RS4JZ, 03RS4KZ, 03RT07Z, 03RT0JZ, 03RT0KZ, 03RT47Z, 03RT4JZ, 03RT4KZ, 03RU07Z, 03RU0JZ, 03RU0KZ, 03RU47Z, 03RU4JZ, 03RU4KZ, 03RV07Z, 03RV0JZ, 03RV0KZ, 03RV47Z, 03RV4JZ, 03RV4KZ, 05RM07Z, 05RM0JZ, 05RM0KZ, 05RM47Z, 05RM4JZ, 05RM4KZ, 05RN07Z, 05RN0JZ, 05RN0KZ, 05RN47Z, 05RN4JZ, 05RN4KZ, 05RP07Z, 05RP0JZ, 05RP0KZ, 05RP47Z, 05RP4JZ, 05RP4KZ, 05RQ07Z, 05RQ0JZ, 05RQ0KZ, 05RQ47Z, 05RQ4JZ, 05RQ4KZ, 05RR07Z, 05RR0JZ, 05RR0KZ, 05RR47Z, 05RR4JZ, 05RR4KZ, 05RS07Z, 05RS0JZ, 05RS0KZ, 05RS47Z, 05RS4JZ, 05RS4KZ, 05RT07Z, 05RT0JZ, 05RT0KZ, 05RT47Z, 05RT4JZ, 05RT4KZ, 05RV07Z, 05RV0JZ, 05RV0KZ, 05RV47Z, 05RV4JZ, 05RV4KZ
Coagulopathy	286.6, 286.7, 286.9	D65, D6832, D684, D688, D689
Ischemic Heart Disease/ Coronary Artery	ICD-9 Diagnosis: 410.xx, 411.0, 412, 429.71, 429.79, 413.x, 411.1, 411.8x, 414.0x, 414.8, 414.9 CPT: 33508, 33510, 33511, 33512,	**ICD-10 Diagnosis:** I220, I221, I228, I214, I222, I213, I229, I241, I200, I240, I248, I249, I252, I208, I201, I209, I255, I256, I259, I231, I232, I510, I230, I233, I236, I237, I238, I513, I2109, I2101, I2102, I2119, I2111, I2129, I2121, I2510,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
	33513, 33514, 33516, 33517, 33518, 33519, 33521, 33522, 33523, 33530, 33533, 33534, 33535, 33536, 33572, 34001, 35301, 35501, 35506, 35507, 35508, 35509, 35510, 35515, 35601, 35606, 35691, 35693, 35694, 35695, 92973, 92974, 92975, 92977, 92978, 92979, 92980, 92981, 92982, 92984 ICD-9 procedure: 00.66, 17.55, 36.01, 36.02, 36.03, 36.04, 36.05, 36.06, 36.07, 36.09, 36.1, 36.10, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.17, 36.19, 36.2, 36.31, 36.32, 36.33, 36.34, 36.39, 36.91, 36.99, 00.50, 00.51, 00.52, 00.53, 00.54, 37.90, 37.91, 37.92, 37.93, 37.94, 37.95, 37.96, 37.97, 37.98, 37.99	I2589, I25110, I25111, I25118, I25119, I25700, I25701, I25708, I25709, I25710, I25711, I25718, I25719, I25720, I25721, I25728, I25729, I25730, I25731, I25738, I25739, I25750, I25751, I25758, I25759, I25760, I25761, I25768, I25769, I25790, I25791, I25798, I25799, I25810, I25811, I25812 **ICD-10 Procedure:** 0210093, 0210093, 0210098, 0210098, 0210099, 0210099, 021009C, 021009F, 021009W, 02100A3, 02100A8, 02100A9, 02100AC, 02100AF, 02100AW, 02100J3, 02100J8, 02100J9, 02100JC, 02100JF, 02100JW, 02100K3, 02100K8, 02100K9, 02100KC, 02100KF, 02100KW, 02100Z3, 02100Z8, 02100Z9, 02100ZC, 02100ZF, 0210344, 0210344, 02103D4, 0210444, 0210444, 0210493, 0210493, 0210498, 0210498, 0210499, 0210499, 021049C, 021049F, 021049W, 02104A3, 02104A8, 02104A9, 02104AC, 02104AF, 02104AW, 02104D4, 02104J3, 02104J8, 02104J9, 02104JC, 02104JF, 02104JW, 02104K3, 02104K8, 02104K9, 02104KC, 02104KF, 02104KW, 02104Z3, 02104Z8, 02104Z9, 02104ZC, 02104ZF, 0211093, 0211098, 0211098, 0211099, 0211099, 021109C, 021109F, 021109W, 02110A3, 02110A8, 02110A9, 02110AC, 02110AF, 02110AW, 02110J3, 02110J8, 02110J9, 02110JC, 02110JF, 02110JW, 02110K3, 02110K8, 02110K9, 02110KC, 02110KF, 02110KW, 02110Z3, 02110Z8, 02110Z9, 02110ZC, 02110ZF, 0211344, 0211344, 02113D4, 0211444, 0211444, 0211493, 0211498, 0211498, 0211499, 0211499, 021149C, 021149F, 021149W, 02114A3, 02114A8, 02114A9, 02114AC, 02114AF, 02114AW, 02114D4, 02114J3, 02114J8, 02114J9, 02114JC, 02114JF, 02114JW, 02114K3, 02114K8, 02114K9, 02114KC, 02114KF, 02114KW, 02114Z3, 02114Z8, 02114Z9, 02114ZC, 02114ZF, 0212093, 0212098, 0212099, 021209C, 021209F, 021209W, 02120A3, 02120A8, 02120A9, 02120AC, 02120AF, 02120AW, 02120J3, 02120J8, 02120J9, 02120JC, 02120JF, 02120JW, 02120K3, 02120K8, 02120K9, 02120KC, 02120KF, 02120KW, 02120Z3, 02120Z8, 02120Z9, 02120ZC, 02120ZF, 0212344, 0212344, 02123D4, 0212444, 0212444, 0212493, 0212498, 0212499, 021249C, 021249F, 021249W, 02124A3,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		02124A8, 02124A9, 02124AC, 02124AF, 02124AW, 02124D4, 02124J3, 02124J8, 02124J9, 02124JC, 02124JF, 02124JW, 02124K3, 02124K8, 02124K9, 02124KC, 02124KF, 02124KW, 02124Z3, 02124Z8, 02124Z9, 02124ZC, 02124ZF, 0213093, 0213098, 0213099, 021309C, 021309F, 021309W, 02130A3, 02130A8, 02130A9, 02130AC, 02130AF, 02130AW, 02130J3, 02130J8, 02130J9, 02130JC, 02130JF, 02130JW, 02130K3, 02130K8, 02130K9, 02130KC, 02130KF, 02130KW, 02130Z3, 02130Z8, 02130Z9, 02130ZC, 02130ZF, 0213344, 0213344, 02133D4, 0213444, 0213444, 0213493, 0213498, 0213499, 021349C, 021349F, 021349W, 02134A3, 02134A8, 02134A9, 02134AC, 02134AF, 02134AW, 02134D4, 02134J3, 02134J8, 02134J9, 02134JC, 02134JF, 02134JW, 02134K3, 02134K8, 02134K9, 02134KC, 02134KF, 02134KW, 02134Z3, 02134Z8, 02134Z9, 02134ZC, 02134ZF, 021K0Z5, 021K0Z8, 021K0Z9, 021K0ZC, 021K0ZF, 021K0ZW, 021K4Z5, 021K4Z8, 021K4Z9, 021K4ZC, 021K4ZF, 021K4ZW, 021L09P, 021L09Q, 021L09R, 021L0AP, 021L0AQ, 021L0AR, 021L0JP, 021L0JQ, 021L0JR, 021L0KP, 021L0KQ, 021L0KR, 021L0Z5, 021L0Z8, 021L0Z9, 021L0ZC, 021L0ZF, 021L0ZP, 021L0ZQ, 021L0ZR, 021L49P, 021L49Q, 021L49R, 021L4AP, 021L4AQ, 021L4AR, 021L4JP, 021L4JQ, 021L4JR, 021L4KP, 021L4KQ, 021L4KR, 021L4Z5, 021L4Z8, 021L4Z9, 021L4ZC, 021L4ZF, 021L4ZP, 021L4ZQ, 021L4ZR, 02540ZZ, 02543ZZ, 02544ZZ, 0270046, 027004Z, 02700D6, 02700DZ, 02700T6, 02700TZ, 02700Z6, 02700ZZ, 0270346, 027034Z, 02703D6, 02703DZ, 02703T6, 02703TZ, 02703Z6, 02703ZZ, 0270446, 027044Z, 02704D6, 02704DZ, 02704T6, 02704TZ, 02704Z6, 02704ZZ, 0271046, 027104Z, 02710D6, 02710DZ, 02710T6, 02710TZ, 02710Z6, 02710ZZ, 0271346, 027134Z, 02713D6, 02713DZ, 02713T6, 02713TZ, 02713Z6, 02713ZZ, 0271446, 027144Z, 02714D6, 02714DZ, 02714T6, 02714TZ, 02714Z6, 02714ZZ, 0272046, 027204Z, 02720D6, 02720DZ, 02720T6, 02720TZ, 02720Z6, 02720ZZ, 0272346, 027234Z, 02723D6, 02723DZ, 02723T6, 02723TZ, 02723Z6, 02723ZZ, 0272446, 027244Z, 02724D6, 02724DZ, 02724T6, 02724TZ,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		02724Z6, 02724ZZ, 0273046, 027304Z, 02730D6, 02730DZ, 02730T6, 02730TZ, 02730Z6, 02730ZZ, 0273346, 027334Z, 02733D6, 02733DZ, 02733T6, 02733TZ, 02733Z6, 02733ZZ, 0273446, 027344Z, 02734D6, 02734DZ, 02734T6, 02734TZ, 02734Z6, 02734ZZ, 02880ZZ, 02883ZZ, 02884ZZ, 02B40ZZ, 02B43ZZ, 02B44ZZ, 02C00ZZ, 02C03ZZ, 02C04ZZ, 02C10ZZ, 02C13ZZ, 02C14ZZ, 02C20ZZ, 02C23ZZ, 02C24ZZ, 02C30ZZ, 02C33ZZ, 02C34ZZ, 02C40ZZ, 02C43ZZ, 02C44ZZ, 02H402Z, 02H403Z, 02H40DZ, 02H40JZ, 02H40KZ, 02H432Z, 02H433Z, 02H43DZ, 02H43JZ, 02H43KZ, 02H43MZ, 02H442Z, 02H443Z, 02H44DZ, 02H44JZ, 02H44KZ, 02H60JZ, 02H60KZ, 02H63JZ, 02H63KZ, 02H64JZ, 02H64KZ, 02H70KZ, 02H73KZ, 02H74KZ, 02HK0JZ, 02HK0KZ, 02HK3JZ, 02HK3KZ, 02HK4JZ, 02HK4KZ, 02HL0JZ, 02HL0KZ, 02HL3JZ, 02HL3KZ, 02HL4JZ, 02HL4KZ, 02HN0KZ, 02HN3KZ, 02HN4KZ, 02PA0MZ, 02PA3MZ, 02PA4MZ, 02PAXMZ, 02Q00ZZ, 02Q03ZZ, 02Q04ZZ, 02Q10ZZ, 02Q13ZZ, 02Q14ZZ, 02Q20ZZ, 02Q23ZZ, 02Q24ZZ, 02Q30ZZ, 02Q33ZZ, 02Q34ZZ, 02Q40ZZ, 02Q43ZZ, 02Q44ZZ, 02QA0ZZ, 02QA3ZZ, 02QA4ZZ, 02QB0ZZ, 02QB3ZZ, 02QB4ZZ, 02QC0ZZ, 02QC3ZZ, 02QC4ZZ, 02U73JZ, 02U74JZ, 0JH607Z, 0JH608Z, 0JH609Z, 0JH637Z, 0JH638Z, 0JH639Z, 0JH807Z, 0JH808Z, 0JH809Z, 0JH837Z, 0JH838Z, 0JH839Z, 0JPT0PZ, 0JPT3PZ, 0JWT0PZ, 0JWT3PZ, 3E07017, 3E070GC, 3E070KZ, 3E070PZ, 3E07317, 3E073GC, 3E073KZ, 3E073PZ, 3E080GC, 3E080KZ, 3E083GC, 3E083KZ
Dementia	290-290.9	F0390, F0150, F0151
Dyspepsia	787.1, 789.0, 789.4, 789.6, 536.8	K30, R12, R100, R109, R102, R1011, R1012, R1031, R1032, R1033, R1013, R1084, R1010, R1030, R1930, R1931, R1932, R1933, R1934, R1935, R1936, R1937, R10819, R10829, R10811, R10821, R10812, R10822, R10813, R10823, R10814, R10824, R10815, R10825, R10816, R10826, R10817, R10827
Hemiplegia or Paraplegia	344.1, 342-342.9	G041, G8100, G8101, G8102, G8103, G8104, G8110, G8111, G8112, G8113, G8114, G8190, G8191, G8192, G8193, G8194, G8220, G8221, G8222
Hyperlipidemia	272.2, 272.4	E782, E784, E785
Pneumonia	480.x-486	J13, J14, J17, B250, B440, A221, J120, J121, J122, J123, J129, J181, J150, J151, J154, J153, J158, J155, J156, A481, J159, J157, J160, J168,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		J180, J188, J189, A3791, B7781, A3701, A3711, A3781, J1281, J1289, J1520, J1529, J15211, J15212
Rheumatologic disease	710.1, 710.1, 710.4, 714.0-714.2, 714.81, 725	M340, M341, M342, M349, M059, M069, M061, M353, M3481, M0540, M0549, M0550, M0559, M3321, M3322, M3482, M3483, M3489, M3320, M3329, M0570, M0579, M0580, M0589, M0600, M0608, M0609, M0620, M0628, M0629, M0630, M0638, M0639, M0680, M0688, M0689, M0500, M0509, M0520, M0529, M0530, M0539, M0560, M0569, M0510, M0519, M05411, M05412, M05419, M05421, M05422, M05429, M05431, M05432, M05439, M05441, M05442, M05449, M05451, M05452, M05459, M05461, M05462, M05469, M05471, M05472, M05479, M05511, M05512, M05519, M05521, M05522, M05529, M05531, M05532, M05539, M05541, M05542, M05549, M05551, M05552, M05559, M05561, M05562, M05569, M05571, M05572, M05579, M05711, M05712, M05719, M05721, M05722, M05729, M05731, M05732, M05739, M05741, M05742, M05749, M05751, M05752, M05759, M05761, M05762, M05769, M05771, M05772, M05779, M05811, M05812, M05819, M05821, M05822, M05829, M05831, M05832, M05839, M05841, M05842, M05849, M05851, M05852, M05859, M05861, M05862, M05869, M05871, M05872, M05879, M06011, M06012, M06019, M06021, M06022, M06029, M06031, M06032, M06039, M06041, M06042, M06049, M06051, M06052, M06059, M06061, M06062, M06069, M06071, M06072, M06079, M06211, M06212, M06219, M06221, M06222, M06229, M06231, M06232, M06239, M06241, M06242, M06249, M06251, M06252, M06259, M06261, M06262, M06269, M06271, M06272, M06279, M06311, M06312, M06319, M06321, M06322, M06329, M06331, M06332, M06339, M06341, M06342, M06349, M06351, M06352, M06359, M06361, M06362, M06369, M06371, M06372, M06379, M06811, M06812, M06819, M06821, M06822, M06829, M06831, M06832, M06839, M06841, M06842, M06849, M06851, M06852, M06859, M06861, M06862, M06869, M06871, M06872, M06879, M05011, M05012, M05019, M05021, M05022, M05029, M05031, M05032, M05039, M05041, M05042, M05049, M05051, M05052, M05059, M05061, M05062, M05069, M05071, M05072, M05079, M05211, M05212, M05219, M05221, M05222, M05229, M05231, M05232, M05239, M05241, M05242, M05249, M05251, M05252, M05259, M05261, M05262,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		M05269, M05271, M05272, M05279, M05311, M05312, M05319, M05321, M05322, M05329, M05331, M05332, M05339, M05341, M05342, M05349, M05351, M05352, M05359, M05361, M05362, M05369, M05371, M05372, M05379, M05611, M05612, M05619, M05621, M05622, M05629, M05631, M05632, M05639, M05641, M05642, M05649, M05651, M05652, M05659, M05661, M05662, M05669, M05671, M05672, M05679, M05111, M05112, M05119, M05121, M05122, M05129, M05131, M05132, M05139, M05141, M05142, M05149, M05151, M05152, M05159, M05161, M05162, M05169, M05171, M05172, M05179
Sleep apnea	327.23, 780.57 CPT: G8839, G8841, G8900	G4733, G4730
Spinal Cord Injury	952.xx	S14101A, S14102A, S14103A, S14104A, S14111A, S14112A, S14113A, S14114A, S14131A, S14132A, S14133A, S14134A, S14121A, S14122A, S14123A, S14124A, S14151A, S14152A, S14153A, S14154A, S14105A, S14106A, S14107A, S14108A, S14115A, S14116A, S14117A, S14118A, S14135A, S14136A, S14137A, S14138A, S14125A, S14126A, S14127A, S14128A, S14155A, S14156A, S14157A, S14158A, S24101A, S24102A, S24111A, S24112A, S24131A, S24132A, S24151A, S24152A, S24103A, S24104A, S24113A, S24114A, S24133A, S24134A, S24153A, S24154A, S34109A, S34139A, S343XXA, S14109A, S24109A, S140XXA, S14141A, S14142A, S14143A, S14144A, S14145A, S14146A, S14147A, S14148A, S240XXA, S24141A, S24142A, S24143A, S24144A, S3401XA, S34101A, S34102A, S34103A, S34104A, S34105A, S34111A, S34112A, S34113A, S34114A, S34115A, S34119A, S34121A, S34122A, S34123A, S34124A, S34125A, S34129A, S3402XA, S34131A, S34132A, S14119A, S14129A, S14139A, S14149A, S14159A, S24119A, S24139A, S24149A, S24159A
Thrombocytopenia	287.3x, 287.4x, 287.5x, 446.6, 289.84	D693, D696, M311, D6941, D6942, D6949, D6951, D6959, D7582
Thrombophilia	286.9, 289.81	D688, D689, D6851, D6852, D6859, D6861, D6862
Varicose Veins	454.x	**ICD-10 Diagnosis:** I8310, I8311, I8312, I8390, I8391, I8392, I8393, I83001, I83002, I83003, I83004, I83005, I83008, I83009, I83011, I83012, I83013, I83014, I83015, I83018, I83019, I83021, I83022, I83023, I83024,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		I83025, I83028, I83029, I83201, I83202, I83203, I83204, I83205, I83208, I83209, I83211, I83212, I83213, I83214, I83215, I83218, I83219, I83221, I83222, I83223, I83224, I83225, I83228, I83229, I83811, I83812, I83813, I83819, I83891, I83892, I83893, I83899
Congestive Heart Failure	**ICD-9-CM codes:** 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.xx **ICD-9-PCS:** 37.20, 37.26, 37.27, 37.51, 37.52, 37.53, 37.54, 37.55, 37.60, 37.61, 37.62, 37.63, 37.64, 37.65, 37.66, 37.67, 37.68 **CPT codes:** 33930, 33933, 33935, 33940, 33944, 33945, 33960, 33961, 33967, 33968, 33970, 33971, 33973, 33974, 33975, 33976, 33977, 33978, 33979, 33980, 33981, 33982, 33983, 33990, 33991, 33992, 33993	**ICD-10-diagnosis codes:** I110, I130, I132, I509, I501, I5020, I5021, I5022, I5023, I5030, I5031, I5032, I5033, I5040, I5041, I5042, I5043, I0981 **ICD-10-procedure codes:** 02HA0QZ, 02HA0RS, 02HA0RZ, 02HA3QZ, 02HA3RS, 02HA3RZ, 02HA4QZ, 02HA4RS, 02HA4RZ, 02HN0MZ, 02HN3MZ, 02HN4MZ, 02K80ZZ, 02K83ZZ, 02K84ZZ, 02PA0QZ, 02PA0RZ, 02PA3QZ, 02PA3RZ, 02PA4QZ, 02PA4RZ, 02WA0JZ, 02WA0QZ, 02WA0RZ, 02WA3QZ, 02WA3RZ, 02WA4QZ, 02WA4RZ, 02YA0Z0, 02YA0Z1, 02YA0Z2, 0KXF0ZZ, 0KXG0ZZ, 0PT10ZZ, 0PT20ZZ, 3E053KZ, 3E063KZ, 4A023FZ, 4A02X4Z, 4A02XFZ, 5A02110, 5A02116, 5A0211D, 5A02210, 5A02216, 5A0221D
Diabetes Mellitus	249, 250, 357.2, 362, 366.41, 648.0, E932.3, V58.67	E9323, V5867, E089, E139, E088, E138, E119, E109, E118, E108, E098, E0821, E0836, E0840, E0841, E0842, E0843, E0844, E0849, E0851, E0921, E0936, E0940, E0941, E0942, E0943, E0944, E0949, E0951, E1036, E1040, E1042, E1051, E1136, E1140, E1142, E1151, E1336, E1340, E1341, E1342, E1343, E1344, E1349, E0822, E0829, E0852, E0922, E0929, E0952, E1041, E1043, E1044, E1049, E1052, E1141, E1143, E1144, E1149, E1152, E1351, E1352, E0865, E0810, E1310, E0800, E0801, E1300, E1301, E0811, E1311, E1321, E1322, E1329, E0839, E1339, E0859, E1359, E0869, E1365, E1369, E1165, E1065, E1169, E1010, E1100, E1101, E1069, E1011, E1121, E1122, E1129, E1021, E1022, E1029, E1139, E1039, E1159, E1059, O2402, O2412, O2432, O2482, O2492, O2493, O2403, O2413, O2433, O2483, E0910, E0901, E0911, E0965, E0969, E08311, E08319, E08610, E08618, E08628, E08630, E08638, E09311, E09319, E09610, E09618, E09628, E09630, E09638, E10311, E10319, E10618, E10630, E11311, E11319, E11329, E11339, E11349, E11359, E11618, E11630, E08321, E08329, E08331, E08339, E08341, E08349, E08351, E08359, E08649, E09321, E09329, E09331, E09339, E09341, E09349, E09351, E09359, E10321, E10329, E10331, E10339,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		E10341, E10349, E10351, E10359, E10610, E11321, E11331, E11341, E11351, E11610, E13311, E13319, E13321, E13329, E13331, E13339, E13341, E13349, E13351, E13359, E13610, E13618, E13630, E08641, E13641, E08620, E08621, E08622, E13620, E13621, E13622, E13628, E13638, E13649, E11641, E10641, E11620, E11621, E11622, E11628, E11638, E11649, E10620, E10621, E10622, E10628, E10638, E10649, O24019, O24119, O24319, O24819, O24919, O24011, O24012, O24013, O24111, O24112, O24113, O24311, O24312, O24313, O24811, O24812, O24813, O24911, O24912, O24913, T383X5A, T383X5S, Z794
Hypertension	362.11, 401, 402, 403, 404, 405	I10, I119, I110, I129, I120, I130, I132, I150, I158, I151, N262, I152, I159, I1310, I1311, H35031, H35032, H35033, H35039
Renal Disease	**ICD-9-CM:** V45.1x, V56.x, V42.0, 250.4x, 403.00, 403.10, 403.90, 404.00, 404.10, 404.90, 572.4, 581-583, 585, 586, 588, 791.0 **ICD-9-PCS**: 38.95, 39.27, 39.42, 39.43, 39.93, 39.95, 54.98, 55.69 **CPT Codes:** 36147, 36148, 36800-36821, 36825, 36830-36833, 36838, 36870, 90918-90925, 90935-90999, 50340, 50360, 50365, 50370	ICD-10 diagnosis : N08, N16, N19, B520, I129, K767, N044, N021, N022, N023, N041, N042, N024, N025, N026, N027, N043, N045, N046, N020, N040, N028, N047, N048, N029, N049, N032, N031, N033, N034, N035, N036, N037, N038, N030, N039, N059, N052, N062, N072, N053, N054, N055, N063, N064, N065, N073, N074, N075, N171, N172, N050, N051, N056, N057, N058, N060, N061, N066, N067, N068, N070, N071, N076, N077, N078, N140, N141, N142, N143, N144, N150, N158, N069, N079, N159, N181, N182, N183, N184, N185, N186, N189, N250, N251, N259, R800, R801, R803, R808, R809, M3214, M3215, M3504, Z4822, E1121, E1122, E1129, E1321, E1322, E1329, E1021, E1022, E1029, I1310, N2581, N2589, Z940, Z992, Z9115, Z4931, Z4901, Z4902, Z4932 **ICD-10 PCS Code:** 031209D, 031209F, 03120AD, 03120AF, 03120JD, 03120JF, 03120KD, 03120KF, 03120ZD, 03120ZF, 031309D, 031309F, 03130AD, 03130AF, 03130JD, 03130JF, 03130KD, 03130KF, 03130ZD, 03130ZF, 031409D, 031409F, 03140AD, 03140AF, 03140JD, 03140JF, 03140KD, 03140KF, 03140ZD, 03140ZF, 031509D, 031509F, 03150AD, 03150AF, 03150JD, 03150JF, 03150KD, 03150KF, 03150ZD, 03150ZF, 031609D, 031609F, 03160AD, 03160AF, 03160JD, 03160JF, 03160KD, 03160KF, 03160ZD, 03160ZF, 031709D, 031709F, 03170AD, 03170AF, 03170JD, 03170JF, 03170KD, 03170KF, 03170ZD, 03170ZF, 031809D, 031809F,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		03180AD, 03180AF, 03180JD, 03180JF, 03180KD, 03180KF, 03180ZD, 03180ZF, 031909F, 03190AF, 03190JF, 03190KF, 03190ZF, 031A09F, 031A0AF, 031A0JF, 031A0KF, 031A0ZF, 031B09F, 031B0AF, 031B0JF, 031B0KF, 031B0ZF, 031C09F, 031C0AF, 031C0JF, 031C0KF, 031C0ZF, 03PY07Z, 03PY0JZ, 03PY0KZ, 03PY37Z, 03PY3JZ, 03PY3KZ, 03PY47Z, 03PY4JZ, 03PY4KZ, 05HY33Z, 06HY33Z, 0TY00Z0, 0TY00Z1, 0TY00Z2, 0TY10Z0, 0TY10Z1, 0TY10Z2, 3E1M39Z, 5A1D70Z, 5A1D80Z, 5A1D90Z
Liver Disease	**ICD-9-CM Codes:** 070.22, 070.23, 070.32, 070.33, 070.42-070.49, 070.52-070.59, 070.6, 070.7x, 070.9, 277.4, 456.0-456.2, 571-573, 751.62, 996.82, V42.7 **ICD-9-PCS:** 39.1, 42.91, 50.5 **CPT Codes:** 47135, 47136	**ICD-10-CM Codes:** K77, B251, B181, B180, B170, B172, B182, B178, B188, B189, B190, B179, B199, E804, E805, E806, E807, K700, K702, K709, K739, K730, K754, K731, K732, K738, K740, K743, K744, K745, K760, K741, K742, K769, K750, K751, K766, K767, K761, K710, K712, K713, K714, K716, K717, K718, K719, K752, K753, K759, K764, K763, K765, K7291, K7041, K7111, K7201, K7211, Z4823, B1920, B1921, I8501, I8500, I8511, I8510, K7010, K7011, K7030, K7031, K7040, K7460, K7469, K7581, K7689, K7290, K7210, K7110, K7150, K7151, K7589, K7681, T8640, T8641, T8642, T8643, T8649, Z944 **ICD-10-PCS Codes:** 0610075, 0610075, 0610076, 0610076, 061007Y, 0610095, 0610095, 0610096, 0610096, 061009Y, 06100A5, 06100A6, 06100AY, 06100J5, 06100J6, 06100JY, 06100K5, 06100K6, 06100KY, 06100Z5, 06100Z6, 06100ZY, 0610475, 0610475, 0610476, 0610476, 061047Y, 0610495, 0610495, 0610496, 0610496, 061049Y, 06104A5, 06104A6, 06104AY, 06104J5, 06104J6, 06104JY, 06104K5, 06104K6, 06104KY, 06104Z5, 06104Z6, 06104ZY, 0611079, 0611079, 061107B, 061107Y, 0611099, 0611099, 061109B, 061109Y, 06110A9, 06110AB, 06110AY, 06110J9, 06110JB, 06110JY, 06110K9, 06110KB, 06110KY, 06110Z9, 06110ZB, 06110ZY, 0611479, 0611479, 061147B, 061147Y, 0611499, 0611499, 061149B, 061149Y, 06114A9, 06114AB, 06114AY, 06114J9, 06114JB, 06114JY, 06114K9, 06114KB, 06114KY, 06114Z9, 06114ZB, 06114ZY, 061207Y, 061209Y, 06120AY, 06120JY, 06120KY, 06120ZY, 061247Y, 061249Y, 06124AY, 06124JY,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		06124KY, 06124ZY, 061407Y, 061409Y, 06140AY, 06140JY, 06140KY, 06140ZY, 061447Y, 061449Y, 06144AY, 06144JY, 06144KY, 06144ZY, 061507Y, 061509Y, 06150AY, 06150JY, 06150KY, 06150ZY, 061547Y, 061549Y, 06154AY, 06154JY, 06154KY, 06154ZY, 061607Y, 061609Y, 06160AY, 06160JY, 06160KY, 06160ZY, 061647Y, 061649Y, 06164AY, 06164JY, 06164KY, 06164ZY, 061707Y, 061709Y, 06170AY, 06170JY, 06170KY, 06170ZY, 061747Y, 061749Y, 06174AY, 06174JY, 06174KY, 06174ZY, 0618079, 0618079, 061807B, 061807Y, 0618099, 0618099, 061809B, 061809Y, 06180A9, 06180AB, 06180AY, 06180J9, 06180JB, 06180JY, 06180K9, 06180KB, 06180KY, 06180Z9, 06180ZB, 06180ZY, 0618479, 0618479, 061847B, 061847Y, 0618499, 0618499, 061849B, 061849Y, 06184A9, 06184AB, 06184AY, 06184J9, 06184JB, 06184JY, 06184K9, 06184KB, 06184KY, 06184Z9, 06184ZB, 06184ZY, 061907Y, 061909Y, 06190AY, 06190JY, 06190KY, 06190ZY, 061947Y, 061949Y, 06194AY, 06194JY, 06194KY, 06194ZY, 061B07Y, 061B09Y, 061B0AY, 061B0JY, 061B0KY, 061B0ZY, 061B47Y, 061B49Y, 061B4AY, 061B4JY, 061B4KY, 061B4ZY, 061J07Y, 061J09Y, 061J0AY, 061J0JY, 061J0KY, 061J0ZY, 061J47Y, 061J49Y, 061J4AY, 061J4JY, 061J4KY, 061J4ZY, 06L30ZZ, 06L33ZZ, 06L34ZZ, 0FY00Z0, 0FY00Z1, 0FY00Z2
COPD	491, 492, 496	J410, J411, J449, J441, J440, J418, J42, J439, J430, J431, J432, J438
Peptic Ulcer Disease	531-534	K250, K251, K252, K253, K254, K255, K256, K257, K259, K260, K261, K262, K263, K264, K265, K266, K267, K269, K270, K271, K272, K273, K274, K275, K276, K277, K279, K280, K281, K282, K283, K284, K285, K286, K287, K289
Inflammatory Bowel Disease	555, 556	K5000, K5010, K5080, K5090, K5180, K5120, K5130, K5140, K5150, K5100, K5190, K50012, K50013, K50014, K50112, K50113, K50114, K50812, K50813, K50814, K50912, K50913, K50914, K51012, K51013, K51014, K51212, K51213, K51214, K51312, K51313, K51314, K51412, K51413, K51414, K51512, K51513, K51514, K51812, K51813, K51814, K51912, K51913, K51914, K50011, K50018, K50019, K50111, K50118, K50119, K50811, K50818, K50819, K50911, K50918, K50919, K51211, K51218, K51219, K51311, K51318, K51319,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		K51411, K51418, K51419, K51511, K51518, K51519, K51011, K51018, K51019, K51811, K51818, K51819, K51911, K51918, K51919
Peripheral Vascular Disease	440, 441, 442, 443, 444, 445	I700, I701, I708, I711, I712, I713, I714, I718, I715, I716, I719, I790, I721, I722, I723, I724, I720, I728, I729, I731, I670, I791, I798, I739, I742, I743, I744, I745, I748, I749, I7025, I7035, I7045, I7055, I7065, I7075, I7301, I7092, I7090, I7091, I7100, I7101, I7102, I7103, I7300, I7771, I7772, I7773, I7774, I7779, I7381, I7389, I7401, I7409, I7410, I7419, I7411, I7581, I7589, I70231, I70232, I70233, I70234, I70235, I70238, I70239, I70241, I70242, I70243, I70244, I70245, I70248, I70249, I70331, I70332, I70333, I70334, I70335, I70338, I70339, I70341, I70342, I70343, I70344, I70345, I70348, I70349, I70361, I70362, I70363, I70368, I70369, I70431, I70432, I70433, I70434, I70435, I70438, I70439, I70441, I70442, I70443, I70444, I70445, I70448, I70449, I70461, I70462, I70463, I70468, I70469, I70531, I70532, I70533, I70534, I70535, I70538, I70539, I70541, I70542, I70543, I70544, I70545, I70548, I70549, I70561, I70562, I70563, I70568, I70569, I70631, I70632, I70633, I70634, I70635, I70638, I70639, I70641, I70642, I70643, I70644, I70645, I70648, I70649, I70661, I70662, I70663, I70668, I70669, I70731, I70732, I70733, I70734, I70735, I70738, I70739, I70741, I70742, I70743, I70744, I70745, I70748, I70749, I70761, I70762, I70763, I70768, I70769, I70201, I70202, I70203, I70208, I70209, I70211, I70212, I70213, I70218, I70219, I70221, I70222, I70223, I70228, I70229, I70261, I70262, I70263, I70268, I70269, I70291, I70292, I70293, I70298, I70299, I70301, I70302, I70303, I70308, I70309, I70311, I70312, I70313, I70318, I70319, I70321, I70322, I70323, I70328, I70329, I70391, I70392, I70393, I70398, I70399, I70601, I70602, I70603, I70608, I70609, I70611, I70612, I70613, I70618, I70619, I70621, I70622, I70623, I70628, I70629, I70691, I70692, I70693, I70698, I70699, I70701, I70702, I70703, I70708, I70709, I70711, I70712, I70713, I70718, I70719, I70721, I70722, I70723, I70728, I70729, I70791, I70792, I70793, I70798, I70799, I70401, I70402, I70403, I70408, I70409, I70411, I70412, I70413, I70418, I70419, I70421, I70422, I70423, I70428, I70429, I70491,

Condition	ICD-9 Code(s)	ICD-10 Code(s)
		I70492, I70493, I70498, I70499, I70501, I70502, I70503, I70508, I70509, I70511, I70512, I70513, I70518, I70519, I70521, I70522, I70523, I70528, I70529, I70591, I70592, I70593, I70598, I70599, I75011, I75012, I75013, I75019, I75021, I75022, I75023, I75029
Fractures/ Trauma involving the Lower Extremities	820-828, 835-838, 890-897, 904, 928.0-928.3, 928.8, 928.9, 945, 956, 959.6, 959.7	 Fractures Involving the Lower Extremitie
Falls	E8800, E8801, E8809, E8810, E8811, E882, E8830, E8831, E8832, E8839, E8840, E8841, E8842, E8843, E8843, E8843, E8844, E8845, E8846, E8849, E8849, E8849, E8850, E8851, E8852, E8853, E8854, E8859, E8860, E8869, E887, E8880, E8881, E8888, E8889	W100XXA, W100XXD, W101XXA, W101XXD, W102XXA, W102XXD, W108XXA, W108XXD, W109XXA, W109XXD, W07XXXA, W07XXXD, W050XXA, W050XXD, W051XXA, W051XXD, W052XXA, W052XXD, W06XXXA, W06XXXD, W08XXXA, W08XXXD, W1811XA, W1811XD, W1812XA, W1812XD, W001XXA, W001XXD, W002XXA, W002XXD, W1789XA, W1789XD, W000XXA, W000XXD, W009XXA, W009XXD, W010XXA, W010XXD, W182XXA, W182XXD, W03XXXA, W03XXXD, W19XXXA, W0110XA, W0110XD, W01110A, W01110D, W01111A, W01111D, W01118A, W01118D, W01119A, W01119D, W1802XA, W1802XD, W01190A, W01190D, W01198A, W01198D, W1800XA, W1800XD, W1809XD, W04XXXA, W04XXXD, W1830XA, W1830XD, W1831XA, W1831XD, W1839XA, W1839XD, W19XXXD, W11XXXA, W11XXXD
Pelvic or orthopedic surgery	**Refer to Table 9**	**Refer to Table 9**
Any hospitalization	Any acute-care inpatient stay from medical claims	

TABLE 7: SELECTED SURGERIES


Selected Surgeries.xls

TABLE 8: DEYO-CHARLSON COMORBIDITY INDEX CODES

Comorbidity	ICD-9 Codes	ICD-10 Codes	Points
Myocardial Infarction	410, 412	I2109, I2111, I2119, I2129, I213, I214, I252,	1

Comorbidity	ICD-9 Codes	ICD-10 Codes	Points
Congestive Heart Failure	428-428.9	I50.1, I50.20, I50.21, I50.22, I50.23, I50.30, I50.31, I50.32, I50.33, I50.40, I50.41, I50.42, I50.43, I50.9	1
Peripheral vascular disease	443.9, 441-441.9, 785.4, V43.4, 38.48	I7100, I7101, I7102, I7103, I711, I712, I713, I714, I718, I715, I716, I719, I739, I96, Z95828, 04RK07Z, 04RK0JZ, 04RK0KZ, 04RK47Z, 04RK4JZ, 04RK4KZ, 04RL07Z, 04RL0JZ, 04RL0KZ, 04RL47Z, 04RL4JZ, 04RL4KZ, 04RM07Z, 04RM0JZ, 04RM0KZ, 04RM47Z, 04RM4JZ, 04RM4KZ, 04RN07Z, 04RN0JZ, 04RN0KZ, 04RN47Z, 04RN4JZ, 04RN4KZ, 04RP07Z, 04RP0JZ, 04RP0KZ, 04RP47Z, 04RP4JZ, 04RP4KZ, 04RQ07Z, 04RQ0JZ, 04RQ0KZ, 04RQ47Z, 04RQ4JZ, 04RQ4KZ, 04RR07Z, 04RR0JZ, 04RR0KZ, 04RR47Z, 04RR4JZ, 04RR4KZ, 04RS07Z, 04RS0JZ, 04RS0KZ, 04RS47Z, 04RS4JZ, 04RS4KZ, 04RT07Z, 04RT0JZ, 04RT0KZ, 04RT47Z, 04RT4JZ, 04RT4KZ, 04RU07Z, 04RU0JZ, 04RU0KZ, 04RU47Z, 04RU4JZ, 04RU4KZ, 04RV07Z, 04RV0JZ, 04RV0KZ, 04RV47Z, 04RV4JZ, 04RV4KZ, 04RW07Z, 04RW0JZ, 04RW0KZ, 04RW47Z, 04RW4JZ, 04RW4KZ, 04RY07Z, 04RY0JZ, 04RY0KZ, 04RY47Z, 04RY4JZ, 04RY4KZ	1
Cerebrovascular disease	430-438	G450, , G451, G454, G458, G459, I609, I619, I6200, I621, I629, I63019, I63119, I63139, I6320, I63219, I6322, I63239, I6330, I6340, I6350, I6359, , I6509, I651, I6529, I658, I658, I659, I6609, I6619, , I6629, I669, I671, I672, I674, I675, I676, I677, I6781, I6782, I67848, I6789, I679, I69.9	1
Dementia	290-290.9	F0150, F0151, F0390, F05	1
Rheumatologic Disease	710.1, 710.4, 714.0-714.2, 714.81, 725	M0500, M0510, M0530, M0560, M061, M069, M3320, M340, M341, M349, M353	1
Peptic Ulcer Disease	531-534.9	K250-K289	1
Mild Liver Disease	571.2, 571.5, 571.6, 571.4	K7030, K730, K732, K738, K739, K740, K743, K744, K745, K7460, K7469, K754,	1
Diabetes	250-250.3, 250.7	E1010, E1011, E1051, E10641, E1065, E1069, E109, E1100, E1101, E1151, E11641, E1165, E1169, E119	1
Diabetes w/ Complications	250.4-250.6	E1021, E1029, E10311, E10319, E1036, E1039, E1040, E1065, E1121, E1129, E11311, E11319, E1136, E1139, E1140, E1165	2
Hemiplegia or Paraplegia	344.1, 342-342.9	G8101-G8104, G8110-G8114, G8190-GG8194, G8220	2
Renal Disease	582-582.9, 583-583.7, 585, 586, 588-588.9	N032, N033, N035, N038, N039, N052, N055, N059, N08, N171, N172, N181, N182, N183, N184, N185, N186, N189, N19, N250, N251, N2581, N2589, N259,	2
Any Malignancy	140-172.9, 174-195.8, 200-208.9	C0-C96, D0310, D0311, D0312, D0320, D0321, D0322, D0330, D0339, D034, D0351, D0352, D0359, D0360, D0361, D0362, D0370, D0371, D0372, D038, D039, D45, D45, D45,	2
Moderate or Severe Liver Disease	572.2-572.8, 456.0-456.21	I8500, I8501, I8510, I8511, K7210, K7290, K7290, K7291, K766, K767,	3
Metastatic Solid Tumor	196-199.1	C770, C771, C772, C773, C774, C775, C778, C779, C7800, C781, C782, C7839, C784, C785, C786, C787, C787, C7889,	6

Comorbidity	ICD-9 Codes	ICD-10 Codes	Points
		C7900, C7911, C7919, C792, C7931, C7932, C7949, C7951, C7952, C7960, C7970, C7981, C7982, C7989, C800	
AIDS	042-044	B20	6

TABLE 9: CODES FOR PHARMACOTHERAPY

Drug	NDCs	HCPCS Codes*
ACE inhibitors/ARBs	Benazepril, Captopril, Enalapril, Fosinopril, Lisinopril , Moexipril, Perindopril, Quinapril, Ramipril, Trandolapril, azilsartan, candesartan, eprosartan, irbesartan, losartan, olmesartan, telmisartan, valsartan,	N/A
Antiarrhythmic	Alinidine, Bretylium, Digitalis, Diltiazem, Diphenylhydantoin, Disopyramide, Dofetilide, Enacainide, Flecainide, Mexiletine, Moricizine, Nadolol, Propafenone, Quinidine, Tocainide, Verapamil	N/A
	Adenosine	J0150, J0151, J0152, J0153
	Amiodarone	J0282
	Atropine	J0461, J7635, J7636
	Digoxin	J1160, J1162
	Ibutilide	J1742
	Lidocaine	C9285, J2001
	Procainamide	J2690
	Sotalol	C9482
Antiplatelet	Abciximab	J0130
	Anagrelide Hydrochloride	N/A
	Aspirin/Dipyridamole	G8598, G8599, G8895, G8896, G8897, G9277, G9278, G9435, G9436, G9437, G9793, G9794, G9795
	Cilstazol	G9531
	Clopidogrel Hydrogen Sulfate	G9531
	Dipyridamole	G9531, J1245
	Eptifibatide	J1327
	Prasugrel Hydrochloride	G9531
	Ticagrelor	G9531
	Ticlopidine Hydrochloride	G9531
	Tirofiban Hydrochloride	J3246
Aromatase inhibitors	Arimidex, aromasin, femara	N/A
Beta blockers	Acebutolol , Atenolol, Betaxolol, Bisoprolol, Esmolol, Carteolol, Carvedeolol, Labetalol, Levobunolol, Metipranolol, Metoprolol, Nebivolol, Nadolol, Penbutolol, Pinodolol, Propranolol, Sotalal, Timolol,	N/A
Erythropoiesis stimulating agents	Epoetin alfa	J0885, J0886, Q4081
	Epoetin beta	J0887, J0888, Q9973, Q9972

Drug	NDCs	HCPCS Codes*
	Epoetin delta	N/A
	Epoetin omega	N/A
	Darbepoetin alpha	J0881, J0882
	Pegylated Epoetin beta	N/A
Gastroprotective agents	Celecoxib, ketoprofen, meloxicam, etoricoxib, misoprostol, dexlansoprazole, esomeprazole, esomeprazole, lansoprazole, omeprazole, pantoprazole, rabeprazole	N/A
Hormones		
NSAIDs	Diclofenac	J 1130
	Bromfenac, Choline and Magnesium salicylate, Methanamine and sodium salicylate , Fenoprofen, Flurbiprofen, Ketoprofen, Naproxen, Oxaprozin, Sulindac, Piroxicam, Etodolac, Meloxicam, Nabumetone, Celecoxib/Celebrex, Indomethacin, Mefenamic acid, Meclofenamate, Diflunisal, Tolmetin, Salsalate,	N/A
	Aspirin	G8598, G8895, G9277, G9793
	Ibuprofen	J1741
	Ketorolac	J1885, C9447
	Diclofenac	J 1130
SERMs	Tamoxifen, raloxifene, arzoxifene, bazedoxifene, lasofoxifene, ospemifene, clomifene, cyclofenil, ormeloxifene, toremifene, raloxifene,	N/A
	Tamoxifen	S0187
Statins	Atorvastatin, Fluvastatin, Lovastatin, Pitavastatin, Pravastatin, Rosuvastatin, Simvastatin.	N/A

*NDCs will be used wherever applicable.

TABLE 10: MAJOR BLEEDING CODES

Category	ICD-9 Codes	ICD-10 Codes
Gastrointestinal	**ICD-9-CM Codes:** 456.0x, 456.20, 530.82, 531.0x, 531.2x, 531.4x, 531.6x, 532.0x, 532.2x, 532.4x, 532.6x, 533.0x, 533.2x, 533.4x, 533.6x, 534.0x, 534.2x, 534.4x, 534.6x, 535.01, 535.11, 535.21, 535.31, 535.41, 535.51, 535.61, 537.83, 562.02, 562.03, 562.12, 562.13, 568.81, 569.3, 569.85, 578.x **ICD-9-PCS Codes**: 44.43	**ICD-10-CM Codes:** I8501, I8511, K2211, K226, K250, K252, K254, K256, K260, K262, K264, K266, K270, K272, K274, K276, K280, K282, K284, K286, K2901, K2921, K2931, K2941, K2951, K2961, K2971, K2981, K2991, K31811, K3182, K5521, K5701, K5711, K5713, K5721, K5731, K5733, K5741, K5751, K5753, K5781, K5791, K5793, K625, K6381, K661, K920, K921, K922, K9161, K9162, K91840, K91841 **ICD-10-PCS Codes**: no codes
Intracranial	430.xx, 431.xx, 432.xx, 852.0x, 852.2x, 852.4x, 853.0x	I6000, I6001, I6002, I6010, I6011, I6012, I602, I6030, I6031, I6032, I604, I6050, I6051, I6052, I606, I607, I608, I609, I610, I611, I612, I613, I614, I615, I616, I618, I619, I6200, I6201, I6202, I6203, I621, I629, S06340A, S06341A, S06342A, S06343A, S06344A, S06345A, S06346A, S06347A, S06348A, S06349A, S06350A, S06351A, S06352A, S06353A, S06354A, S06355A, S06356A, S06357A, S06358A, S06359A, S06360A, S06361A, S06362A, S06363A, S06364A, S06365A, S06366A, S06367A, S06368A, S06369A, S064X0A,

Category	ICD-9 Codes	ICD-10 Codes
		S064X1A, S064X2A, S064X3A, S064X4A, S064X5A, S064X6A, S064X7A, S064X8A, S064X9A, S065X0A, S065X1A, S065X2A, S065X3A, S065X4A, S065X5A, S065X6A, S065X7A, S065X8A, S065X9A, S066X0A, S066X1A, S066X2A, S066X3A, S066X4A, S066X5A, S066X6A, S066X7A, S066X8A, S066X9A
Other MB	**ICD-9-Diagnosis:** 285.1, 360.43, 362.43, 362.81, 363.61, 363.62, 363.72, 364.41, 372.72, 374.81, 376.32, 377.42, 379.23, 423.0x, 596.7x, 599.7x, 602.1x, 620.1, 621.4, 626.2, 626.5, 626.7, 626.8, 626.9, 719.1x, 782.7, 784.7, 784.8, 786.3x, 958.2, 997.02, 998.11 **ICD-9 procedure:** 99.04	**ICD-10 CM Codes:** D62, D7801, D7802, D7821, D7822, E3601, E3602, E89810, E89811, G9731, G9732, G9751, G9752, H05231, H05232, H05233, H05239, H1130, H1131, H1132, H1133, H2100, H2101, H2102, H2103, H31301, H31302, H31303, H31309, H31311, H31312, H31313, H31319, H31411, H31412, H31413, H31419, H3560, H3561, H3562, H3563, H35731, H35732, H35733, H35739, H4310, H4311, H4312, H4313, H44811, H44812, H44813, H44819, H47021, H47022, H47023, H47029, H59111, H59112, H59113, H59119, H59121, H59122, H59123, H59129, H59311, H59312, H59313, H59319, H59321, H59322, H59323, H59329, H9521, H9522, H9541, H9542, I312, I97410, I97411, I97418, I9742, I97610, I97611, I97618, I97620, J9561, J9562, J95830, J95831, L7601, L7602, L7621, L7622, M2500, M25011, M25012, M25019, M25021, M25022, M25029, M25031, M25032, M25039, M25041, M25042, M25049, M25051, M25052, M25059, M25061, M25062, M25069, M25071, M25072, M25073, M25074, M25075, M25076, M2508, M96810, M96811, M96830, M96831, N421, N857, N897, N920, N923, N930, N938, N939, N9961, N9962, N99820, N99821, R040, R041, R042, R0489, R049, R233, R310, R319, R58, T792XXA **ICD-10 PCS Codes:** 30230N1, 30230P1, 30233N1, 30233P1, 30240N1, 30240P1, 30243N1, 30243P1, 30250N1, 30250P1, 30253N1, 30253P1, 30260N1, 30260P1, 30263N1, 30263P1

TABLE 11: CRNM BLEEDING CODES

Critical Care Site	Bleeding Category	ICD-10-CM	ICD-9-CM
No	GI	I8501	4560
No	GI	I8511	45620
No	GI	K228	53082
No	GI	K250	53100
No	GI	K250	53101
No	GI	K252	53120
No	GI	K252	53121
No	GI	K254	53140
No	GI	K254	53141

No	GI	K256	53160
No	GI	K256	53161
No	GI	K260	53200
No	GI	K260	53201
No	GI	K262	53220
No	GI	K262	53221
No	GI	K264	53240
No	GI	K264	53241
No	GI	K266	53260
No	GI	K266	53261
No	GI	K270	53300
No	GI	K270	53301
No	GI	K272	53320
No	GI	K272	53321
No	GI	K274	53340
No	GI	K274	53341
No	GI	K276	53360
No	GI	K276	53361
No	GI	K280	53400
No	GI	K280	53401
No	GI	K282	53420
No	GI	K282	53421
No	GI	K284	53440
No	GI	K284	53441
No	GI	K286	53460
No	GI	K286	53461
No	GI	K2901	53501
No	GI	K2931	53511
No	GI	K2941	53511
No	GI	K2951	53511
No	GI	K2961	53521
No	GI	K2921	53531
No	GI	K2931	53541
No	GI	K2961	53541
No	GI	K2971	53551
No	GI	K2991	53551
No	GI	K2981	53561
No	GI	K31811	53783
No	GI	K5711	56202
No	GI	K5713	56203

No	GI	K5731	56212
No	GI	K5791	56212
No	GI	K5733	56213
No	GI	K5793	56213
Yes Probably	GI	K661	56881
No	GI	K625	5693
No	GI	K5521	56985
No	GI	K920	5780
No	GI	K921	5781
No	GI	K922	5789
Yes	ICH	I6000	430
Yes	ICH	I6001	430
Yes	ICH	I6002	430
Yes	ICH	I6010	430
Yes	ICH	I6011	430
Yes	ICH	I6012	430
Yes	ICH	I602	430
Yes	ICH	I6030	430
Yes	ICH	I6031	430
Yes	ICH	I6032	430
Yes	ICH	I604	430
Yes	ICH	I6050	430
Yes	ICH	I6051	430
Yes	ICH	I6052	430
Yes	ICH	I606	430
Yes	ICH	I607	430
Yes	ICH	I608	430
Yes	ICH	I609	430
Yes	ICH	I610	431
Yes	ICH	I611	431
Yes	ICH	I612	431
Yes	ICH	I613	431
Yes	ICH	I614	431
Yes	ICH	I615	431
Yes	ICH	I616	431
Yes	ICH	I618	431
Yes	ICH	I619	431
Yes	ICH	I621	4320
Yes	ICH	I6200	4321
Yes	ICH	I6201	4321

Yes	ICH	I6202	4321
Yes	ICH	I6203	4321
Yes	ICH	I629	4329
Yes	ICH	S066X0A	85200
Yes	ICH	S066X0A	85201
Yes	ICH	S066X1A	85202
Yes	ICH	S066X2A	85202
Yes	ICH	S066X3A	85203
Yes	ICH	S066X4A	85203
Yes	ICH	S066X5A	85204
Yes	ICH	S066X6A	85205
Yes	ICH	S066X7A	85205
Yes	ICH	S066X8A	85205
Yes	ICH	S066X9A	85206
Yes	ICH	S066X0A	85209
Yes	ICH	S066X9A	85209
Yes	ICH	S065X0A	85220
Yes	ICH	S065X0A	85221
Yes	ICH	S065X1A	85222
Yes	ICH	S065X2A	85222
Yes	ICH	S065X3A	85223
Yes	ICH	S065X4A	85223
Yes	ICH	S065X5A	85224
Yes	ICH	S065X6A	85225
Yes	ICH	S065X7A	85225
Yes	ICH	S065X8A	85225
Yes	ICH	S065X9A	85226
Yes	ICH	S065X0A	85229
Yes	ICH	S065X9A	85229
Yes	ICH	S064X0A	85240
Yes	ICH	S064X0A	85241
Yes	ICH	S064X1A	85242
Yes	ICH	S064X2A	85242
Yes	ICH	S064X3A	85243
Yes	ICH	S064X4A	85243
Yes	ICH	S064X5A	85244
Yes	ICH	S064X6A	85245
Yes	ICH	S064X7A	85245
Yes	ICH	S064X8A	85245
Yes	ICH	S064X9A	85246

Yes	ICH	S064X0A	85249
Yes	ICH	S064X9A	85249
Yes	ICH	S06360A	85300
Yes	ICH	S06340A	85301
Yes	ICH	S06350A	85301
Yes	ICH	S06360A	85301
Yes	ICH	S06341A	85302
Yes	ICH	S06342A	85302
Yes	ICH	S06351A	85302
Yes	ICH	S06352A	85302
Yes	ICH	S06361A	85302
Yes	ICH	S06362A	85302
Yes	ICH	S06343A	85303
Yes	ICH	S06344A	85303
Yes	ICH	S06353A	85303
Yes	ICH	S06354A	85303
Yes	ICH	S06363A	85303
Yes	ICH	S06364A	85303
Yes	ICH	S06345A	85304
Yes	ICH	S06355A	85304
Yes	ICH	S06365A	85304
Yes	ICH	S06346A	85305
Yes	ICH	S06347A	85305
Yes	ICH	S06348A	85305
Yes	ICH	S06356A	85305
Yes	ICH	S06357A	85305
Yes	ICH	S06358A	85305
Yes	ICH	S06366A	85305
Yes	ICH	S06367A	85305
Yes	ICH	S06368A	85305
Yes	ICH	S06349A	85306
Yes	ICH	S06359A	85306
Yes	ICH	S06369A	85306
Yes	ICH	S06360A	85309
Yes	ICH	S06369A	85309
No But Defines A Major Bleed	Other	D62	2851
Yes	Other	H44811	36043
Yes	Other	H44812	36043
Yes	Other	H44813	36043
Yes	Other	H44819	36043

Yes	Other	H35731	36243
Yes	Other	H35732	36243
Yes	Other	H35733	36243
Yes	Other	H35739	36243
Yes	Other	H3560	36281
Yes	Other	H3561	36281
Yes	Other	H3562	36281
Yes	Other	H3563	36281
Yes	Other	H31301	36361
Yes	Other	H31302	36361
Yes	Other	H31303	36361
Yes	Other	H31309	36361
Yes	Other	H31311	36362
Yes	Other	H31312	36362
Yes	Other	H31313	36362
Yes	Other	H31319	36362
Yes	Other	H31411	36372
Yes	Other	H31412	36372
Yes	Other	H31413	36372
Yes	Other	H31419	36372
Yes	Other	H2100	36441
Yes	Other	H2101	36441
Yes	Other	H2102	36441
Yes	Other	H2103	36441
No	Other	H1130	37272
No	Other	H1131	37272
No	Other	H1132	37272
No	Other	H1133	37272
No	Other	H0289	37481
Yes	Other	H05231	37632
Yes	Other	H05232	37632
Yes	Other	H05233	37632
Yes	Other	H05239	37632
Yes	Other	H47021	37742
Yes	Other	H47022	37742
Yes	Other	H47023	37742
Yes	Other	H47029	37742
Yes	Other	H4310	37923
Yes	Other	H4311	37923
Yes	Other	H4312	37923

Yes	Other	H4313	37923
Yes	Other	I312	4230
No	Other	N3289	5967
No	Other	R319	59970
No	Other	R310	59971
No	Other	R311	59972
No	Other	R312	59972
No	Other	N421	6021
No	Other	N831	6201
No	Other	N857	6214
No	Other	N920	6262
No	Other	N923	6265
No	Other	N930	6267
No	Other	N897	6268
No	Other	N925	6268
No	Other	N938	6268
No	Other	N926	6269
No	Other	N939	6269
Yes	Other	M2500	71910
Yes	Other	M25011	71911
Yes	Other	M25012	71911
Yes	Other	M25019	71911
Yes	Other	M25021	71912
Yes	Other	M25022	71912
Yes	Other	M25029	71912
Yes	Other	M25031	71913
Yes	Other	M25032	71913
Yes	Other	M25039	71913
Yes	Other	M25041	71914
Yes	Other	M25042	71914
Yes	Other	M25049	71914
Yes	Other	M25051	71915
Yes	Other	M25052	71915
Yes	Other	M25059	71915
Yes	Other	M25061	71916
Yes	Other	M25062	71916
Yes	Other	M25069	71916
Yes	Other	M25071	71917
Yes	Other	M25072	71917
Yes	Other	M25073	71917

Yes	Other	M25074	71917
Yes	Other	M25075	71917
Yes	Other	M25076	71917
Yes	Other	M2508	71918
Yes	Other	M2500	71919
No	Other	R233	7827
No	Other	R040	7847
No	Other	R041	7848
No	Other	R042	78630
No	Other	R049	78630
No	Other	R0481	78631
No	Other	R0489	78639
No	Other	T792XXA	9582
Yes If Brain Or Spinal	Other	G9731	99702
Yes If Brain Or Spinal	Other	G9732	99702
No These Are Infarcts	Other	I97810	99702
No These Are Infarcts	Other	I97811	99702
No These Are Infarcts	Other	I97820	99702
No These Are Infarcts	Other	I97821	99702
Yes As Retroperitoneal	Other	D7801	99811
Yes As Retroperitoneal	Other	D7802	99811
Yes As Retroperitoneal	Other	D7821	99811
Yes As Retroperitoneal	Other	D7822	99811
Yes If Retroperitoneal E.G Pancreas, Adrenal	Other	E3601	99811
Yes If Retroperitoneal E.G Pancreas, Adrenal	Other	E3602	99811
Yes If Brain Or Spinal	Other	G9731	99811
Yes If Brain Or Spinal	Other	G9732	99811
Yes If Brain Or Spinal	Other	G9751	99811
Yes If Brain Or Spinal	Other	G9752	99811
Yes	Other	H59111	99811
Yes	Other	H59112	99811
Yes	Other	H59113	99811
Yes	Other	H59119	99811
Yes	Other	H59121	99811
Yes	Other	H59122	99811
Yes	Other	H59123	99811
Yes	Other	H59129	99811
Yes	Other	H59311	99811
Yes	Other	H59312	99811
Yes	Other	H59313	99811

Yes	Other	H59319	99811
Yes	Other	H59321	99811
Yes	Other	H59322	99811
Yes	Other	H59323	99811
Yes	Other	H59329	99811
No	Other	H9521	99811
No	Other	H9522	99811
No	Other	H9541	99811
No	Other	H9542	99811
Yes As May Be Pericardial Or Extend To Retroperitoneal	Other	I97410	99811
Yes As May Be Pericardial Or Extend To Retroperitoneal	Other	I97411	99811
Yes As May Be Pericardial Or Extend To Retroperitoneal	Other	I97418	99811
Yes As May Be Pericardial Or Extend To Retroperitoneal	Other	I9742	99811
Yes As May Be Pericardial Or Extend To Retroperitoneal	Other	I97610	99811
Yes As May Be Pericardial Or Extend To Retroperitoneal	Other	I97611	99811
Yes As May Be Pericardial Or Extend To Retroperitoneal	Other	I97618	99811
Yes As May Be Pericardial Or Extend To Retroperitoneal	Other	I9762	99811
No Respiratory Not Critical	Other	J9561	99811
No	Other	J9562	99811
No	Other	J95830	99811
No	Other	J95831	99811
No GI Not Critical	Other	K9161	99811
No	Other	K9162	99811
No	Other	K91840	99811
No	Other	K91841	99811
No	Other	L7601	99811
No	Other	L7602	99811
No	Other	L7621	99811
No	Other	L7622	99811
No Unless Associated With Compartment Syndrome	Other	M96810	99811
No Unless Associated With Compartment Syndrome	Other	M96811	99811
No Unless Associated With Compartment Syndrome	Other	M96830	99811
No Unless Associated With Compartment	Other	M96831	99811

Syndrome			
No Unless Renal Which Is Retroperitoneal	Other	N9961	99811
No Unless Renal Which Is Retroperitoneal	Other	N9962	99811
No Unless Renal Which Is Retroperitoneal	Other	N99820	99811
No Unless Renal Which Is Retroperitoneal	Other	N99821	99811

APPENDIX 2. OPERATIONAL ALGORITHM

Operational algorithm for differentiating between prophylactic versus therapeutic use of OAC/PAC agents:

Step 1: Identifying anticoagulation treatment episodes based on OAC and PAC use during the period of interest; an episode will be assumed to be terminated when a gap ≥30 days occurred

Step 2: Each identified anticoagulation treatment episode will be determined as prophylactic use if:

(1) Duration of episode is ≤42 days; and

(2) Initiation date of anticoagulation in the episode occurred within 2 days before or 7 days after knee/hip replacement surgery; or

Initiation date of anticoagulation in the episode occurred within 7 days after the admission date of a hospitalization associated with a "medically ill" primary diagnosis (see below for corresponding codes) and with LOS ≥3 days

Step 3: A patient will be excluded from the study if any of his/her 6-month pre-index anticoagulation treatment episodes is determined as non-prophylactic use.

The algorithm may be modified based on exploratory analyses of the study databases.

HCPCS CODES FOR ORAL AND PARENTERAL ANTICOAGULANTS

Drug	Anticoagulant Type	HCPCS Codes*
Low Molecular Weight Heparin	PAC	
Dalteparin	PAC	J1645
Enoxaparin	PAC	J1650
Tinzaparin	PAC	J1655
Heparin	PAC	J1642, J1644
Fondaparinux	PAC	J1652
Warfarin	OAC	-
Apixaban	OAC	-
Dabigatran etexilate mesylate	OAC	-
Rivaroxaban	OAC	-
Edoxaban	OAC	-

*Codes from the NDC system will also be used to characterize use of PAC

Condition	ICD-9-CM Codes	ICD-10-CM Codes
Knee-replacement surgery	81.54. 81.55	0SRC07Z, 0SRC0J9, 0SRC0JA, 0SRC0JZ, 0SRC0KZ, 0SRD07Z, 0SRD0J9, 0SRD0JA, 0SRD0JZ, 0SRD0KZ, 0SRT07Z, 0SRT0J9, 0SRT0JA, 0SRT0JZ, 0SRT0KZ, 0SRU07Z, 0SRU0J9, 0SRU0JA, 0SRU0JZ, 0SRU0KZ, 0SRV07Z, 0SRV0J9, 0SRV0JA, 0SRV0JZ, 0SRV0KZ, 0SRW07Z, 0SRW0J9, 0SRW0JA, 0SRW0JZ, 0SRW0KZ, 0SWC0JZ, 0SWC3JZ, 0SWC4JZ, 0SWD0JZ, 0SWD3JZ, 0SWD4JZ

Hip-replacement surgery	81.51, 81.52, 81.53	0SR9039, 0SR903A, 0SR903Z, 0SR907Z, 0SR90J9, 0SR90JA, 0SR90JZ, 0SR90KZ, 0SRA009, 0SRA00A, 0SRA00Z, 0SRA019, 0SRA01A, 0SRA01Z, 0SRA039, 0SRA03A, 0SRA03Z, 0SRA07Z, 0SRA0J9, 0SRA0JA, 0SRA0JZ, 0SRA0KZ, 0SRB039, 0SRB03A, 0SRB03Z, 0SRB07Z, 0SRB0J9, 0SRB0JA, 0SRB0JZ, 0SRB0KZ, 0SRE009, 0SRE00A, 0SRE00Z, 0SRE019, 0SRE01A, 0SRE01Z, 0SRE039, 0SRE03A, 0SRE03Z, 0SRE07Z, 0SRE0J9, 0SRE0JA, 0SRE0JZ, 0SRE0KZ, 0SRR019, 0SRR01A, 0SRR01Z, 0SRR039, 0SRR03A, 0SRR03Z, 0SRR07Z, 0SRR0J9, 0SRR0JA, 0SRR0JZ, 0SRR0KZ, 0SRS019, 0SRS01A, 0SRS01Z, 0SRS039, 0SRS03A, 0SRS03Z, 0SRS07Z, 0SRS0J9, 0SRS0JA, 0SRS0JZ, 0SRS0KZ, 0SW90JZ, 0SW93JZ, 0SW94JZ, 0SWB0JZ, 0SWB3JZ, 0SWB4JZ
Medically-ill	 Medically-ill.docx	

13. ANNEX 1. ADDITIONAL INFORMATION

Not Applicable

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