

Supplemental Appendix**Appendix table 1**

| Category | Code Type | Code | Description |
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| Pericarditis (which includes all diagnoses of pericarditis that were not intervened upon) | ICD9-DX | 420.0 | Acute Pericarditis in diseases classified elsewhere |
| | ICD10-DX | I30.0 | Acute nonspecific idiopathic pericarditis |
| | ICD9-DX | 420.90 | Acute pericarditis, unspecified |
| | ICD9-DX | 420.91 | Acute idiopathic pericarditis |
| | ICD9-DX | 420.99 | Other acute pericarditis |
| | ICD9-DX | 423.0 | Hemopericardium |
| | ICD9-DX | 423.1 | Adhesive pericarditis |
| | ICD9-DX | 423.2 | Constrictive pericarditis |
| | ICD9-DX | 423.8 | Other specified diseases of pericardium |
| | ICD9-DX | 423.9 | Unspecified disease of the pericardium |
| | ICD10-DX | I30.0 | Acute nonspecific idiopathic pericarditis |
| | ICD10-DX | I30.1 | Infective pericarditis |
| | ICD10-DX | I30.8 | Other forms of acute pericarditis |
| | ICD10-DX | I30.9 | Acute pericarditis, unspecified |
| | ICD10-DX | I31.2 | Hemopericardium, not elsewhere specified |
| | ICD10-DX | I31.3 | Pericardial effusion (noninflammatory) |
| | ICD10-DX | I31.8 | Other specified diseases of the pericardium |
| ICD10-DX | I31.9 | Disease of the pericardium, unspecified | |
| Tamponade or intervention | ICD-9 DX | 423.9 | Cardiac Tamponade |
| | ICD-10 DX | I31.4 | Cardiac Tamponade |
| | ICD-9 PX | 37.0 | Pericardiocentesis |
| | ICD-10 PX | 0W9C30Z | Drainage of Mediastinum with Drainage Device, Percutaneous Approach |
| | ICD-10 PX | 0W9C3ZZ | Drainage of Mediastinum, Percutaneous Approach |

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| ICD-10 PX | 0W9D30Z | Drainage of Pericardial Cavity with Drainage Device, Percutaneous Approach |
| ICD-10 PX | 0W9D3ZX | Drainage of Pericardial Cavity, Percutaneous Approach, Diagnostic |
| ICD-10 PX | 0W9D3ZZ | Drainage of Pericardial Cavity, Percutaneous Approach |
| ICD-10 PX | 0W9D40Z | Drainage of Pericardial Cavity with Drainage Device, Percutaneous Endoscopic Approach |
| ICD-10 PX | 0W9D4ZX | Drainage of Pericardial Cavity, Percutaneous Endoscopic Approach, Diagnostic |
| ICD-10 PX | 0W9D4ZZ | Drainage of Pericardial Cavity, Percutaneous Endoscopic Approach |
| CPT | 33010 | Pericardiocentesis; initial |
| CPT | 33011 | Pericardiocentesis; subsequent |
| CPT | G9408 | Patients with cardiac tamponade and/or pericardiocentesis occurring within 30 days |
| CPT | G9409 | Patients without cardiac tamponade and/or pericardiocentesis occurring within 30 days |
| ICD-9 PX | 37.10 | Incision of Heart, Not Otherwise Specified |
| ICD-10 PX | 02N60ZZ | Release Right Atrium, Open Approach |
| ICD-10 PX | 02N63ZZ | Release Right Atrium, Percutaneous Approach |
| ICD-10 PX | 02N64ZZ | Release Right Atrium, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02N70ZZ | Release Left Atrium, Open Approach |
| ICD-10 PX | 02N73ZZ | Release Left Atrium, Percutaneous Approach |
| ICD-10 PX | 02N74ZZ | Release Left Atrium, Percutaneous Endoscopic Approach |
| ICD-9 PX | 37.11 | Cardiotomy |
| ICD-10 PX | 02C60ZZ | Extirpation of Matter from Right Atrium, Open Approach |
| ICD-10 PX | 02C63ZZ | Extirpation of Matter from Right Atrium, Percutaneous Approach |
| ICD-10 PX | 02C64ZZ | Extirpation of Matter from Right Atrium, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02C70ZZ | Extirpation of Matter from Left Atrium, Open Approach |

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| ICD-10 PX | 02C73ZZ | Extirpation of Matter from Left Atrium, Percutaneous Approach |
| ICD-10 PX | 02C74ZZ | Extirpation of Matter from Left Atrium, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02PA0YZ | Removal of Other Device from Heart, Open Approach |
| ICD-10 PX | 02PA4YZ | Removal of Other Device from Heart, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02WA0YZ | Revision of Other Device in Heart, Open Approach |
| ICD-10 PX | 02WA3YZ | Revision of Other Device in Heart, Percutaneous Approach |
| ICD-10 PX | 02WA4YZ | Revision of Other Device in Heart, Percutaneous Endoscopic Approach |
| CPT | 33310 | Cardiotomy, exploratory |
| CPT | 33315 | Cardiotomy, exploratory with cardiopulmonary bypass |
| ICD-9 PX | 37.12 | Pericardiotomy |
| ICD-10 PX | 02CN0ZZ | Extirpation of Matter from Pericardium, Open Approach |
| ICD-10 PX | 02CN3ZZ | Extirpation of Matter from Pericardium, Percutaneous Approach |
| ICD-10 PX | 02CN4ZZ | Extirpation of Matter from Pericardium, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02NN0ZZ | Release Pericardium, Open Approach |
| ICD-10 PX | 02NN3ZZ | Release Pericardium, Percutaneous Approach |
| ICD-10 PX | 02NN4ZZ | Release Pericardium, Percutaneous Endoscopic Approach |
| ICD-10 PX | 0W9D00Z | Drainage of Pericardial Cavity with Drainage Device, Open Approach |
| ICD-10 PX | 0W9D0ZX | Drainage of Pericardial Cavity, Open Approach, Diagnostic |
| ICD-10 PX | 0W9D0ZZ | Drainage of Pericardial Cavity, Open Approach |
| ICD-10 PX | 0WCD0ZZ | Extirpation of Matter from Pericardial Cavity, Open Approach |
| ICD-10 PX | 0WCD3ZZ | Extirpation of Matter from Pericardial Cavity, Percutaneous Approach |

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| ICD-10 PX | 0WCD4ZZ | Extirpation of Matter from Pericardial Cavity, Percutaneous Endoscopic Approach |
| ICD-9 PX | 37.24 | Biopsy of Pericardium |
| ICD-10 PX | 02BN0ZX | Excision of Pericardium, Open Approach, Diagnostic |
| ICD-10 PX | 02BN3ZX | Excision of Pericardium, Percutaneous Approach, Diagnostic |
| ICD-10 PX | 02BN4ZX | Excision of Pericardium, Percutaneous Endoscopic Approach, Diagnostic |
| ICD-9 PX | 37.31 | Pericardiectomy |
| ICD-10 PX | 02BN0ZZ | Excision of Pericardium, Open Approach |
| ICD-10 PX | 02BN3ZZ | Excision of Pericardium, Percutaneous Approach |
| ICD-10 PX | 02BN4ZZ | Excision of Pericardium, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02TN0ZZ | Resection of Pericardium, Open Approach |
| ICD-10 PX | 02TN3ZZ | Resection of Pericardium, Percutaneous Approach |
| ICD-10 PX | 02TN4ZZ | Resection of Pericardium, Percutaneous Endoscopic Approach |
| ICD-9 PX | 37.49 | Other Repair of Heart and Pericardium |
| ICD-10 PX | 02163Z7 | Bypass Right Atrium to Left Atrium, Percutaneous Approach |
| ICD-10 PX | 02H60YZ | Insertion of Other Device into Right Atrium, Open Approach |
| ICD-10 PX | 02H63YZ | Insertion of Other Device into Right Atrium, Percutaneous Approach |
| ICD-10 PX | 02H64YZ | Insertion of Other Device into Right Atrium, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02H70YZ | Insertion of Other Device into Left Atrium, Open Approach |
| ICD-10 PX | 02H73YZ | Insertion of Other Device into Left Atrium, Percutaneous Approach |
| ICD-10 PX | 02H74YZ | Insertion of Other Device into Left Atrium, Percutaneous Endoscopic Approach |

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| ICD-10 PX | 02HA0YZ | Insertion of Other Device into Heart, Open Approach |
| ICD-10 PX | 02HA3YZ | Insertion of Other Device into Heart, Percutaneous Approach |
| ICD-10 PX | 02HA4YZ | Insertion of Other Device into Heart, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02HK0YZ | Insertion of Other Device into Right Ventricle, Open Approach |
| ICD-10 PX | 02HK3YZ | Insertion of Other Device into Right Ventricle, Percutaneous Approach |
| ICD-10 PX | 02HK4YZ | Insertion of Other Device into Right Ventricle, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02HL0YZ | Insertion of Other Device into Left Ventricle, Open Approach |
| ICD-10 PX | 02HL3YZ | Insertion of Other Device into Left Ventricle, Percutaneous Approach |
| ICD-10 PX | 02HL4YZ | Insertion of Other Device into Left Ventricle, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02HN0YZ | Insertion of Other Device into Pericardium, Open Approach |
| ICD-10 PX | 02HN3YZ | Insertion of Other Device into Pericardium, Percutaneous Approach |
| ICD-10 PX | 02HN4YZ | Insertion of Other Device into Pericardium, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02QA0ZZ | Repair Heart, Open Approach |
| ICD-10 PX | 02QA3ZZ | Repair Heart, Percutaneous Approach |
| ICD-10 PX | 02QA4ZZ | Repair Heart, Percutaneous Endoscopic Approach |
| ICD-10 PX | 02QN0ZZ | Repair Pericardium, Open Approach |
| ICD-10 PX | 02QN3ZZ | Repair Pericardium, Percutaneous Approach |
| ICD-10 PX | 02QN4ZZ | Repair Pericardium, Percutaneous Endoscopic Approach |
| ICD-9 PX | 37.91 | Open Chest Cardiac Massage |
| ICD-10 PX | 02QA0ZZ | Repair Heart, Open Approach |

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| CPT | 33015 | Tube pericardiostomy |
| CPT | 33300 | Repair of cardiac wound, without bypass |
| CPT | 33305 | Repair of cardiac wound with cardiopulmonary bypass |
| ICD-9 PX | 37.93 | Injection of Therapeutic Substance into Pericardium |
| ICD-10 PX | 3E080GC | Introduction of Other Therapeutic Substance into Heart, Open Approach |
| ICD-10 PX | 3E083GC | Introduction of Other Therapeutic Substance into Heart, Percutaneous Approach |

*Stroke/TIA codes are contained in Appendix Table 2

Appendix table 2.

| Logic Code | Description | Code Type | Codes | Description | Additional Logic |
|------------|---|-----------|----------|---|------------------|
| A1 | Atrioesophageal fistula | ICD-9 DX | 530.89 | Other specified disorders of esophagus | |
| | | ICD-10 DX | K22.8 | Other specified diseases of esophagus | |
| A2 | Esophageal Injury/ Esophageal hematoma | ICD-9 DX | 862.22 | Injury to esophagus without mention of open wound in cavity | |
| | | ICD-9 DX | 998.6 | Persistent postoperative fistula | |
| | | ICD-9 DX | 530.4 | Perforation of esophagus | |
| | | ICD-9 PX | 42.84 | Repair of esophageal fistula, not elsewhere classified | |
| | | ICD-10 DX | S27.81xx | Injury of esophagus (thoracic part) | |
| | | ICD-10 DX | T81.83XA | Persistent postprocedural fistula, initial encounter | |
| | | ICD-10 DX | K22.3 | Perforation of esophagus | |
| | | ICD-10 DX | J95.04 | Tracheo-esophageal fistula following tracheostomy | |
| B | Esophageal Surgery/ Resection | ICD-9 PX | 42.4 | Excision of esophagus | |
| | | ICD-9 PX | 42.41 | Partial esophagectomy | |
| | | ICD-9 PX | 42.42 | Total esophagectomy | |
| | | ICD-9 PX | 42.84 | Repair of esophageal fistula, not elsewhere classified | |
| | | ICD-9 PX | 42.82 | Suture of laceration of esophagus | |
| | | ICD-9 PX | 43.9 | Total gastrectomy | |
| | | ICD-9 PX | 43.5 | Partial gastrectomy with anastomosis to esophagus | |
| | | ICD-10 PX | 0DB50ZZ | Excision of Esophagus, Open Approach | |
| | | ICD-10 PX | 0DB53ZZ | Excision of Esophagus, Percutaneous Approach | |

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| | | ICD-10 PX | 0DB57ZZ | Excision of Esophagus, Via Natural or Artificial Opening |
| | | ICD-10 PX | 0DT50ZZ | Resection of Esophagus, Open Approach |
| | | ICD-10 PX | 0DT54ZZ | Resection of Esophagus, Percutaneous Endoscopic Approach |
| | | ICD-10 PX | 0DT57ZZ | Resection of Esophagus, Via Natural or Artificial Opening |
| | | ICD-10 PX | 0DT58ZZ | Resection of Esophagus, Endo |
| | | ICD-10 PX | 0DB40ZZ | Excision of Esophagogastric Junction, Open Approach |
| | | ICD-10 PX | 0DB43ZZ | Excision of Esophagogastric Junction, Percutaneous Approach |
| | | ICD-10 PX | 0DB44ZZ | Excision of Esophagogastric Junction, Perc Endo Approach |
| | | ICD-10 PX | 0DB47ZZ | Excision of Esophagogastric Junction, Via Opening |
| | | ICD-10 PX | 0DT40ZZ | Resection of Esophagogastric Junction, Open Approach |
| | | ICD-10 PX | 0DT44ZZ | Resection of Esophagogastric Junction, Perc Endo Approach |
| | | ICD-10 PX | 0DT47ZZ | Resection of Esophagogastric Junction, Via Opening |
| | | ICD-10 PX | 0DT48ZZ | Resection of Esophagogastric Junction, Endo |
| | | ICD-10 PX | 0DQ50ZZ | Repair Esophagus, Open Approach |
| | | ICD-9 PX | 42.81 | Insertion of permanent tube into esophagus |
| | | ICD-10 PX | 0DH50DZ | Insertion of Intraluminal Device into Esophag, Open Approach |
| C | Esophageal stenting | ICD-10 PX | 0DH50UZ | Insertion of Feeding Device into Esophagus, Open Approach |
| | | ICD-10 PX | 0DH53DZ | Insertion of Intraluminal Device into Esophag, Perc Approach |

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| | | ICD-10 PX | ODH53UZ | Insertion of Feeding Device into Esophagus, Perc Approach |
| | | ICD-10 PX | ODH54DZ | Insertion of Intralum Dev into Esophag, Perc Endo Approach |
| | | ICD-10 PX | ODH54UZ | Insertion of Feeding Device into Esophag, Perc Endo Approach |
| | | ICD-10 PX | ODH57DZ | Insertion of Intraluminal Device into Esophagus, Via Opening |
| | | ICD-10 PX | ODH57UZ | Insertion of Feeding Device into Esophagus, Via Opening |
| | | ICD-10 PX | ODH58DZ | Insertion of Intraluminal Device into Esophagus, Endo |
| | | ICD-10 PX | ODH58UZ | Insertion of Feeding Device into Esophagus, Endo Esophagoscopy, flexible, transoral; with placement of endoscopic stent (includes pre- and post-dilation and guide wire passage, when performed) |
| | | CPT | 43212 | Esophagogastroduodenoscopy, flexible, transoral; with placement of endoscopic stent (includes pre- and post-dilation and guide wire passage, when performed) |
| | | CPT | 43266 | Esophagogastroduodenoscopy, flexible, transoral; with placement of endoscopic stent (includes pre- and post-dilation and guide wire passage, when performed) |
| D | Mediastinal infection | ICD-9 DX | 519.2 | Mediastinitis |
| | | ICD-9 DX | 519.3 | Other diseases of mediastinum, not elsewhere classified |
| | | ICD-10 DX | J98.51 | Mediastinitis |
| | | ICD-10 DX | J98.59 | Other diseases of mediastinum, not elsewhere classified |
| E | Air Embolism (pulmonary/cardiac) | ICD-9 DX | 999.1 | Air embolism as a complication of medical care, not elsewhere classified |
| | | ICD-9 DX | 909.3 | Late effect of complications of surgical and medical care |

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| | | ICD-10 DX | T80.0XXA | Air embolism following infusion, transfusion and therapeutic injection, initial encounter | |
| | | ICD-10 DX | T80.0XXD | Air embolism following infusion, transfusion and therapeutic injection, subsequent encounter | |
| | | ICD-10 DX | T80.0XXS | Air embolism following infusion, transfusion and therapeutic injection, sequela | |
| F | Hematemesis | ICD-10 DX | K92.0 | Hematemesis | |
| | | ICD-9 DX | 430 | Subarachnoid hemorrhage | |
| | | ICD-9 DX | 431 | Intracerebral hemorrhage | |
| | | ICD-9 DX | 433.01 | Occlusion and stenosis of basilar artery with cerebral infarction | |
| | | ICD-9 DX | 433.10 | Occlusion and stenosis of carotid artery without mention of cerebral infarction | EXCLUSION: If any of the qualifying claims have: |
| | | ICD-9 DX | 433.11 | Occlusion and stenosis of carotid artery with cerebral infarction | 800 <= DX Code <= 804.9, 850 <= DX Code <= 854.1 in any DX position OR DX V57xx as the principal DX Code, then EXCLUDE. |
| | | ICD-9 DX | 433.21 | Occlusion and stenosis of vertebral artery with cerebral infarction | |
| G | Stroke/TIA | ICD-9 DX | 433.31 | Occlusion and stenosis of multiple and bilateral precerebral arteries with cerebral infarction | |
| | | ICD-9 DX | 433.81 | Occlusion and stenosis of other specified precerebral artery with cerebral infarction | |
| | | ICD-9 DX | 433.91 | Occlusion and stenosis of unspecified precerebral artery with cerebral infarction | |
| | | ICD-9 DX | 434.00 | Cerebral thrombosis without mention of cerebral infarction | |
| | | ICD-9 DX | 434.01 | Cerebral thrombosis with cerebral infarction | |
| | | ICD-9 DX | 434.10 | Cerebral embolism without mention of cerebral infarction | |
| | | ICD-9 DX | 434.11 | Cerebral embolism with cerebral infarction | |

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| ICD-9 DX | 434.90 | Cerebral artery occlusion, unspecified without mention of cerebral infarction | |
| ICD-9 DX | 434.91 | Cerebral artery occlusion, unspecified with cerebral infarction | |
| ICD-9 DX | 435.0 | Basilar artery syndrome | |
| ICD-9 DX | 435.1 | Vertebral artery syndrome | |
| ICD-9 DX | 435.3 | Vertebrobasilar artery syndrome | |
| ICD-9 DX | 435.8 | Other specified transient cerebral ischemias | |
| ICD-9 DX | 435.9 | Unspecified transient cerebral ischemia | |
| ICD-9 DX | 436 | Acute, but ill-defined, cerebrovascular disease | |
| ICD-9 DX | 997.02 | iatrogenic cerebrovascular infarction or hemorrhage | |
| ICD-10 DX | G45.0 | Vertebro-basilar artery syndrome | EXCLUSION: If any of the qualifying claims have any of the following codes in any DX position then EXCLUDE: S01.90XA, S02.0XXA, S02.0XXB, S02.10XA, S02.10XB, S02.101A, S02.101B, S02.102A, S02.102B, S02.109A, |
| ICD-10 DX | G45.1 | Carotid artery syndrome (hemispheric) | |
| ICD-10 DX | G45.2 | Multiple and bilateral precerebral artery syndromes | |
| ICD-10 DX | G45.8 | Other transient cerebral ischemic attacks and related syndromes | |
| ICD-10 DX | G45.9 | Transient cerebral ischemic attack, unspecified | |
| ICD-10 DX | G46.0 | Middle cerebral artery syndrome | |
| ICD-10 DX | G46.1 | Anterior cerebral artery syndrome | |
| ICD-10 DX | G46.2 | Posterior cerebral artery syndrome | |
| ICD-10 DX | G46.3 | Brain stem stroke syndrome | |
| ICD-10 DX | G46.4 | Cerebellar stroke syndrome | |
| ICD-10 DX | G46.5 | Pure motor lacunar syndrome | |
| ICD-10 DX | G46.6 | Pure sensory lacunar syndrome | |
| ICD-10 DX | G46.7 | Other lacunar syndromes | |
| ICD-10 DX | G46.8 | Other vascular syndromes of brain in cerebrovascular diseases | |

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| ICD-10 DX | G97.31 | Intraoperative hemorrhage and hematoma of a nervous system organ or structure complicating a nervous system procedure | S02.109B, S02.11GA, S02.11GB, |
| ICD-10 DX | G97.32 | Intraoperative hemorrhage and hematoma of a nervous system organ or structure complicating other procedure | S02.11HA, S02.11HB, S02.110A, |
| ICD-10 DX | I60.00 | Nontraumatic subarachnoid hemorrhage from unspecified carotid siphon and bifurcation | S02.111A, S02.112A, |
| ICD-10 DX | I60.01 | Nontraumatic subarachnoid hemorrhage from right carotid siphon and bifurcation | S02.113A, S02.110B, |
| ICD-10 DX | I60.02 | Nontraumatic subarachnoid hemorrhage from left carotid siphon and bifurcation | S02.111B, S02.112B, |
| ICD-10 DX | I60.10 | Nontraumatic subarachnoid hemorrhage from unspecified middle cerebral artery | S02.113B, S02.118A, |
| ICD-10 DX | I60.11 | Nontraumatic subarachnoid hemorrhage from right middle cerebral artery | S02.118B, S02.119A, |
| ICD-10 DX | I60.12 | Nontraumatic subarachnoid hemorrhage from left middle cerebral artery | S02.119B, S02.19XA, |
| ICD-10 DX | I60.2 | Nontraumatic subarachnoid hemorrhage from anterior communicating artery | S02.19XB, S02.2XXA, |
| ICD-10 DX | I60.30 | Nontraumatic subarachnoid hemorrhage from unspecified posterior communicating artery | S02.2XXB, S02.3XXA, |
| ICD-10 DX | I60.31 | Nontraumatic subarachnoid hemorrhage from right posterior communicating artery | S02.30XA, S02.3XXB, |
| ICD-10 DX | I60.32 | Nontraumatic subarachnoid hemorrhage from left posterior communicating artery | S02.30XB, S02.31XA, |
| ICD-10 DX | I60.4 | Nontraumatic subarachnoid hemorrhage from basilar artery | S02.31XB, S02.32XA, |
| ICD-10 DX | I60.50 | Nontraumatic subarachnoid hemorrhage from unspecified vertebral artery | S02.32XB, S02.40AA, |

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| ICD-10 DX | I60.51 | Nontraumatic subarachnoid hemorrhage from right vertebral artery | S02.40AB, S02.40BA, |
| ICD-10 DX | I60.52 | Nontraumatic subarachnoid hemorrhage from left vertebral artery | S02.40BB, S02.40CA, S02.40CB, |
| ICD-10 DX | I60.6 | Nontraumatic subarachnoid hemorrhage from other intracranial arteries | S02.40DA, S02.40DB, |
| ICD-10 DX | I60.7 | Nontraumatic subarachnoid hemorrhage from unspecified intracranial artery | S02.40EA, S02.40EB, |
| ICD-10 DX | I60.8 | Other nontraumatic subarachnoid hemorrhage | S02.40FA, S02.40FB, |
| ICD-10 DX | I60.9 | Nontraumatic subarachnoid hemorrhage, unspecified | S02.400A, S02.400B, |
| ICD-10 DX | I61.0 | Nontraumatic intracerebral hemorrhage in hemisphere, subcortical | S02.401A, S02.401B, |
| ICD-10 DX | I61.1 | Nontraumatic intracerebral hemorrhage in hemisphere, cortical | S02.402A, S02.402B, |
| ICD-10 DX | I61.2 | Nontraumatic intracerebral hemorrhage in hemisphere, unspecified | S02.411A, S02.411B, |
| ICD-10 DX | I61.3 | Nontraumatic intracerebral hemorrhage in brain stem | S02.412A, S02.412B, |
| ICD-10 DX | I61.4 | Nontraumatic intracerebral hemorrhage in cerebellum | S02.413A, S02.413B, |
| ICD-10 DX | I61.5 | Nontraumatic intracerebral hemorrhage, intraventricular | S02.42XA, S02.42XB, |
| ICD-10 DX | I61.6 | Nontraumatic intracerebral hemorrhage, multiple localized | S02.600A, S02.600B, |
| ICD-10 DX | I61.8 | Other nontraumatic intracerebral hemorrhage | S02.601A, S02.601B, |
| ICD-10 DX | I61.9 | Nontraumatic intracerebral hemorrhage, unspecified | S02.602A, |
| ICD-10 DX | I63.00 | Cerebral infarction due to thrombosis of unspecified precerebral artery | |

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| ICD-10 DX | I63.011 | Cerebral infarction due to thrombosis of right vertebral artery | S02.602B, S02.609A, |
| ICD-10 DX | I63.012 | Cerebral infarction due to thrombosis of left vertebral artery | S02.609B, S02.61XA, |
| ICD-10 DX | I63.013 | Cerebral infarction due to thrombosis of bilateral vertebral arteries | S02.610A, S02.610B, |
| ICD-10 DX | I63.019 | Cerebral infarction due to thrombosis of unspecified vertebral artery | S02.611A, S02.611B, |
| ICD-10 DX | I63.02 | Cerebral infarction due to thrombosis of basilar artery | S02.612A, S02.612B, |
| ICD-10 DX | I63.031 | Cerebral infarction due to thrombosis of right carotid artery | S02.62XA, S02.620A, |
| ICD-10 DX | I63.032 | Cerebral infarction due to thrombosis of left carotid artery | S02.62XB, S02.620B, |
| ICD-10 DX | I63.039 | Cerebral infarction due to thrombosis of unspecified carotid artery | S02.621A, S02.621B, |
| ICD-10 DX | I63.09 | Cerebral infarction due to thrombosis of other precerebral artery | S02.622A, S02.622B, |
| ICD-10 DX | I63.10 | Cerebral infarction due to embolism of unspecified precerebral artery | S02.63XA, S02.630A, |
| ICD-10 DX | I63.111 | Cerebral infarction due to embolism of right vertebral artery | S02.63XB, S02.630B, |
| ICD-10 DX | I63.112 | Cerebral infarction due to embolism of left vertebral artery | S02.631A, S02.631B, |
| ICD-10 DX | I63.119 | Cerebral infarction due to embolism of unspecified vertebral artery | S02.632A, S02.632B, |
| ICD-10 DX | I63.12 | Cerebral infarction due to embolism of basilar artery | S02.64XA, S02.640A, |
| ICD-10 DX | I63.131 | Cerebral infarction due to embolism of right carotid artery | S02.64XB, S02.640B, |

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| ICD-10 DX | I63.132 | Cerebral infarction due to embolism of left carotid artery | S02.641A, S02.641B, |
| ICD-10 DX | I63.139 | Cerebral infarction due to embolism of unspecified carotid artery | S02.642A, S02.642B, |
| ICD-10 DX | I63.19 | Cerebral infarction due to embolism of other precerebral artery | S02.65XA, S02.650A, |
| ICD-10 DX | I63.20 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified precerebral arteries | S02.65XB, S02.650B, |
| ICD-10 DX | I63.211 | Cerebral infarction due to unspecified occlusion or stenosis of right vertebral artery | S02.651A, S02.651B, |
| ICD-10 DX | I63.212 | Cerebral infarction due to unspecified occlusion or stenosis of left vertebral artery | S02.652A, S02.652B, |
| ICD-10 DX | I63.213 | Cerebral infarction due to unspecified occlusion or stenosis of bilateral vertebral arteries | S02.66XA, S02.66XB, |
| ICD-10 DX | I63.219 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified vertebral artery | S02.67XA, S02.670A, S02.670B, |
| ICD-10 DX | I63.22 | Cerebral infarction due to unspecified occlusion or stenosis of basilar artery | S02.671A, S02.671B, |
| ICD-10 DX | I63.231 | Cerebral infarction due to unspecified occlusion or stenosis of right carotid arteries | S02.672A, S02.672B, |
| ICD-10 DX | I63.232 | Cerebral infarction due to unspecified occlusion or stenosis of left carotid arteries | S02.69XA, S02.61XB, |
| ICD-10 DX | I63.233 | Cerebral infarction due to unspecified occlusion or stenosis of bilateral carotid arteries | S02.62XA, S02.63XA, |
| ICD-10 DX | I63.239 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified carotid artery | S02.64XA, S02.65XA, |
| ICD-10 DX | I63.29 | Cerebral infarction due to unspecified occlusion or stenosis of other precerebral arteries | S02.66XA, S02.67XB, |
| ICD-10 DX | I63.30 | Cerebral infarction due to thrombosis of unspecified cerebral artery | S02.69XB, |

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| ICD-10 DX | I63.311 | Cerebral infarction due to thrombosis of right middle cerebral artery | S02.8XXA, S02.80XA, |
| ICD-10 DX | I63.312 | Cerebral infarction due to thrombosis of left middle cerebral artery | S02.8XXB, S02.80XB, |
| ICD-10 DX | I63.313 | Cerebral infarction due to thrombosis of bilateral middle cerebral arteries | S02.81XA, S02.81XB, |
| ICD-10 DX | I63.319 | Cerebral infarction due to thrombosis of unspecified middle cerebral artery | S02.82XA, S02.82XB, |
| ICD-10 DX | I63.321 | Cerebral infarction due to thrombosis of right anterior cerebral artery | S02.91XA, S02.91XB, |
| ICD-10 DX | I63.322 | Cerebral infarction due to thrombosis of left anterior cerebral artery | S02.92XA, S02.92XB, |
| ICD-10 DX | I63.323 | Cerebral infarction due to thrombosis of bilateral anterior cerebral arteries | S06.0X0A, S06.0X1A, |
| ICD-10 DX | I63.329 | Cerebral infarction due to thrombosis of unspecified anterior cerebral artery | S06.0X2A, S06.0X3A, |
| ICD-10 DX | I63.331 | Cerebral infarction due to thrombosis of right posterior cerebral artery | S06.0X4A, S06.0X5A, |
| ICD-10 DX | I63.332 | Cerebral infarction due to thrombosis of left posterior cerebral artery | S06.0X6A, S06.0X7A, |
| ICD-10 DX | I63.333 | Cerebral infarction due to thrombosis of bilateral posterior cerebral arteries | S06.0X8A, S06.0X9A, |
| ICD-10 DX | I63.339 | Cerebral infarction due to thrombosis of unspecified posterior cerebral artery | S06.1X0A, S06.1X1A, |
| ICD-10 DX | I63.341 | Cerebral infarction due to thrombosis of right cerebellar artery | S06.1X2A, S06.1X3A, |
| ICD-10 DX | I63.342 | Cerebral infarction due to thrombosis of left cerebellar artery | S06.1X4A, S06.1X5A, |
| ICD-10 DX | I63.343 | Cerebral infarction due to thrombosis of bilateral cerebellar arteries | S06.1X6A, S06.1X7A, |

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| ICD-10 DX | I63.349 | Cerebral infarction due to thrombosis of unspecified cerebellar artery | S06.1X8A, S06.1X9A, |
| ICD-10 DX | I63.39 | Cerebral infarction due to thrombosis of other cerebral artery | S06.2X0A, S06.2X1A, |
| ICD-10 DX | I63.40 | Cerebral infarction due to embolism of unspecified cerebral artery | S06.2X2A, S06.2X3A, |
| ICD-10 DX | I63.411 | Cerebral infarction due to embolism of right middle cerebral artery | S06.2X4A, S06.2X5A, |
| ICD-10 DX | I63.412 | Cerebral infarction due to embolism of left middle cerebral artery | S06.2X6A, S06.2X7A, |
| ICD-10 DX | I63.413 | Cerebral infarction due to embolism of bilateral middle cerebral arteries | S06.2X8A, S06.2X9A, |
| ICD-10 DX | I63.419 | Cerebral infarction due to embolism of unspecified middle cerebral artery | S06.2X0B, S06.2X1B, |
| ICD-10 DX | I63.421 | Cerebral infarction due to embolism of right anterior cerebral artery | S06.2X2B, S06.2X3B, |
| ICD-10 DX | I63.422 | Cerebral infarction due to embolism of left anterior cerebral artery | S06.2X4B, S06.2X5B, |
| ICD-10 DX | I63.423 | Cerebral infarction due to embolism of bilateral anterior cerebral arteries | S06.2X6B, S06.2X7B, |
| ICD-10 DX | I63.429 | Cerebral infarction due to embolism of unspecified anterior cerebral artery | S06.2X8B, S06.2X9B, |
| ICD-10 DX | I63.431 | Cerebral infarction due to embolism of right posterior cerebral artery | S06.300A, S06.301A, |
| ICD-10 DX | I63.432 | Cerebral infarction due to embolism of left posterior cerebral artery | S06.302A, S06.303A, |
| ICD-10 DX | I63.433 | Cerebral infarction due to embolism of bilateral posterior cerebral arteries | S06.304A, S06.305A, |
| ICD-10 DX | I63.439 | Cerebral infarction due to embolism of unspecified posterior cerebral artery | S06.306A, S06.307A, |

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| ICD-10 DX | I63.441 | Cerebral infarction due to embolism of right cerebellar artery | S06.308A, S06.309A, |
| ICD-10 DX | I63.442 | Cerebral infarction due to embolism of left cerebellar artery | S06.310A, S06.311A, |
| ICD-10 DX | I63.443 | Cerebral infarction due to embolism of bilateral cerebellar arteries | S06.312A, S06.313A, |
| ICD-10 DX | I63.449 | Cerebral infarction due to embolism of unspecified cerebellar artery | S06.314A, S06.315A, |
| ICD-10 DX | I63.49 | Cerebral infarction due to embolism of other cerebral artery | S06.316A, S06.317A, |
| ICD-10 DX | I63.50 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebral artery | S06.318A, S06.319A, |
| ICD-10 DX | I63.511 | Cerebral infarction due to unspecified occlusion or stenosis of right middle cerebral artery | S06.320A, S06.321A, |
| ICD-10 DX | I63.512 | Cerebral infarction due to unspecified occlusion or stenosis of left middle cerebral artery | S06.322A, S06.323A, |
| ICD-10 DX | I63.513 | Cerebral infarction due to unspecified occlusion or stenosis of bilateral middle cerebral arteries | S06.324A, S06.325A, |
| ICD-10 DX | I63.519 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified middle cerebral artery | S06.326A, S06.327A, |
| ICD-10 DX | I63.521 | Cerebral infarction due to unspecified occlusion or stenosis of right anterior cerebral artery | S06.328A, S06.329A, |
| ICD-10 DX | I63.522 | Cerebral infarction due to unspecified occlusion or stenosis of left anterior cerebral artery | S06.330A, S06.331A, |
| ICD-10 DX | I63.523 | Cerebral infarction due to unspecified occlusion or stenosis of bilateral anterior cerebral arteries | S06.332A, S06.333A, |
| ICD-10 DX | I63.529 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified anterior cerebral artery | S06.334A, S06.335A, |
| ICD-10 DX | I63.531 | Cerebral infarction due to unspecified occlusion or stenosis of right posterior cerebral artery | S06.336A, S06.337A, |

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| ICD-10 DX | I63.532 | Cerebral infarction due to unspecified occlusion or stenosis of left posterior cerebral artery | S06.338A, S06.339A, |
| ICD-10 DX | I63.533 | Cerebral infarction due to unspecified occlusion or stenosis of bilateral posterior cerebral arteries | S06.340A, S06.341A, |
| ICD-10 DX | I63.539 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified posterior cerebral artery | S06.342A, S06.343A, S06.344A, |
| ICD-10 DX | I63.541 | Cerebral infarction due to unspecified occlusion or stenosis of right cerebellar artery | S06.345A, S06.346A, |
| ICD-10 DX | I63.542 | Cerebral infarction due to unspecified occlusion or stenosis of left cerebellar artery | S06.347A, S06.348A, |
| ICD-10 DX | I63.543 | Cerebral infarction due to unspecified occlusion or stenosis of bilateral cerebellar arteries | S06.349A, S06.350A, |
| ICD-10 DX | I63.549 | Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebellar artery | S06.351A, S06.352A, |
| ICD-10 DX | I63.59 | Cerebral infarction due to unspecified occlusion or stenosis of other cerebral artery | S06.353A, S06.354A, |
| ICD-10 DX | I63.6 | Cerebral infarction due to cerebral venous thrombosis, nonpyogenic | S06.355A, S06.356A, |
| ICD-10 DX | I63.89 | Other cerebral infarction | S06.357A, |
| ICD-10 DX | I63.9 | Cerebral infarction, unspecified | S06.358A, S06.359A, |
| ICD-10 DX | I66.01 | Occlusion and stenosis of right middle cerebral artery | S06.360A, S06.361A, |
| ICD-10 DX | I66.02 | Occlusion and stenosis of left middle cerebral artery | S06.362A, S06.363A, |
| ICD-10 DX | I66.03 | Occlusion and stenosis of bilateral middle cerebral arteries | S06.364A, S06.365A, |
| ICD-10 DX | I66.09 | Occlusion and stenosis of unspecified middle cerebral artery | S06.366A, S06.367A, |
| ICD-10 DX | I66.11 | Occlusion and stenosis of right anterior cerebral artery | S06.368A, |

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| ICD-10 DX | I66.12 | Occlusion and stenosis of left anterior cerebral artery | S06.369A, S06.370A, |
| ICD-10 DX | I66.13 | Occlusion and stenosis of bilateral anterior cerebral arteries | S06.371A, S06.372A, |
| ICD-10 DX | I66.19 | Occlusion and stenosis of unspecified anterior cerebral artery | S06.373A, S06.374A, |
| ICD-10 DX | I66.21 | Occlusion and stenosis of right posterior cerebral artery | S06.375A, S06.376A, |
| ICD-10 DX | I66.22 | Occlusion and stenosis of left posterior cerebral artery | S06.377A, S06.378A, |
| ICD-10 DX | I66.23 | Occlusion and stenosis of bilateral posterior cerebral arteries | S06.379A, S06.380A, |
| ICD-10 DX | I66.29 | Occlusion and stenosis of unspecified posterior cerebral artery | S06.381A, S06.382A, |
| ICD-10 DX | I66.3 | Occlusion and stenosis of cerebellar arteries | S06.383A, |
| ICD-10 DX | I66.8 | Occlusion and stenosis of other cerebral arteries | S06.384A, S06.385A, |
| ICD-10 DX | I66.9 | Occlusion and stenosis of unspecified cerebral artery | S06.386A, S06.387A, |
| ICD-10 DX | I67.841 | Reversible cerebrovascular vasoconstriction syndrome | S06.388A, S06.389A, |
| ICD-10 DX | I67.848 | Other cerebrovascular vasospasm and vasoconstriction | S06.4X0A, S06.4X1A, |
| ICD-10 DX | I67.89 | Other cerebrovascular disease | S06.4X2A, S06.4X3A, |
| ICD-10 DX | I97.810 | Intraoperative cerebrovascular infarction during cardiac surgery | S06.4X4A, S06.4X5A, |
| ICD-10 DX | I97.811 | Intraoperative cerebrovascular infarction during other surgery | S06.4X6A, S06.4X7A, |
| ICD-10 DX | I97.820 | Postprocedural cerebrovascular infarction following cardiac surgery | S06.4X8A, S06.4X9A, |
| ICD-10 DX | I97.821 | Postprocedural cerebrovascular infarction following other surgery | |

S06.5X0A,
S06.5X1A,
S06.5X2A,
S06.5X3A,
S06.5X4A,
S06.5X5A,
S06.5X6A,
S06.5X7A,
S06.5X8A,
S06.5X9A,
S06.6X0A,
S06.6X1A,
S06.6X2A,
S06.6X3A,
S06.6X4A,
S06.6X5A,
S06.6X6A,
S06.6X7A,
S06.6X8A,
S06.6X9A,
S06.810A,
S06.811A,
S06.812A,
S06.813A,
S06.814A,
S06.815A,
S06.816A,
S06.817A,
S06.818A,
S06.819A,
S06.820A,

S06.821A,
S06.822A,
S06.823A,
S06.824A,
S06.825A,
S06.826A,
S06.827A,
S06.828A,
S06.829A,
S06.890A,
S06.891A,
S06.892A,
S06.893A,
S06.894A,
S06.895A,
S06.896A,
S06.897A,
S06.898A,
S06.899A,
S06.9X0A,
S06.9X1A,
S06.9X2A,
S06.9X3A,
S06.9X4A,
S06.9X5A,
S06.9X6A,
S06.9X7A,
S06.9X8A,
S06.9X9A, OR
Z51.89 as the
principal DX

| | | | | Code then EXCLUDE. |
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| H | Multi-organ failure | ICD-9 DX | 995.94 | Systemic inflammatory response syndrome due to noninfectious process with acute organ dysfunction |
| | | ICD-10 DX | R65.1x | Systemic inflammatory response syndrome (SIRS) of non-infectious origin |
| I | Infection/sepsis (including septic shock) | ICD-9 DX | 038.xx | Septicemia |
| | | ICD-9 DX | 472.1 | Chronic Pharyngitis |
| | | ICD-9 DX | 785.50 | Unspecified Shock |
| | | ICD-9 DX | 785.52 | Septic shock |
| | | ICD-9 DX | 790.7 | Bacteremia |
| | | ICD-9 DX | 421.0 | Acute and subacute bacterial endocarditis |
| | | ICD-9 DX | 421.9 | Acute endocarditis, unspecified |
| | | ICD-9 DX | 424.9x | Endocarditis, valve unspecified |
| | | ICD-9 DX | 995.91 | Sepsis |
| | | ICD-9 DX | 995.92 | Severe sepsis |
| | | ICD-9 DX | 998.5 | Other complications of procedures, NEC; postoperative infection |
| | | ICD-9 DX | 998.59 | Other postoperative infection |
| | | ICD-9 DX | 999.3x | Complications of medical care, not elsewhere classified; other infection |
| | | ICD-10 DX | A40.x | Streptococcal sepsis |
| | | ICD-10 DX | R65.2x | Severe sepsis |
| | | ICD-10 DX | R78.81 | Bacteremia |
| | | ICD-10 DX | I33.0 | Acute and subacute infective endocarditis |
| | | ICD-10 DX | I33.9 | Acute and subacute endocarditis, unspecified |
| ICD-10 DX | I38 | Endocarditis, valve unspecified | | |
| ICD-10 DX | A41.xx | Other sepsis | | |

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| | | ICD-10 DX | T81.4xxx | Infection following a procedure |
| | | ICD-10 DX | K68.11 | Postprocedural retroperitoneal abscess |
| | | ICD-10 DX | T81.12xx | Postprocedural septic shock |
| J | Altered mental status | ICD-10 DX | R41.82 | Altered mental status, unspecified |
| | | ICD-10 DX | R41.0 | Disorientation unspecified |
| | | ICD-10 DX | R40.0 | Somnolence |
| | | ICD-10 DX | R40.1 | Stupor |
| | | ICD-10 DX | R40.2 | Coma |
| | | ICD-10 DX | R40.4 | Transient alteration of awareness |
| K | Fever | ICD-9 DX | 780.60 | Fever, unspecified |
| | | ICD-9 DX | 780.61 | Fever presenting with conditions classified elsewhere |
| | | ICD-9 DX | 780.62 | Postprocedural fever |
| | | ICD-10 DX | R50.81 | Fever presenting with conditions classified elsewhere |
| | | ICD-10 DX | R50.82 | Postprocedural fever |
| | | L | Chest pain | ICD-10 DX |
| ICD-10 DX | R07.89 | | | Other chest pain |
| M | Dysphagia | ICD-10 DX | R13.1 | Dysphagia |
| | | ICD-10 DX | R13.19 | Other dysphagia |
| | | ICD-10 DX | R13.10 | Dysphagia unspecified |
| | | ICD-10 DX | R13.14 | Dysphagia pharyngoesophageal phase |
| | | ICD-10 DX | K21.0 | GERD with Esophagitis |

Appendix Table 3.

| Definition | Code Logic |
|----------------------|--|
| Definite AEF | (A1 or A2) AND Death or (B or C) AND (A1 or A2 or D or E or F) |
| Highly Probable AEF | (B or C) AND (G or H or I or J or K or L or M) or (D or E or F) AND Death or (G and I) AND Death |
| Sensitivity Analysis | (A1 or A2 or D or E or F or G or H or I or J or K or L or M) Any 2 of the above |