

**Supplemental Digital Content 13A: Subgroup Analysis: Multivariable Analysis of Preoperative Characteristics and Postoperative Acute Kidney Injury – Logistic Regression Full Model<sup>†</sup> Performed on Derivation Cohort Among Cases Receiving General Anesthesia**

Risk Factor	$\beta$ Coefficient	Multivariable model p-value	Adjusted Odds Ratio (95% Confidence Interval) <sup>†</sup>
<b>Medical Factors</b>			
Patient Age (years) <sup>§</sup>	0.0000248	0.025	1.00 (1.00-1.00)
BMI (kg/m <sup>2</sup> ) <sup>§§</sup>	0.205	<0.001	1.23 (1.18-1.28)
Male Gender	0.356	<0.001	1.43 (1.34-1.52)
<b>Patient Medical History <sup>*</sup></b>			
Congestive Heart Failure	0.095	0.075	1.10 (0.99-1.22)
Cardiac Arrhythmias	0.171	<0.001	1.19 (1.09-1.29)
Valvular Disease	-0.008	0.904	0.99 (0.87-1.13)
Pulmonary Circulation Disorders	0.143	0.026	1.15 (1.02-1.31)
Peripheral Vascular Disorders	0.048	0.271	1.05 (0.96-1.14)
Hypertension, Uncomplicated	0.022	0.545	1.02 (0.95-1.10)
Hypertension, Complicated	0.495	<0.001	1.64 (1.47-1.82)
Paralysis/Other Neurological Disorders	0.086	0.122	1.09 (0.98-1.22)
Chronic Pulmonary Disease	-0.012	0.779	0.99 (0.91-1.07)
Diabetes, Uncomplicated	0.035	0.387	1.04 (0.96-1.12)
Diabetes, Complicated	0.380	<0.001	1.46 (1.23-1.74)
Hypothyroidism	-0.122	0.019	0.89 (0.80-0.98)
Liver Disease	0.534	<0.001	1.71 (1.55-1.88)
Peptic Ulcer Disease Excluding Bleeding	-0.074	0.516	0.93 (0.74-1.16)
AIDS/HIV	0.254	0.427	1.29 (0.69-2.41)
Rheumatoid Arthritis / Collagen Vascular Diseases	-0.011	0.894	0.99 (0.84-1.16)
Coagulopathy	0.441	<0.001	1.55 (1.40-1.72)
Lymphoma	0.058	0.613	1.06 (0.85-1.33)
Metastatic Cancer	-0.004	0.937	0.99 (0.89-1.11)
Solid Tumor	-0.037	0.430	0.96 (0.88-1.06)
Weight Loss	0.169	0.001	1.18 (1.08-1.30)
Alcohol Abuse	-0.149	0.055	0.86 (0.74-1.00)
Drug Abuse	-0.055	0.570	0.95 (0.78-1.15)
Psychoses	-0.058	0.671	0.94 (0.72-1.23)
<b>Preoperative Chronic Medications</b>			
ACEI/ARB	0.039	0.410	1.04 (0.95-1.14)
Beta Blocker	0.014	0.750	1.01 (0.93-1.10)
Preoperative hemoglobin (g/dL) <sup>§</sup>	-0.006	<0.001	0.99 (0.99-0.99)
Preoperative eGFR (mL/min/1.73 m <sup>2</sup> ) <sup>** §</sup>	-0.00004	<0.001	0.99 (0.99-0.99)
Preinduction Baseline Mean Arterial Pressure (mmHg) <sup>§</sup>	0.00001	0.059	1.00 (1.00-1.00)
<b>Surgical Factors</b>			
<b>Surgical Body Region</b>			
Elevated Risk	0.920	<0.001	2.51 (2.26-2.78)
Emergent Surgery	0.360	<0.001	1.43 (1.30-1.58)
<b>Anesthetic Factors</b>			
<b>ASA Class</b>			
ASA Class 1	0		(reference)
ASA Class 2	-0.002	0.989	0.99 (0.77-1.30)
ASA Class 3	0.693	<0.001	2.00 (1.55-2.59)
ASA Class 4	1.101	<0.001	3.01 (2.30-3.92)
ASA Class 5	1.794	<0.001	6.01 (4.01-9.01)
Expected Anesthesia Duration <sup>§§§</sup>	1.493	<0.001	4.45 (3.85-5.14)
<b>Institutional Factors</b>			
Non-university Hospital (Fixed Effect)	0.080	0.655	1.02 (0.76-1.54)
Institution (Random Effect), ICC (95% CI)			0.20 (0.11-0.37)
Original Model performance (c-statistic)			0.75 (0.74-0.76)
New Model performance (c-statistic)			0.76 (0.75-0.76)

<sup>†</sup> Mixed effects model with anonymized institution ID as random effect; all other covariates fixed effects.

<sup>\*</sup> As determined by Elixhauser Comorbidity Enhanced ICD-9-CM/ICD-10 CM Algorithm

\*\* As determined by CKD-EPI formula, indexed by body surface area. Race assumed non-black for patients with race data unavailable.

§ Squared transformation

§§ Square root transformation

§§§ Logarithmic transformation

*ACEI = angiotensin-converting enzyme inhibitor; AIDS = autoimmune deficiency syndrome; AKI = acute kidney injury; ARB = angiotensin II receptor blocker; ASA = American Society of Anesthesiologists; CKD-EPI = Chronic Kidney Disease Epidemiology Collaboration; CPT = Current Procedural Terminology; eGFR = estimated glomerular filtration rate; HIV = human immunodeficiency virus; ICC = intraclass correlation coefficient; KDIGO = Kidney Disease: Improving Global Outcomes; WHO = World Health Organization*

*Log likelihood = -15,059.97*

## Supplemental Digital Content 13B: Subgroup Analysis: Risk of Acute Kidney Injury Associated with

### Intraoperative Hypotension by Preoperative Risk Quartile – General Anesthesia Cases

Absolute Hypotension - Derivation Cohort					Adjusted Odds Ratio – Color Scale <sup>†</sup>
Intraoperative Hypotension <sup>†</sup> - Absolute MAP Values	Quartile 1* Low Preoperative Risk (N = 15,159)	Quartile 2* Medium Preoperative Risk (N = 15,157)	Quartile 3* High Preoperative Risk (N = 15,158)	Quartile 4* Highest Preoperative Risk (N = 15,158)	
No Absolute Hypotension	(reference) n = 8,392	(reference) n = 8,392	(reference) n = 8,282	(reference) n = 7,329	
MAP 60-64 mmHg	1.13 (0.85-1.50) n = 3,434	1.21 (0.99-1.48) n = 3,338	1.14 (0.98-1.32) n = 3,371	1.06 (0.95-1.17) n = 3,538	
MAP 55-59 mmHg	0.92 (0.64-1.33) n = 2,215	1.36 (1.08-1.71) <b>Increased AKI</b> n = 2,201	1.05 (0.88-1.25) n = 2,213	1.41 (1.27-1.58) <b>Increased AKI</b> n = 2,561	
MAP 50-54 mmHg	1.55 (0.98-2.47) n = 763	1.20 (0.83-1.73) n = 806	1.35 (1.05-1.73) <b>Increased AKI</b> n = 778	1.56 (1.33-1.81) <b>Increased AKI</b> n = 1,027	
MAP <50 mmHg	1.43 (0.72-2.82) n = 355	1.47 (0.94-2.29) n = 420	1.82 (1.39-2.38) <b>Increased AKI</b> n = 514	2.04 (1.72-2.43) <b>Increased AKI</b> n = 703	
Relative Hypotension - Derivation Cohort					
Intraoperative Hypotension <sup>†</sup> – Relative MAP Values	Quartile 1* Low Preoperative Risk (N = 15,159)	Quartile 2* Medium Preoperative Risk (N = 15,157)	Quartile 3* High Preoperative Risk (N = 15,158)	Quartile 4* Highest Preoperative Risk (N = 15,158)	
No Relative Hypotension	(reference) n = 4,115	(reference) n = 4,335	(reference) n = 4,323	(reference) n = 4,931	
MAP 20-30% Below Baseline	1.13 (0.82-1.56) n = 4,145	0.99 (0.79-1.24) n = 3,863	0.93 (0.79-1.10) n = 3,913	0.84 (0.75-0.94) <b>Decreased AKI</b> n = 3,691	
MAP 30-40% Below Baseline	1.23 (0.89-1.70) n = 4,219	1.06 (0.85-1.32) n = 4,083	1.05 (0.90-1.24) n = 4,048	0.86 (0.77-0.96) <b>Decreased AKI</b> n = 3,575	
MAP > 40% Below Baseline	1.91 (1.37-2.66) <b>Increased AKI</b> n = 2,680	1.36 (1.08-1.72) <b>Increased AKI</b> n = 2,876	1.27 (1.07-1.50) <b>Increased AKI</b> n = 2,874	1.03 (0.92-1.15) n = 2,961	

Values presented as adjusted odds ratio and 95% confidence interval.

\* Patients were stratified by risk of postoperative AKI using the full multivariable model.

<sup>†</sup> Color scale used only for adjusted odds ratios demonstrating statistically significant associations.

Regression within each quartile included all four blood pressure ranges and operative duration (log transformed).

AKI = acute kidney injury; MAP = mean arterial pressure