**Supplementary Material** Study data on each of the 125 condition definitions

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| 1 | Abdominal Aortic Aneurysm | 1 OR 2 OR 3 OR 4 OR 5 | Abdominal aortic aneurysm (disorder) [233985008], including descendants or Dissection of abdominal aorta (disorder) [408666009], including descendants or History of repair of aneurysm of abdominal aorta (situation) [429205001], including descendants or Repair of aneurysm of abdominal aorta (procedure) [405525004], including descendants or Insertion of abdominal aorta stent (procedure) [233407007], including descendants |
| 2 | Abdominal Gas Pain | 1 | Abdominal wind pain (finding) [45979003], including descendants |
| 3 | Acne | 1 | Acne (disorder) [11381005], including descendants |
| 4 | Acoustic Neuroma | 1 OR 2 | Acoustic neuroma (disorder) [126949007], including descendants or History of acoustic neuroma (situation) [138381000119101], including descendants |
| 5 | Acute Lymphoblastic Leukemia ALL | 1 | Acute lymphoid leukemia (disorder) [91857003], including descendants |
| 6 | Acute Myelogenous Leukemia AML | 1 OR 2 | Acute myeloid leukemia, disease (disorder) [91861009], including descendants or History of acute myeloid leukemia (situation) [79081000119100], including descendants |
| 7 | ADD/ADHD Attention Deficit Hyperactivity Disorder | 1 AND NOT 2 | Attention deficit hyperactivity disorder (disorder) [406506008], including descendants and not Hyperkinesis with developmental delay (disorder) [192131001], including descendants |
| 8 | Adjustment Disorder | 1 | Adjustment disorder (disorder) [17226007], including descendants |
| 9 | Allergic Rhinitis | 1 OR 2 | Allergic rhinitis (disorder) [61582004], including descendants or Allergic rhinitis caused by mold (disorder) [10629471000119106], including descendants |
| 10 | Allogeneic Bone Marrow Transplant | 1 OR 2 | Allogeneic bone marrow transplantation (procedure) [58390007], including descendants or History of allotransplantation of bone marrow (situation) [152621000119105], including descendants |
| 11 | Alzheimer's Disease | (1 OR 2) AND NOT 3 | (Alzheimers disease (disorder) [26929004], including descendants or Senile dementia (disorder) [15662003], including descendants) and not Senile dementia of the Lewy body type (disorder) [312991009], including descendants |
| 12 | Amenorrhea | 1 OR 2 OR 3 OR 4 OR 5 OR 6 | Amenorrhea (finding) [14302001], including descendants or Hypergonadotropic amenorrhea (disorder) [426780009], including descendants or Hypothalamic amenorrhea (disorder) [237120002], including descendants or Postpill amenorrhea (disorder) [39931000], including descendants or Postpartum amenorrhea-galactorrhea syndrome (disorder) [85039006], including descendants or H/O: amenorrhea (situation) [161780009], including descendants |
| 13 | Amyotrophic Lateral Sclerosis ALS | 1 | Amyotrophic lateral sclerosis (disorder) [86044005], including descendants |
| 14 | Anemia In Neoplastic Disease | 1 OR 2 OR 3 | Anemia in neoplastic disease (disorder) [191265009], including descendants or Pancytopenia due to antineoplastic chemotherapy (disorder) [328301000119102], including descendants or Anemia due to chemotherapy (disorder) [429564000], including descendants |
| 15 | Anxiety | 1 | Anxiety (finding) [48694002], including descendants |

(*Continued*)

**Supplementary Material** (*Continued*)

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| 16 | Aortic Valve Regurgitation | 1 | Aortic valve regurgitation (disorder) [60234000], including descendants |
| 17 | Aortic Valve Replacement | 1 | History of aortic valve replacement (situation) [1231000119100], including descendants |
| 18 | Aortic Valve Stenosis | 1 | Aortic valve stenosis (disorder) [60573004], including descendants |
| 19 | Arterial Thromboembolism | (1 OR 2 OR 3) AND NOT (4 OR 5) | (Arterial thrombosis (disorder) [65198009], including descendants or Arterial embolism (disorder) [54687002], including descendants or History of artery embolism (situation) [10824251000119108], including descendants) and not Pulmonary embolism (disorder) [59282003], including descendants and not H/O: pulmonary embolus (situation) [161512007], including descendants |
| 20 | Ascites | 1 | Ascites (disorder) [389026000], including descendants |
| 21 | Asthma | 1 OR 2 | Asthma (disorder) [195967001], including descendants or H/O: asthma (situation) [161527007], including descendants |
| 22 | Atrial Fibrillation | 1 OR 2 | Atrial fibrillation (disorder) [49436004], including descendants or H/O: atrial fibrillation (situation) [312442005], including descendants |
| 23 | Atrial Flutter | 1 OR 2 | Atrial flutter (disorder) [5370000], including descendants or History of atrial flutter (situation) [428076002], including descendants |
| 24 | Back Pain | (1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8) AND NOT (9 OR 10 OR 11 OR 12 OR 13 OR 14) | (Backache (finding) [161891005], including descendants or Disorder characterized by back pain (disorder) [399194009], including descendants or Stiff back (finding) [249921008], including descendants or Lumbar radiculopathy (disorder) [128196005], including descendants or Lumbosacral neuritis (disorder) [62195001], including descendants or Lumbosacral radiculopathy (disorder) [2415007], including descendants or Post-laminectomy syndrome (disorder) [27151001], including descendants or Strain of thoracic region (disorder) [66540002], including descendants) and not Finding of neck region (finding) [298378000], including descendants and not Finding of sensation of kidney (finding) [300445007], including descendants and not Neoplasm of peripheral nerves of trunk (disorder) [126994001], including descendants and not Injury of nerve of trunk (disorder) [63942007], including descendants and not O/E - rebound tenderness (finding) [163236001], including descendants and not Arthralgia of the pelvic region and thigh (finding) [267952008], including descendants |
| 25 | Bipolar Disorder | 1 OR 2 | Bipolar disorder (disorder) [13746004], including descendants or H/O: manic depressive disorder (situation) [400998002], including descendants |
| 26 | Bleeding | 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 | Acute hemorrhage (morphologic abnormality) [8573003], including descendants or Abnormal uterine bleeding (disorder) [44991000119100], including descendants or Accidental hemorrhage during medical care (finding) [242996005], including descendants or Acute bloody pericarditis (disorder) [176401009], including descendants or Acute hemorrhagic cholecystitis (disorder) [48413001], including descendants or Bleeding of unknown origin (finding) [413245000], including descendants or Delayed AND/OR excessive hemorrhage following molar AND/OR ectopic pregnancy (disorder) [79133008], including descendants or Dysfunctional uterine bleeding (finding) [19155002], including descendants or Enterostomy hemorrhage (disorder) [1086761000119107], including descendants or Exsanguination (finding) [48149007], |

**Supplementary Material** (*Continued*)

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| | | | including descendants or Failed attempted termination of pregnancy complicated by delayed and/or excessive hemorrhage (disorder) [26623000], including descendants or Gastrointestinal hemorrhage (disorder) [74474003], including descendants or Genitourinary tract hemorrhage (disorder) [417941003], including descendants or Hemorrhagic shock (disorder) [355001], including descendants or Hemopericardium (disorder) [23412002], including descendants or Hemorrhage of abdominal cavity structure (disorder) [444312002], including descendants or Hemorrhagic ascites (disorder) [71603004], including descendants or Hemorrhagic complication of pregnancy (disorder) [106004004], including descendants or Hemorrhagic diarrhea (disorder) [95545007], including descendants or Hemothorax (disorder) [31892009], including descendants or Intracranial hemorrhage (disorder) [1386000], including descendants or Postoperative hemorrhage (disorder) [110265006], including descendants or Postpartum hemorrhage (disorder) [47821001], including descendants or Respiratory tract hemorrhage (disorder) [95431003], including descendants or Retroperitoneal hemorrhage (disorder) [95549001], including descendants or Secondary hemorrhage (disorder) [262938004], including descendants or Splenic hemorrhage (disorder) [56517003], including descendants or History of cerebral hemorrhage (situation) [428267002], including descendants or History of gastrointestinal bleed (situation) [275551007], including descendants or H/O subarachnoid hemorrhage (situation) [161515009], including descendants |
| 27 | Blindness And Visual Impairment | (1 OR 2 OR 3 OR 4) AND NOT (5 OR 6 OR 7 OR 8 OR 9 OR 10) | (Visual impairment (disorder) [397540003], including descendants or Visual disturbance (disorder) [63102001], including descendants or Abnormal vision as a late effect of cerebrovascular disease (disorder) [441759008], including descendants or Disorder of vision due to secondary diabetes mellitus (disorder) [138591000119106], including descendants) and not Color blindness (disorder) [193683001], including descendants and not Phosphene (disorder) [112218005], including descendants and not Photopsia (disorder) [56170001], including descendants and not Scotopic sensitivity (disorder) [390843008], including descendants and not Visual perceptual weakness (disorder) [395219004], including descendants and not Xanthopsia (disorder) [48505000], including descendants |
| 28 | Bone Metastases-Secondary | 1 OR 2 OR 3 | Secondary malignant neoplasm of bone (disorder) [94222008], including descendants or Secondary malignant neoplasm of bone marrow (disorder) [94217008], including descendants or History of cancer metastatic to bone (situation) [1099291000119102], including descendants |
| 29 | Brain Abscess | 1 | Abscess of brain (disorder) [441806004], including descendants |
| 30 | CAD Coronary Artery Disease | (1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11) AND NOT (12 OR 13) | (Ischemic heart disease (disorder) [414545008], including descendants or Coronary arteriosclerosis (disorder) [53741008], including descendants or Coronary artery atheroma (disorder) [67682002], including descendants or Coronary artery embolism (disorder) [29899005], including descendants or Coronary occlusion (disorder) [63739005], including descendants or Fracture of stent of coronary artery (disorder) [442298000], including descendants or Furcation lesion of coronary artery (disorder) [440444007], including descendants or Mechanical complication of coronary bypass |

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| | | | (disorder) [213037002], including descendants or History of percutaneous coronary intervention (situation) [405741001], including descendants or History of coronary artery bypass grafting (situation) [399261000], including descendants or History of myocardial infarction (situation) [399211009], including descendants) and not Silent coronary vasospastic disease (disorder) [703214003], including descendants and not Transient myocardial ischemia of newborn (disorder) [276517000], including descendants |
| 31 | Cancer | (1 OR 2 OR 3 OR 4) AND NOT (5 OR 6) | (Malignant neoplastic disease (disorder) [363346000], including descendants or Carcinoma in situ (disorder) [109355002], including descendants or Adenocarcinoma in situ in villous adenoma (morphologic abnormality) [4935000], including descendants or Neoplasm of brain (disorder) [126952004], including descendants) and not Benign neoplasm of brain (disorder) [92030004], including descendants and not Family history of clinical finding (situation) [416471007], including descendants |
| 32 | Cancer Bladder | (1 OR 2 OR 3) AND NOT (4) | (Malignant tumor of urinary bladder (disorder) [399326009], including descendants or Cancer in situ of urinary bladder (disorder) [92546004], including descendants or History of malignant neoplasm of bladder (situation) [415086001], including descendants) and not Secondary malignant neoplasm of bladder (disorder) [94186002], including descendants |
| 33 | Cancer Breast-Current Only | (1 OR 2 OR 3 OR 4) AND NOT (5 OR 6 OR 7 OR 8 OR 9) | (Malignant tumor of breast (disorder) [254837009], including descendants or Carcinoma in situ of breast (disorder) [189336000], including descendants or Primary malignant neoplasm of skin of breast (disorder) [94012007], including descendants or Metastasis from malignant tumor of breast (disorder) [315004001], including descendants) and not Malignant lymphoma of breast (disorder) [278052009], including descendants and not Malignant melanoma of breast (disorder) [188050009], including descendants and not Secondary malignant neoplasm of axillary tail of breast (disorder) [372093008], including descendants and not Secondary malignant neoplasm of female breast (disorder) [94297009], including descendants and not Secondary malignant neoplasm of male breast (disorder) [94401004], including descendants |
| 34 | Cancer Colorectal | (1 OR 2 OR 3 OR 4) AND NOT (5 OR 6) | (Malignant tumor of large intestine (disorder) [363510005], including descendants or Malignant neoplasm of anorectum (disorder) [443488001], including descendants or History of malignant neoplasm of colon (situation) [429699009], including descendants or History of malignant neoplasm of rectum (situation) [429084005], including descendants) and not Malignant tumor of appendix (disorder) [363411007], including descendants and not Secondary malignant neoplasm of large intestine (disorder) [94365007], including descendants |
| 35 | Cancer Colorectal-Current Only | (1 OR 2) AND NOT (3 OR 4) | (Malignant tumor of large intestine (disorder) [363510005], including descendants or Malignant neoplasm of anorectum (disorder) [443488001], including descendants) and not Malignant tumor of appendix (disorder) [363411007], including descendants and not Secondary malignant neoplasm of large intestine (disorder) [94365007], including descendants |
| 36 | Cancer Lung-Current Only | (1) AND NOT (2 OR 3) | Malignant tumor of lung (disorder) [363358000], including descendants and not Kaposis sarcoma of lung (disorder) [109390005], including descendants and not Secondary malignant neoplasm of lung (disorder) [94391008], including descendants |

**Supplementary Material** (*Continued*)

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| 37 | Cancer Prostate | (1 OR 2) AND NOT 3 | (Malignant tumor of prostate (disorder) [399068003], including descendants or Metastasis from malignant tumor of prostate (disorder) [314994000], including descendants) and not Secondary malignant neoplasm of prostate (disorder) [94503003], including descendants |
| 38 | Cancer Renal / Kidney | (1 OR 2) AND NOT (3) | (Malignant tumor of kidney (disorder) [363518003], including descendants or Carcinoma in situ of kidney (disorder) [92624000], including descendants) and not Secondary malignant neoplasm of kidney (disorder) [94360002], including descendants |
| 39 | Cancer Renal Cell Carcinoma | 1 OR 2 OR 3 | Renal cell carcinoma (disorder) [702391001], including descendants or Chromophobe renal cell carcinoma (disorder) [733471003], including descendants or Clear cell carcinoma of kidney (disorder) [254915003], including descendants |
| 40 | Carpal Tunnel Syndrome | 1 OR 2 | Carpal tunnel syndrome (disorder) [57406009], including descendants or Decompression of median nerve (procedure) [47534009], including descendants |
| 41 | Cataract | 1 OR 2 | Cataract finding (finding) [247052002], including descendants or Cataract surgery (procedure) [110473004], including descendants |
| 42 | Central Sleep Apnea | 1 | Central sleep apnea syndrome (disorder) [27405005], including descendants |
| 43 | Cerebral AVM-Arteriovenous Malformation | 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 | Cerebral arteriovenous malformation (disorder) [234142008], including descendants or Percutaneous arterial and venous embolization of cerebral arteriovenous malformation using fluoroscopic guidance (procedure) [438822008], including descendants or Percutaneous venous embolization of cerebral arteriovenous malformation using fluoroscopic guidance (procedure) [440236009], including descendants or Endovascular obliteration of intracranial arteriovenous malformation (procedure) [230917007], including descendants or Embolization of intracranial arteriovenous malformation (procedure) [230910009], including descendants or Excision of intracranial arteriovenous malformation (procedure) [230905005], including descendants or Stereotactic radiosurgery of intracranial arteriovenous malformation (procedure) [230912001], including descendants |
| 44 | Cerebral Palsy | 1 | Cerebral palsy (disorder) [128188000], including descendants |
| 45 | Cervical Cancer | (1 OR 2 OR 3) AND NOT (4 OR 5 OR 6 OR 7) | (Malignant tumor of cervix (disorder) [363354003], including descendants or Metastasis from malignant tumor of cervix (disorder) [314992001], including descendants or History of malignant neoplasm of cervix (situation) [429484003], including descendants) and not Malignant tumor involving uterine cervix by direct extension from fallopian tube (disorder) [369497003], including descendants and not Malignant tumor involving uterine cervix by direct extension from ovary (disorder) [369498008], including descendants and not Malignant tumor involving uterine cervix by direct extension from vagina (disorder) [369499000], including descendants and not Secondary malignant neoplasm of cervix uteri (disorder) [188469005], including descendants |
| 46 | Cervical Spinal Stenosis | 1 OR 2 | Spinal stenosis in cervical region (disorder) [83561009], including descendants or Stenosis of spinal canal at craniovertebral junction (disorder) [445100000], including descendants |

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| 47 | Chronic Lymphocytic Leukemia CLL | 1 OR 2 | Chronic lymphoid leukemia, disease (disorder) [92814006], including descendants or History of chronic lymphocytic leukemia (situation) [63581000119104], including descendants |
| 48 | Chronic Mesenteric Ischemia | 1 OR 2 | Chronic vascular insufficiency of intestine (disorder) [111354009], including descendants or Insufficiency of mesenteric artery (disorder) [734041006], including descendants |
| 49 | Chronic Myelogenous Leukemia CML | 1 OR 2 OR 3 | Chronic myeloid leukemia (disorder) [92818009], including descendants or Chronic monocytic leukemia (disorder) [188745007], including descendants or Chronic myelomonocytic leukemia (disorder) [127225006], including descendants |
| 50 | Cirrhosis Liver | 1 AND NOT 2 | Cirrhosis of liver (disorder) [19943007], including descendants and not Primary biliary cholangitis (disorder) [31712002], including descendants |
| 51 | CKD 1-Chronic Kidney Disease Stage 1 | 1 | Chronic kidney disease stage 1 (disorder) [431855005], including descendants |
| 52 | CKD 2-Chronic Kidney Disease Stage 2 | 1 | Chronic kidney disease stage 2 (disorder) [431856006], including descendants |
| 53 | CKD 3-Chronic Kidney Disease Stage 3 | 1 | Chronic kidney disease stage 3 (disorder) [433144002], including descendants |
| 54 | CKD 4-Chronic Kidney Disease Stage 4 | 1 | Chronic kidney disease stage 4 (disorder) [431857002], including descendants |
| 55 | CKD 5-Chronic Kidney Disease Stage 5 | 1 OR 2 | Chronic kidney disease stage 5 (disorder) [433146000], including descendants or End stage renal disease (disorder) [46177005], including descendants |
| 56 | CKD Chronic Kidney Disease | 1 OR 2 OR 3 OR 4 OR 5 OR 6 | Chronic kidney disease (disorder) [709044004], including descendants or End stage renal disease (disorder) [46177005], including descendants or Chronic hypertensive uremia (disorder) [78544004], including descendants or Anemia of chronic renal failure (disorder) [49708008], including descendants or History of chronic renal impairment (situation) [472953006], including descendants or History of renal failure (situation) [414417004], including descendants |
| 57 | Coagulation Disorder Bleeding Risk | 1 OR 2 | Blood coagulation disorder (disorder) [64779008], including descendants or Other specified disorders of clotting or bleeding (disorder) [191332004], including descendants |
| 58 | Congenital Heart Disease-Structural | (1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16) AND NOT (17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27) | (Congenital heart disease (disorder) [13213009], including descendants or Congenital abnormality of arterial duct (disorder) [297218007], including descendants or Congenital anomaly of pulmonary artery (disorder) [36110001], including descendants or Congenital anomaly of pulmonary veins (disorder) [111322000], including descendants or Absent venous duct (disorder) [448635000], including descendants or History of Damus-Stansel-Kaye operation (situation) [698589003], including descendants or History of Norwood type operation (situation) [698457005], including descendants or History of Sano procedure (situation) [698458000], including descendants or History of repair of atrial septal defect (situation) [429278003], including descendants or History of surgically corrected congenital heart defect (situation) [30801000119107], including descendants or History of |

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| | | | ventricular septal defect repair (situation) [704450003], including descendants or History of anastomosis of pulmonary artery to subclavian artery (situation) [698421000], including descendants or History of anastomosis of vena cava to pulmonary artery (situation) [60851000119102], including descendants or History of creation of conduit of right atrium and pulmonary artery (situation) [698455002], including descendants or History of interatrial transposition of venous return operation (situation) [61611000119105], including descendants or History of repair of coarctation of aorta (situation) [428071007], including descendants) and not Patent foramen ovale (disorder) [204317008], including descendants and not Atrial septal aneurysm (disorder) [95440004], including descendants and not Premature closure of foramen ovale (disorder) [19249002], including descendants and not Congenital conduction defect (disorder) [315027009], including descendants and not Arrhythmogenic right ventricular dysplasia (disorder) [253528005], including descendants and not Cardiac channelopathy (disorder) [698271000], including descendants and not Congenital rhabdomyoma of heart (disorder) [64862009], including descendants and not False tendon - heart (disorder) [264467005], including descendants and not Abnormal left ventricular muscle band (disorder) [253542002], including descendants and not Myxomatosis of cardiac valve (disorder) [5203004], including descendants and not Post-infarction ventricular septal defect (disorder) [233846000], including descendants |
| 59 | COPD-Chronic Obstructive Pulmonary Disease | 1 OR 2 | Chronic obstructive lung disease (disorder) [13645005], including descendants or History of chronic obstructive airway disease (situation) [270473001], including descendants |
| 60 | CTD-ILD Connective Tissue Disease Of The Lung | 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 | Rheumatoid lung disease (disorder) [398726004], including descendants or Diffuse interstitial rheumatoid disease of lung (disorder) [10713006], including descendants or Lung disease with systemic sclerosis (disorder) [196133001], including descendants or Lupus disease of the lung (disorder) [77753005], including descendants or Lung disease with systemic lupus erythematosus (disorder) [196138005], including descendants or Lung disease with Sjögrens disease (disorder) [196137000], including descendants or Pseudolymphoma of lung in Sjögrens disease (disorder) [44833003], including descendants or Lung disease with polymyositis (disorder) [196136009], including descendants or Interstitial lung disease due to connective tissue disease (disorder) [711379004], including descendants or Interstitial lung disease due to collagen vascular disease (disorder) [427123006], including descendants |
| 61 | Cystic Fibrosis | 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 | Cystic fibrosis (disorder) [190905008], including descendants or Suspected cystic fibrosis (situation) [428301001], including descendants or Arthropathy associated with cystic fibrosis (disorder) [698940002], including descendants or Diabetes mellitus due to cystic fibrosis (disorder) [427089005], including descendants or Digestive system manifestation co-occurrent and due to cystic fibrosis (disorder) [707536003], including descendants or Elevated liver enzymes level due to cystic fibrosis (disorder) [707734002], including descendants or Female infertility due to cystic fibrosis (disorder) [707577004], including descendants or Liver disease due to cystic fibrosis (disorder) [427022004], including descendants or Male infertility due to cystic fibrosis (disorder) [707418001], |

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
|  |  |  | including descendants or Osteoporosis due to cystic fibrosis (disorder) [707419009], including descendants or Otorhinolaryngological manifestation co-occurrent and due to cystic fibrosis (disorder) [707542004], including descendants or Perinatal jaundice due to cystic fibrosis (disorder) [206471004], including descendants or Polyneuropathy due to classical cystic fibrosis (disorder) [721197001], including descendants or Portal hypertension due to cystic fibrosis (disorder) [707420003], including descendants or Pancreatic insufficiency due to cystic fibrosis of pancreas (disorder) [707450006], including descendants or Perforation of intestine due to cystic fibrosis with meconium ileus (disorder) [707578009], including descendants |
| 62 | Deep Venous Thrombosis (DVT) | 1 OR 2 | Deep venous thrombosis (disorder) [128053003], including descendants or H/O: Deep vein thrombosis (situation) [161508001], including descendants |
| 63 | Depression | 1 OR 2 | Depressive disorder (disorder) [35489007], including descendants or H/O: depression (situation) [161469008], including descendants |
| 64 | Developmental Delay | (1 OR 2 OR 3 OR 4) AND NOT (5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14) | (Developmental delay (disorder) [248290002], including descendants or Early childhood developmental disability (disorder) [716710007], including descendants or Mixed developmental disorder (disorder) [442059001], including descendants or Neurodevelopmental disorder (disorder) [700364009], including descendants) and not Disorders of attention and motor control (disorder) [229712006], including descendants and not Disorder of stature (disorder) [237834000], including descendants and not Acquired epileptic aphasia (disorder) [230438007], including descendants and not Fluency disorder as sequela of cerebrovascular disease (disorder) [133991000119109], including descendants and not Acquired choreiform dyspraxia (disorder) [229704003], including descendants and not Acquired stammering (disorder) [229631007], including descendants and not Dysfluency (disorder) [229622007], including descendants and not Neurogenic stammering (disorder) [229632000], including descendants and not Normal non-fluency (disorder) [229625009], including descendants and not Childhood disintegrative disorder (disorder) [71961003], including descendants |
| 65 | Diabetes Mellitus | (1 OR 2) AND NOT (3 OR 4 OR 5 OR 6) | (Diabetes mellitus (disorder) [73211009], including descendants or Diabetic complication (disorder) [74627003], including descendants) and not H/O: diabetes mellitus (situation) [161445009], including descendants and not Gestational diabetes mellitus (disorder) [11687002], including descendants and not History of gestational diabetes mellitus (situation) [472971004], including descendants and not At risk of disease (finding) [313424005], including descendants |
| 66 | Diabetic Macular Edema | 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 | Diabetic macular edema (disorder) [312912001], including descendants or Retinal edema due to type 1 diabetes mellitus (disorder) [109171000119104], including descendants or Retinal edema due to type 2 diabetes mellitus (disorder) [28331000119107], including descendants or Macular edema and retinopathy due to type 2 diabetes mellitus (disorder) [97331000119101], including descendants or Non-high-risk proliferative diabetic retinopathy with clinically significant macular edema (disorder) [399875001], including descendants or Proliferative diabetic retinopathy - high risk with clinically significant macular edema (disorder) [399874002], including |

**Supplementary Material** (*Continued*)

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| | | | descendants or Severe nonproliferative diabetic retinopathy with clinically significant macular edema (disorder) [399872003], including descendants or Very severe nonproliferative diabetic retinopathy with clinically significant macular edema (disorder) [399877009], including descendants |
| 67 | Diastolic CHF Congestive Heart Failure Only | (1 OR 2) AND NOT 3 | (Diastolic heart failure (disorder) [418304008], including descendants or Heart failure with normal ejection fraction (disorder) [446221000], including descendants) and not Combined systolic and diastolic dysfunction (finding) [442304009], including descendants |
| 68 | Drug-Related ILD Interstitial Lung Disease | 1 OR 2 OR 3 | Drug-induced diffuse interstitial pulmonary fibrosis (disorder) [233725001], including descendants or Drug-induced interstitial lung disorder (disorder) [196051003], including descendants or Drug induced pulmonary fibrosis (disorder) [713244007], including descendants |
| 69 | Dysphagia | 1 | Dysphagia (disorder) [40739000], including descendants |
| 70 | Elbow Forearm Wrist Hand Disorder | (1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16) AND NOT (17 OR 18 OR 19) | (Finding of elbow region (finding) [116309007], including descendants or Disorder of forearm (disorder) [128132009], including descendants or Finding of wrist region (finding) [116310002], including descendants or Finding of hand region (finding) [116311003], including descendants or Brachial plexus disorder (disorder) [3548001], including descendants or Neuropathy of upper limb (disorder) [609599003], including descendants or Raynauds disease (disorder) [195295006], including descendants or Raynauds phenomenon (disorder) [266261006], including descendants or Dupuytrens disease (disorder) [410812005], including descendants or History of implantation of joint prosthesis into elbow joint (situation) [698546002], including descendants or History of implantation of joint prosthesis into wrist joint (situation) [698547006], including descendants or History of replacement of joint of digit of hand (situation) [698548001], including descendants or Compartment syndrome of upper limb (disorder) [263264005], including descendants or Postmastectomy lymphedema syndrome (disorder) [33129002], including descendants or Injury of digital nerve (disorder) [4412009], including descendants or Rupture of tendon of upper limb (disorder) [281547005], including descendants) and not Laceration of digital nerve in toe (disorder) [445497004], including descendants and not Tendon rupture - shoulder (disorder) [288216005], including descendants and not Traumatic rupture of rotator cuff (disorder) [698299009], including descendants |
| 71 | Encephalopathy Toxic Metabolic | 1 | Toxic metabolic encephalopathy (disorder) [472916000], including descendants |
| 72 | Esophageal Varices | 1 | Esophageal varices (disorder) [28670008], including descendants |
| 73 | Esophagitis | 1 OR 2 | Esophagitis (disorder) [16761005], including descendants or Barretts esophagus (disorder) [302914006], including descendants |
| 74 | Exposure-Related ILD Interstitial Lung Disease | (1 OR 2) AND NOT (3 OR 4 OR 5) | (Environmental lung disease (disorder) [24417004], including descendants or Extrinsic allergic respiratory disease (disorder) [105978008], including descendants) and not Non-smokers second hand smoke syndrome (disorder) [129570009], including descendants and not Occupational asthma (disorder) [57607007], including descendants and not Occupational bronchitis (disorder) [49691004], including descendants |

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| 75 | Familial IPF Idiopathic Pulmonary Fibrosis | 1 | Familial idiopathic pulmonary fibrosis (disorder) [426437004], including descendants |
| 76 | Fatigue | 1 OR 2 OR 3 OR 4 | Fatigue (finding) [84229001], including descendants or Fatigability (finding) [79915001], including descendants or Lack of energy (finding) [248274002], including descendants or Lack of stamina (finding) [248277009], including descendants |
| 77 | Gestational Diabetes | 1 OR 2 | Gestational diabetes mellitus (disorder) [11687002], including descendants or History of gestational diabetes mellitus (situation) [472971004], including descendants |
| 78 | Glaucoma | 1 | Glaucoma (disorder) [23986001], including descendants |
| 79 | Heart Transplant Rejection | 1 | Cardiac transplant rejection (disorder) [233933006], including descendants |
| 80 | HF Heart Failure | 1 OR 2 | Heart failure (disorder) [84114007], including descendants or H/O: heart failure (situation) [161505003], including descendants |
| 81 | HHT-Hereditary Hemorrhagic Telangiectasia | 1 | Osler hemorrhagic telangiectasia syndrome (disorder) [21877004], including descendants |
| 82 | Human Immunodefi-ciency Virus Disease HIV | 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 | Human immunodeficiency virus infection (disorder) [86406008], including descendants or HIV disease resulting in other types of non-Hodgkins lymphoma (disorder) [186724008], including descendants or HIV-related sclerosing cholangitis (disorder) [281388009], including descendants or Oral hairy leukoplakia associated with HIV disease (disorder) [402901009], including descendants or Pulmonary arterial hypertension associated with HIV infection (disorder) [697904001], including descendants or HIV positive (finding) [165816005], including descendants or HIV CDC category finding (finding) [385353004], including descendants or HIV WHO class finding (finding) [385354005], including descendants or Increased human immunodeficiency virus (HIV) viral load (finding) [442662004], including descendants |
| 83 | Hx Cornea Transplant | (1 OR 2) AND NOT (3 OR 4) | (Corneal transplant (procedure) [60656008], including descendants or Corneal graft disorder (disorder) [314551004], including descendants) and not Awaiting corneal transplant (situation) [698304005], including descendants and not Eye donor for corneal transplant (person) [105464001], including descendants |
| 84 | Hx Heart Transplant | (1 OR 2 OR 3 OR 4) AND NOT 5 | (H/O: heart recipient (situation) [161666008], including descendants or Transplantation of heart (procedure) [32413006], including descendants or Heart transplant recipient (finding) [702776000], including descendants or Disorder related to cardiac transplantation (disorder) [427927008], including descendants) and not Donor for heart transplant (person) [105465000], including descendants |
| 85 | Hx Liver Transplant | (1 OR 2 OR 3) AND NOT (4 OR 5 OR 6) | (H/O: liver recipient (situation) [161671001], including descendants or Liver transplant recipient (finding) [702777009], including descendants or Liver transplant disorder (disorder) [235910007], including descendants) and not Liver transplant planned (situation) [704201006], including descendants and not Awaiting transplantation of liver (situation) [698305006], including descendants and not Donor for liver transplant (person) [105463007], including descendants |

**Supplementary Material** (*Continued*)

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| 86 | Hx Lung Transplant | (1 OR 2 OR 3 OR 4 OR 5) AND NOT (6 OR 7) | (H/O: lung recipient (situation) [161672008], including descendants or Transplant of lung (procedure) [88039007], including descendants or Lung transplant recipient (finding) [702775001], including descendants or Disorder related to lung transplantation (disorder) [427928003], including descendants or Lung transplant rejection (disorder) [312603000], including descendants) and not Lung transplant planned (situation) [704202004], including descendants and not Donor for lung transplant (person) [105466004], including descendants |
| 87 | Hx Renal Kidney Transplant | (1 OR 2 OR 3) AND NOT (4 OR 5 OR 6 OR 7 OR 8) | (History of renal transplant (situation) [161665007], including descendants or Transplant of kidney (procedure) [70536003], including descendants or Disorder related to renal transplantation (disorder) [429451003], including descendants) and not Patient awaiting renal transplant (finding) [1721000119108], including descendants and not Awaiting transplantation of kidney (situation) [698306007], including descendants and not Kidney transplant evaluation (procedure) [113127005], including descendants and not Renal transplant planned (situation) [183985008], including descendants and not Donor of kidney for transplant (person) [105462002] |
| 88 | Hyperlipidemia | 1 OR 2 | Hyperlipidemia (disorder) [55822004], including descendants or Dyslipidemia (disorder) [370992007], including descendants |
| 89 | Hypertension | 1 OR 2 OR 3 | Hypertensive disorder (disorder) [38341003], including descendants or Hypertensive complication (disorder) [449759005], including descendants or H/O: hypertension (situation) [161501007], including descendants |
| 90 | IPF Idiopathic Pulmonary Fibrosis | 1 | Idiopathic pulmonary fibrosis (disorder) [700250006], including descendants |
| 91 | Irritable Bowel Syndrome | 1 OR 2 | Irritable bowel syndrome (disorder) [10743008], including descendants or History of irritable bowel syndrome (situation) [70871000119100], including descendants |
| 92 | Ischemic Cardiomyopathy | 1 AND NOT (2 OR 3) | Ischemic myocardial dysfunction (disorder) [281091000], including descendants and not Hibernating myocardium (disorder) [281093002], including descendants and not Stunned myocardium (disorder) [281092007], including descendants |
| 93 | Leukemia And Lymphoma | 1 OR 2 | Leukemia (disorder) [93143009], including descendants or Malignant lymphoma (clinical) (disorder) [118600007], including descendants |
| 94 | Liver AVM- Arteriovenous Malformation | 1 | Arteriovenous malformation of liver (disorder) [84150000], including descendants |
| 95 | Malignant Lymphoma | 1 OR 2 OR 3 OR 4 OR 5 OR 6 | Malignant lymphoma (clinical) (disorder) [118600007], including descendants or HIV disease resulting in other types of non-Hodgkins lymphoma (disorder) [186724008], including descendants or Lymphoma stage finding (finding) [385389007], including descendants or Lymphoma finding (finding) [399600009], including descendants or Malignant lymphoma - category (morphologic abnormality) [115244002], including descendants or History of malignant lymphoma (situation) [429014004], including descendants |
| 96 | Malignant Melanoma | 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 | Malignant melanoma (disorder) [372244006], including descendants or Melanoma in situ by body site (clinical) (disorder) [127330008], including descendants or Melanoma in |

(*Continued*)

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| | | | situ of non-skin site (disorder) [109268007], including descendants or Melanoma-associated retinopathy (disorder) [312941005], including descendants or Malignant melanoma - category (morphologic abnormality) [372156000], including descendants or Clark melanoma level finding (finding) [385347004], including descendants or Uveal melanoma TNM finding (finding) [399705007], including descendants or H/O Malignant melanoma (situation) [161432005], including descendants or History of melanoma in situ of skin (situation) [1251000119106], including descendants |
| 97 | Multiple Myeloma | 1 OR 2 | Multiple myeloma (disorder) [109989006], including descendants or Osteoporosis in multiple myelomatosis (disorder) [203436008], including descendants |
| 98 | Multiple Sclerosis MS | 1 OR 2 OR 3 | Multiple sclerosis (disorder) [24700007], including descendants or Suspected multiple sclerosis (situation) [700409000], including descendants or Dementia associated with multiple sclerosis (disorder) [698626001], including descendants |
| 99 | Muscular Dystrophy | 1 | Muscular dystrophy (disorder) [73297009], including descendants |
| 100 | Narcolepsy | 1 OR 2 | Narcolepsy (disorder) [60380001], including descendants or Cataplexy and narcolepsy (disorder) [193042000], including descendants |
| 101 | Necrotizing Fasciitis | 1 | Necrotizing fasciitis caused by microorganism (disorder) [4141000119104], including descendants |
| 102 | Nodular Or Follicular Lymphoma | 1 OR 2 OR 3 OR 4 | Nodular lymphoma (disorder) [269476000], including descendants or Nodular lymphoma of extranodal AND/OR solid organ site (disorder) [95194004], including descendants or Nodular lymphoma of unspecified site (disorder) [188608008], including descendants or Follicular non-Hodgkins lymphoma (disorder) [308121000], including descendants |
| 103 | Non-Alcoholic Liver Disease NAFLD NASH | 1 OR 2 OR 3 OR 4 | Chronic nonalcoholic liver disease (disorder) [79720007], including descendants or Other non-alcoholic chronic liver disease (disorder) [197314007], including descendants or Non-alcoholic fatty liver (disorder) [197315008], including descendants or Nonalcoholic steatohepatitis (disorder) [442685003], including descendants |
| 104 | Obsessive Compulsive Disorder OCD | 1 OR 2 OR 3 | Obsessive-compulsive disorder (disorder) [191736004], including descendants or Obsessive compulsive personality disorder (disorder) [1376001], including descendants or Obsessive-compulsive personality trait (finding) [112091009], including descendants |
| 105 | Obstructive Sleep Apnea | 1 OR 2 | Obstructive sleep apnea syndrome (disorder) [78275009], including descendants or Acute hypercapnic respiratory failure due to obstructive sleep apnea (disorder) [101301000119106], including descendants |
| 106 | Occipital Neuralgia Headache | 1 OR 2 | Cervico-occipital neuralgia (finding) [71760005], including descendants or Occipital headache (finding) [330007], including descendants |
| 107 | Orthostatic Hypotension | 1 OR 2 OR 3 OR 4 | Orthostatic hypotension (disorder) [28651003], including descendants or Syncope due to orthostatic hypotension (disorder) [432524006], including descendants or Orthostatic tremor (finding) [430690005], including descendants or Parkinsonian syndrome associated with idiopathic orthostatic hypotension (disorder) [72585000], including descendants |
| 108 | Osteoporosis | 1 | Osteoporosis (disorder) [64859006], including descendants |

**Supplementary Material** (*Continued*)

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
| 109 | Osteoporosis or Osteopenia | 1 OR 2 | Osteoporosis (disorder) [64859006], including descendants or Osteopenia (disorder) [312894000], including descendants |
| 110 | Pancreatic Cyst | 1 | Cyst of pancreas (disorder) [31258000], including descendants |
| 111 | Parkinson's Disease | 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 | Parkinsonism (disorder) [32798002], including descendants or Dementia associated with Parkinsons Disease (disorder) [425390006], including descendants or Cerebral degeneration due to Parkinsons disease (disorder) [438513002], including descendants or Parkinsons facies (finding) [26823002], including descendants or Parkinsonian ataxia (finding) [250053004], including descendants or Parkinsonian facies (finding) [248208000], including descendants or Parkinsonian features (finding) [304535004], including descendants or Parkinsonian flexion posture (finding) [271704002], including descendants |
| 112 | Peripheral Vascular Disease PVD | (1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11) AND NOT (12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18) | (Arteriosclerotic vascular disease (disorder) [72092001], including descendants or Abdominal aortic aneurysm without rupture (disorder) [75878002], including descendants or Aneurysm of descending aorta (disorder) [426948001], including descendants or Aneurysm of supraceliac aorta (disorder) [427490006], including descendants or Ruptured abdominal aortic aneurysm (disorder) [14336007], including descendants or Aortic aneurysm repair (procedure) [233370007], including descendants or History of peripheral vascular disease (situation) [473109007], including descendants or History of repair of aneurysm of abdominal aorta (situation) [429205001], including descendants or History of arterial bypass of lower limb artery (situation) [429367008], including descendants or History of carotid endarterectomy (situation) [428534000], including descendants or Iatrogenic complication of vascular surgery (disorder) [429724002], including descendants) and not Coronary artery finding (finding) [251015000], including descendants and not Cerebral arteriosclerosis (disorder) [65312002], including descendants and not Atheroma of cerebral arteries (disorder) [111299004], including descendants and not H/O: heart disorder (situation) [275544003], including descendants and not History of cerebrovascular disease (situation) [308064009], including descendants and not FH: Cardiovascular disease (situation) [266894000], including descendants and not Accidental puncture during a procedure on a blood vessel (disorder) [714386006], including descendants |
| 113 | Personality Disorder | 1 AND NOT 2 | Personality disorder (disorder) [33449004], including descendants and not Organic personality disorder (disorder) [36217008], including descendants |
| 114 | Pregnancy | (1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19) AND NOT 20 | (Pregnant (finding) [77386006], including descendants or Pregnancy (observable entity) [289908002], including descendants or Pregnancy observable (observable entity) [364320009], including descendants or Clinical sign related to pregnancy (finding) [106111002], including descendants or Finding of gravid uterus (finding) [289675001], including descendants or Finding of measures of pregnancy (finding) [289205009], including descendants or Finding of pattern of pregnancy (finding) [289203002], including descendants or Finding of position of pregnancy (finding) [301801008], including descendants or Finding of viability of pregnancy (finding) [289208006], including descendants or Antenatal care status (finding) [243826008], including descendants or Advanced maternal age gravida (finding) [416413003], including descendants or Abnormal pregnancy (finding) |

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
|  |  |  | [11082009], including descendants or Complication occurring during pregnancy (disorder) [609496007], including descendants or Disorder of pregnancy (disorder) [173300003], including descendants or Abnormal hematologic finding on antenatal screening of mother (finding) [199733009], including descendants or Alcohol consumption during pregnancy (finding) [427013000], including descendants or Grand multiparity with antenatal problem (finding) [199715003], including descendants or History of recurrent miscarriage - not delivered (finding) [199088001], including descendants or Spotting per vagina in pregnancy (finding) [284075002], including descendants) and not Pregnancy with abortive outcome (disorder) [363681007], including descendants |
| 115 | Pressure Ulcer | 1 | Pressure ulcer (disorder) [399912005], including descendants |
| 116 | Pulmonary AVM-Arteriovenous Malformation | 1 OR 2 OR 3 | Pulmonary arteriovenous malformation (disorder) [303070000], including descendants or Embolization of pulmonary arteriovenous malformation (procedure) [233220007], including descendants or Operation for pulmonary arteriovenous malformation (procedure) [233219001], including descendants |
| 117 | Rheumatoid Arthritis | 1 | Rheumatoid arthritis (disorder) [69896004], including descendants |
| 118 | Septic Shock | 1 OR 2 OR 3 | Septic shock (disorder) [76571007], including descendants or Septic shock associated with other non-bacterial microorganism (disorder) [276740004], including descendants or Miscarriage with septic shock (disorder) [18613002], including descendants |
| 119 | Spinal Cord Injury | 1 OR 2 | Spinal cord injury (disorder) [90584004], including descendants or Paralysis due to lesion of spinal cord (disorder) [372310001], including descendants |
| 120 | Spinal Stenosis | 1 | Spinal stenosis (disorder) [76107001], including descendants |
| 121 | TIA Transient Ischemic Attack | 1 | Transient cerebral ischemia (disorder) [266257000], including descendants |
| 122 | Tinnitus | 1 OR 2 OR 3 OR 4 OR 5 | Tinnitus (finding) [60862001], including descendants or Noise-induced tinnitus (disorder) [232318001], including descendants or Tinnitus due to spontaneous oto-acoustic emission (disorder) [232323001], including descendants or Tinnitus of muscular origin (disorder) [232319009], including descendants or Tinnitus of vascular origin (disorder) [232322006], including descendants |
| 123 | Tobacco Use | 1 | Tobacco user (finding) [110483000], including descendants |
| 124 | Vascular Disease-Arteriosclerotic | (1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12) AND NOT (13 OR 14) | (Arteriosclerotic vascular disease (disorder) [72092001], including descendants or Abdominal aortic aneurysm without rupture (disorder) [75878002], including descendants or Aneurysm of descending aorta (disorder) [426948001], including descendants or Aneurysm of supraceliac aorta (disorder) [427490006], including descendants or Ruptured abdominal aortic aneurysm (disorder) [14336007], including descendants or Aortic aneurysm repair (procedure) [233370007], including descendants or History of peripheral vascular disease (situation) [473109007], including descendants or History of repair of aneurysm of abdominal aorta (situation) [429205001], including descendants or History of arterial bypass of lower limb artery (situation) [429367008], including descendants or History of coronary artery bypass grafting (situation) [399261000], including |

**Supplementary Material** (*Continued*)

| Study ID | Condition | Boolean Logic (see column D for SNOMED concept names and SCT IDs) | SNOMED concepts, with Boolean logic in Symedical |
|---|---|---|---|
|  |  |  | descendants or History of carotid endarterectomy (situation) [428534000], including descendants or Iatrogenic complication of vascular surgery (disorder) [429724002], including descendants) and not FH: Cardiovascular disease (situation) [266894000], including descendants and not Accidental puncture during a procedure on a blood vessel (disorder) [714386006], including descendants |
| 125 | Viral Hepatitis | 1 OR 2 OR 3 OR 4 | Viral hepatitis (disorder) [3738000], including descendants or Non-A, non-B, non-C hepatitis (disorder) [406584008], including descendants or History of hepatitis B (situation) [429721005], including descendants or History of hepatitis C (situation) [93871000119101], including descendants |

**Supplementary Material** (*Continued*)

| Study ID | Condition | SNOMED Concept Hierarchies to Define | SNOMED Concepts Included | Distinct ICD-10 Codes | Distinct ICD-9 Codes | Total ICD Codes | Clinical Term Qty |
|---|---|---|---|---|---|---|---|
| 1 | Abdominal Aortic Aneurysm | 5 | 74 | 9 | 10 | 19 | 119 |
| 2 | Abdominal Gas Pain | 1 | 2 | 1 | 1 | 2 | 4 |
| 3 | Acne | 1 | 61 | 17 | 9 | 26 | 106 |
| 4 | Acoustic Neuroma | 2 | 3 | 2 | 1 | 3 | 11 |
| 5 | Acute Lymphoblastic Leukemia ALL | 1 | 21 | 15 | 12 | 27 | 140 |
| 6 | Acute Myelogenous Leukemia AML | 2 | 40 | 40 | 25 | 65 | 281 |
| 7 | ADD/ADHD Attention Deficit Hyperactivity Disorder | 2 | 11 | 7 | 6 | 13 | 120 |
| 8 | Adjustment Disorder | 1 | 40 | 19 | 21 | 40 | 122 |
| 9 | Allergic Rhinitis | 2 | 34 | 21 | 8 | 29 | 281 |
| 10 | Allogeneic Bone Marrow Transplant | 2 | 11 | 1 | 1 | 2 | 5 |
| 11 | Alzheimer's Disease | 3 | 37 | 8 | 8 | 16 | 225 |
| 12 | Amenorrhea | 6 | 19 | 4 | 3 | 7 | 41 |
| 13 | Amyotrophic Lateral Sclerosis ALS | 1 | 4 | 1 | 1 | 2 | 64 |
| 14 | Anemia In Neoplastic Disease | 3 | 5 | 4 | 2 | 6 | 324 |
| 15 | Anxiety | 1 | 146 | 60 | 46 | 106 | 344 |
| 16 | Aortic Valve Regurgitation | 1 | 20 | 10 | 10 | 20 | 118 |
| 17 | Aortic Valve Replacement | 1 | 4 | 3 | 2 | 5 | 67 |
| 18 | Aortic Valve Stenosis | 1 | 29 | 9 | 10 | 19 | 136 |
| 19 | Arterial Thromboembolism | 5 | 178 | 132 | 53 | 185 | 976 |
| 20 | Ascites | 1 | 29 | 9 | 8 | 17 | 59 |
| 21 | Asthma | 2 | 105 | 31 | 26 | 57 | 1,759 |
| 22 | Atrial Fibrillation | 2 | 14 | 7 | 4 | 11 | 98 |
| 23 | Atrial Flutter | 2 | 8 | 7 | 4 | 11 | 26 |
| 24 | Back Pain | 14 | 75 | 43 | 32 | 75 | 606 |
| 25 | Bipolar Disorder | 2 | 109 | 47 | 36 | 83 | 1,438 |
| 26 | Bleeding | 30 | 691 | 737 | 414 | 1,151 | 8,090 |
| 27 | Blindness And Visual Impairment | 10 | 175 | 65 | 75 | 140 | 3,334 |
| 28 | Bone Metastases-Secondary | 3 | 70 | 8 | 4 | 12 | 391 |
| 29 | Brain Abscess | 1 | 16 | 7 | 13 | 20 | 72 |
| 30 | CAD Coronary Artery Disease | 13 | 178 | 82 | 63 | 145 | 1,415 |
| 31 | Cancer | 6 | 4,658 | 1,346 | 851 | 2,197 | 29,416 |
| 32 | Cancer Bladder | 4 | 48 | 14 | 14 | 28 | 197 |
| 33 | Cancer Breast-Current Only | 9 | 128 | 79 | 22 | 101 | 3,894 |
| 34 | Cancer Colorectal | 6 | 108 | 49 | 39 | 88 | 658 |
| 35 | Cancer Colorectal-Current Only | 4 | 103 | 47 | 38 | 85 | 668 |
| 36 | Cancer Lung-Current Only | 3 | 122 | 35 | 15 | 50 | 1,105 |
| 37 | Cancer Prostate | 3 | 19 | 4 | 3 | 7 | 143 |
| 38 | Cancer Renal / Kidney | 3 | 38 | 14 | 9 | 23 | 718 |
| 39 | Cancer Renal Cell Carcinoma | 3 | 13 | 5 | 2 | 7 | 195 |

(*Continued*)

| Study ID | Condition | SNOMED Concept Hierarchies to Define | SNOMED Concepts Included | Distinct ICD-10 Codes | Distinct ICD-9 Codes | Total ICD Codes | Clinical Term Qty |
|---|---|---|---|---|---|---|---|
| 40 | Carpal Tunnel Syndrome | 2 | 8 | 6 | 3 | 9 | 56 |
| 41 | Cataract | 2 | 251 | 143 | 48 | 191 | 1,655 |
| 42 | Central Sleep Apnea | 1 | 9 | 4 | 5 | 9 | 31 |
| 43 | Cerebral AVM-Arteriovenous Malformation | 7 | 14 | 3 | 1 | 4 | 79 |
| 44 | Cerebral Palsy | 1 | 29 | 12 | 10 | 22 | 110 |
| 45 | Cervical Cancer | 7 | 33 | 11 | 10 | 21 | 135 |
| 46 | Cervical Spinal Stenosis | 2 | 6 | 3 | 2 | 5 | 18 |
| 47 | Chronic Lymphocytic Leukemia CLL | 2 | 36 | 17 | 19 | 36 | 138 |
| 48 | Chronic Mesenteric Ischemia | 2 | 3 | 3 | 2 | 5 | 24 |
| 49 | Chronic Myelogenous Leukemia CML | 3 | 19 | 14 | 8 | 22 | 84 |
| 50 | Cirrhosis Liver | 2 | 57 | 17 | 12 | 29 | 111 |
| 51 | CKD 1-Chronic Kidney Disease Stage 1 | 1 | 8 | 1 | 2 | 3 | 154 |
| 52 | CKD 2-Chronic Kidney Disease Stage 2 | 1 | 9 | 2 | 2 | 4 | 155 |
| 53 | CKD 3-Chronic Kidney Disease Stage 3 | 1 | 11 | 2 | 2 | 4 | 176 |
| 54 | CKD 4-Chronic Kidney Disease Stage 4 | 1 | 10 | 2 | 2 | 4 | 170 |
| 55 | CKD 5-Chronic Kidney Disease Stage 5 | 2 | 27 | 6 | 12 | 18 | 412 |
| 56 | CKD Chronic Kidney Disease | 6 | 97 | 33 | 31 | 64 | 1,634 |
| 57 | Coagulation Disorder Bleeding Risk | 2 | 342 | 118 | 71 | 189 | 1,429 |
| 58 | Congenital Heart Disease-Structural | 27 | 921 | 92 | 71 | 163 | 1,638 |
| 59 | COPD-Chronic Obstructive Pulmonary Disease | 2 | 50 | 20 | 22 | 42 | 236 |
| 60 | CTD-ILD Connective Tissue Disease Of The Lung | 10 | 12 | 28 | 2 | 30 | 85 |
| 61 | Cystic Fibrosis | 16 | 27 | 6 | 6 | 12 | 55 |
| 62 | Deep Venous Thrombosis (DVT) | 2 | 146 | 118 | 35 | 153 | 2,144 |
| 63 | Depression | 2 | 151 | 59 | 57 | 116 | 1,521 |
| 64 | Developmental Delay | 14 | 335 | 75 | 58 | 133 | 1,181 |
| 65 | Diabetes Mellitus | 6 | 441 | 475 | 86 | 561 | 17,870 |
| 66 | Diabetic Macular Edema | 8 | 11 | 86 | 1 | 87 | 2,977 |
| 67 | Diastolic CHF Congestive Heart Failure Only | 3 | 11 | 6 | 7 | 13 | 355 |
| 68 | Drug-Related ILD Interstitial Lung Disease | 3 | 5 | 3 | 2 | 5 | 12 |
| 69 | Dysphagia | 1 | 13 | 17 | 11 | 28 | 88 |
| 70 | Elbow Forearm Wrist Hand Disorder | 19 | 3,888 | 10,528 | 706 | 11,234 | 1,16,0-43 |

(*Continued*)

(*Continued*)

| Study ID | Condition | SNOMED Concept Hierarchies to Define | SNOMED Concepts Included | Distinct ICD-10 Codes | Distinct ICD-9 Codes | Total ICD Codes | Clinical Term Qty |
|---|---|---|---|---|---|---|---|
| 71 | Encephalopathy Toxic Metabolic | 1 | 59 | 53 | 36 | 89 | 366 |
| 72 | Esophageal Varices | 1 | 10 | 4 | 4 | 8 | 37 |
| 73 | Esophagitis | 2 | 45 | 16 | 16 | 32 | 116 |
| 74 | Exposure-Related ILD Interstitial Lung Disease | 5 | 95 | 46 | 27 | 73 | 349 |
| 75 | Familial IPF Idiopathic Pulmonary Fibrosis | 1 | 1 | 1 | 1 | 2 | 1 |
| 76 | Fatigue | 4 | 32 | 19 | 10 | 29 | 101 |
| 77 | Gestational Diabetes | 2 | 7 | 13 | 6 | 19 | 135 |
| 78 | Glaucoma | 1 | 155 | 271 | 47 | 318 | 3,816 |
| 79 | Heart Transplant Rejection | 1 | 7 | 3 | 1 | 4 | 38 |
| 80 | HF Heart Failure | 2 | 112 | 42 | 35 | 77 | 1,711 |
| 81 | HHT-Hereditary Hemorrhagic Telangiectasia | 1 | 1 | 1 | 1 | 2 | 24 |
| 82 | Human Immunodeficiency Virus Disease HIV | 9 | 133 | 12 | 9 | 21 | 437 |
| 83 | Hx Cornea Transplant | 4 | 19 | 5 | 5 | 10 | 21 |
| 84 | Hx Heart Transplant | 5 | 27 | 23 | 6 | 29 | 155 |
| 85 | Hx Liver Transplant | 6 | 11 | 6 | 2 | 8 | 142 |
| 86 | Hx Lung Transplant | 7 | 24 | 12 | 5 | 17 | 83 |
| 87 | Hx Renal Kidney Transplant | 8 | 36 | 10 | 8 | 18 | 432 |
| 88 | Hyperlipidemia | 2 | 60 | 13 | 11 | 24 | 221 |
| 89 | Hypertension | 3 | 233 | 111 | 81 | 192 | 2,729 |
| 90 | IPF Idiopathic Pulmonary Fibrosis | 1 | 5 | 1 | 2 | 3 | 18 |
| 91 | Irritable Bowel Syndrome | 2 | 8 | 9 | 4 | 13 | 53 |
| 92 | Ischemic Cardiomyopathy | 3 | 4 | 1 | 2 | 3 | 5 |
| 93 | Leukemia And Lymphoma | 2 | 602 | 478 | 297 | 775 | 3,817 |
| 94 | Liver AVM-Arteriovenous Malformation | 1 | 1 | 2 | 2 | 4 | 6 |
| 95 | Malignant Lymphoma | 6 | 597 | 387 | 219 | 606 | 3,052 |
| 96 | Malignant Melanoma | 9 | 241 | 105 | 42 | 147 | 1,186 |
| 97 | Multiple Myeloma | 2 | 18 | 7 | 8 | 15 | 63 |
| 98 | Multiple Sclerosis MS | 3 | 18 | 1 | 1 | 2 | 55 |
| 99 | Muscular Dystrophy | 1 | 94 | 12 | 13 | 25 | 263 |
| 100 | Narcolepsy | 2 | 7 | 5 | 5 | 10 | 62 |
| 101 | Necrotizing Fasciitis | 1 | 6 | 2 | 2 | 4 | 12 |
| 102 | Nodular Or Follicular Lymphoma | 4 | 33 | 74 | 11 | 85 | 303 |
| 103 | Non-Alcoholic Liver Disease NAFLD NASH | 4 | 4 | 5 | 3 | 8 | 18 |
| 104 | Obsessive Compulsive Disorder OCD | 3 | 11 | 6 | 5 | 11 | 58 |
| 105 | Obstructive Sleep Apnea | 2 | 6 | 2 | 2 | 4 | 43 |
| 106 | Occipital Neuralgia Headache | 2 | 2 | 2 | 2 | 4 | 17 |

(*Continued*)

| Study ID | Condition | SNOMED Concept Hierarchies to Define | SNOMED Concepts Included | Distinct ICD-10 Codes | Distinct ICD-9 Codes | Total ICD Codes | Clinical Term Qty |
|---|---|---|---|---|---|---|---|
| 107 | Orthostatic Hypotension | 4 | 12 | 8 | 8 | 16 | 33 |
| 108 | Osteoporosis | 1 | 43 | 164 | 22 | 186 | 2,287 |
| 109 | Osteoporosis or Osteopenia | 2 | 53 | 191 | 25 | 216 | 2,377 |
| 110 | Pancreatic Cyst | 1 | 10 | 3 | 3 | 6 | 13 |
| 111 | Parkinson's Disease | 8 | 52 | 18 | 9 | 27 | 153 |
| 112 | Peripheral Vascular Disease PVD | 18 | 158 | 275 | 39 | 314 | 1,535 |
| 113 | Personality Disorder | 2 | 48 | 23 | 31 | 54 | 187 |
| 114 | Pregnancy | 20 | 1,262 | 1,903 | 639 | 2,542 | 34,164 |
| 115 | Pressure Ulcer | 1 | 63 | 168 | 5 | 173 | 1,764 |
| 116 | Pulmonary AVM-Arteriovenous Malformation | 3 | 5 | 2 | 2 | 4 | 5 |
| 117 | Rheumatoid Arthritis | 1 | 48 | 265 | 11 | 276 | 891 |
| 118 | Septic Shock | 3 | 39 | 8 | 11 | 19 | 98 |
| 119 | Spinal Cord Injury | 2 | 367 | 317 | 55 | 372 | 2,063 |
| 120 | Spinal Stenosis | 1 | 27 | 57 | 9 | 66 | 138 |
| 121 | TIA Transient Ischemic Attack | 1 | 15 | 13 | 12 | 25 | 88 |
| 122 | Tinnitus | 5 | 19 | 12 | 4 | 16 | 198 |
| 123 | Tobacco Use | 1 | 35 | 13 | 7 | 20 | 264 |
| 124 | Vascular Disease-Arteriosclerotic | 14 | 194 | 311 | 64 | 375 | 1,974 |
| 125 | Viral Hepatitis | 4 | 73 | 36 | 27 | 63 | 396 |
|  | Sum | 525 | 19,673 | 20,456 | 5,121 | 25,577 | 2,77,1-15 |
|  | Minimum | 1 | 1 | 1 | 1 | 2 | 1 |
|  | 25th percentile | 1 | 11 | 5 | 3 | 8 | 63 |
|  | **50th percentile (Median)** | **2** | **32** | **13** | **9** | **22** | **155** |
|  | 75th percentile | 5 | 97 | 53 | 27 | 85 | 976 |
|  | Maximum | 30 | 4,658 | 10,528 | 851 | 11,234 | 1,16,0-43 |
|  | Mean | 4.2 | 157.4 | 163.6 | 41.0 | 204.6 | 2,216.9 |

Note: Includes condition name, condition definition using SNOMED CT hierarchies and Boolean logic ("intentional" value set), number of SNOMED CT concept hierarchies needed to define the condition, number of SNOMED CT concepts included (with descendants), number of associated ICD-9 and ICD-10 codes, and number of clinical terms (from IMO) available for selection in the EHR by clinicians.

For each of the 125 conditions, a derived list of included SNOMED CT concepts (extensional value set) is available online in a GitHub repository at https://doi.org/10.5281/zenodo.1171102.

## Appendix  Managing the difference between a registry population and reported-on populations

For some conditions, a payer-specified ICD value set definition already existed for reporting CQMs. In Venn diagram terms (see Figure), the population of all persons with a given condition is generally not completely knowable. For instance, some patients who have a condition have not yet seen a physician, or if so, have not yet been diagnosed.
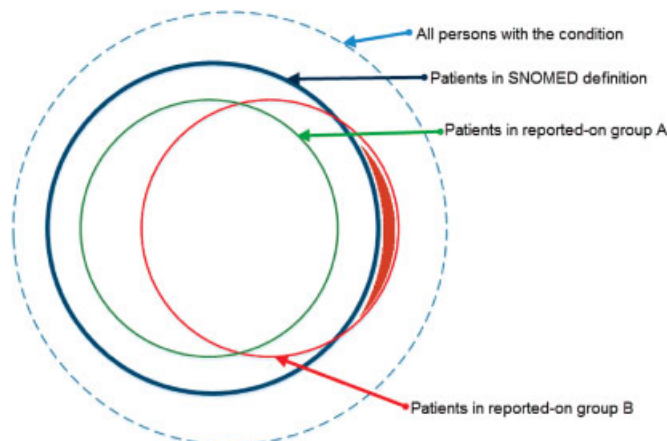
In using a SNOMED CT-based code set (grouper) definition applicable to EHR data as well as coded billing data, we attempted to find the broadest range possible of people in our health care organization with the condition.  We wanted to include all these patients (or as many as feasible) in condition-specific activities such as real-time clinical decision support within the EHR, care gap identification and resolution, quality-of-care measurement, and condition-specific patient communications.

One external group (government agency, payer, peer group) may have decided to report on a CQM for this population using method A (green circle in Figure).  This could include additional restrictions for attribution, demographic variables such as age ranges, and may involve a specification of the condition via an ICD-9/10 value set.  Another group may have decided to report on the same or different CQM (but still for the same condition) using method B (red circle), with slightly different business rules for inclusion/exclusion, and even a slightly different ICD value set.  We wanted to ensure all reported-on patients would be included in our registry of patients to whom we are directing best practice CDS, care coordination, etc.  The area of concern in the diagram is the shaded area where circle B extends outside the blue "Patients in SNOMED definition" circle.

When this situation arose, we handled it by including any reported-on population ICD definitions as sub-groups in addition to the SNOMED CT-based grouper.  That is, in set theory terms, the grouper inclusion for the example below would be extended to:

> (Dx in SNOMED definition) *Union* (Dx in ICD value set by Method A) *Union* (Dx in ICD value set by Method B).

This proved straightforward to do in our EHR, as additional payer-specified ICD grouper(s) can simply be attached within the standard SNOMED CT grouper definition before compiling the list of included clinical terms.  It also proved straightforward in our HIE-associated clinical terminology management software (Symedical).



**Appendix Figure**  Venn diagram of patient population, registry population, and reported-on populations