Supplemental Digital Content 12A: Sensitivity Analysis: Multivariable Analysis of Preoperative Characteristics and Postoperative Acute Kidney Injury – Missing Data Handled via Multiple Imputation

Risk Factor	β Coefficient	Multivariable model p-value	95% Confidence Interval †
Medical Factors			
Patient Age (years)§	0.0000007	0.29	-0.0000006 - 0.000002
BMI (kg/m²)§§	0.017	<0.001	0.01 - 0.02
Male Gender	0.027	<0.001	0.023 – 0.303
Patient Medical History *			
Congestive Heart Failure	0.018	<0.001	0.010 – 0.026
Cardiac Arrhythmias	0.010	<0.001	0.005 – 0.016
Valvular Disease	0.007	0.12	-0.002 – 0.016
Pulmonary Circulation Disorders	0.016	0.001	0.007 – 0.026
Peripheral Vascular Disorders	0.014	<0.001	0.008 – 0.020
Hypertension, Uncomplicated	-0.0008	0.73	-0.005 – 0.004
Hypertension, Complicated	0.077	<0.001	0.068 – 0.086
Paralysis/Other Neurological Disorders	0.009	0.01	0.002 – 0.016
Chronic Pulmonary Disease	0.0008	0.77	-0.005 – 0.006
Diabetes, Uncomplicated	0.008	0.01	0.002 – 0.013
Diabetes, Complicated	0.065	<0.001	0.050 – 0.081
Hypothyroidism	-0.010	0.01	-0.016 - -0.003
Liver Disease	0.055	<0.001	0.047 - 0.062
Peptic Ulcer Disease Excluding Bleeding	0.002	0.75	-0.013 – 0.018
AIDS/HIV	0.036	0.09	-0.006 – 0.078
Rheumatoid Arthritis / Collagen Vascular Diseases	-0.007	0.21	-0.017 – 0.004
Coagulopathy	0.062	<0.001	0.054 – 0.070
Lymphoma	0.005	0.52	-0.010 – 0.020
Metastatic Cancer	-0.0003	0.94	-0.007 – 0.007
Solid Tumor	-0.0006	0.84	-0.006 – 0.005
Weight Loss	0.029	<0.001	0.022 – 0.035
Alcohol Abuse	-0.013	0.02	-0.023 - -0.002
Drug Abuse	-0.003	0.68	-0.015 – 0.010
Psychoses	-0.013	0.14	-0.030 – 0.004
Preoperative Chronic Medications			
ACEI/ARB	-0.004	0.16	-0.010 – 0.002
Beta Blocker	-0.009	0.002	-0.014 – -0.003
Preoperative hemoglobin (g/dL) §	-0.0004	<0.001	-0.0005 - -0.0004
Preoperative eGFR (mL/min/1.73 m²) ** §	-0.000003	<0.001	-0.000003 – -0.000002
Preinduction Baseline Mean Arterial Pressure (mmHg) §	0.0000003	0.36	-0.0000003 – 0.000001
Surgical Factors			
Surgical Body Region			
Elevated Risk	0.047	<0.001	0.042 – 0.052
Emergent Surgery	0.030	<0.001	0.024 – 0.036
Anesthetic Factors			
ASA Class			
ASA Class 1	0		(reference)
ASA Class 2	0.0003	0.96	-0.010 – 0.011
ASA Class 3	0.025	<0.001	0.015 – 0.036
ASA Class 4	0.080	<0.001	0.068 – 0.092
ASA Class 5	0.214	<0.001	0.146 – 0.248
Expected Anesthesia Duration§§§	0.091	<0.001	0.083 – 0.100
General Anesthesia	0.024	<0.001	0.018 – 0.030
Institutional Factors			
Non-university Hospital (Fixed Effect)	0.004	0.64	-0.014 - 0.023
Institution (Random Effect), ICC (95% CI)			0.012 (0.006-0.022)
Original Model performance (c-statistic)			0.75 (0.74-0.76)
New Model performance (c-statistic)			0.75 (0.74-0.75)

† Mixed effects model with anonymized institution ID as random effect; all other covariates fixed effects.
*As determined by Elixhauser Comorbidity Enhanced ICD-9-CM/ICD-10 CM Algorithm

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Supplemental Digital Content 12B: Sensitivity Analysis: Risk of Acute Kidney Injury Associated with

Intraoperative Hypotension by Preoperative Risk Quartile – Missing Data Handled via Multiple Imputation

Absolute Hypotension - Derivation Cohort				
Intraoperative Hypotension[†] - Absolute MAP Values	Quartile 1[*] Low Preoperative Risk (N = 22,806)	Quartile 2[*] Medium Preoperative Risk (N = 22,802)	Quartile 3[*] High Preoperative Risk (N = 22,791)	Quartile 4[*] Highest Preoperative Risk (N = 22,793)
No Absolute Hypotension	(reference) n= 13,614	(reference) n= 13,510	(reference) n= 12,753	(reference) n= 12,319
MAP 60-64 mmHg	1.04 (0.83-1.30) n= 4,698	1.01 (0.86-1.20) n= 4,677	1.23 (1.09-1.38) **Increased AKI** n= 4,860	1.15 (1.06-1.16) **Increased AKI** n= 4,864
MAP 55-59 mmHg	0.89 (0.67-1.19) n= 2,927	1.30 (1.08-1.57) **Increased AKI** n= 2,980	1.17 (1.01-1.34) **Increased AKI** n= 3,173	1.45 (1.32-1.59) **Increased AKI** n= 3,308
MAP 50-54 mmHg	1.28 (0.87-1.90) n= 1,049	1.53 (1.16-2.01) **Increased AKI** n=1,036	1.33 (1.09-1.63) **Increased AKI** n= 1,215	1.61 (1.41-1.83) **Increased AKI** n= 1,349
MAP <50 mmHg	1.65 (1.02-2.69) **Increased AKI** n= 518	1.63 (1.16-2.29) **Increased AKI** n= 599	1.62 (1.29-2.03) **Increased AKI** n= 790	2.02 (1.74-2.33) **Increased AKI** n= 953

Relative Hypotension - Derivation Cohort				
Intraoperative Hypotension[†] – Relative MAP Values	Quartile 1[*] Low Preoperative Risk (N = 22,806)	Quartile 2[*] Medium Preoperative Risk (N = 22,802)	Quartile 3[*] High Preoperative Risk (N = 22,791)	Quartile 4[*] Highest Preoperative Risk (N = 22,793)
No Relative Hypotension	(reference) n= 7,548	(reference) n= 7,294	(reference) n= 7,263	(reference) n= 8,652
MAP 20-30% Below Baseline	0.92 (0.73-1.16) n = 5,846	0.92 (0.77-1.09) n = 5,811	0.89 (0.78-1.01) n = 5,678	0.85 (0.78-0.93) **Decreased AKI** n = 5,472
MAP 30-40% Below Baseline	1.00 (0.79-1.26) n = 5,673	0.98 (0.82-1.16) n = 5,671	1.01 (0.89-1.15) n = 5,636	0.88 (0.81-0.97) **Decreased AKI** n = 4,899
MAP > 40% Below Baseline	1.38 (1.08-1.76) **Increased AKI** n = 3,739	1.33 (1.11-1.59) **Increased AKI** n = 4,026	1.25 (1.09-1.42) **Increased AKI** n = 4,214	1.05 (0.95-1.15) n = 3,770

Adjusted Odds Ratio – Color Scale[†]

1.00
1.20
1.40
1.60
1.80
2.00
2.20
2.40
2.60
2.80
3.00

Values presented as adjusted odds ratio and 95% confidence interval.
[*] Patients were stratified by risk of postoperative AKI using the full multivariable model.
[†] 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