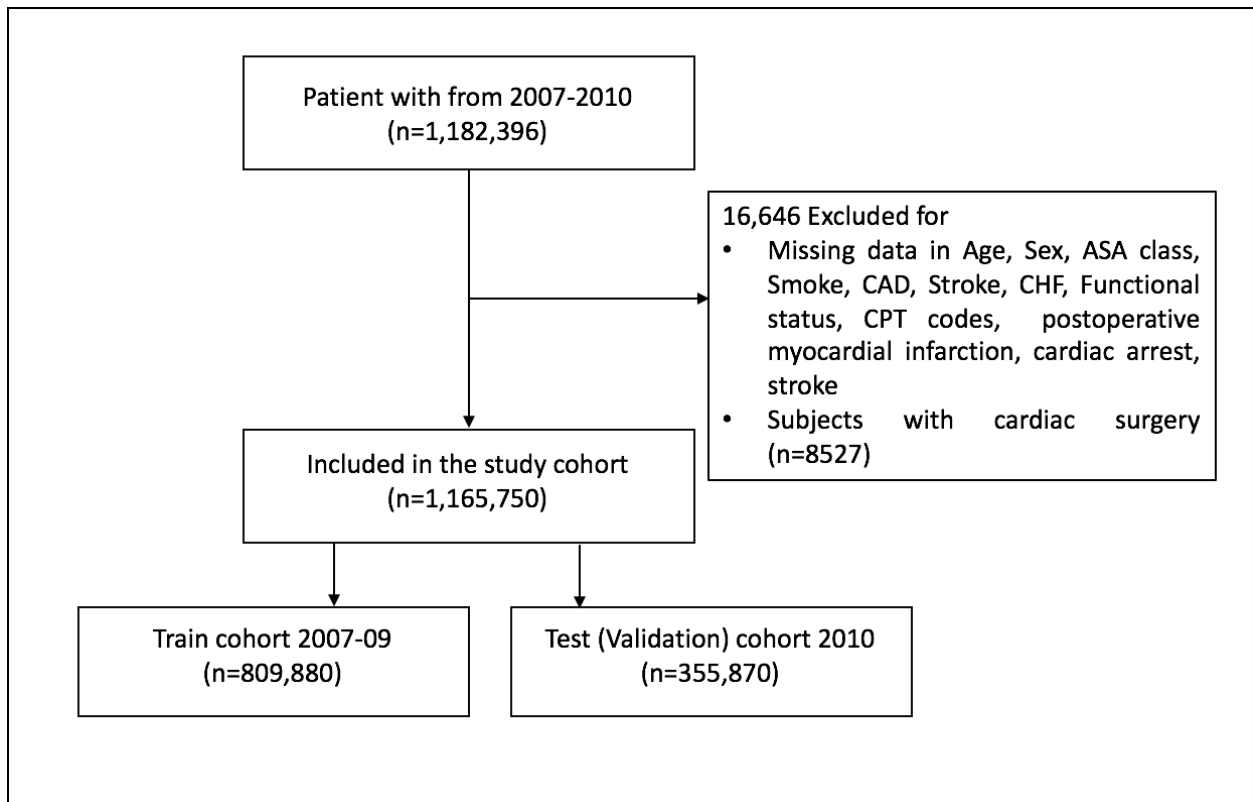
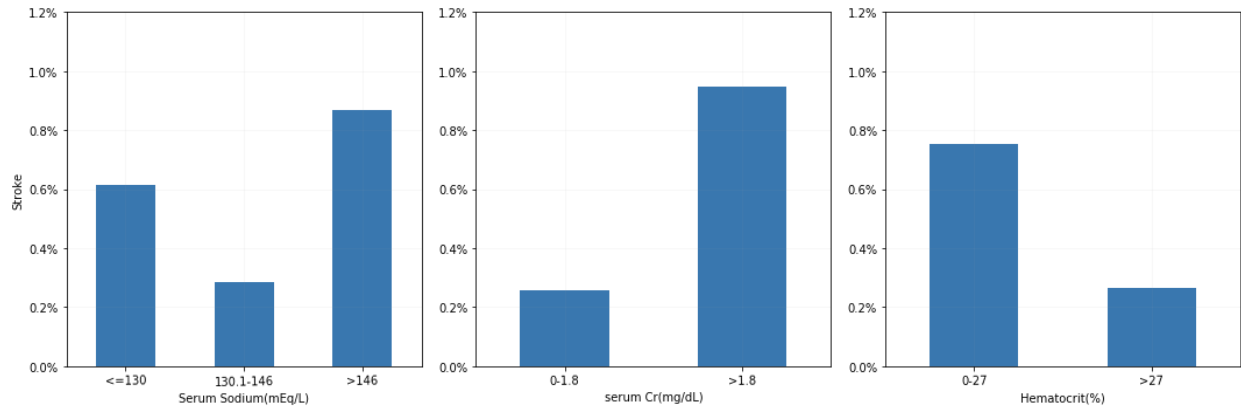


# **SUPPLEMENTAL MATERIAL**

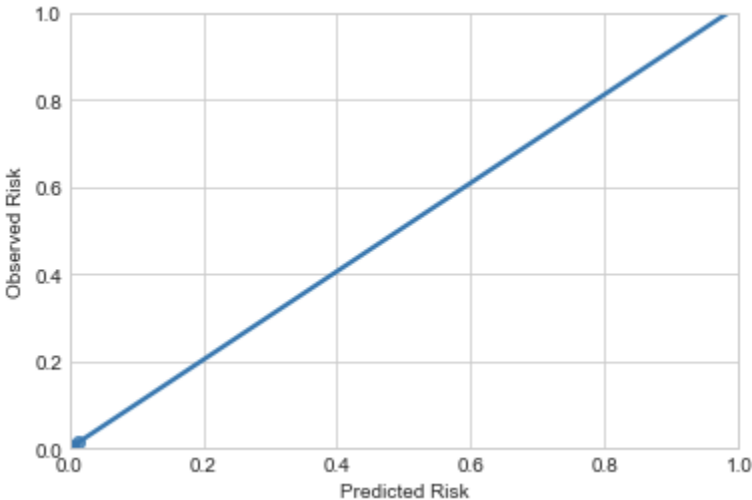
**Figure S1. Participant flow chart.**



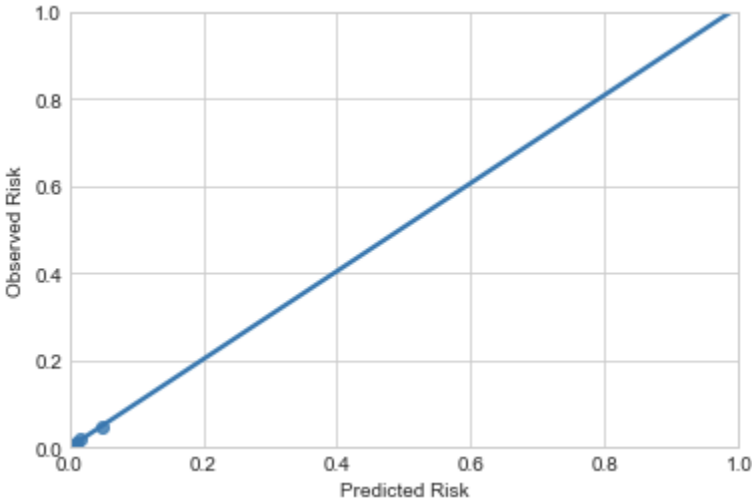
**Figure S2. Postoperative stroke according to serum sodium, creatinine and hematocrit. Stroke rate from 2007-2009 cohort.**



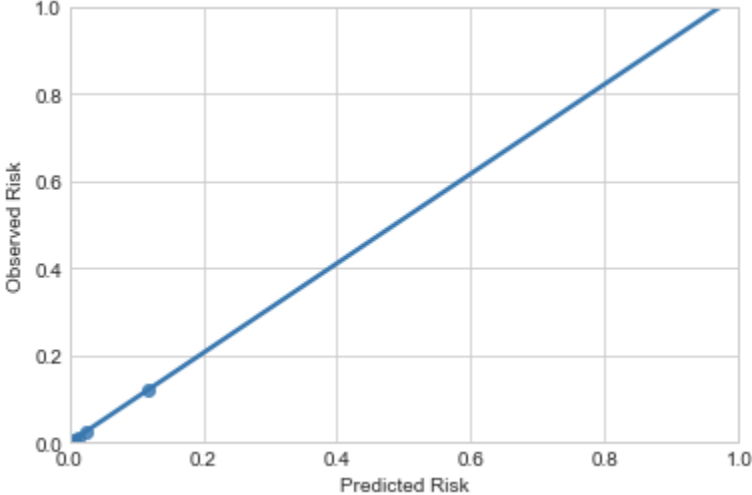
**Figure S3a. Calibration plot for postoperative stroke. Observed vs expected stroke risk.**



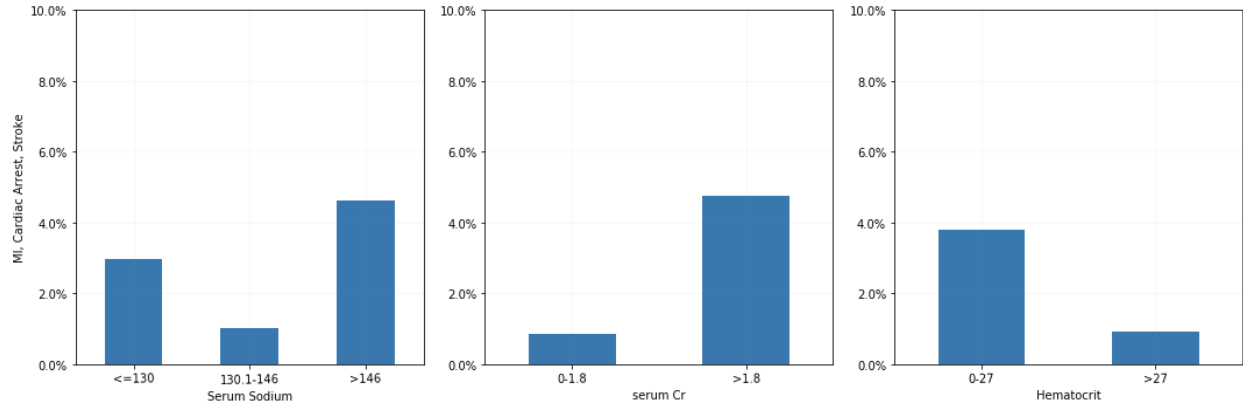
**Figure S3b. Calibration plot for postoperative major cardiovascular events(myocardial infarction, cardiac arrest, stroke). Observed vs expected risk.**



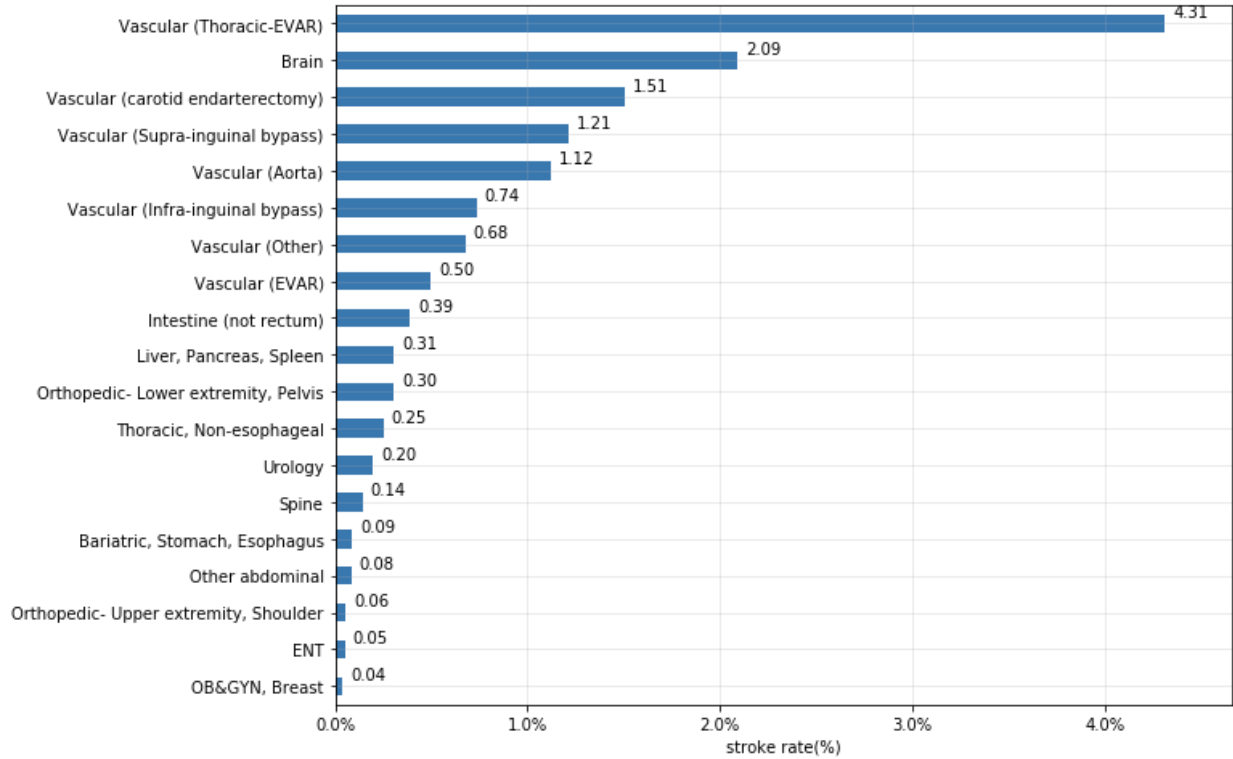
**Figure S3c. Calibration plot for 30-day postoperative death.**

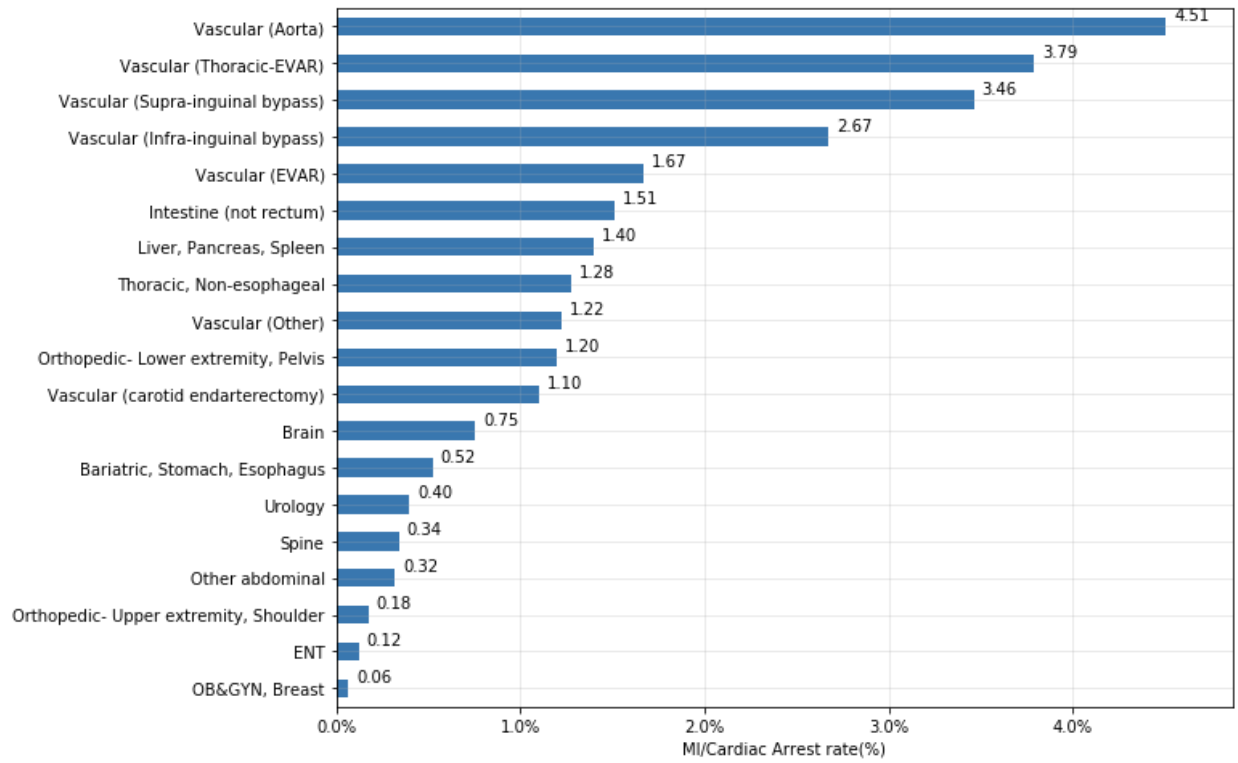


**Figure S4. Postoperative major cardiovascular events (MI, Cardiac Arrest or Stroke) according to serum sodium, creatinine and hematocrit. from 2007-2009 cohort**



**Figure S5. The rates (%) of 30-day postoperative stroke and major cardiac complications in patients according to surgery types.**







**Table S1. Adjusted odds ratio of predictors for 30-day postoperative stroke.**

	Adjusted odds ratio	Coefficient	SE	P-value
Intercept		-10.382	0.366	<0.001
Age (per year)	1.03 (1.02-1.03)	0.026	0.002	<0.001
Stroke	2.3 (2.08-2.55)	0.834	0.052	<0.001
Coronary artery disease	1.02 (0.9-1.15)	0.021	0.062	0.732
Emergency Surgery	1.89 (1.68-2.12)	0.634	0.059	<0.001
Hematocrit 0-27% (ref: >27%)	1.29 (1.08-1.55)	0.255	0.093	0.006
Hematocrit: missing	0.93(0.69-1.26)	-0.071	0.154	0.647
Creatinine >1.8mg/dL (ref:≤1.8)	1.41 (1.24-1.6)	0.343	0.066	<0.001
Creatinine: missing	0.84(0.58-1.23)	-0.171	0.195	0.381
Serum sodium ≤ 130mEq/L (ref: 130.1-146)	1.04 (0.8-1.36)	0.042	0.136	0.755
Serum sodium > 146mEq/L	1.41 (0.99-2.01)	0.346	0.181	0.056
Serum sodium: missing	0.83(0.58-1.21)	-0.181	0.189	0.338
ASA class (ref: ASA 1)				
ASA 2 - mild disturbance	3.48 (1.71-7.08)	1.248	0.362	0.001
ASA 3- severe disturbance	8.51 (4.2-17.25)	2.142	0.360	<0.001

ASA 4- life threatening	14.01 (6.88-28.56)	2.640	0.363	<0.001
ASA 5- moribund	14.71 (6.77-31.93)	2.688	0.396	<0.001
Surgery type (ref: other abdominal surgery)				
ENT	0.71 (0.45-1.13)	-0.337	0.234	0.150
bariatric, stomach, esophagus	0.89 (0.67-1.18)	-0.118	0.147	0.420
brain	11.91 (8.88-15.96)	2.477	0.149	<0.001
intestine (not rectum)	2.18 (1.85-2.57)	0.781	0.083	<0.001
liver, pancreas, spleen	2.41 (1.82-3.19)	0.879	0.143	<0.001
obstetrics, gynecology, breast	0.65 (0.47-0.9)	-0.434	0.168	0.010
orthopedic (lower extremity, pelvis)	1.63 (1.3-2.04)	0.488	0.115	<0.001
orthopedic (upper extremity, shoulder)	0.3 (0.08-1.22)	-1.191	0.710	0.094
spine	1.82 (1.15-2.88)	0.599	0.234	0.010
thoracic (non-esophageal)	1.83 (1.21-2.75)	0.602	0.208	0.004
urology	1.51 (1.03-2.22)	0.414	0.195	0.034
vascular (carotid endarterectomy)	5.19 (4.36-6.17)	1.647	0.089	<0.001
vascular (aorta)	3.08 (2.33-4.06)	1.124	0.141	<0.001
vascular (thoracic EVAR)	15.11 (10.98-20.79)	2.715	0.163	<0.001
vascular (EVAR)	2.17 (1.59-2.96)	0.773	0.159	<0.001

vascular (supra-inguinal)	5.32 (0.72-39.24)	1.671	1.020	0.101
vascular (infra-inguinal)	3.21 (2.59-3.98)	1.167	0.109	<0.001
vascular (other)	3.03 (2.48-3.71)	1.109	0.103	<0.001
other surgery	0.97 (0.66-1.41)	-0.035	0.194	0.856

SE- standard error, CI- confidence interval, EVAR- endovascular aneurysm repair

**Table S2. Adjusted odds ratio of predictors for 30-day postoperative major cardiovascular complications (myocardial infarction, cardiac arrest, and/or stroke).**

	Adjusted odds ratio (95% CI)	Coefficient	SE	P-value
intercept		-9.368	0.224	<0.001
Age (per year)	1.03 (1.03-1.03)	0.027	0.001	<0.001
Stroke	1.46 (1.37-1.55)	0.377	0.031	<0.001
Coronary artery disease	1.43 (1.34-1.52)	0.356	0.031	<0.001
Emergency Surgery	1.88 (1.77-1.99)	0.630	0.031	<0.001
Hematocrit 0-27% (ref: >27%)	1.42 (1.31-1.55)	0.353	0.044	<0.001
Hematocrit: missing	0.91 (0.77-1.08)	-0.097	0.087	0.268
Creatinine >1.8mg/dL	1.96 (1.84-2.09)	0.673	0.032	<0.001
Creatinine: missing	0.78 (0.63-0.97)	-0.249	0.112	0.026
Serum sodium ≤ 130mEq/L (ref: 130.1-146)	1.2 (1.06-1.36)	0.184	0.064	0.004
Serum sodium > 146mEq/L	1.67 (1.42-1.97)	0.515	0.084	<0.001
Serum sodium: missing	0.88 (0.72-1.09)	-0.123	0.107	0.252
ASA class (ref: ASA 1)				
ASA 2 - mild disturbance	3.71 (2.4-5.75)	1.312	0.223	<0.001
ASA 3- severe disturbance	12.01 (7.78-18.54)	2.486	0.221	<0.001

ASA 4- life threatening	25.26 (16.33-39.08)	3.229	0.223	<0.001
ASA 5- moribund	41.62 (26.45-65.51)	3.729	0.231	<0.001
Surgery type				
ENT (ref: other abdominal surgery)	0.56 (0.43-0.72)	-0.582	0.131	<0.001
bariatric, stomach, esophagus	1.3 (1.15-1.47)	0.264	0.061	<0.001
brain	3.74 (2.95-4.74)	1.320	0.121	<0.001
intestine (not rectum)	2.08 (1.92-2.25)	0.733	0.040	<0.001
liver, pancreas, spleen	2.73 (2.4-3.1)	1.003	0.066	<0.001
obstetrics, gynecology, breast	0.36 (0.29-0.45)	-1.008	0.111	<0.001
orthopedic (lower extremity, pelvis)	1.68 (1.51-1.87)	0.520	0.054	<0.001
orthopedic (upper extremity, shoulder)	0.39 (0.22-0.72)	-0.931	0.304	0.002
spine	1.42 (1.1-1.84)	0.354	0.130	0.006
thoracic (non-esophageal)	2 (1.66-2.41)	0.694	0.094	<0.001
urology	1.01 (0.81-1.26)	0.008	0.112	0.944
vascular (carotid endarterectomy)	2.13 (1.92-2.37)	0.758	0.053	<0.001
vascular (aorta)	3.02 (2.65-3.43)	1.104	0.066	<0.001
vascular (thoracic EVAR)	5.27 (4.16-6.67)	1.662	0.120	<0.001
vascular (EVAR)	1.61 (1.37-1.89)	0.476	0.083	<0.001

vascular (supra-inguinal)	2.15 (0.51-9.06)	0.766	0.734	0.297
vascular (infra-inguinal)	2.93 (2.63-3.25)	1.074	0.054	<0.001
vascular (other)	1.58 (1.41-1.77)	0.459	0.058	<0.001
other surgery	1.01 (0.85-1.21)	0.013	0.091	0.890

**Table S3. Adjusted odds ratio of predictors for postoperative Myocardial Infarction or Cardiac Arrest.**

	adjusted odds ratio	coefficient	SE	P-value
Intercept		-9.828	0.283	<0.001
Age (per year)	1.03 (1.03-1.03)	0.027	0.001	<0.001
Stroke	1.19 (1.1-1.28)	0.170	0.037	<0.001
Coronary artery disease	1.58 (1.48-1.69)	0.458	0.035	<0.001
Emergency Surgery	1.85 (1.73-1.98)	0.615	0.035	<0.001
Hematocrit 0-27% (ref: >27%)	1.43 (1.3-1.57)	0.355	0.048	<0.001
Hematocrit: missing	0.93 (0.76-1.13)	-0.075	0.102	0.462
Serum creatinine >1.8mg/dL (ref:≤1.8)	2.13 (1.99-2.29)	0.758	0.036	<0.001
Serum creatinine: missing	0.74 (0.57-0.96)	-0.297	0.133	0.025
Serum sodium ≤ 130mEq/L (ref: 130.1-146)	1.23 (1.07-1.41)	0.205	0.071	0.004
Serum sodium > 146mEq/L	1.69 (1.41-2.02)	0.525	0.092	<0.001
Serum sodium: missing	0.95 (0.74-1.22)	-0.048	0.126	0.702
ASA class (ref: ASA 1)				
ASA 2 - mild disturbance	4.02 (2.31-7)	1.391	0.283	<0.001
ASA 3- severe disturbance	14.55 (8.39-25.22)	2.678	0.281	<0.001

ASA 4- life threatening	33.26 (19.14-57.79)	3.505	0.282	<0.001
ASA 5- moribund	58.15 (32.96-102.6)	4.063	0.290	<0.001
Surgery type (ref: other abdominal surgery)				
ENT	0.49 (0.36-0.68)	-0.704	0.159	<0.001
bariatric, stomach, esophagus	1.42 (1.25-1.62)	0.352	0.067	<0.001
brain	1.18 (0.76-1.83)	0.164	0.224	0.466
intestine (not rectum)	2.04 (1.87-2.23)	0.714	0.045	<0.001
liver, pancreas, spleen	2.82 (2.44-3.25)	1.036	0.073	<0.001
obstetrics, gynecology, breast	0.27 (0.2-0.36)	-1.312	0.146	<0.001
orthopedic (lower extremity, pelvis)	1.68 (1.49-1.89)	0.520	0.060	<0.001
orthopedic (upper extremity, shoulder)	0.41 (0.21-0.8)	-0.884	0.336	0.009
spine	1.3 (0.96-1.75)	0.259	0.154	0.094
thoracic (non-esophageal)	2.02 (1.65-2.48)	0.705	0.104	<0.001
urology	0.84 (0.64-1.1)	-0.175	0.137	0.202
vascular (carotid endarterectomy)	1.16 (1.01-1.34)	0.152	0.073	0.037
vascular (aorta)	2.95 (2.56-3.4)	1.082	0.073	<0.001
vascular (thoracic EVAR)	2.64 (1.89-3.68)	0.969	0.171	<0.001



vascular (EVAR)	1.47 (1.22-1.77)	0.387	0.095	<0.001
vascular (supra-inguinal)	1.29 (0.17-9.53)	0.255	1.020	0.803
vascular (infra-inguinal)	2.83 (2.52-3.19)	1.041	0.060	<0.001
vascular (other)	1.23 (1.08-1.41)	0.209	0.070	0.003
other surgery	1.02 (0.84-1.24)	0.020	0.101	0.846

**Table S4. Adjusted odds ratio of predictors for postoperative Myocardial Infarction.**

	Adjusted odds ratio	Coefficient	SE	P value
Intercept	0 (0-0)	-11.330	0.457	<0.001
Age (per year)	1.04 (1.04-1.04)	0.040	0.002	<0.001
Stroke	1.23 (1.1-1.36)	0.204	0.054	<0.001
Coronary artery disease	2.03 (1.84-2.23)	0.708	0.049	<0.001
Emergency Surgery	1.74 (1.57-1.94)	0.557	0.054	<0.001
Hematocrit 0-27% (ref: >27%)	1.19 (1.01-1.4)	0.171	0.084	0.041
Hematocrit: missing	0.81 (0.60-1.1)	-0.213	0.156	0.172
Serum creatinine >1.8mg/dL (ref:≤1.8)	1.66 (1.48-1.86)	0.506	0.058	<0.001
Serum creatinine: missing	0.87 (0.60-1.26)	-0.142	0.189	0.452
Serum sodium ≤ 130mEq/L (ref: 130.1-146)	1.09 (0.86-1.38)	0.087	0.119	0.464
Serum sodium > 146mEq/L	1.14 (0.81-1.61)	0.132	0.175	0.452
Serum sodium: missing	0.91 (0.64-1.3)	-0.095	0.181	0.599
ASA class (ref: ASA 1)				
ASA 2 - mild disturbance	4.19 (1.72-10.21)	1.433	0.454	0.002
ASA 3- severe disturbance	12.01 (4.95-29.12)	2.486	0.452	<0.001

ASA 4- life threatening	20.32 (8.35-49.45)	3.012	0.454	<0.001
ASA 5- moribund	22.22 (8.79-56.17)	3.101	0.473	<0.001
Surgery type (ref: other abdominal surgery)				
ENT	0.39 (0.23-0.67)	-0.940	0.274	0.001
bariatric, stomach, esophagus	1.39 (1.12-1.72)	0.328	0.109	0.003
brain	1.1 (0.52-2.33)	0.095	0.384	0.806
intestine (not rectum)	2.1 (1.83-2.42)	0.743	0.071	<0.001
liver, pancreas, spleen	2.36 (1.86-3)	0.859	0.122	<0.001
obstetrics, gynecology, breast	0.31 (0.21-0.47)	-1.165	0.205	<0.001
orthopedic (lower extremity, pelvis)	1.85 (1.55-2.22)	0.616	0.092	<0.001
orthopedic (upper extremity, shoulder)	0.21 (0.05-0.86)	-1.539	0.710	0.030
spine	1.59 (1.05-2.41)	0.464	0.212	0.029
thoracic (non-esophageal)	1.64 (1.15-2.33)	0.495	0.179	0.006
urology	1.2 (0.85-1.69)	0.183	0.175	0.294
vascular (carotid endarterectomy)	1.64 (1.36-1.99)	0.497	0.098	<0.001
vascular (aorta)	3.46 (2.79-4.29)	1.242	0.109	<0.001
vascular (thoracic EVAR)	2.11 (1.18-3.79)	0.748	0.298	0.012

vascular (EVAR)	2.25 (1.77-2.86)	0.810	0.123	<0.001
vascular (supra-inguinal)	4.02 (0.55-29.59)	1.392	1.018	0.171
vascular (infra-inguinal)	4.13 (3.5-4.87)	1.417	0.084	<0.001
vascular (other)	1.28 (1.02-1.59)	0.243	0.112	0.030
other surgery	0.75 (0.52-1.08)	-0.285	0.186	0.125

**Table S5. Adjusted odds ratio of predictors for 30-day mortality.**

	Adjusted odds ratio	Coefficient	SE	P-value
Intercept		-9.700	0.204	<0.001
Age (per year)	1.04 (1.04-1.04)	0.039	0.001	<0.001
Stroke	1.18 (1.12-1.24)	0.165	0.026	<0.001
Coronary artery disease	1.01 (0.96-1.07)	0.013	0.026	0.632
Emergency Surgery	2.77 (2.66-2.89)	1.019	0.022	<0.001
Hematocrit 0-27% (ref: >27%)	1.78 (1.68-1.89)	0.578	0.030	<0.001
Hematocrit: missing	0.75 (0.64-0.88)	-0.288	0.08	<0.001
Serum creatinine >1.8mg/dL	2.14 (2.04-2.24)	0.759	0.024	<0.001
Serum creatinine: missing	0.77 (0.63-0.93)	-0.265	0.100	0.008
Serum sodium ≤ 130mEq/L (ref: 130.1-146)	1.62 (1.49-1.76)	0.481	0.043	<0.001
Serum sodium > 146mEq/L	2.25 (2-2.53)	0.811	0.059	<0.001
Serum sodium: missing	0.82 (0.68-1.00)	-0.194	0.097	0.047
ASA class (ref: ASA 1)				
ASA 2 - mild disturbance	2.74 (1.83-4.1)	1.008	0.205	<0.001
ASA 3- severe disturbance	15.01 (10.1-22.31)	2.709	0.202	<0.001

ASA 4- life threatening	59.93 (40.29-89.13)	4.093	0.203	<0.001
ASA 5- moribund	261.22 (174.15-391.83)	5.565	0.207	<0.001
Surgery type (ref: other abdominal surgery)				
ENT	0.29 (0.22-0.38)	-1.231	0.135	<0.001
bariatric, stomach, esophagus	1.14 (1.05-1.24)	0.132	0.044	0.003
brain	1.99 (1.62-2.43)	0.687	0.103	<0.001
intestine (not rectum)	1.76 (1.67-1.86)	0.567	0.028	<0.001
liver, pancreas, spleen	1.8 (1.62-2)	0.588	0.053	<0.001
obstetrics, gynecology, breast	0.23 (0.19-0.28)	-1.466	0.104	<0.001
orthopedic (lower extremity, pelvis)	1.13 (1.04-1.22)	0.120	0.040	0.002
orthopedic (upper extremity, shoulder)	0.41 (0.27-0.6)	-0.904	0.202	<0.001
spine	0.72 (0.56-0.93)	-0.324	0.128	0.012
thoracic (non-esophageal)	2.03 (1.8-2.3)	0.709	0.063	<0.001
urology	0.41 (0.33-0.52)	-0.890	0.115	<0.001
vascular (carotid endarterectomy)	0.46 (0.41-0.51)	-0.784	0.060	<0.001
vascular (aorta)	1.45 (1.31-1.61)	0.372	0.053	<0.001
vascular (thoracic EVAR)	1.14 (0.88-1.49)	0.135	0.133	0.313
vascular (EVAR)	0.63 (0.54-0.73)	-0.465	0.074	<0.001

vascular (supra-inguinal)	0.68 (0.19-2.45)	-0.386	0.654	0.555
vascular (infra-inguinal)	1 (0.91-1.1)	0.002	0.049	0.962
vascular (other)	0.82 (0.76-0.9)	-0.193	0.045	<0.001
other surgery	0.85 (0.74-0.96)	-0.168	0.065	0.009