Acute Ischemic Stroke Treatment

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14 Nov 2555 บุรีรัมย์
Acute Treatment

I. Overview

II. Pre-hospital Care

III. Acute stroke care unit

IV. Thrombolysis

V. Other treatments
### 3rd Leading Cause of Globaling Mortality

<table>
<thead>
<tr>
<th>1. Cardiovascular disease</th>
<th>19.60 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Neoplasm</td>
<td>12.80 %</td>
</tr>
<tr>
<td>3. Stroke</td>
<td>9.70 %</td>
</tr>
<tr>
<td>4. Injuries</td>
<td>9.10 %</td>
</tr>
<tr>
<td>5. Respiratory Infections</td>
<td>6.50 %</td>
</tr>
<tr>
<td>6. HIV</td>
<td>5.20 %</td>
</tr>
</tbody>
</table>

**First leading cause of disability in adults**
โรคหลอดเลือดสมองในประเทศไทย

- อัตราการเกิดโรค 690/ประชากร 1 แสนคน ในปี 2552 (206 ปี 2554)
- คนไทยเป็น stroke ทุก 3 นาที (2554)
- ค่อนเมอริกัน ทุก 45 วินาที (2004)
- อัตราตายในปี 2005 ประมาณ 13/100,000
- คนไทยเสียชีวิตจากโรคหลอดเลือดสมองปีละ 13,353 คน
- เลือยวันละ 37 คน หรือประมาณ 3 คน ทุกๆ 2 ชั่วโมง

สถาบันประสาทวิทยา และสำนักงานสถิติแห่งชาติปี 2552 กรมควบคุมโรค กระทรวงสาธารณสุข
แนวทางการรักษาโรคหลอดเลือดสมอง National Guideline 2554
Heart Disease and Stroke Statistics 2004

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“Rapidly developing clinical signs of focal (at times global disturbance of cerebral function), lasting more than 24 hr or leading to death with no apparent cause other than that of vascular origin”
Stroke Types

88% of all strokes are ischemic

- Ischemic Stroke 88%
- Intracerebral Hemorrhage 9%
- Subarachnoid Hemorrhage 3%
- Venous Infarcts 1-13%
**Definition and Evaluation of Transient Ischemic Attack:**

*Stroke* 2009, 40:2276-2293; originally published online May 7, 2009

**Definition**

TIAs are brief episodes of neurological dysfunction resulting from focal cerebral ischemia not associated with permanent cerebral infarction. In the past, TIAs were operationally defined as any focal cerebral ischemic event with symptoms lasting <24 hours. Recently, however, studies from many groups worldwide have demonstrated that this arbitrary time threshold was too broad because 30% to 50% of classically defined TIAs show brain injury on diffusion-weighted magnetic resonance (MR) imaging.
<table>
<thead>
<tr>
<th>SCORE</th>
<th>FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age $\geq$ 60 years</td>
</tr>
<tr>
<td>1</td>
<td>Blood pressure $\geq$140/90 mmHg on first evaluation</td>
</tr>
<tr>
<td>2</td>
<td>Clinical symptoms of focal weakness with the spell (or) speech impairment without weakness</td>
</tr>
<tr>
<td>2</td>
<td>Duration $\geq$60 min (or) 10 to 59 min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ABCD² SCORE</th>
<th>STROKE RISK (2d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 1</td>
<td>0%</td>
</tr>
<tr>
<td>2 - 3</td>
<td>1.3%</td>
</tr>
<tr>
<td>4 - 5</td>
<td>4.1%</td>
</tr>
<tr>
<td>6 - 7</td>
<td>8.1%</td>
</tr>
</tbody>
</table>

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High-Risk TIA

- ABCD2 score >3
- AF/ cardioembolism
- Carotid territory symptoms
  (Carotid endarterectomy: ASP in stroke) (A)
- Crescendo TIA

- AF/ cardioembolic (A)
- ASA (A)
- Urgent Imaging & carotid imaging (B)
- Low risk: manage within 48 h (B)
Suspect a stroke? Act FAST. Call 999.

**FAST**

**Face**
Can the person smile? Has their mouth or eye drooped?

**Arm**
Can the person raise both arms?

**Speech**
Can the person speak clearly and understand what you say?

**Time**
Every second brain cells die. Call 9-1-1 at any sign of stroke!

**Test all three symptoms**

Stroke is a medical emergency. By calling 999 early treatment can be given which can prevent further brain damage.

Stroke helpline 0845 3033 109 www.stroke.org.uk

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Welcome to the London stroke unit lookup

Enter your patient's home postcode in the box below and click on 'Go' to find out which stroke unit they should be repatriated to following their HASU stay.

Go
เมื่อสูบสี้รายเดือน/หน้าติดเป็นโรคอัมพาตควรทำอย่างไร

- ห้ามอุ้มอาการว่าสิ้นที่อยู่อยู่
- รับยาป้องกันเพื่อป้องกันการหายหรือหิว
- โทรสั่งรับยาให้โรงพยาบาลหรือร้านยาเลข 1669
- หรือ แย้มควบคุมโรงพยาบาลใกล้บ้าน

รับยาเบร่... นัยที่จะดื่ม

จำนำการมอบ

สำนักงาน หรือ โทรไป 1669
1669 ศูนย์เอราวัณ รพ.พระมงกุฎ

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ถึงที่เกิดเหตุภายใน ไม่เกิน 10 นาที

14 Nov 2555 บุรีรัมย์
“Time is Brain”

<table>
<thead>
<tr>
<th></th>
<th>Neurons Lost</th>
<th>Synapses Lost</th>
<th>Myelinated Fibers Lost</th>
<th>Accelerated Aging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Second</td>
<td>32 000</td>
<td>230 million</td>
<td>200 meters/218 yards</td>
<td>8.7 h</td>
</tr>
<tr>
<td>Per Minute</td>
<td>1.9 million</td>
<td>14 billion</td>
<td>12 km/7.5 miles</td>
<td>3.1 wk</td>
</tr>
<tr>
<td>Per Hour</td>
<td>120 million</td>
<td>830 billion</td>
<td>714 km/447 miles</td>
<td>3.6 y</td>
</tr>
</tbody>
</table>
Figure 1. Progression over Time (Left to Right) of the Infarct Core (Red), with Irreversible Damage at the Expense of the Ischemic Penumbra (Green).
Stroke Therapy

- Acute stroke care unit
- Pharmacologic: 0-4.5 h & 48 h
- Mechanical thrombectomy
- Airway, oxygen, temp, glucose, others
- Acute very early rehabilitation
- 2nd prevention: CEA 2 wk
Multidisciplinary in Stroke

Medical Doctors
Neurologist
Nurses
Nerosurgeon
Physiotherapists
Phamacist
Occupational Therapists
Social Workers
Nutritionists
Case Managers

.patient

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ขั้นตอนการปฏิบัติ
โครงการดูแลผู้ป่วย Stroke fast tract

1. พบพยาบาลคัดกรอง ซึ่งเป็นพยาบาลเชี่ยวชาญ (Triage nurse)

2. ทำบัตรเวชระเบียบสายด่วน (Fast track)

3. จัดลำดับ ESI (Emergency severity index)

เป็นประเภท 2 โดยส่งพบแพทย์ให้ห้องฉุกเฉินทันที

**STROKE FAST TRACK IN ER PMK**

14 Nov 2555 บุรีรัมย์
ขั้นตอนการปฏิบัติในการดูแลผู้ป่วย Stroke fast tract

4. พบแพทย์เวชศาสตร์ฉุกเฉินภายในเวลา 5 นาที

5. Consult แพทย์ศัลยกรรมประสาท โดยให้แพทย์ visit case ภายในเวลา 10 นาที

6. Consult แพทย์ประสาทวิทยา โดยให้แพทย์ visit case ภายในเวลา 10 นาที

STROKE FAST TRACK IN ER PMK

14 Nov 2555 บุรีรัมย์
ขั้นตอนการปฏิบัติ
ในการดูแลผู้ป่วย Stroke fast tract

7. ส่ง CT Scan ภายในเวลา 25 นาที
8. ได้ผล CT Scan ภายในเวลา 45 นาที
9. ส่ง Lab ด่วนได้ผลภายใน 45 นาที
ขั้นตอนการปฏิบัติ
ในการดูแลผู้ป่วย Stroke fast tract

10. ได้รับยา rtPA ภายในเวลา 60 นาที
11. Admit ภายในเวลา 180 นาที
<table>
<thead>
<tr>
<th>Time Interval</th>
<th>Time Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door to doctor</td>
<td>10 min</td>
</tr>
<tr>
<td>Access to neurologic expertise</td>
<td>15 min</td>
</tr>
<tr>
<td>Door to CT scan completion</td>
<td>25 min</td>
</tr>
<tr>
<td>Door to CT scan interpretation</td>
<td>45 min</td>
</tr>
<tr>
<td>Door to treatment</td>
<td>60 min</td>
</tr>
<tr>
<td>Admission to stroke unit or ICU</td>
<td>3 h</td>
</tr>
</tbody>
</table>

*National Institute of Neurologic Disorders and Stroke*
<table>
<thead>
<tr>
<th>การมาถึง</th>
<th>เป้าหมาย</th>
<th>ปฏิบัติได้จริง</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>11.6</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>48.85</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>207.78</td>
<td></td>
</tr>
</tbody>
</table>

การพยาบาลด่วน (PMK Fast track 2554) วันที่ 14 Nov 2555
Reviewer’s Conclusion

Patients with acute stroke are more likely to survive, return home, and regain independence if they receive organized inpatient (stroke unit) care. This is typically provided by a coordinated multidisciplinary team operating within a discrete ward, which can offer a substantial period of rehabilitation if required. There are no firm grounds for restricting access according to patient age, sex, or stroke severity. The absolute benefits of organized inpatient (stroke unit) care appear to be sufficiently large to justify service reorganization.
Organised inpatient care (Acute stroke care unit)

- 23 trials: compared with alternative services
- Reductions in the odds of death recorded at final (median one year) follow-up (odds ratio 0.86; 95% CI 0.71 to 0.94; P=0.005)

- The odds of death or institutionalised care (0.80; 0.71 to 0.90; P=0.0002) and death or dependency (0.78; 0.68 to 0.89; P=0.0003).
AHA/ASA Guideline

Guidelines for the Early Management of Adults With Ischemic Stroke

Class I Recommendations

1. The use of comprehensive specialized stroke care (stroke units) incorporating rehabilitation is recommended (Class I, Level of Evidence A). This recommendation is unchanged from the previous guideline.

2. The use of standardized stroke care order sets is recommended to improve general management (Class I, Level of Evidence B). This recommendation was not in previous guidelines.
Key components of German Stroke Units.

**Two variants of stroke units are certified:** “Regionale Stroke Units” **(primary stroke centre, PSC)** and “Überregionale Stroke Units” **(comprehensive stroke centre, CSC)**

- Minimum of 6 (CSC) and 4 (PSC) stroke beds in a dedicated area.
- Every bed is capable of automated multimodal monitoring (blood pressure, breathing, temperature, ECG, heart rate, oxygen saturation).
- Special beds for patients with severe strokes or unstable conditions that need longer expert supervision (enhanced care concept).

**Absolutely necessary are:**

- Intensive care unit in-house available, CT available 24/7, multi-professional stroke team.
- Only stroke patients treated on stroke units.
- Access to a neurosurgeon.
- Availability of any angiographic method (DSA, MRA, CTA) and vascular ultrasound 24/7. Availability of echocardiography.

**In “Überregionalen Stroke Units”, MRI, neurosurgery in-house and invasive neuroradiology must be available**

- Intravenous rt-PA protocols 24/7.
- Minimum of 80 stroke patients per bed per year.
- Stroke trained physicians 24/7.

**“Überregionale Stroke Units” must be located in neurological departments**

- High personnel resources: Überregionale Stroke Units: 2 nurses/bed, Regionale Stroke Units: 1.5 nurses/bed.
- Daily availability of physiotherapy, ergotherapy, speech therapy including dysphagia screening and therapy.
- Social worker.
- Availability of neuropsychological competence.
Features considered absolutely necessary by international stroke experts [25].

**Absolutely necessary for more than 75% of experts.**

- Multidisciplinary team
- Trained stroke nurses
- Brain CT scan available 24/7
- Extracranial Doppler ultrasound
- Automated ECG monitoring at bed-side
- Intravenous rt-PA protocols 24/7
- Emergency department (in-house)

**Absolutely necessary for more than 50% of experts.**

- Neurologist on call
- Neurologist on staff
- Stroke trained physician 24/7
- Diagnostic radiologist on call
- Multidisciplinary ICU
- Speech therapy start within 2 days
- Physiotherapy start within 2 days
- Physician expert in carotid ultrasound
- Extracranial colour-coded duplex ultrasound
- Transcranial Doppler ultrasound
- Transthoracic echocardiography
- Social worker
- Automated multi-parametric monitoring (pulsoximetry, blood pressure, temperature, breathing)
- Stroke outpatients clinic
- Collaboration with outside rehabilitation centre
- Outpatients rehabilitation available
- Emergency medical services training programme
- Community stroke awareness program
- Stroke pathways/algorithms
Stroke unit in Singapore

- Tan Tock Seng 1100-bedded hospital
- Stroke unit since 1992
  - 8 bed stroke intensive care
  - 4 bed dependency
- Multidisciplinary team
  - Doctors, nurses, social workers
  - PT, OT, Speech T
- Noninvasive cerebrovascular lab
- Neuroradiology
- Rehabilitation...

14 Nov 2555  Neurol J Southeast Asia 1997;2:71-76
Ischemic penumbra

- Penumbra: Poorly perfused brain cells
- Core of infarction: DEAD tissue
- Thrombus or embolism

Ischaemic & poorly perfused brain cells may be saved from infarction by prompt treatment
IV rt-PA (0.9 mg/kg, maximum 90 mg) with 10% of the dose given as a bolus followed by an infusion over 60 min for selected patients within 3 hours of onset (Class I, Level A)

Brain imaging (either CT or MRI) should be interpreted by an experienced clinician (Class I, Level C) before starting thrombolytic therapy (Class I, Level A)
NINDS t-PA Stroke Trial

Excellent outcome at 3 months on all scales

Barthel Index
Rankin Scale
Glasgow Outcome
NIHSS score

Global outcome statistic: OR=1.7, 50% v. 38% = 12% benefit

**Number Needed to Treat to Benefit from IV tPA Across Full Range of Functional Outcomes**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>NNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal/Near Normal</td>
<td>8.3</td>
</tr>
<tr>
<td>Improved</td>
<td>3.1</td>
</tr>
</tbody>
</table>

For every 100 patients treated with tPA: 32 benefit & 3 harmed
TPA for Cerebral Ischemia within 3 Hours of Onset—Changes in Outcome Due to Treatment

Changes in final outcome as a result of treatment:
- Normal or nearly normal
- Better
- No major change
- Worse
- Severely disabled or dead

Early course:
- No early worsening with brain bleeding
- Early worsening with brain bleeding
ECASS III trial

- 821 pts randomized to t-PA vs placebo
- Median time: 3h 59min
- Favorable outcome: 52% vs 45%, p=0.04
- Symptomatic ICH: 2.4% vs 0.2%, p=0.008
- No mortality difference

ECASS-3 extending the time window to 4.5 hrs (821 patients)

Odds ratio

OR 2.55
OR 1.64
OR 1.34

NNT = Number needed to treat

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**Table 1. Major Inclusion and Exclusion Criteria.**

**Main inclusion criteria**
- Acute ischemic stroke
- Age, 18 to 80 years
- Onset of stroke symptoms 3 to 4.5 hours before initiation of study-drug administration
- Stroke symptoms present for at least 30 minutes with no significant improvement before treatment

**Main exclusion criteria**
- Intracranial hemorrhage
- Time of symptom onset unknown
- Symptoms rapidly improving or only minor before start of infusion
- Seizure at the onset of stroke
- Stroke or serious head trauma within the previous 3 months
- Combination of previous stroke and diabetes mellitus
- Administration of heparin within the 48 hours preceding the onset of stroke, with an activated partial-thromboplastin time at presentation exceeding the upper limit of the normal range
- Platelet count of less than 100,000 per cubic millimeter
- Systolic pressure greater than 185 mm Hg or diastolic pressure greater than 110 mm Hg, or aggressive treatment (intravenous medication) necessary to reduce blood pressure to these limits
- Blood glucose less than 50 mg per deciliter or greater than 400 mg per deciliter
- Symptoms suggestive of subarachnoid hemorrhage, even if CT scan was normal
- Oral anticoagulant treatment
- Major surgery or severe trauma within the previous 3 months
- Other major disorders associated with an increased risk of bleeding
Hemorrhagic Transformation

- Common and natural consequence of infarction
  - 43% HT rate at 4 wks in natural Hx studies

- Risk of severe HT increases with rt-PA (and all revascularization therapies)
  - 6.4% risk in NINDS (0.6% in placebo)
  - Increased risk with older age and large strokes, but still overall benefit

Khatri, Stroke, 2007
Thrombectomy

Merci retriever        Penumbra system          Solitaire

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Figure 4. Perfusion CT Scans Obtained 1 Hour 45 Minutes after the Onset of Ischemia in the Territory of the Right Middle Cerebral Artery.

A large area shows prolongation of the mean transit time (in seconds) (Panel A), and a smaller area shows a reduction in cerebral blood volume (in milliliters per 100 g) (Panel B). These two maps suggest a large penumbra and a small infarct core (Panel C, with the penumbra shown in green and the suggested infarct core in red).
Carotid Endarterectomy: Conventional Gold Standard Surgical Treatment
## CEA vs. Medical Therapy

### Table 5. Prospective Trials Comparing Carotid Endarterectomy and Medical Therapy

<table>
<thead>
<tr>
<th>Trial</th>
<th>Mean Follow-Up</th>
<th>Surgical Arm, %*</th>
<th>Medical Arm, %*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECST</td>
<td>3 y</td>
<td>2.8</td>
<td>16.8</td>
</tr>
<tr>
<td>NASCET</td>
<td>2.7 y</td>
<td>9</td>
<td>26</td>
</tr>
<tr>
<td>VACS</td>
<td>11.9 mo</td>
<td>7.9</td>
<td>25.6</td>
</tr>
</tbody>
</table>

ECST indicates European Carotid Surgery Trial; NASCET, North American Symptomatic Carotid Endarterectomy Trial; and VACS, Veterans Affairs Cooperative Study Program.

*Risk of fatal or nonfatal ipsilateral stroke.
### Table 6. Hazard Ratio for CAS Versus CEA in 1321 Symptomatic Patients by Treatment Group

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Periprocedural HR (95% CI)</th>
<th>4-Year Study Period HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI</td>
<td>0.45 (0.18–1.11)</td>
<td>...</td>
</tr>
<tr>
<td>Any periprocedural stroke or postprocedural ipsilateral stroke</td>
<td>1.74 (1.02–2.98)</td>
<td>1.29 (0.84–1.98)</td>
</tr>
<tr>
<td>Any periprocedural stroke, death, or postprocedural ipsilateral stroke</td>
<td>1.89 (1.11–3.21)</td>
<td>1.37 (0.90–2.09)</td>
</tr>
<tr>
<td>Any periprocedural stroke, MI, death, or postprocedural ipsilateral stroke</td>
<td>1.26 (0.81–1.96)</td>
<td>1.08 (0.74–1.59)</td>
</tr>
</tbody>
</table>
Table 9. Recommendations for Antithrombotic Therapy for Noncardioembolic Stroke or TIA (Oral Anticoagulant and Antiplatelet Therapies)

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class/Level of Evidence*</th>
</tr>
</thead>
<tbody>
<tr>
<td>For patients with noncardioembolic ischemic stroke or TIA, the use of antiplatelet agents rather than oral anticoagulation is recommended to reduce risk of recurrent stroke and other cardiovascular events (Class I; Level of Evidence A).</td>
<td>Class I; Level A</td>
</tr>
<tr>
<td>Aspirin (50 mg/d to 325 mg/d) monotherapy (Class I; Level of Evidence A), the combination of aspirin 25 mg and extended-release dipyridamole 200 mg twice daily (Class I; Level of Evidence B), and clopidogrel 75 mg monotherapy (Class IIA; Level of Evidence B) are all acceptable options for initial therapy. The selection of an antiplatelet agent should be individualized on the basis of patient risk factor profiles, cost, tolerance, and other clinical characteristics.</td>
<td>Class I; Level A; Class I; Level B; Class IIA; Level B</td>
</tr>
<tr>
<td>The addition of aspirin to clopidogrel increases risk of hemorrhage and is not recommended for routine secondary prevention after ischemic stroke or TIA (Class III; Level of Evidence A).</td>
<td>Class III; Level A</td>
</tr>
<tr>
<td>For patients allergic to aspirin, clopidogrel is reasonable (Class IIA; Level of Evidence C).</td>
<td>Class IIA; Level C</td>
</tr>
<tr>
<td>For patients who have an ischemic stroke while taking aspirin, there is no evidence that increasing the dose of aspirin provides additional benefit. Although alternative antiplatelet agents are often considered, no single agent or combination has been studied in patients who have had an event while receiving aspirin (Class IIb; Level of Evidence C).</td>
<td>Class IIb; Level C</td>
</tr>
</tbody>
</table>

*See Tables 1 and 2 for explanation of class and level of evidence.
Selection of Antiplatelet Agents for Patients Who Experience a Stroke While on Therapy

Patients who present with a first or recurrent stroke are commonly already on antiplatelet therapy. Unfortunately, there have been no clinical trials to indicate that switching antiplatelet agents reduces the risk for subsequent events.
| Blood glucose         | Treat hypoglycemia with D50  
|                      | Treat hyperglycemia with insulin if serum glucose >200 mg/dL (90-140) |
| Cardiac monitor      | Continuous monitoring for ischemic changes or AF |
| Intravenous fluids   | Avoid D5W and excessive fluid administration  
|                      | IV isotonic NaCl solution at 50 mL/h |
| Oral intake          | NPO initially; aspiration risk is great, avoid oral intake until swallowing assessed |
| Oxygen               | Supplement if indicated (SaO₂ < 94%)  
| Temperature          | Avoid hyperthermia; acetaminophen and cooling blankets as needed |

14 Nov 2555  ปู้รีรัมย์  Stroke 2007;38:1655-711
# BP Management in Patients With Stroke

## Candidates for fibrinolysis

<table>
<thead>
<tr>
<th>Blood Pressure</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pretreatment:</strong></td>
<td>Nicardipine 5 mg/h</td>
</tr>
<tr>
<td>SBP &gt;185 or DBP &gt;110 mm Hg</td>
<td></td>
</tr>
<tr>
<td><strong>Posttreatment:</strong></td>
<td>Sodium nitroprusside (0.5 mcg/kg/min)</td>
</tr>
<tr>
<td>DBP &gt;140 mm Hg</td>
<td></td>
</tr>
<tr>
<td>SBP &gt;230 mm Hg or DBP 121-140 mm Hg</td>
<td>Labetalol or Nicardipine 5 mg/h, titrate by 2.5 mg/h every 5-15 min, maximum 15 mg/h</td>
</tr>
<tr>
<td>SBP 180-230 mm Hg or DBP 105-120 mm Hg</td>
<td>Labetalol 10 mg IVP, may repeat and double every 10 min up to maximum dose of 300 mg</td>
</tr>
</tbody>
</table>

*guidelines ASA Scientific Statement 2007*
## BP Management in Patients With Stroke

### Noncandidates for fibrinolysis

<table>
<thead>
<tr>
<th>SBP or DBP</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBP &gt; 140 mm Hg</td>
<td>Sodium nitroprusside 0.5 mcg/kg/min; may reduce approximately 10-20%</td>
</tr>
<tr>
<td>SBP &gt; 220 or DBP 121-140 mm Hg or MAP &gt; 130 mm Hg</td>
<td>Labetalol or Nicardipine</td>
</tr>
<tr>
<td>SBP &lt; 220 mm Hg or DBP 105-120 mm Hg or MAP &lt; 130 mm Hg</td>
<td>Antihypertensive therapy indicated only if acute myocardial infarction, aortic dissection, severe CHF, or hypertensive encephalopathy present</td>
</tr>
</tbody>
</table>

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14 Nov 2555 บุรีรัมย์  Advanced Cardiac Life Support (ACLS) 2005
Time lost = Brain lost

ประชุมวิชาการประจำปี 16-18 แมค 56

Take Home Message