



# Management of hypertension in a patient with Acute stroke

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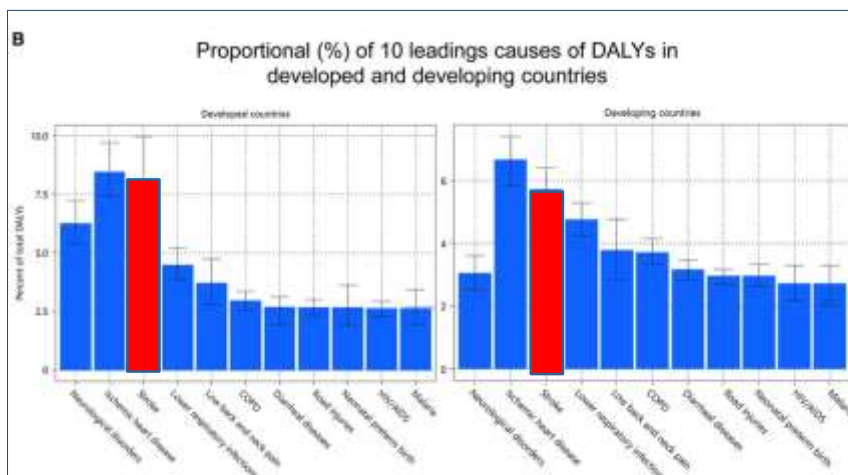
**Conflict of interest: None**

# Acute stroke management

- Pathophysiology
- Review of Literature
- what guidelines recommend

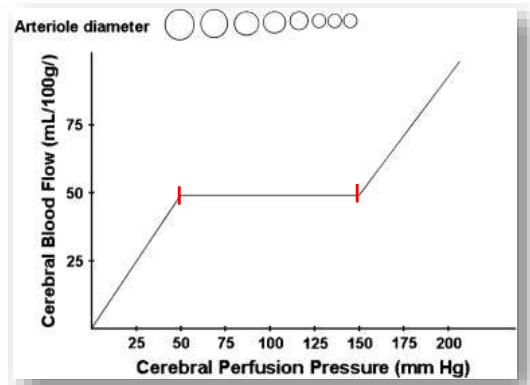
## Global Burden of Stroke

Valery L. Feigin, Bo Norrving, George A. Mensah



Circ Res. 2017;120:439-448

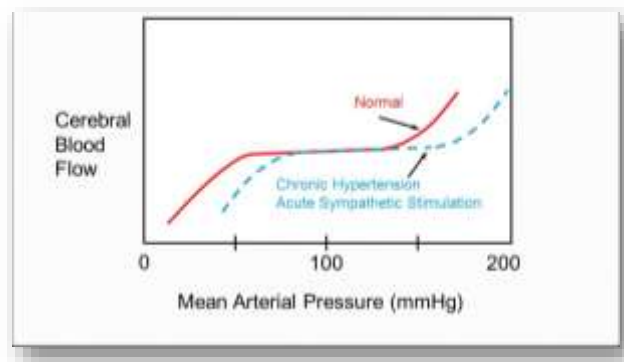
## Cerebral autoregulation



Autoregulatory system in the brain can maintain essentially constant CBF between a MAP of 50 to 60 mm Hg to 150 to 160 mmHg.

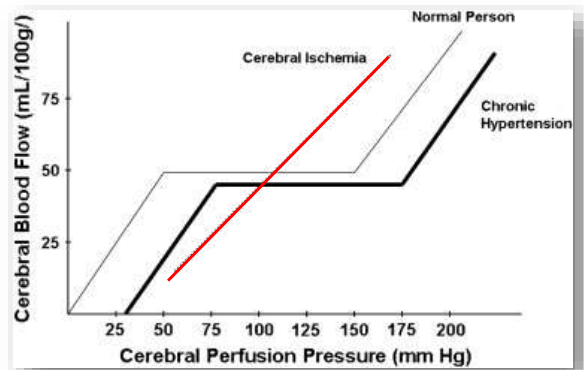
Journal of Human Hypertension (2009) 23, 559–56

## Cerebral autoregulation



Chronic Hypertension= Vascular hypertrophy

## Cerebral autoregulation

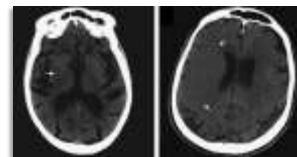


Acute stroke: relation between CBF and MAP becomes linear

## Impaired Cerebral autoregulation

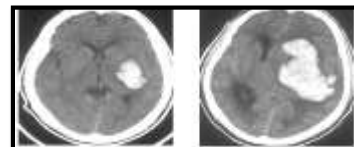
↓ BP

- Increased cerebral infarction or Perihematoma ischaemia

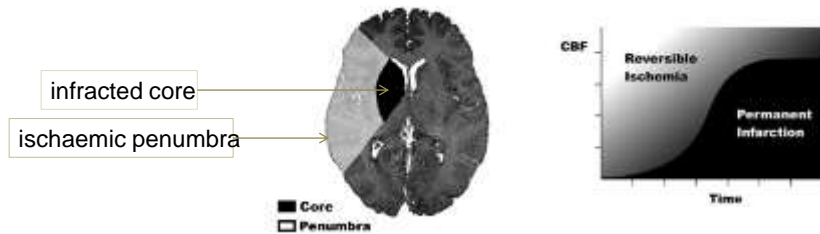


↑ BP

- Inc. cerebral oedema, haematoma expansion
- haemorrhagic transformation



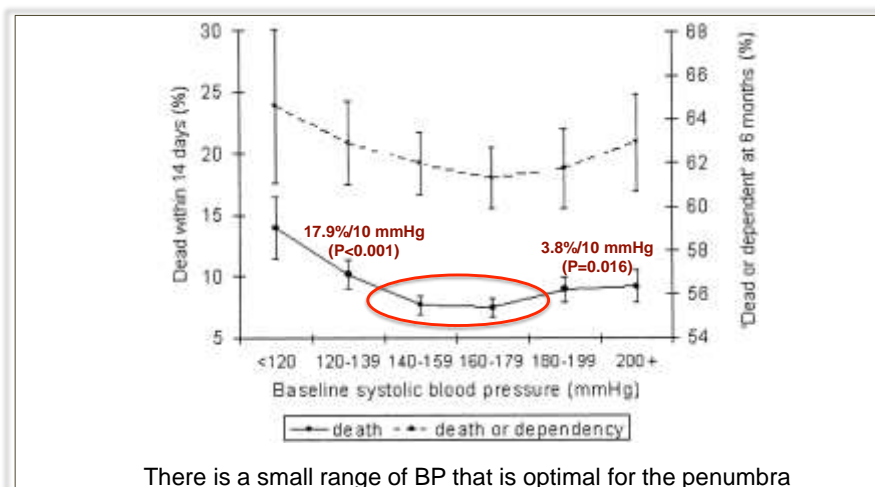
## Aim of BP management in acute stroke



The primary goal of stroke care is to preserve as much of the penumbra as possible, which means optimizing BP and CBF

J. of Human Hypertension (2009) 23, 559–569

## The International Stroke Trial (IST)



Jo -Bee et al. Stroke. 2002;33:1315-1320

## Controversies in Acute Stroke management

### Questions to be Answered

- To treat or not to treat?
- Who we should treat? ICH vs AIS
- When to initiate treatment ?
- What is the BP goal ?
- Which drug class should be used?

### **I. Acute Ischemic Stroke**

## I. Acute Ischemic Stroke

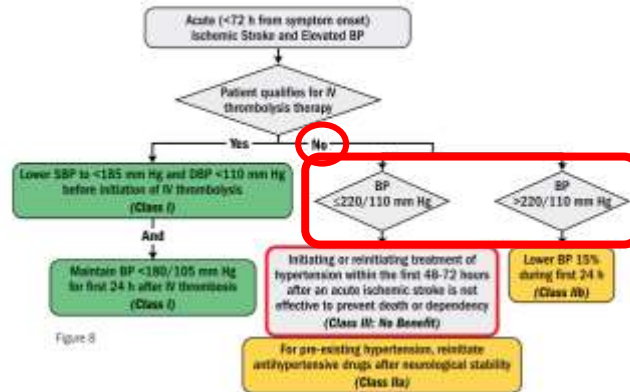
- Management of blood pressure in the setting of AIS remains largely empiric
- Treatment of elevated BP in patients who is candidates for thrombolytic differs from that who are not thrombolytic candidate
- In a majority of patients, a decline in BP occurs within the first hours after stroke even without any specific medical treatment
- Aggressive treatment of initial high BP may lead to neurological worsening by reducing perfusion pressure to ischemic areas of the brain

## Cerebrovascular disease

Recommendations	Class	Level
It is not recommended to intervene with BP-lowering therapy during the first week after acute stroke irrespective of BP level, although clinical judgement should be used in the face of very high SBP values.	III	B
Antihypertensive treatment is recommended in hypertensive patients with a history of stroke or TIA, even when initial SBP is in the 140-159 mmHg range.	I	B
In hypertensive patients with a history of stroke or TIA, a SBP goal of <140 mmHg should be considered.	IIa	B
In elderly hypertensives with stroke or TIA, SBP values for intervention and goal may be considered to be somewhat higher.	IIb	B
All drug regimens are recommended for stroke prevention, provided that BP is effectively reduced.	I	A

2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA  
Guideline for the Prevention, Detection, Evaluation, and Management  
of High Blood Pressure in Adults

Management of Hypertension in Patients with  
Acute ischemic Stroke



AHA/ASA Guideline

2018 Guidelines for the Early Management of Patients  
With Acute Ischemic Stroke


A Guideline for Healthcare Professionals From the American Heart  
Association/American Stroke Association

Acute Ischemic Stroke: who to treat early

4.3. Blood Pressure	COR	LOE
1. In patients with AIS, early treatment of hypertension is indicated when required by <u>comorbid conditions</u> (eg, concomitant acute coronary event, acute heart failure, aortic dissection, postthrombolysis sICH, or preeclampsia/eclampsia). Lowering BP initially by <u>15%</u> is probably safe.	I	C-EO
3. In patients with BP $\geq 220/120$ mm Hg who did not receive IV alteplase or EVT and have <u>no comorbid conditions</u> requiring acute antihypertensive treatment, <u>the benefit of initiating or reinitiating treatment of hypertension within the first 48 to 72 hours is uncertain</u> . It might be reasonable to lower BP by <u>15%</u> during the first 24 hours after onset of stroke.	IIb	C-EO

Stroke. 2018; March





**AHA/ASA Guideline**

**2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke**

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

## Acute Ischemic Stroke: who to treat early

2. In patients with BP <220/120 mm Hg who did not receive IV alteplase or EVT and do not have a comorbid condition requiring acute antihypertensive treatment, initiating or reinitiating treatment of hypertension within the first 48 to 72 hours after an AIS is not effective to prevent death or dependency.

III: No Benefit

A

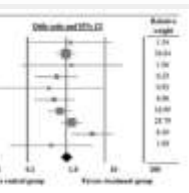
Stroke. 2018; March

**Blood Pressure Reduction in the Acute Phase of an Ischemic Stroke Does Not Improve Short- or Long-Term Dependency or Mortality**

*A Meta-Analysis of Current Literature*

22 Randomized studies ,ttt group (5672) and control group (5416)

Study name Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
Adams (2011)	2011	2011	2011	2011	2011	2011	2011	2011	2011
Al-Jarrah (2011)	2011	2011	2011	2011	2011	2011	2011	2011	2011
Al-Jarrah (2012)	2012	2012	2012	2012	2012	2012	2012	2012	2012
Al-Jarrah (2013)	2013	2013	2013	2013	2013	2013	2013	2013	2013
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Al-Jarrah (2018)	2018	2018	2018	2018	2018	2018	2018	2018	2018
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Al-Jarrah (2020)	2020	2020	2020	2020	2020	2020	2020	2020	2020
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Al-Jarrah (2023)	2023	2023	2023	2023	2023	2023	2023	2023	2023
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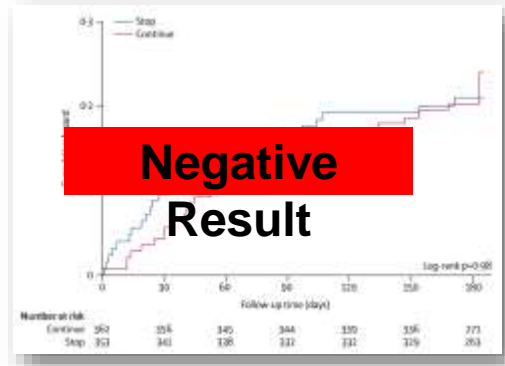
No benefit with respect to short- and long-term dependency and mortality rate

Rong Zhao. Medicine, 94, (23), 20

Effects of antihypertensive treatment after acute stroke in the Continue Or Stop post-Stroke Antihypertensives Collaborative Study

(COSSACS)

Pt were taking antihypertensive drugs were randomly assigned (48 hours of stroke ) to either continue or stop pre-existing antiHTN drugs for 2 weeks



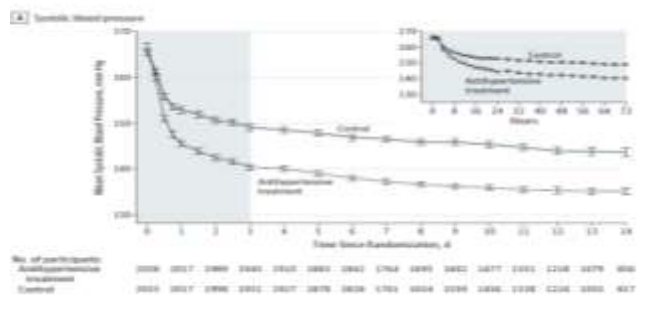
**Continuation of antihypertensive drugs did not reduce 2-week death or dependency, cardiovascular event rate, or mortality at 6 months**

Robinson T, et al. Lancet Neurol. 2010;9:767–775

Original Investigation

Effects of Immediate Blood Pressure Reduction on Death and Major Disability in Patients With Acute Ischemic Stroke The CATIS Randomized Clinical Trial

Pts (n = 2038), randomized to receive antiHTN to lowering SBP by 10% to 25% within the first 24 hours, achieving BP less than 140/90 mm Hg within 7 days, or to discontinue all antiHTN medications (control) during hospitalization



JAMA. 2014;311:479–489

Original Investigation

Effects of Immediate Blood Pressure Reduction on Death and Major Disability in Patients With Acute Ischemic Stroke  
The CATIS Randomized Clinical Trial

	Anti-hypertensive Treatment (n = 2038)	Control (n = 2033)	Blood Pressure Difference or OR (95% CI)	P Value
<b>Primary outcome</b>				
Death or major disability, No. (%)	683	681	1.00 (0.88 to 1.14)	.98
<b>Secondary outcomes</b>				
Score on modified Rankin scale, median (IQR)	(1.0 to 3.0)	(1.0 to 3.0)		.70
Death, No. (%)	25 (1.2)	25 (1.2)	1.00 (0.57 to 1.74)	.99

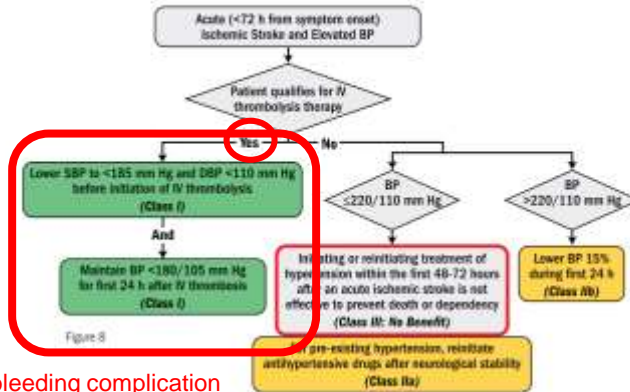
**Negative Result**

JAMA. 2014;311:479–489

**Acute Ischemic Stroke  
Candidate for thrombolysis**

2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA  
Guideline for the Prevention, Detection, Evaluation, and Management  
of High Blood Pressure in Adults

Management of Hypertension in Patients with  
Acute Ischemic Stroke



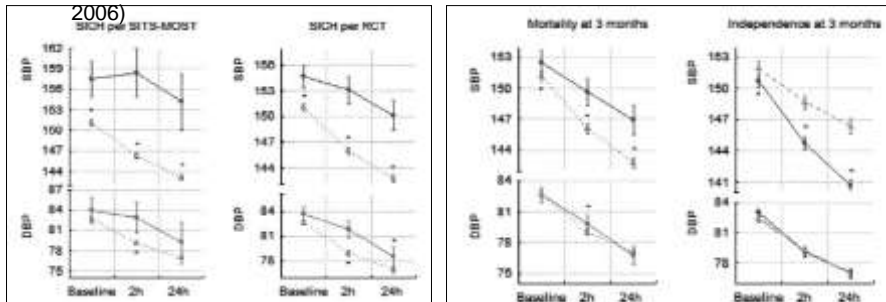
To avoid bleeding complication

Relationship of Blood Pressure, Antihypertensive Therapy,  
and Outcome in Ischemic Stroke Treated With  
Intravenous Thrombolysis

Retrospective Analysis From Safe Implementation of Thrombolysis in  
Stroke—International Stroke Thrombolysis Register (SITS-ISTR)

Determined retrospectively the association of BP and antihypertensive  
therapy with

Clinical outcomes after stroke thrombolysis (11 080 treatments from 2002 to  
2006)



There is a strong association of high systolic BP after thrombolysis with poor outcome  
Increase symptomatic ICH and mortality

Stroke. 2009;40:2442-2449

## Options to Treat Arterial Hypertension in Patients With AIS who are Candidates for Acute Reperfusion Therapy

4. Although no solid data are available to guide selection of medications for BP lowering after AIS, the antihypertensive medications and doses included in Table 5 are reasonable options.

IIa

C-EO

### Short and rapidly acting IV agent

Class IIb, LOE C-EO
Patient otherwise eligible for acute reperfusion therapy except that BP is $>185/110$ mm Hg:
Labetalol 10–20 mg IV over 1–2 min, may repeat 1 time; or
Nicardipine 5 mg/h IV, titrate up by 2.5 mg/h every 5–15 min, maximum 15 mg/h; when desired BP reached, adjust to maintain proper BP limits; or
Clevidipine 1–2 mg/h IV, titrate by doubling the dose every 2–5 min until desired BP reached; maximum 21 mg/h
Other agents (eg, hydralazine, enalaprilat) may also be considered
If BP is not maintained $\leq 185/110$ mm Hg, do not administer alteplase
Management of BP during and after alteplase or other acute reperfusion therapy to maintain BP $\leq 180/105$ mm Hg:
Monitor BP every 15 min for 2 h from the start of alteplase therapy, then every 30 min for 6 h, and then every hour for 16 h
If systolic BP $>180$ –230 mm Hg or diastolic BP $>105$ –120 mm Hg:
Labetalol 10 mg IV followed by continuous IV infusion 2–8 mg/min; or
Nicardipine 5 mg/h IV, titrate up to desired effect by 2.5 mg/h every 5–15 min, maximum 15 mg/h; or
Clevidipine 1–2 mg/h IV, titrate by doubling the dose every 2–5 min until desired BP reached; maximum 21 mg/h
If BP not controlled or diastolic BP $>140$ mm Hg, consider IV sodium nitropruside

### AHA/ASA Guideline

#### 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

## Acute Ischemic Stroke: When to start?

4.3. Blood Pressure (Continued)	COR	LOE
5. Starting or restarting antihypertensive therapy during hospitalization in patients with BP $>140/90$ mm Hg who are neurologically stable is safe and is reasonable to improve long-term BP control unless contraindicated.	IIa	B-R

## II. Acute Intracerebral Hemorrhage

## II. Acute Intracerebral Hemorrhage

- Spontaneous, nontraumatic ICH is a significant global cause of morbidity
- Elevated BP is highly prevalent in the setting of acute ICH and is linked to greater hematoma expansion, neurological worsening, and death and dependency after ICH
- but... how low we can go..

## European Stroke Organisation (ESO) guidelines for the management of spontaneous intracerebral hemorrhage

### ■ Recommendation

In acute ICH within 6h of onset, intensive blood pressure reduction (systolic target < 140 mmHg in < 1h) is safe and may be superior to a systolic target <180 mmHg. No specific agent can be recommended.

### ■ Quality of evidence: Moderate

### ■ Strength of recommendation: Weak

Steiner T, et al. Int J stroke. 2014;9:840-5

## EGYPTIAN HYPERTENSION GUIDELINES

### Intracerebral hemorrhage

SBP >200 mmHg consider aggressive reduction of BP with continuous

IV infusion (labetalol, nicardipine and esmolol)

#### Signs of increased ICP

#### YES

SBP < 180 mmHg for the first 24  
hs

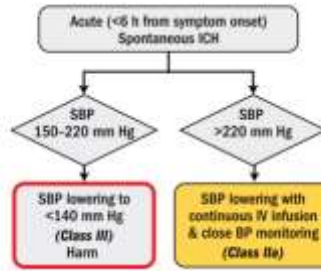
#### NO

SBP < 160 mmHg for the first 24  
hr

EHS, M. Ibrahim, 2014

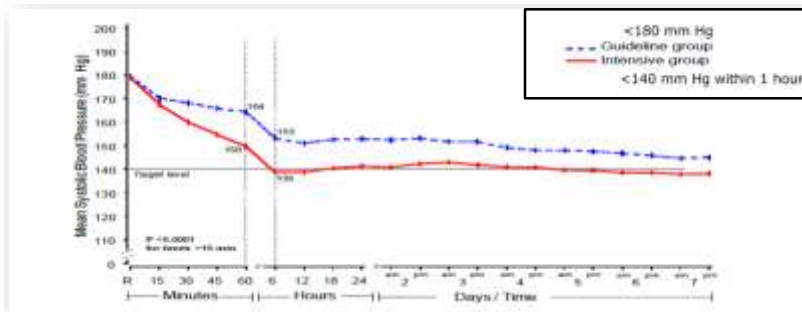
2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA  
Guideline for the Prevention, Detection, Evaluation, and Management  
of High Blood Pressure in Adults

Management of Hypertension in Patients with  
Acute Intracerebral Hemorrhage



## Rapid Blood-Pressure Lowering in Patients with Acute Intracerebral Hemorrhage (INTERACT2 Investigators)

Randomly assigned 2839 pts who had a spontaneous intracerebral hemorrhage within the previous 6 hours and who had elevated SBP



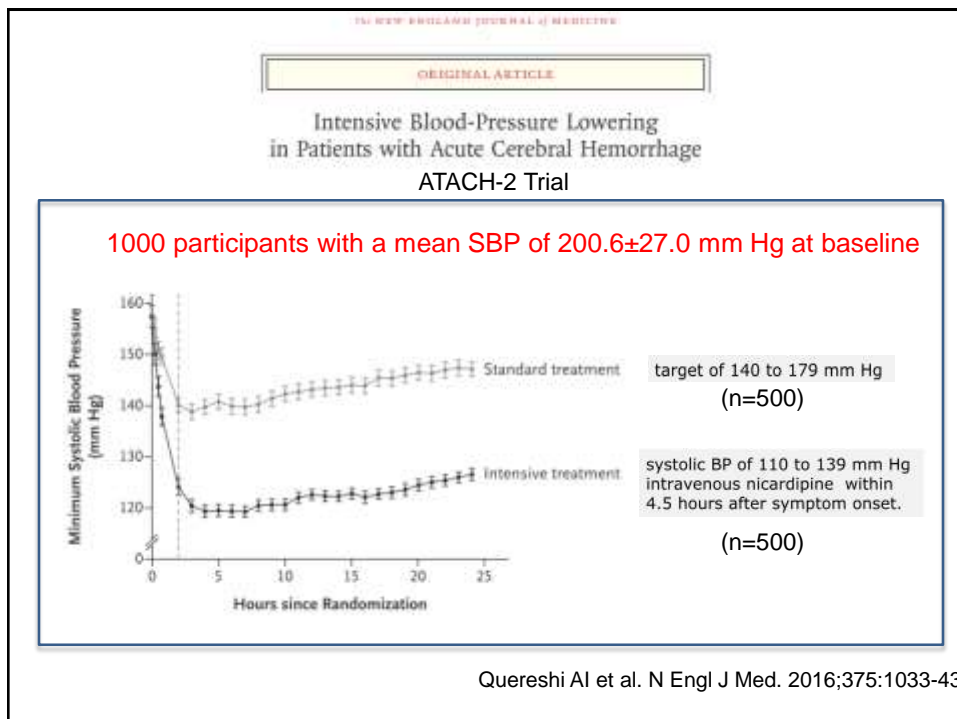
Anderson CS, N Engl J Med. 2013;368:2355-65



## Primary and Secondary Outcomes at 90 Days (INTERACT2 Investigators)

	Intensive Blood-Pressure Lowering (N = 1399)	Guideline- Recommended Blood-Pressure Lowering (N = 1430)	Odds Ratio (95% CI)	P Value
<b>Primary outcome:</b>				
Death or major disability — no./total no. (%)	719/1382 (52.0)	785/1412 (55.6)	0.87 (0.75–1.01)	0.06
<b>Secondary outcomes:</b>				
Score on the modified Rankin scale — no./total no. (%)	Ordinal analysis of mRankin scale		0.87 (0.77–1.00)	0.04
Death — no./total no. (%)	166/1394 (11.9)	170/1421 (12.0)	0.99 (0.79–1.25)	0.96

Anderson CS, N Engl J Med. 2013;368:2355-65



Intensive Blood-Pressure Lowering  
in Patients with Acute Cerebral Hemorrhage  
ATACH-2 Trial

Outcome	Intensive Treatment (N = 500)	Standard Treatment (N = 500)	Adjusted Analysis	
			Relative Risk (95% CI)	P Value
Primary outcome: death or disability — no./total no. (%)	186/481 (38.7)	181/480 (37.7)	1.04	0.72
Hematoma expansion — no./total no. (%)	85/450 (18.9)	104/426 (24.4)	0.78	<b>0.08</b>
Neurologic deterioration within 24 hr — no. (%)	55 (11.0)	40 (8.0)	1.39	0.11
Treatment-related serious adverse event within 72 hr — no. (%)	8 (1.6)	6 (1.2)	1.37	0.56
Any serious adverse event within 3 mo — no. (%)	128 (25.6)	100 (20.0)	1.30	<b>0.05</b>

Quereshi AI et al. N Engl J Med. 2016;375:1033-43

## Conclusion

### Acute ischemic stroke

- If receiving thrombolysis

Prior: reduction of BP  $\leq$  185/110 mmHg

Maintain: BP  $\leq$  180/105 mmHg at least 24hr

No evidence that one class of antihypertensive drug is superior to another

- Not receiving thrombolysis

No BP reduction in the first 24hr **EXCEPT**

- High BP  $>$  220/120 mmHg or severe acute comorbidities

- Initial BP reduction by 15% is a reasonable goal

### Acute hemorrhagic stroke

- High SBP  $>$  220 mmHg, it is reasonable to use continuous intravenous drug infusion to reduce BP to lower level

- Uncertain effect of BP lowering ( $<$ 140 mmHg) in hemorrhagic stroke, but most studies have shown that such BP values are safe (always  $<$  180 mmHg, but may be not too low  $<$  125-130mmHg)

