APPENDIX 1 (as supplied by the authors): METHODS

Appendix 1.1 *Cohort creation*

Index event/inclusion criteria	Patient in Ontario with ≥ 1 periodic health examination (defined below) between April 1st, 2010 and March 31st, 2014. First applicable claim is date of study entry. **Periodic health examination** for adult patient [OHIP] – any of the following claims: ▪ Adult aged 18 to 64 inclusive: FEECODE = K131 ▪ Adult 65 and older: FEECODE = K132 ▪ General health assessment with family physician/general practitioner (FEECODE = A003) with reason as annual health examination (DXCODE = 917)
Exclusion criteria	1. Invalid IKN (IF VALIKN NE 'V' THEN DELETE) 2. Not an adult (age < 18) or invalid age (>105) at time of index PHE • *Necessary to apply as AHE codes not age-specific 3. Residents in long-term care: Lookback 1 year from cohort entry or anytime between a patient's first eligible PHV and their last eligible PHV within the observation window for the following long-term care exclusions: • [OHIP] record with LOCATION = 'L' • [ODB] record with LTC='1' [CAPE] record with STATUS_CAPE='15' (resides in LTC facility) 4. Non-Ontario resident (IF PSTLCODE doesn't start with K,L,M,N,O,P DELETE) [use NACRS] 5. Meet any of the high risk exclusion criteria below 6. Missing data for income quintile, sex, LHIN, or rurality
High-risk exclusion criteria	**Exclusion criteria within lookback window up to and including date of index event:** Lookback a maximum of 3 years from cohort entry or anytime between a patient's first eligible PHV and their last eligible PHV within the observation window for the following high risk exclusions unless otherwise stated: a. Signs and symptoms or diagnosis of cardiopulmonary disease [OHIP]- two physician claims within a two-year period with one of the following diagnostic codes (DXCODE): • 010-017 = Tuberculosis • 785 = Undiagnosed chest pain, tachycardia, syncope, shock, edema, masses • 786 = Undiagnosed epistaxis, hemoptysis, cough, dyspnea, masses, shortness of breath, hyperventilation, sleep apnea • 391 = Rheumatic fever with endocarditis, myocarditis or pericarditis • 402 = Hypertensive heart disease • 410 = Acute myocardial infarction • 412, 413 = Old myocardial infarction, chronic coronary artery disease of arteriosclerotic heart disease, without symptoms; angina pectoris • 415 = Pulmonary embolism, pulmonary infarction • 426 = Heart blocks, other conduction disorders

	• 427 = Paroxysmal tachycardia, atrial or ventricular flutter or fibrillation, cardiac arrest, other arrythmias • 428, 429 = Congestive heart failure; all other forms of heart disease • 432 = Intracranial haemorrhage • 435-437= transient cerebral ischemia, acute cerebrovascular accident, chronic arteriosclerotic cerebrovascular disease, hypertensive encephalopathy • 440 = Generalized arteriosclerosis, atherosclerosis • 441 = Aortic aneurysm (non-syphilitic) • 443 = Peripheral vascular disease • 446 = Polyarteritis nodosa, temporal arteritis • 447 = Other disorders of arteries • 451 = Phlebitis, thrombophlebitis • 452 = Portal vein thrombosis • 466 = Acute bronchitis • 491, 492 = Chronic bronchitis; emphysema • 494 = Bronchiectasis • 074 = Coxsackie myocarditis • 512 = Pneumothorax, spontaneous or tension • 511 = Pleurisy with or without effusion • 515 = Pulmonary fibrosis • 518 = Atelectasis, other disease of lung • 519 = Other diseases of the respiratory system • 530 = Esophagitis, cardiospasm, ulcer of esophagus • 745, 746 = Congenital anomalies of heart • 747 = Pulmonary artery stenosis, other anomalies of the circulatory system • 748 = Congenital anomalies of nose and respiratory system OR Signs, symptoms, or diagnosis related to the respiratory or cardiac system [CIHI – DAD] – at least one admission with one of the following ICD-10 diagnostic codes (DX10CODE:_): • Atrial fibrillation/flutter: I48; other cardiac arrhythmia (I44-147, I49) • Coronary artery disease: I20-I25 • Cardiac valvular disease: I05-I08, I09.1, I09.8, I34-I38 • Heart failure = I50 • Venous thromboembolism: I80.1, I80.2, I80.8, I82.2, I82.3, I82.8, I82.9 • Abnormalities of heart beat = R00 • Cardiac murmurs or other cardiac sounds = R01 • Abnormal blood pressure reading, without diagnosis = R03 • Abnormalities of breathing = R06 • Pain in throat and chest = R07 • Chest pain = R071-R074 • Previous cerebrovascular disease: I60, I61, I63, I64, G45, G46, H34 • Peripheral vascular disease: I70, I71, I73.1, I73.8, I73.9, I77.1, I79.0, I79.2, K55.1, K55.8, K55.9, Z95.8, Z95.9 • Other symptoms and signs involving the circulatory and respiratory system = R09, R098 • Pneumonia: Steptococcus pneumonia (J13); unspecified (J18.9); lobar pneumonia, unspecified (J18.1); bronchopneumonia,

	unspecified (J18.0) • R091 = Pleurisy • R092 = Respiratory arrest b. Prior or existing cancer diagnoses [OHIP, CIHI DAD]: • Two or more claims in OHIP with one of the following diagnostic codes (DXCODE): o Any neoplasm (malignant, unspecified or uncertain behavior) 140-165, 170-172, 174-215, 217-239 OR • One hospital admission in [CIHI DAD] with one of the following ICD-10 codes: C00-C43, C45-C97, D00-D03, D05-D09 c. Heart failure diagnosis [CHF] any time prior to cohort entry d. Hypertension diagnosis [HYPER] any time prior to cohort entry e. Asthma diagnosis [ASTHMA] any time prior to cohort entry f. Chronic obstructive pulmonary disease diagnosis [COPD] any time prior to entry g. Diabetes diagnosis [ODD] any time prior to entry h. Other comorbidities that suggest high risk for cardiopulmonary disease: • *High-risk for cardiopulmonary diseases*: o [OHIP] – two physician claims within a two-year period with one of the following diagnostic codes: AIDS (042), AIDS-related complex (043), other human immunodeficiency virus infection (044); essential, benign hypertension (401); hypertensive renal disease (403); acute renal failure (584), chronic renal failure, uremia (585); chest pain, tachycardia, syncope, shock, edema, masses (785) OR o [CIHI-DAD] – at least one admission with one of the following ICD-10 diagnostic codes: HIV (B20-B24); chronic renal disease (I12, I13, N03.2-N03.7, N05.2-N05.7, N17-19, N25.0, Z49, Z94.0, Z99.2) i. Visits to pulmonologist (respiratory disease specialist) (SPEC=47), cardiologist (SPEC=60), general thoracic surgeon (SPEC=64) or cardiothoracic surgeon (SPEC=09) – one of more claim(s) with the following [OHIP] fee codes: • *Outpatient consultations and visits:* o *Pulmonologist (47):* consultation (A475), comprehensive consultation (A470), limited consultation (A575), repeat consultation (A476), medical specific assessment (A473), medical specific re-assessment (A474), complex medical specific re-assessment (A471), partial assessment (A478) o *Cardiologist (60):* consultation (A605), comprehensive consultation (A600), limited consultation (A675), repeat consultation (A606), medical specific assessment (A603), medical specific re-assessment (A604), complex medical

	specific re-assessment (A601), partial assessment (A608) o *General thoracic surgery (64):* consultation (A645), special surgical consultation (A935) with SPEC=64, repeat consultation (A646), specific assessment (A643), partial assessment (A644) o *Cardiothoracic surgery (09):* consultation (A095), special surgical consultation (A935) with SPEC=09, repeat consultation (A096), specific assessment (A093), partial assessment (A094) • *Non-emergency hospital in-patient services:* o *Pulmonologist (47):* consultation (C475), comprehensive consultation (C470), limited consultation (C575), repeat consultation (C476), medical specific assessment (C473), medical specific re-assessment (C474), complex medical specific re-assessment (C471); subsequent visits – first five weeks (C472), sixth to thirteenth week inclusive (C477), after thirteenth week (C479); concurrent care (C478) o *Cardiologist (60):* consultation (C605), comprehensive consultation (C600), limited consultation (C675), repeat consultation (C606), medical specific assessment (C603), medical specific re-assessment (C604), complex medical specific re-assessment (C601); subsequent visits – first five weeks (C602), sixth to thirteenth week inclusive (C607), after thirteenth week (C609); concurrent care (C608) o *General thoracic surgery (64):* consultation (C645), repeat consultation (C646), specific assessment (C643), specific re-assessment (C644); subsequent visits – first five weeks (C642), sixth to thirteenth week (C647), after thirteenth week (C649); concurrent care (C648); special surgical consultation (C935) where SPEC=09 o *Cardiac surgeon (09):* consultation (C095); repeat consultation (C096); specific assessment (C093); specific re-assessment (C094); subsequent visits – first five weeks (C092), sixth to thirteenth week inclusive (C097), after thirteenth week (C099); concurrent care (C098); special surgical consultation (C935) where SPEC=09 o OR any of the following fee codes where SPEC=47 (pulmonologist) OR SPEC=60 (cardiologist) OR SPEC=64 (general thoracic surgeon) OR SPEC=09 (cardiothoracic surgeon) for the Most Responsible Physician (MRP): ▪ Subsequent visits by the MRP – day following hospital admission assessment (C122), second day following the hospital assessment (C123), day of discharge (C124); subsequent visits by the MRP following transfer from an intensive care area – first visit (C142), second visit (C143), additional visits due to intercurrent illness (C121) j. History of prior cardiothoracic tests and procedures: *Cardiothoracic procedures:* • Misc surgical procedures: o [OHIP]: thoracotomy (M137, M134, Z401, Z414, R750), pericardiectomy (R748, R749), cardiotomy (R706-R714, E660, E661, E658), cardiovascular excisions (R920, R746, R747, E648, R741, E651),

	cardiac or cardiopulmonary transplantation (R874, R870) • Aortic valve replacement: o [OHIP] FEECODE = R738, R863 o [CIHI-DAD] CCI code = 1HV90 • Mitral valve replacement: o [OHIP] FEECODE = R735 o [CIHI-DAD] CCI code = 1HU90 • Coronary artery repair/revascularization: o [OHIP] FEECODE = Z434, Z448, Z449, Z460, Z461, R742, R743; resection coarctation (R758); other heart and pericardium repair (R720-R723, R922-R929, R768-R771) o [CIHI-DAD] CCI codes = 1IJ126, 1IJ50, 1IJ55, 1IJ57, 1IJ76, 1IJ80 • Cardiac catheterization: o [OHIP]: Z439, Z440, Z441, Z442, Z456, Z457, G263, G269, G285, G286 • Device implantation: o [OHIP] FEECODE = ventricular assist devices (R701-R705), implantation of cardioverter defibrillator (R753, R761, Z415), cardiac massage including placement and replacement of pacemakers (R765, Z433, Z444, Z445, Z435, R752, R751, Z429) o [CIHI-DAD] CCI codes = 1HZ53GRFS, 1HZ53LAFS, 1HZ53GRNM, 1HZ53LANM, 1HZ53GRNK, 1HZ53LANK, 1HZ53GRNL, 1HZ53LANL, 1HZ53GRFR, 1HZ53LAFR • Pneumonectomy or lobectomy: o [OHIP] fee codes = M142 (pneumonectomy), M143 (lung lobectomy) o [CIHI-DAD] CCI codes = 1GR87:_(excision partial, lobe of lung), 1GR89:_ (excision total, lobe of lung), 1GR91:_ (excision radical, lobe of lung); history of lobectomy or pneumonectomy (Z902:_, Z8511:_) k. Patients who experienced severe trauma or injury to chest: • [OHIP] – one or more claims with the following diagnostic codes: o *Fractures:* Vertebral column – with spinal cord damage (806), ribs (807), clavicle (810) o 869 = Internal injuries to organ(s) OR • [CIHI – DAD, CIHI - NACRS] – at least one admission or ambulatory visit with the following ICD-10 diagnostic codes: o *Fractures:* thoracic vertebrae, sternum and ribs (S220-SS229), clavicle (S420), scapula (S421) o *Dislocations, sprains and strain of thoracic joints and ligaments:* S230-S235 o *Injury of thoracic blood vessels:* S250-S259 o *Injury of intrathoracic organs (includes pneumothorax, hemothorax and hemopneumothorax):* S26:_, S270-S279 o *Crushed chest*: S28

	o *Other and unspecified injuries of thorax*: S290-S299
Notes: Where noted, specific variables are noted by their fully capitalized name (NAME). Any codes with abbreviated notation (ex. S26:_) are presented in this format (consistent with SAS coding) to show that any codes starting with the characters/values preceding the colon and underscore (:_) will be captured.	

Appendix 1.2 *Outcome measurement*

Primary Outcome Definition	≥ 1 CXR test following a periodic health examination [use OHIP]: CXR test (based on feecodes below) claimed within **7 days** after index event with the physnum OR refphys equivalent to the physnum on the index annual health exam claim: a. CXR single view = X090 b. CXR two views = X091 c. CXR three or more views = X092
Event exclusions	**Exclusions during observation window for each patient:** Any chest X-rays done during visits to hospital, emergency department, during admission process or inpatient stay within 7 days of index event [NACRS, OHIP, DAD] are excluded from the numerator and not captured as events: • Visit date (REGDATE) in NACRS = SERVDATE in OHIP for CXR claim (FEECODE = X090, X091, X092) OR ED visit (EDVISIT=1) in NACRS with following CCI code: 3GY10 (X-ray, thoracic cavity) • Exclude CXR claims (FEECODE = X090, X091, X092) where SERVDATE = between ADMDATE and DDATE in DAD
Notes: Where noted, specific variables are noted by their fully capitalized name (NAME).	

Appendix 1.3. Preliminary analysis results.

Appendix 1.3.1. Proportion of chest X-rays (CXR) occurring within 30 days of PHV/AHE that happened within 7 days of PHV/AHE.

Date of CXR after PHV/AHE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not within 7 days	29027	29.65	29027	29.65
Within 7 days	68880	70.35	97907	100.00

Appendix 1.3.2. Distribution of chest X-rays (CXR) occurring after a periodic health examination by time from visit/exam.

Days after PHV/AHE	No. CXR	% CXR within 30 d	Cumulative Frequency	Cumulative Percent
0	40150	41.01	40150	41.01
1	7297	7.45	47447	48.46
2	4326	4.42	51773	52.88
3	3452	3.53	55225	56.41
4	3167	3.23	58392	59.64
5	2935	3.00	61327	62.64
6	3076	3.14	64403	65.78
7	4477	4.57	68880	70.35
8	2767	2.83	71647	73.18
9	2056	2.10	73703	75.28
10	1691	1.73	75394	77.01
11	1542	1.57	76936	78.58
12	1513	1.55	78449	80.13

Appendix to: Bouck Z, Mecredy G, Ivers NM, et al. Routine use of chest x-ray for low-risk patients undergoing a periodic health examination: a retrospective cohort study. *CMAJ Open* 2018. doi: 10.9778/cmajo.20170138.

Days after PHV/AHE	No. CXR	% CXR within 30 d	Cumulative Frequency	Cumulative Percent
13	1683	1.72	80132	81.85
14	2651	2.71	82783	84.55
15	1556	1.59	84339	86.14
16	1140	1.16	85479	87.31
17	1013	1.03	86492	88.34
18	931	0.95	87423	89.29
19	921	0.94	88344	90.23
20	1082	1.11	89426	91.34
21	1614	1.65	91040	92.99
22	1036	1.06	92076	94.04
23	715	0.73	92791	94.77
24	623	0.64	93414	95.41
25	624	0.64	94038	96.05
26	602	0.61	94640	96.66
27	772	0.79	95412	97.45
28	1136	1.16	96548	98.61
29	743	0.76	97291	99.37
30	616	0.63	97907	100.00

Appendix 1.4. *Covariates*

History of hospitalization in 5 years prior to cohort entry [DAD]	• Dichotomous variable for any admissions to hospital other than admissions with high risk diagnoses defined in exclusion criteria above (including hospital admission codes included in CHF, ODD, HYPER, ASTHMA and COPD case definitions)
Mental health care in past year [OHIP, DAD]	• Outpatient physician claim by family physician (SPEC=00) with one of the following OHIP DXCODE values: 295-304, 306, 309, 311, 897-902, 904-906, 909 OR • Any hospitalization in CIHI DAD with a mental health ICD-10 code: F00-F99 OR • Any billing by a psychiatrist (SPEC=19) in OHIP
Dementia diagnosis in 5 years prior to cohort entry [OHIP, DAD]	Dementia diagnosis in 5 years prior to cohort entry [OHIP, CIHI DAD]: • Outpatient physician visit claim in OHIP with one of the following diagnostic codes: 290, 331, 797 OR

	• One hospital admission in CIHI DAD with one of the following ICD-10 codes: F00.0, F00.1, F00.2, F00.9, F01.0, F01.1, F01.2, F01.3, F01.8, F01.9, F02.0, F02.1, F02.2, F02.3, F02.4, F02.8, F03.X, F05.1, F06.5, F06.6, F06.8, F06.9, F09.X, G300, G30.1, G30.8, G30.9, G31.0 G31.1, R54.X
Rheumatological disease diagnoses in 5 years prior to cohort entry [OHIP, DAD]	• At least three physician visit claims with OHIP diagnostic code 714 over two-year period with at least one visit to a rheumatologist (SPEC=48) or internist (SPEC=13) OR • At least two outpatient physician visit claims within 1 year in OHIP with one of the following diagnostic codes: 710, 711, 715, 730, 733
Primary care practice model	A practice (a group of three or more physicians submitting joint billing claims to OHIP) was noted as belonging to one of the following payment models: • Fee-for-service (FFS): o Should be family physicians who didn't switch from the old FFS model into one of the reformed family practice models. o Old model involves remuneration by FFS payments only with no incentives for services rendered to rostered patients (distinction from FFS and CCM). As a result, under old model physicians did not formally roster patients. This model is more prevalent among small group practices, informing our exclusion of practices with < 3 physicians submitting joint claims to hopefully limit the number of practices using the old FFS model. • Family health groups: o Family health groups are primarily reimbursed via FFS with additional incentives and bonuses for services to enrolled patients • Family health networks: o Reimbursed via blended capitation model plus bonus and incentives for rostered patient services • Family health teams: o Interdisciplinary teams reimbursed via blended capitation, blended salary, or complement-based remuneration plus bonus and incentives • Other: o Includes remaining payment models including community health centres (salaried model) and rural-northern physician group agreements (complement-based remuneration plus bonus and incentives) *Note*: We did not capture physicians under CCM, as these physicians often do not submit joint claims to OHIP (i.e. typically solo physicians)."
Notes: Where noted, specific variables are noted by their fully capitalized name (NAME).	

