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| **Table SI: International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) codes used to identify sickle cell disease (SCD) complications** | | | |
| **Code** | | **Category** | **Description** | |
| 517.3 | | **ACS** | Acute Chest Syndrome (began 2003) | |
|  | |  |  | |
| 733.4 | | **ONFH** | Aseptic necrosis of bone, site unspecified | |
| 733.42 | | **ONFH** | Aseptic necrosis of bone, head and neck of femur | |
| 733.43 | | **ONFH** | Aseptic necrosis of bone, medial femoral condyle | |
| 733.49 | | **ONFH** | Aseptic necrosis of bone, other | |
|  | |  |  | |
| 434.01 | | **Stroke** | Occlusion of cerebral arteries, cerebral thrombosis with infarction | |
| 434.11 | | **Stroke** | Occlusion of cerebral arteries, cerebral embolism with infarction | |
| 434.91 | | **Stroke** | Occlusion of cerebral arteries, unspecified with infarction | |
|  | |  |  | |
| 415.11\* | | **PE** | Iatrogenic pulmonary embolism and infarction | |
| 415.13\* | | **PE** | Saddle embolus of pulmonary artery | |
| 415.19\* | | **PE** | Other pulmonary embolism and infarction | |
| 673.2\* | | **PE** | Obstetrical blood clot embolism | |
| 451.11 | | **DVT** | Thrombophlebitis of deep vessels of lower extremities, femoral vein | |
| 451.19 | | **DVT** | Thrombophlebitis of deep vessel of lower extremities, other | |
| 451.81 | | **DVT** | Thrombophlebitis of other sites, iliac vein | |
| 453.2 | | **DVT** | Venous thrombosis of inferior vena cava | |
| 453.40 | | **DVT** | Acute venous thrombosis of unspecified deep vessels of lower extremity | |
| 453.41\* | | **DVT** | Acute venous thrombosis of deep vessels of proximal lower extremity | |
| 453.42\* | | **DVT** | Acute venous thrombosis of deep vessels of distal lower extremity | |
| 453.8 | | **DVT** | Acute venous thrombosis of other specified veins (eliminated Oct 1, 2009) | |
| 453.89 | | **DVT** | Acute venous thrombosis of other specified veins | |
| 453.9 | | **DVT** | Acute venous thrombosis of unspecified site | |
| 671.31\* | | **DVT** | DVT antepartum-Delivered | |
| 671.33\* | | **DVT** | DVT-antepartum | |
| 671.42\* | | **DVT** | DVT postpartum-Delivered | |
| 671.44\* | | **DVT** | DVT-postpartum | |
| 451.83 | | **UE** | Phlebitis deep veins upper extremity (begin 1993) | |
| 451.89 | | **UE** | Thrombophlebitis, NEC | |
| 451.83 | | **UE** | Phlebitis deep veins upper extremity (begin 1993) | |
| 453.83 | | **UE** | Acute DVT/embolism upper extremity NOS (Begin 2009) | |
| 453.84 | | **UE** | Acute DVT/embolism of axillary veins (Begin 2009) | |
| 453.85 | | **UE** | Acute DVT/embolism of subclavian veins (Begin 2009) | |
| 453.86 | | **UE** | Acute DVT/embolism internal jugular vein (Begin 2009) | |
| 453.87 | | **UE** | Acute DVT/embolism thoracic vein NEC (Begin 2009) | |
|  | |  |  | |
| 430 | **ICH** | Non-traumatic subarachnoid hemorrhage | |
| 431 | **ICH** | Non-traumatic intracerebral hemorrhage | |
| 432 | **ICH** | Non-traumatic extradural hemorrhage | |
| 432.1 | **ICH** | Subdural hemorrhage | |
| 432.9 | **ICH** | Intracranial hemorrhage, NOS | |
| 770.3 | **Pulmonary** | Pulmonary hemorrhage | |
| 456 | **GI** | Esophagus varices w/bleed | |
| 456.2 | **GI** | Bleed esophagus varices other disease | |
| 459 | **GI** | Hemorrhage, NOS | |
| 530.7 | **GI** | Mallory-Weiss Syndrome | |
| 530.82 | **GI** | Esophageal hemorrhage (Begin 1993) | |
| 531 | **GI** | Acute gastric ulcer w/hemorrhage, w/out obstruction | |
| 531.01 | **GI** | Acute gastric ulcer w/hemorrhage, w/obstruction | |
| 531.2 | **GI** | Acute gastric ulcer w/hemorrhage, w/perforation | |
| 531.21 | **GI** | Acute gastric ulcer w/hemorrhage, w/perforation and obstruction | |
| 531.4 | **GI** | Chronic gastric ulcer w/hemorrhage, w/out obstruction | |
| 531.41 | **GI** | Chronic gastric ulcer w/hemorrhage, w/obstruction | |
| 531.6 | **GI** | Chronic gastric ulcer w/hemorrhage, w/perforation | |
| 531.61 | **GI** | Chronic gastric ulcer w/hemorrhage, w/perforation and obstruction | |
| 532 | **GI** | Acute duodenal ulcer w/hemorrhage, w/out obstruction | |
| 532.01 | **GI** | Acute duodenal ulcer w/hemorrhage, w/obstruction | |
| 532.2 | **GI** | Acute duodenal ulcer w/hemorrhage, w/perforation | |
| 532.21 | **GI** | Acute duodenal ulcer w/hemorrhage, w/perforation and obstruction | |
| 532.4 | **GI** | Chronic duodenal ulcer w/hemorrhage, w/out obstruction | |
| 532.41 | **GI** | Chronic duodenal ulcer w/hemorrhage, w/obstruction | |
| 532.6 | **GI** | Chronic duodenal ulcer w/hemorrhage, w/perforation | |
| 532.61 | **GI** | Chronic duodenal ulcer w/hemorrhage, w/perforation and obstruction | |
| 533 | **GI** | Acute peptic ulcer w/hemorrhage, w/out obstruction | |
| 533.01 | **GI** | Acute peptic ulcer w/hemorrhage, w/obstruction | |
| 533.2 | **GI** | Acute peptic ulcer w/hemorrhage, w/perforation | |
| 533.21 | **GI** | Acute peptic ulcer w/hemorrhage, w/perforation and obstruction | |
| 533.4 | **GI** | Chronic peptic ulcer w/hemorrhage, w/out obstruction | |
| 533.41 | **GI** | Chronic peptic ulcer w/hemorrhage, w/obstruction | |
| 533.6 | **GI** | Chronic peptic ulcer w/hemorrhage, w/perforation | |
| 533.61 | **GI** | Chronic peptic ulcer w/hemorrhage, w/perforation and obstruction | |
| 534 | **GI** | Acute gastrojejunal ulcer w/hemorrhage, w/out obstruction | |
| 534.01 | **GI** | Acute gastrojejunal ulcer w/hemorrhage, w/obstruction | |
| 534.2 | **GI** | Acute gastrojejunal ulcer w/hemorrhage, w/perforation | |
| 534.21 | **GI** | Acute gastrojejunal ulcer w/hemorrhage, w/perforation and obstruction | |
| 534.4 | **GI** | Chronic gastrojejunal ulcer w/hemorrhage, w/out obstruction | |
| 534.41 | **GI** | Chronic gastrojejunal ulcer w/hemorrhage, w/obstruction | |
| 534.6 | **GI** | Chronic gastrojejunal ulcer w/hemorrhage, w/perforation | |
| 534.61 | **GI** | Chronic gastrojejunal ulcer w/hemorrhage, w/perforation and obstruction | |
| 535.01 | **GI** | Acute gastritis w/hemorrhage | |
| 535.11 | **GI** | Atrophic Gastritis w/hemorrhage | |
| 535.21 | **GI** | Gastric mucosal hypertrophy w/hemorrhage | |
| 535.31 | **GI** | Alcoholic gastritis w/hemorrhage | |
| 535.41 | **GI** | Other specified gastritis w/hemorrhage | |
| 535.51 | **GI** | Unspecified gastritis and gastroduodenitis w/hemorrhage | |
| 535.61 | **GI** | Duodenitis w/hemorrhage | |
| 537.83 | **GI** | Angiodysplasia of stomach and duodenum w/hemorrhage | |
| 562.02 | **GI** | Diverticulosis of small intestine w/hemorrhage | |
| 562.03 | **GI** | Diverticulitis of small intestine w/hemorrhage | |
| 562.12 | **GI** | Diverticulosis of colon w/hemorrhage | |
| 562.13 | **GI** | Diverticulitis of colon w/hemorrhage | |
| 568.81 | **GI** | Hemoperitoneum | |
| 569.3 | **GI** | Rectal & anal hemorrhage | |
| 569.85 | **GI** | Angiodysplasia of intestine w/hemorrhage | |
| 578 | **GI** | Hematemesis | |
| 578.1 | **GI** | Melena | |
| 578.9 | **GI** | Gastrointestinal hemorrhage, NOS | |
| 360.43 | **Hemophthalmos** | Hemophthalmos | |
| 379.23 | **Hemophthalmos** | Vitreous hemorrhage | |
| 362.81 | **Hemophthalmos** | Retinal hemorrhage | |
| 599.71 | **Gross Hematuria** | Gross hematuria | |
| 423 | **Other bleed** | Hemopericardium | |
| 593.81 | **Other bleed** | Renal vascular disorder | |
| 784.8 | **Other bleed** | Hemorrhage from throat | |
| 786.3 | **Other bleed** | Hemoptysis, unspecified | |
| 786.31 | **Other bleed** | Acute idiopathic pulmonary hemorrhage in infants | |
| 786.39 | **Other bleed** | Other hemoptysis | |
| 719.1 | **Other bleed** | Hemarthrosis, site unspecified | |
| 719.11 | **Other bleed** | Hemarthrosis, shoulder region | |
| 719.12 | **Other bleed** | Hemarthrosis, upper arm | |
| 719.13 | **Other bleed** | Hemarthrosis, forearm | |
| 719.14 | **Other bleed** | Hemarthrosis, hand | |
| 719.15 | **Other bleed** | Hemarthrosis, pelvic region and thigh | |
| 719.16 | **Other bleed** | Hemarthrosis, lower leg | |
| 719.17 | **Other bleed** | Hemarthrosis, ankle and foot | |
| 719.18 | **Other bleed** | Hemarthrosis, other specified sites | |
| 719.19 | **Other bleed** | Hemarthrosis, multiple sites | |
| *SCD complications were searched in all 25 diagnosis positions unless specified.* | | | | |
| *\* VTE Codes searched in all secondary positions (1-24); all other VTE codes were searched in principal diagnosis only* | | | | |
| *ACS- Acute Chest Syndrome* | | | | |
| *ONFH- Osteonecrosis of the femoral head* | | | | |
| *PE- Pulmonary Embolism* | | | | |
| *DVT- Lower extremity deep vein thrombosis* | | | | |
| *UE- Upper extremity deep vein thrombosis* | | | | |
| *GI- Gastrointestinal* | | | | |
| *DX- Diagnosis* | | | | |
| ^ Other bleed code required additional transfusion procedure codes (99.00, 99.03, 99.04, 99.07) to be included as major bleeding | | | | |

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| **Table SII: Types of cancer diagnosed among California sickle cell disease (SCD) patients** | | |
| **Variables** | **N** | **%** |
| **Cancer-Age at Diagnosis** | 115 | 100.0% |
| Pediatric - age <15 | 6 | 5.2% |
| AYA- age 15-39 | 34 | 29.6% |
| Adult - age > 39 | 75 | 65.2% |
| **Cancer Type‡** |  |  |
| Breast | 16 | 13.9% |
| Digestive System | 16 | 13.9% |
| Respiratory System | 16 | 13.9% |
| Lymphoma | 15 | 13.0% |
| Leukemia | 12 | 10.4% |
| Urinary System | 8 | 7.0% |
| Male Genitals | 6 | 5.2% |
| Female Genitals | 5 | 4.3% |
| Brain and other CNS | 4 | 3.5% |
| Myeloma | 4 | 3.5% |
| Other sites | 13 | 0.9% |
| ‡Cancer sites defined using SEER Site recode | | |

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| **Table SIII: Overall survival among SCD patients in California by cancer type, 1991-2013** | | | |
| **Cancer Type\*** | **HR** | **95% CI** | **P-Value** |
| **No cancer** | *Reference* | | |
| **Hematologic cancers** | 10.87 | (6.38, 18.53) | <.0001 |
| Lymphoma | 4.56 | (1.69, 12.31) | 0.0027 |
| Leukemia | 44.98 | (21.64, 93.52) | <.0001 |
| Myeloma | 3.44 | (0.44, 27.05) | 0.2401 |
| Breast | 2.20 | (0.82, 5.91) | 0.1193 |
| **Solid cancers** | 2.37 | (1.66, 3.38) | <.0001 |
| Digestive | 1.24 | (0.56, 2.74) | 0.5983 |
| Respiratory | 7.72 | (4.27, 13.95) | <.0001 |
| Urinary | 1.03 | (0.32, 3.27) | 0.9624 |
| Female genital | 2.05 | (0.29, 14.73) | 0.4756 |
| Brain | 15.80 | (3.56, 70.09) | 0.0003 |
| All other cancers | 2.43 | (0.99, 5.98) | 0.0536 |
| *Cox proportional hazard regression model stratified by entry year and adjusted for SCD severity, gender, race/ethnicity, age at entry, SCD complications (included as time dependent covariates).* | | | |
| *\* covariate included as a time-dependent covariate* | | | |