

SUPPLEMENTAL DIGITAL CONTENT I

Table 1. Baseline and intraoperative characteristics by durations of mean arterial pressure < 60 mmHg.

Variable	Duration of MAP < 60 mmHg (minutes)					p-value
	0 (n=754)	1-5 (n=2490)	6-10 (n=1030)	10-20 (n=579)	> 20 (n=274)	
<i>Baseline</i>						
Age (years)	59.6 (13.7)	61.4 (13.7)	61.7 (14.5)	61.5 (15.7)	62.9 (15.7)	0.004
Female	432 (57.3%)	1399 (56.2%)	504 (48.9%)	253 (43.7%)	120 (43.8%)	< 0.001
Hypertension	368 (48.8%)	1169 (47.0%)	470 (45.6%)	283 (48.9%)	147 (53.7%)	0.14
Coronary Artery Disease	89 (11.8%)	277 (11.1%)	102 (9.9%)	64 (11.1%)	41 (15.0%)	0.20
Heart Failure	10 (1.3%)	33 (1.3%)	8 (0.8%)	12 (2.1%)	7 (2.6%)	0.10
Peripheral Vascular Disease	64 (8.5%)	220 (8.8%)	67 (6.5%)	38 (6.6%)	16 (5.8%)	0.06
Cerebrovascular Disease	27 (3.6%)	71 (2.9%)	13 (1.3%)	10 (1.7%)	5 (1.8%)	0.009
Chronic Obstructive Pulmonary Disease	56 (7.4%)	240 (9.6%)	80 (7.8%)	48 (8.3%)	23 (8.4%)	0.23
Diabetes	105 (13.9%)	349 (14.0%)	158 (15.3%)	93 (16.3%)	59 (21.5%)	0.01
Estimated Glomerular Filtration Rate						
> 60 mL/min	669 (88.7%)	2089 (83.9%)	850 (82.5%)	467 (80.7%)	211 (77.0%)	
30 – 60 mL/min	79 (10.5%)	373 (15.0%)	171 (16.6%)	101 (17.4%)	53 (19.3%)	< 0.001
< 30 mL/min	6 (0.8%)	28 (1.1%)	9 (0.9%)	11 (1.9%)	10 (3.7%)	
Anemia	83 (11.0%)	330 (13.3%)	199 (19.3%)	127 (21.9%)	73 (26.6%)	< 0.001
Malignancy	337 (44.7%)	1313 (52.7%)	580 (56.3%)	337 (58.2%)	175 (63.9%)	< 0.001
Preoperative Medications						
ACE Inhibitor	125 (16.6%)	411 (16.5%)	173 (16.8%)	87 (15.0%)	44 (16.0%)	0.91
Angiotensin Receptor Blocker	58 (7.7%)	262 (10.5%)	113 (11.0%)	80 (13.8%)	43 (15.7%)	< 0.001
Beta Blocker	117 (15.5%)	396 (15.9%)	153 (14.9%)	92 (15.9%)	59 (21.5%)	0.12
Type of Surgery						
General Surgery	153 (20.3%)	617 (24.8%)	298 (28.9%)	199 (34.4%)	84 (30.7%)	
Vascular	96 (12.7%)	292 (11.7%)	75 (7.3%)	51 (8.8%)	16 (5.8%)	
Thoracic	189 (25.1%)	677 (27.2%)	291 (28.3%)	139 (24.0%)	51 (18.6%)	< 0.001
Gynecological	201 (26.7%)	475 (19.1%)	132 (12.8%)	39 (6.7%)	16 (5.8%)	
Ear, Nose and Throat	94 (12.5%)	335 (13.5%)	179 (17.4%)	117 (20.2%)	87 (31.8%)	
Plastic	21 (2.8%)	94 (3.8%)	55 (5.3%)	34 (5.9%)	20 (7.3%)	
<i>Intraoperative</i>						
Blood Loss (mL)						
≤ 100	14 (1.9%)	156 (6.3%)	107 (10.4%)	77 (13.3%)	42 (15.3%)	
101-600	22 (2.9%)	172 (6.9%)	94 (9.1%)	69 (11.9%)	23 (8.4%)	< 0.001
601-1000	209 (27.7%)	793 (31.9%)	320 (31.0%)	182 (31.4%)	103 (37.6%)	
>1000	509 (67.5%)	1369 (55.0%)	510 (49.5%)	251 (43.4%)	106 (38.7%)	
Duration of Surgery						
≤ 2 hours	14 (1.9%)	156 (6.3%)	107 (10.4%)	77 (13.3%)	42 (15.3%)	
2 – 5 hours	22 (2.9%)	172 (6.9%)	94 (9.1%)	69 (11.9%)	23 (8.4%)	< 0.001
≥ 5 hours	209 (27.7%)	793 (31.9%)	320 (31.0%)	183 (31.5%)	103 (37.5%)	

ACE = angiotensin-converting enzyme

Anemia is defined by WHO (preoperative hemoglobin value of < 130 g/L for men and < 120 g/L for women).

Estimated glomerular filtration rate is calculated using the Cockcroft-Gault formula.

MAP = mean arterial pressure.

Table 2. Baseline and intraoperative characteristics by durations of mean arterial pressure < 65 mmHg.

Variable	Duration of MAP < 65 mmHg (minutes)					p-value
	0 (n=316)	1-5 (n=1474)	6-10 (n=1252)	10-20 (n=1182)	> 20 (n=903)	
<i>Baseline</i>						
Age (years)	60.0 (13.4)	61.4 (13.7)	61.7 (13.4)	61.3 (14.6)	60.8 (15.9)	0.33
Female	178 (56.3%)	844 (57.3%)	700 (55.9%)	580 (49.1%)	406 (45.0%)	< 0.001
Hypertension	170 (53.8%)	720 (48.9%)	570 (45.5%)	555 (47.0%)	422 (46.7%)	0.08
Coronary Artery Disease	44 (13.9%)	171 (11.6%)	125 (10.0%)	125 (10.6%)	108 (12.0%)	0.24
Heart Failure	3 (1.0%)	23 (1.6%)	16 (1.3%)	10 (0.9%)	18 (2.0%)	0.21
Peripheral Vascular Disease	34 (10.8%)	141 (9.6%)	97 (7.8%)	78 (6.6%)	55 (6.1%)	0.003
Cerebrovascular Disease	9 (2.9%)	64 (4.3%)	21 (1.7%)	17 (1.4%)	15 (1.7%)	< 0.001
Chronic Obstructive Pulmonary Disease	27 (8.5%)	126 (8.6%)	119 (9.5%)	104 (8.8%)	71 (7.9%)	0.76
Diabetes	44 (13.9%)	206 (14.0%)	168 (13.4%)	190 (16.1%)	156 (17.3%)	0.07
Estimated Glomerular Filtration Rate						
> 60 mL/min	282 (89.2%)	1244 (84.4%)	1049 (83.8%)	978 (82.7%)	733 (81.2%)	
30 – 60 mL/min	32 (10.1%)	211 (14.3%)	191 (15.3%)	192 (16.2%)	151 (16.7%)	0.02
< 30 mL/min	2 (0.6%)	19 (1.3%)	12 (1.0%)	12 (1.0%)	19 (2.1%)	
Anemia	31 (9.8%)	179 (12.1%)	189 (15.1%)	210 (17.8%)	203 (22.5%)	< 0.001
Malignancy	131 (41.5%)	737 (50.0%)	665 (53.1%)	676 (57.2%)	533 (59.0%)	< 0.001
Preoperative Medications						
ACE Inhibitor	60 (19.0%)	234 (15.9%)	203 (16.2%)	197 (16.7%)	146 (16.2%)	0.74
Angiotensin Receptor Blocker	23 (7.3%)	148 (10.0%)	135 (10.8%)	144 (12.2%)	106 (11.7%)	0.09
Beta Blocker	46 (14.6%)	245 (16.6%)	189 (15.1%)	178 (15.1%)	159 (17.6%)	0.38
Type of Surgery						
General Surgery	48 (15.2%)	330 (22.4%)	327 (26.1%)	378 (32.0%)	268 (29.7%)	
Vascular	47 (14.9%)	209 (14.2%)	118 (9.4%)	91 (7.7%)	65 (7.2%)	
Thoracic	76 (24.1%)	395 (26.8%)	362 (28.9%)	318 (26.9%)	196 (21.7%)	< 0.001
Gynecological	93 (29.4%)	341 (23.1%)	237 (18.9%)	134 (11.3%)	58 (6.4%)	
Ear, Nose and Throat	43 (13.6%)	165 (11.2%)	162 (12.9%)	204 (17.3%)	238 (26.4%)	
Plastic	9 (2.9%)	34 (2.3%)	46 (3.7%)	57 (4.8%)	78 (8.6%)	
<i>Intraoperative</i>						
Blood Loss (mL)						
≤ 100	9 (2.9%)	55 (3.7%)	94 (7.5%)	120 (10.2%)	118 (13.1%)	
101-600	4 (1.3%)	86 (5.8%)	81 (6.5%)	110 (9.3%)	99 (11.0%)	< 0.001
601-1000	76 (24.1%)	455 (30.9%)	395 (31.6%)	368 (31.1%)	312 (34.6%)	
>1000	227 (71.8%)	878 (59.6%)	682 (54.5%)	584 (49.4%)	374 (41.4%)	
Duration of Surgery						
≤ 2 hours	133 (42.1%)	425 (28.8%)	273 (21.8%)	194 (16.4%)	72 (8.0%)	
2 – 5 hours	160 (50.6%)	810 (55.0%)	668 (53.4%)	532 (45.0%)	327 (36.2%)	< 0.001
≥ 5 hours	23 (7.3%)	239 (16.2%)	311 (24.8%)	456 (38.6%)	504 (55.8%)	

ACE = angiotensin-converting enzyme

Anemia is defined by WHO (preoperative hemoglobin value of < 130 g/L for men and < 120 g/L for women).

Estimated glomerular filtration rate is calculated using the Cockcroft-Gault formula.

MAP = mean arterial pressure.

Table 3. Sensitivity analysis - association of perioperative characteristics with postoperative acute kidney injury, defined as Acute Kidney Injury Network stage II (200% increase in creatinine) during the first 2 postoperative days.

Variable	Adjusted OR (95% CI)		
	MAP < 55	MAP < 60	MAP < 65
Baseline			
Female	0.67 (0.39-1.16)	0.65 (0.38-1.12)	0.65 (0.38-1.11)
Hypertension	2.39 (1.34-4.26)	2.35 (1.32-4.18)	2.39 (1.34-4.27)
Angiotensin Converting Enzyme Inhibitor	1.16 (0.63-2.13)	1.19 (0.65-2.19)	1.13 (0.62-2.07)
Angiotensin Receptor Blocker	0.94 (0.47-1.91)	0.95 (0.47-1.92)	0.92 (0.46-1.87)
Beta Blocker	1.32 (0.72-2.44)	1.31 (0.71-2.42)	1.33 (0.72-2.45)
Coronary Artery Disease	0.33 (0.14-0.79)	0.34 (0.14-0.82)	0.34 (0.14-0.80)
Peripheral Vascular Disease	1.87 (0.54-6.45)	1.83 (0.53-6.26)	1.88 (0.55-6.45)
Cerebrovascular Disease	0.52 (0.06-4.32)	0.50 (0.06-4.15)	0.53 (0.06-4.38)
Chronic Obstructive Pulmonary Disease	0.77 (0.32-1.84)	0.76 (0.32-1.81)	0.76 (0.32-1.81)
Diabetes	1.34 (0.77-2.35)	1.33 (0.76-2.34)	1.36 (0.78-2.37)
Estimated Glomerular Filtration Rate			
> 60 mL/min	Reference	Reference	Reference
30 – 60 mL/min	1.20 (0.66-2.19)	1.20 (0.66-2.19)	1.20 (0.66-2.19)
< 30 mL/min	0.87 (0.11-6.77)	0.90 (0.12-6.93)	0.88 (0.11-6.81)
Anemia	1.51 (0.90-2.54)	1.56 (0.93-2.62)	1.59 (0.95-2.66)
Malignancy	1.34 (0.77-2.35)	1.32 (0.76-2.31)	1.33 (0.76-2.32)
Type of Surgery			
General Surgery	Reference	Reference	Reference
Vascular	0.88 (0.23-3.35)	0.87 (0.23-3.27)	0.84 (0.22-3.18)
Thoracic	1.02 (0.57-1.82)	0.96 (0.54-1.71)	0.94 (0.53-1.67)
Gynecological	1.07 (0.46-2.48)	1.10 (0.47-2.55)	1.07 (0.46-2.48)
Ear, Nose and Throat	0.03 (0.004-0.22)	0.03 (0.004-0.22)	0.03 (0.004-0.22)
Plastic	0.20 (0.03-1.52)	0.20 (0.03-1.54)	0.20 (0.03-1.51)
Duration of Surgery	3.94 (2.53-6.12)	3.85 (2.49-5.96)	3.81 (2.46-5.90)
Duration of Intraoperative Hypotension			
None	Reference	Reference	Reference
1-5 minutes	0.79 (0.44-1.43)	1.09 (0.45-2.66)	1.17 (0.26-5.21)
6-10 minutes	1.29 (0.61-2.72)	0.76 (0.28-2.07)	1.14 (0.25-5.13)
11-20 minutes	0.79 (0.22-2.87)	1.52 (0.57-4.09)	1.35 (0.31-6.04)
> 20 minutes	4.86 (1.38-17.10)	1.52 (0.49-4.77)	1.32 (0.29-6.03)

Anemia is defined by WHO (preoperative hemoglobin value of < 130 g/L for men and < 120 g/L for women).

Estimated glomerular filtration rate is calculated using the Cockcroft-Gault formula.

MAP = mean arterial pressure.

Table 4. Sensitivity analysis where intraoperative blood loss was added to the primary regression model.

Variable	Adjusted OR (95% CI)		
	MAP < 55	MAP < 60	MAP < 65
Baseline			
Female	0.45 (0.33-0.60)	0.45 (0.33-0.60)	0.45 (0.34-0.60)
Hypertension	1.97 (1.45-2.67)	1.94 (1.43-2.64)	1.99 (1.47-2.71)
Angiotensin Converting Enzyme Inhibitor	1.07 (0.77-1.48)	1.08 (0.78-1.50)	0.76 (0.53-1.10)
Angiotensin Receptor Blocker	1.20 (0.84-1.72)	1.21 (0.84-1.73)	1.05 (0.76-1.46)
Beta Blocker	1.35 (0.99-1.84)	1.35 (0.99-1.85)	1.19 (0.83-1.70)
Coronary Artery Disease	0.75 (0.52-1.08)	0.76 (0.53-1.10)	1.34 (0.98-1.84)
Heart Failure	1.27 (0.60-2.70)	1.24 (0.58-2.63)	1.23 (0.57-2.62)
Peripheral Vascular Disease	0.93 (0.51-1.72)	0.92 (0.50-1.69)	0.91 (0.50-1.68)
Cerebrovascular Disease	0.44 (0.17-1.11)	0.44 (0.18-1.11)	0.45 (0.18-1.13)
Chronic Obstructive Pulmonary Disease	0.94 (0.63-1.40)	0.93 (0.62-1.38)	0.92 (0.61-1.37)
Diabetes	1.23 (0.91-1.66)	1.25 (0.93-1.69)	1.25 (0.92-1.68)
Estimated Glomerular Filtration Rate			
> 60 mL/min	Reference	Reference	Reference
30 – 60 mL/min	1.53 (1.12-2.08)	1.54 (1.13-2.10)	1.54 (1.13-2.10)
< 30 mL/min	5.27 (2.95-9.44)	5.34 (2.99-9.54)	5.30 (2.97-9.49)
Anemia	1.39 (1.05-1.84)	1.38 (1.04-1.82)	1.38 (1.04-1.82)
Malignancy	1.19 (0.89-1.58)	1.18 (0.89-1.57)	1.18 (0.88-1.56)
Type of Surgery			
General Surgery	Reference	Reference	Reference
Vascular	1.24 (0.66-2.33)	1.24 (0.66-2.34)	1.25 (0.67-2.36)
Thoracic	1.22 (0.89-1.67)	1.22 (0.89-1.67)	1.21 (0.88-1.65)
Gynecological	0.76 (0.46-1.25)	0.78 (0.47-1.28)	0.78 (0.47-1.28)
Ear, Nose and Throat	0.19 (0.12-0.32)	0.20 (0.12-0.33)	0.20 (0.12-0.33)
Plastic	0.10 (0.01-0.71)	0.10 (0.01-0.71)	0.09 (0.01-0.67)
Duration of Surgery	1.95 (1.57-2.44)	1.97 (1.58-2.45)	1.92 (1.53-2.39)
Duration of Intraoperative Hypotension			
None	Reference	Reference	Reference
1-5 minutes	1.24 (0.90-1.71)	1.02 (0.65-1.62)	1.19 (0.53-2.68)
6-10 minutes	1.28 (0.83-1.97)	0.96 (0.58-1.60)	1.39 (0.62-3.13)
11-20 minutes	2.04 (1.17-3.56)	1.60 (0.96-2.67)	1.39 (0.62-3.14)
> 20 minutes	3.11 (1.31-7.40)	1.47 (0.80-2.70)	1.93 (0.85-4.38)
Intraoperative Blood Loss (mL)			
≤ 100	Reference	Reference	Reference
101-600	1.18 (0.87-1.60)	1.19 (0.88-1.62)	1.19 (0.88-1.62)
601-1000	2.15 (1.44-3.20)	2.13 (1.43-3.17)	2.12 (1.42-3.16)
>1000	2.65 (1.81-3.87)	2.71 (1.85-3.96)	2.70 (1.85-3.95)

Anemia is defined by WHO (preoperative hemoglobin value of < 130 g/L for men and < 120 g/L for women).

Estimated glomerular filtration rate is calculated using the Cockcroft-Gault formula.

MAP = mean arterial pressure.

Table 5. Sensitivity analysis where patients without any postoperative creatinine measurements were excluded.

Variable	Adjusted OR (95% CI)		
	MAP < 55	MAP < 60	MAP < 65
Baseline			
Female	0.43 (0.32-0.57)	0.43 (0.32-0.58)	0.43 (0.32-0.57)
Hypertension	1.97 (1.45-2.67)	1.96 (1.45-2.66)	2.00 (1.48-2.72)
Angiotensin Converting Enzyme Inhibitor	1.05 (0.76-1.46)	1.07 (0.77-1.48)	1.04 (0.75-1.44)
Angiotensin Receptor Blocker	1.21 (0.84-1.72)	1.21 (0.84-1.72)	1.19 (0.83-1.70)
Beta Blocker	1.32 (0.97-1.80)	1.32 (0.97-1.81)	1.31 (0.96-1.79)
Coronary Artery Disease	0.75 (0.52-1.08)	0.76 (0.53-1.10)	0.76 (0.53-1.10)
Peripheral Vascular Disease	1.19 (0.56-2.50)	0.96 (0.53-1.76)	1.13 (0.53-2.38)
Cerebrovascular Disease	0.41 (0.16-1.02)	0.41 (0.16-1.02)	0.41 (0.16-1.04)
Chronic Obstructive Pulmonary Disease	0.90 (0.61-1.34)	0.89 (0.60-1.33)	0.88 (0.59-1.32)
Diabetes	1.22 (0.91-1.65)	1.24 (0.92-1.67)	1.24 (0.92-1.67)
Estimated Glomerular Filtration Rate			
> 60 mL/min	Reference	Reference	Reference
30 – 60 mL/min	1.42 (1.05-1.93)	1.42 (1.05-1.93)	1.42 (1.05-1.93)
< 30 mL/min	4.81 (2.68-8.64)	4.78 (2.67-8.56)	4.76 (2.65-8.55)
Anemia	1.42 (1.08-1.88)	1.42 (1.07-1.87)	1.42 (1.07-1.87)
Malignancy	1.18 (0.89-1.56)	1.17 (0.88-1.56)	1.17 (0.88-1.55)
Type of Surgery			
General Surgery	Reference	Reference	Reference
Vascular	1.04 (0.55-1.94)	1.04 (0.56-1.94)	1.05 (0.57-1.97)
Thoracic	1.02 (0.75-1.38)	1.01 (0.75-1.37)	1.00 (0.74-1.35)
Gynecological	0.77 (0.47-1.26)	0.78 (0.48-1.29)	0.78 (0.48-1.29)
Ear, Nose and Throat	0.25 (0.15-0.42)	0.26 (0.16-0.42)	0.26 (0.16-0.42)
Plastic	0.20 (0.03-1.48)	0.20 (0.03-1.51)	0.19 (0.03-1.41)
Duration of Surgery	2.32 (1.89-2.85)	2.33 (1.90-2.87)	2.28 (1.85-2.80)
Duration of Intraoperative Hypotension			
None	Reference	Reference	Reference
1-5 minutes	1.33 (0.97-1.84)	1.10 (0.70-1.74)	1.25 (0.55-2.81)
6-10 minutes	1.41 (0.92-2.16)	1.06 (0.64-1.74)	1.54 (0.68-3.46)
11-20 minutes	2.10 (1.21-3.65)	1.77 (1.07-2.95)	1.52 (0.67-3.43)
> 20 minutes	3.53 (1.50-8.26)	1.63 (0.89-2.97)	2.12 (0.94-4.80)

Anemia is defined by WHO (preoperative hemoglobin value of < 130 g/L for men and < 120 g/L for women).

Estimated glomerular filtration rate is calculated using the Cockcroft-Gault formula.

MAP = mean arterial pressure.

Table 6. Sensitivity analysis where only patients with normal preoperative renal function (estimated glomerular filtration rate > 60 ml/min) were included.

Variable	Adjusted OR (95% CI)		
	MAP < 55	MAP < 60	MAP < 65
Baseline			
Female	0.39 (0.27-0.56)	0.40 (0.28-0.57)	0.39 (0.27-0.56)
Hypertension	2.20 (1.56-3.10)	2.21 (1.57-3.12)	2.26 (1.60-3.19)
Angiotensin Converting Enzyme Inhibitor	0.97 (0.66-1.42)	0.96 (0.65-1.42)	0.95 (0.64-1.39)
Angiotensin Receptor Blocker	1.14 (0.73-1.76)	1.13 (0.73-1.75)	1.13 (0.73-1.74)
Beta Blocker	1.23 (0.83-1.82)	1.23 (0.83-1.82)	1.22 (0.83-1.80)
Coronary Artery Disease	0.78 (0.50-1.22)	0.80 (0.51-1.25)	0.79 (0.51-1.23)
Peripheral Vascular Disease	1.12 (0.52-2.39)	1.07 (0.50-2.26)	1.09 (0.35-3.35)
Cerebrovascular Disease	0.28 (0.06-1.25)	0.27 (0.06-1.19)	0.27 (0.06-1.19)
Chronic Obstructive Pulmonary Disease	0.95 (0.59-1.54)	0.95 (0.59-1.53)	0.94 (0.58-1.52)
Diabetes	1.39 (0.98-1.98)	1.41 (0.99-2.10)	1.41 (0.99-2.00)
Anemia	1.47 (1.05-2.06)	1.44 (1.03-2.02)	1.45 (1.04-2.03)
Malignancy	1.27 (0.91-1.76)	1.25 (0.90-1.74)	1.26 (0.91-1.75)
Type of Surgery			
General Surgery	Reference	Reference	Reference
Vascular	1.19 (0.55-2.58)	1.23 (0.57-2.65)	1.21 (0.56-2.62)
Thoracic	1.06 (0.75-1.50)	1.05 (0.75-1.49)	1.04 (0.73-1.46)
Gynecological	0.90 (0.50-1.60)	0.93 (0.52-1.66)	0.92 (0.51-1.64)
Ear, Nose and Throat	0.14 (0.08-0.25)	0.14 (0.08-0.25)	0.14 (0.07-0.25)
Plastic	0.08 (0.01-0.60)	0.08 (0.01-0.59)	0.08 (0.01-0.57)
Duration of Surgery	2.71 (2.12-3.46)	2.68 (2.10-3.42)	2.66 (2.08-3.39)
Duration of Intraoperative Hypotension			
None	Reference	Reference	Reference
1-5 minutes	1.22 (0.85-1.77)	1.19 (0.69-2.04)	1.50 (0.58-3.88)
6-10 minutes	1.44 (0.88-2.35)	1.23 (0.69-2.22)	1.48 (0.57-3.84)
11-20 minutes	1.96 (0.99-3.88)	2.04 (0.12-3.72)	1.73 (0.67-4.48)
> 20 minutes	3.49 (1.25-9.74)	1.78 (0.87-3.65)	2.28 (0.87-5.94)

Anemia is defined by WHO (preoperative hemoglobin value of < 130 g/L for men and < 120 g/L for women).

MAP = mean arterial pressure.