Anthem is an independent licensee of the Blue Cross and Blue Shield (BCBS) Association and serves its members as the Blue Cross licensee for California and as the BCBS licensee for Colorado, Connecticut, Georgia, Indiana, Kentucky, Maine, Missouri (excluding 30 counties in the Kansas City area), Nevada, New Hampshire, New York (as the BCBS licensee in ten New York City metropolitan and surrounding counties and as the Blue Cross or BCBS licensee in selected upstate counties only), Ohio, Virginia (excluding the Northern Virginia suburbs of Washington, DC), and Wisconsin. All plans except Colorado and Wisconsin were used for this research.

**Appendix Table 1. Definitions of Risk Factors for Surgical Site Infection after Mastectomy**

|  | **Timeframe relative to mastectomy (in days)** | **Number of inpatient facility, provider/ outpatient facility, or Rx drug claims required** | **ICD-9-CM diagnosis codea** | **Drug category** | **ICD-9-CM, CPT-4, or HCPCS procedure code, or UB-04 revenue code** |
| --- | --- | --- | --- | --- | --- |
| **Patient comorbidities/ medications**26, 29 | | | | | |
| Anticoagulant drugs | -120 to -1 | n/a, n/a, ≥ 1 | n/a | Coumarin anticoagulants | n/a |
| Blood loss anemia | -365 to -1 | ≥ 1, ≥ 2, n/a | 280–280.9, 648.20–648.24 | n/a | n/a |
| Coagulopathy | -365 to +7 | ≥ 1, ≥ 2, n/a | 286.0–286.9, 287.1, 287.3–287.5, 289.84, 649.30–649.34 | n/a | n/a |
| Congestive heart failure | -365 to +7 | ≥ 1, ≥ 2, n/a | 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0–428.9 | n/a | n/a |
| Congestive heart failure drugs | -120 to -1 | n/a, n/a, ≥ 1 | n/a | Loop diuretics | n/a |
| Deficiency anemia | -365 to +7 | ≥ 1, ≥ 2, n/a | 280.1–281.9, 285.21–285.29, 285.9 | n/a | n/a |
| Depression | -365 to +7 | ≥ 1, ≥ 2, n/a | 300.4, 301.12, 309.00, 309.1, 311 | n/a | n/a |
| Diabetes | -365 to +7  -365 to -1 Rx | ≥ 1, ≥ 2, ≥ 1 | 249.00–249.91, 250.00–250.93, 648.00–648.04 | Antidiabetics | n/a |
| DMARD drugs or biologic medical or drugs | -120 to -1 | ≥ 1, ≥ 1, ≥ 1 | n/a | Antimalarials, alkylating agents, antimetabolites, inflammatory bowel agents, antirheumatic antimetabolites, pyrimidine synthesis inhibitors, immunosuppressive agents, antineoplastic- antibodies, interleukin-1 receptor antagonist (IL-1Ra), anti-TNF-alpha- monoclonoal antibodies, soluble tumor necrosis factor receptor agents, selective costimulation modulators, interleukin-6 receptor inhibitors | C9230, J0129, J0135, J3490, C9249, J0718, J1438, J1745, J9310, C9264, J3262 |
| Hypertension | -365 to +7  -365 to -1 Rx | ≥ 1, ≥ 2, ≥ 1 Rx plus 1 hypertension medical claim | 401.0, 401.1, 401.9, 402.00–405.99, 437.2, 642.00–642.04, 642.10–642.24, 642.70–642.94 | Beta blockers, calcium channel blockers, antihypertensives, diuretics, peripheral vasodilators, phosphodiesterase inhibitors, endothelin receptor antagologis,  prostaglandin vasodilators,  vasoactive natriuretics peptides | n/a |
| Liver disease | -365 to +7 | ≥ 1, ≥ 2, n/a | 070.22, 070.23, 070.32, 070.33, 070.44, 070.54, 456.0–456.21, 571.0, 571.2–571.9, 572.3, 572.8, V42.7 | n/a | n/a |
| Malnutrition / weight loss | -365 to +7 | ≥ 1, ≥ 1, n/a | 260–263.9, 783.21, 783.22 | n/a | n/a |
| Non-breast malignancy– lymphoma | -365 to +7 | ≥ 1, ≥ 2, n/a | 200.00–202.38, 202.50–203.82, 238.6, 273.3, V10.71, V10.72, V10.79 | n/a | n/a |
| Non-breast malignancy – lymph node metastases | -365 to +7 | ≥ 1, ≥ 2, n/a | 196.0–196.2, 196.5–196.9 | n/a | n/a |
| Non-breast malignancy – metastatic cancer | -365 to +7 | ≥ 1, ≥ 2, n/a | 197.0–198.1, 198.3–198.7, 198.82–199.2, 209.70–209.79, 789.51 | n/a | n/a |
| Non-breast malignancy – solid tumor | -365 to +7 | ≥ 1, ≥ 2, n/a | 140.0–172.9, 179–195.8, 209.00–209.36, 258.01–258.03, V10.0–V10.29, V10.4–V10.91 | n/a | n/a |
| Obesity | -365 to +7 | ≥ 1, ≥ 1, n/a | 278.00, 278.01, 278.03, 649.10–649.14, 793.91, V85.30–V85.45 | n/a | n/a |
| Obesity– obstructive sleep apnea | -365 to +7 | ≥ 1, ≥ 2, n/a | 327.23 | n/a | n/a |
| Oral steroids | -120 to -1 | n/a, n/a, ≥ 1 | n/a | Glucocorticosteroids | n/a |
| Peripheral vascular disease | -365 to +7 | ≥ 1, ≥ 2, n/a | 440.0–440.9, 441.00–441.9, 442.0–442.9, 443.1–443.9, 444.21, 444.22, 447.1, 449, 557.1, 557.9, V43.4 | n/a | n/a |
| Pneumonia or urinary tract infection | -30 to -1 | ≥ 1, ≥ 1, n/a | 482–482.9, 485, 486, 510.0, 510.9, 513.0, 590.0–590.2, 590.80, 590.9, 595.0, 599.0 | n/a | n/a |
| Psychoses | -365 to +7 | ≥ 1, ≥ 2, n/a | 295.00–298.9, 299.10, 299.11 | n/a | n/a |
| Rheumatologic disease – collagen vascular disease | -365 to +7 |  | 701.0, 710.0–710.4, 710.8, 710.9, 446.0 |  |  |
| Rheumatologic disease –rheumatoid arthritis | -365 to +7 | ≥ 1, ≥ 2, n/a | 714.0–714.2, 714.30–714.4, 714.81–714.9, 720.0, 725 | n/a | n/a |
| Skin disease | -365 to +7 | ≥ 1, ≥ 2, n/a | 690–690.18, 691.8, 694.0–694.5, 694.60, 694.8, 694.9, 695.0–695.4, 695.50–695.9, 696.0–696.8, 697.0–697.9, 698.2–698.9 | n/a | n/a |
| Tobacco use disorderb | -365 to +7  -365 to -1 Rx | ≥ 1, ≥ 1, ≥ 1 | 305.1, 649.00–649.04, V15.82 | Smoking deterrents | n/a |
| Smoking-related diseases30,b | -365 to +7 | ≥ 1, ≥ 2, n/a | 162.2–162.9, 231.1, 410.00–411.89, 412–413.9, 414.8, 414.9, 430–438.9, 491.20, 491.21, 496 | n/a | n/a |
| **Cancer-related factors** | | | | | |
| Prophylactic mastectomy | -7 to +7 | ≥ 1, ≥ 1, n/a | V16.3, V50.41, V84.01 | n/a | n/a |
| Carcinoma *in situ* | -365 to +30 | ≥ 1, ≥ 2, n/a | 233.0 | n/a | n/a |
| Local breast cancer | -365 to +30 | ≥ 1, ≥ 2, n/a | 174.0–174.9, 198.2 | n/a | n/a |
| Regional breast cancer | -365 to +30 | ≥ 1, ≥ 2, n/a | 174.0–174.9 + 196.3 | n/a | n/a |
| Metastatic cancer | -365 to +30 | ≥ 1, ≥ 2, n/a | 174.0–174.9 + (197.0–198.1, 198.3–198.7, 198.82, 198.89, 199.0) | n/a | n/a |
| Previous breast cancer | -365 to -60 | ≥ 1, ≥ 1, n/a | V10.3 | n/a | n/a |
| Previous radiotherapy31, 32 | -365 to -1 | ≥ 1, ≥ 1, n/a | (909.2 or 990 on claim with V10.3), V15.3, V58.0, V66.1, V67.1 | n/a | 92.21–92.29, 77401–77499, 77520, 77523, 77750–77799, G0256, G0261, 0330, 0333 |
| Neoadjuvant chemotherapy33 | -60 to -1 | ≥ 2 claims | V58.1–V58.12, V66.2, V67.2 | n/a | 99.25, 96400–96549, J9000–J9999, Q0083–Q0085, 0331, 0332, 0335 |
| Previous breast-conserving surgery | -183 to -4 | n/a | n/a | n/a | 85.20–85.23, 19120, 19125, 19160, 19162, 19301, 19302 |
| Previous lymph node surgery | -183 to -8 | n/a | n/a | n/a | 40.11, 40.19, 40.23, 40.3, 40.50, 40.51, 19162, 19302, 38500, 38525, 38740, 38745, 38792 |
| Inflammatory breast disease | -365 to -1 | ≥ 1, ≥ 2, n/a | 611.0 | n/a | n/a |
| **Operative risk factors** | | | | | |
| Sentinel node removal | -7 to +7 | ≥ 1, ≥ 1, n/a | n/a | n/a | 40.11, 40.19, 40.23, 38500, 38525, 38740, 38792 |
| Modified radical mastectomy | -7 to +7 | ≥ 1, ≥ 1, n/a | n/a | n/a | 40.3, 40.50, 40.51, 85.43–85.48, 19200, 19220, 19240, 19305–19307, 38745 |
| **Postoperative risk factors** | | | | | |
| Anemia | 0 to 29 and before an SSI or NIWC | ≥ 1, ≥ 1, n/a | 280–285.9, 998.11 | n/a | n/a |
| Pneumonia or urinary tract infection | 0 to 29 and before an SSI or NIWC | ≥ 1, ≥ 1, n/a | 482–482.9, 485, 486, 510.0, 510.9, 513.0, 590.0–590.2, 590.80, 590.9, 595.0, 599.0 | n/a | n/a |
| Home health care | 0 to 29 and before an SSI or NIWC, don't count if had an SSI or NIWC during mastectomy admission | ≥ 1, ≥ 1, n/a | Based on place of service | n/a | n/a |

CPT-4 Current Procedural Terminology, 4th edition, DMARD disease-modifying antirheumatic drugs, HCPCS Healthcare Common Procedure Coding System, ICD-9-CM International Classification of Diseases, 9th Revision, Clinical Modification, n/a not applicable, NIWC non-infectious wound complication, Rx prescription, SSI surgical site infection, UB Uniform Billing.

a For diagnosis codes, all inpatient facility claims were included; provider and outpatient facility claims containing only CPT-4 or Uniform Billing-04 revenue codes for pharmacy, diagnostic radiology/cardiology/pulmonology, clinical laboratory, physical/occupational therapy, speech pathology or ambulance services were excluded in order to identify diagnoses assigned by a clinician.

b Tobacco use disorder and smoking-related diseases (e.g., chronic obstructive pulmonary disease) were analyzed separately to determine if smoking resulting in pulmonary disease was associated with greater SSI risk than coding for tobacco disorder alone.

**Appendix Figure 1. Type of Mastectomy Procedure in the Derivation and Validation Cohorts**