

Diagnostic accuracy of early warning scores – secondary reference standard

Areas under the ROC curves for each EWS at each paramedic working diagnostic impression threshold are provided for the secondary reference standard in Table 1. The AUROC for diagnostic impression alone was 0.810 (0.787, 0.833). Subsequent tables show the sensitivity, specificity and predictive values for NEWS2 at every threshold and the remaining EWS at pre-specified thresholds for each working impression threshold for the secondary reference standard. The prevalence of secondary reference standard positive cases was 2.9%.

Table 1 Area under the ROC curve for EWS at different diagnostic impression thresholds (secondary)

EWS	Sepsis	Sepsis or infection	Sepsis, infection or nonspecific impression	All diagnostic impressions
Pre-alert	0.557 (0.54, 0.574)	0.565 (0.547, 0.583)	0.587 (0.566, 0.607)	0.592 (0.57, 0.613)
NEWS2	0.647 (0.623, 0.671)	0.741 (0.715, 0.768)	0.845 (0.822, 0.867)	0.866 (0.847, 0.884)
qSOFA	0.638 (0.614, 0.661)	0.721 (0.695, 0.747)	0.797 (0.772, 0.821)	0.79 (0.767, 0.814)
90-30-90	0.619 (0.596, 0.641)	0.677 (0.652, 0.702)	0.733 (0.708, 0.759)	0.735 (0.71, 0.76)
Borelli	0.631 (0.608, 0.654)	0.7 (0.675, 0.726)	0.768 (0.743, 0.793)	0.774 (0.75, 0.799)
CIS	0.646 (0.622, 0.67)	0.741 (0.715, 0.768)	0.833 (0.81, 0.855)	0.827 (0.806, 0.849)
HEWS	0.647 (0.623, 0.671)	0.737 (0.711, 0.764)	0.826 (0.803, 0.849)	0.822 (0.8, 0.845)
MEWS	0.646 (0.622, 0.67)	0.74 (0.713, 0.766)	0.838 (0.815, 0.861)	0.843 (0.822, 0.863)
NHS	0.619 (0.596, 0.641)	0.686 (0.66, 0.711)	0.742 (0.717, 0.767)	0.738 (0.714, 0.762)
PHANTASi	0.62 (0.597, 0.642)	0.697 (0.672, 0.723)	0.736 (0.711, 0.762)	0.733 (0.708, 0.758)
PITSTOP	0.532 (0.519, 0.545)	0.543 (0.528, 0.557)	0.546 (0.531, 0.561)	0.551 (0.535, 0.567)
PreSAT	0.642 (0.618, 0.665)	0.722 (0.696, 0.748)	0.778 (0.755, 0.802)	0.765 (0.744, 0.787)
PRESEP	0.646 (0.622, 0.67)	0.736 (0.71, 0.763)	0.833 (0.809, 0.857)	0.844 (0.821, 0.866)
PRESS	0.548 (0.533, 0.563)	0.554 (0.537, 0.57)	0.575 (0.556, 0.594)	0.582 (0.562, 0.602)
PSP	0.647 (0.623, 0.67)	0.741 (0.714, 0.767)	0.826 (0.804, 0.849)	0.821 (0.8, 0.842)
REMS	0.646 (0.622, 0.67)	0.739 (0.712, 0.765)	0.805 (0.782, 0.827)	0.753 (0.729, 0.777)
RST	0.641 (0.617, 0.664)	0.724 (0.698, 0.75)	0.771 (0.749, 0.792)	0.719 (0.701, 0.738)
SAS	0.535 (0.522, 0.548)	0.54 (0.526, 0.554)	0.555 (0.539, 0.572)	0.56 (0.543, 0.577)
SEPSIS	0.647 (0.623, 0.671)	0.741 (0.714, 0.768)	0.851 (0.829, 0.873)	0.873 (0.856, 0.891)
STSS	0.644 (0.621, 0.668)	0.736 (0.71, 0.763)	0.829 (0.805, 0.852)	0.826 (0.804, 0.848)
Suffoletto	0.634 (0.61, 0.657)	0.716 (0.69, 0.741)	0.784 (0.76, 0.808)	0.79 (0.767, 0.812)
UK	0.64 (0.617, 0.664)	0.721 (0.695, 0.746)	0.776 (0.754, 0.797)	0.748 (0.729, 0.768)

Table 2 Diagnostic impression alone (secondary)

Threshold	N	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV
Sepsis	12870	115	285	253	12217	0.312 (0.267, 0.362)	0.977 (0.974, 0.98)	0.288 (0.245, 0.334)	0.98 (0.977, 0.982)
Sepsis or infection	12870	201	1078	167	11424	0.546 (0.495, 0.596)	0.914 (0.909, 0.919)	0.157 (0.138, 0.178)	0.986 (0.983, 0.988)
Sepsis, infection or nonspecific impression	12870	325	5563	43	6939	0.883 (0.846, 0.912)	0.555 (0.546, 0.564)	0.055 (0.05, 0.061)	0.994 (0.992, 0.995)
All	12870	368	12502	0	0	1 (0.99, 1)	0 (0, 0)	0.029 (0.026, 0.032)	NaN (NaN, NaN)

Table 3 NEWS2: diagnostic impression of sepsis (secondary)

Threshold	N	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV
0	12859	115	281	252	12211	0.313 (0.268, 0.363)	0.978 (0.975, 0.98)	0.29 (0.248, 0.337)	0.98 (0.977, 0.982)
1	12859	115	277	252	12215	0.313 (0.268, 0.363)	0.978 (0.975, 0.98)	0.293 (0.25, 0.34)	0.98 (0.977, 0.982)
2	12859	115	272	252	12220	0.313 (0.268, 0.363)	0.978 (0.976, 0.981)	0.297 (0.254, 0.345)	0.98 (0.977, 0.982)
3	12859	114	261	253	12231	0.311 (0.265, 0.36)	0.979 (0.976, 0.981)	0.304 (0.26, 0.352)	0.98 (0.977, 0.982)
4	12859	112	244	255	12248	0.305 (0.26, 0.354)	0.98 (0.978, 0.983)	0.315 (0.269, 0.365)	0.98 (0.977, 0.982)
5	12859	109	227	258	12265	0.297 (0.253, 0.346)	0.982 (0.979, 0.984)	0.324 (0.277, 0.376)	0.979 (0.977, 0.982)
6	12859	105	190	262	12302	0.286 (0.242, 0.334)	0.985 (0.982, 0.987)	0.356 (0.303, 0.412)	0.979 (0.976, 0.982)
7	12859	95	157	272	12335	0.259 (0.217, 0.306)	0.987 (0.985, 0.989)	0.377 (0.319, 0.438)	0.978 (0.976, 0.981)
8	12859	86	129	281	12363	0.234 (0.194, 0.28)	0.99 (0.988, 0.991)	0.4 (0.337, 0.467)	0.978 (0.975, 0.98)
9	12859	73	94	294	12398	0.199 (0.161, 0.243)	0.992 (0.991, 0.994)	0.437 (0.364, 0.513)	0.977 (0.974, 0.979)
10	12859	59	65	308	12427	0.161 (0.127, 0.202)	0.995 (0.993, 0.996)	0.476 (0.39, 0.563)	0.976 (0.973, 0.978)
11	12859	40	36	327	12456	0.109 (0.081, 0.145)	0.997 (0.996, 0.998)	0.526 (0.416, 0.635)	0.974 (0.972, 0.977)
12	12859	25	21	342	12471	0.068 (0.047, 0.099)	0.998 (0.997, 0.999)	0.543 (0.402, 0.678)	0.973 (0.97, 0.976)
13	12859	8	12	359	12480	0.022 (0.011, 0.042)	0.999 (0.998, 0.999)	0.4 (0.219, 0.613)	0.972 (0.969, 0.975)
14	12859	4	7	363	12485	0.011 (0.004, 0.028)	0.999 (0.999, 1)	0.364 (0.152, 0.646)	0.972 (0.969, 0.974)
15	12859	0	3	367	12489	0 (0, 0.01)	1 (0.999, 1)	0 (0, 0.561)	0.971 (0.968, 0.974)
16	12859	0	0	367	12492	0 (0, 0.01)	1 (1, 1)	NaN (NaN, NaN)	0.971 (0.968, 0.974)

Table 4 NEWS2: diagnostic impression of sepsis or infection (secondary)

Threshold	N	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV
0	12859	199	1031	168	11461	0.542 (0.491, 0.593)	0.917 (0.913, 0.922)	0.162 (0.142, 0.183)	0.986 (0.983, 0.988)
1	12859	198	966	169	11526	0.54 (0.488, 0.59)	0.923 (0.918, 0.927)	0.17 (0.15, 0.193)	0.986 (0.983, 0.988)
2	12859	198	888	169	11604	0.54 (0.488, 0.59)	0.929 (0.924, 0.933)	0.182 (0.16, 0.206)	0.986 (0.983, 0.988)
3	12859	192	775	175	11717	0.523 (0.472, 0.574)	0.938 (0.934, 0.942)	0.199 (0.175, 0.225)	0.985 (0.983, 0.987)
4	12859	182	657	185	11835	0.496 (0.445, 0.547)	0.947 (0.943, 0.951)	0.217 (0.19, 0.246)	0.985 (0.982, 0.987)
5	12859	172	539	195	11953	0.469 (0.418, 0.52)	0.957 (0.953, 0.96)	0.242 (0.212, 0.275)	0.984 (0.982, 0.986)
6	12859	155	410	212	12082	0.422 (0.373, 0.473)	0.967 (0.964, 0.97)	0.274 (0.239, 0.313)	0.983 (0.98, 0.985)
7	12859	133	314	234	12178	0.362 (0.315, 0.413)	0.975 (0.972, 0.977)	0.298 (0.257, 0.342)	0.981 (0.979, 0.983)
8	12859	109	218	258	12274	0.297 (0.253, 0.346)	0.983 (0.98, 0.985)	0.333 (0.284, 0.386)	0.979 (0.977, 0.982)
9	12859	91	146	276	12346	0.248 (0.207, 0.295)	0.988 (0.986, 0.99)	0.384 (0.324, 0.447)	0.978 (0.975, 0.981)
10	12859	68	91	299	12401	0.185 (0.149, 0.228)	0.993 (0.991, 0.994)	0.428 (0.353, 0.505)	0.976 (0.974, 0.979)
11	12859	47	48	320	12444	0.128 (0.098, 0.166)	0.996 (0.995, 0.997)	0.495 (0.396, 0.594)	0.975 (0.972, 0.978)
12	12859	29	28	338	12464	0.079 (0.056, 0.111)	0.998 (0.997, 0.998)	0.509 (0.383, 0.634)	0.974 (0.971, 0.976)
13	12859	11	17	356	12475	0.03 (0.017, 0.053)	0.999 (0.998, 0.999)	0.393 (0.236, 0.576)	0.972 (0.969, 0.975)
14	12859	5	8	362	12484	0.014 (0.006, 0.031)	0.999 (0.999, 1)	0.385 (0.177, 0.645)	0.972 (0.969, 0.975)
15	12859	0	3	367	12489	0 (0, 0.01)	1 (0.999, 1)	0 (0, 0.561)	0.971 (0.968, 0.974)
16	12859	0	0	367	12492	0 (0, 0.01)	1 (1, 1)	NaN (NaN, NaN)	0.971 (0.968, 0.974)

Table 5 NEWS2: diagnostic impression of sepsis, infection or nonspecific impression (secondary)

Threshold	N	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV
0	12859	318	4627	49	7865	0.866 (0.828, 0.898)	0.63 (0.621, 0.638)	0.064 (0.058, 0.071)	0.994 (0.992, 0.995)
1	12859	311	3824	56	8668	0.847 (0.807, 0.881)	0.694 (0.686, 0.702)	0.075 (0.068, 0.084)	0.994 (0.992, 0.995)
2	12859	306	3239	61	9253	0.834 (0.792, 0.868)	0.741 (0.733, 0.748)	0.086 (0.078, 0.096)	0.993 (0.992, 0.995)
3	12859	295	2590	72	9902	0.804 (0.76, 0.841)	0.793 (0.785, 0.8)	0.102 (0.092, 0.114)	0.993 (0.991, 0.994)
4	12859	277	2041	90	10451	0.755 (0.708, 0.796)	0.837 (0.83, 0.843)	0.119 (0.107, 0.133)	0.991 (0.99, 0.993)
5	12859	259	1605	108	10887	0.706 (0.657, 0.75)	0.872 (0.866, 0.877)	0.139 (0.124, 0.155)	0.99 (0.988, 0.992)
6	12859	223	1149	144	11343	0.608 (0.557, 0.656)	0.908 (0.903, 0.913)	0.163 (0.144, 0.183)	0.987 (0.985, 0.989)
7	12859	184	820	183	11672	0.501 (0.45, 0.552)	0.934 (0.93, 0.939)	0.183 (0.161, 0.208)	0.985 (0.982, 0.987)
8	12859	150	510	217	11982	0.409 (0.36, 0.46)	0.959 (0.956, 0.963)	0.227 (0.197, 0.261)	0.982 (0.98, 0.984)
9	12859	113	309	254	12183	0.308 (0.263, 0.357)	0.975 (0.972, 0.978)	0.268 (0.228, 0.312)	0.98 (0.977, 0.982)
10	12859	84	179	283	12313	0.229 (0.189, 0.275)	0.986 (0.983, 0.988)	0.319 (0.266, 0.378)	0.978 (0.975, 0.98)
11	12859	56	89	311	12403	0.153 (0.119, 0.193)	0.993 (0.991, 0.994)	0.386 (0.311, 0.467)	0.976 (0.973, 0.978)
12	12859	35	46	332	12446	0.095 (0.069, 0.13)	0.996 (0.995, 0.997)	0.432 (0.33, 0.541)	0.974 (0.971, 0.977)
13	12859	13	27	354	12465	0.035 (0.021, 0.06)	0.998 (0.997, 0.999)	0.325 (0.201, 0.48)	0.972 (0.969, 0.975)
14	12859	6	12	361	12480	0.016 (0.008, 0.035)	0.999 (0.998, 0.999)	0.333 (0.163, 0.563)	0.972 (0.969, 0.975)
15	12859	0	3	367	12489	0 (0, 0.01)	1 (0.999, 1)	0 (0, 0.561)	0.971 (0.968, 0.974)
16	12859	0	0	367	12492	0 (0, 0.01)	1 (1, 1)	NaN (NaN, NaN)	0.971 (0.968, 0.974)

Table 6 NEWS2: all diagnostic impressions (secondary)

Threshold	N	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV
0	12859	359	9172	8	3320	0.978 (0.958, 0.989)	0.266 (0.258, 0.274)	0.038 (0.034, 0.042)	0.998 (0.995, 0.999)
1	12859	347	6734	20	5758	0.946 (0.917, 0.964)	0.461 (0.452, 0.47)	0.049 (0.044, 0.054)	0.997 (0.995, 0.998)
2	12859	339	5197	28	7295	0.924 (0.892, 0.947)	0.584 (0.575, 0.593)	0.061 (0.055, 0.068)	0.996 (0.994, 0.997)
3	12859	324	3789	43	8703	0.883 (0.846, 0.912)	0.697 (0.689, 0.705)	0.079 (0.071, 0.087)	0.995 (0.993, 0.996)
4	12859	300	2782	67	9710	0.817 (0.775, 0.854)	0.777 (0.77, 0.785)	0.097 (0.087, 0.108)	0.993 (0.991, 0.995)
5	12859	280	2079	87	10413	0.763 (0.717, 0.804)	0.834 (0.827, 0.84)	0.119 (0.106, 0.132)	0.992 (0.99, 0.993)
6	12859	238	1457	129	11035	0.649 (0.598, 0.696)	0.883 (0.878, 0.889)	0.14 (0.125, 0.158)	0.988 (0.986, 0.99)
7	12859	199	1015	168	11477	0.542 (0.491, 0.593)	0.919 (0.914, 0.923)	0.164 (0.144, 0.186)	0.986 (0.983, 0.988)
8	12859	158	613	209	11879	0.431 (0.381, 0.482)	0.951 (0.947, 0.955)	0.205 (0.178, 0.235)	0.983 (0.98, 0.985)
9	12859	119	362	248	12130	0.324 (0.278, 0.374)	0.971 (0.968, 0.974)	0.247 (0.211, 0.288)	0.98 (0.977, 0.982)
10	12859	88	212	279	12280	0.24 (0.199, 0.286)	0.983 (0.981, 0.985)	0.293 (0.245, 0.347)	0.978 (0.975, 0.98)
11	12859	58	109	309	12383	0.158 (0.124, 0.199)	0.991 (0.989, 0.993)	0.347 (0.279, 0.422)	0.976 (0.973, 0.978)
12	12859	37	56	330	12436	0.101 (0.074, 0.136)	0.996 (0.994, 0.997)	0.398 (0.304, 0.499)	0.974 (0.971, 0.977)
13	12859	14	34	353	12458	0.038 (0.023, 0.063)	0.997 (0.996, 0.998)	0.292 (0.182, 0.432)	0.972 (0.969, 0.975)
14	12859	6	15	361	12477	0.016 (0.008, 0.035)	0.999 (0.998, 0.999)	0.286 (0.138, 0.5)	0.972 (0.969, 0.975)
15	12859	0	4	367	12488	0 (0, 0.01)	1 (0.999, 1)	0 (0, 0.49)	0.971 (0.968, 0.974)
16	12859	0	1	367	12491	0 (0, 0.01)	1 (1, 1)	0 (0, 0.793)	0.971 (0.968, 0.974)

Table 7 qSOFA and other tools: diagnostic impression of sepsis (secondary)

EWS	Threshold	N	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV
Pre-alert	0	12870	45	110	323	12392	0.122 (0.093, 0.16)	0.991 (0.989, 0.993)	0.29 (0.225, 0.366)	0.975 (0.972, 0.977)
qSOFA	0	12869	108	248	260	12253	0.293 (0.249, 0.342)	0.98 (0.978, 0.982)	0.303 (0.258, 0.353)	0.979 (0.977, 0.982)
qSOFA	1	12869	72	103	296	12398	0.196 (0.158, 0.239)	0.992 (0.99, 0.993)	0.411 (0.341, 0.485)	0.977 (0.974, 0.979)
qSOFA	2	12869	19	21	349	12480	0.052 (0.033, 0.079)	0.998 (0.997, 0.999)	0.475 (0.329, 0.625)	0.973 (0.97, 0.975)
90-30-90	0	12857	92	168	275	12322	0.251 (0.209, 0.297)	0.987 (0.984, 0.988)	0.354 (0.298, 0.414)	0.978 (0.975, 0.981)
Borelli	0	12835	102	203	264	12266	0.279 (0.235, 0.327)	0.984 (0.981, 0.986)	0.334 (0.284, 0.389)	0.979 (0.976, 0.981)
CIS	0	12855	115	282	252	12206	0.313 (0.268, 0.363)	0.977 (0.975, 0.98)	0.29 (0.247, 0.336)	0.98 (0.977, 0.982)
CIS	4	12855	32	42	335	12446	0.087 (0.062, 0.12)	0.997 (0.995, 0.998)	0.432 (0.326, 0.546)	0.974 (0.971, 0.976)
HEWS	4	12835	101	209	265	12260	0.276 (0.233, 0.324)	0.983 (0.981, 0.985)	0.326 (0.276, 0.38)	0.979 (0.976, 0.981)
MEWS	4	12859	89	188	278	12304	0.243 (0.201, 0.289)	0.985 (0.983, 0.987)	0.321 (0.269, 0.378)	0.978 (0.975, 0.98)
NHS	0	12855	93	203	274	12285	0.253 (0.212, 0.3)	0.984 (0.981, 0.986)	0.314 (0.264, 0.369)	0.978 (0.975, 0.981)
PHANTASi	0	12858	94	209	273	12282	0.256 (0.214, 0.303)	0.983 (0.981, 0.985)	0.31 (0.261, 0.364)	0.978 (0.976, 0.981)
PITSTOP	0	12813	24	20	341	12428	0.066 (0.045, 0.096)	0.998 (0.998, 0.999)	0.545 (0.401, 0.683)	0.973 (0.97, 0.976)
PreSAT	0	12835	111	249	255	12220	0.303 (0.258, 0.352)	0.98 (0.977, 0.982)	0.308 (0.263, 0.358)	0.98 (0.977, 0.982)
PRESEP	3	12835	112	241	254	12228	0.306 (0.261, 0.355)	0.981 (0.978, 0.983)	0.317 (0.271, 0.368)	0.98 (0.977, 0.982)
PRESS	1	12835	35	33	331	12436	0.096 (0.07, 0.13)	0.997 (0.996, 0.998)	0.515 (0.398, 0.629)	0.974 (0.971, 0.977)
PSP	1	12835	112	257	254	12212	0.306 (0.261, 0.355)	0.979 (0.977, 0.982)	0.304 (0.259, 0.352)	0.98 (0.977, 0.982)
REMS	2	12855	115	268	252	12220	0.313 (0.268, 0.363)	0.979 (0.976, 0.981)	0.3 (0.257, 0.348)	0.98 (0.977, 0.982)
RST	0	12857	111	263	256	12227	0.302 (0.258, 0.351)	0.979 (0.976, 0.981)	0.297 (0.253, 0.345)	0.979 (0.977, 0.982)
SAS	0	12836	26	14	340	12456	0.071 (0.049, 0.102)	0.999 (0.998, 0.999)	0.65 (0.495, 0.779)	0.973 (0.97, 0.976)
SEPSIS	4	12856	78	123	289	12366	0.213 (0.174, 0.257)	0.99 (0.988, 0.992)	0.388 (0.323, 0.457)	0.977 (0.974, 0.98)
STSS	1	12855	105	210	262	12278	0.286 (0.242, 0.334)	0.983 (0.981, 0.985)	0.333 (0.284, 0.387)	0.979 (0.976, 0.981)
Suffoletto	0	12813	104	218	261	12230	0.285 (0.241, 0.333)	0.982 (0.98, 0.985)	0.323 (0.274, 0.376)	0.979 (0.976, 0.981)
UK	0	12855	110	236	257	12252	0.3 (0.255, 0.348)	0.981 (0.979, 0.983)	0.318 (0.271, 0.369)	0.979 (0.977, 0.982)

Table 8 qSOFA and other tools: diagnostic impression of sepsis or infection (secondary)

EWS	Threshold	N	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV
Pre-alert	0	12870	52	133	316	12369	0.141 (0.109, 0.181)	0.989 (0.987, 0.991)	0.281 (0.221, 0.35)	0.975 (0.972, 0.978)
qSOFA	0	12869	181	757	187	11744	0.492 (0.441, 0.543)	0.939 (0.935, 0.943)	0.193 (0.169, 0.219)	0.984 (0.982, 0.986)
qSOFA	1	12869	106	192	262	12309	0.288 (0.244, 0.336)	0.985 (0.982, 0.987)	0.356 (0.304, 0.412)	0.979 (0.977, 0.982)
qSOFA	2	12869	23	22	345	12479	0.062 (0.042, 0.092)	0.998 (0.997, 0.999)	0.511 (0.37, 0.65)	0.973 (0.97, 0.976)
90-30-90	0	12857	141	386	226	12104	0.384 (0.336, 0.435)	0.969 (0.966, 0.972)	0.268 (0.232, 0.307)	0.982 (0.979, 0.984)
Borelli	0	12835	160	463	206	12006	0.437 (0.387, 0.488)	0.963 (0.959, 0.966)	0.257 (0.224, 0.293)	0.983 (0.981, 0.985)
CIS	0	12855	200	1037	167	11451	0.545 (0.494, 0.595)	0.917 (0.912, 0.922)	0.162 (0.142, 0.183)	0.986 (0.983, 0.988)
CIS	4	12855	38	54	329	12434	0.104 (0.076, 0.139)	0.996 (0.994, 0.997)	0.413 (0.318, 0.515)	0.974 (0.971, 0.977)
HEWS	4	12835	154	477	212	11992	0.421 (0.371, 0.472)	0.962 (0.958, 0.965)	0.244 (0.212, 0.279)	0.983 (0.98, 0.985)
MEWS	4	12859	136	411	231	12081	0.371 (0.323, 0.421)	0.967 (0.964, 0.97)	0.249 (0.214, 0.287)	0.981 (0.979, 0.983)
NHS	0	12855	150	470	217	12018	0.409 (0.36, 0.46)	0.962 (0.959, 0.966)	0.242 (0.21, 0.277)	0.982 (0.98, 0.984)
PHANTASi	0	12858	162	587	205	11904	0.441 (0.391, 0.493)	0.953 (0.949, 0.957)	0.216 (0.188, 0.247)	0.983 (0.981, 0.985)
PITSTOP	0	12813	32	28	333	12420	0.088 (0.063, 0.121)	0.998 (0.997, 0.998)	0.533 (0.409, 0.654)	0.974 (0.971, 0.977)
PreSAT	0	12835	184	731	182	11738	0.503 (0.452, 0.554)	0.941 (0.937, 0.945)	0.201 (0.176, 0.228)	0.985 (0.982, 0.987)
PRESEP	3	12835	184	737	182	11732	0.503 (0.452, 0.554)	0.941 (0.937, 0.945)	0.2 (0.175, 0.227)	0.985 (0.982, 0.987)
PRESS	1	12835	40	61	326	12408	0.109 (0.081, 0.145)	0.995 (0.994, 0.996)	0.396 (0.306, 0.494)	0.974 (0.972, 0.977)
PSP	1	12835	189	722	177	11747	0.516 (0.465, 0.567)	0.942 (0.938, 0.946)	0.207 (0.182, 0.235)	0.985 (0.983, 0.987)
REMS	2	12855	199	985	168	11503	0.542 (0.491, 0.593)	0.921 (0.916, 0.926)	0.168 (0.148, 0.19)	0.986 (0.983, 0.988)
RST	0	12857	189	835	178	11655	0.515 (0.464, 0.566)	0.933 (0.929, 0.937)	0.185 (0.162, 0.209)	0.985 (0.983, 0.987)
SAS	0	12836	30	22	336	12448	0.082 (0.058, 0.115)	0.998 (0.997, 0.999)	0.577 (0.442, 0.701)	0.974 (0.971, 0.976)
SEPSIS	4	12856	107	216	260	12273	0.292 (0.247, 0.34)	0.983 (0.98, 0.985)	0.331 (0.282, 0.384)	0.979 (0.977, 0.982)
STSS	1	12855	175	606	192	11882	0.477 (0.426, 0.528)	0.951 (0.948, 0.955)	0.224 (0.196, 0.255)	0.984 (0.982, 0.986)
Suffoletto	0	12813	177	668	188	11780	0.485 (0.434, 0.536)	0.946 (0.942, 0.95)	0.209 (0.183, 0.238)	0.984 (0.982, 0.986)
UK	0	12855	182	685	185	11803	0.496 (0.445, 0.547)	0.945 (0.941, 0.949)	0.21 (0.184, 0.238)	0.985 (0.982, 0.987)

Table 9 qSOFA and other tools: diagnostic impression of sepsis, infection or nonspecified impression (secondary)

EWS	Threshold	N	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV
Pre-alert	0	12870	73	311	295	12191	0.198 (0.161, 0.242)	0.975 (0.972, 0.978)	0.19 (0.154, 0.232)	0.976 (0.974, 0.979)
qSOFA	0	12869	281	2977	87	9524	0.764 (0.718, 0.804)	0.762 (0.754, 0.769)	0.086 (0.077, 0.096)	0.991 (0.989, 0.993)
qSOFA	1	12869	153	547	215	11954	0.416 (0.367, 0.467)	0.956 (0.953, 0.96)	0.219 (0.19, 0.251)	0.982 (0.98, 0.985)
qSOFA	2	12869	32	45	336	12456	0.087 (0.062, 0.12)	0.996 (0.995, 0.997)	0.416 (0.312, 0.527)	0.974 (0.971, 0.976)
90-30-90	0	12857	214	1458	153	11032	0.583 (0.532, 0.632)	0.883 (0.878, 0.889)	0.128 (0.113, 0.145)	0.986 (0.984, 0.988)
Borelli	0	12835	230	1157	136	11312	0.628 (0.578, 0.676)	0.907 (0.902, 0.912)	0.166 (0.147, 0.186)	0.988 (0.986, 0.99)
CIS	0	12855	323	5137	44	7351	0.88 (0.843, 0.909)	0.589 (0.58, 0.597)	0.059 (0.053, 0.066)	0.994 (0.992, 0.996)
CIS	4	12855	53	134	314	12354	0.144 (0.112, 0.184)	0.989 (0.987, 0.991)	0.283 (0.224, 0.352)	0.975 (0.972, 0.978)
HEWS	4	12835	222	1378	144	11091	0.607 (0.556, 0.655)	0.889 (0.884, 0.895)	0.139 (0.123, 0.157)	0.987 (0.985, 0.989)
MEWS	4	12859	180	906	187	11586	0.49 (0.44, 0.541)	0.927 (0.923, 0.932)	0.166 (0.145, 0.189)	0.984 (0.982, 0.986)
NHS	0	12855	227	1690	140	10798	0.619 (0.568, 0.667)	0.865 (0.859, 0.871)	0.118 (0.105, 0.134)	0.987 (0.985, 0.989)
PHANTASi	0	12858	209	1216	158	11275	0.569 (0.518, 0.619)	0.903 (0.897, 0.908)	0.147 (0.129, 0.166)	0.986 (0.984, 0.988)
PITSTOP	0	12813	35	51	330	12397	0.096 (0.07, 0.13)	0.996 (0.995, 0.997)	0.407 (0.309, 0.513)	0.974 (0.971, 0.977)
PreSAT	0	12835	264	2054	102	10415	0.721 (0.673, 0.765)	0.835 (0.829, 0.842)	0.114 (0.102, 0.127)	0.99 (0.988, 0.992)
PRESEP	3	12835	261	1730	105	10739	0.713 (0.665, 0.757)	0.861 (0.855, 0.867)	0.131 (0.117, 0.147)	0.99 (0.988, 0.992)
PRESS	1	12835	58	163	308	12306	0.158 (0.125, 0.199)	0.987 (0.985, 0.989)	0.262 (0.209, 0.324)	0.976 (0.973, 0.978)
PSP	1	12835	274	2423	92	10046	0.749 (0.702, 0.79)	0.806 (0.799, 0.813)	0.102 (0.091, 0.114)	0.991 (0.989, 0.993)
REMS	2	12855	322	4906	45	7582	0.877 (0.84, 0.907)	0.607 (0.599, 0.616)	0.062 (0.055, 0.068)	0.994 (0.992, 0.996)
RST	0	12857	287	3000	80	9490	0.782 (0.737, 0.821)	0.76 (0.752, 0.767)	0.087 (0.078, 0.097)	0.992 (0.99, 0.993)
SAS	0	12836	42	52	324	12418	0.115 (0.086, 0.151)	0.996 (0.995, 0.997)	0.447 (0.35, 0.547)	0.975 (0.972, 0.977)
SEPSIS	4	12856	139	425	228	12064	0.379 (0.331, 0.429)	0.966 (0.963, 0.969)	0.246 (0.213, 0.284)	0.981 (0.979, 0.984)
STSS	1	12855	270	2218	97	10270	0.736 (0.688, 0.778)	0.822 (0.816, 0.829)	0.109 (0.097, 0.121)	0.991 (0.989, 0.992)
Suffoletto	0	12813	250	1448	115	11000	0.685 (0.636, 0.73)	0.884 (0.878, 0.889)	0.147 (0.131, 0.165)	0.99 (0.988, 0.991)
UK	0	12855	282	2713	85	9775	0.768 (0.723, 0.809)	0.783 (0.775, 0.79)	0.094 (0.084, 0.105)	0.991 (0.989, 0.993)

Table 10 qSOFA and other tools: all diagnostic impressions (secondary)

EWS	Threshold	N	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV
Pre-alert	0	12870	83	528	285	11974	0.226 (0.186, 0.271)	0.958 (0.954, 0.961)	0.136 (0.111, 0.165)	0.977 (0.974, 0.979)
qSOFA	0	12869	312	4897	56	7604	0.848 (0.808, 0.881)	0.608 (0.6, 0.617)	0.06 (0.054, 0.067)	0.993 (0.991, 0.994)
qSOFA	1	12869	164	786	204	11715	0.446 (0.396, 0.497)	0.937 (0.933, 0.941)	0.173 (0.15, 0.198)	0.983 (0.98, 0.985)
qSOFA	2	12869	33	65	335	12436	0.09 (0.065, 0.123)	0.995 (0.993, 0.996)	0.337 (0.251, 0.435)	0.974 (0.971, 0.976)
90-30-90	0	12857	229	1930	138	10560	0.624 (0.573, 0.672)	0.845 (0.839, 0.852)	0.106 (0.094, 0.12)	0.987 (0.985, 0.989)
Borelli	0	12835	245	1502	121	10967	0.669 (0.62, 0.716)	0.88 (0.874, 0.885)	0.14 (0.125, 0.157)	0.989 (0.987, 0.991)
CIS	0	12855	364	10844	3	1644	0.992 (0.976, 0.997)	0.132 (0.126, 0.138)	0.032 (0.029, 0.036)	0.998 (0.995, 0.999)
CIS	4	12855	59	169	308	12319	0.161 (0.127, 0.202)	0.986 (0.984, 0.988)	0.259 (0.206, 0.319)	0.976 (0.973, 0.978)
HEWS	4	12835	239	1919	127	10550	0.653 (0.603, 0.7)	0.846 (0.84, 0.852)	0.111 (0.098, 0.125)	0.988 (0.986, 0.99)
MEWS	4	12859	194	1228	173	11264	0.529 (0.478, 0.579)	0.902 (0.896, 0.907)	0.136 (0.12, 0.155)	0.985 (0.982, 0.987)
NHS	0	12855	248	2493	119	9995	0.676 (0.626, 0.722)	0.8 (0.793, 0.807)	0.09 (0.08, 0.102)	0.988 (0.986, 0.99)
PHANTASi	0	12858	221	1704	146	10787	0.602 (0.551, 0.651)	0.864 (0.857, 0.869)	0.115 (0.101, 0.13)	0.987 (0.984, 0.989)
PITSTOP	0	12813	39	67	326	12381	0.107 (0.079, 0.143)	0.995 (0.993, 0.996)	0.368 (0.282, 0.463)	0.974 (0.971, 0.977)
PreSAT	0	12835	285	3091	81	9378	0.779 (0.733, 0.818)	0.752 (0.744, 0.76)	0.084 (0.076, 0.094)	0.991 (0.989, 0.993)
PRESEP	3	12835	278	2264	88	10205	0.76 (0.713, 0.801)	0.818 (0.812, 0.825)	0.109 (0.098, 0.122)	0.991 (0.989, 0.993)
PRESS	1	12835	65	212	301	12257	0.178 (0.142, 0.22)	0.983 (0.981, 0.985)	0.235 (0.189, 0.288)	0.976 (0.973, 0.979)
PSP	1	12835	302	4408	64	8061	0.825 (0.783, 0.861)	0.646 (0.638, 0.655)	0.064 (0.057, 0.071)	0.992 (0.99, 0.994)
REMS	2	12855	363	10268	4	2220	0.989 (0.972, 0.996)	0.178 (0.171, 0.185)	0.034 (0.031, 0.038)	0.998 (0.995, 0.999)
RST	0	12857	314	5207	53	7283	0.856 (0.816, 0.888)	0.583 (0.574, 0.592)	0.057 (0.051, 0.063)	0.993 (0.991, 0.994)
SAS	0	12836	46	78	320	12392	0.126 (0.096, 0.164)	0.994 (0.992, 0.995)	0.371 (0.291, 0.459)	0.975 (0.972, 0.977)
SEPSIS	4	12856	145	488	222	12001	0.395 (0.346, 0.446)	0.961 (0.957, 0.964)	0.229 (0.198, 0.263)	0.982 (0.979, 0.984)
STSS	1	12855	293	3315	74	9173	0.798 (0.754, 0.836)	0.735 (0.727, 0.742)	0.081 (0.073, 0.091)	0.992 (0.99, 0.994)
Suffoletto	0	12813	269	1963	96	10485	0.737 (0.69, 0.78)	0.842 (0.836, 0.849)	0.121 (0.108, 0.135)	0.991 (0.989, 0.993)
UK	0	12855	308	4280	59	8208	0.839 (0.798, 0.873)	0.657 (0.649, 0.666)	0.067 (0.06, 0.075)	0.993 (0.991, 0.994)

The following figures are those from Section 5 repeated for the secondary reference standard.

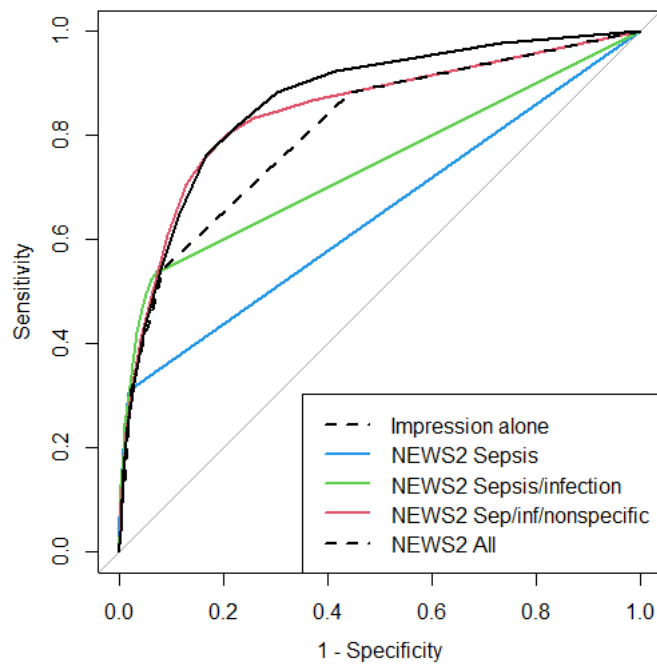


Figure 1 ROC curves for NEWS2 applied at different working impression thresholds (secondary)

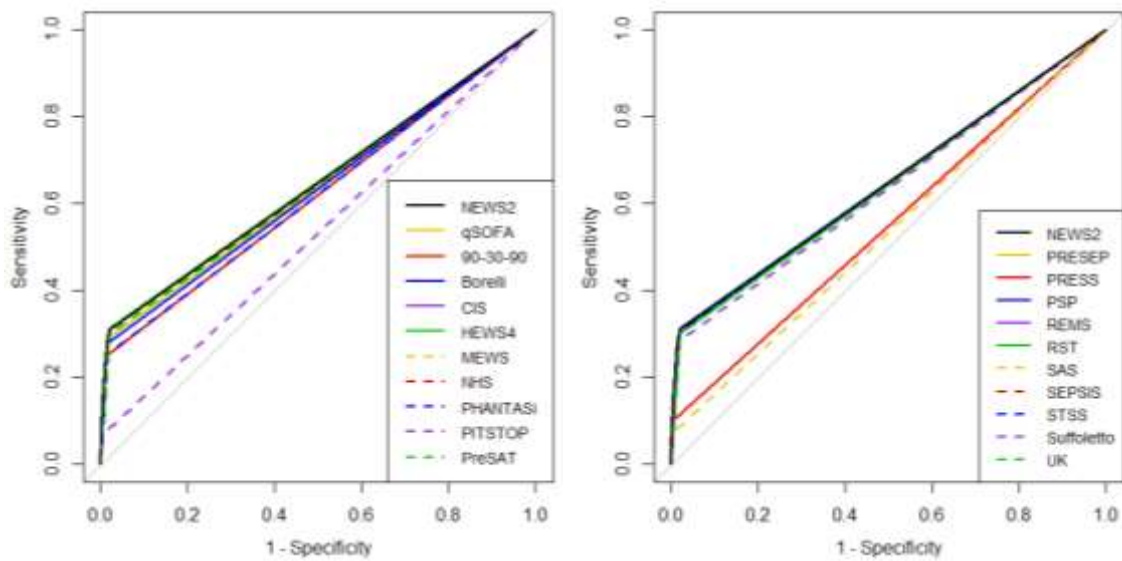


Figure 2 ROC curves for EWS and diagnostic impression of sepsis (secondary)

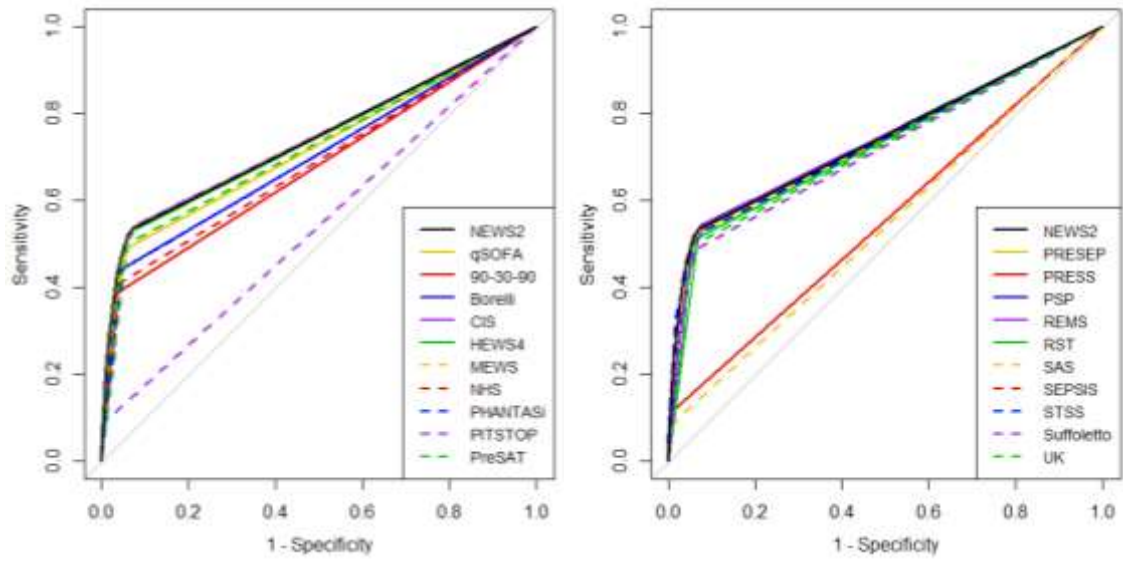


Figure 3 ROC curves for EWS and diagnostic impression of sepsis or infection (secondary)

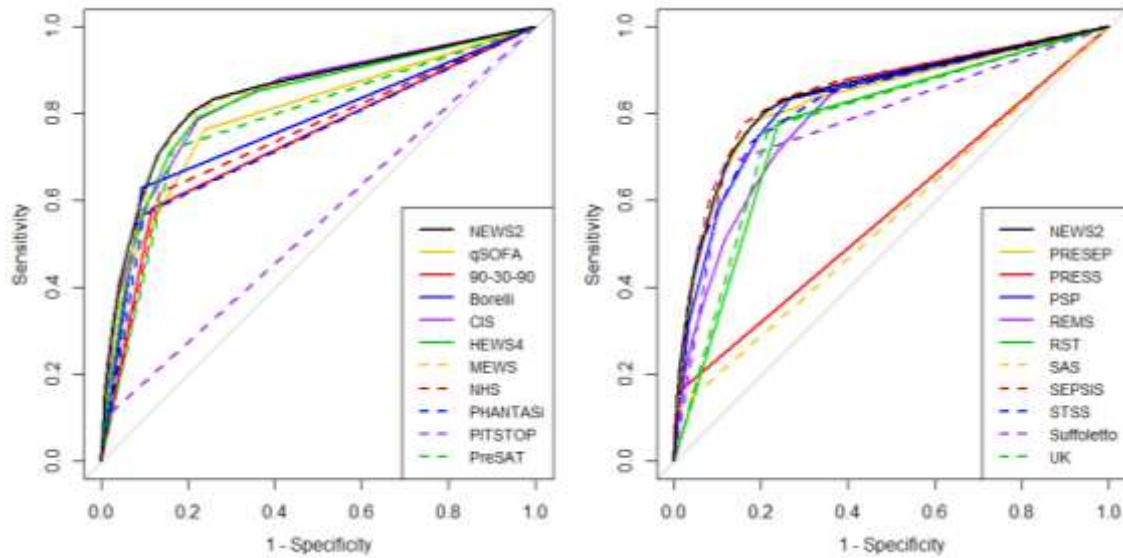


Figure 4 ROC curves for EWS and diagnostic impression of sepsis, infection or nonspecified impression (secondary)

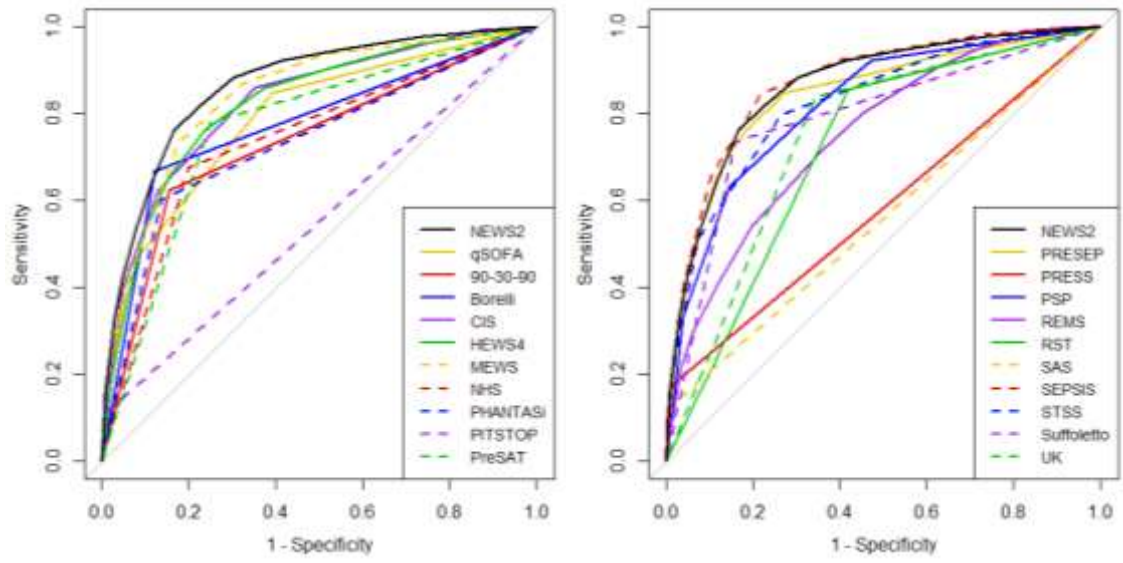


Figure 5 ROC curves for EWS and all diagnostic impressions (secondary)