Prediction of In-Hospital Falls Using NRS, PACD Score and FallRS: A Retrospective Cohort Study

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VERSION: May8th 2023

SUPPLEMENTARY MATERIAL: 11 tables, 2 figures

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Table S1 Composition of the NRS as presented in the original study (Kondrup 2003)

Nutritional status		Score
Normal	-	0
Mild	weight loss > 5% in 3 months OR food intake below 50-75% of requirement in preceding week	1
Moderate	weight loss > 5% in 2 months OR food intake below 25-50% of requirement in preceding week OR BMI 18.5-20.5	2
Severe	weight loss > 5% in 1 month OR food intake below 0-25% of requirement in preceding week OR BMI < 18.5	3
Severity of disease		
Normal	-	0
Mild	e.g. hip fracture, diabetes	1
Moderate	e.g. pneumonia	2
Severe	e.g. head injury, intensive care patients	3
Age	>70 years	1

Abbr: NRS (Nutritional Risk Score), BMI (Body Mass Index)
Legend: Add the Scroe points for a maximum score of 7

Table S2 Composition of PACD as presented in the original study (Conca, Gabele et al. 2018)

Number of active medical problems on admission	Infinite
Person in the same household who can provide help Yes = 0 points, No = 4 points	Max. 4 points

Number of limitations in ADL (1 point per limitation)
Needed help for:
   -   Personal hygiene
   -   Dressing/undressing
   -   Toileting
   -   Bathing/showering
   -   Eating/drinking
   -   Moving
   -   Transfer (bed/chair)
   -   Car or public transportation
   -   Shopping
   -   Cooking
   -   Homework
   -   Medication management
	Max. 12 points

Age (years)
     <60 = 0 points
     ≥60 = 1 point
     ≥70 = 2 points
     ≥80 = 3 points
     ≥90 = 4 points
     ≥100 = 5 points
	Max. 5 points

Abbr: PACD (Post Acute Care Discharge Score), ADL (Activities of Daily Living)

Legend: Add all points for the score of your patient. Because there is no maximum number of medical problems, the score potentially ranges to infinity.

Table S3 Composition of DOS as presented in the original study (Marieke J Schuurmans 2003)

Observation	No (points)	Yes (points)
Falls asleep during conversation	0	1
Quickly distracted by environmental stimuli	0	1
Remains attentive to the conversation or the action	1	0
Does not finish questions or answers	0	1
gives inappropriate responses to questions	0	1
Reacts slowly to orders	0	1
Missing local orientation	0	1
Knows daytime	1	0
Remembers recent events	1	0
Restlessness	0	1
Pulls on installations	0	1
Reacts inappropriate emotional	0	1
Visual, auditory or olfactory hallucinations	0	1

Abbr: DOS (Delirium Observation Screening Scale)

Legend: Add the points for a maximum score of 13.

Table S4 Predictive ability for in-hospital fall of DOS. Derivation years 2016 – 2019 and validation years 2020 – 2022.

	Derivation 2016-2019 AUC (95% CI)	Validation 2020-2022 AUC (95% CI)	P-value
DOS	0. 58 (0.48 – 0.67)	0.63 (0.60 – 0.67)	0.04

Abbr: AUC (Area under curve), CI (confidence interval), DOS (delirium observation screening scale)

Table S5 Calibration for NRS (nutritional risk screening)

NRS	Probability (%)	Observed Falls	Expected Falls	Total Sample
0	1.8	6	12.8	706
1	2.3	31	35.4	1,517
2	3.0	60	49.3	1,649
3	3.8	40	34.1	891
4	4.9	31	25.9	530
5	6.2	13	20.8	335
6	7.9	5	7.6	97
7	9.9	1	1.1	11

Table S6 Calibration for DOS (delirium observation screening scale)

DOS	Probability (%)	Observed Falls	Expected Falls	Total Sample
1	3.0	102	120.4	4,080
2	3.5	24	18.1	511
3	4.2	25	14.8	351
4	5.0	16	9.9	196
5	6.0	11	9.4	157
6	7.2	11	9.4	132
7	8.5	9	8.4	99
8	10.0	5	8.5	85
9	11.9	4	6.8	57
10	13.9	7	7.1	51
11	16.3	5	4.1	25
12	19.0	1	2.3	12
13	22.0	1	1.5	7
14	25.4	0	0.3	1

Table S7 Calibration for FallRS (Fall Risk Score)

FallRS	Probability %	Observed Falls	Expected Falls	Total Sample
0	1.3	0	0.0	2
1	1.5	0	0.9	64
2	1.6	0	2.6	159
3	1.8	3	2.5	139
4	2.0	1	2.8	139
5	2.2	5	3.9	176
6	2.4	4	4.8	199
7	2.7	5	4.5	166
8	3.0	5	5.1	170
9	3.3	6	4.2	127
10	3.7	4	4.4	121
11	4.0	7	4.0	98
12	4.5	5	4.2	95
13	4.9	5	3.7	74
14	5.5	3	2.8	52
15	6.0	5	4.3	71
16	6.6	4	3.7	55
17	7.3	2	3.7	50
18	8.1	6	3.0	37
19	8.9	2	2.1	24
20	9.8	2	4.0	41
21	10.7	1	3.0	28
22	11.8	2	2.0	17
23	12.9	2	1.9	15
24	14.1	2	1.7	12
25	15.5	1	1.2	8
26	16.9	0	1.7	10
27	18.4	1	0.6	3
28	20.0	0	0.2	1
29	21.7	1	0.7	3

Table S8 Calibration for PACD (Post-Acute Care Discharge score)

PACD	Probability (%)	Observed Falls	Expected Falls	Total Sample
0	1.6	0	0.0	3
1	1.7	2	4.8	281
2	1.9	4	5.5	290
3	2.1	2	6.6	314
4	2.3	10	6.5	283
5	2.6	5	6.3	246
6	2.8	7	5.1	182
7	3.1	5	4.9	156
8	3.4	9	5.1	150
9	3.8	7	4.3	115
10	4.2	6	5.2	124
11	4.6	5	3.6	79
12	5.1	5	4.9	96
13	5.6	4	4.1	73
14	6.1	5	3.9	64
15	6.7	3	4.3	64
16	7.4	6	4.1	56
17	8.1	4	4.8	59
18	8.9	2	3.1	35
19	9.8	1	3.1	32
20	10.7	1	2.6	24
21	11.7	1	2.0	17
22	12.8	2	0.9	7
23	14.0	0	0.7	5
24	15.3	0	0.5	3
25	16.6	2	1.0	6

Table S9 Final multivariable model for NRS from validation data from 2018-2020

Probability $= \dfrac{e^{(\beta 0 + \beta_1 * var1 + \beta_2 * var2 + etc)}}{1 + e^{(\beta 0 + \beta x * var1 + Bx2 * var2 + etc)}}$

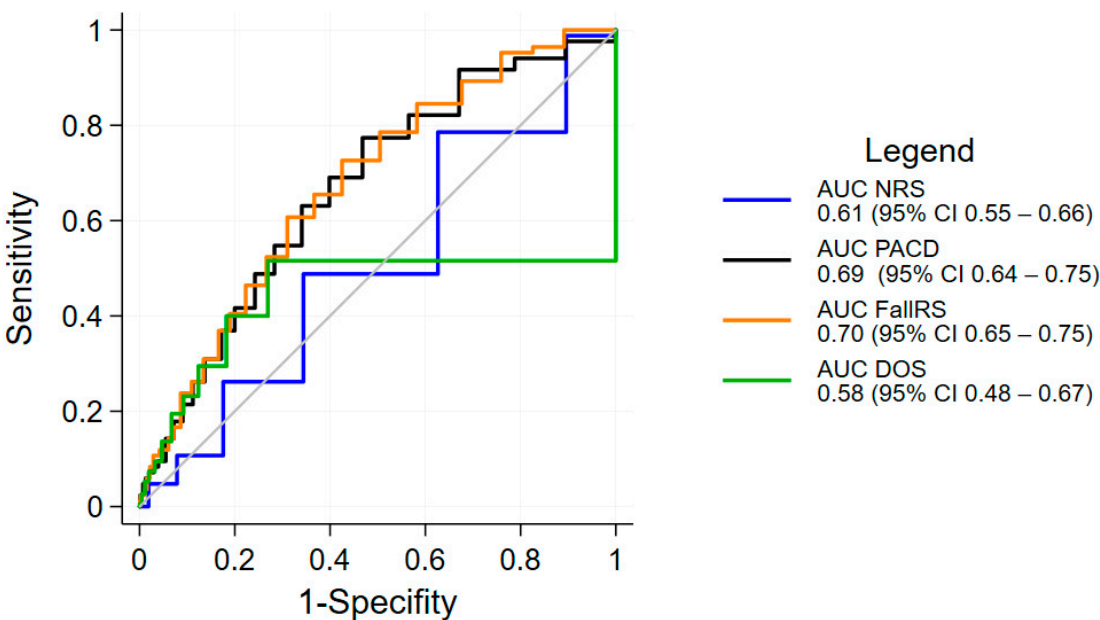| Fall and NRS	Beta-Coefficient	OR	95% Conf. Interval	
NRS	0.09997	1.105137	0.9547286	1.27924
Age	0.01669	1.016835	0.9981085	1.035913
Elixhauser comorbidity index	0.16086	1.174522	1.027319	1.342818
Frailty score	0.11456	1.121378	1.061937	1.184146
Gender	-0.69627	0.498439	0.3123563	0.7953785
Intercept	-5.78050	0.0030872	0.0008177	0.0116554

Table S10 Final multivariable model for PACD from validation data from 2018-2020

Fall and PACD	Beta-Coefficient	OR	95% Conf. Interval	
PACD	0.0220483	1.022293	-0.0260982	0.0701949
Age	0.0190903	1.019274	-0.0016873	0.0398679
Elixhauser comorbidity index	0.1930107	1.212896	0.0617039	0.3243175
Frailty score	0.1157946	1.122765	0.0574712	0.174118
Gender	-0.719912	0.4867951	-1.191087	-0.2487368
Intercept	-5.873976	0.0028117	-7.290627	-4.457325

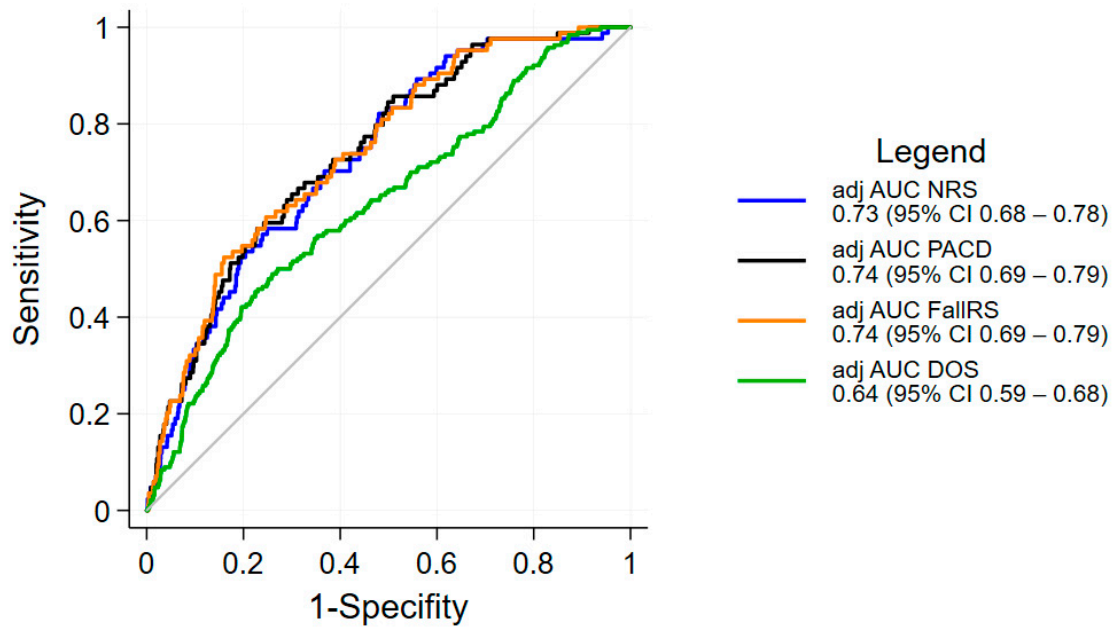**Table S11 Final multivariable model for DOS from validation data from 2018-2020**

Fall and DOS	Beta-Coefficient	OR	95% Conf. Interval	
DOS	0.0380328	1.038765	0.855245	1.261666
Age	0.0485518	1.04975	0.9838168	1.120101
Elixhauser comorbidity index	0.2086366	1.231997	0.8468074	1.7924
Frailty score	0.0644411	1.066563	0.9048786	1.257137
Gender	-2.347167	0.0956397	0.0145744	0.6276051
Intercept	-7.691481	0.0004567	1.81E-06	0.1153605

Figure S1 ROC curves for accuracy of predicting fall in unadjusted models

Abbr.: AUC (Area under curve), CI (confidence interval), NRS (nutritional risk screening), DOS (delirium observation screening scale), PACD (post-acute care discharge), FallRS (Fall Risk Score)

Figure S2 ROC curves for accuracy of predicting fall in adjusted models. Adjusted for age, gender, Elixhauser comorbidity index, Frailty score.

Abbr.: AUC (Area under curve), CI (confidence interval), NRS (nutritional risk screening), DOS (delirium observation screening scale), PACD (post-acute care discharge), FallRS(Fall Risk Score)

References

Conca, A., et al. (2018). "Prediction of post-acute care demand in medical and neurological inpatients: diagnostic assessment of the post-acute discharge score - a prospective cohort study." <u>BMC Health Serv Res</u> **18**(1): 111.

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Marieke J Schuurmans 1, L. M. S.-B., Sijmen A Duursma (2003). "The Delirium Observation Screening Scale: a screening instrument for delirium." <u>Research and theory for nursing practice</u>.