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<tr>
<th>Search</th>
<th>Group</th>
<th>Keywords or phrases utilized</th>
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<td><strong>Characteristics</strong></td>
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<tr>
<td><strong>MeSH terms used in (PubMed only)</strong></td>
<td></td>
<td>&quot;Pharmacoepidemiology/methods&quot; OR &quot;Records as Topic/methods&quot; OR &quot;Records as Topic/statistics and numerical data&quot; OR &quot;Records as Topic/standards&quot; OR &quot;Records as Topic/organization&quot; OR &quot;Reproducibility of results&quot; OR &quot;Current Procedural Terminology&quot; OR &quot;Healthcare Common Procedure Coding System&quot; OR &quot;International Classification of Diseases&quot; OR &quot;Logical Observation Identifiers Names and Codes&quot;</td>
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| **Major healthcare databases AND** | | "Truven MarketScan" OR "marketscan OR "SEER" OR "SEER-Medicare" OR "Premier Perspective" OR "Quintiles Centricity" OR "GE Centricity" OR "OptumInsight" OR "Clinformatics DataMart" OR "HealthCore" OR "Humedica" OR "Integrated Dataverse" OR "Symphony Health Solutions" OR "Canadian Institute for Health Information" OR "Canadian Primary Care Sentinel Surveillance Network" OR "IMS LifeLink Disease
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<tr>
<td>&quot;Reproducibility of Results&quot; OR &quot;Predictive Value of Tests&quot; OR &quot;Sensitivity and Specificity&quot;</td>
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### Table A2. Characteristics of application articles captured in the review where a check mark indicates the presence of a performance measure.

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<th>Therapeutic Area (specific area)</th>
<th>Database</th>
<th>Validation</th>
<th>Case validation method&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Code vs. algorithm&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Accuracy</th>
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<td>Hepatology (Cirrhosis and complications)</td>
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<sup>a</sup>Case validation method: Yes = validated, No = not validated.

<sup>b</sup>Code vs. algorithm: ✓ = validated, × = not validated.
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<th>Accuracy</th>
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<td>Diagnosis</td>
<td>Cardiology (Congenital cardiac malformations)</td>
<td>CPRD</td>
<td>Yes</td>
<td>3 codes</td>
<td>✓</td>
<td>0-100</td>
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<td></td>
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<td>Read</td>
<td>Diagnosis</td>
<td>Cardiology (Intracerebral hemorrhage and subarachnoid hemorrhage stroke)</td>
<td>THIN</td>
<td>Yes</td>
<td>1,3 algorithm</td>
<td>✓</td>
<td>73-91</td>
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<td></td>
<td></td>
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<td>Diagnosis</td>
<td>Dermatology (Psoriatic arthritis)</td>
<td>THIN</td>
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<td>35.1-83.8</td>
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<td>Dermatology (Psoriasis)</td>
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<td>Yes</td>
<td>3 algorithm</td>
<td>✓</td>
<td>74-100</td>
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<td>Yes</td>
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<td>✓</td>
<td>30.8-91.9</td>
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<td>Infections and infectious diseases (Hepatitis C virus)</td>
<td>THIN</td>
<td>Yes</td>
<td>1,3 algorithm</td>
<td>✓</td>
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<td>Obstetrics/ Gynecology (Stillbirth, elective termination, spontaneous abortions or miscarriages, normal full-term deliveries, pre-and post-term births, multiple live births)</td>
<td>CPRD/GPRD</td>
<td>Yes</td>
<td>1,3 algorithm</td>
<td>✓</td>
<td>86.30</td>
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<td>93</td>
<td></td>
<td></td>
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<td>Yes</td>
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<td>93</td>
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<td>Yes</td>
<td>1,3 algorithm</td>
<td>✓</td>
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<td>Psychiatry/ Psychology (Anxiety and depression)</td>
<td>CPRD/GPRD</td>
<td>Yes</td>
<td>1 algorithms</td>
<td>✓ 5-49</td>
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<td>Specificity</td>
<td>PPV</td>
<td>NPV</td>
<td>Accuracy</td>
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<td>Ophthalmology (Cataracts and glaucomas)</td>
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<td>Yes</td>
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<td>Yes</td>
<td>1 algorithm</td>
<td>✓</td>
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<td>CPRD</td>
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<td>3 codes</td>
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<td>CPRD</td>
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<td>3 algorithms</td>
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<td>Hospitalization</td>
<td>Respiratory (Pneumonia hospitalization)</td>
<td>THIN</td>
<td>Yes</td>
<td>1 algorithm</td>
<td>✓</td>
<td>86-88</td>
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<td>Diagnosis</td>
<td>Cardiology (Sudden cardiac death and ventricular arrhythmia)</td>
<td>CPRD/GPRD</td>
<td>Yes</td>
<td>3 codes</td>
<td>✓</td>
<td>0-100</td>
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<td></td>
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<td>Hennessy 2008</td>
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<td>Diagnosis</td>
<td>Cardiology (Ventricular septal defect tetralogy of Fallot, and coarctation of the aorta)</td>
<td>CPRD/GPRD</td>
<td>Yes</td>
<td>1,3 algorithms</td>
<td>✓</td>
<td>90-100</td>
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<td>Diagnosis</td>
<td>Dermatology (pressure ulcer)</td>
<td>CPRD/GPRD</td>
<td>Yes</td>
<td>3 algorithm</td>
<td>✓</td>
<td>91</td>
<td>100</td>
<td>100</td>
<td>95</td>
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<td>CPRD/GPRD</td>
<td>Yes</td>
<td>3 algorithms</td>
<td>✓</td>
<td>52-76</td>
<td>33-78</td>
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<td>Lewis 2002</td>
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<td>Diagnosis</td>
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<td>CPRD/GPRD</td>
<td>Yes</td>
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<td>✓</td>
<td>53-86</td>
<td>94</td>
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<td>92-96</td>
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<td>Diagnosis</td>
<td>Musculoskeletal (Hip and vertebral fractures)</td>
<td>CPRD/GPRD</td>
<td>Yes</td>
<td>1,3 algorithms</td>
<td>✓</td>
<td>76.3-91</td>
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<td>Van Staa 2000</td>
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<td><strong>Read/OXMIS</strong></td>
<td>Diagnosis</td>
<td>Obstetrics/Gynaecology (Genital malformations)</td>
<td>CPRD/GPRD</td>
<td>Yes</td>
<td>1 algorithm</td>
<td>✓</td>
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<td></td>
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<td>Charlton 2010</td>
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<td><strong>Read/OXMIS</strong></td>
<td>Diagnosis</td>
<td>Oncology (Esophageal cancer)</td>
<td>CPRD</td>
<td>Yes</td>
<td>1,3 algorithm</td>
<td>✓</td>
<td>94</td>
<td>16</td>
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<td>Walker 2011</td>
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<td>Diagnosis</td>
<td>Obstetrics/Gynaecology (Neural tube defects)</td>
<td>CPRD/GPRD</td>
<td>Yes</td>
<td>3 algorithms</td>
<td>✓</td>
<td>0-86</td>
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<td></td>
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<td>Devine 2008</td>
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<td>Diagnosis</td>
<td>Various (Various)</td>
<td>CPRD/GPRD (VAMP)</td>
<td>Yes</td>
<td>1 codes</td>
<td>✓</td>
<td>96-100</td>
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<td></td>
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<td>Jick 1992</td>
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*Procedural coding systems*
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<th>Coding system</th>
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<th>Therapeutic Area (specific area)</th>
<th>Database</th>
<th>Validation</th>
<th>Case validation method*</th>
<th>Code vs. algorithm*</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Accuracy</th>
<th>Reference</th>
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<tbody>
<tr>
<td>CPT</td>
<td>Nursing home admission</td>
<td>General (Nursing home admission)</td>
<td>Marketscan</td>
<td>Yes</td>
<td>1 algorithms</td>
<td>✓</td>
<td>33-97</td>
<td>✓</td>
<td>99-100</td>
<td>72-93.5</td>
<td>Zuckerman 2007</td>
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<td>CPT</td>
<td>Procedure</td>
<td>General (RotaTeq and Rotarix vaccine administration)</td>
<td>Healthcare</td>
<td>Yes</td>
<td>1 algorithm</td>
<td>✓</td>
<td>72.9-93.5</td>
<td></td>
<td></td>
<td></td>
<td>Quinlan 2015</td>
<td></td>
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</tbody>
</table>

**Multiple coding systems – diagnosis + treatment**

| ATC ICD-9 | Diagnosis | Respiratory, Psychiatry, Psychology, Cardiology, Endocrinology, Neurology (COPD, dementia, depression, diabetes, hypertension, osteoarthritis, Parkinsonism, and epilepsy) | CPCSSN | Yes | 1 algorithm | ✓ | 77.8-98.8 (all); 84.9 (cardiology); 95.6 (endocrinology); 81.2 (psychiatry); 82.1 (respiratory); 77.8 (rheumatology); 96.8-98.8 (neurology) | ✓ | 93.5-99.0 (all); 93.5 (cardiology); 97.1 (endocrinology); 94.8 (psychiatry); 97.3 (respiratory); 94.9 (rheumatology); 98.1-99.0 (neurology) | ✓ | 72.1-92.9 (all); 92.9 (cardiology); 87.0 (endocrinology); 79.6 (psychiatry); 72.1 (respiratory); 87.7 (rheumatology); 72.8-85.6 (neurology) | ✓ | 86.0-99.9 (all); 86.0 (cardiology); 99.1 (endocrinology); 95.2 (psychiatry); 98.4 (respiratory); 90.2 (rheumatology); 99.8-99.9 (neurology) | Williamson 2014 |

| ICD-9-CM + NDC and Multilex + Read | Diagnosis | Cardiology (Acute myocardial infarction) | CPRD, Optum | No | | | | | | | | |

| ICD-9-CM NDC | Diagnosis | Cardiology (Hypertension) | HealthCare | Yes | 1 algorithm | ✓ | 70.8 (ICD-9-CM), 76.2 (ICD-9-CM and NDC codes) | 74.9 (ICD-9-CM), 93.3 (ICD-9-CM and NDC codes) | ✓ | 86.0-99.9 (all); 86.0 (cardiology); 99.1 (endocrinology); 95.2 (psychiatry); 98.4 (respiratory); 90.2 (rheumatology); 99.8-99.9 (neurology) | | | | |

| Multilex Read | Treatment Use | General (Long Acting Reversible Contraceptives) | THIN | Yes | 3 algorithms | ✓ | 70 (Read), 88 (Multilex), 100 (Read & Multilex) | | | | Cea Soriano 2014 |

| Multilex Read | Diagnosis | Psychiatry/ Psychology (Autism) | CPRD/ GPRD | Yes | 1 algorithm | ✓ | 80.6-92.5 | | | | Fombonne 2004 |

| Multilex Read | Diagnosis | Oncology (Colonrectal cancer) | THIN | Yes | 3 algorithms | ✓ | 86.0-97.9 | ✓ | 6.1 | | Cea Soriano 2016 |

| Read Multilex | Diagnosis | Oncology (Breast cancer) | CPRD/ GPRD | Yes | 3 algorithm | ✓ | 27.88 | | | | Hagberg 2013 |

| Multilex Read | Diagnosis | Rheumatology (Ankylosing spondylitis) | THIN | Yes | 3 algorithms | ✓ | 63.9-95.1 (Read); 29.5-98.4 (Read & Multilex) | ✓ | 71.8-88.6 (Read); 71.5-85.6 (Read & Multilex) | | | Dubreuil 2016 |

**Multiple coding systems – diagnosis + procedural**
<table>
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<tr>
<th>Coding system</th>
<th>Case being validated</th>
<th>Therapeutic Area (specific area)</th>
<th>Database</th>
<th>Validation</th>
<th>Case validation method</th>
<th>Code vs. algorithm&lt;sup&gt;a&lt;/sup&gt;</th>
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<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Accuracy</th>
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<tbody>
<tr>
<td>AJCC-TNM</td>
<td>Diagnosis</td>
<td>Oncology (Recurrent Breast Cancer)</td>
<td>SEER- Medicare</td>
<td>No</td>
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<td>✓ 67.46-62.50 (general); 7.14-17.86 (endocrinology)</td>
<td>✓ 92.19-100 (general); 99.15-100 (endocrinology)</td>
<td>✓ 50-100 (general); 90.91-100 (endocrinology)</td>
<td>✓ 70.75-95.19 (general); 69.41-71.71 (endocrinology)</td>
<td>Cheng 2012</td>
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<td>Diagnosis</td>
<td>Endocrinology, general (Recurrent Breast Obesity, smoking)</td>
<td>HealthCore</td>
<td>Yes 1 algorithms</td>
<td>✓ 69.4 (algorithms); 0-75 (codes) ✓ 95.7-96.0 (algorithms); 60-100 (codes) ✓ &gt;75 (algorithms) ✓ &gt;90 (algorithms)</td>
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<td>✓ 97</td>
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<td>✓ 99</td>
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<td>Diagnosis</td>
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<td>SEER- Medicare</td>
<td>Yes 1 algorithm</td>
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<td>Diagnosis</td>
<td>Oncology (Lymphedema)</td>
<td>Medicare claims</td>
<td>Yes 3 algorithms/codes</td>
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<td>Diagnosis</td>
<td>Oncology (Recurrent Breast Cancer)</td>
<td>SEER- Medicare</td>
<td>Yes 1 algorithm</td>
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<td>Mortality</td>
<td>Oncology, Endocrinology, Cardiology, Neurology, Respiratory (Pediatric comorbidities)</td>
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<td>Diagnosis</td>
<td>Cardiology, Neurology, Gastroenterology (Myocardial infarction, ischemic stroke, severe upper gastrointestinal bleed)</td>
<td>Healthcare</td>
<td>Yes 1 algorithm</td>
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<td>Diagnosis</td>
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<td>Smoyer-Tomic 2012</td>
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<td>Procedure</td>
<td>Oncology (Axillary lymph node dissection and sentinel lymph node biopsy)</td>
<td>SEER- Medicare</td>
<td>Yes 1 algorithm</td>
<td>✓ 80.11-80.26 (general); 99.33-99.97 (endocrinology)</td>
<td>✓ 99.4-100 (general); 98.6-99.6 (endocrinology)</td>
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<td>Oncology (Bone metastasis)</td>
<td>SEER- Medicare</td>
<td>Yes 1 algorithm</td>
<td>✓ 80.11-80.26 (general); 99.33-99.97 (endocrinology)</td>
<td>✓ 99.4-100 (general); 98.6-99.6 (endocrinology)</td>
<td>✓ 97</td>
<td>✓ 98</td>
<td>✓ 99</td>
<td>Onukwugha 2014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPT ICD-9-CM</td>
<td>Diagnosis</td>
<td>Oncology (Myelodysplastic Syndromes)</td>
<td>SEER- Medicare</td>
<td>Yes 1 algorithm</td>
<td>✓ 80.11-80.26 (general); 99.33-99.97 (endocrinology)</td>
<td>✓ 99.4-100 (general); 98.6-99.6 (endocrinology)</td>
<td>✓ 97</td>
<td>✓ 98</td>
<td>✓ 99</td>
<td>Cogle 2011</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Coding system
- **CPT ICD-9-CM**
  - Stage
    - Oncology (Regional or distant cancer)
    - SEER-Medicare
    - Yes, 1 algorithm
    - Sensitivity: 11.7-79.4
    - Specificity: 38.3-88.2
  - **Bui 2014**

- **CPT ICD-9-CM**
  - Diagnosis
    - Hepatology (Noninfectious acute liver injury)
    - HealthCore
    - Yes, 1 algorithms
    - Specificity: 48-100
  - **Fenton 2009**

- **HCPCS ICD-9-CM**
  - Procedure
    - Oncology (Mammogram)
    - SEER-Medicare
    - No
    - **Baker 2016**

- **ICD-10 OPCS-4 Read**
  - Diagnosis
    - Trauma (Poisoning, burns, fractures)
    - CPRD
    - No
    - **Jette 2010**

### Multiple coding systems – diagnosis + diagnosis

<table>
<thead>
<tr>
<th>Coding system</th>
<th>Therapeutic Area (specific area)</th>
<th>Database</th>
<th>Validation</th>
<th>Code vs. algorithm</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Accuracy</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ICD-9-CA ICD-10-CM</strong></td>
<td>Diagnosis Cardiology (Hypertension)</td>
<td>CIHI DAD</td>
<td>Yes</td>
<td>4</td>
<td>algorithm</td>
<td>✓ 73.7</td>
<td>✓ 96.2</td>
<td>✓ 86.7</td>
<td>✓ 91.5</td>
<td>Peng 2015</td>
</tr>
<tr>
<td><strong>ICD-9-CM ICD-10-CA</strong></td>
<td>Diagnosis Neurology (Epilepsy)</td>
<td>CIHI DAD and ACCS</td>
<td>Yes</td>
<td>1</td>
<td>codes</td>
<td>98.8 (ICD-9-CM), 69.6 (ICD-10-CM)</td>
<td>79.4-100 (ICD-9-CM), 71.6-100 (ICD-10-CM)</td>
<td>97.0-99.1 (ICD-9-CM), 70.0-98.5 (ICD-10-CM)</td>
<td>Jette 2010</td>
<td></td>
</tr>
</tbody>
</table>

### Abbreviations:
- ACCS, Ambulatory Care Classification System Database
- AJCC, American Joint Committee on Cancer staging system
- COPD, chronic obstructive pulmonary disease
- CIHI, Canadian Institute for Health Information
- CM, Clinical Modification
- CPCS SN, Canadian Primary Care Sentinel Surveillance Network
- DAD, Discharge Abstract Database
- GP I, Generic Product Identifier
- GPRD, General Practice Research Data
- HCPCS, Healthcare Common Procedure Coding System
- HealthCore
- HealthCore Integrated Research Database
- ICD-9, International Classification of Diseases 9th revision
- MarketScan, Truven Health MarketScan Research Database
- NDC, National Drug Code
- NHIRD, National Health Insurance Research Database
- NSAPD, Nova Scotia Atele Perinatal Database
- Premier, Premier Perspective database
- PPV, positive predictive value
- NPV, negative predictive value
- Optum, OptumInsight Clinformatics Data Mart
- Read, Read codes
- SEER, Surveillance, Epidemiology and End Results Program
- THIN, The Health Improvement Network
- VAMP, Value Added Medical Products

**Case validation method:** 1) a review of a patient’s chart, case notes, or other medical records, 2) comparison of observed study results with other data sources such as databases or registries, 3) surveys administered to physicians or patients, or 4) other.

**Code vs. algorithm** refers to whether a code, code(s), algorithm, or algorithm(s) were validated in each study.
<table>
<thead>
<tr>
<th>Table A3. List of all references (i.e. characteristic and application) captured in the review.</th>
</tr>
</thead>
</table>


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