SAPS 3 - From Evaluation of the Patient to Evaluation of the Intensive Care Unit.

Electronic Supplementary Material

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Introduction

This file contains the Electronic Supplementary Material for both parts of the report “SAPS 3 - From evaluation of the patient to evaluation of the Intensive Care Unit”.

For Appendix C, *Data definitions* we left the text as it was published for the data collection. However, since the original data definitions contained typographic errors and misspellings we applied some corrections (language editing), without changing the content. We are aware that the text might still contain semantic or syntactic errors but wanted to keep the definitions as close to the original as possible.

With respect to the details of the different board members and coordinators (Appendices D-F), please note that they are displayed as registered in our project database.

A software for calculation of the SAPS 3 Admission Score is already available and can be downloaded from www.saps3.org.

Rui Moreno & Philipp Metnitz on behalf of all authors

Appendix A. Additional tables.

For details about variables see Appendix C, Data definitions.

Table E1. Kappa- and Intraclass-correlation coefficients

Coefficient	Kappa	Intraclass
Admission Data		
Gender	0.97	
Age		0.98
Body height		0.98
Body weight		0.79
Hospital admission date		0.97
Time of hospital admission		0.94
ICU admission date		0.89
Time of admission to the ICU		0.94
Origin	0.90	
Intrahospital origin	0.91	
Readmission to the ICU	0.95	
Planned admission	0.92	
Comorbidities	0.89	
Physiological data		
Heartrate maximum		0.98
Heartrate minimum		0.96
Systolic blood pressure maximum		0.96
Systolic blood pressure minimum		0.80
Body temperature maximum		0.94
Body temperature minimum		0.91
Respiratory rate maximum		0.90
Respiratory rate minimum		0.93
PaO2 minimum		0.97
PaCO2 minimum		0.97
FiO2		0.95
PEEP		0.72
Tidal volume		0.97
pH maximum		0.98
pH minimum		0.98
HCO3 maximum		0.95
HCO3 minimum		0.95
Base excess maximum		0.91
Base excess minimum		0.95
Urea nitrogen		0.97
Serume creatinine		0.88
Serum bilirubine		0.98
Leukcocytes maximum		0.57
Leukocytes minimum		0.94

Platelets minimum		0.87
GCS Actual		0.91
GCS Actual eye		0.91
GCS Actual motor		0.91
GCS Actual verbal		0.88
GCS Estimated		0.92
GCS Estimated eye		0.90
GCS Estimated motor		0.93
GCS Estimated verbal		0.85
CPR	0.96	
Vasoactive medication	0.87	
Mechanical ventilation	0.82	
Ventilatory support	0.88	

Maximum and minimum refer to the highest and lowest values during the observation interval, respectively. All physiologic values are taken from the day of ICU admission (observation interval: within one hour before and after ICU admission). Kappa and Intraclass refer to Kapp- and Intraclass-correlation coefficients, respectively.

Table E2. ICU specialities (Basic SAPS 3 cohort).

	N	%
Specialty		
Mixed medical-surgical	214	69.7
Surgical. non cardiac	21	6.8
Medical	18	5.9
Mixed medical coro-nary	17	5.5
Other	8	2.6
Neurosurgical	6	2.0
Neurological	3	1.0
Surgical. cardiac	2	0.7
Coronary care	1	0.3
Transplant	1	0.3
Trauma	1	0.3
missing	15	4.9

Table E3. Comorbidities.

		N	%	N	%
Number of patients		**19577**	100.00	**16784**	100.00
Alcoholism		1310	6.69	1139	6.79
Arterial hypertension		7139	36.47	6023	35.89
Chemoterapy		464	2.37	410	2.44
Chronic heart failure					
	Class II NYHA	939	4.80	853	5.08
	Class III NYHA	606	3.10	547	3.26
	Class IV NYHA	240	1.23	203	1.21
Chronic pulmonary failure		840	4.29	726	4.33
Cirrhosis		601	3.07	523	3.12
COPD		2347	11.99	2086	12.43
EV drug addict		209	1.07	189	1.13
Haematological cancer		317	1.62	279	1.66
HIV / AIDS					
	HIV positive, no AIDS	63	0.32	51	0.30
	AIDS	91	0.46	81	0.48
Immunosuppression, other		341	1.74	293	1.75
Diabetes					
	Insuline-dependent	581	2.97	513	3.06
	Non-insuline-dependent	1185	6.05	992	5.91
Cancer					
	Metastatic cancer	553	2.82	499	2.97
	Non-metastatic cancer	1113	5.69	988	5.89
Radiotherapy		286	1.46	252	1.50
Steroid treatment		744	3.80	649	3.87
Chronical renal failure		1131	5.78	989	5.89

Tables E3 – E6:
N=19,577 depicts the SAPS 3 BASIC Cohort, N= 16784 the SAPS 3 Hospital Outcome Cohort.

Table E4. Reasons for ICU admission.

	N	%	N	%
Number of patients	**19577**	100.00	**16784**	100.00
Basic				
Basic and observational	6265	32.00	5299	31.57
Cardiovascular				
Cardiac arrest	560	2.86	528	3.15
Hypovolemic non hemorragic shock	202	1.03	187	1.11
Hypovolemic hemorragic shock	462	2.36	424	2.53
Septic shock	704	3.60	659	3.93
Cardiogenic shock	308	1.57	284	1.69
Anaphylatic shock	23	0.12	21	0.13
Mixed and undefined shock	310	1.58	288	1.72
Chest pain (with ECG changes compatible with either angina or AMI)	1200	6.13	917	5.46
Hypertensive crisis	163	0.83	135	0.80
Rhythm disturbances	662	3.38	582	3.47
Cardiac failure without shock either left, right or global	709	3.62	618	3.68
Shock	59	0.30	755	4.50
Other	923	4.71	46	0.27
Digestive				
Bleeding	517	2.64	460	2.74
Acute abdomen	579	2.96	525	3.13
Severe pancreatitis	160	0.82	138	0.82
Other	356	1.82	296	1.76
Hematological				
Haemorraghic syndrome/disseminated intravascular coagulation	224	1.14	208	1.24
Severe hemolysis	25	0.13	18	0.11
Other	189	0.97	166	0.99
Hepatic				
Liver failure	286	1.46	257	1.53
Other	136	0.69	114	0.68
Metabolic				
Acid-base and/or electrolyte disturbance	991	5.06	919	5.48
Hypo and hypertermia	87	0.44	77	0.46
Hypo and hyperglicemia (includes diabetic coma)	186	0.95	167	0.99
Other	106	0.54	90	0.54
Neurological				
Coma, stupor, obtunded, vigilance disturbances, confusion, agitation, delirium	926	4.73	855	5.09
Seizures	282	1.44	240	1.43
Focal neurological deficit (hemiplegia, paraplegia, tetraplegia)	415	2.12	335	2.00
Intracranial mass efect	446	2.28	386	2.30
Other	429	2.19	354	2.11
Renal				
Pre-renal ARF	549	2.80	509	3.03
Obstructive ARF	57	0.29	49	0.29
Organic ARF	337	1.72	305	1.82
Other	214	1.09	177	1.05
Respiratory				
ALI and ARDS	1109	5.66	1034	6.16
Acute respiratory failure on chronic pulmonary disease	1411	7.21	1243	7.41
Other	1881	9.61	1646	9.81

Other					
	Severe trauma	943	4.82	839	5.00
	other	461	2.35	363	2.16

Table E5. Acute medical diseases.

	N	%	N	%
Number of patients	19577	100.00	16784	100.00
Cardiovascular				
Myocardial infarction	1239	6.33	1034	6.16
Cardiopathy	941	4.66	824	4.91
Unstable angina	913	4.81	718	4.28
Rhythm disturbances	858	4.38	761	4.53
Other	1583	8.09	1370	8.16
Digestive				
Neoplasia of the upper digestive tract	438	2.24	386	2.30
Neoplasia of the lower digestive tract	432	2.21	373	2.22
Oesophageal, gastric, duodenal ulcer	233	1.19	204	1.22
Pancreatitis	197	1.01	172	1.02
Oesophageal, gastric varices	120	0.61	100	0.60
Cholecistitis	106	0.54	94	0.56
Acute toxic, drug hepatitis	35	0.18	28	0.17
Acute alcoholic hepatitis	29	0.15	24	0.14
Other	1008	5.15	874	5.21
Haematological				
Malignant disease	153	0.78	137	0.82
Non malignant disease	41	0.21	41	0.24
Transfusional reaction	32	0.16	32	0.19
Drug toxicity and secondary effects	27	0.14	25	0.15
Sickle Cell Anemia	1	0.01	1	0.01
Other	110	0.56	92	0.55
Metabolic				
Other intoxication, acute	229	1.17	211	1.26
Drug overdose	224	1.14	202	1.20
Diabetic ketoacidosis	113	0.58	102	0.61
Endocrinopathy	89	0.45	76	0.45
Adverse effects of medication	38	0.19	35	0.21
Hyperosmolar diabetic coma	27	0.14	26	0.15
Other	238	1.22	200	1.19
Neurological				
Cerebrovascular accident	1231	6.29	1047	6.24
Intracranial tumor	531	2.71	451	2.69
Post-anoxic coma	134	0.68	127	0.76
Idiopathic epilepsy	113	0.58	96	0.57
Degenerative disease	90	0.46	75	0.45
Myopathia, myasthenia gravis	66	0.34	63	0.38
Delirium tremens	44	0.22	37	0.22
Polyneuritis and polyradiculoneuritis	40	0.20	31	0.18
Other	695	3.55	595	3.55
Pregnancy				
Eclampsia, preeclampsia	36	0.18	31	0.18
Delivery haemorrage	36	0.18	31	0.18
HELLP syndrome	22	0.11	18	0.11
Other	47	0.24	39	0.23

Renal					
	Acute tubular necrosis	150	0.77	137	0.82
	Gynaecologic diseases, malignant	100	0.51	87	0.52
	Renal neoplasia	98	0.50	88	0.52
	Gynaecologic diseases, non malignant	53	0.27	47	0.28
	Vascular nephropathy	40	0.20	39	0.23
	Acute glomerulopathy	36	0.18	29	0.17
	Interstitial nephropathy	34	0.17	29	0.17
	Other	358	1.83	295	1.76
Respiratory					
	Exacerbation of chronic pulmonary disease	926	4.73	824	4.91
	Tumor	290	1.48	253	1.51
	Pulmonary embolism	188	0.96	169	1.01
	Pleural effusion	167	0.85	150	0.89
	Obstruction	131	0.67	118	0.70
	Asthma attack	133	0.68	120	0.71
	Inhalation pneumonitis	127	0.65	114	0.68
	Other	1245	6.36	1105	6.58
Trauma					
	Polytrauma with brain trauma	493	2.52	443	2.64
	Polytrauma without brain trauma	407	2.08	362	2.16
	Isolated brain trauma	351	1.79	297	1.77
	Monotrauma without brain trauma	233	1.19	196	1.17
	Burns	40	0.20	38	0.23
	Near-drowning	4	0.02	3	0.02
	Other	98	0.50	83	0.49
Other					
	Other	701	3.58	579	3.45

Table E6. Sites of surgery.

	N	%	N	%
Number of patients	**19577**	100.00	**16784**	100.00
Abdominal surgery				
Lower gastro-intestinal	1338	6.83	1157	6.89
Upper gastro-intestinal	549	2.80	472	2.81
Biliar tract	272	1.39	227	1.35
Liver	206	1.05	178	1.06
Pancreas	182	0.93	156	0.93
Ear, nose and throat surgery	216	1.10	183	1.09
Endocrine surgery	88	0.45	69	0.41
Gynaecological surgery	184	0.94	163	0.97
Heart surgery				
CABG without valvular repair	904	4.62	761	4.53
Valvular, without CABG	430	2.20	382	2.28
Valvular with CABG	180	0.92	162	0.97
Other	143	0.73	109	0.65
Limb Surgery	340	1.74	300	1.79
Maxillo-facial surgery	158	0.81	137	0.82
Neurosurgery				
Intracranial tumour	516	2.64	432	2.57
Cerebrovascular accident	432	2.21	375	2.23
Spinal surgery	189	0.97	142	0.85
Other	250	1.28	209	1.25
Obstetric surgery	126	0.64	110	0.66
Thoracic surgery				
Lobectomy	150	0.77	117	0.70
Pleural surgery	80	0.41	73	0.43
Pneumonectomy	54	0.28	45	0.27
Other	220	1.12	196	1.17
Transplantation				
Liver	114	0.58	90	0.54
Kidney	64	0.33	55	0.33
Lung	12	0.06	8	0.05
Heart	11	0.06	11	0.07
Kidney and pancreas	6	0.03	5	0.03
Pancreas	5	0.03	3	0.02
Heart and lung	1	0.01	1	0.01
Other	4	0.02	4	0.02
Trauma				
Limb	249	1.27	218	1.30
Brain	165	0.84	142	0.85
Multiple	115	0.59	101	0.60
Abdomen	96	0.49	82	0.49
Thorax	23	0.12	20	0.12
Vascular surgery				
Major aortic surgery	541	2.76	478	2.85
Carotid endarterectomy	176	0.90	155	0.92
Other major vascular surgery	148	0.76	130	0.77
Peripheral vascular surgery	121	0.62	107	0.64
Other	29	0.15	21	0.13
Other	665	3.40	562	3.35
Missing	1353	6.91	1103	6.57

Table E7. Performance of the SAPS II in the SAPS 3 Hospital Outcome Cohort.

	GOF H-Test	p	GOF C-Test	p	O/E	CI		aROC
All (n = 16.784)	227.21	<0.0001	184.70	<0.0001	1.08	1.06-1.1	*	0.831
AREAS								
Australasia	66.62	<0.0001	56.80	<0.0001	1.03	0.96-1.1		0.818
Central and South America	119.00	<0.0001	121.81	<0.0001	1.32	1.25-1.38	*	0.828
Central and WesternEurope	80.70	<0.0001	46.70	<0.0001	0.86	0.81-0.91	*	0.845
Eastern Europe	25.88	0.004	26.40	0.003	1.17	1.07-1.26	*	0.870
North America	17.91	0.056	15.63	0.111	0.96	0.83-1.09		0.798
Northern Europe	15.53	0.114	21.87	0.016	1.21	1.06-1.36	*	0.811
Southern Europe and Mediterranean countries	151.67	<0.0001	144.75	<0.0001	1.14	1.1-1.17		0.826
SUBGROUPS								
Trauma	19.67	0.033	20.22	0.027	0.99	0.9-1.07		0.838
Surgical status: non-operative	356.81	<0.0001	340.74	<0.0001	1.16	1.13-1.18	*	0.809
Surgical status: scheduled	20.44	0.025	18.69	0.044	0.94	0.87-1.01		0.806
Surgical status: emergency	27.57	0.002	25.76	0.004	0.99	0.94-1.04		0.806
Infection: no infection	117.83	<0.0001	87.69	<0.0001	1.01	0.98-1.04		0.837
Infection: community acquired	130.28	<0.0001	137.11	<0.0001	1.15	1.1-1.2	*	0.770
Infection: hospital acquired	320.50	<0.0001	335.49	<0.0001	1.41	1.34-1.47	*	0.742

GOF: Hosmer-Lemeshow goodness-of-fit; O/E: observed-to-expected mortality; CI: 95% confidence interval; aROC: area under the receiver operating characteristic (curve). Non-operative admissions, Scheduled surgery, Emergency surgery: see data definitions, Appendix C, ESM;

No infection: Patients not infected at ICU admission; Community-acquired infection: Patients with community-acquired infection at ICU admission; Hospital-acquired infection: Patients with hospital-acquired infection at ICU admission; Asterix mark confidence intervals wich do not overlap 1.

Table E8. Estimated coefficients for the variables used in the SAPS 3 model.

Estimated coefficients for the variables used in the SAPS 3 model. Estimates are presented for the overall sample and for each of the 5 sub-sets used for model development. Results are presented unrounded and rounded with respective p values.

A. Partitioning by patients

	All			**Part 1**			**Part 2**			**Part 3**			**Part 4**			**Part 5**		
	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p
Estimated Glasgow Coma Scale 3-4	1.4798	15	<.0001	1.4595	15	<.0001	1.5802	16	<.0001	1.4665	15	<.0001	1.4574	15	<.0001	1.4304	14	<.0001
Estimated Glasgow Coma Scale 5	1.0252	10	<.0001	1.0360	10	<.0001	1.2533	13	<.0001	0.9452	9	0.0005	0.8956	9	0.0008	0.9860	10	0.0002
Estimated Glasgow Coma Scale 6	0.7056	7	<.0001	0.5703	6	0.0045	0.9006	9	<.0001	0.7269	7	0.0003	0.6097	6	0.0027	0.7336	7	0.0002
Estimated Glasgow Coma Scale 7-12	0.2228	2	0.0089	0.1401	1	0.1435	0.2810	3	0.0032	0.2478	2	0.0087	0.2001	2	0.0359	0.2394	2	0.0113
Age, 40-60 years	0.5411	5	<.0001	0.4973	5	<.0001	0.5672	6	<.0001	0.4737	5	<.0001	0.5596	6	<.0001	0.5784	6	<.0001
Age, 60-70 years	0.8964	9	<.0001	0.8476	8	<.0001	0.9144	9	<.0001	0.8859	9	<.0001	0.9624	10	<.0001	0.8418	8	<.0001
Age, 70-75 years	1.3097	13	<.0001	1.3270	13	<.0001	1.3031	13	<.0001	1.2413	12	<.0001	1.3650	14	<.0001	1.2640	13	<.0001
Age, 75-80 years	1.4688	15	<.0001	1.4584	15	<.0001	1.4541	15	<.0001	1.4495	14	<.0001	1.4877	15	<.0001	1.4376	14	<.0001
Age >= 80 years	1.7922	18	<.0001	1.7636	18	<.0001	1.8154	18	<.0001	1.7092	17	<.0001	1.8878	19	<.0001	1.7450	17	<.0001
Intrahospital location before ICU admission: emergency room	0.4865	5	<.0001	0.4863	5	<.0001	0.4688	5	<.0001	0.5695	6	<.0001	0.4834	5	<.0001	0.4449	4	<.0001
Intrahospital location before ICU admission: other ICU	0.6924	7	<.0001	0.6959	7	<.0001	0.6899	7	<.0001	0.6747	7	<.0001	0.7096	7	<.0001	0.7034	7	<.0001
Intrahospital location before ICU admission: other	0.7601	8	<.0001	0.7608	8	<.0001	0.7337	7	<.0001	0.8250	8	<.0001	0.7618	8	<.0001	0.7517	8	<.0001
Cancer therapy (aggregated)	0.3231	3	0.0002	0.3317	3	0.0008	0.3248	3	0.0008	0.3222	3	0.0009	0.2885	3	0.0033	0.3584	4	0.0003
Chronic heart failure, class IV NYHA	0.6196	6	0.0016	0.7299	7	0.0008	0.7429	7	0.0007	0.7363	7	0.0008	0.5987	6	0.0058	0.2261	2	0.3214
Cirrhosis	0.7737	8	<.0001	0.8762	9	<.0001	0.7803	8	<.0001	0.7744	8	<.0001	0.6982	7	<.0001	0.7379	7	<.0001
Haematological cancer	0.5900	6	0.0005	0.6391	6	0.0008	0.4804	5	0.0118	0.6655	7	0.0004	0.5616	6	0.003	0.6108	6	0.0013
AIDS	0.7560	8	0.0107	0.6139	6	0.0598	1.0029	10	0.0032	0.9917	10	0.0028	0.6019	6	0.0695	0.6177	6	0.0611
Cancer	1.0719	11	<.0001	1.0474	10	<.0001	1.1001	11	<.0001	1.0544	11	<.0001	1.0254	10	<.0001	1.0856	11	<.0001
Length of stay in the hospital before ICU admission: 14-28 days	0.5540	6	<.0001	0.5921	6	<.0001	0.6089	6	<.0001	0.5450	5	<.0001	0.5607	6	<.0001	0.5070	5	<.0001
Length of stay in the hospital before ICU admission >= 28 days	0.6893	7	<.0001	0.6501	7	<.0001	0.7083	7	<.0001	0.7339	7	<.0001	0.6513	7	<.0001	0.7435	7	<.0001
Vasoactive drugs before ICU admission	0.2960	3	<.0001	0.2976	3	<.0001	0.2069	2	0.0046	0.3314	3	<.0001	0.3233	3	<.0001	0.3047	3	<.0001
unplanned ICU admission	0.3450	3	<.0001	0.3149	3	0.0003	0.3627	4	<.0001	0.2771	3	0.0015	0.3512	4	<.0001	0.4011	4	<.0001
Non-operative patient	0.4865	5	<.0001	0.4984	5	<.0001	0.4885	5	<.0001	0.4613	5	<.0001	0.4677	5	<.0001	0.5393	5	<.0001
Emergency surgery patient	0.6272	6	<.0001	0.5931	6	<.0001	0.6736	7	<.0001	0.6354	6	<.0001	0.6276	6	<.0001	0.6186	6	<.0001
Reason for ICU admission: Cardiovascular: Hypovolemic, hemorragic shock, non-hemorragic shock	0.2793	3	0.0154	0.2758	3	0.0319	0.3191	3	0.0133	0.2216	2	0.0911	0.3162	3	0.014	0.2776	3	0.0299

	All			Part 1			Part 2			Part 3			Part 4			Part 5		
	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p
Reason for ICU admission: Cardiovascular: Septic shock	0.4784	5	<.0001	0.4958	5	<.0001	0.5579	6	<.0001	0.4693	5	0.0001	0.4092	4	0.001	0.4737	5	0.0001
Reason for ICU admission: Cardiovascular: anaphylactic and mixed and undefined shock	0.4939	5	0.0007	0.5213	5	0.0015	0.4494	4	0.005	0.5428	5	0.0007	0.5812	6	0.0003	0.4144	4	0.0126
Reason for ICU admission: Cardiovascular: rhythm disturbances	-0.4856	-5	0.0004	-0.5561	-6	0.0003	-0.4191	-4	0.0062	-0.4509	-5	0.003	-0.4759	-5	0.0015	-0.5446	-5	0.0004
Reason for ICU admission: Digestive: severe pancreatistis	0.9173	9	<.0001	0.8750	9	0.0005	1.0670	11	<.0001	1.0642	11	<.0001	0.7987	8	0.0013	0.8175	8	0.0015
Reason for ICU admission: Digestive: acute abdomen and other	0.3450	3	0.0008	0.3176	3	0.0062	0.2883	3	0.0127	0.4077	4	0.0003	0.3899	4	0.0007	0.3416	3	0.0027
Reason for ICU admission: Hepatic: Liver failure	0.5945	6	0.001	0.5776	6	0.0041	0.6352	6	0.0017	0.5769	6	0.0041	0.6247	6	0.0022	0.6001	6	0.0024
Reason for ICU admission: Neurologic: coma, stupor, obtunded patient, vigilance disturbances, confusion, agitation, delirium	0.3995	4	0.0002	0.4142	4	0.0004	0.3548	4	0.0026	0.3400	3	0.0037	0.4282	4	0.0003	0.4132	4	0.0004
Reason for ICU admission: Neurologic: seizures	-0.4308	-4	0.0341	-0.5250	-5	0.0223	-0.3256	-3	0.1469	-0.4209	-4	0.0738	-0.5332	-5	0.0203	-0.3752	-4	0.0902
Reason for ICU admission: Neurologic: focal neurologic deficit (hemiplegia, paraplegia, tetraplegia)	0.7060	7	<.0001	0.5818	6	0.0008	0.8323	8	<.0001	0.8259	8	<.0001	0.6300	6	0.0003	0.6922	7	<.0001
Reason for ICU admission: Neurologic: intracranial mass effect	0.9975	10	<.0001	1.0829	11	<.0001	1.1098	11	<.0001	0.8989	9	<.0001	0.8767	9	<.0001	1.0252	10	<.0001
Anatomical site of surgery: cerebrovascular accident	0.4896	5	0.0018	0.5963	6	0.0006	0.3186	3	0.0737	0.5556	6	0.0012	0.5755	6	0.0012	0.4676	5	0.0075
Anatomical site of surgery: CABG without valvular repair	-0.6373	-6	0.0023	-0.6986	-7	0.0036	-0.5213	-5	0.0224	-0.5527	-6	0.0133	-0.8653	-9	0.0003	-0.6376	-6	0.0083
Anatomical site of surgery: Trauma - Other, isolated (includes Thorax, Abdomen, limb) and Trauma – Multiple	-0.8404	-8	<.0001	-0.7324	-7	0.0004	-0.9793	-10	<.0001	-0.8993	-9	<.0001	-0.8783	-9	<.0001	-0.7745	-8	0.0003
Anatomical site of surgery: Transplantation surgery (liver, kidney, pancreas, kidney and pancreas, other)	-1.1126	-11	0.0011	-1.0010	-10	0.0058	-1.3854	-14	0.0006	-1.2858	-13	0.0011	-0.9431	-9	0.0091	-1.0658	-11	0.0058
Pneumonia	0.5403	5	<.0001	0.4807	5	<.0001	0.5210	5	<.0001	0.5708	6	<.0001	0.5711	6	<.0001	0.5549	6	<.0001
Infection acquired in the hospital	0.4137	4	<.0001	0.4389	4	<.0001	0.4354	4	<.0001	0.4252	4	<.0001	0.3634	4	0.0002	0.3978	4	<.0001
Highest serum bilirubin 0-6	0.4428	4	<.0001	0.4385	4	<.0001	0.4088	4	0.0002	0.4437	4	<.0001	0.4209	4	0.0001	0.5039	5	<.0001
Highest serum bilirubin >= 6	0.4642	5	0.0019	0.5372	5	0.0012	0.4118	4	0.0135	0.4433	4	0.0077	0.5261	5	0.0018	0.3805	4	0.0241
Highest body temperature < 35.0	0.6802	7	<.0001	0.6526	7	<.0001	0.7049	7	<.0001	0.6962	7	<.0001	0.6139	6	<.0001	0.6956	7	<.0001
Highest creatinine 0.1 – 2.0	0.1983	2	0.0008	0.1804	2	0.0064	0.1613	2	0.0145	0.2099	2	0.0015	0.1784	2	0.0068	0.2627	3	<.0001
Highest creatinine 2.0 – 3.5	0.6725	7	<.0001	0.6661	7	<.0001	0.6292	6	<.0001	0.6751	7	<.0001	0.6997	7	<.0001	0.6961	7	<.0001
Highest creatinine >= 3.5	0.8048	8	<.0001	0.7597	8	<.0001	0.8201	8	<.0001	0.7724	8	<.0001	0.8407	8	<.0001	0.8610	9	<.0001

Electronic Supplementary Material

	All			Part 1			Part 2			Part 3			Part 4			Part 5		
	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p
Highest heath rate 120-160	0.4512	5	<.0001	0.4756	5	<.0001	0.4569	5	<.0001	0.4322	4	<.0001	0.4358	4	<.0001	0.4508	5	<.0001
Highest hearth rate >= 160	0.6563	7	<.0001	0.7064	7	<.0001	0.6938	7	0.0002	0.5503	6	0.0018	0.6976	7	0.0001	0.6140	6	0.0004
Lowest leukocytes >= 15.000	0.1526	2	0.0072	0.1424	1	0.0251	0.1692	2	0.0078	0.1227	1	0.053	0.2171	2	0.0007	0.1088	1	0.086
Lowest pH <= 7.25	0.2795	3	<.0001	0.2903	3	0.0001	0.2678	3	0.0005	0.2619	3	0.0006	0.2500	3	0.001	0.3523	4	<.0001
Lowest platelets < 20	1.3330	13	<.0001	1.2194	12	<.0001	1.3649	14	<.0001	1.1750	12	<.0001	1.4580	15	<.0001	1.3883	14	<.0001
Lowest west platelets 20-50	0.7550	8	<.0001	0.7341	7	<.0001	0.8201	8	<.0001	0.7838	8	<.0001	0.7207	7	<.0001	0.7018	7	<.0001
Lowest platelets 50-100	0.4935	5	<.0001	0.4932	5	<.0001	0.5085	5	<.0001	0.5013	5	<.0001	0.5186	5	<.0001	0.4318	4	<.0001
Lowest systolic blood pressure < 40	1.1053	11	<.0001	1.1446	11	<.0001	1.2511	13	<.0001	1.0803	11	<.0001	1.0300	10	<.0001	1.1211	11	<.0001
Lowest systolic blood pressure 40-70	0.8321	8	<.0001	0.8289	8	<.0001	0.8927	9	<.0001	0.8469	8	<.0001	0.8656	9	<.0001	0.7404	7	<.0001
Lowest systolic blood pressure 70-120	0.3191	3	<.0001	0.3377	3	<.0001	0.3250	3	<.0001	0.3020	3	<.0001	0.2630	3	<.0001	0.3755	4	<.0001
Ventilatory support and oxygenation: PaO2 < 60 and no MV	0.5448	5	<.0001	0.6051	6	<.0001	0.5544	6	<.0001	0.4656	5	0.0006	0.6464	6	<.0001	0.4392	4	0.0011
Ventilatory support and oxygenation: PaO2/FiO2 ratio >= 200 and MV	0.6537	7	<.0001	0.6285	6	<.0001	0.6358	6	<.0001	0.6792	7	<.0001	0.7090	7	<.0001	0.6215	6	<.0001
Ventilatory support and oxygenation: PaO2/FiO2 ratio 100-200 and MV	0.7443	7	<.0001	0.7315	7	<.0001	0.7422	7	<.0001	0.7530	8	<.0001	0.8021	8	<.0001	0.6785	7	<.0001
Ventilatory support and oxygenation: PaO2/iO2 ratio < 100 and MV	1.0677	11	<.0001	1.1685	12	<.0001	1.0048	10	<.0001	1.0911	11	<.0001	1.0483	10	<.0001	1.0199	10	<.0001

Est: Estimated coefficients, unrounded; *R:* Estimated coefficients, rounded; *p*: respective *p*-values.

B. Partitioning by ICUs

	All			Part 1			Part 2			Part 3			Part 4			Part 5		
	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p
Estimated Glasgow Coma Scale 3-4	1.4798	15	<0.0001	1.4204	14	<0.0001	1.5909	16	<0.0001	1.4473	14	<0.0001	1.4591	15	<0.0001	1.4857	15	<0.0001
Estimated Glasgow Coma Scale 5	1.0252	10	<0.0001	1.0367	10	0.0002	1.1156	11	<0.0001	1.0201	10	0.0001	0.9584	10	0.0003	0.9962	10	0.0002
Estimated Glasgow Coma Scale 6	0.7056	7	<0.0001	0.7455	7	0.0004	0.8286	8	<0.0001	0.7008	7	0.0005	0.6926	7	0.0007	0.5574	6	0.0062
Estimated Glasgow Coma Scale 7-12	0.2228	2	0.0089	0.1638	2	0.0921	0.2398	2	0.0109	0.2182	2	0.0191	0.2294	2	0.0149	0.2626	3	0.0077
Age, 40-60 years	0.5411	5	<0.0001	0.5444	5	<0.0001	0.5163	5	<0.0001	0.5579	6	<0.0001	0.5581	6	<0.0001	0.5292	5	<0.0001
Age, 60-70 years	0.8964	9	<0.0001	0.9087	9	<0.0001	0.8604	9	<0.0001	0.9147	9	<0.0001	0.9362	9	<0.0001	0.8600	9	<0.0001
Age, 70-75 years	1.3097	13	<0.0001	1.3326	13	<0.0001	1.2382	12	<0.0001	1.3137	13	<0.0001	1.3483	13	<0.0001	1.3195	13	<0.0001
Age, 75-80 years	1.4688	15	<0.0001	1.4854	15	<0.0001	1.4145	14	<0.0001	1.4958	15	<0.0001	1.4364	14	<0.0001	1.5185	15	<0.0001
Age >= 80 years	1.7922	18	<0.0001	1.8501	19	<0.0001	1.7048	17	<0.0001	1.8187	18	<0.0001	1.7833	18	<0.0001	1.8161	18	<0.0001
Intrahospital location before ICU admission: emergency room	0.4865	5	<0.0001	0.4125	4	<0.0001	0.5189	5	<0.0001	0.5395	5	<0.0001	0.4843	5	<0.0001	0.4689	5	<0.0001
Intrahospital location before ICU admission: other ICU	0.6924	7	<0.0001	0.6988	7	<0.0001	0.6596	7	<0.0001	0.7426	7	<0.0001	0.692	7	<0.0001	0.6636	7	<0.0001
Intrahospital location before ICU admission: other	0.7601	8	<0.0001	0.7247	7	<0.0001	0.7350	7	<0.0001	0.7732	8	<0.0001	0.7813	8	<0.0001	0.7837	8	<0.0001
Cancer therapy (aggregated)	0.3231	3	0.0002	0.3124	3	0.0014	0.3656	4	0.0003	0.3598	4	0.0002	0.3723	4	0.0002	0.2103	2	0.0369
Chronic heart failure, class IV NYHA	0.6196	6	0.0016	0.638	6	0.0032	0.4736	5	0.0328	0.6238	6	0.0069	0.681	7	0.0026	0.6789	7	0.0012
Cirrhosis	0.7737	8	<0.0001	0.7585	8	<0.0001	0.8968	9	<0.0001	0.7239	7	<0.0001	0.7343	7	<0.0001	0.7531	8	<0.0001
Haematological cancer	0.5900	6	0.0005	0.6493	6	0.0007	0.5636	6	0.0035	0.2741	3	0.139	0.6468	6	0.0005	0.8384	8	<0.0001
AIDS	0.7560	8	0.0107	0.7671	8	0.0131	0.6817	7	0.0659	0.7283	7	0.0281	0.7912	8	0.0147	0.7951	8	0.0163
Cancer	1.0719	11	<0.0001	1.042	10	<0.0001	1.0421	10	<0.0001	1.1316	11	<0.0001	0.9784	10	<0.0001	1.1711	12	<0.0001
Length of stay in the hospital before ICU admission: 14-28 days	0.5540	6	<0.0001	0.5382	5	<0.0001	0.4638	5	<0.0001	0.5516	6	<0.0001	0.5667	6	<0.0001	0.6659	7	<0.0001
Length of stay in the hospital before ICU admission >= 28 days	0.6893	7	<0.0001	0.66	7	<0.0001	0.6469	6	<0.0001	0.7184	7	<0.0001	0.7535	8	<0.0001	0.6654	7	<0.0001
Vasoactive drugs before ICU admission	0.2960	3	<0.0001	0.2853	3	<0.0001	0.3227	3	<0.0001	0.2892	3	<0.0001	0.303	3	<0.0001	0.2888	3	0.0001
unlanned ICU admission	0.3450	3	<0.0001	0.3143	3	0.0003	0.2986	3	0.0007	0.4110	4	<0.0001	0.3633	4	<0.0001	0.3443	3	0.0002
Non-operative patient	0.4865	5	<0.0001	0.5598	6	<0.0001	0.4725	5	<0.0001	0.4423	4	<0.0001	0.4671	5	<0.0001	0.5026	5	<0.0001
Emergency surgery patient	0.6272	6	<0.0001	0.6351	6	<0.0001	0.6467	6	<0.0001	0.5327	5	<0.0001	0.6548	7	<0.0001	0.6744	7	<0.0001
Reason for ICU admission: Cardiovascular: Hypovolemic, hemorragic shock, non-hemorragic shock	0.2793	3	0.0154	0.3576	4	0.0051	0.3048	3	0.0184	0.2441	2	0.0535	0.1569	2	0.2401	0.3222	3	0.0129
Reason for ICU admission: Cardiovascular: Septic shock	0.4784	5	<0.0001	0.5578	6	<0.0001	0.3772	4	0.0026	0.5338	5	<0.0001	0.4673	5	0.0001	0.4594	5	0.0003

	All			Part 1			Part 2			Part 3			Part 4			Part 5		
	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p
Reason for ICU admission: Cardiovascular: anaphylactic and mixed and undefined shock	0.4939	5	0.0007	0.5284	5	0.0010	0.4468	4	0.0085	0.5488	5	0.0005	0.4779	5	0.0041	0.4647	5	0.0038
Reason for ICU admission: Cardiovascular: rhythm disturbances	-0.4856	-5	0.0004	-0.5433	-5	0.0002	-0.5599	-6	0.0005	-0.4527	-5	0.0018	-0.3872	-4	0.0136	-0.4822	-5	0.0016
Reason for ICU admission: Digestive: severe pancreatistis	0.9173	9	<0.0001	0.9254	9	0.0002	0.8106	8	0.0026	1.0475	10	<0.0001	0.9971	10	<0.0001	0.7922	8	0.0019
Reason for ICU admission: Digestive: acute abdomen and other	0.3450	3	0.0008	0.3482	3	0.0027	0.3434	3	0.0027	0.3881	4	0.0006	0.3148	3	0.0051	0.3382	3	0.0045
Reason for ICU admission: Hepatic: Liver failure	0.5945	6	0.001	0.527	5	0.0071	0.6224	6	0.0027	0.5108	5	0.0099	0.7114	7	0.0005	0.6342	6	0.0019
Reason for ICU admission: Neurologic: coma, stupor, obtunded patient, vigilance disturbances, confusion, agitation, delirium	0.3995	4	0.0002	0.4496	4	<0.0001	0.3418	3	0.004	0.3929	4	0.0009	0.4702	5	<0.0001	0.3464	3	0.0049
Reason for ICU admission: Neurologic: seizures	-0.4308	-4	0.0341	-0.4317	-4	0.0478	-0.3705	-4	0.1165	-0.3625	-4	0.1023	-0.4902	-5	0.0313	-0.4992	-5	0.0352
Reason for ICU admission: Neurologic: focal neurologic deficit (hemiplegia, paraplegia, tetraplegia)	0.7060	7	<0.0001	0.7657	8	<0.0001	0.7974	8	<0.0001	0.6538	7	0.0002	0.6098	6	0.0003	0.7088	7	<0.0001
Reason for ICU admission: Neurologic: intracranial mass effect	0.9975	10	<0.0001	0.9281	9	<0.0001	1.0014	10	<0.0001	1.2256	12	<0.0001	0.9273	9	<0.0001	0.9073	9	<0.0001
Anatomical site of surgery: cerebrovascular accident	0.4896	5	0.0018	0.5787	6	0.0010	0.3975	4	0.0191	0.5550	6	0.0014	0.4694	5	0.0076	0.4735	5	0.0100
Anatomical site of surgery: CABG without valvular repair	-0.6373	-6	0.0023	-0.529	-5	0.0215	-0.7633	-8	0.0008	-0.3993	-4	0.1153	-0.6966	-7	0.0028	-0.7258	-7	0.0017
Anatomical site of surgery: Trauma - Other, isolated (includes Thorax, Abdomen, limb) and Trauma – Multiple	-0.8404	-8	<0.0001	-0.8052	-8	0.0003	-0.7950	-8	0.0002	-0.7729	-8	0.0005	-0.8175	-8	0.0001	-1.0259	-10	<0.0001
Anatomical site of surgery: Transplantation surgery (liver, kidney, pancreas, kidney and pancreas, other)	-1.1126	-11	0.0011	-1.0898	-11	0.0031	-0.8491	-8	0.0353	-0.9957	-10	0.0068	-1.5886	-16	0.0001	-0.9536	-10	0.0081
Pneumonia	0.5403	5	<0.0001	0.5653	6	<0.0001	0.5730	6	<0.0001	0.4900	5	<0.0001	0.5245	5	<0.0001	0.5568	6	<0.0001
Infection acquired in the hospital	0.4137	4	<0.0001	0.335	3	0.0004	0.4593	5	<0.0001	0.3989	4	<0.0001	0.4257	4	<0.0001	0.4576	5	<0.0001
Highest serum bilirubin 0-6	0.4428	4	<0.0001	0.4374	4	<0.0001	0.4324	4	<0.0001	0.4257	4	<0.0001	0.4636	5	<0.0001	0.4515	5	<0.0001
Highest serum bilirubin >= 6	0.4642	5	0.0019	0.4028	4	0.0149	0.5902	6	0.0005	0.5696	6	0.0009	0.4129	4	0.0118	0.3455	3	0.0407
Highest body temperature < 35.0	0.6802	7	<0.0001	0.5646	6	<0.0001	0.6779	7	<0.0001	0.7992	8	<0.0001	0.6538	7	<0.0001	0.7270	7	<0.0001
Highest creatinine 0.1 – 2.0	0.1983	2	0.0008	0.2046	2	0.0019	0.1644	2	0.013	0.1708	2	0.0085	0.2547	3	0.0001	0.1968	2	0.0037
Highest creatinine 2.0 – 3.5	0.6725	7	<0.0001	0.6228	6	<0.0001	0.7118	7	<0.0001	0.6204	6	<0.0001	0.7219	7	<0.0001	0.6867	7	<0.0001
Highest creatinine >= 3.5	0.8048	8	<0.0001	0.7405	7	<0.0001	0.7915	8	<0.0001	0.8428	8	<0.0001	0.8652	9	<0.0001	0.7778	8	<0.0001
Highest heath rate 120-160	0.4512	5	<0.0001	0.4824	5	<0.0001	0.4507	5	<0.0001	0.4296	4	<0.0001	0.4444	4	<0.0001	0.4569	5	<0.0001
Highest hearth rate >= 160	0.6563	7	<0.0001	0.6865	7	<0.0001	0.6246	6	0.0006	0.6128	6	0.0003	0.6151	6	0.0008	0.7645	8	<0.0001

	All			Part 1			Part 2			Part 3			Part 4			Part 5		
	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p	Est	R	p
Lowest leukocytes >= 15.000	0.1526	2	0.0072	0.1596	2	0.0117	0.1029	1	0.1025	0.1912	2	0.0022	0.1181	1	0.0627	0.1933	2	0.0034
Lowest pH <= 7.25	0.2795	3	<0.0001	0.2709	3	0.0004	0.3641	4	<0.0001	0.2315	2	0.002	0.3108	3	<0.0001	0.2159	2	0.0062
Lowest platelets < 20	1.3330	13	<0.0001	1.3543	14	<0.0001	1.4053	14	<0.0001	1.4824	15	<0.0001	1.1999	12	<0.0001	1.2450	12	<0.0001
Lowest west platelets 20-50	0.7550	8	<0.0001	0.803	8	<0.0001	0.7641	8	<0.0001	0.8699	9	<0.0001	0.6737	7	<0.0001	0.6723	7	<0.0001
Lowest platelets 50-100	0.4935	5	<0.0001	0.5041	5	<0.0001	0.4877	5	<0.0001	0.5213	5	<0.0001	0.4067	4	<0.0001	0.5531	6	<0.0001
Lowest systolic blood pressure < 40	1.1053	11	<0.0001	1.0783	11	<0.0001	1.0973	11	<0.0001	1.1530	12	<0.0001	1.1046	11	<0.0001	1.1029	11	<0.0001
Lowest systolic blood pressure 40-70	0.8321	8	<0.0001	0.8364	8	<0.0001	0.7868	8	<0.0001	0.8530	9	<0.0001	0.7775	8	<0.0001	0.8994	9	<0.0001
Lowest systolic blood pressure 70-120	0.3191	3	<0.0001	0.3065	3	<0.0001	0.3175	3	<0.0001	0.3202	3	<0.0001	0.2988	3	<0.0001	0.3582	4	<0.0001

Est: Estimated coefficients, unrounded; *R:* Estimated coefficients, rounded; *p*: respective *p*-values.

Table E9. Hosmer-Lemeshow tests for the SAPS 3 in the overall sample.

Probability of death	Observed Survivors	Expected Survivors	Observed Deaths	Expected Deaths
0.0 - 0.1	6819	6788.33	286	316.67
0.1 - 0.2	2231	2248.92	401	383.08
0.2 - 0.3	1539	1538.14	504	504.86
0.3 - 0.4	875	873.10	476	477.90
0.4 - 0.5	472	489.29	417	399.71
0.5 - 0.6	419	413.14	486	491.86
0.6 - 0.7	257	274.44	516	498.56
0.7 - 0.8	156	150.35	442	447.65
0.8 - 0.9	58	55.13	309	311.87
0.9 - 1.0	13	8.36	108	112.64

Hosmer-Lemeshow Goodness-of-fit Test test $\hat{H} = 10.56$ ($p = 0.39$)

Probability of death	Observed Survivors	Expected Survivors	Observed Deaths	Expected Deaths
0.000 - 0.018	1566	1574.97	26	17.03
0.021 - 0.035	1704	1700.50	45	48.50
0.040 - 0.057	1586	1570.81	65	80.19
0.064 - 0.089	1549	1538.32	116	126.68
0.099 - 0.133	1484	1474.85	183	192.15
0.145 - 0.205	1454	1480.78	340	313.22
0.221 - 0.295	1246	1235.15	416	426.85
0.315 - 0.419	992	1009.00	593	576.00
0.440 - 0.604	816	826.36	895	884.64
0.622 - 1.000	442	428.45	1266	1279.55

Hosmer-Lemeshow Goodness-of-fit Test test $\hat{C} = 14.29$ ($p = 0.16$)

Table E10. Number of patients and O/E ratios (SAPS 3) by country.

Region	Country	N	OBS	EXP	OE	OELI	OERE
Central and South America	Argentinia	440	146	106.7	1.4	1.23	1.507
Australasia	Australia	651	138	165.3	0.8	0.73	0.943
Central and Western Europe	Austria	657	130	166.6	0.8	0.67	0.89
Central and Western Europe	Belgium	795	130	145.1	0.9	0.77	1.02
Central and South America	Brasil	1483	359	281.3	1.3	1.19	1.365
Eastern Europe	Bulgaria	69	4	3.772	1.1	0.14	1.98
North America	Canada	414	65	79.47	0.8	0.66	0.979
Central and South America	Cuba	32	9	6.302	1.4	0.81	2.049
Eastern Europe	Czech Republik	265	89	87.01	1	0.88	1.161
Northern Europe	Denmark	60	23	21.41	1.1	0.78	1.368
Southern Europe and Mediterranean countries	France	543	133	164.6	0.8	0.7	0.915
Central and Western Europe	Germany	430	52	61.1	0.9	0.65	1.052
Southern Europe and Mediterranean countries	Greece	371	110	103.7	1.1	0.93	1.195
Australasia	Hongkong	573	99	145.6	0.7	0.56	0.797
Eastern Europe	Hungary	340	69	64.56	1.1	0.89	1.246
Australasia	India	532	152	111.9	1.4	1.22	1.501
Central and Western Europe	Ireland	27	13	8.705	1.5	1.04	1.945
Southern Europe and Mediterranean countries	Israel	93	12	13.43	0.9	0.45	1.341
Southern Europe and Mediterranean countries	Italy	2521	628	674.9	0.9	0.88	0.984
Central and Western Europe	Luxembourg	163	26	34.71	0.7	0.5	0.996
Central and South America	Mexico	175	62	49.26	1.3	1.06	1.458
Central and Western Europe	Netherlands	458	73	90.82	0.8	0.66	0.949
Northern Europe	Norway	155	55	55.69	1	0.8	1.171
Eastern Europe	Poland	5	5	3.717	1.3	0.87	1.821
Southern Europe and Mediterranean countries	Portugal	1307	462	441.3	1	0.98	1.11
Eastern Europe	Russian Federation	1	0	0.089	-	-	-
Eastern Europe	Serbia	11	7	3.421	2	1.27	2.822
Eastern Europe	Slovakia	61	22	17.6	1.2	0.92	1.581
Eastern Europe	Slovenia	136	33	29.75	1.1	0.84	1.379
Southern Europe and Mediterranean countries	Spain	1652	365	323.7	1.1	1.04	1.211
Northern Europe	Sweden	124	27	32.41	0.8	0.58	1.088
Central and Western Europe	Switzerland	1163	131	188.4	0.7	0.58	0.81
Southern Europe and Mediterranean countries	Turkey	261	108	67.69	1.6	1.42	1.768
Central and Western Europe	United Kingdom	499	151	140.4	1.1	0.95	1.197
North America	United States	317	57	54.43	1	0.83	1.264

N = number of patients; OBS: obeserved deaths; EXP: Expected deaths; OE: Observed-to-expected ratio; OELI / OERE: upper and lower border of the 95% confidence interval;

Table E11. O/E ratios (SAPS 3) for the customized equations by country.

Region	Country	N	OBS	EXP	OE	OELI	OERE
Central and South America	Argentinia	440	146	137,41	1,06	0,95	1,17
Australasia	Australia	651	138	152,29	0,91	0,79	1,02
Central and Western Europe	Austria	657	130	144,17	0,90	0,78	1,02
Central and Western Europe	Belgium	795	130	121,49	1,07	0,93	1,21
Central and South America	Brasil	1483	359	367,12	0,98	0,91	1,05
Eastern Europe	Bulgaria	69	4	3,47	1,15	0,22	2,09
North America	Canada	414	65	71,86	0,90	0,72	1,09
Central and South America	Cuba	32	9	8,38	1,07	0,57	1,58
Eastern Europe	Czech Republik	265	89	96,24	0,92	0,81	1,04
Northern Europe	Denmark	60	23	20,63	1,11	0,81	1,41
Southern Europe and Mediterranean countries	France	543	133	167,07	0,80	0,69	0,90
Central and Western Europe	Germany	430	52	49,78	1,04	0,82	1,27
Southern Europe and Mediterranean countries	Greece	371	110	105,00	1,05	0,91	1,18
Australasia	Hongkong	573	99	134,10	0,74	0,61	0,86
Eastern Europe	Hungary	340	69	69,52	0,99	0,84	1,15
Australasia	India	532	152	102,60	1,48	1,33	1,63
Central and Western Europe	Ireland	27	13	7,72	1,68	1,20	2,17
Southern Europe and Mediterranean countries	Israel	93	12	14,07	0,85	0,42	1,29
Southern Europe and Mediterranean countries	Italy	2521	628	685,03	0,92	0,86	0,97
Central and Western Europe	Luxembourg	163	26	29,56	0,88	0,61	1,15
Central and South America	Mexico	175	62	62,92	0,99	0,82	1,15
Central and Western Europe	Netherlands	458	73	78,70	0,93	0,77	1,08
Northern Europe	Norway	155	55	53,65	1,03	0,84	1,21
Eastern Europe	Poland	5	5	4,14	1,21	0,85	1,57
Southern Europe and Mediterranean countries	Portugal	1307	462	444,61	1,04	0,98	1,10
Eastern Europe	Russian Federation	1	0	0,08	0,00	-6,81	6,81
Eastern Europe	Serbia	11	7	3,74	1,87	1,17	2,57
Eastern Europe	Slovakia	61	22	19,40	1,13	0,85	1,42
Eastern Europe	Slovenia	136	33	32,41	1,02	0,78	1,26
Southern Europe and Mediterranean countries	Spain	1652	365	333,26	1,10	1,01	1,18
Northern Europe	Sweden	124	27	30,71	0,88	0,62	1,14
Central and Western Europe	Switzerland	1163	131	153,79	0,85	0,72	0,98
Southern Europe and Mediterranean countries	Turkey	261	108	68,84	1,57	1,40	1,74
Central and Western Europe	United Kingdom	499	151	120,88	1,25	1,12	1,38
North America	United States	317	57	50,15	1,14	0,90	1,37

N = number of patients; OBS: obeserved deaths; EXP: Expected deaths; OE: Observed-to-expected ratio; OELI / OERE: upper and lower border of the 95% confidence interval;

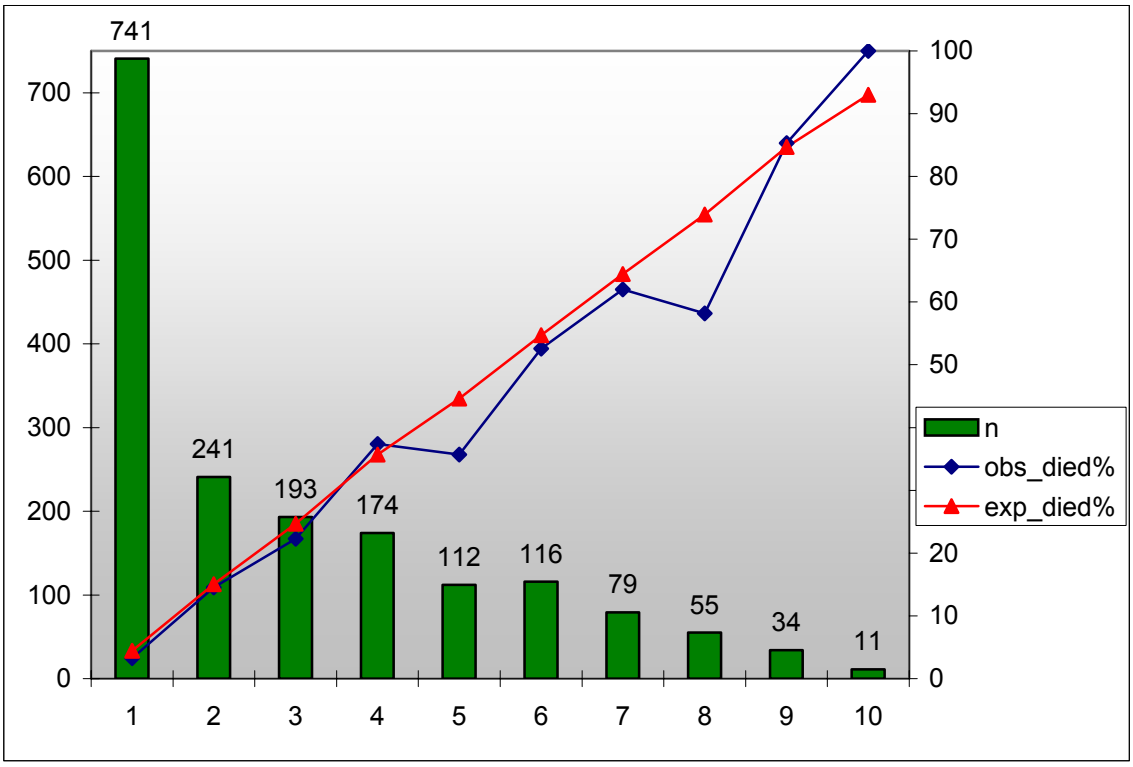
Appendix B. Additional figures.

B.1. Calibration curves and Hosmer-Lemeshow goodness-of-fit tests for the SAPS 3.

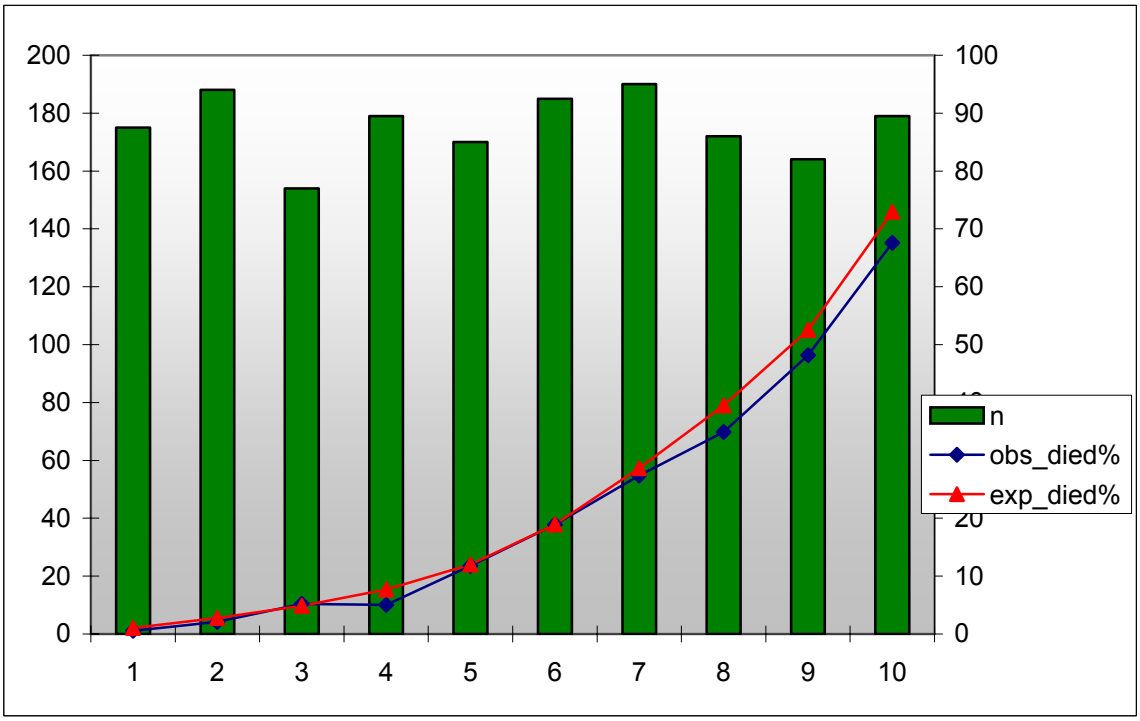
Australasia (n = 1756):

aROC: 0.839

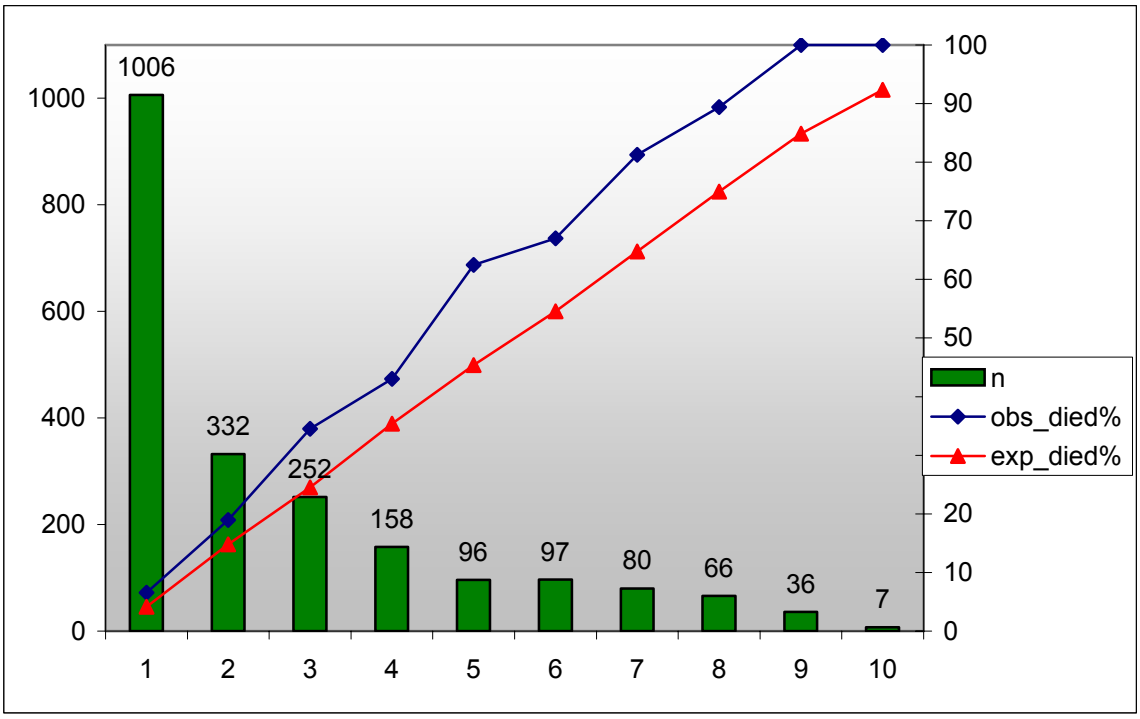
Hosmer-Lemeshow goodness-of-fit test $\hat{H}$: 15.25, p = 0.12



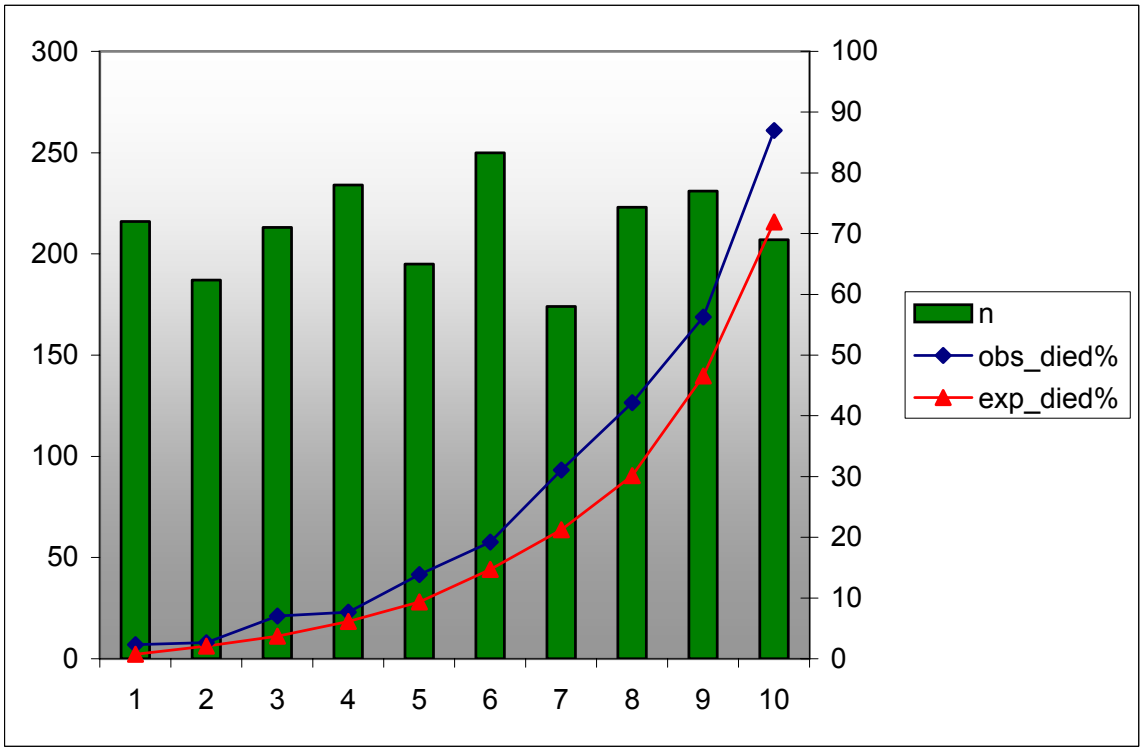
Hosmer-Lemeshow goodness-of-fit test $\hat{C}$: 8.09, p = 0.62



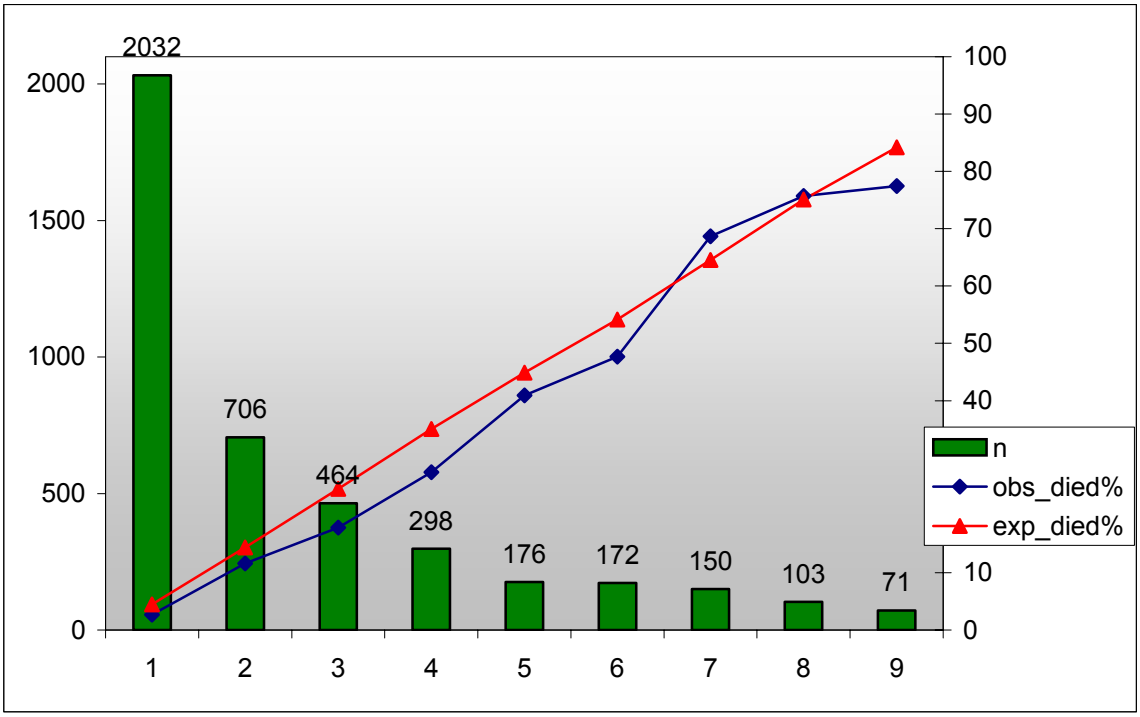
Central and South America (n = 2130):
aROC: 0.855
Hosmer-Lemeshow goodness-of-fit test $\hat{H}$: 78.01, p < 0.01



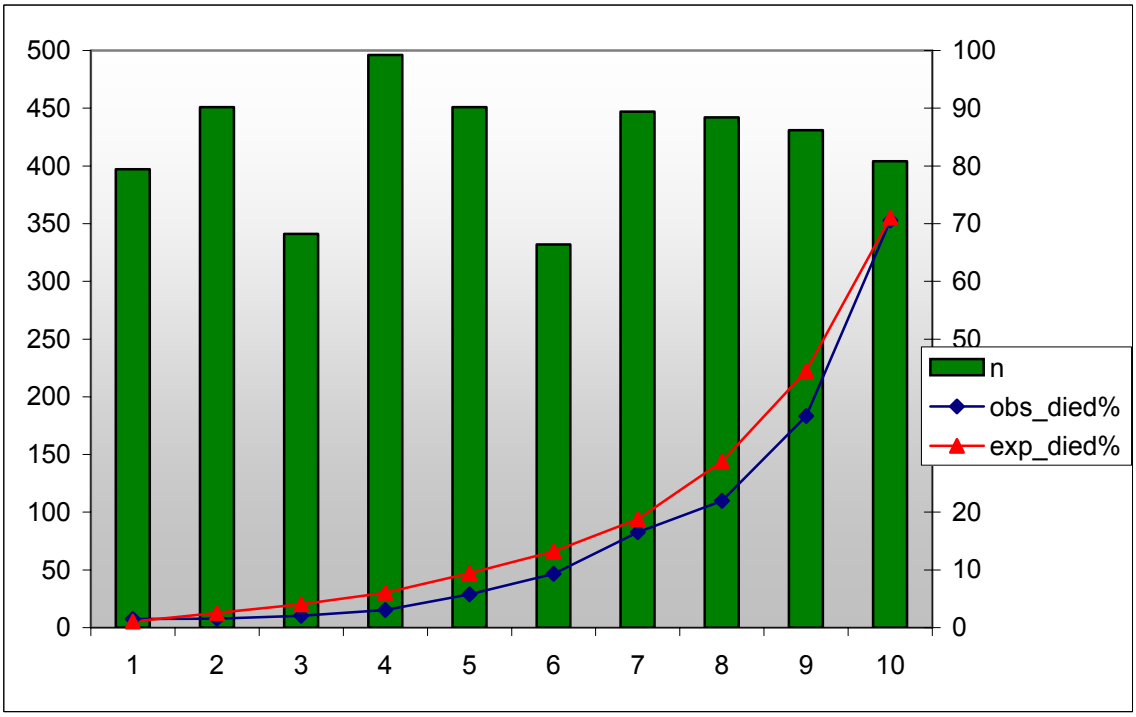
Hosmer-Lemeshow goodness-of-fit test $\hat{C}$: 80.82, p < 0.01



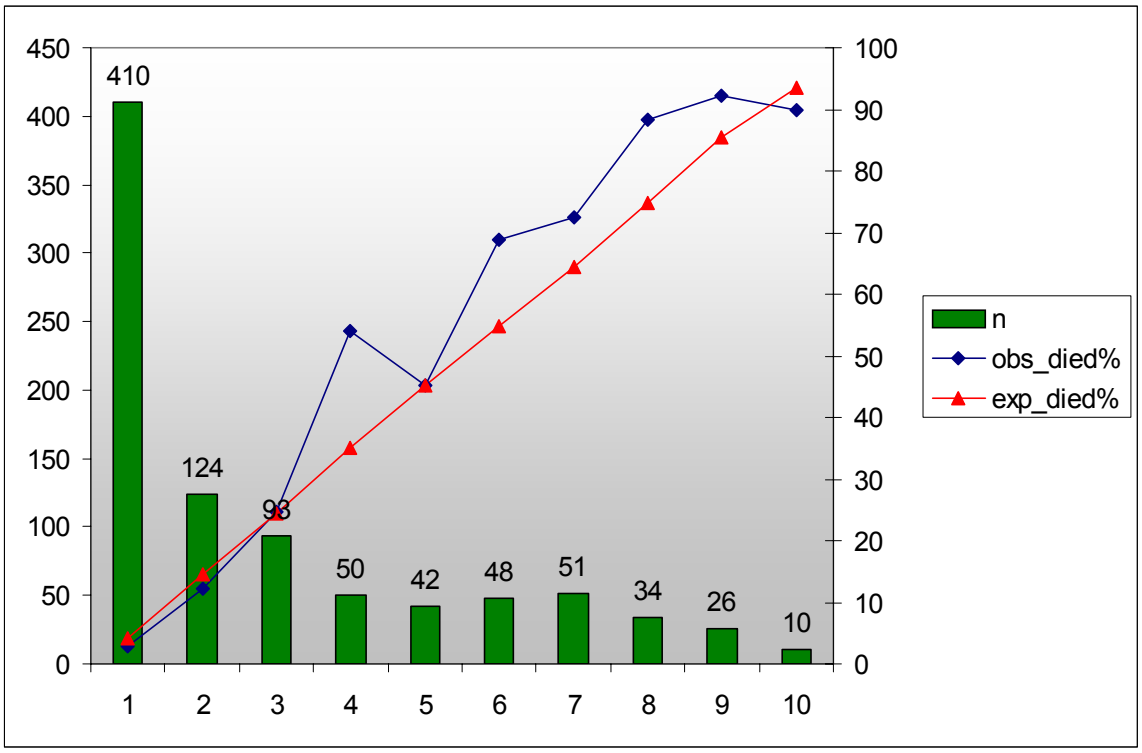
Central and Western Europe (n = 4192):
aROC: 0.861
Hosmer-Lemeshow goodness-of-fit test $\hat{H}$: 56.45, p < 0.01



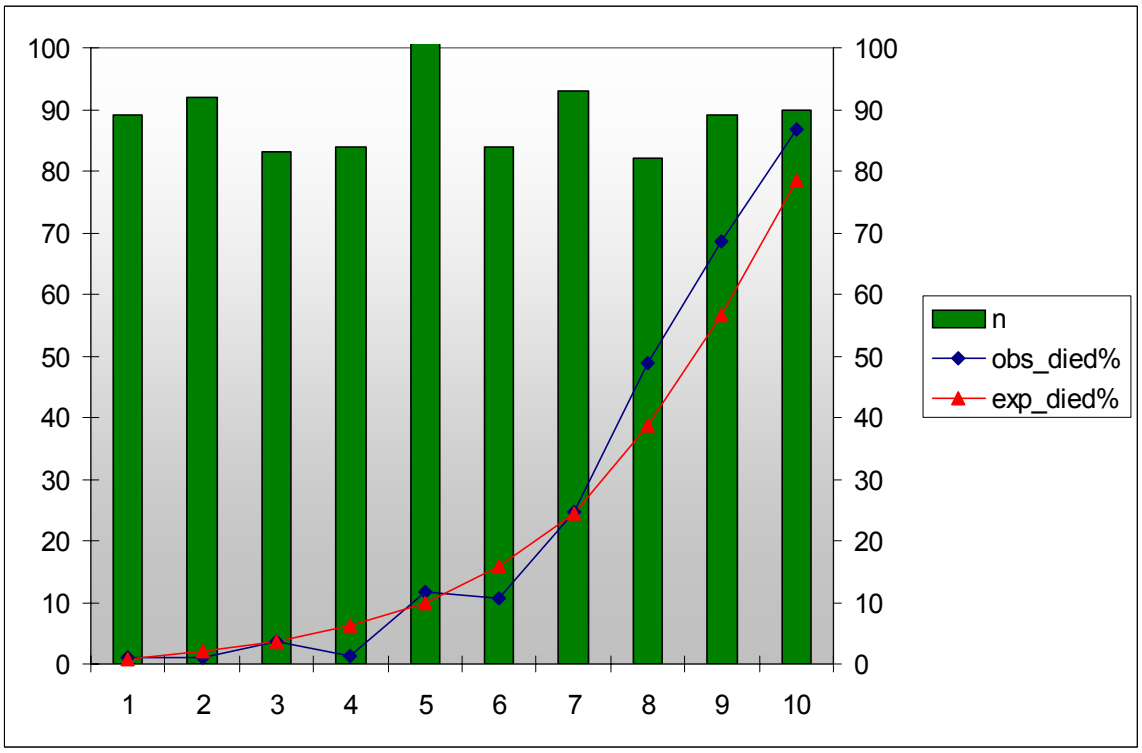
Hosmer-Lemeshow goodness-of-fit test $\hat{C}$: 47.89, p < 0.01



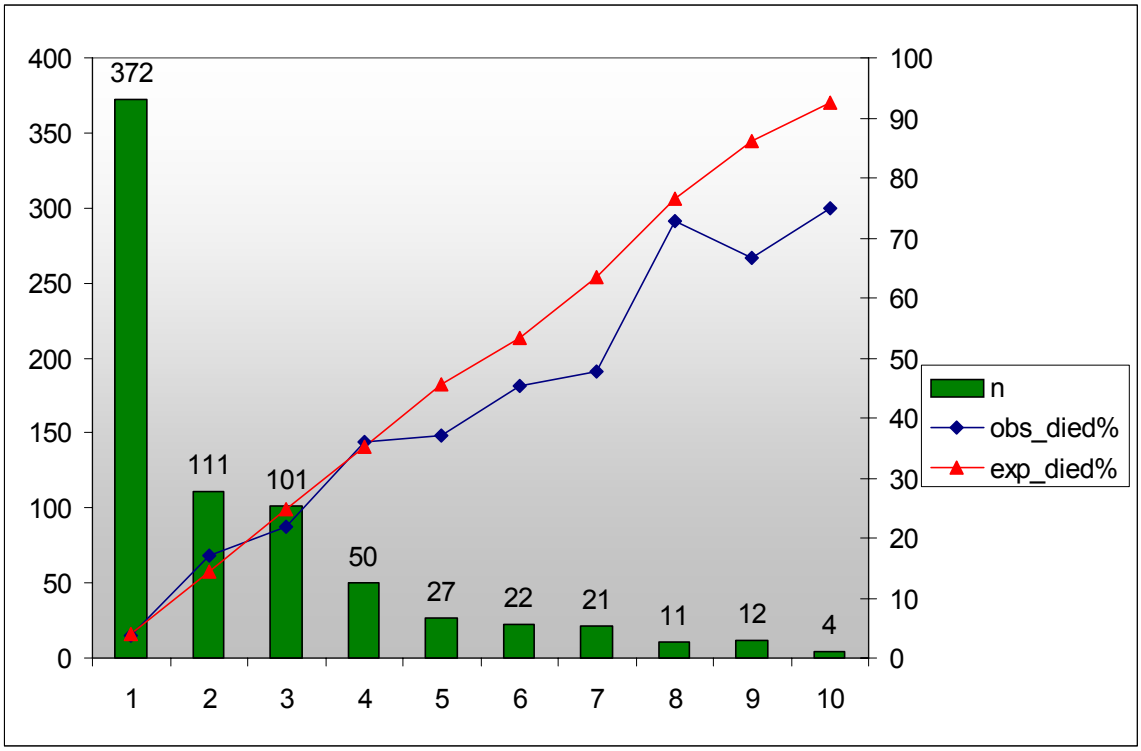
Eastern Europe (n = 888):
aROC: 0.903
Hosmer-Lemeshow goodness-of-fit test $\hat{H}$: 19.45, p = 0.03



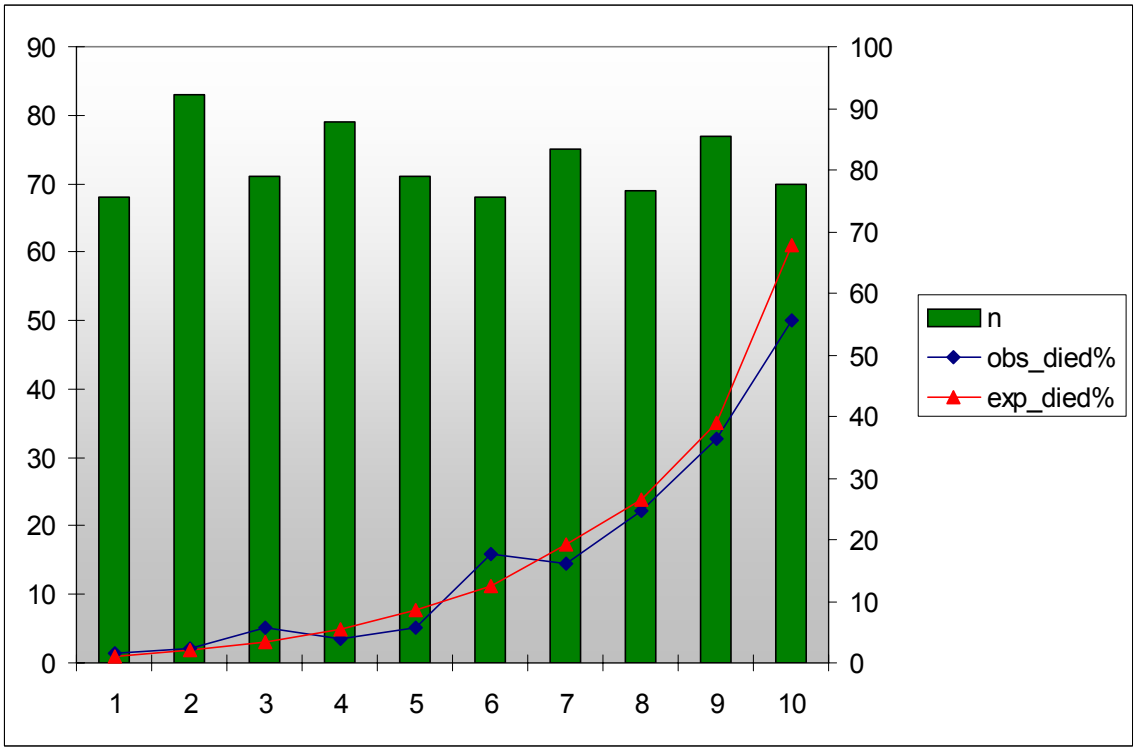
Hosmer-Lemeshow goodness-of-fit test $\hat{C}$: 18.69, p = 0.04



North America (n = 731):
aROC: 0.812
Hosmer-Lemeshow goodness-of-fit test Ĥ: 10.57, p = 0.39

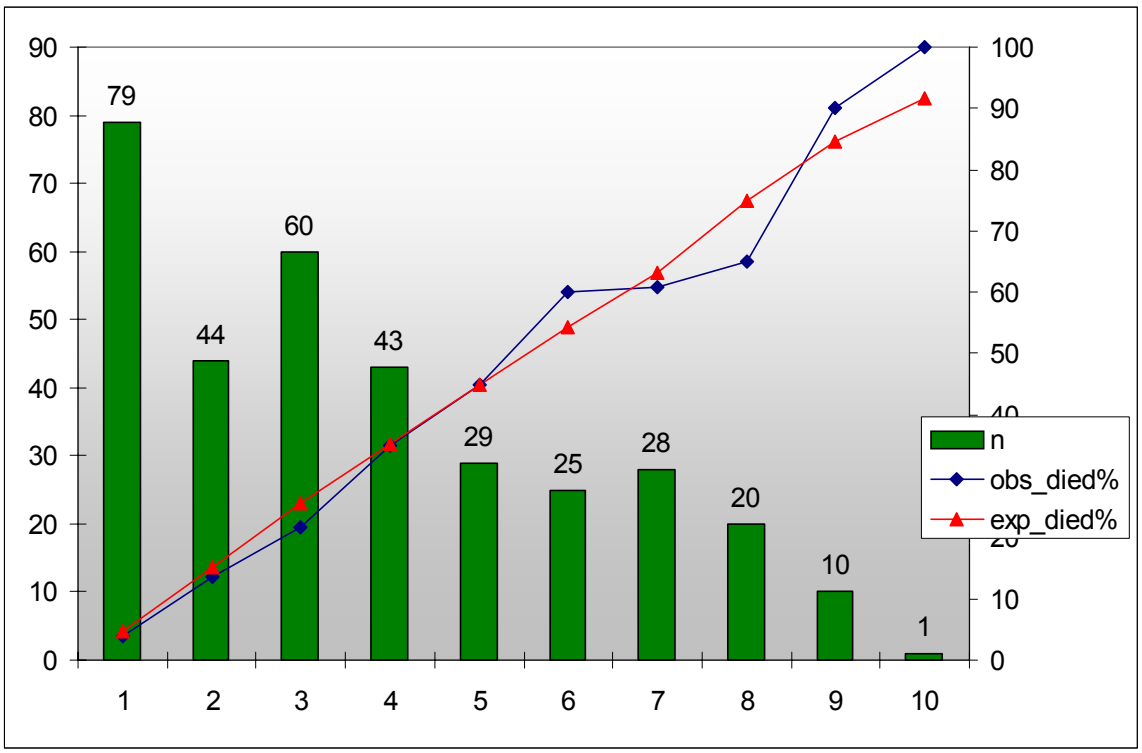


Hosmer-Lemeshow goodness-of-fit test Ĉ: 9.63, p = 0.47

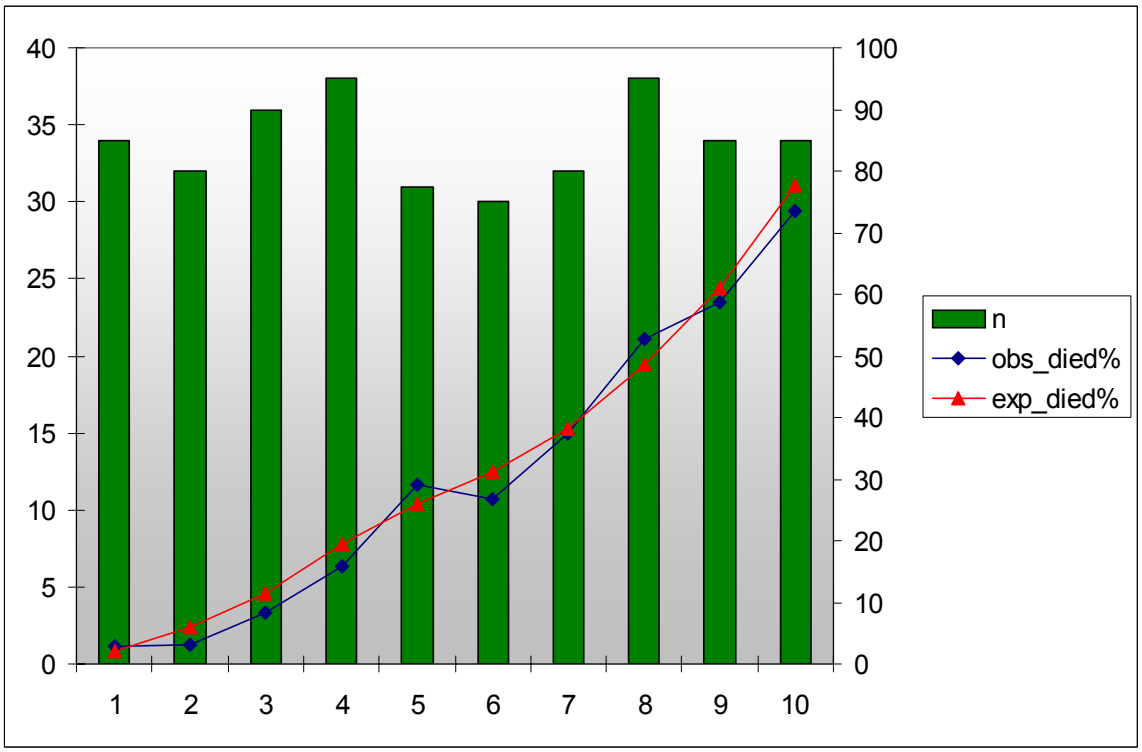


Northern Europe (n = 339):
aROC: 0.814

Hosmer-Lemeshow goodness-of-fit test $\hat{H}$: 2.44, p = 0.99

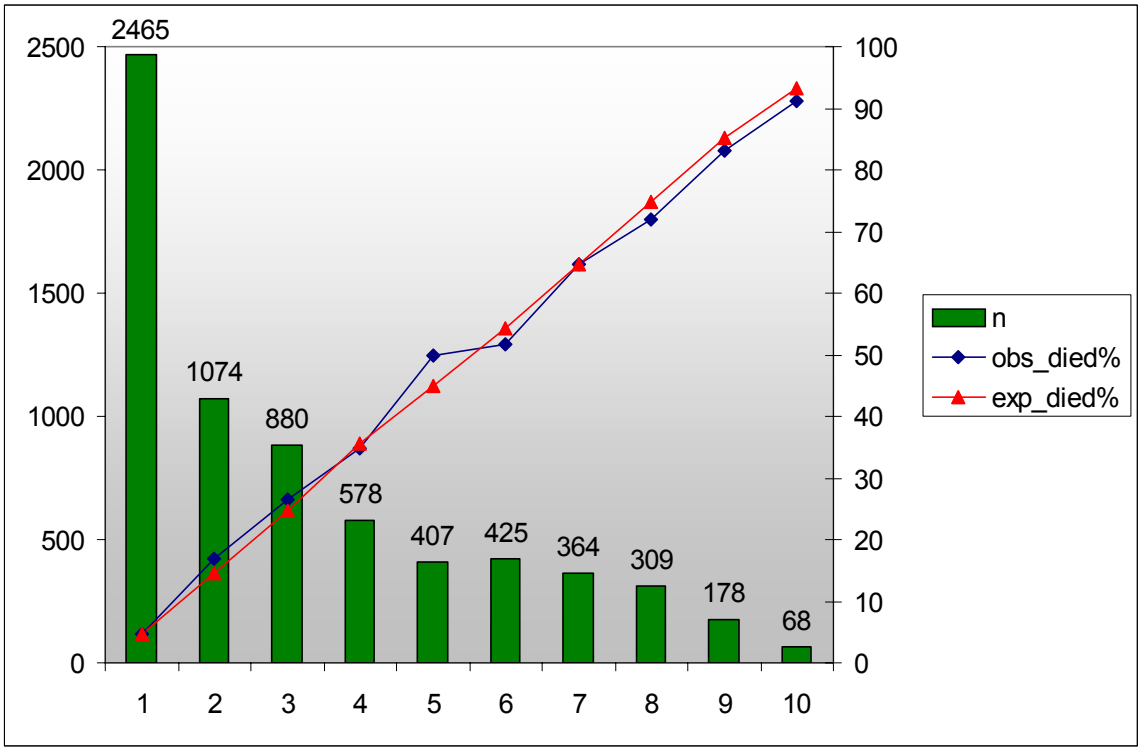


Hosmer-Lemeshow goodness-of-fit test $\hat{C}$: 2.34, p = 0.99

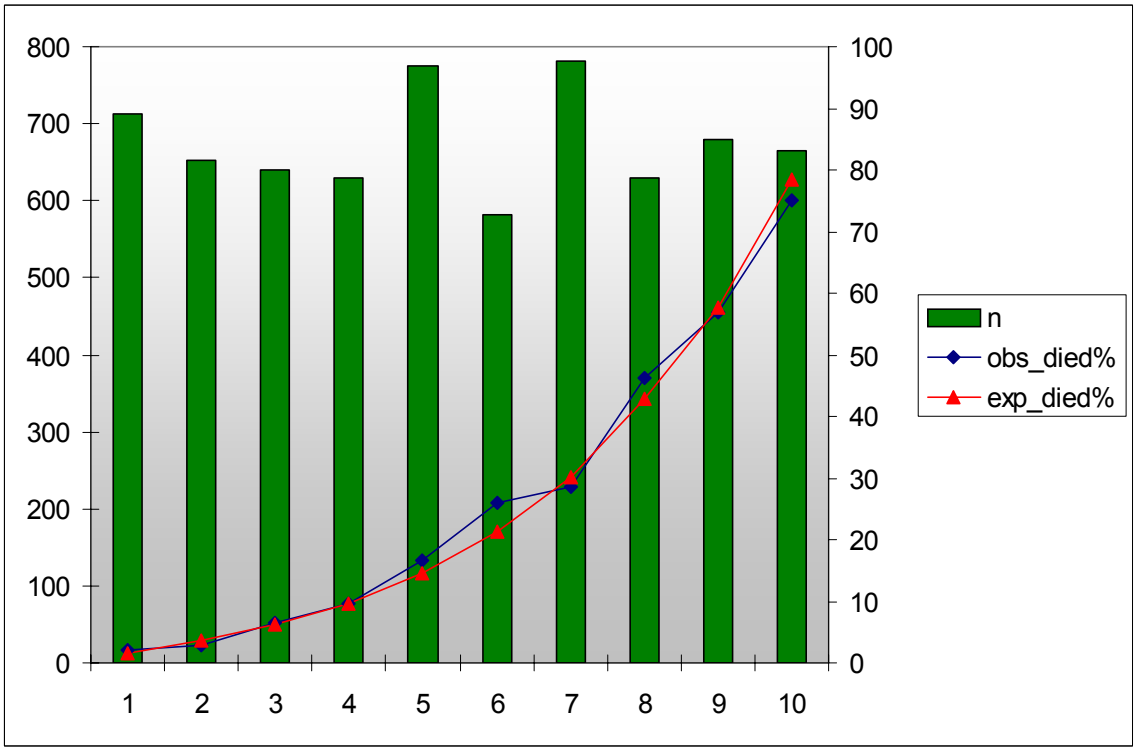


Southern Europe and Mediterranean countries (n = 6748):
aROC: 0.834

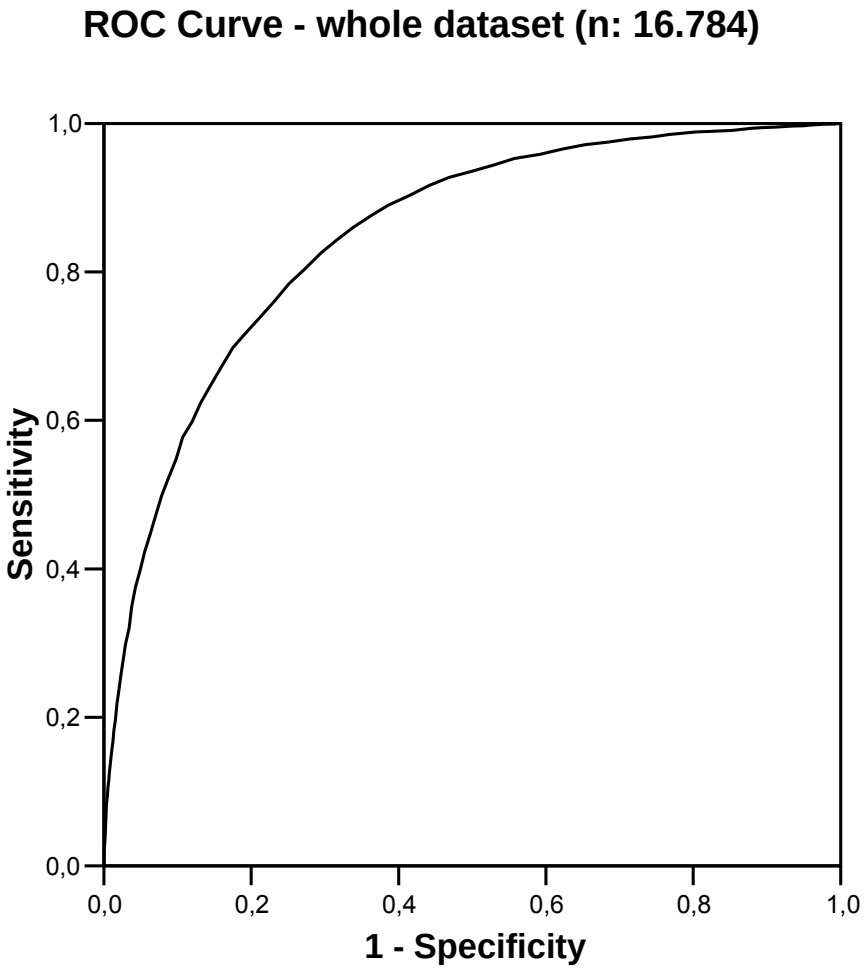
Hosmer-Lemeshow goodness-of-fit test $\hat{H}$: 14.18, p = 0.16



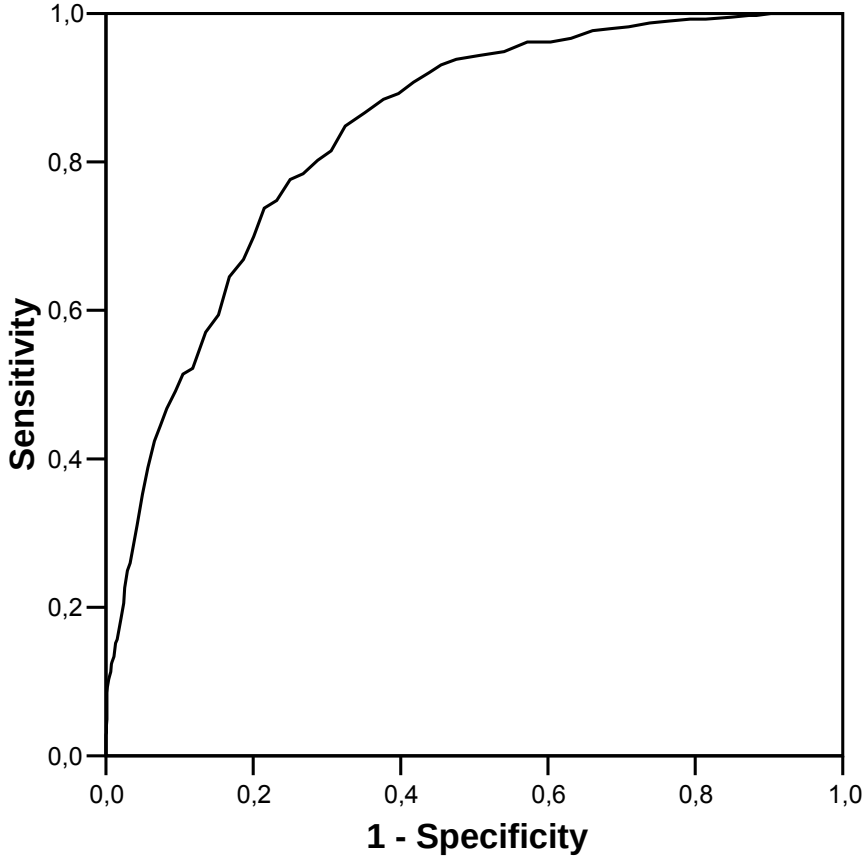
Hosmer-Lemeshow goodness-of-fit test $\hat{C}$: 20.78, p = 0.02



B.2. Area under the ROC curves for the SAPS 3 for the geographic regions.

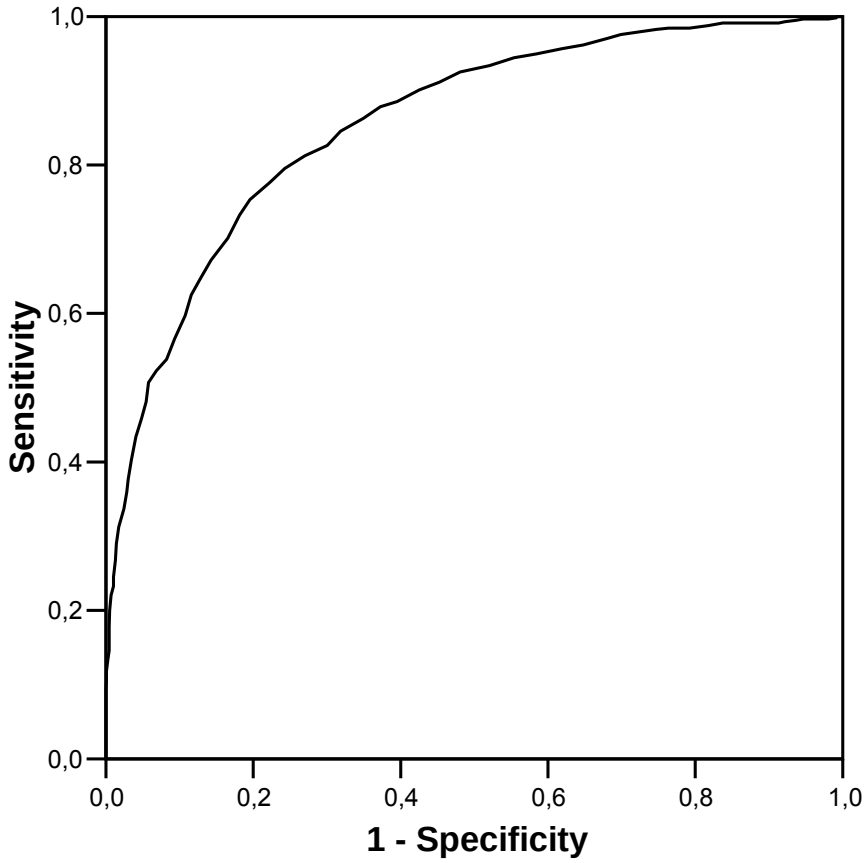


Area	Asymptotic 95% Confidence Interval	
	Lower Bound	Upper Bound
0.848	0.841	0.854



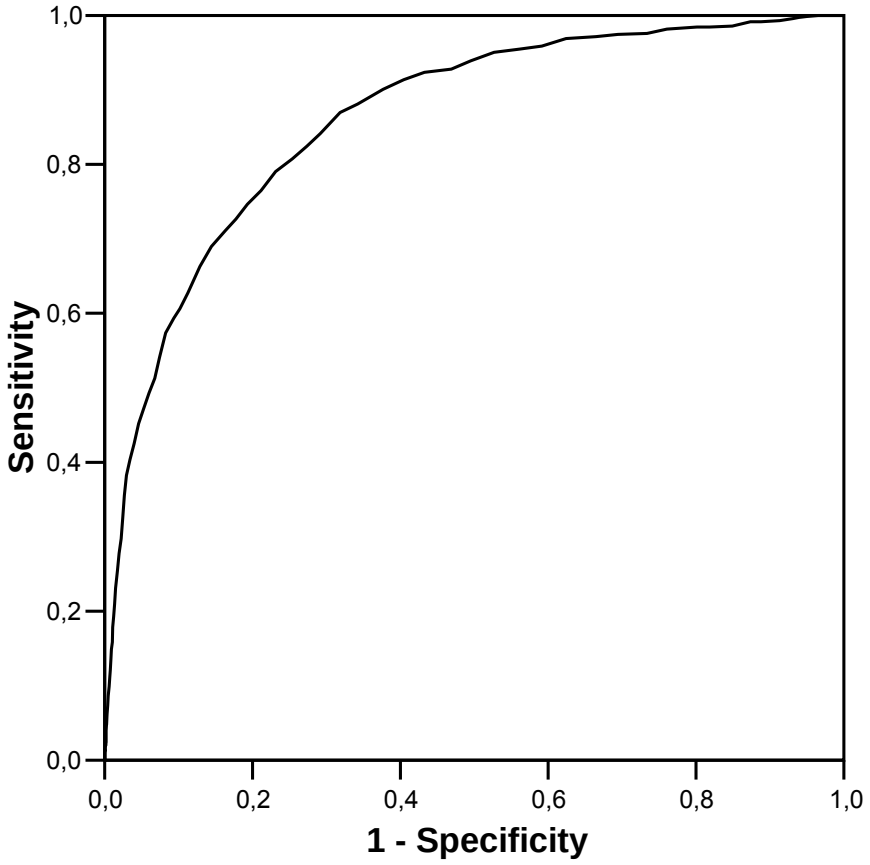
Area	Asymptotic 95% Confidence Interval	
	Lower Bound	Upper Bound
0.839	0.818	0.859

ROC Curve - Central and South America (n: 2.130)

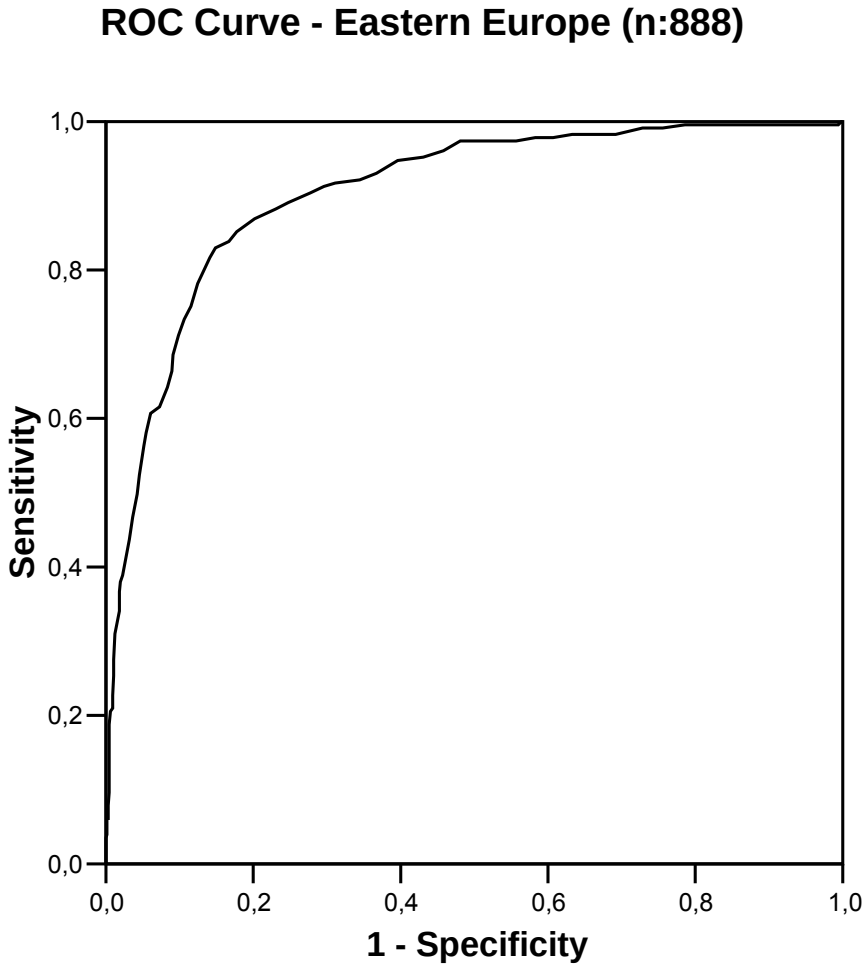


Area	Asymptotic 95% Confidence Interval	
	Lower Bound	Upper Bound
0.855	0.837	0.873

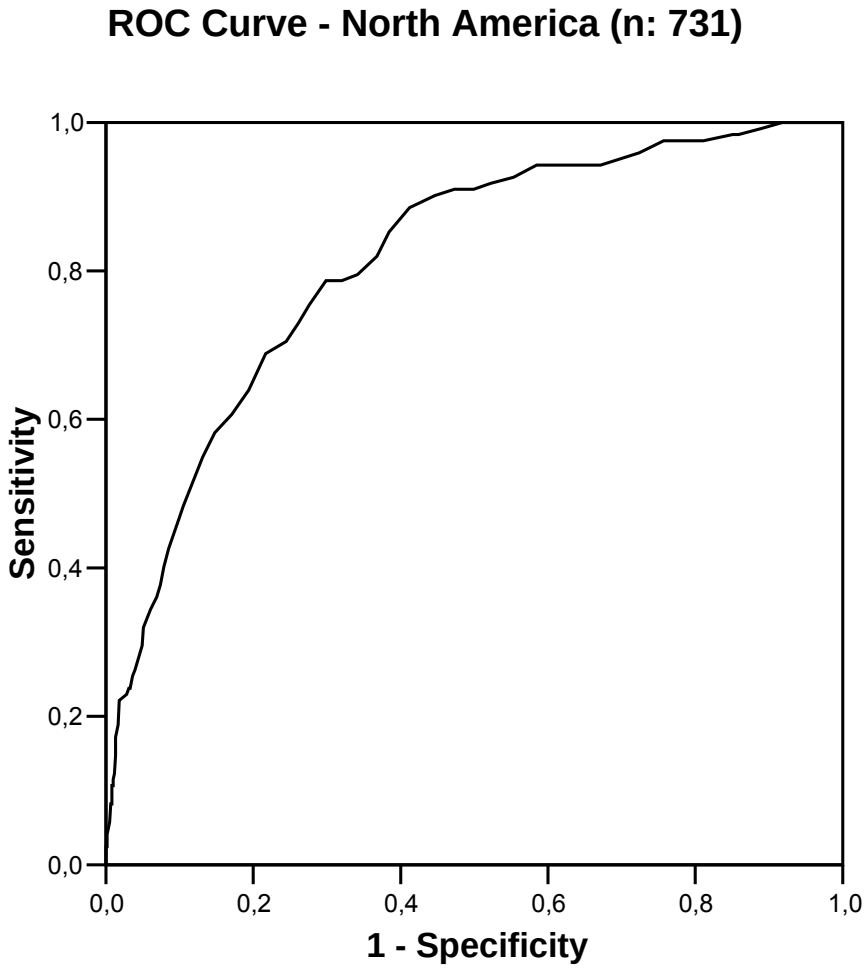
ROC Curve - Central and Western Europe (n: 4.192)



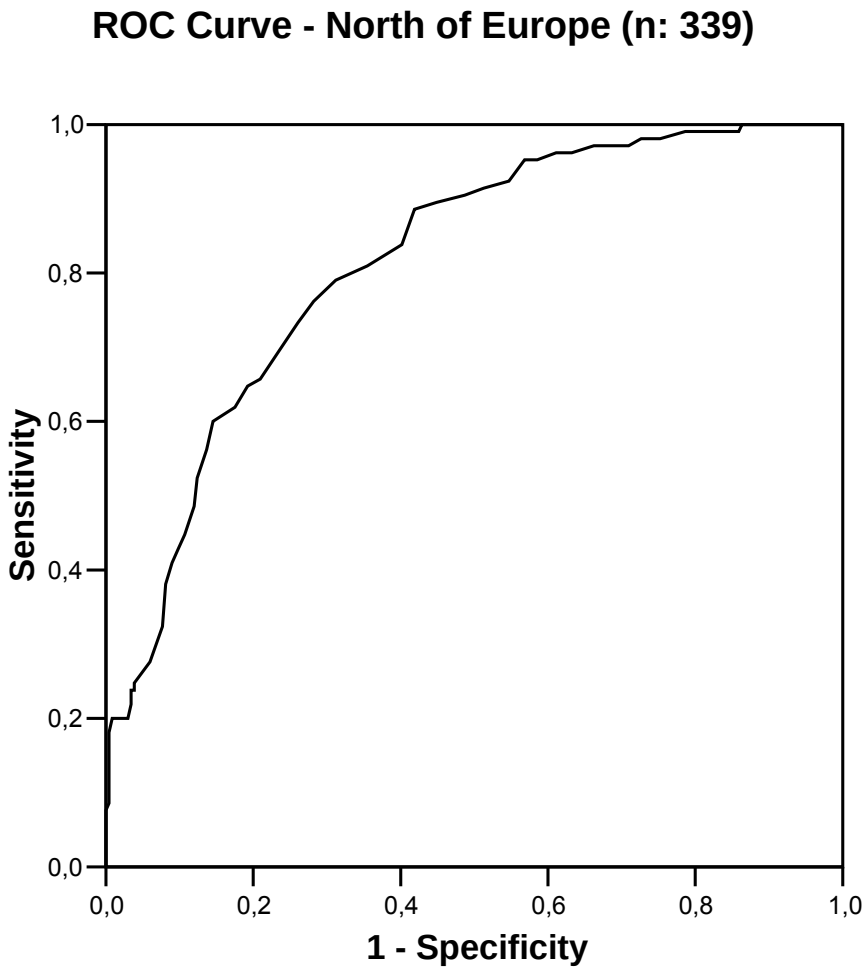
Area	Asymptotic 95% Confidence Interval	
	Lower Bound	Upper Bound
0.861	0.846	0.876



Area	Asymptotic 95% Confidence Interval	
	Lower Bound	Upper Bound
0.903	0.881	0.926

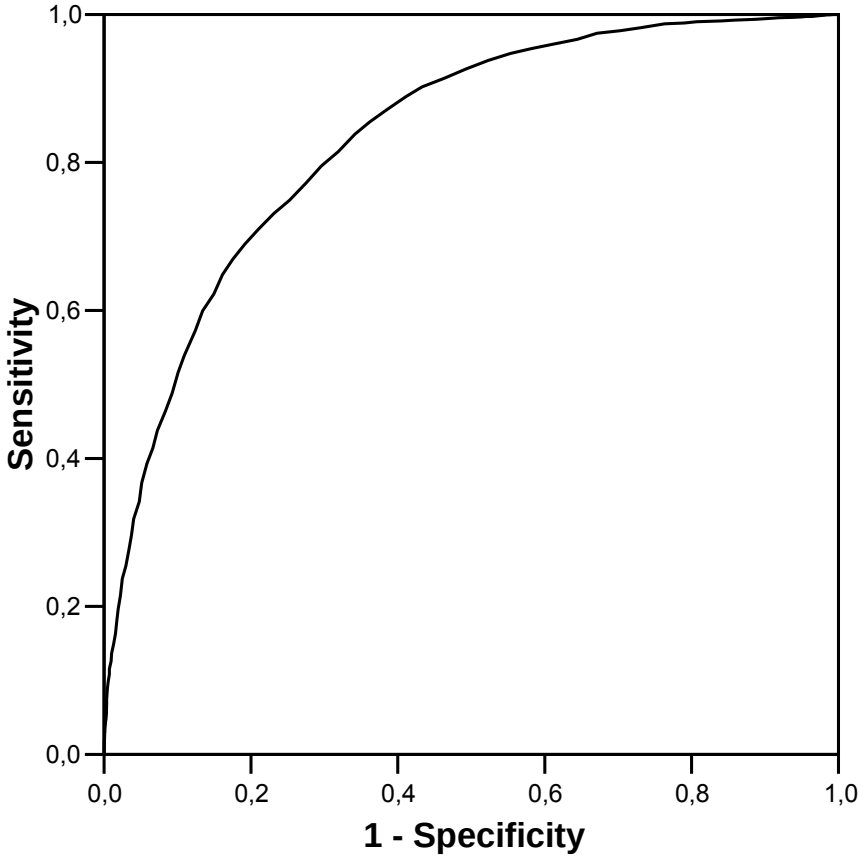


Area	Asymptotic 95% Confidence Interval	
	Lower Bound	Upper Bound
0.812	0.772	0.853



Area	Asymptotic 95% Confidence Interval	
	Lower Bound	Upper Bound
0.814	0.767	0.860

ROC Curve - South of Europe and Mediterranean Countries (n: 6784)



Area	Asymptotic 95% Confidence Interval	
	Lower Bound	Upper Bound
0.834	0.823	0.844

Appendix C. Data definitions as used in the SAPS 3 study.

Parameter descriptions.

Name:
Name of the parameter.

Unit:
Unit in which the parameter has to be recorded.

Format:
Description of the data field.

Input:
Input expected from the user.

Selection:
Type of selection

Values:
***Usual range*:** These represent usual values in adult intensive care (although they might differ between laboratories). These values will be accepted by the system without further confirmation.
Plausible range: These are pathologic values, not frequently encountered in adult intensive care patients, but still plausible. These values will be accepted by the system after confirmation.
Storage range: Values outside the plausible range are extremely deviated values which are still stored. Values outside the storage range are normally not compatible with life and are therefore not further processed. These values will be accepted by the system after confirmation.
Attention: If you detect such an outrageous value in a patient, please record the maximal possible value (equal to the storage range). Make sure, however, that this is not due to laboratory or recording failures.

Description: Description of the variable.

ACUTE INFECTION AT ICU ADMISSION - ACQUISITION

Name:
Acute infection at ICU admission: Acquisition

Format:
Number (1)

Unit:

Input:
Combo box; Single selection.

Selection:
Select the appropriate type of acquisition from the list:
- ***Community-acquired***:
Infection present on admission to hospital or developing within 48 hours of admission. (A patient may be admitted to hospital ward for a community-acquired infection and transferred a few days later to ICU for organ failure. If the infection is the acute disease, it should be considered community-acquired at ICU entry. For example: if a patient is admitted to the ward for tuberculosis infection and transferred 5 days later for acute respiratory failure, the acute disease is a community-acquired tuberculosis).
- ***Hospital-acquired***:
Infection not present on admission to the hospital and developing 48 hours or more after hospital admission or secondary to a medical/surgical (diagnostic or therapeutic) measure.

Description:
Describes the acquisition of an acute infection, present at ICU admission. Should only be displayed if there is an infection at ICU admission.

ACUTE INFECTION AT ICU ADMISSION - SITE

Name:
Acute infection at ICU admission: Site

Format:
Number (3)

Unit:

Input:
Combo box; Multiple selection.

Selection:
Select the appropriate site from the list:
- ***Neurologic***:

Cerebral abscess: Symptoms of a mass lesion, seizures, signs of focal deficit and / or cerebral lesion documented by CT scan or anatomical evidence. It may be treated surgically or not.

Encephalitis: Involvement of the brain parenchyma by infectious agent inducing neurological symptoms. It may be documented by CSF abnormalities, serology, isolation of the causal agent, CT scan.

Meningitis: Symptoms of meningeal syndrome with positive CSF culture or CSF abnormalities compatible with meningitis.

Neurologic, other: Other infections of the central nervous system
- ***ORL (upper respiratory tract)***:

Sinusitis

Otitis

Other infections of the upper respiratory tract
- ***Lower respiratory tract***:

Pneumonia:

a. Definite pneumonia (all major clinical criteria or 2 major plus 2 minor clinical criteria plus at least one microbiological criterion):

b. Probable pneumonia: 2 major plus 1 or more minor clinical criteria

Clinical features:

Major:

- Fever or hypothermia
- Inflammatory response: WBC >15.10^9/L, C-reactive protein > twice normal
- New infiltrate on chest radiograph

Minor:

- Expectoration of purulent sputum
- Physical signs of consolidation
- Change in oxygen requirement, not explicable by other means

Microbiological features:

- Positive blood culture with a respiratory pathogen.
- Good-quality sputum (Murray and Washington criteria) with a predominant growth of a presumptive pathogen (non-ventilated patients only).
- Positive culture of a deep lung specimen from a protected bronchial lavage (quantitative culture 10^3 CFU/ml), transtracheal aspiration (quantitative culture equal to or greater than 10^6 CFU/ml) or a percutaneous lung aspirate (ventilated patient).
- Pneumococcal antigen detected in blood, sputum or urine.

- Serological diagnosis, only acceptable for the diagnosis of *Legionella*, *Mycoplasma* and *Chlamydia* pneumonia.

Bronchitis: Patient has no clinical or radiographic evidence of pneumonia and has two of the following: fever (>38° C), cough, new or increased sputum production, ronchi, wheezing; AND either of the following: organism isolated from culture obtained by deep tracheal aspirate or bronchoscopy, or positive antigen test on respiratory secretions.

Lung abscess

Other lower respiratory tract infections

- ***Thoracic***:

Mediastinitis

Pleurisy

Other thoracic infections

- ***Cardiac***:

Endocarditis: Infection of the heart valves or of the endocardium in proximity to congenital or acquired cardiac defects documented by clinical symptoms, blood cultures and / or echocardiographic signs. It may be acute or subacute.

Myocarditis

Pericarditis

Other

- ***Digestive***:

Biliary tract: Includes acute suppurative cholangitis and acute cholecystitis.

Acute hepatitis: Acute hepatitis due to viral or other infection.

Liver abscess: Acute or chronic liver abscess.

Digestive tract: Includes appendicitis, diverticulitis, infected colitis, ileitis.

Peritonitis and intra-abdominal abscess: Acute infection of the peritoneum. Can be either diffuse or collected.

Severe diarrhoea: Due to food poisoning - staphylococcal enterotoxin -, gastroenteritis by virus, bacteria, parasite or antibiotic-associated.

Other infections of the digestive tract

- ***Urinary***:

Lower urinary tract: Vesical infection evaluated by microscopy: >50 WBC/high-powered field plus Midstream urine specimen $>10^5$ organisms/ml / Suprapubic aspirate $>10^3$ organisms/ml / Catheter specimen: pure culture of $>10^5$ organisms/ml)

Upper urinary tract: Includes pyelonephritis, renal and para-renal abscess.

Prostatitis: Acute infection of the prostate.

Urinary, other

- ***Genital***:

Includes endometritis, salpingitis, septic abortion, postpartum infection, orchiepididymitis, urethritis.

- ***Skin & Soft Tissue***:

Skin infection

Soft tissue infection: Necrotising fasciitis, infectious gangrene, necrotising cellulitis, infectious myositis, lymphadenitis, or lymphangitis.

Decubitus ulcer infection

Burn infection

Incisional surgical wound infection

Deep surgical wound infection

- ***Bone & Joint***:

Includes osteomyelitis, arthritis, and intervertebral disc space infections.

- ***Systemic Infection***:

Includes infections induced by infectious agents that could involve more than one organ, e.g., typhoid fever, brucellosis, yellow fever, malaria, tetanus, botulism, tuberculosis, Lyme disease, rabies.

- ***Catheter Related***:
Positive culture of withdrawn catheter (>15 CFU by semi-quantitative technique or $>10^3$ CFU/ml by quantitative technique) and either general or local infectious symptoms, or positive blood culture with the same microorganism.
- ***Primary Bacteremia***:
Presence of viable bacteria in the blood or other organisms (virus, fungi, parasites) in the absence of any other obvious site of infection.
- ***Unknown***: This could be the case of neutropenic patients who could have criteria of infection (e.g., sepsis, severe sepsis, septic shock) without any microbiologically or clinically documented infection but no other obvious explanation that could explain the symptoms.
- ***Other***:
Other infection, not specified elsewhere.

Description:
Anatomical site of the infection. Several sites may be filled in but only one item by anatomical location. For each site, one to three identified microorganisms may be collected (see Acute infection at ICU admission: Agent). Should only be displayed if there is an infection at ICU admission.

AGE

Name:
Patient age

Format:
Number (3)

Units:
Years of age

Input:
Numerical input field

Selection:
Enter the age of the patient (in years) at ICU admission.

Values:
Usual range: 16 - 100
Plausible range: 16 - 100
Storage range: 0 - 200

Description:
Age (in years) of the patient at the time of ICU admission. If no birth date is known, an estimate of age should be given.

ANATOMICAL SITE OF SURGERY

Name:
Anatomical site of surgery

Format:
Number (3)

Units:

Input:
Combo box; Single selection.

Selection:
Selection from a list:
- ***No surgery in the actual hospital stay***.
- ***Neurosurgery***:
    Cerebrovascular accident: neurosurgery of intracranial hematoma or other non-traumatic accident (e.g. haemorrhage, aneurysm)
    Intracranial tumour: neurosurgery for any type of tumour, primary or secondary
    Neurosurgery, other
    Spinal surgery
- ***Ear, nose and throat surgery***
- ***Thoracic surgery***:
    Pneumonectomy
    Lobectomy
    Pleural surgery: includes all surgery on pleura either for tumour or several talcage/abrasion for pneumothorax
    Thoracic surgery, other
- ***Heart surgery***
    Valvular, without coronary artery by-pass grafting (CABG): all the surgical treatments of valvulopathies without coronary surgery
    Valvular with CABG: valvular repair with coronary surgery
    CABG without valvular repair: coronary artery by-pass grafting without valvular repair
    Heart surgery, other: pericardial effusion, congenital anomaly, ventricular aneurysm, neoplastic disease, vena cava clipping/filter
- ***Upper gastrointestinal surgery*** (up to and including the jejunum)
- ***Lower gastrointestinal surgery***
- ***Biliary tract surgery***: surgery of gallbladder and/or biliary tract
- ***Liver surgery***: partial hepatectomy, portal-systemic shunt surgery
- ***Pancreas surgery***
- ***Endocrine surgery***: thyroid, adrenal, pancreas surgery.
- ***Obstetric surgery***: caesarean section, surgery for ectopic pregnancy, peri- or post-partum haemorrhage, intra-uterine death.
- ***Gynaecological surgery***: surgery of uterus, ovaries, cervix uteri, genitalia.
- ***Maxillo-facial surgery***
- ***Limb surgery***
- ***Vascular surgery***:
    Major aortic surgery: includes all surgery on aorta for dissection, atheroma, aneurysm.
    Carotid endarterectomy: includes all surgery on the carotid artery.

Other major vascular surgery: includes all surgery on intrathoracic or intra-abdominal vessels.

Peripheral vascular surgery: includes all surgery on non-intracranial, non-intrathoracic, non-intra-abdominal vessels, either arteries or veins with or without by-pass graft.

Other vascular surgery

- ***Trauma***:

Brain: surgery for subdural, epidural, intracerebral haematoma or skull fracture.

Thorax: surgery of intrathoracic organs (either cardiac, respiratory or digestive tract) and vessels.

Abdomen

Limb

Multiple

- ***Transplantation***:

Liver

Heart

Kidney

Pancreas

Lung

Heart and lung

Kidney and pancreas

Transplantation, other

- ***Other surgical procedures***: other site of surgery, not otherwise specified.

Description:

The anatomical site of surgery should be indicated for patients undergoing surgery during the same hospital stay before ICU admission. Only one selection is possible. Invasive radiology procedures and definitive pacemaker insertions should not be considered surgical procedures.

ARTERIAL OXYGEN PARTIAL PRESSURE (LOWEST)

Name:
Arterial oxygen partial pressure (PaO_2)

Format:
Number (4 / 6.2)

Unit:
mm Hg (kPa)

Input:
Numerical input field

Selection:
Enter the value which, together with the FiO_2, gives the lowest PaO_2/FiO_2 ratio. When in doubt, enter the lowest measured value.

Values:
Usual range: 80 - 200 mm Hg (10.64 - 26.20 kPa)
Plausible range: 40 - 300 mm Hg (5.32 - 39.9 kPa)
Storage range: 0 - 900 mm Hg (0 - 119.7 kPa)

Description:
Oxygen partial pressure in the arterial blood, measured by blood gas analysis. This value should correspond in time to the value of the FiO_2 and the use of ventilatory support/mechanical ventilation.

BODY TEMPERATURE (HIGHEST)

Name:
Body temperature (highest)

Format:
Number (4.1)

Unit:
Degrees Celsius

Input:
Numerical input field

Selection:
Enter the highest measured body temperature.

Values:
Usual range: 36.0 - 38.5º Celsius
Plausible range: 20 - 42º Celsius
Storage range: 0 - 45º Celsius

Description:
Measurement of highest central body temperature. If possible, confirm measurements of peripheral temperature with measurements of core temperature (nasopharyngeal, tympanic, oesophageal, rectal, pulmonary artery), especially in the case of hypothermia. If using peripheral temperature, please add 0.5º C to the peripheral temperature.

CANCER THERAPY

Name:
Cancer therapy

Format:
Text

Units:

Input:
Multiple box; Single selection.

Description:
Measurement of highest central body temperature. If possible, confirm measurements of peripheral temperature with measurements of core temperature (nasopharyngeal, tympanic, oesophageal, rectal, pulmonary artery), especially in the case of hypothermia. If using peripheral temperature, please add 0.5º C to the peripheral temperature.

CO-MORBIDITIES

Name:
Co-Morbidities

Format:
Text

Units:

Input:
Multiple box; Single selection.

Selection:
Yes/No (default) for each parameter from a list:
- ***HIV positive*** (no AIDS): The patient presents positive serology for HIV virus, but does not present, according to the CDC/WHO definitions, any AIDS-defining disease; CD4 cells, if measured, are usually greater than 200.
- ***AIDS***: Patient meeting the CDC/WHO definitions for AIDS, such as an HIV-positive patient with clinical complications such as *Pneumocystis carinii* pneumonia, Kaposi's sarcoma, lymphoma, tuberculosis or toxoplasma infection, or CD4 cells, if measured, are usually lower than 200.
- ***Steroid treatment***: Equal to or greater than 0.3 mg/kg prednisolone or an equivalent dosage of another corticosteroid, daily, in the 6 months prior to ICU admission. The exclusive use of topical steroids or steroids by inhalation is not included.
- ***Radiotherapy***: In the 6 months prior to admission, externally administered radiotherapy, excluding radiotherapy for non-invasive skin tumours, enteral or parenteral radioisotope therapy, radioactive implants, radiotherapy for prevention of heterotopic bone formation.
- ***Chemotherapy***: In the 6 months prior to admission, including immunosuppressing treatment for malignancy, vasculitis, rheumatoid arthritis or inflammatory bowel disease (excludes isolated treatment with steroids).
- ***Immunosuppression, other***: The patient has a disease that is sufficiently advanced to suppress resistance to infection: e.g., severe malnutrition state, congenital immunohumoral or cellular immune deficiency state; excludes AIDS and HIV infection, metastatic cancer, haematological cancer, chemotherapy, radiotherapy, and treatment with steroids.
- ***Metastatic cancer***: Cancer with proven distant (not regional lymph nodes) metastasis by surgery, computed tomography scan, or any other method.

- ***Non-metastatic cancer***: cancer without proven distant (not regional lymph nodes) metastasis by surgery, computed tomography scan, or any other method.
- ***Haematological cancer***: lymphoma, acute leukaemia or multiple myeloma.
- ***Chronic renal failure***: chronic renal supportive therapy (either chronic haemodialysis, chronic hemofiltration or chronic peritoneal dialysis) for irreversible renal disease or history of chronic renal insufficiency at a sufficient level to provoke visceral effects.
- ***Chronic pulmonary failure***: permanent shortness of breath on light activity, due to pulmonary disease (chronic restrictive or obstructive disease). Functionally, the patient is unable to work, to climb stairs or perform household duties. Should be scored also if there exists documented chronic hypoxia, hypercapnia, secondary polycythemia, severe pulmonary hypertension (>40 mmHg) or respiratory dependency.
- ***COPD***: chronic obstructive pulmonary disease due to chronic bronchitis and/or emphysema.

- ***Chronic heart failure, class II NYHA***: fatigue, dyspnoea or angina that appears with ordinary exertion. The patient does not present dyspnoea with the decubitus or symptoms at rest.
- ***Chronic heart failure class III NYHA***: fatigue, dyspnoea or angina with a moderate level of activity (less-than-ordinary exertion).
- ***Chronic heart failure class IV NYHA***: fatigue, dyspnoea or angina at rest, or at a minimum level of activity. Functionally, this patient cannot stand alone, walk slowly or dress without symptoms.
- ***Cirrhosis***: documented by biopsy prior to admission/ at admission or clinical symptoms of portal hypertension: presence of oesophageal or gastric varices demonstrated by surgery, imaging or endoscopy or the demonstration of retrograde splenic-venous flow by ultrasound, history of variceal bleeding, prior episodes of hepatic failure/encephalopathy/coma.
- ***Alcoholism***: alcohol intake to an extent that surpasses the social drinking custom, usually regular intake of more than 80 g of alcohol per day for at least 6 months prior to admission and responsible for clinical symptoms such as logorrhoea, encephalopathy, neurological disorders, nutritional diseases, or cirrhosis.
- ***Arterial hypertension***: history of systolic blood pressure equal to or greater than 160 mm Hg and/or diastolic blood pressure equal to or greater than 95 mm Hg, treated or not treated.
- ***Insulin-dependent diabetes***: patient needing daily injection(s) of insulin before ICU admission.
- ***Non-insulin-dependent diabetes***: patient with prior diagnosis of diabetes mellitus, controlled with diet and/or drugs. The patient does not need daily injection(s) of insulin before ICU admission.
- ***IV drug addict***: drug addiction with intravenous drugs (e.g., cocaine, opiates and derivatives) for at least 6 months prior to admission; patients who are in a methadone program, without any other drug consumption in the last 6 months, should not be considered.

Description:
Describes the presence or absence of specific pathological conditions, chosen from a list. The specified conditions should be present at hospital admission.

CREATININE (HIGHEST)

Name:
Creatinine (highest)

Format:
Number (7.2 / 6.1)

Unit:
mg/dL (micromol/L)

Input:
Numerical input field

Selection:
Enter the highest measured creatinine value (independently from the concomitant use of extra-renal depuration techniques).

Values:
Usual range: 0.7 - 2.5 mg/dL (82.0 - 221.0 micromol/L)
Plausible range: 0.2 - 15.0 mg/dL (17.7 - 1326 micromol/L)
Storage range: 0 - 50.0 mg/dL (0 - 4420 micromol/L)

Description:
Laboratory measurement in the arterial or venous blood.

ESTIMATED GLASGOW COMA SCALE, EYE RESPONSE

Name:
Estimated Glasgow coma scale: eye response

Format:
Number (1)

Unit:
Points

Input:
Combo box; Single selection.

Selection: Selection from a list. All entered values (eye, motor, verbal response) have to be from one measurement. When several measurements were recorded, please enter the one with the lowest measurement.

This GCS has to be recorded for the sedated and paralysed patients only. Record the response as it was before sedation / relaxation was started. If the proper values are unknown, please use an estimate, based on the last observations.

- ***Spontaneously***
- ***To verbal commands***
- ***To pain***
- ***None***

Description:
Best eye response, measured in a sedated/paralysed patient.

ESTIMATED GLASGOW COMA SCALE, MOTOR RESPONSE

Name:
Estimated Glasgow coma scale: motor response

Format:
Number (1)

Unit:
Points

Input:
Combo box; Single selection.

Selection:
Selection from a list. All entered values (eye, motor, verbal response) have to be from one measurement. When several measurements were recorded, please enter the one with the lowest measurement.

This GCS has to be recorded for the sedated and paralysed patients only. Record the response as it was before sedation / relaxation was started. If the proper values are unknown, please use an estimate, based on the last observations.

- ***Obeys verbal***
- ***Localises pain***
- ***Flexion withdrawal***
- ***Flexion (decortication)***
- ***Extension (decerebration)***
- ***No response (flaccid)***

Description:
Best motor reaction measured in a sedated/paralysed patient.

ESTIMATED GLASGOW COMA SCALE, VERBAL RESPONSE

Name:
Estimated Glasgow coma scale: verbal response

Format:
Number, 1

Unit:
Points

Input:
Combo box; Single selection.

Selection:
Selection from a list. All entered values (eye, motor, verbal response) have to be from one measurement. When several measurements were recorded, please enter the one with the lowest measurement.

This GCS has to be recorded for the sedated and paralysed patients only. Record the response as it was before sedation / relaxation was started. If the proper values are unknown, please use an estimate, based on the last observations.

- ***Oriented and converses***
- ***Disoriented and converses***
- ***Inappropriate words***
- ***Incomprehensible words***
- ***No verbal response***

Description:
Best verbal response measured in a sedated/paralysed patient.

ESTIMATED GLASGOW COMA SCALE, TOTAL

Name:
Estimated Glasgow Coma Scale: Total

Format:
Number, 1

Unit:
Points

Input:
No input required.

Selection:
No selection possible.

Description:
Sum of the three sub-scores: Estimated Glasgow Coma Scale: eye response, Estimated Glasgow Coma Scale: motor response, Estimated Glasgow Coma Scale: verbal response;

HEART RATE (HIGHEST)

Name:
Heart rate: highest

Format:
Number (3)

Unit:
beats/minute

Input:
Numerical input field

Selection:
Enter the highest measured heart rate.

Values:
Usual range: 50 - 120 beats/minute
Plausible range: 40 - 240 beats/minute
Storage range: 0 - 600 beats/minute

Description:
In the case of patients with a distinct atrial and ventricular rate, the number corresponding to the ventricular rate should be entered.

HOSPITAL ADMISSION - DATE AND TIME

Name:
Hospital admission: date and time

Format:
Date/time (dd.mm.yyyy / hh.mm)

Units:

Input:
Date/time input field

Selection:
Date/time

Value:
Usual range: 01.01.2002 / 00.00
Plausible range: 01.01.2002 / 00.00
Storage range: 01.01.1990 / 00.00

Description:
Date and time of hospital admission. If the patient was admitted to more than one hospital before ICU admission, use the first hospital admission as the time of hospital entry.

HOSPITAL DISCHARGE - VITAL STATUS

Name:
Hospital discharge: vital status

Format:
Number (1)

Units:

Input:
Combo box; Single selection.

Selection:
Selection from the list. Enter the vital status of the patient at discharge from the hospital:
- ***Alive***
- ***Dead***
- ***Still in the hospital***
- ***Unknown***

Description:
Vital status at hospital discharge. Should only be recorded for patients alive at ICU discharge. If the patient has been discharged to another acute hospital, he/she should be followed and the final vital status registered.

HYDROGEN ION CONCENTRATION (LOWEST)

Name:
Hydrogen ion concentration: pH (lowest)

Format:
Number (5.3)

Unit:

Input:
Numerical input field

Selection:
Enter the lowest measured pH value.

Values:
Usual range: 7.36 - 7.44
Plausible range: 6.50 - 7.70
Storage range: 6.00 - 8.00

Description:
Laboratory measurement, either from the arterial or the venous blood.

ICU ADMISSION - DATE AND TIME

Name:
ICU admission: date and time

Format:
Date / Time (dd.mm.yyyy / hh.mm)

Units:

Input:
Date/time input field

Selection:
Date / time input field

Value:
Usual range: 01.01.2002 / 00.00
Plausible range: 01.01.2002 / 00.00
Storage range: 01.01.1990 / 00.00

Description:
Date and time of ICU admission. The registered value should not be earlier than the value registered for hospital admission.

ICU ADMISSION - PLANNED OR UNPLANNED

Name:
ICU admission: planned / unplanned

Format:
Number (1)

Units:

Input:
Combo box; Single selection.

Selection:
Selection from the list:
- ***Planned***: patients whose admission was planned at least 12 hours in advance.
- ***Unplanned***: patients whose admission was unplanned or planned less than 12 hours in advance.

Description:
Planned/unplanned status of the decision to admit a patient to the ICU.

ICU DISCHARGE - PLANNED OR UNPLANNED

Name:
ICU discharge: planned / unplanned

Format:
Number (1)

Units:

Input:
Combo box; Single selection.

Selection:
Selection from the list:
- ***Planned***: patients whose discharge was planned at least 12 hours in advance.
- ***Unplanned***: patients whose discharge was unplanned or planned less than 12 hours in advance.

Description:
Planned/unplanned status of the decision to discharge the patient from the ICU. Should only be recorded for patients alive at ICU discharge.

ICU DISCHARGE - VITAL STATUS

Name:
ICU discharge: vital status

Format:
Number (1)

Units:

Input:
Combo box; Single selection.

Selection:
Selection from the list. Enter the vital status of the patient at discharge from the ICU:
- ***Alive***
- ***Dead***
- ***Still in the ICU***

Description:
Vital status at ICU discharge.

INSPIRATORY OXYGEN CONCENTRATION

Name:
Inspiratory oxygen concentration (FiO_2)

Format:
Number (3)

Unit:
%

Input:
Numerical input field.

Selection:
Enter the measured inspiratory oxygen concentration, corresponding to the same arterial blood gases analysis used for the measurement of PaO_2. In each case, the value that results in the lowest PaO_2/FiO_2 ratio should be selected.

Values:
Usual range: 21 - 60 %
Plausible range: 21 - 100 %
Storage range: 10 - 100%

Description:
Inspiratory oxygen concentration in the inspiratory gas.

INTRA-HOSPITAL LOCATION BEFORE ICU ADMISSION

Name:
Intra-hospital location before ICU admission.

Format:
Number (1)

Units:

Input:
Combo box; Single selection.

Selection:
Selection from a list:
- ***Ward***: the patient was admitted to the ICU from a regular medical or surgical ward;
- ***Emergency room***: the patient was admitted to the ICU from the emergency room;
- ***Other ICU***: the patient was admitted to the ICU from another ICU, located on the same hospital or in another hospital;
- ***Intermediate Care Unit / High-dependency Unit***: the patient was admitted to the ICU from an Intermediate Care Unit / High-dependency Unit, located in the same hospital or in another hospital;
- ***Operative room***: the patient was admitted to the ICU from the operative room;
- ***Recovery room***: the patient was admitted to the ICU from the recovery room or the post-anaesthesia recovery room;
- ***Other***: the patient was admitted to the ICU from other locations.

Description:
Location from which the patient was admitted to the ICU.

LEUKOCYTES (HIGHEST)

Name:
Leukocytes: highest

Format:
Number (8.1)

Unit:
G/L, Cells x 10^3 / mm^3

Input:
Numerical input field

Selection:
Enter the highest measured WBC count. Enter the actual value, regardless of steroids, inotropes or splenectomy.

Values:
Usual range: 4.0 - 15.0 G/L
Plausible range: 1.0 - 40.0 G/L
Storage range: 0 - 999.0 G/L

Description:
Laboratory measurement in the arterial or venous blood.

PLATELETS (LOWEST)

Name:
Platelets (lowest)

Format:
Number (5)

Unit:
Cells x 10^3 / mm^3

Input:
Numeric input field

Selection:
Lowest measured platelet count.

Values:
Usual range: 100 - 500 cells x 10^3 / mm^3
Plausible range: 0 - 1000 cells x 10^3 / mm^3
Storage range: 0 - 5000 cells x 10^3 / mm^3

Description:
Laboratory measurement.

REASON(S) FOR ICU ADMISSION

Name:
Reason(s) for ICU admission

Format:
Text

Units:

Input:
Multiple box; Multiple selection.

Selection:
Selection from a list:
- ***Basic and observational intensive care*** (including preparation for scheduled surgery): the patient is in ICU for surveillance, simple weaning from ventilator after surgery, routine post-surgery care, needing complex nursing care or monitoring for drug intoxication without organ dysfunction. Generally, vital systems are well compensated and any support is at a minimal level.
- ***Neurological***:
    Coma, stupor, obtunded patient, vigilance disturbances, confusion, agitation, delirium
    Seizures
    Focal neurologic deficit (hemiplegia, paraplegia, tetraplegia)
    Intracranial mass effect
    Neurological, other
- **Cardiovascular**:
    Cardiac arrest: Needing cardiopulmonary resuscitation (CPR) prior to admission to ICU. CPR must include chest compression, defibrillation or cardiac massage.
    Shock: Defined by a systolic blood pressure (SBP) less than 90 mm Hg or a drop in SBP of >40 mm Hg from baseline with presence of clinical signs of peripheral circulatory insufficiency (cold, moist skin, cyanosis) and organ hypoperfusion (oliguria, encephalopathy, metabolic acidosis) or use of inotropic/vasopressor to maintain SBP at a level allowing organ perfusion (adrenaline, noradrenaline, dobutamine at any doses, dopamine >5 µg/kg.min). The shock should be classified according to the possible etiology in:
        Hypovolemic non-haemorrhagic shock (by external fluid losses or internal sequestration)
        Hypovolemic haemorrhagic shock (due to haemorrhage or other blood losses)
        Septic shock
        Cardiogenic shock
        Anaphylactic shock
        Mixed and undefined shock
        Chest pain (with electrocardiographic changes compatible with either angina or acute myocardial infarction)
        Hypertensive crisis
        Rhythm disturbances (due to heart rate or heart conduction disturbances)
        Cardiac failure without shock (either left, right or global)
        Cardiovascular, other
- ***Renal***:

Pre-renal ARF: pre-renal or functional acute renal failure induced by hypovolaemia or shock)

Obstructive ARF: post-renal acute renal failure: obstruction of the urinary tract or the intra-renal ducts

Organic ARF: acute renal failure resulting from lesions in the arteries (intra- or extra-renal), in the glomeruli, or in the interstitium

Renal, other

- ***Respiratory***:

ALI and ARDS: Syndrome of acute inflammation and increased permeability associated with clinical, radiological and physiologic abnormalities: arterial hypoxemia resistant to oxygen therapy (ALI: PaO_2/FiO_2 <300 mm Hg; ARDS: PaO_2/FiO_2 <200 mm Hg) and diffuse bilateral radiological infiltrates without signs of cardiac failure or pulmonary capillary hypertension (pulmonary artery occlusion pressure <18 mm Hg).

Acute respiratory failure on chronic pulmonary disease: chronic pulmonary disease could be obstructive or restrictive.

Respiratory, other: Impaired respiratory function less than that defined by ALI, due to pulmonary lesion or pleuritis, necessitating oxygen or mechanical ventilation.

- ***Hepatic***:

Liver failure: hepatic failure inducing metabolic disturbances and/or encephalopathy.

Liver, other

- ***Haematological***:

Haemorrhagic syndrome / disseminated intravascular coagulation: induced by coagulation disorders like thrombocytopenia with platelet count <20,000/mL and/or increase in prothrombin time and/or congenital disorders of blood coagulation factors and/or acquired disorders of blood coagulation factors.

Severe hemolysis

Haematological, other

- ***Metabolic***:

Acid-base and/or electrolyte disturbance

Hypo- and hyperthermia

Hypo- and hyperglycemia (includes diabetic comas)

Metabolic, other

- ***Digestive***:

Bleeding: either upper or lower gastrointestinal tract

Acute abdomen: related to infection, ischemia, perforation, inflammation, either upper or lower gastrointestinal tract. Excludes severe pancreatitis

Severe pancreatitis

Digestive, other

- ***Severe trauma***
- ***Other***

Description:

That is(are) the reason(s) why the patient is admitted into the ICU either for monitoring or active treatment. Overall, several answers are possible, but within each organ and system only one answer is possible, and the main reason should be chosen.

If basic and observational intensive care is selected no further selection is possible.

SURGICAL STATUS AT ICU ADMISSION

Name:
Surgical status at ICU admission

Format:
Number (1)

Units:

Input:
Combo box; Single selection.

Selection:
Selection from a list:
- **Patient not submitted to surgery**: patients not undergoing surgery before ICU admission.
- ***Scheduled surgery***: patients undergoing a surgical procedure before ICU admission which was planned more than 24 hours in advance (including laparoscopic surgery).
- **Emergency surgery**: patients undergoing a surgical procedure before ICU admission, which was planned less than 24 hours in advance (including laparoscopic surgery).

Description:
Surgical status at admission. Only one selection possible. Invasive radiology procedures and definitive pacemaker insertions should not be considered surgical acts.

SYSTOLIC BLOOD PRESSURE (LOWEST)

Name:
Systolic blood pressure (lowest)

Format:
Number (3)

Unit:
mm Hg

Input:
Numeric input field

Selection:
Enter the lowest measured systolic arterial blood pressure.

Values:
Usual range: 70 - 160 mm Hg
Plausible range: 0 - 200 mm Hg
Storage range: 0 - 400 mm Hg

Description:
Measurement of systolic arterial blood pressure, invasive or non-invasive. In the case of a documented cardiac arrest during the considered period, 0 should be entered.

TOTAL BILIRUBINE (HIGHEST)

Name:
Total bilirubin (highest)

Format:
Number (7.2)

Unit:
mg/dL (micromol/L)

Input:
Numeric input field

Selection:
Enter the highest measured total bilirubine value. This value is only mandatory if the patient presents clinically evident jaundice.

Values:
Usual range: 0.2 - 1.2 mg/dL (3.42 - 20.52 micromol/L)
Plausible range: 0.1 -50.0 mg/dL (1.71 - 855 micromol/L)
Storage range: 0 - 200.0 mg/dL (0 - 3420 micromol/L)

Description:
Laboratory measurement in the arterial or venous blood. This value is only mandatory if the patient presents clinically evident jaundice.

USE OF MAJOR THERAPEUTIC OPTIONS BEFORE ICU ADMISSION

Name:
Use of major therapeutic options before ICU admission

Format:
Text

Unit:

Input:
Combo box; Multiple selection.

Selection:
The following treatment should have been provided to the patient before ICU admission. Several answers are possible, but within each item only a Yes/No answer is possible. In case no information is available about a particular item, this item should be scored as No.
Selection from a list:
- ***CPR***: cardiac arrest, needing cardiopulmonary resuscitation (CPR). CPR must include chest compression, defibrillation or cardiac massage.
- ***Vasoactive drugs***: vasoactive drugs are defined as dopamine equal to or greater than 5 microgram/kg/minute or any dose of dobutamine, adrenaline or noradrenaline administered intravenously in continuous perfusion for more than 1 hour prior to ICU admission.
- ***Mechanical ventilation***: the patient has been subjected to invasive or non-invasive ventilation. Excluded is the use of ventilatory support alone, such as the administration of oxygen by nasal plugs or Venturi mask.

Description:
Describes the use of major therapeutic options before ICU admission.

VENTILATORY SUPPORT AND MECHANICAL VENTILATION

Name:
Ventilatory support / mechanical ventilation

Format:
Number (2)

Unit:

Input:
Combo box; Single selection.

Selection:
Selection from a list, only one choice possible:
- ***No oxygen support***
- ***Oxygen support***:
  Nasal plug
  Face or bag mask
  Other
- ***Non-invasive ventilation***:

CPAP/BiPAP: Continuous positive pressure ventilation: spontaneous breathing at a pressure higher than atmospheric pressure, non-invasively delivered by a ventilator or a specifically designed apparatus to the patient by a mask

PSV: Pressure Support Ventilation: The ventilator assists the patient upon spontaneous effort by delivering a set level of pressure non-invasively delivered by a ventilator or a specifically designed apparatus to the patient by a mask

Non-invasive ventilation, other
- ***Invasive ventilation***:

CPAP: Continuous positive pressure ventilation: spontaneous breathing at a pressure higher than atmospheric pressure, invasively delivered by a ventilator or a specifically designed apparatus to the patient by an endotracheal tube or a tracheostomy

PSV: Pressure Support Ventilation: The ventilator assists the patient upon spontaneous effort by delivering a set level of pressure non-invasively delivered by the ventilator to the patient by an endotracheal tube or a tracheostomy

SIMV: Synchronized Intermittent Mandatory Ventilation: The ventilator assists the patient by delivering a set level of volume and flow at a fixed determined respiratory rate. In between, the patient may breathe spontaneously. Ventilation is delivered by the ventilator to the patient by an endotracheal tube or a tracheostomy

SIMV+PSV: Synchronized Intermittent Mandatory Ventilation plus Pressure Support Ventilation: The ventilator assists the patient by delivering a set level of volume and flow at a fixed determined respiratory rate. In between, when the patient breathes spontaneously the ventilator assists the patient by delivering a set level of pressure. Ventilation is delivered by the ventilator to the patient by an endotracheal tube or a tracheostomy

PCV: Pressure Control Ventilation: The ventilator delivers a set level of pressure at a set, minimal rate for a set inspiratory time. Ventilation is delivered by the ventilator to the patient by an endotracheal tube or a tracheostomy

CMV and A/CMV: Controlled Mechanical Ventilation / Assisted / Controlled Mechanical Ventilation: The ventilator delivers a set level of volume and flow at a set, minimal rate for a set inspiratory time. Control Mechanical Ventilation: when the rate set on the ventilator is identical to the measured rate, this means that there is no spontaneous activity (i.e., during curare infusion). Assisted Mechanical Ventilation: when the rate set on the

ventilator is lower than the measured rate, this means that there is spontaneous activity and the patient triggers more breaths than the set on the ventilator. Ventilation is delivered by the ventilator to the patient by an endotracheal tube or a tracheostomy

Invasive ventilation, other

Attention: If the answer is ***Non-invasive ventilation*** or ***Invasive ventilation***, please fill in the fields "***PEEP***" and "***Tidal Volume***".

Description:
Type of ventilatory support / mechanical ventilation provided to the patient during the period when the blood sample used to register PaO_2 was taken.

Appendix D. Scientific Board of the SAPS 3 Project.

Project coordinator:

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Steering Committee:

- Eduardo Almeida, Intensive Care Unit, Hospital Garcia de Orta, Pragal, Portugal.
- Ricardo Abizanda Campos, Dept. of Intensive Care, General Castello Hospital, Castello, Spain.
- David Edbrooke, Critical Care Directorate, Royal Hallamshire Hospital, Sheffield, United Kingdom.
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Appendix E. Country coordinators of the SAPS 3 Project.

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	Flávio Nacul	Rio de Janeiro
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Hungary	Akos Csomos	Eger
India	Shirish Prayag	Pune
Ireland	Thomas Ryan	Dublin
Israel	Charles Sprung	Jerusalem
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Luxembourg	Margareth Hemmer	Luxembourg
Mexico	Guillermo Dominguez	Morelia
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Appendix F. List of participating ICUs and their respective coordinators

Coordinator	Icu	Department	Hospital	City	Country
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Jorge de Castro	Servicio de Terapia Intensiva		Hospital Ramon Santamarina de Tandil	Tandil (7000)	Argentina
Delgado Miguel Angel	ICU		Clínica Roca S.A.	Río Negro	Argentina
Carlos Castarataro	Servicio de Terapia Intensiva Adultos	Departamento de Medicina	Hospital Italiano de Buenos Aires	Buenos Aires	Argentina
Cristian Becerra	Unidad Terapia Intensiva Clinica Privada Caraffa	Departamento de Cuidados Intensivos	Clinica Privada Caraffa	Cordoba	Argentina
Maximiliano Waschbusch	Unidad de Terapia Intensiva (UTI)		Hospital de Monte Grande	Buenos Aires	Argentina
Lilinan Monica Vetere	Servicio de Cuidados Intensivos		Hospital Escuela "U.A.I."	Buenos Aires	Argentina
Ricardo Valentini	Unidad de Terapia Intensiva de CEMIC	Departamento de Medicina	Centro de Educacion Medica e Investigaciones Clinicas "Norberto Quirno"	Buenos Aires	Argentina
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Camilo Velluso		Emergencias Medicas	Hospital Bernardino Rivadavia		Argentina
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Cristina Santos	Adults Intensive Care Unit		Hospital Interzonal de Agudos Eva Perón (Catex)	San Martín	Argentina
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Jonathon Foote	Intensive Care Unit		The Queen Elizabeth Hospital	SA 5011 Woodville	Australia
Tamara Hunt	Critical Care Unit		Flinders Medical Centre	SA 5042	Australia
Peter Bristow	Critical Care Ward	Intensive Care Dep.	Toowoomba Hospital	Toowoomba, 4350, Queenland	Australia
John Santamaria	ICU		St. Vincent Hospital	Melbourne	Australia
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