

## Appendix 1 (as supplied by the authors): Databases and definitions used.

**Table e1:** The Institute for Clinical Evaluative Sciences databases used in this study and their descriptions

Database	Description
Ontario Health Insurance Plan (OHIP)	Contains claims data paid for by the Ontario Health Insurance Plan for most healthcare professionals in the province
Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD)	Contains patient-level data for acute, chronic, and day surgery institutions in Ontario
Canadian Institute for Health Information National Ambulatory Care Reporting System (CIHI-NACRS)	Contains patient visits to hospital and community based ambulatory care: day surgery, outpatient clinics and emergency departments
Canadian Institute for Health Information Same Day Surgery (CIHI-SDS)	Contains patient-level data for day surgery institutions in Ontario
Canadian Organ Replacement Register (CORR)	Contains activity and outcomes of vital organ transplantation and renal dialysis for donors and recipients treated in Ontario
Ontario Renal Reporting System (ORRS)	Contains data on patients with chronic kidney disease and renal dialysis
Ontario Diabetes Database (ODD)	Contains all incident cases of diabetes in Ontario
Ontario Cancer Registry (OCR)	Contains Ontario residents newly diagnosed, or died, with cancer (except non-melanoma skin cancers)
Ontario Myocardial Infarction Database (OMID)	Contains hospitalized patients with first acute myocardial infarction
Chronic Obstructive Pulmonary Disease (COPD)	Contains all Ontario patients with COPD
Ontario Drug Benefit (ODB)	Contains claims for prescription drugs received under the ODB program (most are for those $\geq 65$ years of age)
Ontario Congestive Heart Failure (CHF) Database	Contains all Ontario individuals identified as having CHF
Ontario Human Immunodeficiency Virus (HIV) database	Contains all Ontario HIV positive patients
Ontario Hypertension Database (HYPER)	Contains all Ontario individuals identified as having hypertension.

**Table e2:** Databases and codes used to define medical conditions

Medical Condition	Definition
Hypertension	Hypertension was defined as

Appendix to: Schwartz KL, Jembere N, Campitelli MA, et al. Using physician billing claims from the Ontario Health Insurance Plan to determine individual influenza vaccination status: an updated validation study. *CMAJ Open* 2016. DOI: 10.9778/cmajo.20160009. Copyright © 2016 The Author(s) or their employer(s).

To receive this resource in an accessible format, please contact us at [cmajgroup@cmaj.ca](mailto:cmajgroup@cmaj.ca).

Medical Condition	Definition
	<p>a) one hospital admission with a hypertension diagnosis, or  b) an OHIP claim with a hypertension diagnosis followed within two years by either an OHIP claim or a hospital admission with a hypertension diagnosis.(1)</p> <p><u>CIHI-DAD, CIHI-SDS</u>  ICD-9 diagnostic codes: 401, 402, 403 404, 405  ICD-10 diagnostic codes: I10, I11, I12, I13, I15</p> <p><u>OHIP</u>  OHIP diagnostic codes: 401, 402, 403 404, or 405</p>
Asthma	<p>Asthma database was used to identify patients with asthma, based on 2 or more ambulatory care visits and/or 1 or more hospitalizations.(2)</p> <p><u>OHIP</u>  OHIP diagnostic code: 493</p> <p><u>CIHI-DAD</u>  ICD-9 diagnostic code: 493  ICD-10 diagnostic codes: J45, J46</p>
Diabetes	<p>ODD was used to identify patients with diabetes, based on 2 OHIP diagnostic codes or 1 OHIP service code or 1 CIHI admission within 2 years.(3)</p> <p><u>OHIP</u>  OHIP diagnostic code: 250  OHIP service codes: Q040, K029, K030, K045, K046</p> <p><u>CIHI-DAD, CIHI-SDS</u>  ICD-9 diagnostic code: 250  ICD-10 diagnostic codes: E10, E11, E13, E14</p>
Cancer	<p>OCR was used to identify patients with a history of cancer diagnosed in Ontario except for non-melanoma skin cancer.(4)</p>
Chronic obstructive pulmonary disease (COPD)	<p>COPD database was used to identify patients with COPD, based on 3 or more ambulatory care visits and/or 1 or more hospitalizations within 2 years.(5)</p> <p><u>OHIP</u>  OHIP diagnostic codes: 491, 492, 496</p>

Medical Condition	Definition
	<p><u>CIHI-DAD</u>            ICD-9 diagnostic codes: 491, 492, 496            ICD-10 diagnostic codes: J41, J42, J43, J44</p>
<p>Congestive heart failure (CHF)</p>	<p>CHF database was used to identify patients with CHF, based on 1 CIHI NACRS, CIHI-DAD, CIHI-SDS, or OHIP claim and a second claim (from either) in 1 year.(6)</p> <p><u>OHIP</u>            OHIP diagnostic code: 428</p> <p><u>CIHI-DAD, CIHI-SDS</u>            ICD-9 diagnostic code: 428            ICD-10 diagnostic codes: I500, I501, I509</p>
<p>Acute myocardial infarction (AMI)</p>	<p>OMID was used to identify patients with a history of AMI using OHIP, CIHI-DAD, and CIHI-SDS.(7)</p> <p><u>OHIP:</u>            OHIP service codes: C132, C133, C134, C135, C136, C137, C139, C435, C602, C603, C604, C605, C606, C607, C609, C675, C002, C003, C004, C005, C006, C007, C009, C905, G297, G557, G558, G559, G400, G401, G402, G405, G406, G407, R742, R743, Z434, Z442.</p> <p><u>CIHI-DAD, CIHI-SDS</u>            CCI procedure codes: 3IS10, 3IP10, 2HZ28, 1IJ50, 1IJ57, or 1IJ76            CCP procedure codes: 4802, 4803, 4809, 4892, 4893, 4894, 4895, 4896, 4897, 4898, 4996, or 4997            ICD-9 diagnostic codes: 410, 411, 413, or 428            ICD-10 diagnostic codes: I21, I50, or I20</p>
<p>Chronic kidney disease (CKD)</p>	<p>Identifying patients with CKD.(8)</p> <p><u>OHIP</u>            OHIP diagnostic codes: 403, 585</p> <p><u>CIHI NACRS, CIHI-DAD</u>            ICD-10 diagnostic codes: E102, E112, E132, E142, I12, I13, N08, N18, N19</p> <hr/> <p>Identifying patients on chronic dialysis(9)</p> <p>At least 2 of any of the following codes in OHIP, CIHI-DAD, or</p>

Medical Condition	Definition
	<p data-bbox="505 233 1308 268">CIHI-SDS separated by at least 90 days, but less than 150 days</p> <p data-bbox="505 306 581 342"><u>OHIP</u></p> <p data-bbox="505 342 1365 485">OHIP service codes: R849, G323, G325, G326, G860, G862, G865, G863, G866, G330, G331, G332, G333, G861, G082, G083, G085, G090, G091, G092, G093, G094, G095, G096, G294, G295, G864, H540, H740</p> <p data-bbox="505 525 800 560"><u>CIHI-DAD, CIHI-SDS</u></p> <p data-bbox="505 560 935 596">CCI procedure codes: 5195, 6698</p> <p data-bbox="505 596 867 632">CCP procedure code: 1PZ21</p> <p data-bbox="505 672 594 707"><u>CORR</u></p> <p data-bbox="505 707 1365 814">Treatment codes: 060, 111, 112, 113, 121, 122, 123, 131, 132, 133, 141, 151, 152, 211, 221, 231, 241, 242, 251, 252, 311, 312, 313, 321, 322, 323, 331, 332, 333, 413, 423, 433, 443, 453</p> <p data-bbox="505 854 589 890"><u>ORRS</u></p> <p data-bbox="505 890 846 926">Patients included in ORRS</p> <hr/> <p data-bbox="505 966 756 1001"><b>Exclusion criteria:</b></p> <p data-bbox="505 1001 964 1037">Patients with kidney transplants(10)</p> <p data-bbox="505 1077 581 1113"><u>OHIP</u></p> <p data-bbox="505 1113 922 1148">OHIP service codes: S435, S434</p> <p data-bbox="505 1188 649 1224"><u>CIHI DAD</u></p> <p data-bbox="505 1224 849 1260">CCP procedure code: 6759</p> <p data-bbox="505 1260 865 1295">CCI procedure code: 1PC85</p> <p data-bbox="505 1335 594 1371"><u>CORR</u></p> <p data-bbox="505 1371 1377 1440">Treatment code: 171 plus one or more of Transplanted Organ Codes (1-3): 10, 11, 12, 18, 19</p> <p data-bbox="505 1480 589 1516"><u>ORRS</u></p> <p data-bbox="505 1516 1166 1551">Type of event during patient care: Transplanted (tx)</p>
Stroke	<p data-bbox="505 1589 1365 1696">CIHI-DAD was used to identify patients with a history of acute ischemic stroke, based on at least one hospitalization with the most responsible diagnosis coded with one of the following codes (11):</p> <p data-bbox="505 1736 800 1772"><u>CIHI-DAD, CIHI-SDS</u></p> <p data-bbox="553 1772 984 1808">ICD-9 diagnostic codes: 434, 436</p> <p data-bbox="553 1808 1325 1843">ICD-10 diagnostic codes: I63 (excluding 163.6), I64, H34.1</p>

Medical Condition	Definition
Immunosuppression	<p data-bbox="505 233 1365 302">ACG macro was used to identify patients in OHIP, CIHI-NACRS, and CIHI-DAD(12) with any mention of immune system disorders.</p> <p data-bbox="505 344 1328 413">In addition, the following databases and definitions were used to identify patients with immunosuppression:</p> <p data-bbox="505 455 574 485"><u>ODB</u></p> <p data-bbox="505 491 1349 596">30 days of oral corticosteroids in the past 6 months, antineoplastic use in the past 6 months, or use of another immunocompromising drug in the past 6 months</p> <p data-bbox="505 638 670 667"><u>CORRLINK</u></p> <p data-bbox="505 674 1352 779">CORRLINK is a dataset in ICES which links CORR and CIHI-DAD data. This database only includes patients that have received an organ transplant and does not include dialysis patients.</p> <p data-bbox="505 821 565 850"><u>HIV</u></p> <p data-bbox="505 856 1382 961">HIV database was used to identify patients with HIV, based on 3 physician claims in 3 years with OHIP diagnostic codes: 042, 043 or 044.(13)</p>
Dementia	<p data-bbox="505 1003 1352 1108">1 hospitalization for dementia or 3 ambulatory visits for dementia, each separated by at least 30 days, within 2 years or 1 prescription from ODB.(14)</p> <p data-bbox="505 1150 581 1180"><u>OHIP</u></p> <p data-bbox="505 1186 927 1215">OHIP diagnostic codes: 290, 331</p> <p data-bbox="505 1257 802 1287"><u>CIHI-DAD, CIHI-SDS</u></p> <p data-bbox="505 1293 1276 1323">ICD-9 diagnostic codes: 0461, 290, 294, 331.0, 331.1, 331.5</p> <p data-bbox="505 1329 1157 1358">ICD-10 diagnostic codes: F00, F01, F02, F03, G30</p> <p data-bbox="505 1400 574 1430"><u>ODB</u></p> <p data-bbox="505 1436 1057 1465">1 prescription for a cholinesterase inhibitor</p>

CCI= Canadian Classification of Health Interventions, CCP=Canadian Classification of Procedures, ACG=Adjusted Clinical Groups®

## **References:**

1. Tu K, Campbell NR, Chen ZL, Cauch-Dudek KJ, McAlister FA. Accuracy of administrative databases in identifying patients with hypertension. *Open Med* 2007;1(1):e18-e26.
2. Gershon AS, Wang C, Guan J, Vasilevska-Ristovska J, Cicutto L, To T. Identifying patients with physician-diagnosed asthma in health administrative databases. *Can Respir J* 2009 Nov;16(6):183-8.
- 3.. Hux JE, Ivis F, Flintoft V, Bica A. Diabetes in Ontario: determination of prevalence and incidence using a validated administrative data algorithm. *Diabetes Care* 2002 Mar;25(3):512-6.
4. Hall S, Schulze K, Groome P, Mackillop W, Holowaty E. Using cancer registry data for survival studies: the example of the Ontario Cancer Registry. *J Clin Epidemiol* 2006 Jan;59(1):67-76.
5. Gershon AS, Wang C, Guan J, Vasilevska-Ristovska J, Cicutto L, To T. Identifying individuals with physician diagnosed COPD in health administrative databases. *COPD* 2009 Oct;6(5):388-94.
6. Schultz SE, Rothwell DM, Chen Z, Tu K. Identifying cases of congestive heart failure from administrative data: a validation study using primary care patient records. *Chronic Dis Inj Can* 2013 Jun;33(3):160-6.
7. Austin PC, Daly PA, Tu JV. A multicenter study of the coding accuracy of hospital discharge administrative data for patients admitted to cardiac care units in Ontario. *Am Heart J* 2002 Aug;144(2):290-6.
8. Fleet JL, Dixon SN, Shariff SZ, Quinn RR, Nash DM, Harel Z, et al. Detecting chronic kidney disease in population-based administrative databases using an algorithm of hospital encounter and physician claim codes. *BMC Nephrol* 2013;14:81.
9. Quinn RR, Laupacis A, Austin PC, Hux JE, Garg AX, Hemmelgarn BR, et al. Using administrative datasets to study outcomes in dialysis patients: a validation study. *Med Care* 2010 Aug;48(8):745-50.
10. Lam NN, McArthur E, Kim SJ, Knoll GA. Validation of kidney transplantation using administrative data. *Can J Kidney Health Dis* 2015;2:20.
11. The Canadian Stroke Strategy. Canadian Stroke Strategy Core Performance Indicator Update 2010. The Canadian Stroke Strategy 2010 [Accessed 2016 Aug 9];Available from: URL: [http://strokebestpractices.ca/wp-content/uploads/2010/12/Stroke\\_Core\\_ENG.pdf](http://strokebestpractices.ca/wp-content/uploads/2010/12/Stroke_Core_ENG.pdf)

12. Starfield B, Weiner J, Mumford L, Steinwachs D. Ambulatory care groups: a categorization of diagnoses for research and management. *Health Serv Res* 1991 Apr;26(1):53-74.
13. Antoniou T, Zagorski B, Loutfy MR, Strike C, Glazier RH. Validation of case-finding algorithms derived from administrative data for identifying adults living with human immunodeficiency virus infection. *PLoS One* 2011;6(6):e21748.
14. Jaakkimainen RL, Bronskill SE, Tierney MC, Hermann N, Green D, Young J, et al. Identification of physician-diagnosed Alzheimer's disease and related dementias in population-based administrative data: a validation study using family physicians' electronic medical records. *J Alzheimers Dis* 2016; (In press).