Supplementary Material

Table S1: Baseline characteristics for derivation cohort stratified by complexity.

	Overall (N=1889)	Non-complex (N=1326)	Complex (N=563)
	n (%) or median [interquartile range]		
Age			
≥ 80 years	447 (32)	337 (35)	110 (25)
70 to 79 years	327 (23)	218 (23)	109 (24)
60 to 69 years	239 (17)	152 (16)	87 (19)
< 60 years	391 (28)	251 (26)	140 (31)
Missing	3 (0.2)	2 (0.2)	1 (0.2)
Gender			
Male	748 (53)	494 (51)	254 (57)
Female	656 (47)	464 (48)	192 (43)
Missing	3 (0.2)	2 (0.2)	1 (0.2)
Living area[1]			
Urban	460 (33)	335 (35)	125 (28)
Rural	923 (66)	606 (63)	317 (71)
Missing	24 (2)	19 (2)	5 (1)
Marital status			
Single	477 (34)	306 (32)	171 (38)
Couple	673 (48)	458 (48)	215 (48)
Widowed	252 (18)	193 (20)	59 (13)
Missing	5 (0.4)	3 (0.3)	2 (0.4)
Hospitalization within last 12 months	480 (34)	317 (33)	163 (36)
Medication[2]			
Antineoplastic and immunomodulating agents at admission	43 (3)	20 (2)	23 (5)
Nervous system at admission	1001 (71)	666 (69)	335 (75)
Systemic hormonal preparations, excluding sex hormones and insulins at discharge	253 (18)	163 (17)	90 (20)
High costs during hospitalization[3]			
For imaging procedures	367 (26)	179 (19)	188 (42)
For laboratory analysis	365 (26)	147 (15)	218 (49)
High nurse workload[4]	358 (25)	146 (15)	212 (47)
Charlson Comorbidity Index	2 [0; 4]	2 [0; 3]	2.5 [1; 5]
Principal or concomitant diagnosis at discharge			
Cancer[5]	175 (12)	104 (11)	71 (16)
COPD[6]	139 (10)	91 (9)	48 (11)
Dementia[7]	120 (8)	89 (9)	31 (7)
Depression[8]	148 (10)	94 (10)	54 (12)
Heart failure[9]	235 (17)	143 (15)	92 (21)

[1] Defined according to the Swiss Federal Statistical Office based on place of residence
[2] Group of drugs according to ATC classification
[3] Defined as costs of all imaging procedures or medication during hospital stay above 75th percentile
[4] Defined as sum of hours of all nursing work (incl. sitting guard) during hospital stay above 75th percentile
[5] ICD10-codes B21, C00 through C97, Z03.1
[6] ICD10-codes J44
[7] ICD10-codes F00 through F03, F05.0, F05.1
[8] ICD10-codes F20.4, F25.1, F31.3 F31.4, F31.5, F32, F33, F41.2, F92.0
[9] ICD10-codes I50

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Pneumonia[10]	186 (13)	115 (12)	71 (16)
Sepsis[11]	162 (11)	88 (9)	74 (17)
Stroke[12]	72 (5)	50 (5)	22 (5)
Substance abuse[13]	154 (11)	90 (9)	64 (14)
Syncope[14]	68 (5)	55 (6)	13 (3)
Malnutrition[15]	190 (13)	82 (8)	108 (24)
Multimorbidity			
Low (number of diagnoses ≤ 6)	387 (27)	322 (33)	65 (14)
Middle (number of diagnoses > 6 and <14)[16]	642 (46)	443 (46)	199 (44)
High (number of diagnoses ≥ 14)	375 (27)	193 (20)	182 (41)
PCCL			
No complication or comorbidity	297 (21)	239 (25)	58 (13)
Light complication or comorbidity	22 (2)	15 (2)	7 (2)
Moderate complication or comorbidity	211 (15)	161 (17)	50 (11)
Severe complication or comorbidity	390 (28)	289 (30)	101 (23)
Very severe complication or comorbidity	484 (34)	254 (26)	230 (51)
Missing	3 (0.2)	2 (0.2)	1 (0.2)
Abnormal creatinine level[17]			
At admission and discharge	278 (20)	181 (19)	97 (22)
At admission only	128 (9)	72 (7)	56 (12)
At discharge only	50 (4)	24 (2)	26 (6)
Missing	275 (19)	229 (24)	46 (10)
Leukocytosis[18]			
At admission and discharge	15 (1)	6 (0.6)	9 (2)
At admission only	60 (4)	35 (4)	25 (6)
At discharge only	11 (0.8)	3 (0.3)	8 (2)
Missing	260 (18)	223 (23)	37 (8)
Patient destination			
Death	105 (7)	73 (8)	32 (7)
Home	875 (62)	621 (65)	254 (57)
Hospital	141 (10)	85 (9)	56 (12)
Nursing home	109 (8)	79 (8)	30 (7)
Rehabilitation	138 (10)	79 (8)	59 (13)
Others and missing	39 (3)	23 (2)	16 (4)

Table S2: Baseline characteristics for all patients in the validation cohort stratified by complexity.

	Overall (N=1889)	Non-complex (N=1326)	Complex (N=563)
	n (%) or median [interquartile range]		
Age			
≥ 80 years	132 (27)	105 (29)	27 (23)

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[10] ICD10-codes A48.1, B01.2, B05.2, J10.0, J11.0, J12 through J18, J68.0, J69, J85.1, O74.0, U69.00

[11] ICD10-codes A02.1, A20.7, A22.7, A26.7, A32.7, A39.2, A39.3, A39.4, A40, A41, A42.7, B37.7

[12] ICD10-codes I63

[13] ICD10-codes F10 through F19, F53, F66.8, F66.9

[14] ICD10-codes R55

[15] ICD10-codes E40 through E46

[16] Between 25th and 75th percentile

[17] Defined as creatinine ≥100 μmol/l

[18] Defined as leukocyte count ≥20 G/l

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70 to 79 years	110 (23)	86 (23)	24 (21)
60 to 69 years	83 (17)	59 (16)	24 (21)
< 60 years	146 (30)	112 (31)	34 (29)
Missing	11 (2)	4 (1)	7 (6)
Gender			
Male	254 (53)	199 (54)	55 (47)
Female	217 (45)	163 (44)	54 (47)
Missing	11 (2)	4 (1)	7 (6)
Living area[1]			
Urban	151 (31)	118 (32)	33 (28)
Rural	315 (65)	242 (66)	73 (63)
Missing	16 (3)	6 (2)	10 (9)
Marital status			
Single	159 (33)	123 (34)	36 (31)
Couple	243 (50)	183 (50)	60 (52)
Widowed	79 (16)	59 (16)	20 (17)
Missing	1 (0.2)	1 (0.3)	0 (0)
Hospitalization within last 12 months	193 (40)	135 (37)	58 (50)
Medication[2]			
Antineoplastic and immunomodulating agents at admission	27 (6)	18 (5)	9 (8)
Nervous system at admission	339 (70)	252 (69)	87 (75)
Systemic hormonal preparations, excluding sex hormones and insulins at discharge	105 (22)	73 (20)	32 (28)
High costs during hospitalization[3]			
For imaging procedures	118 (24)	76 (21)	42 (36)
For laboratory analysis	117 (24)	56 (15)	61 (53)
High nurse workload[4]	117 (24)	57 (15.6)	60 (52)
Charlson Comorbidity Index	2 [0; 4]	2.00 [0; 3]	3 [1; 5]
Principal or concomitant diagnosis at discharge			
Cancer[5]	50 (10)	50 (10)	50 (10)
COPD[6]	32 (9)	32 (8)	32 (9)
Dementia[7]	18 (15)	18 (15)	18 (15)
Depression[8]	47 (10)	47 (10)	47 (10)
Heart failure[9]	33 (9)	33 (9)	33 (9)
Pneumonia[10]	14 (12)	14 (12)	14 (12)
Sepsis[11]	43 (9)	43 (9)	43 (9)
Stroke[12]	36 (10)	36 (9)	36 (10)
Substance abuse[13]	7 (6)	7 (6)	7 (6)
Syncope[14]	61 (13)	61 (13)	61 (13)

[1] Defined according to the Swiss Federal Statistical Office based on place of residence

[2] Group of drugs according to ATC classification

[3] Defined as costs of all imaging procedures or medication during hospital stay above 75th percentile

[4] Defined as sum of hours of all nursing work (incl. sitting guard) during hospital stay above 75th percentile

[5] ICD10-codes B21, C00 through C97, Z03.1

[6] ICD10-codes J44

[7] ICD10-codes F00 through F03, F05.0, F05.1

[8] ICD10-codes F20.4, F25.1, F31.3 F31.4, F31.5, F32, F33, F41.2, F92.0

[9] ICD10-codes I50

[10] ICD10-codes A48.1, B01.2, B05.2, J10.0, J11.0, J12 through J18, J68.0, J69, J85.1, O74.0, U69.00

[11] ICD10-codes A02.1, A20.7, A22.7, A26.7, A32.7, A39.2, A39.3, A39.4, A40, A41, A42.7, B37.7

[12] ICD10-codes I63

[13] ICD10-codes F10 through F19, F53, F66.8, F66.9

[14] ICD10-codes R55

3

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Malnutrition[15]	46 (13)	46 (13)	46 (13)
Multimorbidity			
Low (number of diagnoses ≤ 6)	123 (25)	113 (31)	10 (9)
Middle (number of diagnoses > 6 and <14)[16]	199 (41)	160 (44)	39 (34)
High (number of diagnoses ≥ 14)	149 (31)	89 (24)	60 (52)
PCCL			
No complication or comorbidity	83 (1)	73 (20)	10 (9)
Light complication or comorbidity	7 (1)	6 (2)	1 (0.9)
Moderate complication or comorbidity	81 (17)	72 (20)	9 (8)
Severe complication or comorbidity	143 (30)	120 (33)	23 (20)
Very severe complication or comorbidity	157 (33)	91 (24)	66 (57)
Missing	11 (2)	4 (1)	7 (6)
Abnormal creatinine level[17]			
At admission and discharge	90 (19)	60 (16)	30 (26)
At admission only	54 (11)	34 (9)	20 (17)
At discharge only	13 (2.7)	10 (3)	3 (3)
Missing	89 (18)	82 (22)	7 (6)
Leukocytosis[18]			
At admission and discharge	4 (0.8)	2 (0)	2 (2)
At admission only	17 (3)	12 (3)	5 (4)
At discharge only	2 (0.4)	2 (0.5)	0 (0)
Missing	91 (19)	83 (23)	8 (7)
Patient destination			
Death	134 (7)	91 (7)	43 (8)
Home	1178 (62)	873 (66)	305 (54)
Hospital	191 (10)	119 (9)	72 (13)
Nursing home	155 (8)	108 (8)	47 (8)
Rehabilitation	171 (9)	101 (8)	70 (12)
Others and missing	60 (3)	34 (3)	26 (5)

[15] ICD10-codes E40 through E46
[16] Between 25th and 75th percentile
[17] Defined as creatinine ≥100 µmol/l
[18] Defined as leukocyte count ≥20 G/l

4