**Appendix 1.** *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) codes for bacterial and fungal infections. Adapted from Angus et al. ([1](#_ENREF_1)).

|  |  |
| --- | --- |
| **ICD-9-CM Code**  | **ICD-9-CM Code Description**  |
| 001  | Cholera  |
| 002  | Typhoid/paratyphoid fever  |
| 003  | Other salmonella infection  |
| 004  | Shigellosis  |
| 005  | Other food poisoning  |
| 008.0  | Intestinal infections due to *Escherichia coli*  |
| 008.1  | Intestinal infections due to Arizona group of paracolon bacill  |
| 008.2  | Intestinal infections due to *Aerobacter aerogenes*  |
| 008.3  | Intestinal infections due to *Proteus (mirabilis) (morganii)*  |
| 008.4  | Intestinal infections due to unspecified bacteria  |
| 008.5  | Bacterial enteritis, unspecified  |
| 009  | Ill-defined intestinal infection  |
| 013  | Central nervous system tuberculosis  |
| 018  | Miliary tuberculosis  |
| 020  | Plague  |
| 021  | Tularemia  |
| 022  | Anthrax  |
| 023  | Brucellosis  |
| 024  | Glanders  |
| 025  | Melioidosis  |
| 026  | Rat-bite fever  |
| 027  | Other bacterial zoonoses  |
| 032  | Diphtheria  |
| 033  | Whooping cough  |
| 034  | Streptococcal throat/scarlet fever  |
| 035  | Erysipelas  |
| 036  | Meningococcal infection  |
| 037  | Tetanus  |
| 038  | Septicemia  |
| 039  | Actinomycotic infections  |
| 040  | Other bacterial diseases  |
| 041  | Bacterial infection in other diseases not specified  |
| 098  | Gonococcal infections  |
| 100  | Leptospirosis  |
| 101  | Vincent’s angina  |
| 112.0  | Candidiasis, of mouth  |
| 112.4  | Candidiasis, of lung  |
| 112.5  | Candidiasis, disseminated  |
| 112.8  | Candidiasis, of other specified sites  |
| 114  | Coccidioidomycosis  |
| 115  | Histoplasmosis  |
| 116  | Blastomycotic infection  |
| 117  | Other mycoses  |
| 118  | Opportunistic mycoses  |
| 320  | Bacterial meningitis  |
| 321.0  | Cryptococcal meningitis  |
| 321.1  | Meningitis in other fungal diseases  |
| 324  | Central nervous system abcess  |
| 325  | Phlebitis of intracranial sinus  |
| 360.0  | Purulent endophthalmitis  |
| 376.0  | Acute inflammation of orbit  |
| 380.14  | Malignant otitis externa  |
| 383.0  | Acute mastoiditis  |
| 420.99  | Acute pericarditis due to other specified organisms  |
| 421  | Acute or subacute endocarditis  |
| 461  | Acute sinusitis  |
| 462  | Acute pharyngitis  |
| 463  | Acute tonsillitis  |
| 464  | Acute laryngitis/tracheitis  |
| 465  | Acute upper respiratory infection of multiple sites/not otherwise specified  |
| 475  | Peritonsillar abscess  |
| 481  | Pneumococcal pneumonia  |
| 482  | Other bacterial pneumonia  |
| 485  | Bronchopneumonia with organism not otherwise specified  |
| 486  | Pneumonia, organism not otherwise specified  |
| 491.21  | Acute exacerbation of obstructive chronic bronchitis  |
| 494  | Bronchiectasis  |
| 510  | Empyema  |
| 513  | Abscess of lung and mediastinum  |
| 522.5  | Periapical abscess without sinus  |
| 522.7  | Periapical abscess with sinus  |
| 526.4  | Inflammatory conditions of the jaw  |
| 527.3  | Abscess of the salivary glands  |
| 528.3  | Cellulitis and abscess of oral soft tissue  |
| 540  | Acute appendicitis  |
| 541  | Appendicitis not otherwise specified  |
| 542  | Other appendicitis  |
| 562.01  | Diverticulitis of the small intestine without hemorrhage  |
| 562.03  | Diverticulitis of the small intestine with hemorrhage  |
| 562.11  | Diverticulitis of colon without hemorrhage  |
| 562.13  | Diverticulitis of colon with hemorrhage  |
| 566  | Abscess of the anal and rectal regions  |
| 567  | Peritonitis  |
| 569.5  | Intestinal abscess  |
| 569.61  | Infection of colostomy or enterostomy  |
| 569.83  | Perforation of intestine  |
| 572.0  | Abscess of liver  |
| 572.1  | Portal pyemia  |
| 575.0  | Acute cholecystitis  |
| 590  | Kidney infection  |
| 599.0  | Urinary tract infection not otherwise specified  |
| 601  | Prostatic inflammation  |
| 604  | Orchitis and epididymitis  |
| 614  | Female pelvic inflammation disease  |
| 615  | Uterine inflammatory disease  |
| 616.3  | Abcess of Bartholin’s gland  |
| 616.4  | Other abcess of vulva  |
| 634.0  | Spontaneous abortion, complicated by genital tract and pelvic infection  |
| 635.0  | Legally induced abortion, complicated by genital tract and pevic infection  |
| 636.0  | Illegally induced abortion, complicated by genital tract and pelvic infection  |
| 637.0  | Unspecified abortion, complicated by genital tract and pelvic infection  |
| 638.0  | Failed attempted abortion, complicated by genital tract and pelvic infection  |
| 639.0  | Complications following abortion and ectopic and molar pregnancies,genital and pelvic infection  |
| 646.6  | Infections of genitourinary tract in pregnancy  |
| 658.4  | Infection of amniotic cavity  |
| 670  | Major puerperal infection  |
| 675.1  | Abscess of breast  |
| 681  | Cellulitis, finger/toe  |
| 682  | Other cellulitis or abscess  |
| 683  | Acute lymphadenitis  |
| 685.0  | Pilonidal cyst, with abscess  |
| 686  | Other local skin infection  |
| 711.0  | Pyogenic arthritis  |
| 728.86  | Necrotizing fasciitis  |
| 730  | Osteomyelitis  |
| 790.7  | Bacteremia  |
| 958.3  | Posttraumatic wound infection, not elsewhere classified  |
| 996.6  | Infection or inflammation of device/graft  |
| 998.5  | Postoperative infection  |
| 999.3  | Infectious complication of medical care not otherwise classified  |

**Appendix 2.** *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) codes for acute organ dysfunction. Adapted from Dombrovskiy et al. ([2](#_ENREF_2)), Shen et al. ([3](#_ENREF_3)), and Angus et al. ([1](#_ENREF_1)).

|  |  |  |
| --- | --- | --- |
| **Organ System**  | **ICD-9-CM Code** | **ICD-9-CM Code Description**  |
| Cardiovascular | 427.5 | Cardiac arrest |
|  | 458.0 | Orthostatic hypotension  |
|  | 458.8 | Other specified hypotension  |
|  | 458.9 | Hypotension, unspecified  |
|  | 785.5 | Shock without mention of trauma  |
|  | 796.3 | Hypotension, transient |
| Hematologic  | 286.2 | Disseminated intravascular coagulation |
|  | 286.6 | Defibrination syndrome  |
|  | 286.9 | Other and unspecified coagulation defects  |
|  | 287.3-5 | Thrombocytopenia, primary, secondary or unspecified |
|  | 790.92 | Abnormal coagulation profile |
| Hepatic  | 570 | Acute and subacute necrosis of liver  |
|  | 572.2 | Hepatic encephalopathy |
|  | 573.3 | Hepatitis (septic & not elsewhere classified) |
|  | 573.4 | Hepatic infarction  |
| Neurologic  | 293 | Transient organic psychosis  |
|  | 348.1 | Anoxic brain damage  |
|  | 348.3 | Encephalopathy, acute |
|  | 780.01 | Coma |
|  | 780.09 | Altered consciousness, unspecified |
|  | 89.14 | Electroencephalography |
| Renal  | 580.x | Acute glomerulonephritis |
|  | 584.x | Acute renal failure  |
|  | 586 | Renal shutdown, renal failure unspecified |
|  | 39.95 | Hemodialysis |
| Respiratory | 518.5 | Pulmonary insufficiency following trauma and surgery |
|  | 518.8 | Respiratory failure  |
|  | 786.03 | Apnea  |
|  | 799.1 | Respiratory arrest  |
|  | 786.09 | Respiratory insufficiency |
|  | 96.7 (96.71,96.72) | Ventilator management |
|  | 96.04 | Endotracheal intubation (emergency procedure) |
|  | 93.90 | Continuous positive airway pressureº |
| Metabolic | 276.2 | Acidosis, metabolic or lactic |

ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification.

**Appendix 3.** *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) codes used to identify the source of infection causing sepsis. Adapted from Esper et al. ([4](#_ENREF_4)) and Wang et al. ([5](#_ENREF_5)), and subsequently modified for HIV patients.

|  |  |  |
| --- | --- | --- |
| **Organ System** | **ICD-9-CM Code** | **ICD-9-CM Code Description**  |
| **Nervous** |  |  |
|  | 013 | Tuberculosis of meninges and central nervous system |
|  | 036 | Meningococcal infection |
|  | 091.81 | Acute syphilitic meningitis (secondary) |
|  | 098.82 | Neurosyphilis |
|  | 320 | Bacterial meningitis  |
|  | 321 | Cryptococcal meningitis  |
|  | 321.1 | Meningitis in other fungal diseases  |
|  | 324 | Central nervous system abscess  |
|  | 325 | Phlebitis of intracranial sinus  |
|  | 360 | Purulent endophthalmitis  |
|  | 376 | Acute inflammation of orbit  |
|  | 380.14 | Malignant otitis externa  |
|  | 383 | Acute mastoiditis  |
| **Circulatory** |  |  |
|  | 093 | Cardiovascular syphilis |
|  | 098.83 – 098.84 | Gonococcal infections |
|  | 036.4 | Meningococcal carditis |
|  | 391.2 | Acute rheumatic myocarditis |
|  | 420.99 | Acute pericarditis due to other specified organisms  |
|  | 421 | Acute or subacute endocarditis  |
| **Respiratory** |  |  |
|  | 010.1 | Tuberculous pleurisy in primary progressive tuberculosis |
|  | 011 | Pulmonary tuberculosis |
|  | 012 | Other respiratory tuberculosis |
|  | 018 | Miliary tuberculosis |
|  | 031.0 | Pulmonary diseases due to other mycobacteria |
|  | 032 | Diphtheria  |
|  | 034 | Streptococcal throat/scarlet fever  |
|  | 098.6 | Gonococcal infection of pharynx |
|  | 112.4 | Candidiasis, of lung  |
|  | 114.0 | Primary coccidioidomycosis (pulmonary) |
|  | 114.2 | Primary extrapulmonary coccidioidomycosis |
|  | 115.15 | Histoplasma duboisii pneumonia |
|  | 115.05 | Histoplasma capsulatum pneumonia |
|  | 115.95 | Histoplasmosis pneumonia unspecified |
|  | 117.5 | Cryptococcus neoformans |
|  | 117.3 | Aspergillosis |
|  | 136.3 | Pneumocystosis |
|  | 461 | Acute sinusitis  |
|  | 462 | Acute pharyngitis  |
|  | 463 | Acute tonsillitis  |
|  | 464 | Acute laryngitis/tracheitis  |
|  | 465 | Acute upper respiratory infection of multiple sites/not  |
|  |  | otherwise specified  |
|  | 475 | Peritonsillar abscess  |
|  | 480 | Viral pneumonia |
|  | 481 | Pneumococcal pneumonia  |
|  | 482 | Other bacterial pneumonia  |
|  | 483 | Pneumonia due to other specified organism |
|  | 485 | Bronchopneumonia with organism not otherwise specified  |
|  | 486 | Pneumonia, organism not otherwise specified  |
|  | 487.0 | Influenza |
|  | 491.21 | Acute exacerbation of obstructive chronic bronchitis  |
|  | 494 | Bronchiectasis  |
|  | 510 | Empyema  |
|  | 513 | Abscess of lung and mediastinum  |
| **Digestive** |  |  |
|  | 001 | Cholera  |
|  | 002 | Typhoid/paratyphoid fever  |
|  | 003 | Other salmonella infection  |
|  | 004 | Shigellosis  |
|  | 005 | Other food poisoning  |
|  | 008 | Intestinal infections due to *Escherichia coli*  |
|  | 008.1 | Intestinal infections due to Arizona group of paracolon bacillus  |
|  | 008.2 | Intestinal infections due to *Aerobacter aerogenes*  |
|  | 008.3 | Intestinal infections due to *Proteus* (*Mirabilis morganii*)  |
|  | 008.4 | Intestinal infections due to unspecified bacteria  |
|  | 008.5 | Bacterial enteritis, unspecified  |
|  | 009 | Ill-defined intestinal infection  |
|  | 014 | Tuberculosis of intestines peritoneum and mesenteric glands |
|  | 129 | Intestinal parasitism unspecified |
|  | 522.5 | Periapical abscess without sinus  |
|  | 522.7 | Periapical abscess with sinus  |
|  | 526.4 | Inflammatory conditions of the jaw  |
|  | 527.3 | Abscess of the salivary glands  |
|  | 528.3 | Cellulitis and abscess of oral soft tissue  |
|  | 540 | Acute appendicitis  |
|  | 541 | Appendicitis not otherwise specified  |
|  | 542 | Other appendicitis  |
|  | 562.01 | Diverticulitis of the small intestine without hemorrhage  |
|  | 562.03 | Diverticulitis of the small intestine with hemorrhage  |
|  | 562.11 | Diverticulitis of colon without hemorrhage  |
|  | 562.13 | Diverticulitis of colon with hemorrhage  |
|  | 566 | Abscess of the anal and rectal regions  |
|  | 567 | Peritonitis  |
|  | 569.5 | Intestinal abscess  |
|  | 569.61 | Infection of colostomy or enterostomy  |
|  | 569.83 | Perforation of intestine  |
|  | 572 | Abscess of liver  |
|  | 572.1 | Portal pyemia  |
|  | 575 | Acute cholecystitis  |
| **Genitourinary** |  |  |
|  | 016 | Tuberculosis of genitourinary system |
|  | 098.17 | Gonococcal salpingitis specified as acute |
|  | 112.2 | Candidiasis of other urogenital sites |
|  | 590 | Kidney infection  |
|  | 599 | Urinary tract infection not otherwise specified  |
|  | 601 | Prostatic inflammation  |
|  | 604 | Orchitis and epididymitis  |
|  | 614 | Female pelvic inflammation disease  |
|  | 615 | Uterine inflammatory disease  |
|  | 616.3 | Abscess of Bartholin’s gland  |
|  | 616.4 | Other abscess of vulva  |
| **Pregnancy** |  |  |
|  | 634 | Spontaneous abortion, complicated by genital tract and pelvic  |
|  |  | infection  |
|  | 635 | Legally induced abortion, complicated by genital tract and  |
|  |  | pelvic infection  |
|  | 636 | Illegally induced abortion, complicated by genital tract and  |
|  |  | pelvic infection  |
|  | 637 | Unspecified abortion, complicated by genital tract and pelvic  |
|  |  | infection  |
|  | 638 | Failed attempted abortion, complicated by genital tract and  |
|  |  | pelvic infection  |
|  | 639 | Complications following abortion and ectopic and molar  |
|  |  | pregnancies  |
|  | 646.6 | Infections of genitourinary tract in pregnancy  |
|  | 658.4 | Infection of amniotic cavity  |
|  | 670 | Major puerperal infection  |
|  | 675.1 | Abscess of breast  |
| **Skin, soft tissue, or bone** |  |
|  | 003.24 | Salmonella osteomyelitis |
|  | 015 | Tuberculosis of bones and joints |
|  | 017 | Tuberculosis of other organs |
|  | 031.1 | Cutaneous diseases due to other mycobacteria |
|  | 035 | Erysipelas  |
|  | 036.82 | Meningococcal arthropathy |
|  | 040.0 | Gas gangrene |
|  | 095.5 | Syphilis of bone |
|  | 098.5 | Gonococcal infection of joint |
|  | 681 | Cellulitis, finger/toe  |
|  | 682 | Other cellulitis or abscess  |
|  | 683 | Acute lymphadenitis  |
|  | 685 | Pilonidal cyst, with abscess  |
|  | 686 | Other local skin infection  |
|  | 711 | Pyogenic arthritis  |
|  | 728.86 | Necrotizing fasciitis  |
|  | 730 | Osteomyelitis  |
| **Other** |  |  |
|  | 790.7 | Bacteremia  |
|  | 958.3 | Posttraumatic wound infection, not elsewhere classified  |
|  | 996.6 | Infection or inflammation of device/graft  |
|  | 998.5 | Postoperative infection  |
|  | 999.3 | Infectious complication of medical care not otherwise classified  |

**Appendix 4.** *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) coding algorithms for Charlson comorbidities. Adapted from Quan et al. ([6](#_ENREF_6)).

|  |  |
| --- | --- |
| **Comorbidities** | **ICD-9-CM** |
| Myocardial infarction | 410.x, 412.x |
| Congestive heart failure | 428.x |
| Peripheral vascular disease | 443.9, 441.x, 785.4, V43.4, Procedure 38.48 |
| Cerebrovascular disease | 430.x–438.x |
| Dementia | 290.x |
| Chronic pulmonary disease | 490.x–505.x, 506.4 |
| Rheumatic disease | 710.0, 710.1, 710.4, 714.0–714.2, 714.81, 725.x |
| Peptic ulcer disease | 531.x–534.x |
| Mild liver disease | 571.2, 571.4–571.6 |
| Diabetes without chronic complication | 250.0–250.3, 250.7 |
| Diabetes with chronic complication | 250.4–250.6 |
| Hemiplegia or paraplegia | 344.1, 342.x |
| Renal disease | 582.x, 583–583.7, 585.x, 586.x, 588.x |
| Any malignancy, including lymphoma and leukemia, except malignant neoplasm of skin | 140.x–172.x, 174.x.–195.8, 200.x–208.x |
| Moderate or severe liver disease | 456.0–456.21, 572.2–572.8 |
| Metastatic solid tumor | 196.x–199.1 |
| AIDS/HIV | 042.x–044.x |

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