

Supplemental Material

Table S1. Cardiac disease diagnosis codes

Diagnosis	ICD-9 codes	ICD-10 codes
Heart failure	428	I099,I255,I420,I425,I426,I427,I428,I429,I43, I50,P290
Ischemic heart disease	410-414	I20-I24
Myocardial Infarction	410	I21, I22, I252
Atrial Fibrillation	427.3	I48

ICD- International Classification of Disease

Table S2. Non-cardiac disease diagnosis codes¹

Diagnosis	ICD-9 codes	ICD-10 codes	OHIP	ODBD
Peripheral Vascular Disease	440-448, 785.4	I70,I71,I731,I738,I739,I771,I790,I792,K551,K558,K559,Z958,Z959		
Cerebrovascular Disease	430-438	G45,G46,H340,I60,I61,I62,I63,I64,I65,I66,I67,I68,I69		
Chronic Obstructive Pulmonary Disease	410	I278,I279,J40,J41,J42,J43, J44,J45, J46, J47, J60, J61, J62, J63, J64, J65, J66, J67, J684, J701, J703		
Cognitive Impairment / Dementia	290.0-290.9, 331.0	F00,F01,F02,F03,F051, G30,G311,G041,G114, G801,G802,G81,G82,G830,G831,G832,G833,G834,G839	290, 331, 797	Any cholinesterase inhibitor script in ODB during 1 year prior to index, ODB subclnam =: 'CHOLINESTERASE INHIBITOR'
Metastatic Cancer	196-199	C77-C80		
Non-metastatic Cancer	140-172, 174-195, 200-208	C0, C1, C20-C26, C30-C34, C37-C41, C43, C45-C58, C6, C70-C76, C81-C85, C88, C90-C97		

ICD- International Classification of Disease; OHIP- Ontario Health Insurance Plan; ODBD- Ontario Drug Benefits Database

Table S3. List of codes for Procedures^{2, 3}

Procedure	CCI (ICD-10) codes	OHIP codes	CCP Codes
Percutaneous coronary intervention	1IJ50, 1IJ54GQAZ, 1IJ57GQ	Z434	48.02, 48.03
Coronary artery bypass surgery	1IJ76	R742, R743	48.1
Mitral Valve Surgery	1HU80, 1HU90	R734-735	47.02, 42.12, 47.22, 47.23
Tricuspid Valve Surgery	1HS80	R728	47.04, 47.14, 47.26, 47.27
Aortic Valve Surgery	1HV80, 1HV90	R738, R863	47.03, 47.13, 47.24, 47.25
Pulmonary Valve Surgery	1HS90, 1HT80 1HT89, 1HT90	R772	47.05, 47.15, 47.28, 47.29
Permanent pacemaker implantation	1HZ53GRNM, 1HZ53LANM, 1HZ53GRNK, 1HZ53LANK, 1HZ53GRNL, 1HZ53LANL, 1HZ53GRFR, 1HZ53LAFR	R752	49.71
Implantable cardiac defibrillator	1HZ53GRFS, 1HZ53LAFS	R761, R753	49.74
Chronic Dialysis (2 codes at least 90 days apart but no more than 150 days separating the first and second code)	1PZ21HQBR 1PZ21HPD4	R849, R850, G323, G325, G326, G330, G331, G332, G860, G333, G083, G091, G085, G295, G082, G090, G092, G093, G094, G861, G862, G863, G864, G865, G866, G294, G095, G096	51.95, 66.98

ICD- International Classification of Disease; CCI- Canadian Classification of Health Interventions; CCP- Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures

Table S4. In Hospital Complications^{1, 3, 4}

Diagnosis	ICD-9 codes/[CCI Codes]	ICD-10 codes/[CCP Codes]	OHIP
<p>Acute Kidney Injury</p> <p>A diagnosis code for acute kidney injury with ≥ 1 code for dialysis during the same hospitalization</p>	<p>Acute Kidney Injury 584.5-584.9, 669.3, 958.5 634.3, 635.3, 636.3, 637.3, 638.3, 639.3</p> <p>Dialysis [51.95, 66.98]</p>	<p>Acute Kidney Injury N17.0-N17.9, O08.4, T79.5, O90.4</p> <p>Dialysis [1PZ21HQBR, 1PZ21HPD4]</p>	<p>Dialysis R849, R850, G323, G325, G326, G330, G331, G332, G860, G333, G083, G091, G085, G295, G082, G090, G092, G093, G094, G861, G862, G863, G864, G865, G866, G294, G095, G096</p>
<p>Bleeding (VARC-2)</p> <p>Classify as:</p> <p>Life-threatening or Disabling or Major Bleeding = Any bleeding code and ≥ 2 units of blood transfused (Blood=BTREDBC) AND All intracranial bleeding</p> <p>Minor Bleeding = Any non-intracranial bleeding code and < 2 units of blood transfused (Blood=BTREDBC)</p>		<p>Gastrointestinal I850, K226, K250, K252, K254, K256, K 260, K 262, K264, K266, K270, K272, K274, K276, K280, K284, K286, K290, K625, K661, K920, K921, K922</p> <p>Intracranial I600, I601, I602, I603, I604, I605, I606, I607, I608, I609, I610, I611, I612, I613, I614, I615, I616, I618, I619, I620, I621, I629</p> <p>Urological N020-029, R310, R311, R318</p> <p>Pulmonary Bleeding R040, R041, R042, R048, R049</p> <p>Other Bleeding R58, T810</p>	

Stroke/TIA

362.3, 430, 431, 434, 435, 436

I60, I61, I63 (excluding I63.6), I64,
H34.0, H34.1, G45 (excluding
G45.4)

ICD- International Classification of Disease; CCI- Canadian Classification of Health Interventions; CCP- Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures; VARC-2 Valve Academic Research Consortium 2; TIA – Transient Ischemic Attack

Table S5. Cause-specific Readmissions¹

Diagnosis	ICD-9 codes	ICD-10 codes
Cardiovascular (primary diagnosis)	Acute Myocardial Infarction 410	Acute Myocardial Infarction I21, I22
	Stroke 430, 431, 434, 436, 362.3	Stroke I60, I61, I63 (excluding I63.6), I64, H34.1
	Heart Failure 428	Heart Failure I50
	Hypertension NA	Hypertension I10, I11, I12, I13 or I15
	Unstable Angina 411, 413	Unstable Angina I20
	Ischemic Stroke 434, 436, 362.3	Ischemic Stroke I63, I64, H34.1 (excluding I63.6)
	Hemorrhagic Stroke 430, 431	Hemorrhagic Stroke I60, I61
	Transient Ischemic Attack 435	Transient Ischemic Attack G45 (excluding G45.4), H34.0
	Atrial Fibrillation 427.3	Atrial Fibrillation I48
	Abdominal Aortic Aneurysm 441.3, 441.4	Abdominal Aortic Aneurysm I71.3, I71.4
Peripheral Arterial Disease 440.2, 443.9, 444.2	Peripheral Arterial Disease I70.2, I73.9, I74.3, I74.4	
Non-cardiovascular	Not meeting criteria for Cardiovascular readmission	

ICD- International Classification of Disease

Table S6. Comparison Between Patients Surviving to Discharge and Dying In-hospital

Baseline And Procedural Characteristics	Survived Hospitalization (N=709)	Died In Hospital (N=27)	p-value
Demographic Characteristics			
Age, median, yrs (IQR)	84 (79-87)	86 (84-89)	0.061
Female, n (%)	300 (42.3%)	16 (59.3%)	0.081
Socioeconomic Status			
1st Quintile (lowest)	124 (17.5%)	0 (0.0%)	0.553
2nd Quintile	135 (19.0%)	SC	
3rd Quintile	138 (19.5%)	SC	
4th Quintile	149 (21.0%)	6 (22.2%)	
5th Quintile (highest)	159 (22.4%)	SC	
Missing	SC	9 (33.3%)	
Cardiac History			
Prior Myocardial Infarction, n (%)	224 (31.6%)	7 (25.9%)	0.533
Ischemic Heart Disease, n (%)	514 (72.5%)	19 (70.4%)	0.808
History of Heart Failure, n (%)	632 (89.1%)	21 (77.8%)	0.067
Heart Failure Hospitalization within 90 days	127 (17.9%)	SC	0.936
New York Heart Association Class			
I and II	107 (15.1%)	SC	0.303
III and IV	474 (66.8%)	15 (55.6%)	
Missing	128 (18.1%)	SC	
Left Ventricular Ejection Fraction, n (%)			
≤50%	183 (25.8%)	SC	0.031
>50%	514 (72.5%)	22 (81.5%)	
Missing	12 (1.7%)	SC	
Prior Cardiac Surgery, n (%)			
Coronary Artery Bypass Grafting	244 (34.4%)	SC	0.034
Aortic Valve Replacement	65 (9.2%)	SC	0.329
Mitral Valve Replacement or Repair	16 (2.3%)	0 (0.0%)	0.430
Tricuspid Valve Replacement or Repair	SC	0 (0.0%)	0.782
History of Percutaneous Coronary Intervention, n (%)	247 (34.8%)	10 (37.0%)	0.814
History of Implantable Cardiac Defibrillator, n (%)	12 (1.7%)	0 (0.0%)	0.496

History of Permanent Pacemaker, n (%)	87 (12.3%)	SC	0.857
Atrial Fibrillation/Flutter, n (%)	228 (32.2%)	10 (37.0%)	0.595
Co-morbid Non-cardiac Conditions			
Diabetes, n (%)	326 (46.0%)	11 (40.7%)	0.592
Hypertension, n (%)	678 (95.6%)	26 (96.3%)	0.867
Hyperlipidemia, n (%)	510 (71.9%)	15 (55.6%)	0.065
Peripheral Vascular Disease, n (%)	90 (12.7%)	SC	0.376
Cerebrovascular Disease, n (%)	126 (17.8%)	SC	0.372
Chronic Obstructive Pulmonary Disease, n (%)	104 (14.7%)	8 (29.6%)	0.034
History of Cancer, n (%)	55 (7.8%)	SC	0.947
Cognitive Impairment / Dementia, n (%)	12 (1.7%)	0 (0.0%)	0.496
Dialysis, n (%)	23 (3.2%)	SC	0.895
Frailty, n (%)	138 (19.5%)	6 (22.2%)	0.723
Pre-procedural Blood Work			
Serum Creatinine, n (%)			
< 120 µmol/L	486 (68.5%)	6 (22.2%)	0.092
120 - 200 µmol/L	143 (20.2%)	14 (51.9%)	
≥ 200 µmol/L	31 (4.4%)	SC	
Missing	49 (6.9%)	SC	
Hemoglobin Status, n (%)			
Anemia*	448 (63.2%)	14(51%)	0.150
Missing	68 (9.6%)	6 (22.2%)	
Pre-procedural Echocardiographic Parameters			
Mean transvalvular gradient, mean, mmHg, (SD)†	46 (15)	46 (16)	0.873
Pre-procedural Risk Score			
Society of Thoracic Surgeons Score, mean, %, (SD)‡	13 (12)	18 (11)	0.162
Procedural Characteristics			
Year of Transfemoral Aortic Valve Replacement, n (%)			
2007	9 (1.3%)	SC	0.934
2008	11 (1.6%)	0 (0.0%)	

2009	39 (5.5%)	SC	
2010	72 (10.2%)	SC	
2011	132 (18.6%)	SC	
2012	147 (20.7%)	SC	
2013	228 (32.2%)	8 (29.6%)	
2014	71 (10.0%)	SC	
Prosthesis Type, n (%)			
Edwards Sapien	312 (44.0%)	11 (40.7%)	<.001
Corevalve	368 (51.9%)	11 (40.7%)	
Missing	24 (3.4%)	SC	
Other	SC	SC	
Valve-in-valve, n (%)	33 (4.7%)	SC	0.817

*Men < 140 g/L and Female < 120 g/L

† n=90 (12.5%) missing

‡ n=458 (64.6%) missing

IQR: interquartile range, SD: standard deviation

SC indicates small cell, in which patient numbers ≤ 5 and cannot be released due to privacy regulations

Table S7. Effect Estimates of Baseline Predictor Variables Used in Multivariable Models

Variable	30-day All-Cause Readmission		1-Year All-Cause Readmission	
	Hazard Ratio (95% CI)	p-value	Hazard Ratio (95% CI)	p-value
Age (per year)	1.03 (1.00 - 1.06)	0.084	1.01 (0.99 - 1.03)	0.246
Female	0.71 (0.16 - 1.26)	0.221	0.85 (0.56 - 1.14)	0.278
Pre-existing Frailty	1.23 (0.94 - 1.52)	0.155	1.23 (1.06 - 1.40)	0.015
LVEF > 50% *	1.17 (0.47 - 1.87)	0.659	1.08 (0.76 - 1.04)	0.632
Pre-existing Peripheral Vascular Disease	1.27 (0.85 - 1.69)	0.259	1.10 (0.92 - 1.28)	0.329
Pre-existing Cerebrovascular Disease	1.21 (0.83 - 1.59)	0.326	1.01 (0.82 - 1.20)	0.957
Pre-existing Chronic Obstructive Pulmonary Disease	1.16 (0.72 - 1.60)	0.513	1.48 (1.19 - 1.77)	0.007
Creatinine < 120 µmol/L †	1.37 (0.81 - 1.93)	0.274	0.76 (0.44 - 1.08)	0.099
Heart Failure Hospitalization within 90 days	1.80 (1.48 - 2.12)	0.000	1.18 (0.88 - 1.48)	0.286
Year of Transcatheter Aortic Valve Replacement (per year) ‡	0.90 (0.75 - 0.05)	0.168	0.95 (0.89 - 1.01)	0.108
Post-procedural Warfarin Use	-	-	1.30 (1.00 - 1.60)	0.089

CI: confidence interval

* reference LVEF ≤ 50%, † reference creatinine ≥120 µmol/L ‡ reference year 2007

Supplemental References:

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2. Lee DS, Stitt A, Wang X, Yu JS, Gurevich Y, Kingsbury KJ, Austin PC, Tu JV. Administrative hospitalization database validation of cardiac procedure codes. *Med Care*. 2013;51:e22-26.
3. Wald R, Quinn RR, Luo J, Li P, Scales DC, Mamdani MM, Ray JG, University of Toronto Acute Kidney Injury Research G. Chronic dialysis and death among survivors of acute kidney injury requiring dialysis. *JAMA*. 2009;302:1179-1185.
4. Ko DT, Yun L, Wijesundera HC, Jackevicius CA, Rao SV, Austin PC, Marquis JF, Tu JV. Incidence, predictors, and prognostic implications of hospitalization for late bleeding after percutaneous coronary intervention for patients older than 65 years. *Circ Cardiovasc Interv*. 2010;3:140-147.