

Supplementary Table 1 ICD-10 and PCS Codes for Comorbidities, Outcomes, and Procedures – identified using Clinical Classifications Software*

Hypertension	I10, I11, I12, I13, I15, I16
Dyslipidaemia	E780, E781, E782, E784, E785, E789
Atrial fibrillation	I480, I481, I482, I483, I484, I4891
Diabetes mellitus	E08, E09, E10, E11, E12, E13
Prior PCI	Z955
Prior CABG	Z951
Chronic kidney disease	N181, N182, N183, N184, N185, N186, N189
HF _r EF	I5020, I5021, I5022, I5023
HF _p EF	I5030, I5031, I5032, I5033
Obesity	E660, E6601, E6609, E661, E662, E663, E668, E669
Liver disease	B18, I85, I864, I982, K70, K711, K713, K714, K715, K717, K72, K73, K74, K760, K762, K763, K764, K765, K766, K767, Z944
Chronic obstructive pulmonary disease	I278, I279, J40, J41, J42, J43, J44, J45, J46, J47, J60, J61, J62, J63, J64, J65, J66, J67, J684, J701, J703
peptic ulcer disease	K250, K251, K252, K253, K254, K255, K256, K257, K260, K261, K262, K263, K264, K265, K266, K267, K270, K271, K272, K273, K274, K275, K276, K277, K280, K281, K282, K283, K284, K285, K286, K287
Obstructive sleep apnea	G4733
Peripheral vascular disease	I700, I701, I702, I703, I704, I705, I706, I707, I708, I709, I738, I739
Stroke/TIA	I630, I631, I632, I633, I634, I635, I636, I638, I639, G459
Dementia	F0150, F0151, F0390, F0391
Anemia	D649, D500, D509
Depression	F320, F321, F322, F323, F324, F325, F326, F327, F328, F329, F330, F331, F332, F333, F334, F335, F336, F337, F338, F339, F330 to F339
Alcohol use disorder	F1010, F10120, F1020, F1021, F10220, F109
Smoking history or current	F17200, F17210, F17220, F17290, Z7282, Z87891
Cannabis use disorder	F1210, F12120, F1220, F1221, F129
NSTEMI	I214, I222
PCI	027*
Acute Kidney Injury	N17, N19
Hemodialysis	5A1D00Z, 5A1D60Z, 5A1D70Z, 5A1D80Z, 5A1D90Z
Pulmonary Edema	J81
Acute Respiratory Failure	J96, J80, R092
Invasive Mechanical Ventilation	5A09B5K, 5A09C5K, 5A09D5K, 5A1935Z, 5A1945Z, 5A1955Z
Cardiogenic Shock	R57, T8111XA, T8111XD, T8111XS

Mechanical Circulatory Support	5A02, 02HA, 5A15223, 5A1522F, 5A1522G
Hypotension	I95
Pulmonary Embolism	I26
Cardiac Arrest	I46
Delirium	F04, F05, F06, F07, F09, R410
Bleeding Complications	D7802, D7822, D7832, E3602, E89811, E89821, G9732, G9752, G9762, H59121, H59122, H59123, H59129, H59321, H59322, H59323, H59329, H59341, H59342, H59343, H59349, H9522, H9542, H9552, I97410, I97418, I9742, I97610, I97618, I9762, I97620, I97621, I97630, I97638, J9562, J95831, J95861, K9162, K91841, K91871, K9401, K9411, K9421, K9431, L7602, L7622, L7632, M96811, M96831, M96841, N99520, N99530, N9962, N99821, N99841, I9751, I9752, M7981, R58, D62, I6000, I6001, I6002, I6010, I6011, I6012, I602, I6020, I6021, I6022, I6030, I6031, I6032, I604, I6050, I6051, I6052, I606, I607, I608, I609, I610, I611, I612, I613, I614, I615, I616, I618, I619, I6200, I6201, I6202, I6203, I621, I629, K250, K252, K260, K262, K270, K272, K280, K282, K625, K920, K921, K922, K683, R310
Transfusion of blood or blood products	30230H0, 30230H1, 30230N0, 30230N1, 30230P0, 30230P1, 30230Q0, 30230Q1, 30230R0, 30230R1, 30233H0, 30233H1, 30233N0, 30233N1, 30233P0, 30233P1, 30233Q0, 30233Q1, 30233R0, 30233R1, 30240H0, 30240H1, 30240N0, 30240N1, 30240P0, 30240P1, 30240Q0, 30240Q1, 30240R0, 30240R1, 30243H0, 30243H1, 30243N0, 30243N1, 30243P0, 30243P1, 30243Q0, 30243Q1, 30243R0, 30243R1, 30250H0, 30250H1, 30250N0, 30250N1, 30250P0, 30250P1, 30250Q0, 30250Q1, 30250R0, 30250R1, 30253H0, 30253H1, 30253N0, 30253N1, 30253P0, 30253P1, 30253Q0, 30253Q1, 30253R0, 30253R1, 30260H0, 30260H1, 30260N0, 30260N1, 30260P0, 30260P1, 30260Q0, 30260Q1, 30260R0, 30260R1, 30263H0, 30263H1, 30263N0, 30263N1, 30263P0, 30263P1, 30263Q0, 30263Q1, 30263R0, 30263R1
Abbreviations:	
PCI: Percutaneous coronary intervention; CABG: Coronary artery bypass grafting; NSTEMI: Non-ST-elevation myocardial infarction; HFrEF: Heart failure with reduced ejection fraction; HFpEF: Heart failure with preserved ejection fraction; TIA: Transient ischemic attack	
References:	
• Clinical Classifications Software Refined (CCSR) for ICD-10-CM Diagnoses. Healthcare	

Cost and Utilization Project (HCUP). 02 2024. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/toolssoftware/ccsr/dxccsr.jsp.

- **ICD Code Lookup.** (n.d.). *ICD-10 Codes Lookup*. Retrieved April 15, 2025, from <https://icdlookup.com/icd-10/codes>
- *ICD codes shown are stems; all descendant codes were counted (e.g., E08.x)

Supplementary Table 2: ICD-10 Codes Which are Included in The Hospital Frailty Risk Scoring System

ICD-10 code	ICD Description
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E46	Unspecified protein-energy malnutrition
F00, F01, F02, F03, F05	
F00*	Dementia in Alzheimer's disease
F00.0*	Dementia in Alzheimer's disease with early onset (G30.0+)
F00.1*	Dementia in Alzheimer's disease with late onset
F00.2*	Dementia in Alzheimer's disease, atypical or mixed type
F00.9*	Dementia in Alzheimer's disease, unspecified
F01	Vascular dementia
F01.0	Vascular dementia of acute onset
F01.1	Multi-infarct dementia
F01.2	Subcortical vascular dementia
F01.3	Mixed cortical and subcortical vascular dementia
F01.8	Other vascular dementia
F01.9	Vascular dementia, unspecified
F02*	Dementia in other diseases classified elsewhere
F02.0*	Dementia in Pick's disease A
F02.1*	Dementia in Creutzfeldt-Jakob disease
F02.2*	Dementia in Huntington's disease
F02.3*	Dementia in Parkinson's disease
F02.4*	Dementia in human immunodeficiency virus [HIV] disease
F02.8*	Dementia in other specified diseases classified elsewhere
F03	Unspecified dementia
F05	Delirium, not induced by alcohol and other psychoactive substances
F05.0	Delirium not superimposed on dementia, so described
F05.1	Delirium superimposed on dementia
F05.8	Other delirium
F05.9	Delirium, unspecified
R15	Faecal incontinence
R26.2	Difficulty in walking, not elsewhere classified
R26.8	Other and unspecified abnormalities of gait and mobility
R32	Unspecified urinary incontinence
R40	Somnolence, stupor and coma
R41	Other symptoms and signs involving cognitive functions and awareness
R41.0	Disorientation, unspecified
R41.1	Anterograde amnesia
R41.2	Retrograde amnesia
R41.3	Other amnesia
R41.8	Other and unspecified symptoms and signs
R46.0	Very low level of personal hygiene
R54	Senility
W00-W19	Falls
Z73.9	Problem related to life-management difficulty, unspecified

Z74	Problems related to care-provider dependency
Z74.0	Reduced mobility, bedfast, chairfast
Z74.1	Need for assistance with personal care
Z74.2	Need for assistance at home, and no other household member is able to render care
Z74.3	Need for continuous supervision
Z74.8	Other problems related to care-provider dependency
Z74.9	Problem related to care-provider dependency, unspecified
Z99.3	Dependence on a wheelchair

References:

- **Gilbert T**, Neuburger J, Kraindler J, Keeble E, Smith P, Ariti C, Arora S, Street A, Parker S, Roberts HC, Bardsley M, Conroy S. Development and validation of a Hospital Frailty Risk Score focusing on older people in acute care settings using electronic hospital records: an observational study. Lancet 2018; 391: 1775–1782. [PMID: 29706364 DOI: 10.1016/S0140-6736(18)30668-8]

Supplementary Table 3 Charlson Comorbidity Index: ICD-10-CM (Enhanced Quan Algorithm) Weights and Code Mappings

Weight	Comorbidity	ICD-10 (Enhanced)
1	Myocardial infarction	I21.x, I22.x, I25.2
1	Congestive heart failure	I09.9, I11.0, I13.0, I13.2, I25.5, I42.0, I42.5–I42.9, I43.x, I50.x, P29.0
1	Peripheral vascular disease	I70.x, I71.x, I73.1, I73.8, I73.9, I77.1, I79.0, I79.2, K55.1, K55.8, K55.9, Z95.8, Z95.9
1	Cerebrovascular disease	G45.x, G46.x, H34.0, I60.x–I69.x
1	Dementia	F00.x–F03.x, F05.1, G30.x, G31.1
1	Chronic pulmonary disease	I27.8, I27.9, J40.x–J47.x, J60.x–J67.x, J68.4, J70.1, J70.3
1	Connective tissue disease/ Rheumatic disease	M05.x, M06.x, M31.5, M32.x–M34.x, M35.1, M35.3, M36.0
1	Peptic ulcer disease	K25.x–K28.x
1	Mild liver disease	B18.x, K70.0–K70.3, K70.9, K71.3–K71.5, K71.7, K73.x, K74.x, K76.0, K76.2–K76.4, K76.8, K76.9, Z94.4
1	Diabetes without chronic complication	E10.0, E10.1, E10.6, E10.8, E10.9, E11.0, E11.1, E11.6, E11.8, E11.9, E12.0, E12.1, E12.6, E12.8, E12.9, E13.0, E13.1, E13.6, E13.8, E13.9, E14.0, E14.1, E14.6, E14.8, E14.9
2	Diabetes with chronic complication	E10.2–E10.5, E10.7, E11.2–E11.5, E11.7, E12.2–E12.5, E12.7, E13.2–E13.5, E13.7, E14.2–E14.5, E14.7

2	Hemiplegia or paraplegia	G04.1, G11.4, G80.1, G80.2, G81.x, G82.x, G83.0–G83.4, G83.9
2	Moderate or severe renal disease	I12.0, I13.1, N03.2–N03.7, N05.2–N05.7, N18.x, N19.x, N25.0, Z49.0–Z49.2, Z94.0, Z99.2
2	Any Tumor	C00.x–C26.x, C30.x–C34.x, C37.x–C41.x, C43.x, C45.x–C58.x, C60.x–C76.x
2	Leukemia	C90.x, C91.x, C92.x, C93.x, C94.x, C95.x, C96.x, C97.x
2	Lymphoma	C81.x, C82.x, C83.x, C84.x, C85.x, C88.x
3	Moderate or severe liver disease	I85.0, I85.9, I86.4, I98.2, K70.4, K71.1, K72.1, K72.9, K76.5, K76.6, K76.7
6	Metastatic solid tumor	C77.x–C80.x

References:

- **Charlson ME**, Pompei P, Ales KL, Mackenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *Journal of Chronic Diseases* 1987; 40: 373–383. [PMID: 3558716 DOI: 10.1016/0021-9681(87)90171-8]
- **Quan H**, Sundararajan V, Luthi J-C, Saunders LD, Feasby TE, Ghali WA, Beck CA, Burnand B, Halfon P, Fong A. Coding Algorithms for Defining Comorbidities in ICD-9-CM and ICD-10 Administrative Data. *Medical Care* 2005; **43**: 1130–1139. [PMID: 16224307 DOI: 10.1097/01.mlr.0000182534.19832.83]