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| Table e-1. Description of Ontario health administrative databases. |
| **Database** | **Description** |
| ***Health Services***  |
| Discharge Abstract Database (DAD)  | The DAD is compiled by the Canadian Institute for Health Information (CIHI) and contains administrative, clinical (diagnoses and procedures/interventions), demographic, and administrative information for all admissions to acute care hospitals in Ontario. At ICES, consecutive DAD records are linked together to form ‘episodes of care’ among the hospitals to which patients have been transferred after their initial admission. Prior to April 1, 2002, diagnoses (up to 16 on a given DAD record) are captured using the International Statistical Classification of Diseases, Injuries, and Causes of Death, 9th Revision (ICD-9) coding system and procedures (up to 10 on a given DAD record) are captured using the Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures (CCP) coding system. Following April 1, 2002, diagnoses (up to 25 on a given DAD record) are captured using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada (ICD-10-CA) coding system and interventions (up to 20 on a given DAD record) are captured using the Canadian Classification of Health Interventions (CCI) coding system. In a hospital medical record reabstraction study of 14,500 hospital discharges from 18 hospital sites between April 2002 and March 2004, DAD records were demonstrated to have excellent agreement (over 99%) for nonmedical information such as demographic and administrative data. Regarding diagnoses, median agreement between the original DAD records and the reabstracted records for the 50 most common most responsible diagnoses was 81% (Sensitivity 82%; Specificity 82%).(1) The corresponding median agreement for the 50 most frequently performed surgical procedures was 92% (sensitivity 95%, positive predictive value 91%). |
| National Ambulatory Care Reporting System (NACRS)  | The NACRS is compiled by the Canadian Institute for Health Information (CIHI) and contains administrative, clinical (diagnoses and procedures), demographic, and administrative information for all patient visits made to hospital- and community-based ambulatory care centres (emergency departments, day surgery units, hemodialysis units, and cancer care clinics) in Ontario. At ICES, NACRS records are linked with other data sources (DAD, Ontario Mental Health Reporting System [OMHRS]) to identify transitions to other care settings, such as inpatient acute care or psychiatric care. Prior to April 1, 2002, diagnoses (up to 6 on a given NACRS record) are captured using the ICD-9 coding system and procedures (up to 10 on a given NACRS record) are captured using the CCP coding system. Following April 1, 2002, diagnoses (up to 10 on a given NACRS record) are captured using the ICD- 10-CA coding system and interventions (up to 10 on a given NACRS record) are captured using the CCI coding system. NACRS emergency department diagnosis codes have been extensively validated.  |
| Ontario Drug Benefit (ODB) program database | The ODB database contains prescription medication claims for those covered under the provincial drug program, mainly: those aged 65 years and older, 24 years and younger without private insurance coverage (as of January 1, 2018), nursing home residents, patients receiving services under the Ontario Home Care program, those receiving social assistance, and residents eligible for specialized drug programs (e.g., programs which cover the costs of medications for individuals whose medication costs exceed 4% of their net household income and for individuals with rare, serious conditions such as Cystic Fibrosis).Each medication claim has an associated prescriber identifier which indicates the health practitioner who wrote the prescription, as well as fields that identify the type and quantity of medication and duration of treatment. A special flag in the ODB database indicates whether the prescription was dispensed to a nursing home resident.An audit of 100 randomly selected prescriptions dispensed from 50 Ontario pharmacies determined that the ODB had an error rate of 0.7% and none of the pharmacy characteristics examined (locations, owner affiliation, productivity) were associated with coding errors.(2) |
| Ontario Health Insurance Plan (OHIP) Claims History Database  | The OHIP claims database contains information on inpatient and outpatient services provided to Ontario residents eligible for the province’s publicly funded health insurance system by fee-for-service health care practitioners (primarily physicians) and “shadow billings” for those paid through non-fee-for-service payment plans. Billing codes on the claims (OHIP fee codes) identify the care provider, their area of specialization and the type and location of service. OHIP billing claims also contain a 3-digit diagnosis code - the main reason for the service - captured using a modified version of the ICD, 8th revision coding system. OHIP claims are well completed, but the validity of the diagnosis coding is highly variable.(3) |
| Same-Day Surgery (SDS) database  | The SDS is compiled by the Canadian Institute for Health Information (CIHI) and contains administrative, clinical (diagnoses and procedures), demographic, and administrative information for all patient visits made to day surgery institutions in Ontario. Prior to April 1, 2002, diagnoses (up to 16 on a given SDS record) were captured using the ICD-9 coding system and procedures (up to 10 on a given SDS record) were captured using the CCP coding system. Since April 1, 2002, diagnoses (up to 25 on a given SDS record) are captured using the ICD-10-CA coding system and interventions (up to 16 on a given SDS record) are captured using the CCI coding system.  |
| ***ICES-derived cohorts*** |  |
| Ontario Diabetes Database (ODD)  | The ODD is created using algorithms applied to inpatient hospitalization (DAD) records, same day surgery (SDS) records, and physician billing claims (OHIP) data to determine the diagnosis date for incident cases of diabetes in Ontario. For adults aged 19 years and greater, the definition for diabetes is 2 physician billing claims with a diagnosis for diabetes (OHIP diagnosis code: 250) or 1 inpatient hospitalization or same day surgery record with a diagnosis for diabetes (ICD-9 diagnosis code: 250; ICD-10 diagnosis codes: E10, E11, E13, E14; in any diagnostic code space) within a 2 year period. Physician claims and hospitalizations with a diagnosis of diabetes occurring within 120 prior to and 180 days after a gestational hospitalization record were excluded. When using primary care chart abstraction as the reference standard, this definition has been shown to have the following performance characteristics: Sensitivity (86.1%), Specificity (97.1%), Positive Predictive Value (79.8%), and Negative Predictive Value (98.1%).(4)For individuals aged 18 years or less, the definition for diabetes is 4 physician billing claims with a diagnosis of diabetes (OHIP diagnosis code: 250) within a 2 year period. Physician claims during the newborn hospitalization episode were excluded. When using primary care chart abstraction as the reference standard, this definition has been shown to have the following performance characteristics: Sensitivity (82.8%), Specificity (98.9%), Positive Predictive Value (99.4%), and Negative Predictive Value (71.2%).(5) |
| Ontario Hypertension Database  | The Ontario Hypertension Database is created using a definition of ≥2 physician billing claims with a diagnosis of hypertension (OHIP diagnosis codes: 401-405) and/or ≥1 inpatient hospitalization or same day surgery record with a diagnosis of hypertension (ICD-9 diagnosis codes: 401-405; ICD-10 diagnosis codes: I10-I13, I15; in any diagnostic code space) in a two-year period applied to hospitalization (DAD), same day surgery (SDS), and physician billing claims (OHIP) data to determine the diagnosis date for incident cases of hypertension in Ontario. Physician claims and hospitalizations with a diagnosis of hypertension occurring within 120 prior to and 180 days after a gestational hospitalization record are excluded. When using electronic medical record data abstraction as the reference standard, the above definition has been demonstrated to have the following performance characteristics: Sensitivity (72%), Specificity (95%), Positive Predictive Value (87%), and Negative Predictive Value (88%).(6) |
| ***Acquired cohorts and registries*** |  |
| Ontario Cancer Registry (OCR)  | The OCR is a computerized database of information on all Ontario residents who have been newly diagnosed with cancer since 1964. All new cases of cancer, expect non-melanoma skin cancer, are registered in the information system which is managed and maintained by Cancer Care Ontario (CCO). Data from multiple sources, including DAD and SDS records from CIHI which include a diagnosis of cancer, paper reports from pathology departments with any mention of cancer, electronic reports from the eight Ontario Regional Cancer Centers and from the Princess Margaret Hospital (the specialized institutions treated cancer patients in Ontario), and electronic reports of all deaths of Ontario residents from the Office of the Registrar General of Ontario based on Ontario Provincial death certificates with cancer as the underlying cause of death are linked to compile incident cases of cancer in Ontario. Approximately 95% of all diagnosed cancer cases in Ontario are captured by the OCR.13 When using a clinical registry of head and neck tumours from a provincial regional cancer centre as the reference standard, there was excellent agreement with the OCR for tumour site (81%) and diagnosis date within 1 month (91.5%).(7) |
| ***Population and demographics*** |  |
| Immigration, Refugees, and Citizenship Canada’s (IRCC) Permanent Resident Database | The Ontario portion of the IRCC Permanent Resident Database includes immigration application records for people who initially applied to land in Ontario since 1985. The dataset contains permanent residents’ demographic information such as country of citizenship, level of education, mother tongue, and landing date. New immigrants who are currently residing in Ontario but originally landed in another province are not captured in this dataset. |
| OHIP Registered Persons Database (RPDB)  | The OHIP RPDB provides basic demographic information (age, sex, location of residence, date of birth, and date of death for deceased individuals) for those issued an Ontario health insurance number. The RPDB also indicates the time periods for which an individual was eligible to receive publicly funded health insurance benefits and the best known postal code for each registrant on July 1st of each year. |
| Ontario Marginalization Index (ON-Marg) | The ON-Marg was developed using census and geography data to quantify differences in population marginalization between regions within Ontario.(8,9)The factor scores or quintile distributions obtained from application of the ON-Marg are used to identify inequalities in health and social well-being. There are four dimensions of marginalization that are represented by the index, including residential instability, material deprivation, dependency, and ethnic concentration.(8,9) Residential instability is measured using population dwelling characteristics, such as the proportion of the population living alone, proportion of dwellings that are apartment buildings, and the proportion of the population who are single, widowed, or divorced. Material deprivation represents socioeconomic characteristics of the population, such as the proportion that is considered low income, the proportion receiving government transfer payments, and the proportion aged 15+ who are unemployed. The dependency dimension uses indicators of population dependency due to unemployment and younger or older age. Ethnic concentration is calculated using data indicating the proportion of the population that are recent immigrants (past 5 years) and the proportion who self-identify as a visible minority. |

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| Table e-2. Administrative codes used to define variables. |
| **Concept** | **Databases** | **Code Type** | **Codes** | **Algorithm** |
| ***Inclusion and Exclusion Criteria*** |
| Stroke (both to define inclusion and to exclude those with prior stroke) | DAD | ICD-9 | 431, 4340, 4341, 436 | Detection of any code in most responsible diagnostic position (for inclusion) and all diagnostic positions (for exclusion)* ICD-9 codes validated by Liu et al.(10) - codes with highest PPVs were used, except for 430 (subarachnoid hemorrhage)
* ICD-10 codes validated by Porter et al.(11); however, some codes (i.e. G453, G458, G459, H341) were excluded as not all stroke types increase epilepsy risk
 |
| ICD-10 | G450, G451, G452, 161, 163, 164 |
| Seizures or epilepsy (exclusion criteria where used: [a] prior seizures/epilepsy, [b] no seizure after stroke, [c] no seizure after two ASM trials) | DAD, NACRS | ICD-9 | 3332, 3450-3455, 3457-3459, 7803  | Detection of any code in any diagnostic position for (a) and (b), and in the most responsible diagnostic position for (c) – algorithm not validated* ICD-9 and ICD-10 codes selected from Jette et al.(12)
 |
| ICD-10 | G40, G41  |
| OHIP | OHIP diagnostic code | 345 |
| Brain Surgery  | DAD, SDS | CCP\* | 14.2-14.8, 15.02, 15.14, 15.2, 15.9 | Detection of any code in any diagnostic position – algorithm not validated |
| CCI\* | 1AA, 1AB52MESJ, 1AB52MFSJ, 1AB52MQSJ, 1AC, 1AF27JA, 1AF27JX, 1AF52SZ, 1AF53SEQS, 1AF54HAQS, 1AF54SEQS, 1AF59SZAD, 1AF59SZAW, 1AF59SZGX, 1AF59SZX7, 1AF87DAAG, 1AF87DAAZ, 1AF87DAGX, 1AF87LUAG, 1AF87LUAZ, 1AF87LUGX, 1AF87PRAG, 1AF87PRAZ, 1AF87PRGX, 1AF87SZAG, 1AF87SZAZ, 1AF87SZGX, 1AG, 1AJ, 1AK, 1AN, 1AP, 1DL, 1JW, 1JX, 2AA, 2AC, 2AE, 2AF, 2AG, 2AJ, 2AK, 2AN, 2AP, 2BA, 2EA, 2JW |
| OHIP | OHIP fee code | E887, E888, E891, E894-E896, E898, E899, E901-E905, E908, E911, E912, E916-E918, E921, E922, E979, G790-G792, N102-N113, N115-N120, N123, N124, N126-N130, N139-N160, N177, N200, N211, N212, N218, N223-N249, Z803, Z813, Z816, Z818, Z823-Z825  |
| Brain Tumour | DAD, SDS, NACRS | ICD-9 | 191, 1920, 1921, 1928, 1929, 1943, 1944, 1983, 2250, 2252, 2258, 2259, 2370, 2371, 2375, 2377, 2379, 2396 | Detection of any code in any diagnostic position – algorithm not validated |
| ICD-10 | C700, C709-C715, C718, C719, C72, D320, D330-D333, D337, D420, D430-D433, D437, D439, 938, 93900, 93903, 940-957 |
| Central Nervous System Infection | DAD, SDS, NACRS | ICD-9 | 0065, 036, 0130-0133, 0136, 0138, 0139, 045-049, 0520, 0521, 0530, 0531, 0543, 0550, 062-064, 0662, 0721, 0722, 094, 1142, 1008, 320-323, 3240, 3249, 325 | Detection of any code in any diagnostic position – algorithm not validated* ICD-9 list based on codes used by Hasbun et al.(13) and Gedeborg et al.(14)
* ICD-10 list based on codes used by Gedeborg et al.(14) and Ahlers et al.(15)
 |
| ICD-10 | A066, A17, A321, A390, A394, A399, A504, A521, A522, A80-A89, A922, A923, B003, B004, B010, B011, B020, B021, B050, B051, B060, B261, B262, B375, B384, B451, B574, B582, B602, B941, G01-G07, G36 |
| Traumatic Brain Injury  | DAD, NACRS | ICD-9 | 800, 801, 803, 804, 850-854, 9590 | Detection of any code in any diagnostic position – algorithm not validated * ICD-9 list based on codes used by Bazarian et al.(16) and McGarry et al.(17)
* ICD-10 list based on codes used by Chen and Colantonio (18)
 |
| ICD-10 | F072, S06, S071, T902, T905 |
| ***Baseline Comorbidities*** |
| Fractures | DAD, SDS, NACRS | ICD-9 | 8052-8057, 808, 812, 813, 820, 8210, 8211 | Detection of any code in any diagnostic position – algorithm not validated |
| ICD-10 | S220-S221, S32, S422, S52, S720-S723 |
| Bipolar Disorder or Schizophrenia | DAD, NACRS | ICD-9 | 295, 296, 301 | Detection of any code in any diagnostic position – algorithm not validated* ICD-9 and ICD-10 lists based on codes used by Grigoriadis et al.(19)
 |
| ICD-10 | F20, F25, F30, F31 |
| Depression or Anxiety | DAD, NACRS | ICD-9 | 2962, 2963, 3000, 3002-3004, 311 | Detection of any code in any diagnostic position – algorithm not validated* Depression codes based on those used by Fiest et al.(20)
 |
| ICD-10 | F32, F330-F333, F338, F339, F341, F40-F431 |
| OHIP | OHIP diagnostic code | 300, 309, 311 |
| Atrial Fibrillation | DAD, NACRS | ICD-9 | 4273 | Detection of any code in any diagnostic position – algorithm not validated |
| ICD-10 | I48 |
| ***Epilepsy Treatment (for cohort description)*** |
| Received EEG | OHIP | OHIP fee code | G414, G418, G540, G542, G545, G546 | Detection of any code |
| Received MRI | OHIP | OHIP fee code | X421 | Detection of code |
| ***Outcomes*** |
| Received Epilepsy Surgery | OHIP | OHIP fee code | N109, N110, N130, Z816, Z823 | Detection of any code |
| Assessed for Surgical Candidacy  | OHIP | OHIP fee code | EEG – G540, G542, G545, G546MRI – X421Intracranial electrodes – N119, N124 | Participants had to meet one of the following criteria:1. Had an inpatient EEG (defined as the billing of all four EEG codes on the same date) and also had an MRI between their date of refractory epilepsy diagnosis and up to 14 days following the simultaneous billing of the four EEG codes;
2. Had surgery for implantation of intracranial electrodes;
3. Received epilepsy surgery.

The first time a patient met any of these criteria, they were considered to have been assessed for surgical candidacy. |
| \* CCI= Canadian Classification of Health Interventions, CCP= Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures |

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| Table e-3. Characteristics of study sample. |
| **Total, N** | **1,902** |
| **Demographics** |  |
| Age, N(%) |   |
| Mean (SD) | 67.0 (13.1) |
| Median (IQR) | 68 (60-76) |
| 18-24 | 6 (0.3) |
| 25-34 | 39 (2.1) |
| 35-44 | 77 (4.0) |
| 45-54 | 170 (8.9) |
| 55-64 | 344 (18.1) |
| 65-74 | 715 (37.6) |
| 75-84 | 415 (21.8) |
| 85-94 | 128 (6.7) |
| 95+ | 8 (0.4) |
| Female, N(%) | 805 (42.3) |
| Neighbourhood Household Income Quintile, N(%) |  |
| Quintile 1 (Lowest)  | 459 (24.1) |
| Quintile 2 | 411 (21.6) |
| Quintile 3 | 370 (19.5) |
| Quintile 4 | 339 (17.8) |
| Quintile 5 (Highest)  | 315 (16.6) |
| Missing | 8 (0.4) |
| Immigrant, N(%) | 187 (9.8) |
| Marginalization Index Factor Scores, N(%) |  |
| Ethnic Concentration |  |
| Quintile 1 | 320 (16.8) |
| Quintile 2 | 333 (17.5) |
| Quintile 3 | 278 (14.6) |
| Quintile 4 | 304 (16.0) |
| Quintile 5 | 354 (18.6) |
| Material Deprivation |  |
| Quintile 1 | 241 (12.7) |
| Quintile 2 | 264 (13.9) |
| Quintile 3 | 305 (16.0) |
| Quintile 4 | 310 (16.3) |
| Quintile 5 | 469 (24.7) |
| Dependency |  |
| Quintile 1 | 271 (14.2) |
| Quintile 2 | 290 (15.2) |
| Quintile 3 | 318 (16.7) |
| Quintile 4 | 310 (16.3) |
| Quintile 5 | 400 (21.0) |
| Residential Instability |  |
| Quintile 1 | 211 (11.1) |
| Quintile 2 | 282 (14.8) |
| Quintile 3 | 288 (15.1) |
| Quintile 4 | 370 (19.5) |
| Quintile 5 | 438 (23.0) |
| Missing  | 313 (16.5) |
| Rurality Index for Ontario Score, N(%)  |  |
| 0-30 | 1,592 (83.7) |
| 31-45 | 147 (7.7) |
| 46-55 | 72 (3.8) |
| 56-75 | 40 (2.1) |
| 75+ | 23 (1.2) |
| Missing  | 28 (1.5) |
| **Epilepsy Characteristics** |  |
| Number of hospital encounters for seizures/SEa |  |
| Mean (SD) | 1.1 (1.7) |
| Median (IQR) | 1 (0-2) |
| Received an EEG, N(%)b | 1,143 (60.1) |
| Received an MRI, N(%)b | 843 (44.3) |
| **Comorbiditiesc** |  |
| Charlson Comorbidty Index, N(%) |  |
| 0 | 287 (15.1) |
| 1 | 328 (17.2) |
| 2 | 192 (10.1) |
| ≥ 3 | 650 (34.2) |
| No Hospitalizations | 445 (23.4) |
| Depression & anxiety, N(%) | 872 (45.8) |
| Bipolar disorder & schizophrenia, N(%) | 36 (1.9) |
| Diabetes, N(%) | 787 (41.4) |
| Hypertension, N(%) | 1,608 (84.5) |
| Atrial Fibrillation, N(%) | 324 (17.0) |
| Fractures, N(%) | 117 (6.2) |
| a Between the first seizure following stroke and drug-resistant epilepsy diagnosis; b Between stroke and drug-resistant epilepsy diagnosis; c In the two years prior to drug-resistant epilepsy diagnosis |

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