

# AHA/ASA 2018 Guidelines for the Early Management of Patients with Acute Ischemic Stroke:

## What's New, What's Different

### **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**

*Reviewed for evidence-based integrity and endorsed by the American Association of Neurological Surgeons and Congress of Neurological Surgeons*

*Endorsed by the Society for Academic Emergency Medicine*

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# 2018 AHA/ASA AIS Guidelines: Purpose and Scope



- The purpose of these Guidelines is to provide an up-to-date comprehensive set of recommendations for clinicians caring for adult patients with acute arterial ischemic stroke in a single document.
- These Guidelines address
  - prehospital care
  - urgent and emergency evaluation
  - treatment with intravenous and intra-arterial therapies
  - in-hospital management
    - including secondary prevention measures that are appropriately instituted within the first 2 weeks.
- These Guidelines do not address
  - cerebral venous sinus thrombosis (covered in a 2011 scientific statement; no new evidence to change those conclusions)
  - children

# 2018 AHA/ASA AIS Guidelines: Class of Recommendation and Level of Evidence



## CLASS (STRENGTH) OF RECOMMENDATION

### CLASS I (STRONG) Benefit >>> Risk

Suggested phrases for writing recommendations:

- Is recommended
- Is indicated/useful/effective/beneficial
- Should be performed/administered/other
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is recommended/indicated in preference to treatment B
  - Treatment A should be chosen over treatment B

### CLASS IIa (MODERATE) Benefit >> Risk

Suggested phrases for writing recommendations:

- Is reasonable
- Can be useful/effective/beneficial
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is probably recommended/indicated in preference to treatment B
  - It is reasonable to choose treatment A over treatment B

### CLASS IIb (WEAK) Benefit ≥ Risk

Suggested phrases for writing recommendations:

- May/might be reasonable
- May/might be considered
- Usefulness/effectiveness is unknown/unclear/uncertain or not well established

### CLASS III: No Benefit (MODERATE) Benefit = Risk (Generally, LOE A or B use only)

Suggested phrases for writing recommendations:

- Is not recommended
- Is not indicated/useful/effective/beneficial
- Should not be performed/administered/other

### CLASS III: Harm (STRONG) Risk > Benefit

Suggested phrases for writing recommendations:

- Potentially harmful
- Causes harm
- Associated with excess morbidity/mortality
- Should not be performed/administered/other

## LEVEL (QUALITY) OF EVIDENCE‡

### LEVEL A

- High-quality evidence‡ from more than 1 RCTs
- Meta-analyses of high-quality RCTs
- One or more RCTs corroborated by high-quality registry studies

### LEVEL B-R (Randomized)

- Moderate-quality evidence‡ from 1 or more RCTs
- Meta-analyses of moderate-quality RCTs

### LEVEL B-NR (Nonrandomized)

- Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies
- Meta-analyses of such studies

### LEVEL C-LD (Limited Data)

- Randomized or nonrandomized observational or registry studies with limitations of design or execution
- Meta-analyses of such studies
- Physiological or mechanistic studies in human subjects

### LEVEL C-EO (Expert Opinion)

Consensus of expert opinion based on clinical experience

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

\* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR I and IIa; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

# 2018 AHA/ASA AIS Guidelines: New Format



**Class of  
Recommendation**

**Level of  
Evidence**

**Recommendation**

3.5. IV Alteplase	COR	LOE	New, Revised, or Unchanged
<b>1. IV alteplase (0.9 mg/kg, maximum dose 90 mg over 60 minutes with initial 10% of dose given as bolus over 1 minute) is recommended for selected patients who may be treated within 3 hours of ischemic stroke symptom onset or patient last known well or at baseline state. Physicians should review the criteria outlined in Table 6 to determine patient eligibility.</b>	<b>I</b>	<b>A</b>	Recommendation unchanged from 2013 AIS Guidelines.
<p>The safety and efficacy of this treatment when administered within the first 3 hours after stroke onset is solidly supported by combined data from multiple RCTs<sup>139 140 90</sup> and confirmed by extensive community experience in many countries.<sup>141</sup></p> <p>The eligibility criteria for IV alteplase have evolved over time as its usefulness and true risks have become clearer. A recent AHA statement provides a detailed discussion of this topic.<sup>15</sup> Eligibility recommendations for IV alteplase in patients with AIS are summarized in Table 6. The benefit of IV alteplase is well established for adult patients with disabling stroke symptoms regardless of age and stroke severity.<sup>142 73</sup> Because of this proven benefit and the need to expedite treatment, when a patient cannot provide consent (e.g. aphasia, confusion) and a legally authorized representative is not immediately available to provide proxy consent, it is justified to proceed with IV thrombolysis in an otherwise eligible adult patient with a disabling AIS. In a recent trial, a lower dose of IV alteplase (0.6 mg/kg) was not shown to be equivalent to standard-dose IV alteplase for the reduction of death and disability at 90 days.<sup>143</sup> Main elements of post-thrombolysis care are listed on Table 7.</p>			See Table XXXIV in online Data Supplement 1.

**Evidence  
Table**

**Knowledge Byte**

# 2018 AHA/ASA AIS Guidelines: Process



- Writing group members accepted topics relevant to their areas of expertise, reviewed the stroke literature with emphasis on publications since the prior guidelines, and drafted recommendations for discussion.
- An independent Evidence Review Committee performed systematic reviews on the “Effect of Dysphagia Screening Strategies on Clinical Outcomes After Stroke” and the “Accuracy of Prediction Instruments for Diagnosing Large Vessel Occlusion in Persons With Suspected Stroke”
- Members were not allowed to participate in discussions or vote on topics relevant to their relationships with industry.
- The members of the writing group unanimously approved the completed guidelines except when relationships with industry precluded members voting.
- Review of the draft guideline was performed by 4 expert peer reviewers and by the members of the Stroke Council Scientific Statements Oversight Committee and Stroke Council Leadership Committee.

# 2018 AHA/ASA AIS Guidelines:



## Our Thanks for their assistance to our colleagues

- **Evidence Review Committee:**

- Eric E. Smith MD MPH, Chair; David Kent MD MS, Vice-Chair, Ketan R. Bulsara MD; Lester Y. Leung MD; Judith L. Lichtman PhD MPH; Mathew J. Reeves PhD DVM; Amytis Towfighi MD; William N. Whiteley BM BCh MSc PhD; and Darin Zahuranec MD<sup>8</sup>

- **American Heart Association/American Stroke Association**

- Prashant Nedungadi, PhD
- Kathleen LaPoint, MS
- ***Debbie Heard, PhD without whose steady guidance we never would have finished on time***

# 2018 AHA/ASA AIS Guidelines: Writing Group



- William J. Powers, MD, FAHA, Chair
- Alejandro A. Rabinstein, MD, FAHA, Vice Chair
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# **AHA/ASA 2018 Guidelines for the Early Management of Patients with Acute Ischemic Stroke:**

**What's New, What's Different**

**Systems of Care**



# 2018 AHA/ASA AIS Guidelines: What's New, What's Different



## Systems of Care

- **Regional Systems**
- **Prehospital Stroke Screening Tools**
- **Prehospital Large Vessel Occlusion Detection Scales**
- **Hospital Bypass**
- **Hospital Systems**

# 2018 AHA/ASA AIS Guidelines: Systems of Care



<b>1. Regional systems of stroke care should be developed. These should consist of the following:</b> <b>a) Healthcare facilities that provide initial emergency care, including administration of IV alteplase, and,</b> <b>b) Centers capable of performing endovascular stroke treatment with comprehensive periprocedural care to which rapid transport can be arranged when appropriate.</b>	<b>I</b>	<b>A</b>	Recommendation, Class, and LOE unchanged from 2015 Endovascular Guidelines.
<b>1. EMS leaders, in coordination with local, regional, and state agencies and in consultation with medical authorities and local experts, should develop triage paradigms and protocols to ensure that patients with a known or suspected stroke are rapidly identified and assessed by use of a validated and standardized instrument for stroke screening, such as the FAST scale, Los Angeles Prehospital Stroke Screen, or Cincinnati Prehospital Stroke Scale.</b>	<b>I</b>	<b>B-NR</b>	Recommendation unchanged from 2013 Systems of Care. Class and LOE added to conform with ACC/AHA 2015 Recommendation Classification System.
<b>1. Patients with a positive stroke screen and/or a strong suspicion of stroke should be transported rapidly to the closest healthcare facilities that can capably administer IV alteplase.</b>	<b>I</b>	<b>B-NR</b>	Recommendation unchanged from 2013 AIS Guidelines.
The 2013 recommendation referred to initial emergency care as described elsewhere in the guidelines, which specified administration of IV alteplase as part of this care. The current recommendation is unchanged in intent but reworded to make this clear.			

# Published Studies of Severity Scale Application in the Prehospital Setting

Table IV. Nonrandomized Studies of Emergency Medical Services Use of Prehospital Stroke Severity Scales

Study Acronym; Author; Year Published	Study Type/Design; Study Size	Patient Population	Primary End Point and Results (P value; OR or RR; & 95% CI)	Summary Conclusions Comments
Carrera D, et al. <sup>339</sup> 2017 <a href="#">27720525</a>	<b>Study type:</b> Reanalysis of observational data  <b>Size:</b> N=341	<b>Inclusion criteria:</b> Previously enrolled in original RACE derivation  <b>Exclusion criteria:</b> No prehospital RACE score available	<b>1<sup>st</sup> end point:</b> Receiver operating characteristics of test performance  <b>Results:</b> <ul style="list-style-type: none"> <li>Seven simpler versions of RACE scale derived</li> <li>Original RACE scale had an AUC of 0.82 for detecting LVO</li> <li>The 7 simpler RACE versions generated slightly lower AUC for detecting LVO</li> </ul>	<ul style="list-style-type: none"> <li>The use of simplified versions of the original RACE scale reduced performance</li> <li>No direct comparison to other scores was feasible, and biases of patient selection in the original cohort persist</li> </ul>
Kim JT, et al. <sup>340</sup> 2017 <a href="#">28087807</a>	<b>Study type:</b> Secondary analysis of prospective data from the FAST-MAG trial  <b>Size:</b> N=1632	<b>Inclusion criteria:</b> Confirmed cerebrovascular disease, transported by EMS and enrolled in FAST-MAG  <b>Exclusion criteria:</b> Non-FAST-MAG transports	<b>1<sup>st</sup> end point:</b> Correlation of prehospital LAMS with early ED NIHSS  <b>Results:</b> <ul style="list-style-type: none"> <li>ED LAMS score correlated with concurrently performed NIHSS in all cerebrovascular cases (<math>r=0.89</math>)</li> <li>Prehospital LAMS correlated moderately with ED NIHSS (<math>r=0.49</math>)</li> <li>Although the ED LAMS correlated moderately with 3-month mRS, <math>r=0.55</math>, the association of prehospital LAMS with 3-month mRS was less strong (<math>r=0.34</math>)</li> </ul>	<ul style="list-style-type: none"> <li>LAMS score correlates well with NIHSS and outcomes when performed in the ED but only moderately when performed by prehospital personnel</li> <li>This paper did not address the utility of LAMS for LVO detection and triage</li> </ul>
McMullan JT, et al. <sup>341</sup> 2017 <a href="#">28121225</a>	<b>Study type:</b> Observational study  <b>Size:</b> N=58	<b>Inclusion criteria:</b> Prehospital suspected stroke (FAST-positive), C-STAT scored, and transported to a comprehensive stroke center or having a stroke team consult note  <b>Exclusion criteria:</b> FAST-negative	<b>1<sup>st</sup> end point:</b> C-STAT sensitivity and specificity  <b>Results:</b> C-STAT sensitivity and specificity for each outcome were: <ul style="list-style-type: none"> <li>NIHSS <math>\geq 15</math>, 77% (95% CI, 46–95) and 84% (95% CI, 69–93)</li> <li>NIHSS <math>\geq 10</math>, 64% (95% CI, 41–83) and 91% (95% CI, 76–98)</li> <li>LVO, 71% (95% CI, 29–96) and 70% (95% CI, 55–83)</li> </ul>	<ul style="list-style-type: none"> <li>Among FAST-positive prehospital suspected stroke patients, C-STAT could be readily performed and incorporated into the prehospital workflow</li> <li>The small study sample size and regional restriction preclude meaningful conclusions on test characteristics for predicting LVO to inform prehospital triage</li> </ul>

At this time, there is insufficient evidence to recommend one scale over the other, or a specific threshold of additional travel time for which bypass of a PSC or ASRH is justifiable.

# 2018 AHA/ASA AIS Guidelines: Hospital Bypass



<b>1. When several IV alteplase-capable hospital options exist within a defined geographical region, the benefit of bypassing the closest to bring the patient to one that offers a higher level of stroke care including mechanical thrombectomy is uncertain. Further research is needed.</b>	<b>IIb</b>	<b>B-NR</b>	New recommendation.
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- Customization of the guideline to optimize patient outcomes will be needed to account for local and regional factors, including the availability of endovascular centers, door in-door out times for nonendovascular stroke centers, interhospital transport times, and DTN and door-to-puncture times.
- Rapid, protected, collaborative, regional quality review, including EMS agencies and hospitals, is recommended for operationalized bypass algorithms.

# 2018 AHA/ASA AIS Guidelines: Hospital Systems



<p><b>1. All hospitals caring for stroke patients within a stroke system of care should develop, adopt, and adhere to care protocols that reflect current care guidelines as established by national and international professional organizations and state and federal agencies and laws.</b></p>	<p><b>I</b></p>	<p><b>C-EO</b></p>	<p>Recommendation unchanged from 2013 Stroke Systems of Care. COR and LOE added to conform with ACC/AHA 2015 Recommendation Classification System.</p>
<p><b>1. Different services within a hospital that may be transferring patients through a continuum of care, as well as different hospitals that may be transferring patients to other facilities, should establish hand-off and transfer protocols and procedures that ensure safe and efficient patient care within and between facilities. Protocols for interhospital transfer of patients should be established and approved beforehand so that efficient patient transfers can be accomplished at all hours of the day and night.</b></p>	<p><b>I</b></p>	<p><b>C-EO</b></p>	<p>Recommendation unchanged from 2013 Stroke Systems of Care. COR and LOE added to conform with ACC/AHA 2015 Recommendation Classification System.</p>
<p><b>1. It may be beneficial for government agencies and third-party payers to develop and implement reimbursement schedules for patients with acute stroke that reflect the demanding care and expertise that such patients require to achieve an optimal outcome, regardless of whether they receive a specific medication or procedure.</b></p>	<p><b>IIb</b></p>	<p><b>C-EO</b></p>	<p>Recommendation revised from 2013 Stroke Systems of Care.</p>

# **AHA/ASA 2018 Guidelines for the Early Management of Patients with Acute Ischemic Stroke:**

## **What's New, What's Different**

# **Intravenous Thrombolysis**

# **2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis**



## **AHA/ASA Guideline**

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

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

*Stroke. 2013;44:870-947.*

## **AHA/ASA Scientific Statement**

### **Scientific Rationale for the Inclusion and Exclusion Criteria for Intravenous Alteplase in Acute Ischemic Stroke**

**A Statement for Healthcare Professionals From the American Heart  
Association/American Stroke Association**

*Stroke. 2016;47:581-641*



# 2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis



	COR	LOE	New, Revised, or Unchanged
<b>IV alteplase (0.9 mg/kg, maximum dose 90 mg over 60 minutes with initial 10% of dose given as bolus over 1 minute) is recommended for selected patients who may be treated within <u>3 hours</u> of ischemic stroke symptom onset or patient last known well or at baseline state. (Eligibility criteria outlined in a Table)</b>	<b>I</b>	<b>A</b>	Recommendation unchanged from 2013 AIS Guidelines.
<b>IV alteplase (0.9 mg/kg, maximum dose 90 mg over 60 minutes with initial 10% of dose given as bolus over 1 minute) is also recommended for selected patients who can be treated within <u>3 and 4.5 hours</u> of ischemic stroke symptom onset or patient last known well. (Eligibility criteria outlined in a Table)</b>	<b>I</b>	<b>B-R</b>	Recommendation unchanged from 2013 AIS Guidelines.
<b>For otherwise eligible patients with <u>mild</u> stroke presenting in the <u>3 to 4.5 hours</u> window, treatment with IV alteplase may be reasonable. Treatment risks should be weighed against possible benefits.</b>	<b>IIb</b>	<b>B-NR</b>	<b>NEW</b> recommendation.

# 2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis



	COR	LOE	New, Revised, or Unchanged
<b>In otherwise eligible patients who have had a previously demonstrated small number (1-10) of CMBs on MRI, administration of IV alteplase is reasonable.</b>	<b>IIa</b>	<b>B-NR</b>	<b>NEW</b> recommendation.
<b>In otherwise eligible patients who have had a previously demonstrated high burden of CMBs (&gt;10) on MRI, treatment with IV alteplase may be associated with an increased risk of sICH and the benefits of treatment are uncertain. Treatment may be reasonable if there is the potential for substantial benefit.</b>	<b>IIb</b>	<b>B-NR</b>	<b>NEW</b> recommendation.

**Two meta-analyses: sICH more common with baseline CMBs (OR, 2.18; 95% CI, 1.12-4.22; and OR, 2.36; 95% CI, 1.21-4.61). However, sICH rates with baseline CMBs are not more common (6.1%, 6.5%) than in the NINDS rtPA trial (6.4%).**

**In patients with >10 CMBs the sICH rate was 40% but based on only 6 events in 15 patients. Meta-analysis on 3- to 6-mo functional outcomes (4 studies): presence of CMBs was associated with worse outcomes (OR, 1.58; 95% CI, 1.18–2.14; P=0.002).**

# 2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis



	COR	LOE	New, Revised, or Unchanged
<b>IV alteplase for adults presenting with an AIS with known <u>sickle cell disease</u> can be beneficial.</b>	<b>Ia</b>	<b>B-NR</b>	<b>NEW</b> recommendation.

**Based on a case-control study of GWTG: SCD has no impact of safety of IV alteplase**

# 2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis



	COR	LOE	New, Revised, or Unchanged
Because time from onset of symptoms to treatment has such a powerful impact on outcomes, treatment with IV alteplase should <b>not</b> be delayed to monitor for further improvement.	<b>III: Harm</b>	<b>C-EO</b>	Wording modified from 2015 Alteplase Scientific Statement to match Class III stratifications.
Given the extremely low risk of unsuspected abnormal platelet counts or coagulation studies in a population, it is reasonable that urgent IV alteplase treatment <b>not</b> be delayed while waiting for hematologic or coagulation testing if there is no reason to suspect an abnormal test.	<b>IIa</b>	<b>B-NR</b>	Recommendation unchanged from 2015 Alteplase Scientific Statement.
Treating clinicians should be aware that hypoglycemia and hyperglycemia may mimic acute stroke presentations and determine blood glucose levels before IV alteplase initiation. IV alteplase is not indicated for nonvascular conditions.	<b>III: No Benefit</b>	<b>B-NR</b>	Recommendation unchanged from 2015 Alteplase Scientific Statement.

# 2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis



	COR	LOE	New, Revised, or Unchanged
Abciximab should <b><u>not</u></b> be administered concurrently with IV alteplase.	<b>III: Harm</b>	<b>B-R</b>	Wording modified from 2013 AIS Guidelines to match Class III stratifications.
IV alteplase should not be administered to patients who have received a <b><u>treatment dose</u></b> of low-molecular-weight heparin (LMWH) within the previous 24 hours.	<b>III: Harm</b>	<b>B-NR</b>	Recommendation unchanged from 2015 Statement.

# 2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis



	COR	LOE	New, Revised, or Unchanged
<b>The risk of antithrombotic therapy within the first 24 hours following treatment with IV alteplase (with or without EVT) is uncertain. Use might be considered in the presence of concomitant conditions for which such treatment given in the absence of IV alteplase is known to provide substantial benefit or withholding such treatment is known to cause substantial risk.</b>	<b>Iib</b>	<b>B-NR</b>	<b>NEW</b> recommendation.

**A retrospective single center study from South Korea found no increased risk of ICH with early initiation of antiplatelet or anticoagulant therapy (< 24 hrs) after IV alteplase or EVT compared with initiation > 24 hrs. However, this study may have been subject to selection bias. Timing of initiation of antiplatelet therapy or anticoagulation should be individualized by balancing risk versus benefit.**

# 2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis



## Indications (Class I)

- Onset within 3 hr (A)
- Age  $\geq 18$  and  $>$  or  $< 80$  yr (A)
- Severe symptoms (A)
- Mild disabling symptoms (B-R)
- Onset within 3-4.5 hr (B-R)
  - Age  $\leq 80$
  - No DM + prior stroke
  - NIHSS  $\leq 25$
  - No OACs
  - No large hypodensity on CT
- BP  $< 185/110$  mmHg (B-NR)
- BS  $> 50$  mg/dL (A)
- Early changes on CT other than hypodensity (A)
- Aspirin use (A)
- Use of combination of antiplatelets (B-NR)
- ESRD on HD (C-LD)



# 2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis



## Contraindications (Class III)

- Onset unknown or known > 4.5 hr (B-NR)
- Hemorrhage on CT (C-EO)
- Large hypodensity on CT (A)
- Ischemic stroke within 3 months (B-NR)
- Head trauma within 3 months (C-EO)
- Intracranial/spinal surgery within 3 months (C-EO)
- Hx of intracranial hemorrhage (C-EO)
- Suspected SAH (C-EO)
- GI cancer or GI bleed within 21 d (C-EO)
- Coagulopathy
  - Plt <100,000; INR >1.7; aPTT >40"; PT >15" (C-EO)
  - Therapeutic dose LMWH within 24 hr (B-NR)
  - DTI or Xa inhibitor (C-EO)
  - Concurrent IIb/IIIa (B-R)
- Suspected IE (C-LD)
- Suspected aortic arch dissection (C-EO)
- Intra-axial intracranial tumor (C-EO)

# 2018 AHA/ASA AIS Guidelines: Intravenous Thrombolysis



## 16 Additional Recommendations

**Class IIa      Benefit >> Risk**

### Including:

- Onset 3-4.5 hr and age >80 (B-NR)
- Seizure at onset (C-LD)
- Cervical dissection (C-LD)
- 1-20 CMBs (B-NR)
- Extra-axial intracranial tumor (C-EO)
- Sickle cell disease (B-NR)
- Stroke mimics (B-NR)

## 25 Additional Recommendations

**Class IIb      Benefit  $\geq$  Risk**

### Including:

- Onset 3-4.5 and DM + prior stroke (B-NR)
- Mild non-disabling deficits (C-LD)
- Warfarin with INR  $\leq 1.7$  (B-NR)
- Dural puncture within 7 d (C-EO)
- Arterial puncture within 7 days (C-LD)
- Non-head major trauma within 14 d (C-LD)
- Major surgery within 14 d (C-LD)
- >10 CMBs (B-NR)

# 2018 AHA/ASA AIS Guidelines: IV Thrombolysis – Beyond Alteplase?



	COR	LOE	New, Revised, or Unchanged
The benefit of IV defibrinogenating agents and of IV fibrinolytic agents <b>other than alteplase and tenecteplase</b> is unproven and therefore their administration is <b>not</b> recommended outside of a clinical trial.	<b>III: No Benefit</b>	<b>B-R</b>	<b>Revised</b> from 2013 AIS Guidelines
<b>Tenecteplase administered as a 0.4 mg/kg single intravenous bolus has not been proven to be superior or non-inferior to alteplase, but might be considered as an alternative to alteplase in patients with minor neurological impairment and no major intracranial occlusion.</b>	<b>IIb</b>	<b>B-R</b>	<b>NEW</b> recommendation
The use of sonothrombolysis as adjuvant therapy with intravenous thrombolysis is <b><u>not</u></b> recommended.	<b>III: No Benefit</b>	<b>B-R</b>	<b>NEW</b> recommendation

**Tenecteplase: NORT-TEST trial**

**Sonothrombolysis: NOR-SASS trial**

# **AHA/ASA 2018 Guidelines for the Early Management of Patients with Acute Ischemic Stroke:**

## **What's New, What's Different** **Mechanical Thrombectomy**

# An Era of Unprecedented Change



## AHA/ASA GUIDELINE

# 2015 American Heart Association/American Stroke Association Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment

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

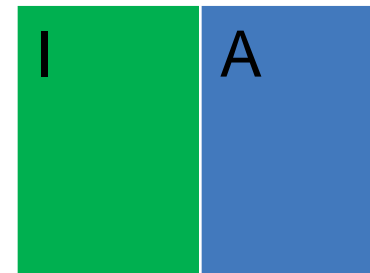
William J. Powers, Colin P. Derdeyn, José Biller, Christopher S. Coffey, Brian L. Hoh, Edward C. Jauch, Karen C. Johnston, S. Claiborne Johnston, Alexander A. Khalessi, Chelsea S. Kidwell, James F. Meschia, Bruce Ovbiagele, Dileep R. Yavagal  
and on behalf of the American Heart Association Stroke Council



# The Role of IV tPA

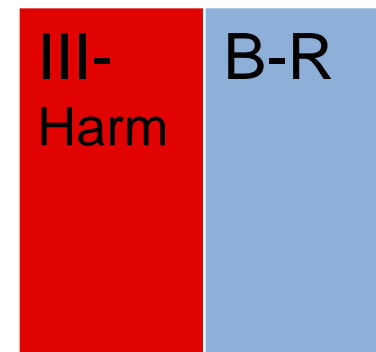


Patients **eligible for IV alteplase should receive IV alteplase** even if endovascular treatments are being considered.



Recommendation unchanged from 2015 Endovascular.

In patients under consideration for mechanical thrombectomy, **observation after IV alteplase to assess for clinical response should not be performed.**

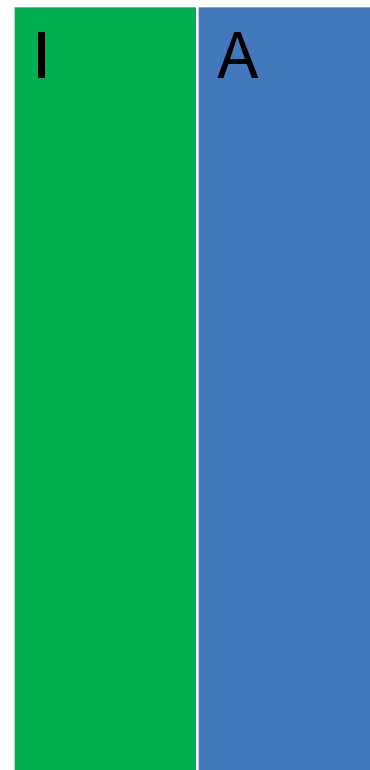


Recommendation revised from 2015 Endovascular.

# Patient Selection for Thrombectomy

**Patients should receive mechanical thrombectomy with a stent retriever if they meet all the following criteria:**

- (1) pre-stroke mRS 0-1
- (2) causative occlusion of the internal carotid artery or middle cerebral artery segment 1 (M1)
- (3) age 18 years and over
- (4) NIHSS score of 6 or greater
- (5) Alberta Stroke Program Early CT Score (ASPECTS) of 6 or greater; and,
- (6) treatment can be initiated (groin puncture) within 6 hours of symptom onset.



Recommendation  
revised from 2015  
Endovascular.

Pretreatment with IV alteplase removed from the prior recommendation.

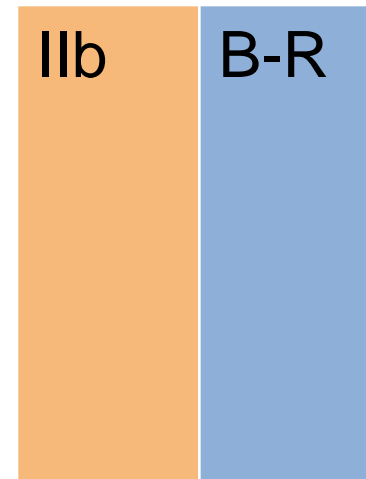


# Patient Selection for Thrombectomy



Although benefits remain uncertain mechanical thrombectomy may be reasonable for patients within 6 hours of onset and with:

- Occlusions of M2, M3 MCA branches
- Occlusions of ACA, vertebral, basilar or PCA branches
- Low ASPECTS scores (<6)
- Low NIHSS scores (<6)
- Baseline functional status with mRS >1

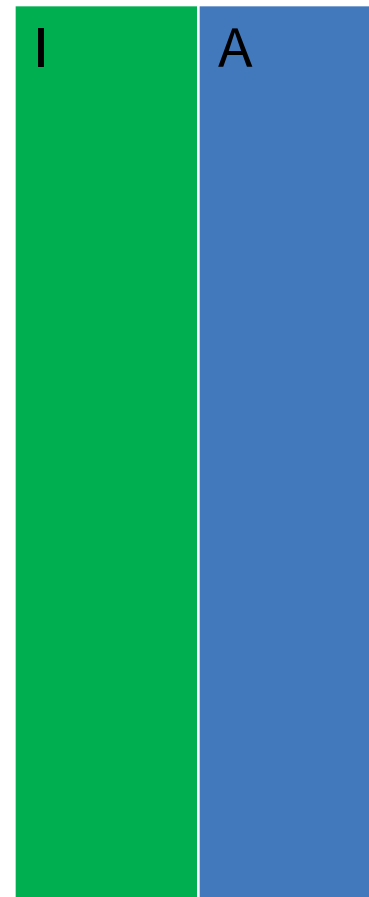


Recommendations generally unchanged from 2015  
Endovascular, LoE revised

Guidelines support further exploring the limits of this therapy

# Imaging Selection for Thrombectomy

**For patients who otherwise meet criteria for endovascular treatment, a noninvasive intracranial vascular study is recommended during the initial imaging evaluation of the acute stroke patient, but should not delay IV alteplase if indicated. For patients who qualify for IV alteplase according to guidelines from professional medical societies, initiating IV alteplase before non-invasive vascular imaging is recommended for patients who have not had non-invasive vascular imaging as part of their initial imaging assessment for stroke. Non-invasive intracranial vascular imaging should then be obtained as quickly as possible.**



Recommendation unchanged from 2015 Endovascular.



# Imaging Selection for Thrombectomy



For patients who otherwise meet criteria for endovascular treatment, it is reasonable to **proceed with CTA if indicated in patients with suspected large vessel intracranial occlusion prior to obtaining a serum creatinine concentration** in patients without a history of renal impairment.

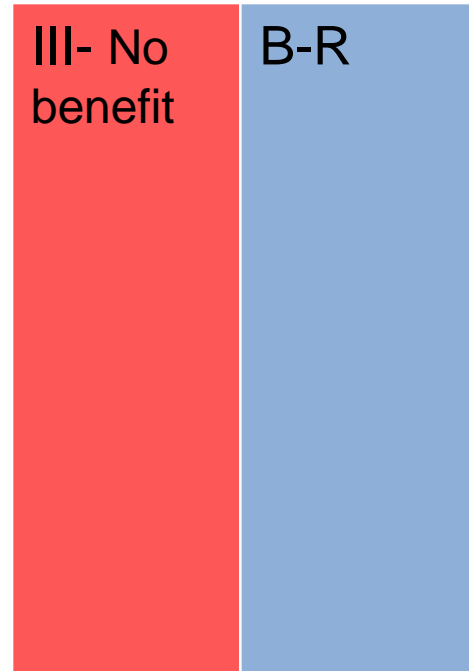


**New  
recommendation**

- Observational studies suggest the risk of contrast-induced nephropathy secondary to CTA contrast exposure is low, especially in absence of renal impairment
- Waiting for laboratory results may incur treatment delays

# Imaging Selection for Thrombectomy <6hrs

**Additional imaging beyond CT and CTA or MRI and magnetic resonance angiography (MRA), such as perfusion studies, for selecting patients for mechanical thrombectomy under 6 hours is not recommended.**

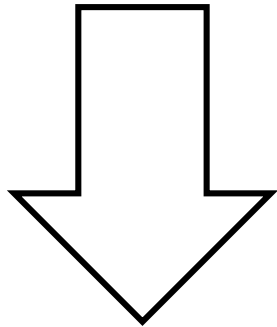


**New  
recommendation**

# Imaging Selection for Thrombectomy <6hrs

## Less Selective

LVO



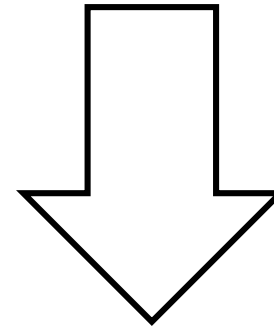
Treatment  
effect

THRACE: 11%  
MR CLEAN: 13%  
REVASCAT: 15%

## More Selective

LVO

Small core infarct

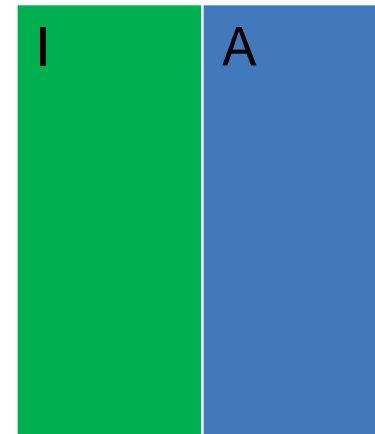


SWIFT PRIME: 24%  
ESCAPE: 25%  
EXTEND-IA: 31%

Potential for additional imaging based eligibility criteria to exclude patients who might benefit

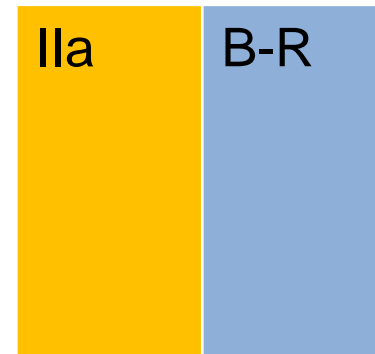
# Thrombectomy 6-24hrs

In selected patients with AIS within 6-16 hours of last known normal who have large vessel occlusion in the anterior circulation and **meet** other **DAWN or DEFUSE-3 eligibility criteria**, mechanical thrombectomy is recommended.



New  
recommendation

In selected patients with AIS within 16-24 hours of last known normal who have large vessel occlusion in the anterior circulation and **meet** other **DAWN eligibility criteria**, mechanical thrombectomy is reasonable.



New  
recommendation

# Thrombectomy 6-24hrs



## ORIGINAL ARTICLE

### Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct

Raul G. Nogueira, M.D., Ashutosh P. Jadhav, M.D., Ph.D., Diogo C. Haussen, M.D., Alain Bonafe, M.D., Ronald F. Budzik, M.D., Parita Bhuvu, M.D., Dileep R. Yavagal, M.D., Marc Ribo, M.D., Christophe Cognard, M.D., Ricardo A. Hanel, M.D., Cathy A. Sila, M.D., Ameer E. Hassan, D.O., Monica Millan, M.D., Elad I. Levy, M.D., Peter Mitchell, M.D., Michael Chen, M.D., Joey D. English, M.D., Qaisar A. Shah, M.D., Frank L. Silver, M.D., Vitor M. Pereira, M.D., Brijesh P. Mehta, M.D., Blaise W. Baxter, M.D., Michael G. Abraham, M.D., Pedro Cardona, M.D., Erol Veznedaroglu, M.D., Frank R. Hellinger, M.D., Lei Feng, M.D., Jawad F. Kirmani, M.D., Demetrius K. Lopes, M.D., Brian T. Jankowitz, M.D., Michael R. Frankel, M.D., Vincent Costalat, M.D., Nirav A. Vora, M.D., Albert J. Yoo, M.D., Ph.D., Amer M. Malik, M.D., Anthony J. Furlan, M.D., Marta Rubiera, M.D., Amin Aghaebrahim, M.D., Jean-Marc Olivot, M.D., Wondwossen G. Tekle, M.D., Ryan Shields, M.Sc., Todd Graves, Ph.D., Roger J. Lewis, M.D., Ph.D., Wade S. Smith, M.D., Ph.D., David S. Liebeskind, M.D., Jeffrey L. Saver, M.D., and Tudor G. Jovin, M.D., for the DAWN Trial Investigators<sup>1</sup>

mRS 0-2 49% vs 13%  
adjusted difference 33%, 95% CI 21%-44%

## ORIGINAL ARTICLE

### Thrombectomy for Stroke at 6 to 16 Hours with Selection by Perfusion Imaging

Gregory W Albers, M.D., Michael P. Marks M.D., Stephanie Kemp, B.S., Soren Christensen, Ph.D., Jenny P. Tsai, M.D., Santiago Ortega-Gutierrez, M.D., Ryan A. McTaggart, M.D., Michel T. Torbey, M.D., May Kim-Tenser, M.D., Thabele Leslie-Mazwi, M.D., Amrou Sarraj, M.D., Scott E. Kasner, M.D., Sameer A. Ansari, M.D., Ph.D., Sharon D. Yeatts, Ph.D., Scott Hamilton, Ph.D., Michael Mlynash, M.D., Jeremy J. Heit, M.D., Greg Zaharchuk, M.D., Sun Kim, M.D., Janice Carrozzella, M.S.N., Yuko Y. Palesch, Ph.D., Andrew M. Demchuk, M.D., Roland Bammer, Ph.D., Philip W. Lavori, Ph.D., Joseph P. Broderick, M.D., and Maarten G. Lansberg, M.D., Ph.D. on behalf of the DEFUSE 3 Investigators\*

40% of the DEFUSE 3 patients were outside DAWN selection criteria

mRS 0-2 44.6% vs 16.7%  
relative risk 2.67, 95% CI 1.60-4.48, P<0.0001

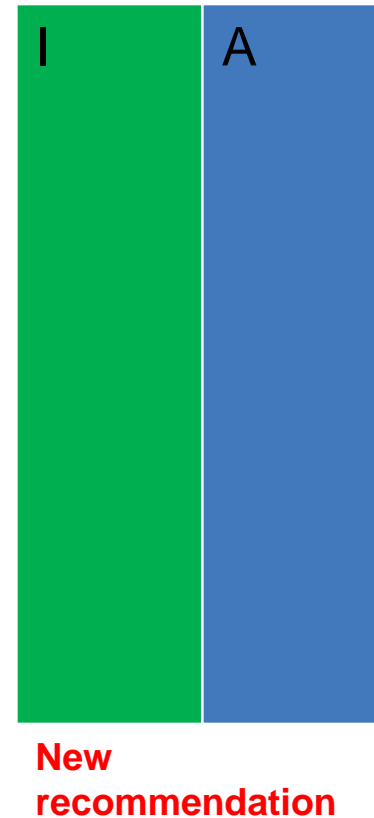
## Highly selective trials, powerful benefit





# Imaging Selection for Thrombectomy 6-24hrs

In selected patients with AIS within 6-24 hours of last known normal who have large vessel occlusion in the anterior circulation, obtaining CT perfusion, diffusion weighted MRI or MRI perfusion is **recommended** to aid in patient selection for mechanical thrombectomy, but only when imaging and other eligibility criteria from RCTs showing benefit are strictly applied



# Imaging Selection for Thrombectomy 6-24hrs



DWI/PWI and CTP Assessment in the Triage of Wake-Up and Late Presenting Strokes Undergoing Neurointervention (DAWN)

6-24hrs

MRI DWI or automated perfusion evaluation for core volume

Group	Age	NIHSS	Infarct
A	$\geq 80$	$\geq 10$	$\leq 20\text{cc}$
B	$< 80$	$\geq 10$	$\leq 30\text{cc}$
C	$< 80$	$\geq 20$	31-50cc



Endovascular Therapy Following Imaging Evaluation for Ischemic Stroke 3 (DEFUSE 3)

6-16hrs

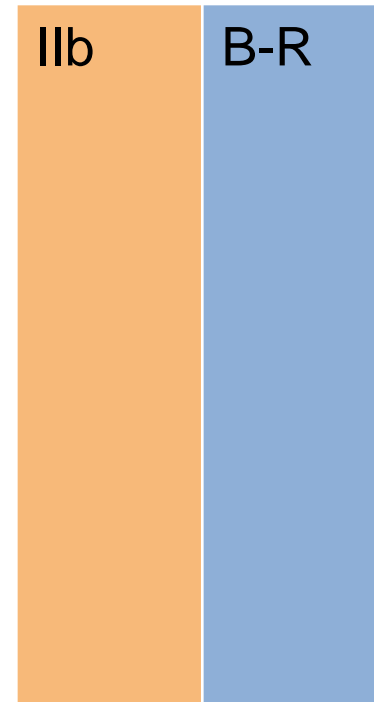
Automated perfusion evaluation of core and mismatch volume

Age 18-90  
NIHSS  $\geq 6$   
Core  $< 70\text{cc}$   
Mismatch ratio  $\geq 1.8$   
Mismatch volume  $\geq 15\text{ml}$

# Device Choices



**The use of mechanical thrombectomy devices other than stent retrievers as first line devices for mechanical thrombectomy may be reasonable** in some circumstances, but stent retrievers remain the first choice.



Recommendation  
revised from 2015  
Endovascular



JAMA | **Original Investigation**

## Effect of Endovascular Contact Aspiration vs Stent Retriever on Revascularization in Patients With Acute Ischemic Stroke and Large Vessel Occlusion The ASTER Randomized Clinical Trial

Bertrand Lapergue, MD, PhD; Raphael Blanc, MD, MSc; Benjamin Gory, MD, PhD; Julien Labreuche, BST; Alain Duhamel, PhD; Gautier Marnat, MD; Suzana Saleme, MD; Vincent Costalat, MD, PhD; Serge Bracard, MD; Hubert Desal, MD, PhD; Mikael Mazighi, MD, PhD; Arturo Consoli, MD; Michel Piotin, MD, PhD; for the ASTER Trial Investigators

**Patients <6 hours with LVO.**

Primary endpoint of revascularization in 85.4% (n=164) in the aspiration group vs 83.1% (n=157) in stent retriever group (OR, 1.20; 95% CI, 0.68-2.10; P=.53)

Secondary clinical endpoint of mRS 0-2 at 90 days achieved by 82/181 (45.3%) in aspiration group vs 91/182 (50.0%) in stent retriever (OR, 0.83; 95% CI, 0.54-1.26; P=.38)

# Procedural Sedation



It is **reasonable to select anesthetic technique** during endovascular therapy for AIS **based on individualized assessment of patient risk factors, technical performance of the procedure, and other clinical characteristics.** Further randomized trial data are needed.



Recommendation  
revised from 2015  
Endovascular

# Procedural Sedation



**Three small ( $\leq 150$  participants) single center RCTs have compared General Anesthesia with Conscious Sedation. None showed superiority of GA for the primary endpoint (two clinical, one DW-MRI infarct growth).**

JAMA | **Original Investigation**

## Effect of Conscious Sedation vs General Anesthesia on Early Neurological Improvement Among Patients With Ischemic Stroke Undergoing Endovascular Thrombectomy A Randomized Clinical Trial

Silvia Schönenberger, MD; Lorenz Uhlmann, MSc; Werner Hacke, MD, PhD; Simon Schieber, MD; Sibu Mundiyanapurath, MD; Jan C. Purrucker, MD; Simon Nagel, MD; Christina Klose; Johannes Pfaff, MD; Martin Bendszus, MD; Peter A. Ringleb, MD; Meinhard Kieser, PhD; Markus A. Möhlenbruch, MD; Julian Bösel, MD, FNCS

### ORIGINAL CONTRIBUTION

## General Anesthesia Versus Conscious Sedation for Endovascular Treatment of Acute Ischemic Stroke

The AnStroke Trial (Anesthesia During Stroke)

Pia Löwhagen Hendén, Alexandros Rentzos, Jan-Erik Karlsson, Lars Rosengren, Birgitta Leiram, Henrik Sundeman, Dennis Dunker, Kunigunde Schnabel, Gunnar Wikholm, Mikael Hellström, Sven-Erik Ricksten

JAMA Neurology | **Original Investigation**

## Effect of General Anesthesia and Conscious Sedation During Endovascular Therapy on Infarct Growth and Clinical Outcomes in Acute Ischemic Stroke A Randomized Clinical Trial

Claus Z. Simonsen, MD, PhD; Albert J. Yoo, MD, PhD; Leif H. Sørensen, MD; Niels Juul, MD; Søren P. Johnsen, MD, PhD; Grethe Andersen, MD, DMSc; Mads Rasmussen, MD, PhD

Not cited in  
2018 AIS  
Guidelines  
due to late  
publication  
date

# **AHA/ASA 2018 Guidelines for the Early Management of Patients with Acute Ischemic Stroke:**

## **What's New, What's Different In-Hospital Treatment**

# 2018 AHA/ASA AIS Guidelines: What's New, What's Different



## In-Hospital Treatment

- **Blood Pressure Management**
- **Prevention of Deep Venous Thrombosis**
- **Dysphagia Screening before Oral Intake**
- **Timing of CEA/CAS for Secondary Prevention**
- **Diagnostic Testing for Instituting Secondary Prevention**



# 2018 AHA/ASA AIS Guidelines: Blood Pressure Management



	COR	LOE	New, Revised, or Unchanged
<b>In patients with BP below 220/120 mmHg who did not receive IV alteplase or endovascular treatment and do not have a comorbid condition requiring acute antihypertensive treatment, initiating or reinitiating treatment of hypertension within the first 48-72 hours after an AIS is not effective to prevent death or dependency.</b>	<b>III: No Benefit</b>	<b>A</b>	<b>CHANGED TO NO BENEFIT</b> from 2013 AIS Guidelines.  <b>I Ib, C → IIINB, A</b>
<b>In patients with BP greater than or equal to 220/120 mmHg who did not receive IV alteplase or endovascular treatment and have no comorbid conditions requiring acute antihypertensive treatment, the benefit of initiating or reinitiating treatment of hypertension within the first 48-72 hours is uncertain. It might be reasonable to lower BP by 15% during the first 24 hours after onset of stroke.</b>	<b>I Ib</b>	<b>C-EO</b>	<b>COR DOWNGRADED</b> from 2013 AIS Guidelines.  <b>I, C → I Ib, C-EO</b>

- *Multiple RCTs have consistently shown that initiating or reinitiating antihypertensive therapy within the first 48-72 hours after an AIS is safe but not associated with improved mortality or functional outcomes.*
- *Patients with severe hypertension (most commonly above 220/120 mmHg) were excluded from these clinical trials. BP reduction has been traditionally advised for these cases, but the benefit of such treatment in the absence of comorbid conditions that may be acutely exacerbated by severe hypertension has not been formally studied.*

# 2018 AHA/ASA AIS Guidelines: Blood Pressure Management



	COR	LOE	New, Revised, or Unchanged
<b>In patients with AIS, early treatment of hypertension is indicated when required by co-morbid conditions (such as concomitant acute coronary event, acute heart failure, aortic dissection, post-thrombolysis sICH, or pre-eclampsia/eclampsia). Lowering BP initially by 15% is probably safe.</b>	<b>I</b>	<b>C-EO</b>	<b>NEW GRADED RECOMMENDATION</b>

- *Patients with AIS can present with severe acute comorbidities that demand emergent BP reduction to prevent serious complications.*
- *Yet, it is important to keep in mind that excessive BP lowering can sometimes worsen patients with AIS. Ideal management in these situations should be individualized, but in general, initial BP reduction by 15% is a reasonable goal.*

# 2018 AHA/ASA AIS Guidelines: Prevention of Deep Venous Thrombosis



	COR	LOE	New, Revised, or Unchanged
<b>In immobile stroke patients without contraindications, intermittent pneumatic compression in addition to routine care (aspirin and hydration) is recommended over routine care to reduce the risk of DVT.</b>	<b>I</b>	<b>B-R</b>	<b>UPGRADED</b> from 2013 AIS Guidelines.  <b>IIa, B → I, B-R</b>

- *CLOTS 3 was a multicenter trial enrolling 2867 patients in 94 centers in the United Kingdom comparing the use of intermittent pneumatic cuffs (IPC) with routine care to no IPC with routine care in immobile stroke patients for venous thromboembolism prophylaxis.*
- *The primary outcome of DVT occurred in 9.6% IPC participants compared with 17.4 of 14.0% no-IPC participants (adjusted OR 0.65, 95% CI, 0.51-0.84; P=0.001).*
- *Among patients treated with IPC, there was a statistically significant improvement in survival to 6 months (HR, 0.86; 95% CI, 0.73-0.99; P=0.042), but no improvement in disability.*
- *Contraindications to IPC include leg conditions such as dermatitis, gangrene, severe edema, venous stasis, severe peripheral vascular disease, post-operative from vein ligation or grafting, and patients who already have swelling or other signs of an existing DVT.*
- *A meta-analysis including this trial and two smaller trials confirmed these results.*

# 2018 AHA/ASA AIS Guidelines: Prevention of Deep Venous Thrombosis



	COR	LOE	New, Revised, or Unchanged
<b>The benefit of prophylactic-dose subcutaneous heparin [unfractionated heparin (UFH) or LMWH] in immobile patients with AIS is not well established.</b>	<b>Iib</b>	<b>A</b>	<b>DOWNGRADED</b> from 2013 AIS Guidelines.  <b>I, A →</b> <b>Iib, A</b>

- In the most recent and comprehensive meta-analysis, prophylactic ACs were not associated with any significant effect on mortality or functional status at final follow-up (OR, 1.00; 95% CI, 0.93-1.07).
- There were statistically significant reductions in symptomatic pulmonary embolism (OR, 0.69; 95% CI, 0.49-0.98) and in DVT, most of which were asymptomatic, (OR, 0.21; 95% CI, 0.15-0.29).
- There were statistically significant increases in symptomatic intracranial hemorrhage (OR, 1.68; 95% CI, 1.11-2.55) and symptomatic extracranial hemorrhages (OR, 1.65; 95% CI, 1.0-2.75).
- No prediction tool has been derived to identify a subgroup for whom the benefits of reducing the risk of venous thromboembolism is high enough to offset the increased risks of intracranial and extracranial bleeding.

# 2018 AHA/ASA AIS Guidelines: Prevention of Deep Venous Thrombosis



	COR	LOE	New, Revised, or Unchanged
<b>When prophylactic anticoagulation is used, the benefit of prophylactic-dose LMWH over prophylactic-dose UFH is uncertain.</b>	<b>Iib</b>	<b>B-R</b>	<b>NEW RECOMMENDATION</b>

- *Meta-analysis comparing low molecular weight heparin or heparinoid to UFH for venous thromboembolism prophylaxis in AIS showed no significant effects on death or disability for LMWH/heparinoids as compared to UFH.*
- *LMWH/heparinoid was associated with statistically significant reduction in DVT (OR, 0.55; 95% CI, 0.44-0.70), which were mostly asymptomatic, at the expense of a greater risk of major extracranial hemorrhages (OR, 3.79; 95% CI, 1.30-11.03).*
- *LMWH can be administered once a day and thus it is more convenient for nurses and comfortable for patients.*
- *Higher cost and increased bleeding risk in elderly patients with renal impairment are disadvantages of LMWH that should be kept in mind.*

# 2018 AHA/ASA AIS Guidelines: Dysphagia Screening before Oral Intake



	COR	LOE	New, Revised, or Unchanged
<b>Dysphagia screening before the patient begins eating, drinking, or receiving oral medications is reasonable to identify patients at increased risk for aspiration.</b>	<b>IIa</b>	<b>C-LD</b>	<b>DOWNGRADED</b> from 2013 AIS Guidelines.  <b>I, B→</b> <b>IIa, C-LD</b>

- Dysphagia, a common complication (37% to 78%) of acute stroke, is a risk factor for aspiration pneumonia and is associated with higher mortality and worse patient outcomes.
- The Evidence Review Committee completed a systematic review to determine if dysphagia screening, as compared to no screening or usual care, decreased outcomes of pneumonia, death, or dependency. There were insufficient data to determine whether implementation of a dysphagia screening protocol reduces risk of death or dependency.
- Patients who failed dysphagia screening were more likely to develop pneumonia (13.1% versus 1.9%), have more severe disability (52.4% versus 18.0%), and be discharged to a long-term care institution (14.0% vs 4.3%).
- Early dysphagia screening is reasonable to identify patients at higher risk for adverse outcomes.

# 2018 AHA/ASA AIS Guidelines: Timing of CEA/CAS for Secondary Prevention

	COR	LOE	New, Revised, or Unchanged
<b>For patients with non-disabling (mRS 0-2) AIS in the carotid territory who are candidates for carotid endarterectomy or stenting, non-invasive imaging of the cervical vessels should be performed routinely within 24 hours of admission.</b>	<b>I</b>	<b>B-NR</b>	<b>NEW RECOMMENDATION</b>
<b>When revascularization is indicated for secondary prevention in patients with minor, nondisabling stroke, it is reasonable to perform the procedure between 48 hours and 7 days of the index event, rather than delay treatment if there are no contraindications to early revascularization.</b>	<b>IIa</b>	<b>B-NR</b>	<b>REVISED RECOMMENDATION</b> from 2014 Secondary Prevention.  <b>&lt; 2 wks → 48 hrs -7 d</b>

- The risk of recurrent stroke due to symptomatic carotid stenosis is highest in the first few weeks after the initial event.*
- In minor non-disabling stroke, meta-analysis demonstrates high rates of complications when CEA/CAS is performed less than 48 hours after the initial event and no difference in risks when performed between 0-7 and 0-15 days.*
- Imaging within 24 hours of admission is feasible and recommended to facilitate CEA/CAS in eligible patients in the 48 hr -7 day window.*

# 2018 AHA/ASA AIS Guidelines: Diagnostic Tests for Instituting Secondary Prevention

- Diagnostic testing can be cost-effective, **but only when it leads to a change in treatment that improves outcomes.**
  - Just leading to a change in treatment is not sufficient
  - There must be good, preferably RCT, data that the change in treatment leads to better clinical outcome
- The 2018 AHA/ASA AIS Guidelines applies this standard to Diagnostic Tests for Instituting Secondary Prevention



# 2018 AHA/ASA AIS Guidelines: Diagnostic Tests for Instituting Secondary Prevention

## What Evidence Does NOT Support *Routine* Use of These Diagnostic Tests in Patients with AIS

Diagnostic Test	Evidence
<b>Brain MRI</b>	Systematic reviews have shown that routine use of MRI in all patients with AIS is not cost-effective. In many patients, the diagnosis of AIS can be made accurately based on the clinical presentation and a negative CT or one showing early ischemic changes.
<b>Intracranial CTA or MRA</b>	No RCT evidence that patients with symptomatic intracranial stenosis should be treated differently than other patients with AIS of presumed atherosclerotic cause.
<b>Prolonged cardiac monitoring</b>	RCTs of prolonged cardiac monitoring after stroke to detect and anticoagulate atrial fibrillation show no significant benefit for stroke prevention
<b>Echocardiography</b>	For detection of intracardiac thrombus in unselected patients, echocardiography will produce at least as many false positive as true positive diagnoses. Screening for PFO, if indicated, should be restricted a clinically defined subgroup.
<b>Blood Cholesterol, not on a statin</b>	2013 ACC/AHA Guidelines on the Treatment of Blood Cholesterol recommend statins for adults with stroke presumed to be of atherosclerotic origin regardless of LDL level
<b>Obstructive sleep apnea</b>	RCTs showed no benefit of treating sleep apnea in preventing cardiovascular events or death in patients with previous stroke
<b>Hyperhomocysteinemia</b>	RCTs did not show benefit of treating hyperhomocysteinemia in a general population of patients with AIS.
<b>Thrombophilic states</b>	There is little, if any, contribution of the inherited thrombophilias to the development of arterial thrombotic events
<b>Antiphospholipid antibodies</b>	APASS RCT did not show benefit of warfarin over aspirin in risk of recurrent stroke in a general population of patients with AIS and APA

# 2018 AHA/ASA AIS Guidelines: Conclusions



- 2018 is a great year for stroke!
- New evidence and new data have create the comprehensive 2018 AHA Acute Ischemic Stroke guidelines.
- Patient-centered outcomes remain the Holy Grail and the focus of all our efforts.



A large, stylized graphic of a torch with a flame, rendered in a lighter shade of red than the background, positioned behind the text.

life is why™  
es por la vida™ 全為生命™