

| | | Number and nature of claims required to substantiate the diagnosis | | | | | | | |
|---|--|--|--------|------|-------|--|--|-----------|---------------------------|
| Morbidity | Algorithm | Hospitalizations | Claims | ACCS | Years | ICD-9 CM | ICD-10 | Permanent | Citation |
| Alcohol misuse [^] | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 265.2, 291.1–291.3, 291.5–291.9, 303.0, 303.9, 305.0, 357.5, 425.5, 535.3, 571.0–571.3, 980, V11.3 | E52, F10, G62.1, I42.6, K29.2, K70.0, K70.3, K70.9, T51, Z50.2, Z71.4, Z72.1 | Y | Quan 2008 [11], 2005 [17] |
| Asthma | 1 hospitalization or 3 ACCS in 2 years or less | 1 | . | 3 | 2 | 493 | J45 | Y | Gershon 2009 [37] |
| Atrial fibrillation | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 427.3 [®] | I48.0 | Y | Alonso 2009 [38] |
| Cancer, lymphoma | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 200–202, 203.0, 238.6 | C81–C85, C88, C90.0, C90.2, C96 | N 5 y | Quan 2008 [11], 2005 [17] |
| Cancer, metastatic | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 196–199 | C77–C80 | N 5 y | Quan 2008 [11], 2005 [17] |
| Cancer, non-metastatic (breast, cervical, | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 153-154, 162-163, 174, 180, 185, 230.3-230.6, 231.2, | C18-C21, C33-C34, C38.4, C45.0, C46.71, C50, | N 5 y | Penberthy 2003 [39] |

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| colorectal, lung, prostate) | | | | | | 233.0-233.1, 233.4 | C53, C61, D01.0-D01.3, D02.2, D05-D06, D07.5 | | |
| Chronic heart failure ^{s^} | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 425.4-425.9, 428 | I09.9, I25.5, I42.0, I42.5-I42.9, I43, I50 | Y | Quan 2008 [11], 2005 [17] |
| Chronic kidney disease | Mean eGFR <60 mL/min*1.73 m ² or mean albuminuria >30 mg/g over 12 months | . | . | . | . | . | . | | Stevens 2013 [16] |
| | or 1 hospitalization or 3 claims in 1 year | 1 | 3 | . | 1 | 583, 584, 585, 586, 592, 593.9 | N00-N23 | Y | Ronksley 2012 [15] |
| Chronic pain | 2 hospitalizations or 2 claims or 2 ACCS in 30 days or less | 2 | 2 | 2 | 30 d | 307.80, 307.89, 338.0, 338.2, 338.4, | F45.4, M08.1, M25.50, M25.51, | N 2 y | Tian 2013 [18] |

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| | | | | | | 719.41, 719.45 - 719.47, 719.49, 720.0, 720.2, 720.9, 721.0 - 721.4, 721.6, 721.8, 721.9, 722, 723.0, 723.1, 723.3 - 723.9, 724.0 - 724.6, 724.70, 724.79, 724.8, 724.9, 729.0 - 729.2, 729.4, 729.5 | M25.55 - M25.57, M43.2 - M43.6, M45, M46.1, M46.3, M46.4, M46.9, M47, M48.0, M48.1, M48.8, M48.9, M50.8, M50.9, M51, M53.1 - M53.3, M53.8, M53.9, M54, M60.8, M60.9, M63.3, M79.0 - M79.2, M79.6, M79.7, M96.1 | | |
| Chronic pulmonary disease* | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 416.8, 416.9, 490-492, 494- 505, 506.4, 508.1, 508.8 | I27.8, I27.9, J40-J44, J46- J47, J60-J67, J68.4, J70.1, J70.3 | Y | Quan 2008 [11] , 2005 [17] |
| Chronic viral hepatitis B | 2 hospitalizations or 2 claims or 2 ACCS | 2 | 2 | 2 | 6 mo | 70.2-70.3 | B16, B18.0- B18.1 | Y | Mahajan 2013 [40] |

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| Cirrhosis^ | 1 hospitalization or 1 claim or 1 ACCS | 1 | 1 | 1 | . | 571.2, 571.5, 571.6 | K70.3, K74.3, K74.4, K74.5, K74.6 | Y | Goldberg 2012 [41] |
| | and hepatic decompensation 1 hospitalization or 1 claim or 1 ACCS | 1 | 1 | 1 | . | 456.0, 456.1, 456.20, 456.21, 567.0, 567.2,* 567.21, 567.29, 567.8, 567.9, 572.2, 572.4, 789.5 | I85.0, I85.9, I98.2, I98.3, K65.0, K65.8, K65.9, K67.0, K67.1, K67.2, K67.3, K67.8, K76.7, K93.0, R18 | | |
| | | | | | | Exclude 567.81, 567.82, 789.51 | | | |
| Dementia^ | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 290, 294.1, 331.2 | F00–F03, F05.1, G30, G31.1 | Y | Quan 2008 [11] , 2005 [17] |
| Depression^ | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 296.2, 296.3, 296.5, 300.4, 309, 311 | F20.4, F31.3–F31.5, F32, F33, F34.1, F41.2, F43.2 | N 2 y | Quan 2008 [11] , 2005 [17] |
| Diabetes | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 250 | E10-E14 | Y | Hux 2005 [42] |

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| Epilepsy | 1 most responsible hospitalization or 2 claims in 2 years or less or 1 most responsible ACCS | 1 | 2 | 1 | 2 | 345 | G40-G41 | Y | Jette 2010 [43] |
| Hypertension^ | 1 hospitalization or 2 claim in 2 years or less | 1 | 2 | . | 2 | 401-405 | I10-I13, I15 | Y | Quan 2009 [44] |
| Hypothyroidism | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 240.9, 243, 244, 246.1, 246.8 | E00–E03, E89.0 | Y | Quan 2008 [11], 2005 [17] |
| Inflammatory bowel disease | 2 hospitalizations or 2 GAST or GP claims in 3 years or less | 2 | 2 | . | 3 | 555, 556 | K50, K51 | Y | Liu 2009 [19] |
| Irritable bowel syndrome | 1 hospitalization without surgery or 2 claims in 2 years or less | 1 | 2 | . | 2 | 564.1 | K58 | Y | Sands 2006 [21] |
| | | | | | | Exclude 153-154, 157, 183.0, 197.5, 198.6, 235.2, 239.0, 555-556, 571.2, 571.5, 577.1, 579 | Exclude C18-C21, C25, C56, C78.5, C79.6, D01.7, D01.9, D37.1-D37.5, K50-K51, K70.2-K70.3, K74.0, K74.2, K74.6, K86.0-K86.1, K90, K91.2 | | |

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|-----------------------------|---|---|---|---|---|--|--|-------|---|
| Multiple sclerosis | 2 hospitalizations or 2 claims in 3 years or less | 2 | 2 | . | 3 | 323, 340, 341.0, 341.9, 377.3 | G35, G36, G37, H46 | Y | Marrie 2013 [20] |
| Myocardial infarction | 1 hospitalization | 1 | . | . | . | 410 | I21-I22 | Y | Austin 2002 [45] |
| Parkinson's disease | 1 hospitalizations or 1 claim | 1 | 1 | . | . | 332 | G20, G21, G22 | Y | Noyes 2007 [46] |
| Peptic ulcer disease | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 531.7, 531.9, 532.7, 532.9, 533.7, 533.9, 534.7, 534.9 | K25.7, K25.9, K26.7, K26.9, K27.7, K27.9, K28.7, K28.9 | N 2 y | Quan 2008 [11] , 2005 [17] |
| Peripheral vascular disease | 1 hospitalization or 1 claim or 1 ACCS | 1 | 1 | 1 | . | 440.2 | I70.2 | Y | Fan 2013 [47] |
| Psoriasis | 1 hospitalization or 1 DERM claim | 1 | 1 | . | . | 696.1 | L40.0 - L40.4, L40.8, L40.9 | Y | Asgari 2013 [48] |
| Rheumatoid arthritis | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 446.5, 710.0–710.4, 714.0–714.2, 714.8, 725 | M05, M06, M31.5, M32–M34, M35.1, M35.3, M36.0 | Y | Quan 2008 [11] , 2005 [17] |
| Schizophrenia^ | 1 hospitalization or 2 claims in 2 years or less | 1 | 2 | . | 2 | 295 | F20, F21, F23.2, F25 | Y | Lurie 1992 [49] , Moscovice 1989 [50] |

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| Severe constipation | 1 hospitalization without surgery or 2 claims in 2 years or less | 1 | 2 | . | 2 | 560.1, 560.30, 560.39, 560.9, 564.0, 569.83, 569.89 | K55.8, K56.0, K56.4, K56.7, K59.0, K63.1, K63.4, K63.81, K63.88, K92.80, K92.88 | N 2 y | Sands 2006 [21] |
| | | | | | | Exclude 152-154, 158, 179-189, 197.5-197.6, 235.2, 239.0, 555-556, 568.0, 614.6, (560.9 if 789.01, 789.02, 789.06), and any CCPx surgery# listed in claims | Exclude C17-C21, C45.1, C48, C51-C58, C60-C68, C78.5-C78.6, D01.7, D01.9, D37.1-D37.5, K50-K51, K66.0, N73.6, N99.4 (K56.6 if R10.1), and any CCPx surgery# listed in claims | | |
| Stroke or TIA | 1 most responsible or post-admittance hospitalization or 1 claim or 1 most responsible ED ACCS | 1 | 1 | 1 | . | 362.3, 430, 431, 433.x1, 434.x1, 435, 436 | G45.0-G45.3, G45.8-G45.9, H34.1, I60, I61, I63, I64 | Y | Kokotailo 2005 [51] |

Table 1 Administrative algorithms for 30 morbidities

From: [Methods for identifying 30 chronic conditions: application to administrative data](#)

1. ACCS ambulatory care classification system, ICD-9 CM International Classification of Diseases 9th Revision Clinical Modification, ICD-10 International Classification of Diseases 10th Revision, CCPx Canadian Classification of Procedures, eGFR estimated glomerular filtration rate, GAST gastroenterologist, GP general practitioner, DERM dermatologist, ED emergency department, TIA transient ischemic attack.
2. Any diagnosis field was considered in the algorithms except when the original text specified otherwise. The index date for disease was set as the date for the first relevant claim. Diseases denoted as “permanent” were assumed to be present continuously from the index date; diseases that are not “permanent” were considered to remit if no claims were present for a specified period of time.
3. *The author did not intend 567.2 to generalize and include 567.22 or 567.23
4. #CCPx surgery codes in claims were included as exclusions for hospitalizations for severe constipation.
5. &In claims the specific ICD-9 CM code for atrial fibrillation was not in use and so the less specific code 427.3 (which includes atrial flutter) was used in place of 427.31.
6. %The ICD-9 CM code 493 and the ICD-10 code J45 was removed from the chronic pulmonary disease algorithm as it was also included in the asthma algorithm.
7. \$The ICD-10 codes I11 and I12 were eliminated from chronic heart failure as separate codes for heart failure are required.
8. ^A number of codes were legitimately used in more than one algorithm: alcohol misuse and chronic heart failure (425.5, I42.6), alcohol misuse and cirrhosis (571.2, K70.3), chronic heart failure and hypertension (402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93), and depression and schizophrenia (F20.4).