

A validation of machine learning-based risk scores in the prehospital setting

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Table 1

	Training dataset (2016-2017)			Test dataset (2018)		
	Excluded, N	Excluded, percent	Remaining, N	Excluded, N	Excluded, percent	Remaining, N
Original			45045			23623
No dispatch CDSS data	2358	5.5	42687	857	3.8	22766
Missing PIN	2113	5.2	40574	1244	5.8	21522
No ambulance journal	2526	6.6	38048	933	4.5	20589
No ambulance transport	3879	11.4	34169	2461	13.6	18128
No hospital journal	3958	13.1	30211	1429	8.6	16699
No ED visit	2939	10.8	27272	1590	10.5	15109
Missing > 2 vitals	1336	5.2	25936	829	5.8	14280
Patient age < 18	1328	5.4	24608	685	5	13595
Included in study	20437	45.4	24608	10028	42.5	13595

Table 2

	Priority				
	1A	1B	2A	2B	Total
N	1283	15533	17227	4160	38203
Age, mean	56.2 (54.8-57.5)	64.5 (64.1-64.8)	67.5 (67.2-67.8)	67.3 (66.7-68.0)	65.9 (65.7-66.1)
Female, percent	46.1 (43.3-48.8)	49.4 (48.6-50.1)	53.9 (53.1-54.6)	54.5 (53.0-56.2)	51.9 (51.3-52.4)
Emergent transport , percent	38.7 (36.0-41.5)	24.6 (23.9-25.2)	4.3 (4.0-4.6)	2.2 (1.8-2.6)	13.5 (13.1-13.8)
Ambulance intervention*, percent	87.9 (86.0-89.8)	87.4 (86.8-87.9)	71.1 (70.4-71.8)	62.1 (60.6-63.5)	77.3 (76.9-77.7)
Missing vitals, percent	33.8 (30.9-36.5)	25.7 (25.0-26.4)	24.4 (23.8-25.0)	23.8 (22.5-25.0)	25.2 (24.7-25.6)
NEWS value, mean	5.79 (5.58-6.02)	3.76 (3.71-3.82)	2.97 (2.92-3.02)	2.40 (2.31-2.48)	3.32 (3.29-3.36)
Prior contacts (30 days), mean	0.21 (0.17-0.24)	0.17 (0.16-0.18)	0.17 (0.16-0.18)	0.23 (0.21-0.25)	0.18 (0.17-0.18)
Intensive Care Unit, percent	10.0 (8.3-11.6)	3.5 (3.2-3.8)	1.7 (1.5-1.8)	1.6 (1.2-1.9)	2.7 (2.5-2.8)
In-hospital death, percent	8.7 (7.2-10.2)	4.0 (3.7-4.3)	3.7 (3.4-4.0)	3.9 (3.4-4.5)	4.0 (3.8-4.2)
Critical care, percent	15.7 (13.6-17.5)	6.6 (6.2-7.0)	4.7 (4.4-5.0)	4.4 (3.8-5.1)	5.8 (5.6-6.0)
Admitted, percent	51.9 (49.0-54.6)	52.3 (51.6-53.1)	52.3 (51.6-53.1)	49.2 (47.5-50.6)	52.0 (51.5-52.5)
2-day mortality, percent	4.8 (3.7-6.0)	1.6 (1.4-1.8)	0.7 (0.6-0.9)	0.7 (0.5-1.0)	1.2 (1.1-1.3)

Figure 1

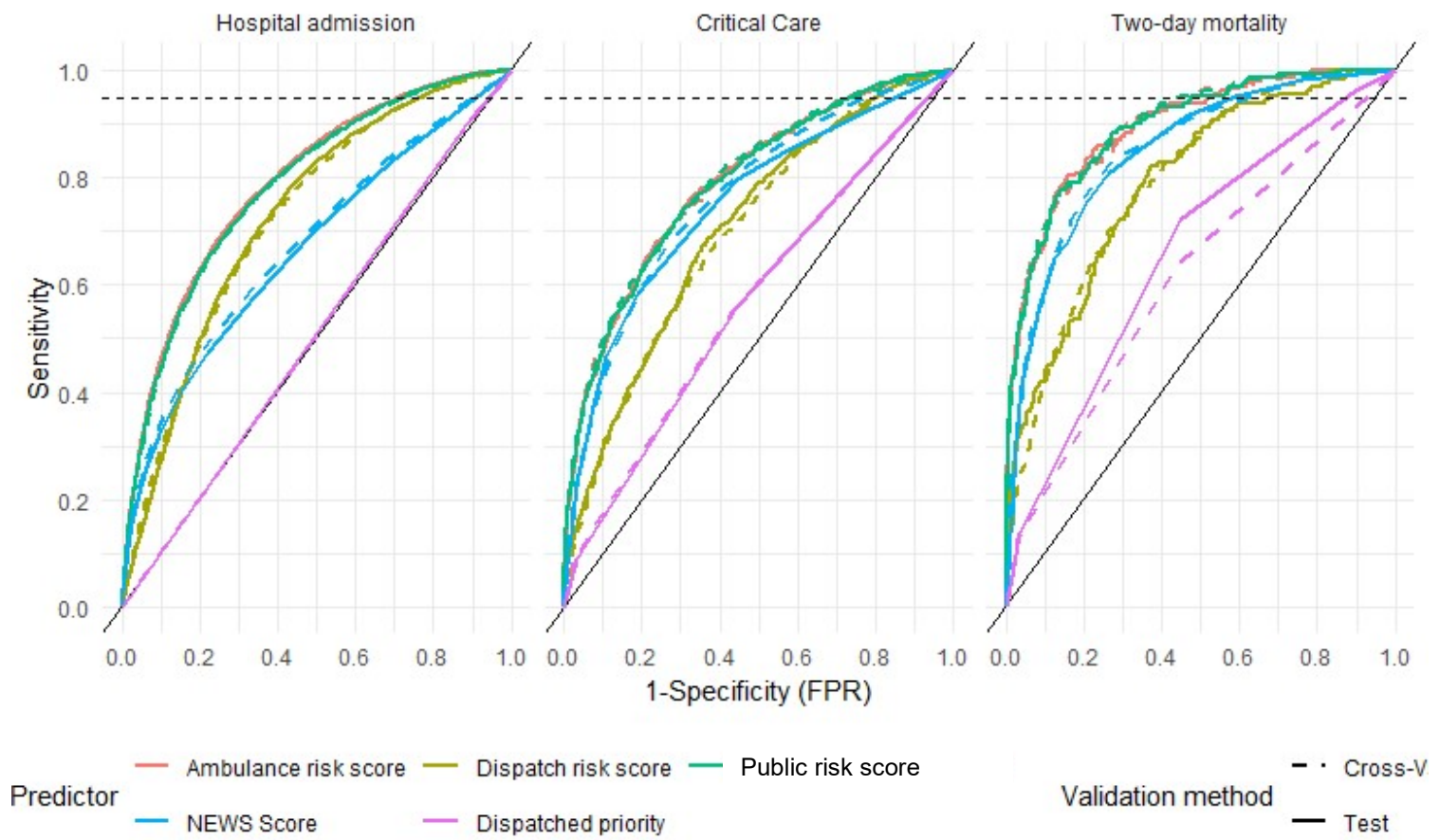


Table 3

Concordance index (95% CI)						
Validation method	Outcome	Dispatched priority	NEWS Score	Dispatch risk score	Ambulance risk score	Public risk score
Test	Hospital admission	0.51 (0.50-0.52)	0.66 (0.65-0.67)	0.73 (0.72-0.73)	0.79 (0.78-0.80)	0.78 (0.77-0.79)
	Critical Care	0.57 (0.55-0.59)	0.75 (0.73-0.77)	0.70 (0.68-0.72)	0.79 (0.77-0.81)	0.79 (0.77-0.80)
	Two-day mortality	0.66 (0.62-0.70)	0.85 (0.81-0.88)	0.79 (0.76-0.82)	0.89 (0.87-0.92)	0.89 (0.87-0.92)
Cross-Validated	Hospital admission	0.50 (0.50-0.51)	0.67 (0.67-0.68)	0.72 (0.72-0.73)	0.79 (0.78-0.79)	0.78 (0.78-0.79)
	Critical Care	0.57 (0.56-0.59)	0.76 (0.75-0.78)	0.70 (0.68-0.71)	0.79 (0.78-0.80)	0.79 (0.78-0.80)
	Two-day mortality	0.62 (0.58-0.65)	0.85 (0.83-0.87)	0.79 (0.77-0.81)	0.89 (0.87-0.91)	0.89 (0.88-0.91)

Table 4

Type	Priority	N	Emergent transport , percent	Ambulance intervention*, percent	NEWS value, mean	Critical care, percent	Admitted, percent	2-day mortality, percent
Current	1A	473	35.3 (31.3-39.3)	87.5 (84.6-90.5)	5.64 (5.26-6.00)	14.6 (11.6-18.2)	48.6 (44.4-53.5)	4.7 (2.8-6.8)
	1B	5657	22.5 (21.4-23.6)	86.4 (85.5-87.3)	3.70 (3.60-3.80)	6.5 (5.9-7.2)	52.3 (50.9-53.6)	1.7 (1.4-2.0)
	2A	6112	3.4 (3.0-3.9)	70.5 (69.4-71.7)	2.81 (2.74-2.89)	4.7 (4.1-5.2)	51.5 (50.3-52.8)	0.6 (0.4-0.9)
	2B	1353	1.7 (1.0-2.4)	60.5 (57.9-63.3)	2.33 (2.19-2.46)	4.4 (3.4-5.4)	47.7 (45.0-50.3)	0.4 (0.1-0.8)
Hypo- thetical	1A	473	37.8 (33.4-42.1)	90.7 (87.9-93.2)	7.22 (6.85-7.61)	22.2 (18.4-26.0)	75.3 (71.0-79.3)	10.1 (7.6-13.1)
	1B	5657	15.3 (14.4-16.2)	77.9 (76.9-78.9)	4.22 (4.12-4.32)	8.2 (7.5-8.9)	69.6 (68.5-71.0)	1.6 (1.2-1.9)
	2A	6112	8.9 (8.2-9.7)	74.9 (73.8-76.0)	2.37 (2.31-2.44)	3.3 (2.8-3.7)	40.3 (39.1-41.5)	0.4 (0.3-0.6)
	2B	1353	6.1 (4.9-7.3)	75.0 (72.8-77.3)	1.55 (1.46-1.64)	1.0 (0.5-1.6)	16.3 (14.3-18.3)	0.0 (0.0-0.0)

Figure 2

