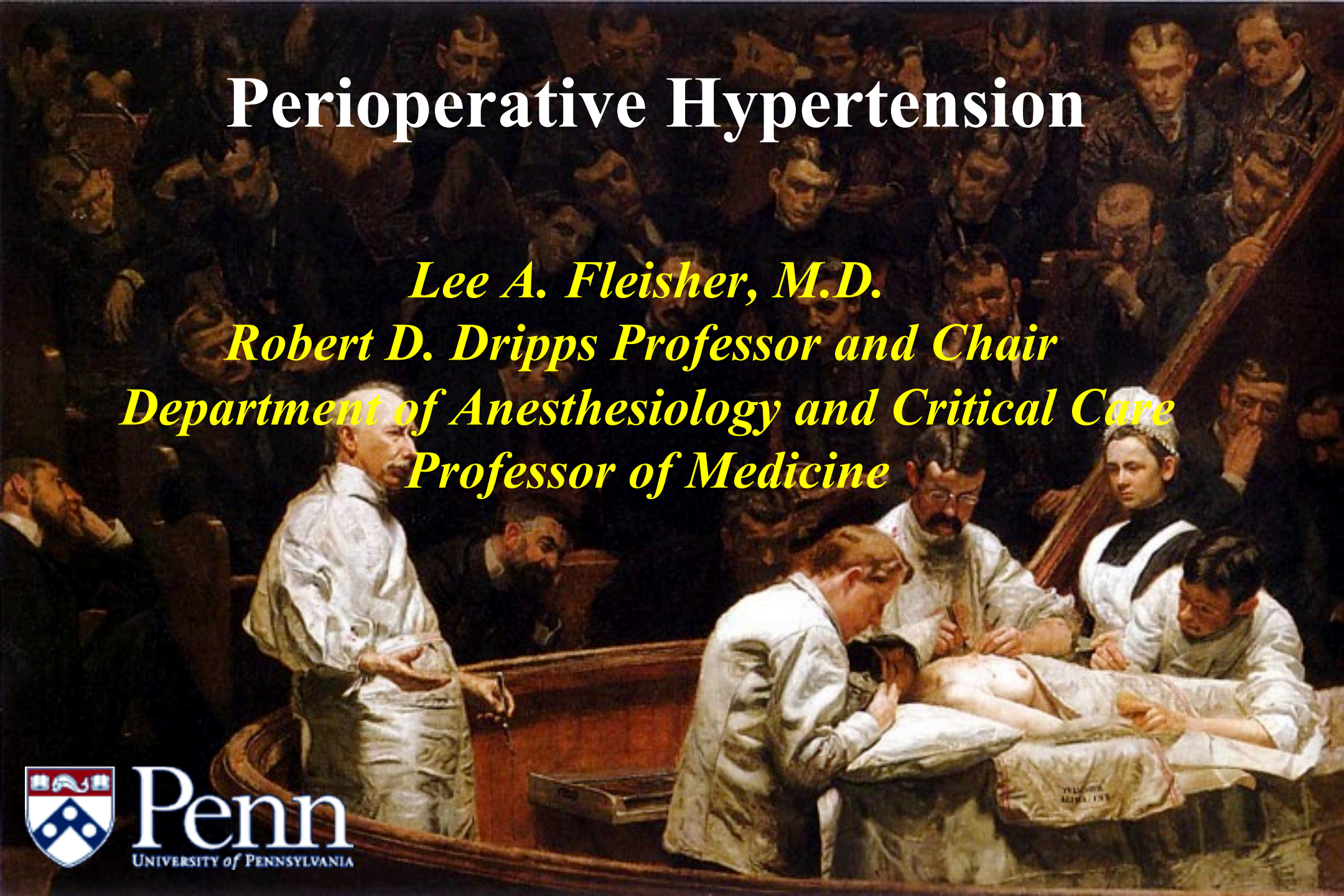
Perioperative Hypertension



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Scenarios-ARS

- 65 year old hypertensive scheduled for colon resection for cancer. Currently on ACE-inhibitor. BP 180/111 the morning of surgery
    1. Proceed to surgery if asymptomatic
    2. Obtain an ECG if asymptomatic
    3. Obtain a CT scan if HA
    4. Choices 1 and 3
    5. Choices 2 and 3

TABLE 1. Relationship of Preoperative Hypertension and Treatment to Perioperative Changes in Blood Pressure

	Mean Preoperative Systolic Pressure* (torr ± SEM)	Mean Intraoperative Systolic Pressure Nadir† (torr ± SEM)	Patients with Perioperative Hypertensive Episodes‡		Patients Receiving Intraoperative Fluid Challenge or Adrenergic Agents to Maintain Blood Pressure§	
			Number	Per Cent	Number	Per Cent
Group I (normotensive, no therapy) (n = 431)	126 ± 1	94 ± 1	33	8	82	19
Group II (diuretics, no history of hypertension) (n = 49)	129 ± 3	95 ± 3	3	6	9	18
Group III (now normotensive receiving therapy) (n = 79)	136 ± 2	100 ± 2	21	27	16	20
Group IV (hypertensive despite therapy) (n = 40)	154 ± 2	97 ± 3	10	25	13	33
Group V (untreated hypertension) (n = 77)	161 ± 2	98 ± 2	15	20	21	27

* All possible pairs are significantly different ($P \leq 0.05$) except Group II versus Group I.

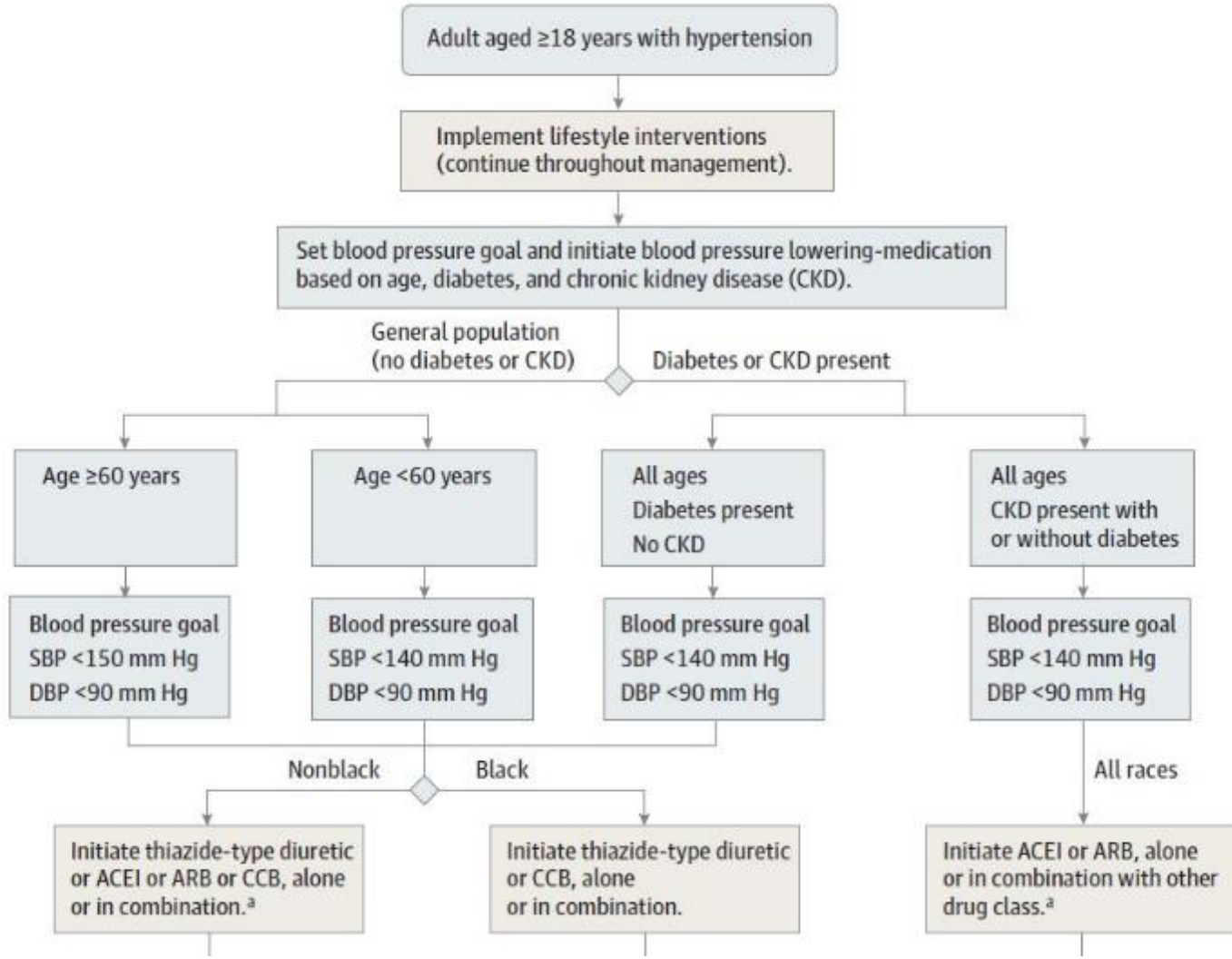
† The only significant different pair is Group I versus Group III.

‡ Group I had significantly fewer hypertensive episodes than Group III, IV, or V; Group II had fewer episodes than Group III or Group IV.

§ No significant difference among the five groups.

2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8)

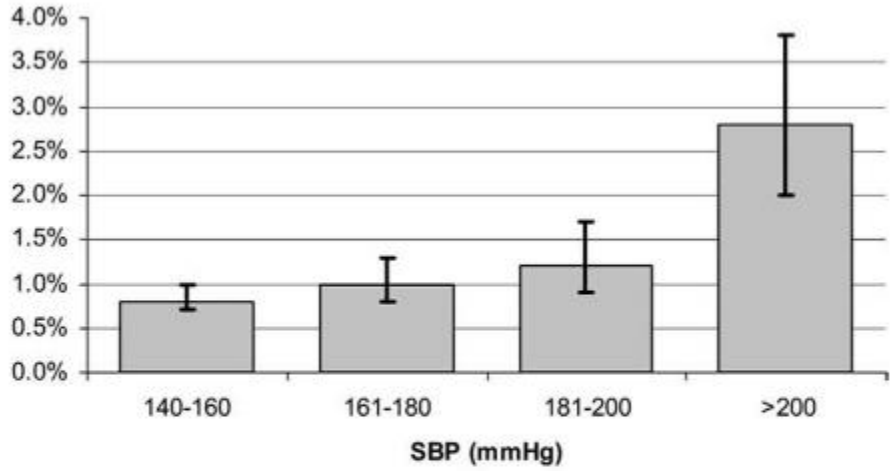
Figure. 2014 Hypertension Guideline Management Algorithm



JAMA. 2014;311(5):507-520.

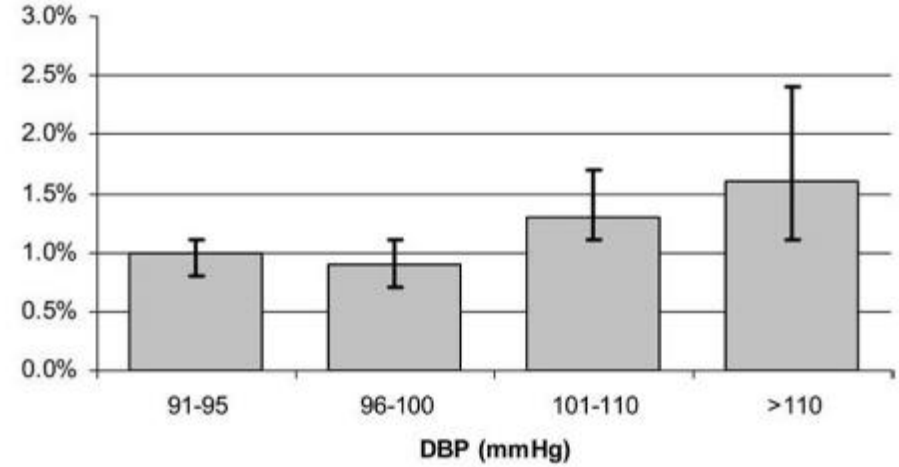
Association of Preanesthesia Hypertension With Adverse Outcomes

David B. Wax, MD, Steven B. Porter, MD, Hung-Mo Lin, PhD, Sabera Hossain, MS, and David L. Reich, MD



* Elevated troponin within 30 days or in-hospital mortality

Fig 1. The incidence (and 95% confidence interval) of adverse outcomes (*) by preinduction SBP.



* Elevated troponin within 30 days or in-hospital mortality

Fig 2. The incidence (and 95% confidence interval) of adverse outcomes (*) by preinduction DBP.

Preinduction hypertension was present
in 21,126 of 209,985 (10%) patients

Independent Predictors of Perioperative Stroke for Age ≥40 Years

N= 57,218

Covariate	*P* Value	Adjusted Odds Ratio (95% CI)
History of stroke/TIA	<0.001	5.0 (2.5–10.1)
History of atrial fibrillation	<0.001	3.7 (1.8–7.6)
Preoperative metoprolol	0.13	1.8 (0.8–3.9)
Preoperative hypertension	0.24	1.4 (0.8–2.7)
Renal insufficiency or failure	0.46	1.3 (0.7–2.4)
Coronary artery disease	0.42	0.7 (0.3–1.5)
Preoperative atenolol	0.24	0.3 (0.1–2.2)

TIA = transient ischemic attack.

From: Perioperative Metoprolol and Risk of Stroke after Noncardiac Surgery
Anesthesiology. 2013;119(6):1340-1346. doi:10.1097/ALN.0b013e318295a25f

To Stop or Not?

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Table 1. Pharmacokinetic Parameters and Duration of Effect of ACE-I and ARB Therapy

ACE-I	Oral dose (mg/day)	Ł½ (hours)	Ł max (hours)	Max BP effect (hours)	Duration of effect[a] (hours)	
					Presence in blood detected (days)	On blood pressure
Captopril[b]	25–150	1.7	1–2	1–2	4–5	6–10
Enalapril[b]	6–20	11	4–8	4–8	48–72	18–30
Lisinopril	5–40	12	2–4	2–4	48–96	18–30
Ramipril[b]	5–20	1.1–4.5	3–8	3–8	14	24–60
ARB	**Oral dose (mg/day)**	**Ł½ (hours)**	**Ł max (hours)**	**Max BP effect[c] (hours)**	**Duration of effect[c] (hours)**	
Losartan[b]	50–100	10–12	1.0–1.5	4–6	~24	
Candesartan[b]	16–32	6–13	2–5	4–6	~24	
Valsartan	80–320	6–10	2–4	2–6[d]	24	
Telmisartan	40–80	21–38	0.5–1.0	4–6	24	
Irbisartan	50–300	11–18	1.3–3.0	3–6	24–36[d]	

BP = blood pressure; ACE-I = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; Ł½ = half-life; Tmax = time to maximal effect.

[a]From Williams.[37]

[b]Active metabolite, prolonging half-life of parent drug.

[c]Onset, duration, and peak antihypertensive effect from Israili.[38]

[d]From Csajka et al.[39]

Chronic Angiotensin-Converting Enzyme Inhibitor or Angiotensin Receptor Blocker Therapy Combined With Diuretic Therapy is Associated With Increased Episodes of Hypotension in Noncardiac Surgery

Sachin Kheterpal, MD, MBA,* Omeed Khodaparast, MD,† Amy Shanks, MS,* Michael O'Reilly, MD,* and Kevin K. Tremper, PhD, MD*

Table 4. Postoperative Renal Failure Among Patients With and Without ACE-I/ARB Therapy

		ACE-I/ARB Yes	ACE-I/ARB No	*p* Value
Neither calcium channel blocker nor diuretic	Total	688	1,427	
	Renal failure	8 (1.2%)	18 (1.3%)	NS
Calcium channel blocker without diuretic	Total	116	176	
	Renal failure	6 (5.2%)	7 (4.0%)	NS
Calcium channel blocker and diuretic	Total	105	79	
	Renal failure	4 (3.8%)	1 (1.3%)	NS
Diuretic without calcium channel blocker	Total	375	290	
	Renal failure	7 (1.9%)	5 (1.7%)	NS

Abbreviation: NS, not significant.

Table 5. Postoperative Myocardial Ischemia Among Patients With and Without ACE-I/ARB Therapy

		ACE-I/ARB Yes	ACE-I/ARB No	*p* Value
Neither calcium channel blocker nor diuretic	Total	2,471	4,588	
	MI	13 (0.5%)	25 (0.5%)	NS
Calcium channel blocker without diuretic	Total	546	759	
	MI	6 (1.1%)	9 (1.2%)	NS
Calcium channel blocker and diuretic	Total	518	330	
	MI	6 (1.2%)	3 (0.9%)	NS
Diuretic without calcium channel blocker	Total	1,538	1,151	
	MI	11 (0.7%)	7 (0.6%)	NS

Abbreviations: MI, postoperative myocardial ischemia; NS, not significant.

Society for Ambulatory Anesthesiology

Section Editor: Peter S. A. Glass

The Risk of Hypertension after Preoperative Discontinuation of Angiotensin-Converting Enzyme Inhibitors or Angiotensin Receptor Antagonists in Ambulatory and Same-Day Admission Patients

Rebecca S. Twersky, MD, MPH,* Vasudha Goel, MD,* Preeti Narayan, MD,* and Jeremy Weedon, PhD, MA, BS†

Table 2. Preoperative Arterial Blood Pressure Results on the Day of Surgery Before Surgical Procedure for the ACEIs/ARBs Discontinuation (DG) and the Continuation (CG) Groups

	DG (*N* = 262)	CG (*N* = 264)	*P*
Systolic blood pressure: median (range)	132 (95–199)	133 (88–207)	0.933
Diastolic blood pressure: median (range)	78 (36–103)	76 (43–109)	0.174
Mean arterial blood pressure: median (range)	96 (68–133)	95 (65–128)	0.452
Stage 1 HTN (>140/90 but not ≥160/100): *n* (%)	72 (27.5%)[a]	77 (29.2%)	0.775*
Stage 2 HTN (>160/100): *n* (%)	26 (9.9%)[b]	22 (8.3%)	0.775*

CONCLUSIONS: Discontinuing ACEIs and ARBs in patients on the day of surgery did not result in a substantively increased incidence of pre- or postoperative HTN compared with patients who continued these medications on the day of surgery. The results provide an evidentiary basis for the safety of discontinuing ACEIs and ARBs on the day of surgery without increasing adverse hemodynamic outcomes. (Anesth Analg 2014;118:938–44)

Association between Withholding Angiotensin Receptor Blockers in the Early Postoperative Period and 30-day Mortality:A Cohort Study of the Veterans Affairs Healthcare System

Parameters	Reference	Hazard Ratio	95% CI	*P* Value
ARB nonresumption at day 2 (unadjusted)	ARB resumed by POD2	2.45	2.08–2.89	<0.001
ARB nonresumption at day 2 (adjusted for decile of propensity score)	ARB resumed by POD2	1.74	1.47–2.05	<0.001
ARB nonresumption at day 2 (propensity-matched cohort only, n = 19,490)	ARB resumed by POD2	1.47	1.22–1.78	<0.001
ARB nonresumption at day 2 (multivariable adjusted—no interactions)	ARB resumed by POD2	1.74	1.47–2.06	<0.001

Cox proportional hazards models: unadjusted, adjusted for propensity score, in propensity-matched subset only, and multivariable adjusted. Variables included in the development of the propensity score are found in table 2. Multivariable-adjusted model includes all variables in table 4, except the interaction with age. As expected, adjustment of confounders by each method reduces the estimated hazard ratio for death by 30 days. Propensity score adjustment in the full cohort produces similar results as multivariable adjustment. However, when analysis is restricted to only those matched on propensity score, the result more closely estimates the treatment effect on the treated because it eliminates those with extreme propensity scores.

ARB = angiotensin receptor blocker; POD = postoperative day.

Anesthesiology. 2015;123(2):288-306

Perioperative angiotensin-converting enzyme inhibitors or angiotensin II type I receptor blockers for preventing mortality and morbidity in adults

Zui Zou[1a], Hong B Yuan[1b], Bo Yang[2c], Fengying Xu[1], Xiao Y Chen[3], Guan J Liu[4], Xue Y Shi[1,5]

Authors' conclusions

Overall, this review did not find evidence to support that perioperative ACEIs or ARBs can prevent mortality, morbidity, and complications (hypotension, perioperative cerebrovascular complications, and cardiac surgery-related renal failure). We found no evidence showing that the use of these drugs may reduce the rate of acute myocardial infarction. However, ACEIs or ARBs may increase cardiac output perioperatively. Due to the low and very low methodology quality, high risk of bias, and lack of power of the included studies, the true effect may be substantially different from the observed estimates. Perioperative (mainly elective cardiac surgery, according to included studies) initiation of ACEIs or ARBs therapy should be individualized.

Editorial group: Cochrane Anaesthesia, Critical and Emergency Care Group.
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6.2.5. Angiotensin-Converting Enzyme Inhibitors: Recommendations

Class IIa

1. Continuation of angiotensin-converting enzyme (ACE) inhibitors or angiotensin-receptor blockers (ARBs) perioperatively is reasonable 300 and 301. ***(Level of Evidence: B)***
2. If ACE inhibitors or ARBs are held before surgery, it is reasonable to restart as soon as clinically feasible postoperatively. ***(Level of Evidence: C)***