

Supplementary Online Content

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eTable 1. Codes to identify hospitalizations

eTable 2. Codes to identify comorbidities

eTable 3. List of ICD-10 codes, prevalence and number of points for each to create the Hospital Frailty Risk Score in acute myocardial infarction, chronic heart failure and pneumonia patients

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Codes to identify hospitalizations

	ICD-10-CM Codes
Acute Myocardial Infarction	I2101, I2102, I2109, I2111, I2119, I2121, I2129, I213, I214, I219, I21A1, I21A9
Heart Failure	I110, I130, I132, I501, I509, I5020, I5021, I5022, I5023, I5030, I5031, I5032, I5033, I5040, I5041, I5042, I5043
Pneumonia	J120, J121, J122, J123, J1281, J1289, J129, J13, J14, J150, J151, J1520, J15211, J15212, J1529, J153, J154, J155, J156, J157, J158, J159, J160, J168, J180, J181, J182, J188, J189

eTable 2. Codes to identify comorbidities

	ICD-10-CM Codes
History of Myocardial Infarction	I25.2
History of Coronary Artery Bypass Graft	Z951
Valvular Heart Disease	A520, I091, I098, Q230, Q231, Q232, Q233, Z952, Z953, Z954, I05, I06, I07, I08, I34, I35, I36, I37, I38, I39
Hypertension	I11, I12, I13, I15
Peripheral Vascular Disease	I731, I738, I739, I771, I790, I792, K551, K558, K559, I70, I71, Z958, Z959
Cerebrovascular Disease	H340, I64, I65, I66, I67, I68, I69, G45, G46, I60, I61, I62, I63
Chronic Obstructive Pulmonary Disease	I278, I279, J684, J701, J703, J40, J41, J42, J43, J44, J45, J46, J47, J60, J61, J62, J63, J64, J65, J66, J67
Diabetes Mellitus	E110, E111, E116, E118, E119, E120, E121, E126, E128, E100, E101, E106, E108, E109, E129, E130, E131, E136, E138, E139, E140, E141, E146, E148, E149, E143, E144, E145, E147, E127, E132, E133, E134, E135, E137, E142, E113, E114, E115, E117, E122, E123, E124, E125, E102, E103, E104, E105, E107, E112
Obesity	E66
Liver Disease	B18, K73, K74, K700, K701, K702, K703, K709, K713, K714, K715, K717, K760, K762, K763, K764, K768, K769, Z944, I850, I859, I864, I982, K704, K711, K721, K729, K765, K766, K767
Renal Failure	N18, N19, N052, N053, N054, N055, N056, N057, N250, I120, I131, N032, N033, N034, N035, N036, N037, Z490, Z491, Z492, Z940, Z992
Iron Deficiency Anemia	D50
Rheumatoid Disease	M05, M32, M33, M34, M06, M315, M351, M353, M360
Peptic Ulcer Disease	K25, K26, K27, K28
Dementia	F00, F01, F02, F03, G30, F051, G311
Depression	F32, F33, F204, F313, F314, F315, F341, F412, F432
Cancer	C00, C01, C02, C03, C04, C05, C06, C07, C08, C09, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C30, C31, C32, C33, C34, C37, C38, C39, C40, C41, C43, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C88, C90, C91, C92, C93, C94, C95, C96, C97
Substance Abuse	G621, I426, K292, K700, K703, K709, Z502, Z714, Z721, F10, E52, T51, F11, F12, F13, F14, F15, F16, F18, F19, Z715, Z722
Acquired Immunodeficiency Syndrome	B20, B21, B22, B24

eTable 3. List of ICD-10 codes, prevalence and number of points for each to create the Hospital Frailty Risk Score in acute myocardial infarction, chronic heart failure and pneumonia patients

		Acute Myocardial Infarction n=166,200	Acute Heart Failure n=348,619	Pneumonia n=270,308	Point
G81	Hemiplegia	2,463 (1.5%)	4,667 (1.3%)	1,817 (0.7%)	4·4
G30	Alzheimer's disease	4,769 (2.9%)	11,775 (3.4%)	12,357 (4.6%)	4·0
I69	Sequelae of cerebrovascular disease (secondary codes)	7,955 (4.8%)	19,008 (5.5%)	10,599 (3.9%)	3·7
R29	Other symptoms and signs involving the nervous and musculoskeletal systems (R29·6 Tendency to fall)	4,779 (2.9%)	13,870 (4.0%)	62,19 (2.3%)	3·6
N39	Other disorders of urinary system (includes urinary tract infection and urinary incontinence)	22,599 (13.6%)	73,011 (20.9%)	37,311 (13.8%)	3·2
F05	Delirium, not induced by alcohol and other psychoactive substances	2,835 (1.7%)	7,665 (2.2%)	4,710 (1.7%)	3·2
W19	Unspecified fall	513 (0.3%)	1,397 (0.4%)	543 (0.2%)	3·2
S00	Superficial injury of head	1,275 (0.8%)	3,582 (1.0%)	1,716 (0.6%)	3·2
R31	Unspecified hematuria	4,432 (2.7%)	12,527 (3.6%)	4,888 (1.8%)	3·0
B96	Other bacterial agents as the cause of diseases classified to other chapters (secondary code)	9,214 (5.5%)	33,306 (9.6%)	15,206 (5.6%)	2·9
R41	Other symptoms and signs involving cognitive functions and awareness	9,189 (5.5%)	24,890 (7.1%)	12,368 (4.6%)	2·7
R26	Abnormalities of gait and mobility	19,861 (12.0%)	57,630 (16.5%)	20,139 (7.5%)	2·6
I67	Other cerebrovascular diseases	2,148 (1.3%)	4,543 (1.3%)	1,949 (0.7%)	2·6
R56	Convulsions, not elsewhere classified	1,615 (1.0%)	3,635 (1.0%)	2,199 (0.8%)	2·6
R40	Somnolence, stupor and coma	1,232 (0.7%)	2,520 (0.7%)	1,323 (0.5%)	2·5
T83	Complications of genitourinary prosthetic devices, implants and grafts	1,143 (0.7%)	4,462 (1.3%)	1,677 (0.6%)	2·4
S06	Intracranial injury	903 (0.5%)	2,577 (0.7%)	970 (0.4%)	2·4
S42	Fracture of shoulder and upper arm	715 (0.4%)	2,280 (0.7%)	1,185 (0.4%)	2·3
E87	Other disorders of fluid, electrolyte and acid-base balance	56,373 (33.9%)	175,733 (50.4%)	101,424 (37.5%)	2·3
M25	Other joint disorders, not elsewhere classified	4,650 (2.8%)	14,124 (4.1%)	6,298 (2.3%)	2·3
E86	Volume depletion	16,702 (10.0%)	46,451 (13.3%)	45,985 (17.0%)	2·3
R54	Senility	1,281 (0.8%)	4,698 (1.3%)	1,908 (0.7%)	2·2
F03	Unspecified dementia	16,518 (9.9%)	47,164 (13.5%)	35,420 (13.1%)	2·1
W18	Other fall on same level	198 (0.1%)	573 (0.2%)	282 (0.1%)	2·1
Z75	Problems related to medical facilities and other health care	117 (0.1%)	372 (0.1%)	180 (0.1%)	2·0
F01	Vascular dementia	1,761 (1.1%)	4,627 (1.3%)	2,850 (1.1%)	2·0
S80	Superficial injury of lower leg	784 (0.5%)	3,035 (0.9%)	939 (0.3%)	2·0
L03	Cellulitis	4,999 (3.0%)	27,321 (7.8%)	5,991 (2.2%)	2·0
H54	Blindness and low vision	3,051 (1.8%)	8,210 (2.4%)	4,338 (1.6%)	1·9
E53	Deficiency of other B group vitamins	2,159 (1.3%)	6,871 (2.0%)	3,997 (1.5%)	1·9

Z60	Problems related to social environment	788 (0.5%)	2,281 (0.7%)	991 (0.4%)	1·8
G20	Parkinson's disease	2,830 (1.7%)	6,751 (1.9%)	7,152 (2.6%)	1·8
R55	Syncope and collapse	5,229 (3.1%)	10,625 (3.0%)	4,826 (1.8%)	1·8
S22	Fracture of rib(s), sternum and thoracic spine	1,352 (0.8%)	4,419 (1.3%)	2,925 (1.1%)	1·8
K59	Other functional intestinal disorders	15,415 (9.3%)	49,077 (14.1%)	26,195 (9.7%)	1·8
N17	Acute renal failure	48,860 (29.4%)	150,260 (43.1%)	60,794 (22.5%)	1·8
L89	Decubitus ulcer	5,077 (3.1%)	20,945 (6.0%)	11,249 (4.2%)	1·7
Z22	Carrier of infectious disease	811 (0.5%)	3,156 (0.9%)	2,004 (0.7%)	1·7
B95	Streptococcus and staphylococcus as the cause of diseases classified to other chapters	3,638 (2.2%)	14,599 (4.2%)	6,527 (2.4%)	1·7
L97	Ulcer of lower limb, not elsewhere classified	3,126 (1.9%)	15,573 (4.5%)	3,533 (1.3%)	1·6
R44	Other symptoms and signs involving general sensations and perceptions	585 (0.4%)	1,894 (0.5%)	1,092 (0.4%)	1·6
K26	Duodenal ulcer	972 (0.6%)	2,673 (0.8%)	835 (0.3%)	1·6
I95	Hypotension	19,650 (11.8%)	51,743 (14.8%)	19,388 (7.2%)	1·6
N19	Unspecified renal failure	551 (0.3%)	1,668 (0.5%)	596 (0.2%)	1·6
A41	Other septicemia	9,385 (5.6%)	31,624 (9.1%)	13,791 (5.1%)	1·6
Z87	Personal history of other diseases and conditions	64,116 (38.6%)	160,048 (45.9%)	110,504 (40.9%)	1·5
J96	Respiratory failure, not elsewhere classified	33,692 (20.3%)	146,216 (41.9%)	95,839 (35.5%)	1·5
M19	Other arthrosis	27,722 (16.7%)	74,333 (21.3%)	42,851 (15.9%)	1·5
G40	Epilepsy	3,786 (2.3%)	8,850 (2.5%)	8,104 (3.0%)	1·5
M81	Osteoporosis without pathological fracture	8,087 (4.9%)	25,826 (7.4%)	19,582 (7.2%)	1·4
S72	Fracture of femur	1,728 (1.0%)	6,312 (1.8%)	2,430 (0.9%)	1·4
S32	Fracture of lumbar spine and pelvis	1,013 (0.6%)	3,612 (1.0%)	1,543 (0.6%)	1·4
E16	Other disorders of pancreatic internal secretion	762 (0.5%)	2,604 (0.7%)	1,144 (0.4%)	1·4
R94	Abnormal results of function studies	1,917 (1.2%)	4,891 (1.4%)	2,227 (0.8%)	1·4
N18	Chronic renal failure	55,853 (33.6%)	187,227 (53.7%)	75,838 (28.1%)	1·4
R33	Retention of urine	7,272 (4.4%)	23,378 (6.7%)	10,475 (3.9%)	1·3
R69	Unknown and unspecified causes of morbidity	18 (<1%)	66 (<1%)	33 (<1%)	1·3
N28	Other disorders of kidney and ureter, not elsewhere classified	6,635 (4.0%)	20,169 (5.8%)	8,387 (3.1%)	1·3
R32	Unspecified urinary incontinence	2,810 (1.7%)	9,967 (2.9%)	5,372 (2.0%)	1·2
G31	Other degenerative diseases of nervous system, not elsewhere classified	1,921 (1.2%)	5,648 (2.0%)	3,039 (1.1%)	1·2
Y95	Nosocomial condition	80 (<1%)	401 (0.1%)	818 (0.3%)	1·2
S09	Other and unspecified injuries of head	576 (0.3%)	1,722 (0.5%)	781 (0.3%)	1·2
R45	Symptoms and signs involving emotional state	1,285 (0.8%)	2,873 (0.8%)	1,438 (0.5%)	1·2
G45	Transient cerebral ischemic attacks and related syndromes	2,109 (1.3%)	4,614 (1.3%)	1,597 (0.6%)	1·2

Z74	Problems related to care-provider dependency	1,891 (1.1%)	6,390 (1.8%)	4,386 (1.6%)	1·1
M79	Other soft tissue disorders, not elsewhere classified	4,690 (2.8%)	14,251 (4.1%)	7,869 (2.9%)	1·1
W06	Fall involving bed	42 (<1%)	127 (<1%)	56 (<1%)	1·1
S01	Open wound of head	1,000 (0.6%)	2,693 (0.8%)	1,167 (0.4%)	1·1
A04	Other bacterial intestinal infections	2,264 (1.4%)	8,054 (2.3%)	3,774 (1.4%)	1·1
A09	Diarrhea and gastroenteritis of presumed infectious origin	193 (0.1%)	590 (0.2%)	234 (0.1%)	1·1
J18	Pneumonia, organism unspecified	19,674 (11.8%)	88,285 (25.3%)	227,822 (84.3%)	1·1
J69	Pneumonitis due to solids and liquids	5,132 (3.1%)	13,603 (3.9%)	5,476 (2.0%)	1·0
R47	Speech disturbances, not elsewhere classified	3,585 (2.2%)	8,190 (2.3%)	3,658 (1.4%)	1·0
E55	Vitamin D deficiency	5,049 (3.0%)	16,151 (4.6%)	7,625 (2.8%)	1·0
Z93	Artificial opening status	2,012 (1.2%)	6,047 (1.7%)	7,409 (2.7%)	1·0
R63	Symptoms and signs concerning food and fluid intake	3,066 (1.8%)	10,762 (3.1%)	8,294 (3.1%)	0·9
H91	Other hearing loss	6,189 (3.7%)	18,107 (5.2%)	10,237 (3.8%)	0·9
W10	Fall on and from stairs and steps	20 (<1%)	72 (<1%)	33 (<1%)	0·9
W01	Fall on same level from slipping, tripping and stumbling	143 (0.1%)	403 (0.1%)	170 (0.1%)	0·9
E05	Thyrotoxicosis [hyperthyroidism]	1,166 (0.7%)	4,199 (1.2%)	1,869 (0.7%)	0·9
M41	Scoliosis	965 (0.6%)	3,203 (0.9%)	2,378 (0.9%)	0·9
R13	Dysphagia	10,998 (6.6%)	33,656 (9.7%)	22,496 (8.3%)	0·8
Z99	Dependence on enabling machines and devices	16,114 (9.7%)	73,697 (21.1%)	47,111 (17.4%)	0·8
M80	Osteoporosis with pathological fracture	388 (0.2%)	1,812 (0.5%)	967 (0.4%)	0·8
K92	Other diseases of digestive system	6,557 (3.9%)	18,771 (5.4%)	5,808 (2.1%)	0·8
I63	Cerebral Infarction	5,487 (3.3%)	10,169 (2.9%)	3,170 (1.2%)	0·8
N20	Calculus of kidney and ureter	1,386 (0.8%)	3,413 (1.0%)	1,808 (0.7%)	0·7
F10	Mental and behavioral disorders due to use of alcohol	4,199 (2.5%)	9,960 (2.9%)	5,597 (2.1%)	0·7
Y84	Other medical procedures as the cause of abnormal reaction of the patient	216 (0.1%)	270 (0.1%)	106 (<1%)	0·7
R00	Abnormalities of heart beat	14,710 (8.9%)	26,756 (7.7%)	12,348 (4.6%)	0·7
J22	Unspecified acute lower respiratory infection	89 (0.1%)	440 (0.1%)	280 (0.1%)	0·7
Z73	Problems related to life-management difficulty	97 (0.1%)	271 (0.1%)	99 (<1%)	0·6
R79	Other abnormal findings of blood chemistry	4,994 (3.0%)	24,498 (7.0%)	8,765 (3.2%)	0·6
Z91	Personal history of risk-factors, not elsewhere classified	21,132 (12.7%)	73,713 (21.1%)	25,955 (9.6%)	0·5
S51	Open wound of forearm	284 (0.2%)	1,090 (0.3%)	467 (0.2%)	0·5
F32	Depressive episode	21,126 (12.7%)	62,184 (17.8%)	42,124 (15.6%)	0·5
M48	Spinal stenosis	4,814 (2.9%)	13,736 (3.9%)	7,968 (2.9%)	0·5
E83	Disorders of mineral metabolism	15,745 (9.5%)	46,024 (13.2%)	24,018 (8.9%)	0·4
M15	Polyarthrosis	1,885 (1.1%)	5,977 (1.7%)	2,610 (1.0%)	0·4
D64	Other anemias	31,060 (18.7%)	98,305 (28.2%)	52,068 (19.3%)	0·4

L08	Other local infections of skin and subcutaneous tissue	264 (0.2%)	975 (0.3%)	284 (0.1%)	0.4
R11	Nausea and vomiting	4,259 (2.6%)	9,350 (2.7%)	5,804 (2.1%)	0.3
K52	Other noninfective gastroenteritis and colitis	2,373 (1.4%)	6,864 (2.0%)	4,415 (1.6%)	0.3
R50	Fever of unknown origin	2,104 (1.3%)	4,108 (1.2%)	3,872 (1.4%)	0.1
F00	Dementia in Alzheimer	0	0	0	0
R02	Gangrene not classified anywhere	0	0	0	0
U80	Agent resistant to penicillin and related antibiotics	0	0	0	0
X59	Exposure unspecified factor	0	0	0	0