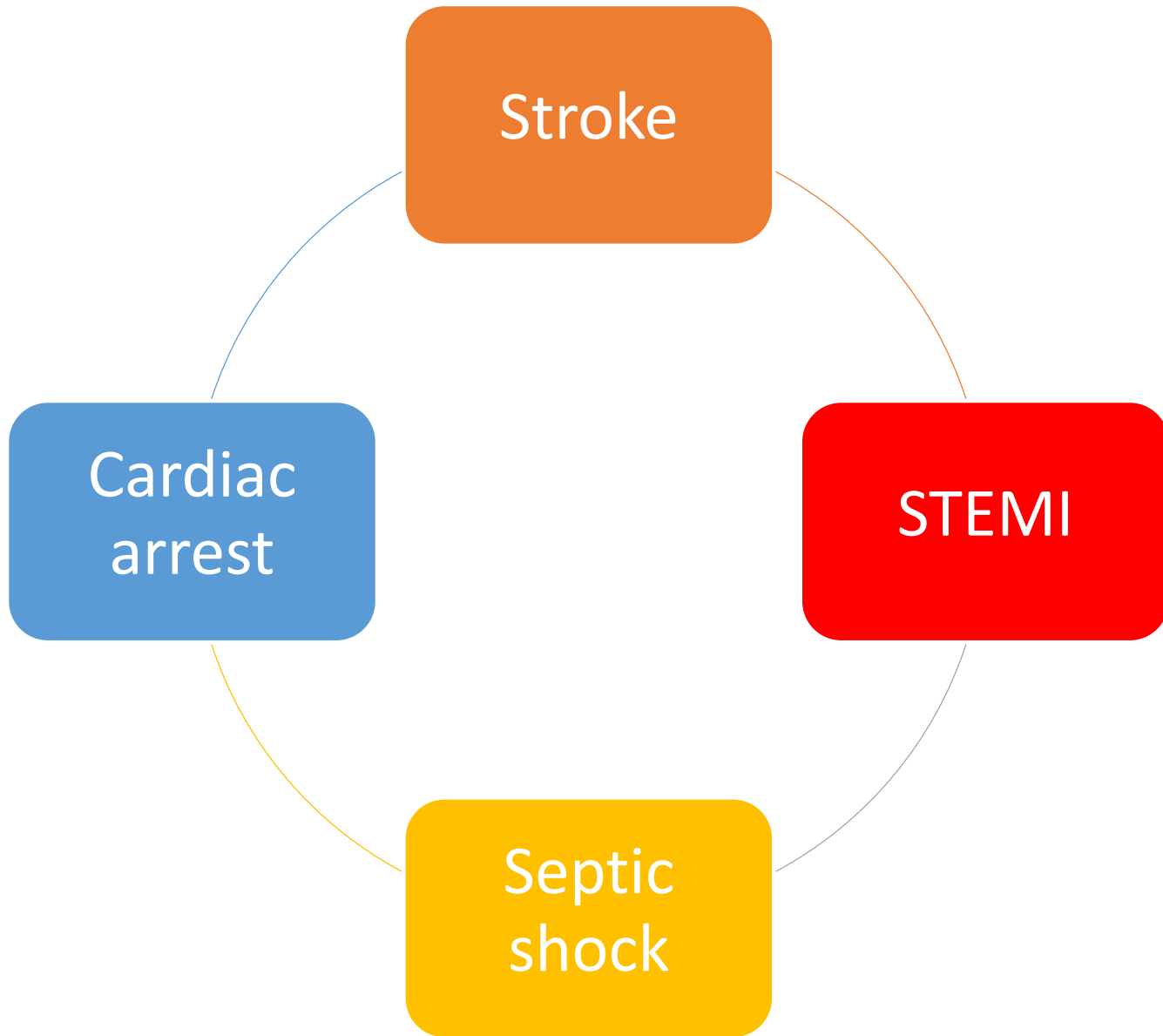


Time Sensitive Disease



Parinya Tianwibool, M.D., FTCEP
Department of Emergency medicine, Chiangmai university



Stroke

STEMI

Septic
shock

Cardiac
arrest

STROKE









On the scene

- Cincinnati Prehospital Stroke Scale (CPSS)
- Los Angeles Prehospital Stroke Scale (LAPSS)
- Melbourne Ambulance Stroke Screen (MASS)

Cincinnati Prehospital Stroke Scale

sensitivity of 66%
specificity of 87%

	F ACE	Does one side of the face droop? Ask the person to smile.
	A RM(S)	Is one arm weak or numb? Ask the person to raise both arms. Does one arm drift downward?
	S PEECH	Is speech slurred? Ask the person to repeat a simple sentence. Is the sentence repeated correctly?
	T IME	If the person shows any of these symptoms, Call 911 or get to the hospital immediately.

Kothari RU, Pancioli A, Liu T, Brott T, Broderick J. "Cincinnati Prehospital Stroke Scale: reproducibility and validity." Ann Emerg Med 1999 Apr;33(4):373-8

Los Angeles Prehospital Stroke Scale

Criteria

Over age 45
No history of seizures
Symptoms < 24 hours
Patient's baseline function is not bedridden or confined to a wheelchair
Blood glucose 60-400

Examination for asymmetry

Facial droop
Grip strength
Arm strength (by downward drift)
Examination finding unilateral?

sensitivity of 91%
specificity of 97%

Yes or Unknown

Stroke

Positive

Melbourne Ambulance Stroke Screen (MASS): Clinical history

- Age > 45 years
- No History of convulsions or epilepsy
- Patient not in bed ridden or in wheelchair
- Glycemia between 50 – 400 mg/dL

Melbourne Ambulance Stroke Screen (MASS): Physical exam

- Facial droop
- Strength in arms
- Handshake
- Speech

Melbourne Ambulance Stroke Screen (MASS)

- Clinical history elements
- Physical examination elements

All Clinical history
& Any Physical exam

Table 2 Operating characteristics of prehospital stroke scales

Stroke scale	Study	Sample size	Stroke prevalence	Sensitivity	Specificity	LR+	LR-
CPSS	Bray et al. ¹³ (2005)	100	73% (63-81)	95% (86-98)	56% (36-74)	2.10 (1.39-3.25)	0.1 (0.04-0.3)
	Bray et al. ¹⁴ (2010)	850	23% (21-26)	88% (83-93)	79% (75-82)	4.17 (3.57-4.87)	0.15 (0.10-0.22)
	Studnek et al. ¹⁵ (2013)	416	45% (40-50)	79% (72-85)	24% (19-30)	1.03 (0.93-1.15)	0.87 (0.61-1.26)
LAPSS	Kidwell et al. ¹¹ (2000)	206	17% (12-22)	91% (76-98)	97% (93-99)	31.30 (13.14-75)	0.08 (0.03-0.27)
	Wojner-Alexandrov et al. ¹² (2005)	11,296	2.5% (2.2-2.7)	86% (81-90)	99% (99-99)	71 (60-86)	0.14 (0.10-0.18)
	Bray et al. ¹³ (2005)	100	73% (63-81)	78% (67-87)	85% (65-95)	5.20 (2.16-13.13)	0.26 (0.16-0.40)
MASS	Chen et al. ¹⁷ (2013)	1,130	88% (86-90)	78% (76-81)	90% (84-95)	8.02 (4.78-13.46)	0.23 (0.21-0.27)
	Bray et al. ¹³ (2005)	100	73% (63-81)	90% (81-96)	74% (54-89)	3.49 (1.83-6.63)	0.13 (0.06-0.27)
	Bray et al. ¹⁴ (2010)	850	23% (21-26)	83% (78-88)	86% (83-88)	5.90 (4.83-7.20)	0.19 (0.14-0.26)

- Brandler ES, Sharma M, Sinert RH, Levine SR. Neurology. 2014 Jun 17;82(24):2241-9

Medical History

- Mimics of stroke
- Recent trauma
- Use of warfarin, clopidogrel or aspirin
- Inclusion and exclusion criteria for tPA

Mimics of Stroke

- Hypoglycemia
- Postictal (Todd) paralysis
- Bell palsy
- Complex migraine
- Conversion disorders
- Encephalopathy
- Labyrinthitis
- Meniere disease

Prehospital treatment of stroke

Airway

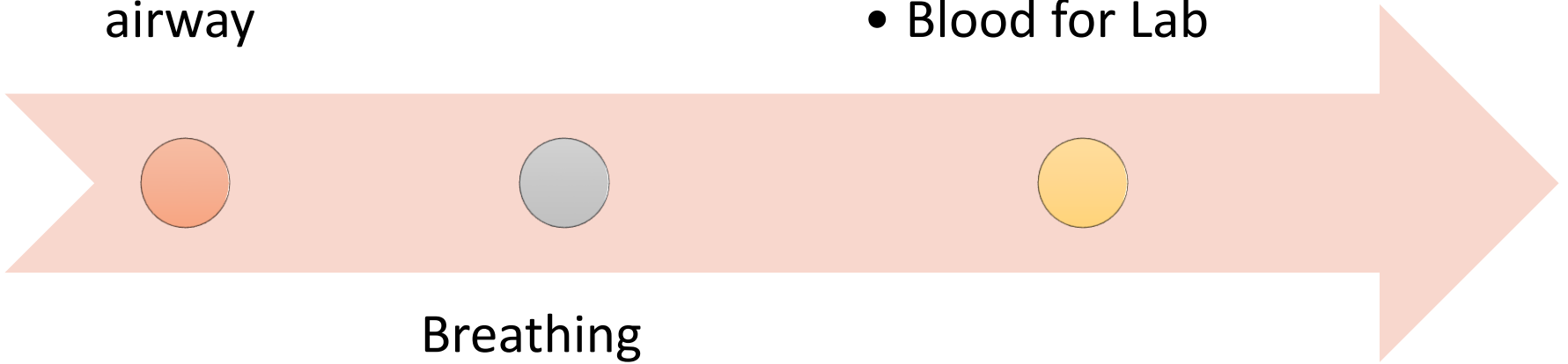
- Maintain airway

Circulation

- IV avoid Dextrose
- Monitor ECG
- Blood for Lab

Breathing

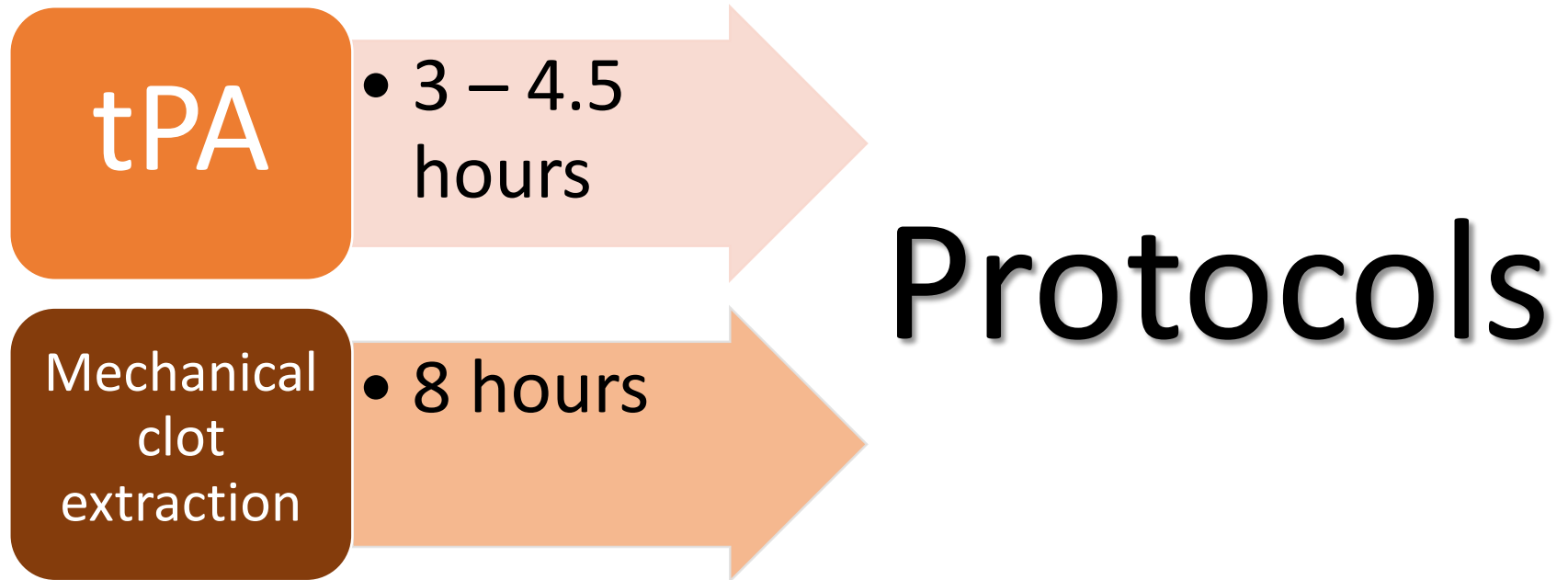
- Give O2
SpO2<94%



2015 Recommendations

- EMS systems should have **protocols** that address triaging the patient when possible directly to a stroke center.(Class I, LOE B)
- Both out-of-hospital and in-hospital medical personnel should administer supplementary oxygen to hypoxemic (ie, **oxygen saturation <94%**) stroke patients (Class 1, LOE C) or those with unknown oxygen saturation.
- Unless the patient is hypotensive (**systolic blood pressure <90 mm Hg**), prehospital intervention for blood pressure is not recommended.(Class III, LOE C)

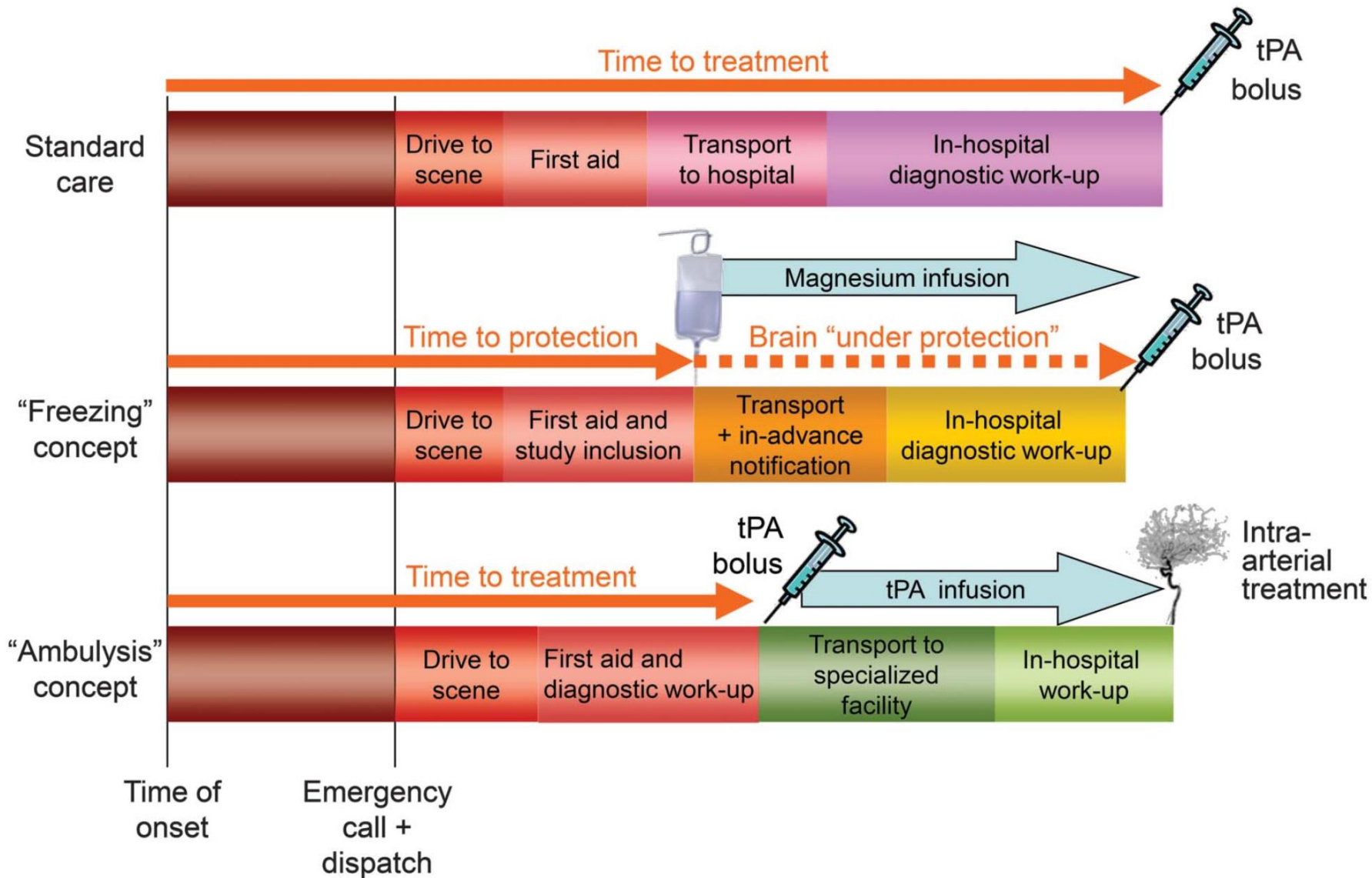
Treatment options and the importance of time



Variants of the stroke rescue chain

Average times (in minutes)

0 30 60 90 120 150



ประเมิน Airway, Breathing, Circulation

การประเมินผู้ป่วยเพื่อยืนยันว่าเป็นโรคหลอดเลือดสมอง

1. ให้ยิ้มอึ้งฟัน : โบน้าอ่อนแรงข้างใดข้างหนึ่ง
2. ให้หงายมือเหยียดแขนสองข้างนาน 10 วินาที : มือตกหรือมือคว่ำข้างใดข้างหนึ่ง
3. ให้พูดตามประโยค "ยายพาลานไปซื้อขนมที่ตลาด" : พูดไม่ชัด

มีอาการข้อใดข้อหนึ่ง

ตรวจระดับน้ำตาลในเลือด

หากต่ำกว่า 60 mg%

ให้ 50% glucose 50 ml ทางหลอดเลือดดำ

หาก > 60 mg% คาดว่าจะเป็นโรคหลอดเลือดสมอง

ไม่มีอาการ

- รักษาตามอาการที่เป็น
- นำส่งโรงพยาบาล

มีอาการภายในเวลา 4 ชั่วโมง

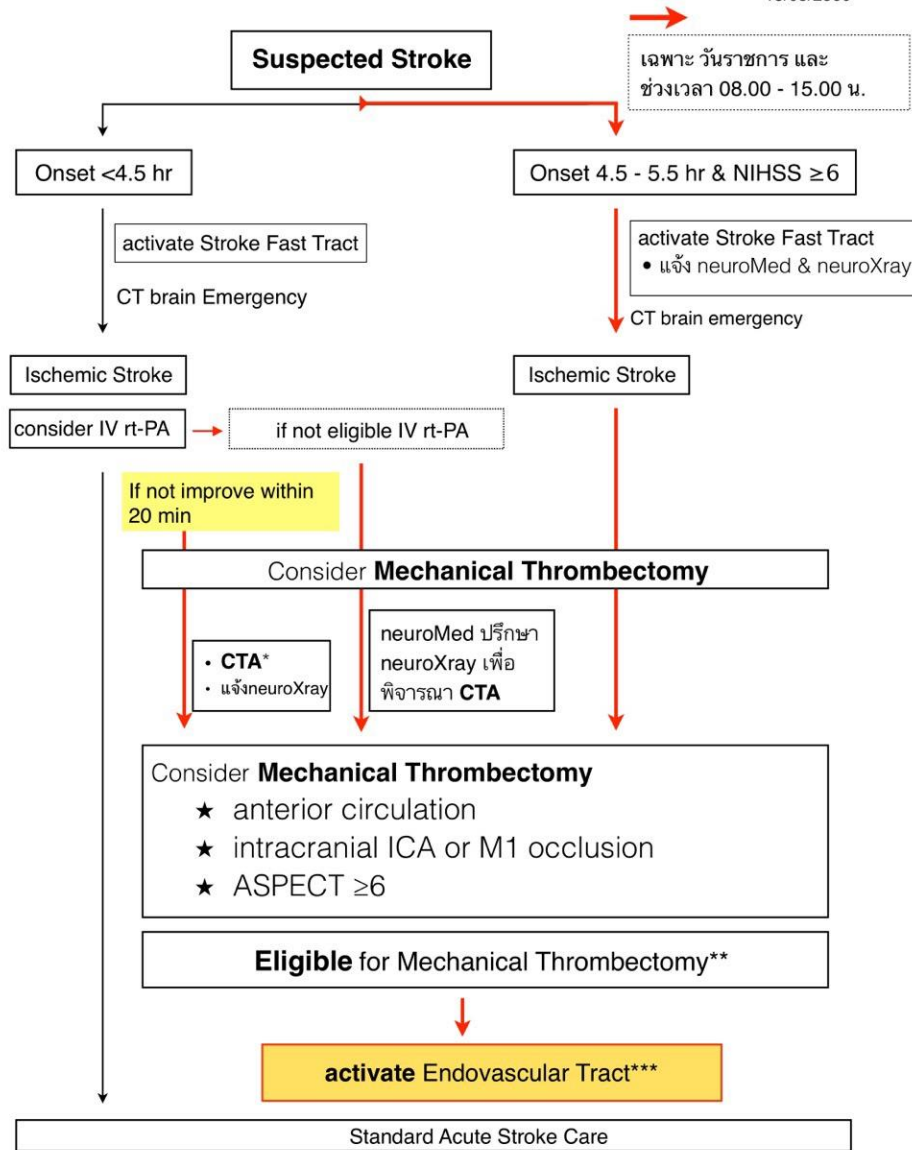
คาดว่าให้ยาละลายลิ่มเลือดได้ทัน

1. ให้ O2 cannula 4 LPM
2. ให้ 0.9% NaCl 1,000 ml
rate 100 ml/hr ทางหลอดเลือดดำ
และเจาะเลือดเพื่อเตรียมส่งตรวจทาง
ห้องปฏิบัติการ
3. Monitor ECG, BP, HR, SpO2
4. ให้ญาติที่สามารถให้ประวัติและ
ตัดสินใจให้การรักษามาด้วย
5. แจ้ง call center เรื่องนำส่งผู้ป่วย
Stroke fast track
6. นำส่งโรงพยาบาล
7. ประเมินข้อห้ามในการให้ยาละลายลิ่ม
เลือด (ถ้ามีเวลา)

มีอาการเกินเวลา 4 ชั่วโมง

คาดว่าให้ยาละลายลิ่มเลือดไม่ทัน

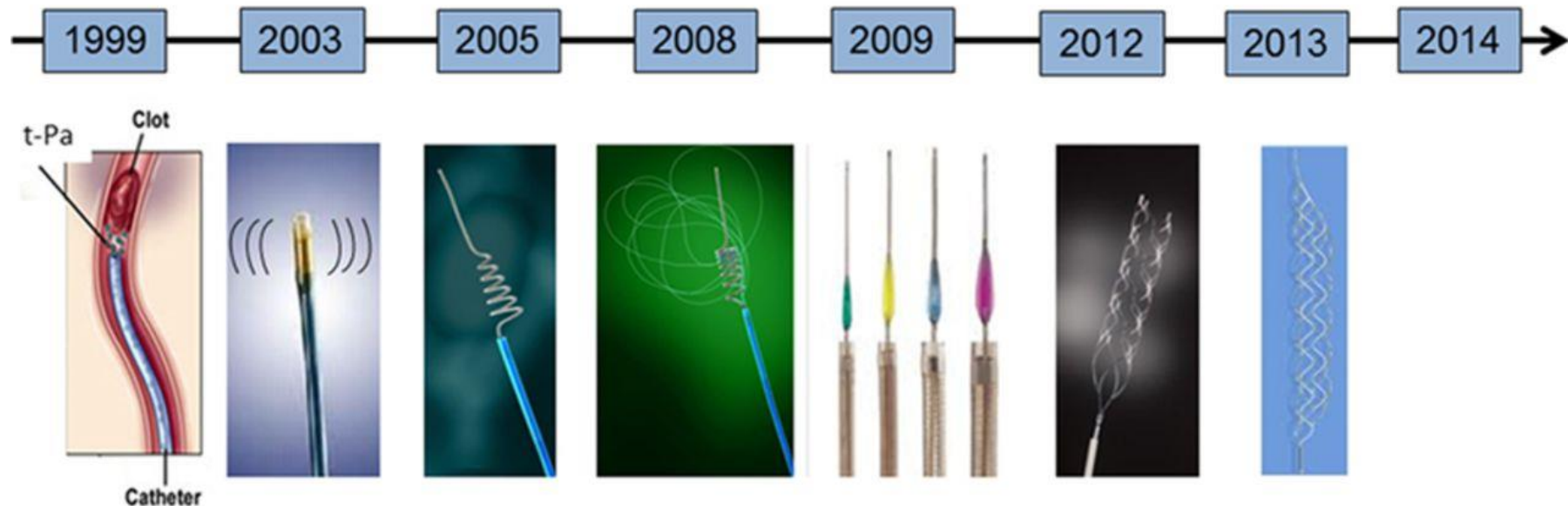
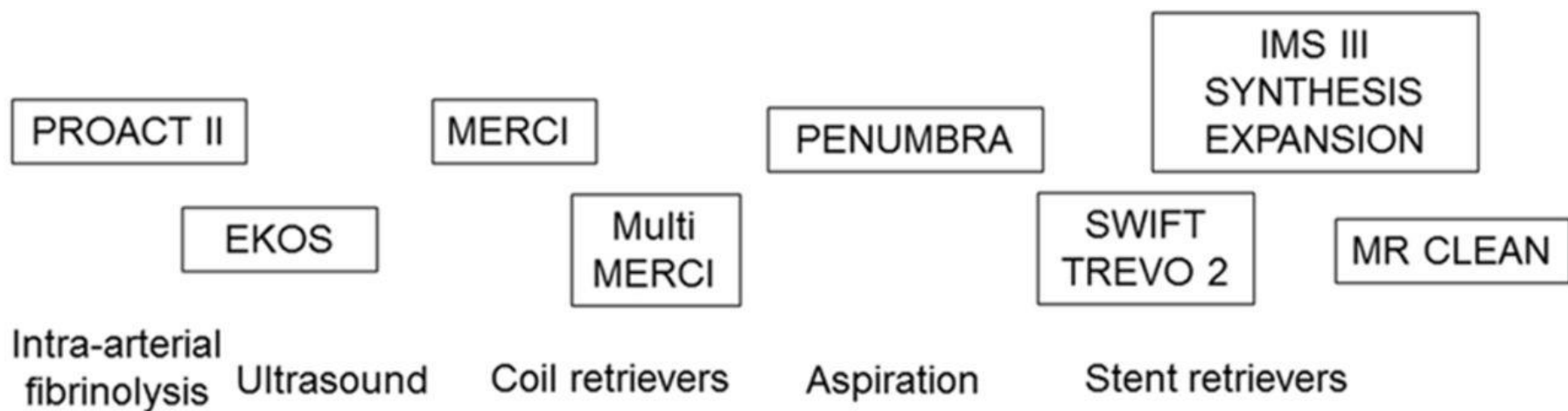
- Monitor ECG, BP, HR, SpO2
- นำส่งโรงพยาบาล



* neuroMed คุยกับ Technician โดยตรงเพื่อทำ CTA

** neuroMed คุยกับผู้ป่วยหรือญาติ เพื่อขออนุญาตและเซ็น ใบยินยอม

*** ER ประสานการเคลื่อนย้ายผู้ป่วย, neuroXray ติดต่อดีเตรียมห้องทำ Intervention



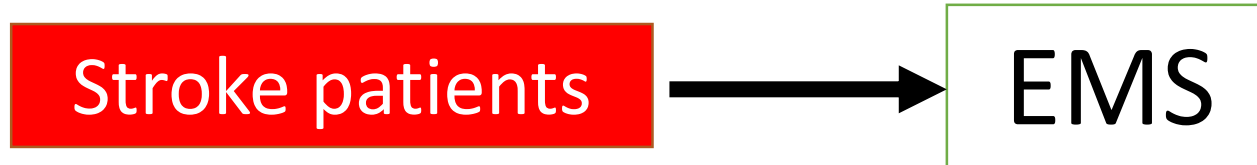
Time interval goals for fibrinolytic therapy

- Arrival at the ED via EMS as soon as safely possible
- Assessment by stroke team or emergency physician within 10 minutes
- Completion of CT scan within 25 minutes
- CT scan interpretation within 25 minutes
- Administration of fibrinolytic (tPA) within 60 minutes of arrival to ED and within 3 hours of symptom onset

Adapted from: American Heart Association. *Advanced Cardiovascular Life Support Provider Manual*, 2006, pp.103–17. American Heart Association. Part 9: Adult stroke. *Circulation* 2005;112 (22): IV-111– IV-120.

Reproduced with permission of Wolters Kluwer Health.

Role of the EMS system in promoting early patient arrival



*Percentage eligible for tPA
4.3% → 28.6%

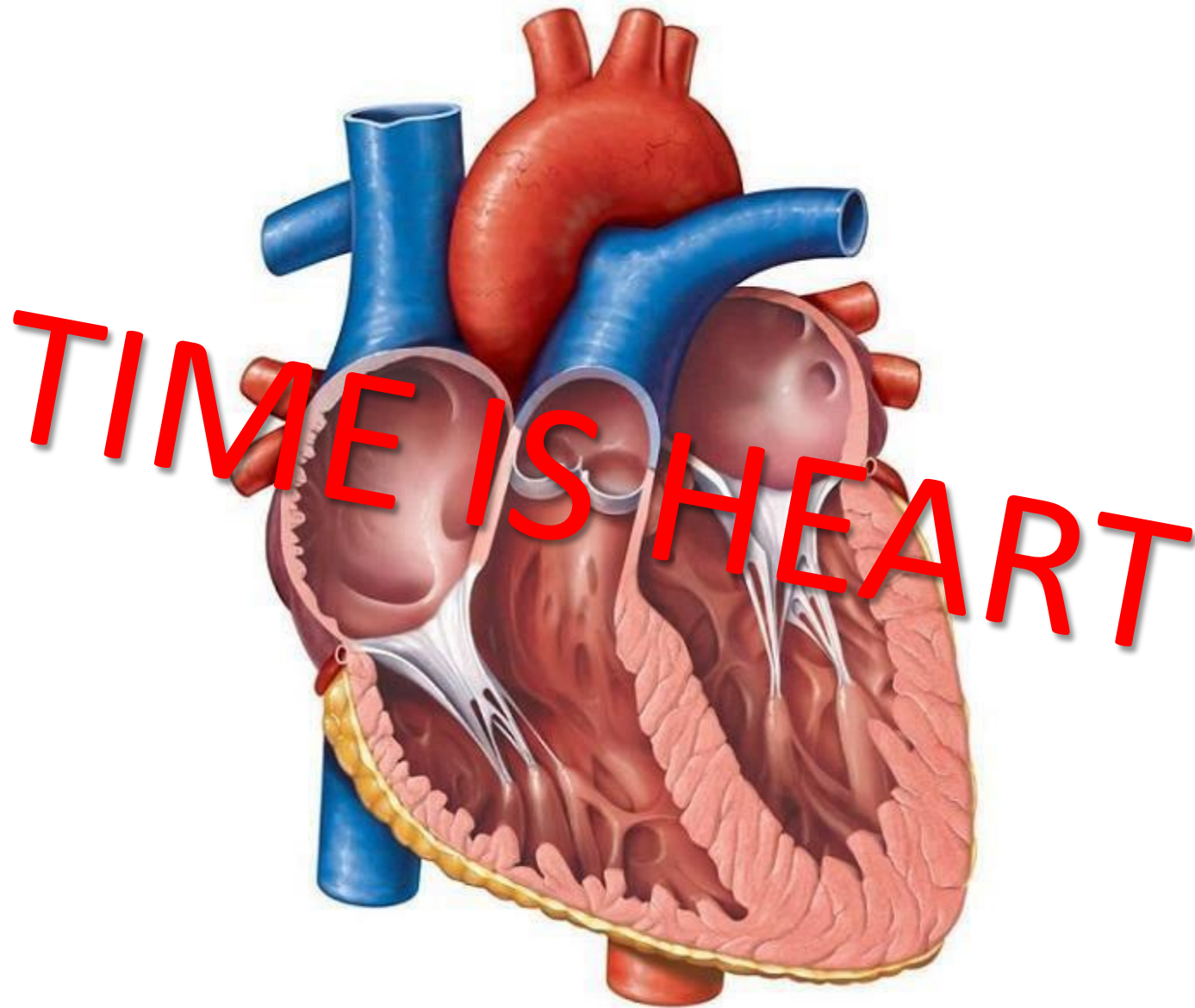
**Time from symptom onset to ED arrival
150 minutes → 90 minutes

*California Acute Stroke Pilot Registry (CASPR) Investigators. Prioritizing interventions to improve rates of thrombolysis for ischemic stroke. *Neurology* 2005;64(4):654–9

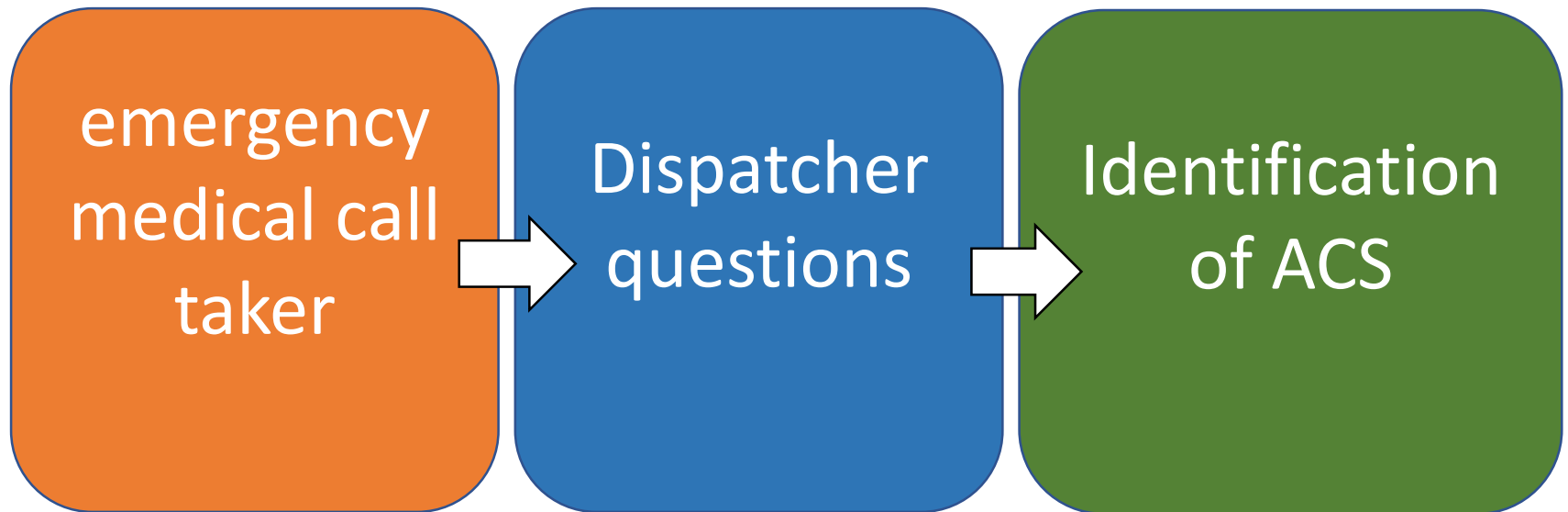
**Quain DA, Parsons MW, Loudfoot AR, et al. Improving access to acute stroke therapies: a controlled trial of organised pre-hospital and emergency care. *Med J Aust* 2008;189(8):429–33.

ACUTE CORONARY SYNDROME

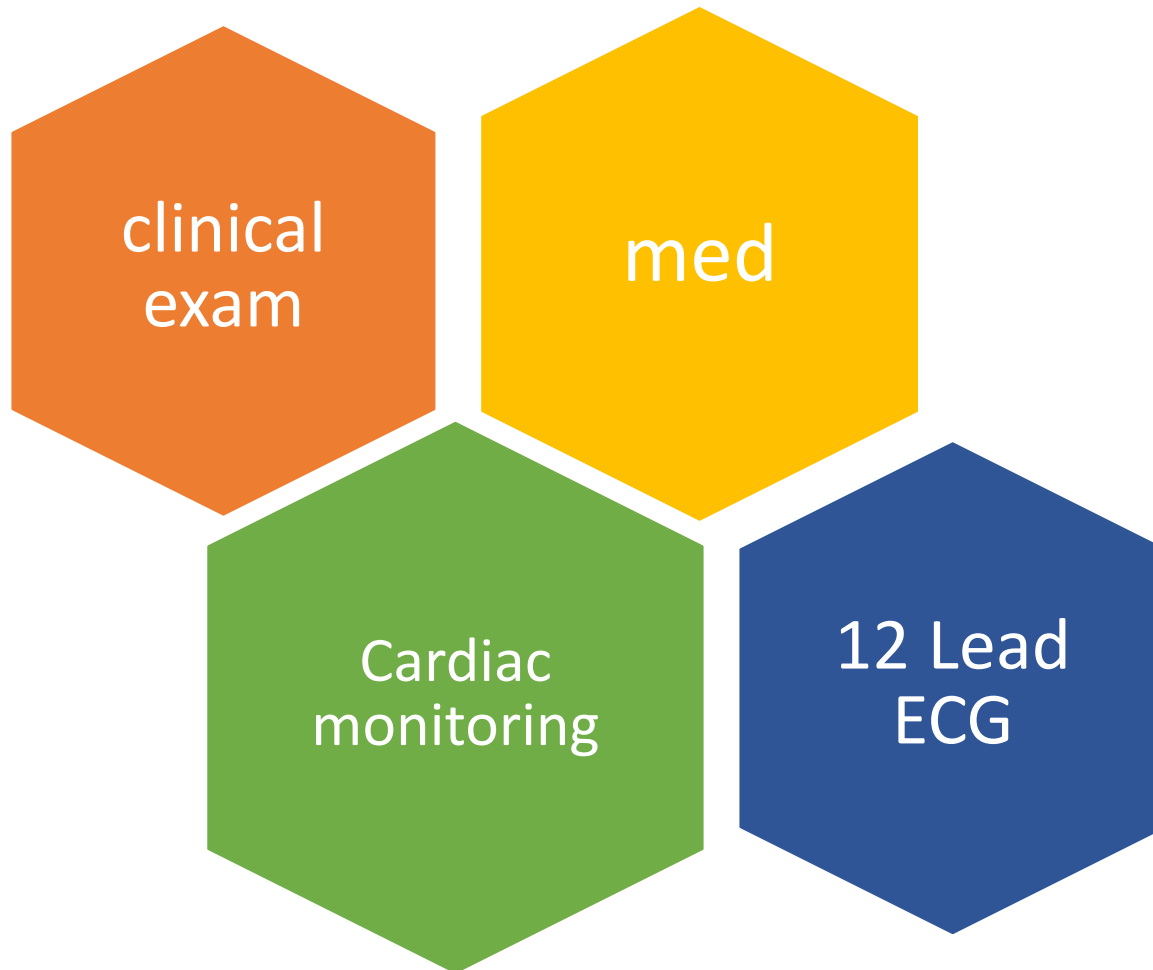




Role of emergency medical dispatch



Prehospital management



The PQRST method

P

- provoked the pain

Q

- quality of the pain

R

- radiation of the pain

S

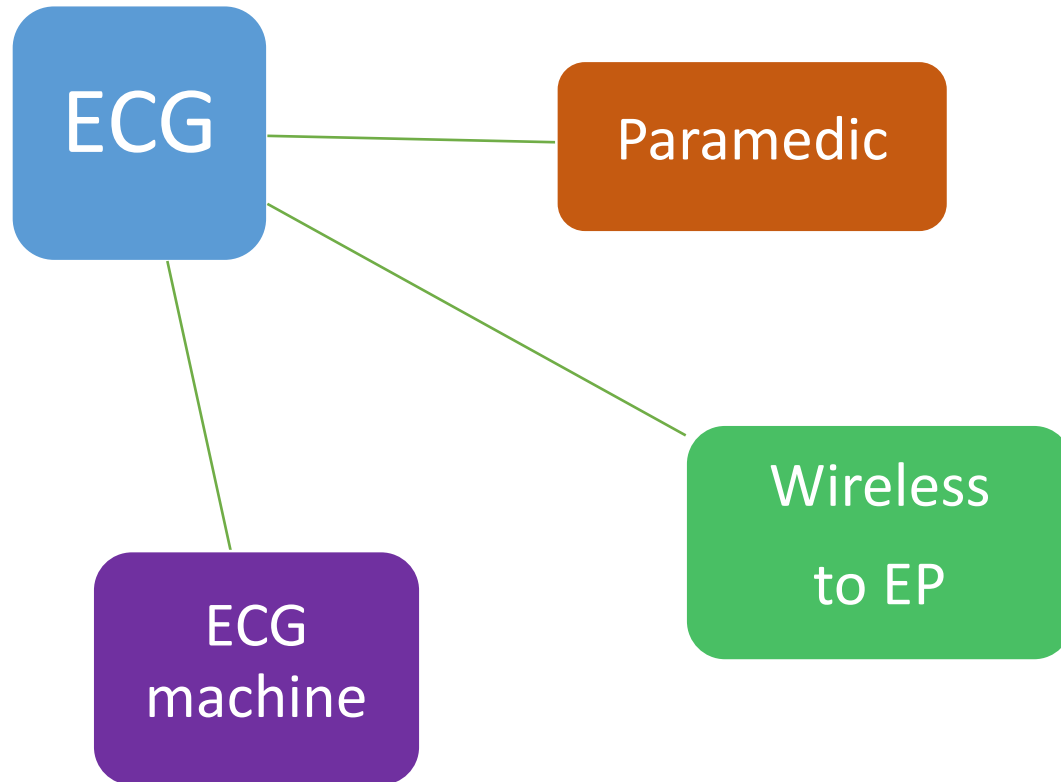
- severity of the pain

T

- temporal aspects of the pain

Prehospital ECG

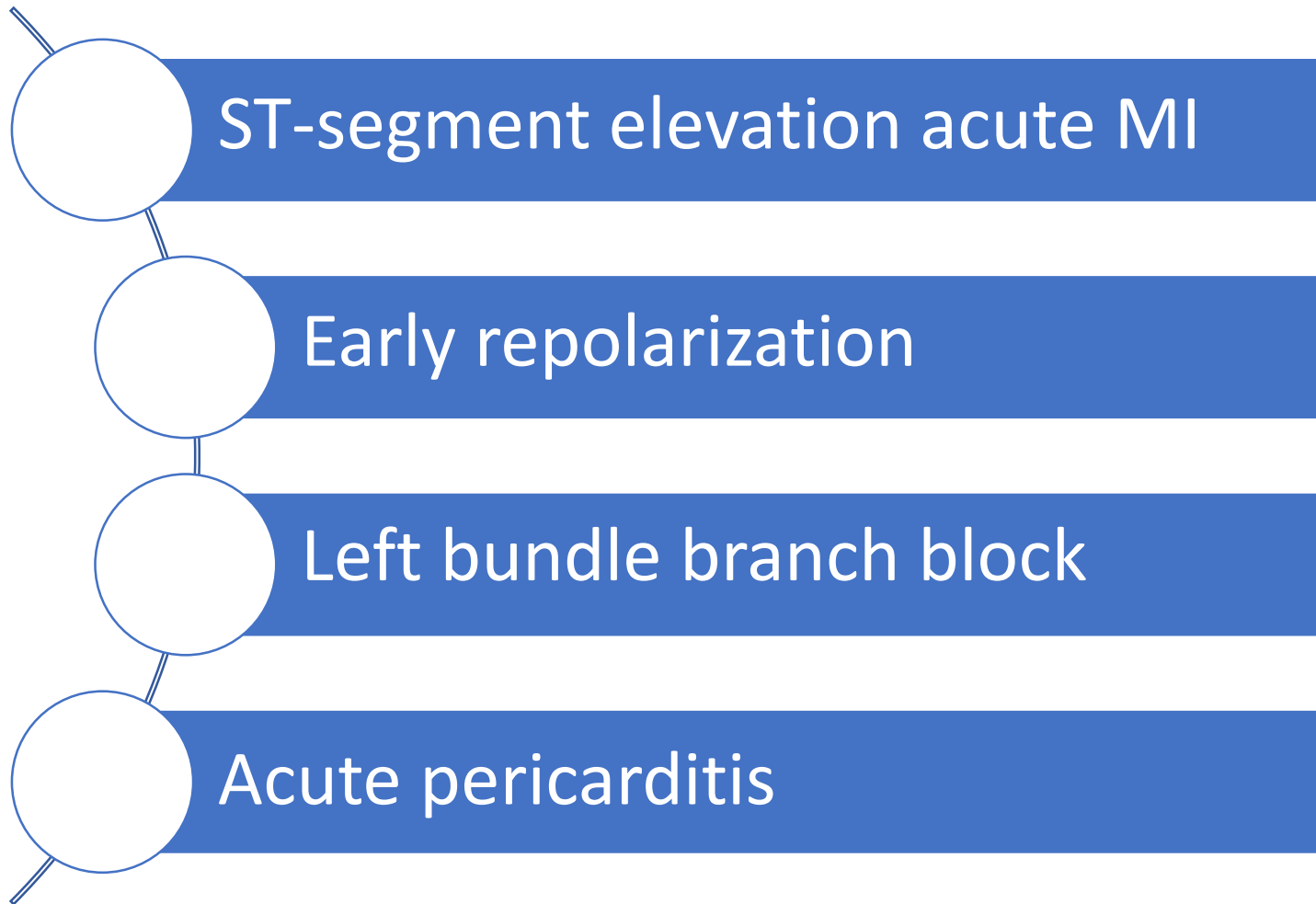
- Performing a prehospital ECG on a patient exhibiting signs and symptoms of ACS is a Class I AHA/ACC recommendation



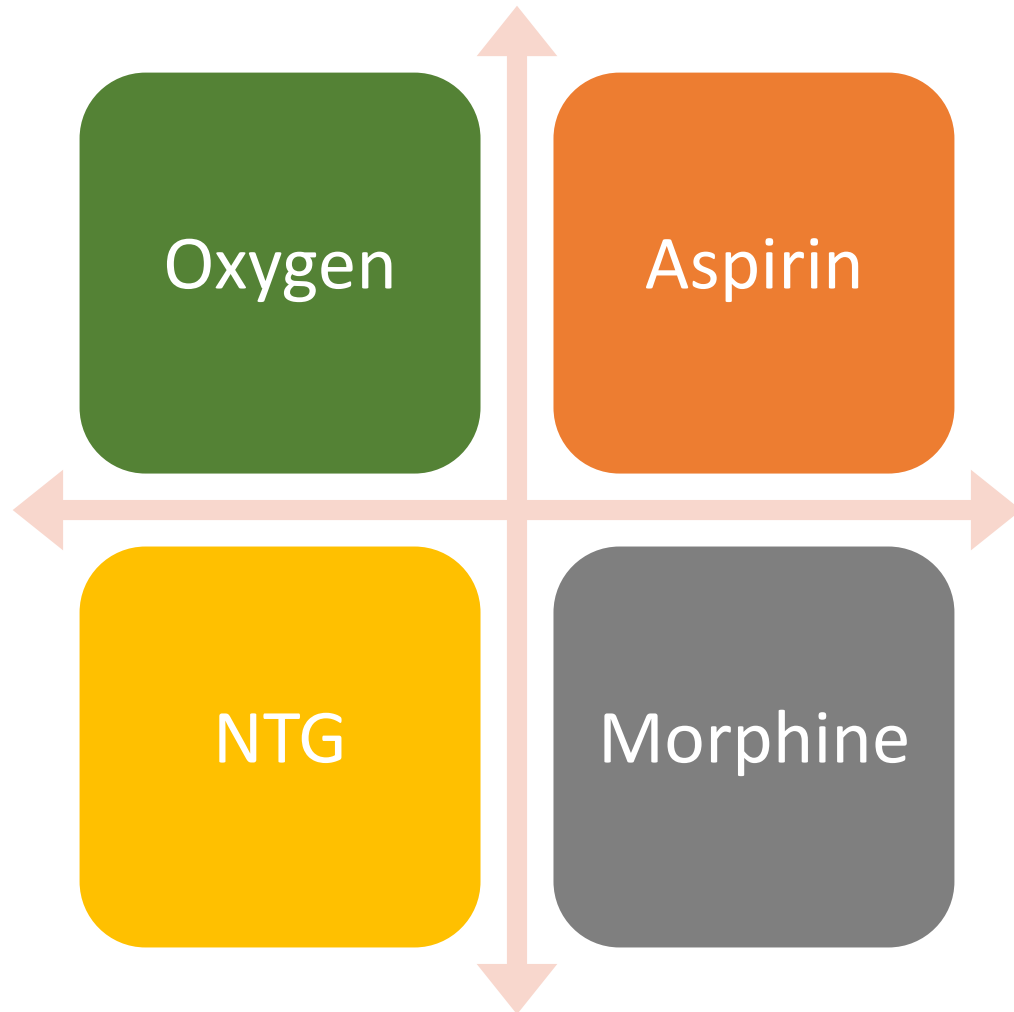
2015 Recommendations—ECG interpretation

- Because of high false-negative rates, we recommend that **computer-assisted ECG interpretation not be used as a sole means to diagnose STEMI** (Class III: Harm, LOE B-NR).
- We recommend that computer-assisted ECG interpretation may be used in conjunction with physician or trained provider interpretation to recognize STEMI (Class IIb, LOE C-LD).

The most common prehospital causes of ST-segment elevation



Medications



Oxygen

- Dyspneic
- SpO₂ <94%,
- signs of heart failure or shock



2015 Recommendations—Oxygen

- The usefulness of supplementary oxygen therapy has not been established in normoxic patients. In the prehospital, ED, and hospital settings, the withholding of supplementary oxygen therapy in normoxic patients with suspected or confirmed acute coronary syndrome may be considered (Class IIb, LOE C-LD).

Aspirin

- given as soon as possible
- Dose: 160 - 325 mg
- 4 x 81 mg baby aspirin
- Rectal preparations (300 mg)
- contraindications
 - aspirin allergy
 - history of active GI bleeding



Cox D, et al., Effect of enteric coating on antiplatelet activity of low-dose aspirin in healthy volunteers. *Stroke* 2006;37:2153–8

Nitroglycerin

- relieve chest pain due to angina
 - ↓ myocardial oxygen demand
 - ↑ collateral blood flow to ischemic areas of the heart
- not effective at ↓ STEMI mortality.
- 0.4 mg sublingual tablets , oral spray
- 3 doses (interval 5 minutes)



- AHA/ACC recommendations for self administered patient use of nitroglycerin is for them to call EMS
- if chest pain is not improved 5 minutes after only a single dose of nitroglycerin to avoid a 15–20 - minute delay before activating the EMS system among STEMI patients

Nitroglycerin

- Avoid phosphodiesterase inhibitors
 - sildenafil or vardenafil 24 hours
 - tadalafil 48 hours



- RV infarction
 - If SBP <100 mmHg or HR <60 bpm → ECG 12 leads
- SBP <90 mmHg or HR <50 or >100 bpm.

Morphine sulfate

non-STEMI : ↑ higher mortality

Fail Nitroglycerin

- Dose : 2–4 mg IV
- ↑ 2–8 mg IV repeated at 5–15-minute



Beta-blockers

- IV
- hypertensive or have ongoing ischemia with no contraindications to their use
- On balance, the guidelines suggest that the need for prehospital administration of beta-blockers to patients with STEMI is limited

Prehospital Fibrinolysis



- Initiation of Treatment 58 minutes.



- All cause Mortality

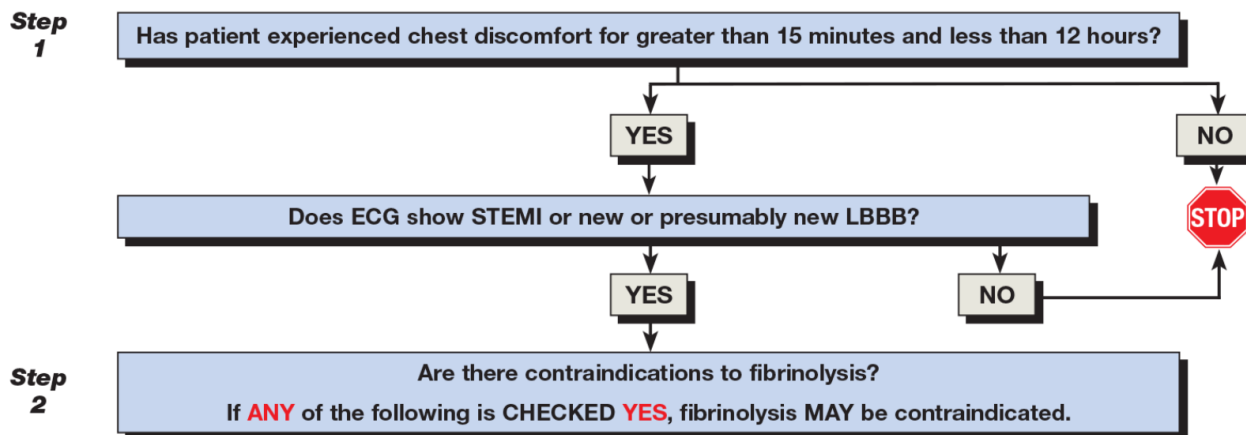
AHA 2015 (Class IIa, LOE B-R): Transport time > 30 mins.

Morrison LJ, Verbeek PR, McDonald AC, Sawadsky BV, Cook DJ.

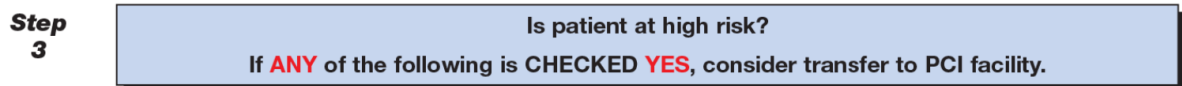
Mortality and prehospital thrombolysis for acute myocardial infarction: A meta-analysis.

JAMA 2000;283:2686–92

Prehospital Fibrinolytic Checklist*

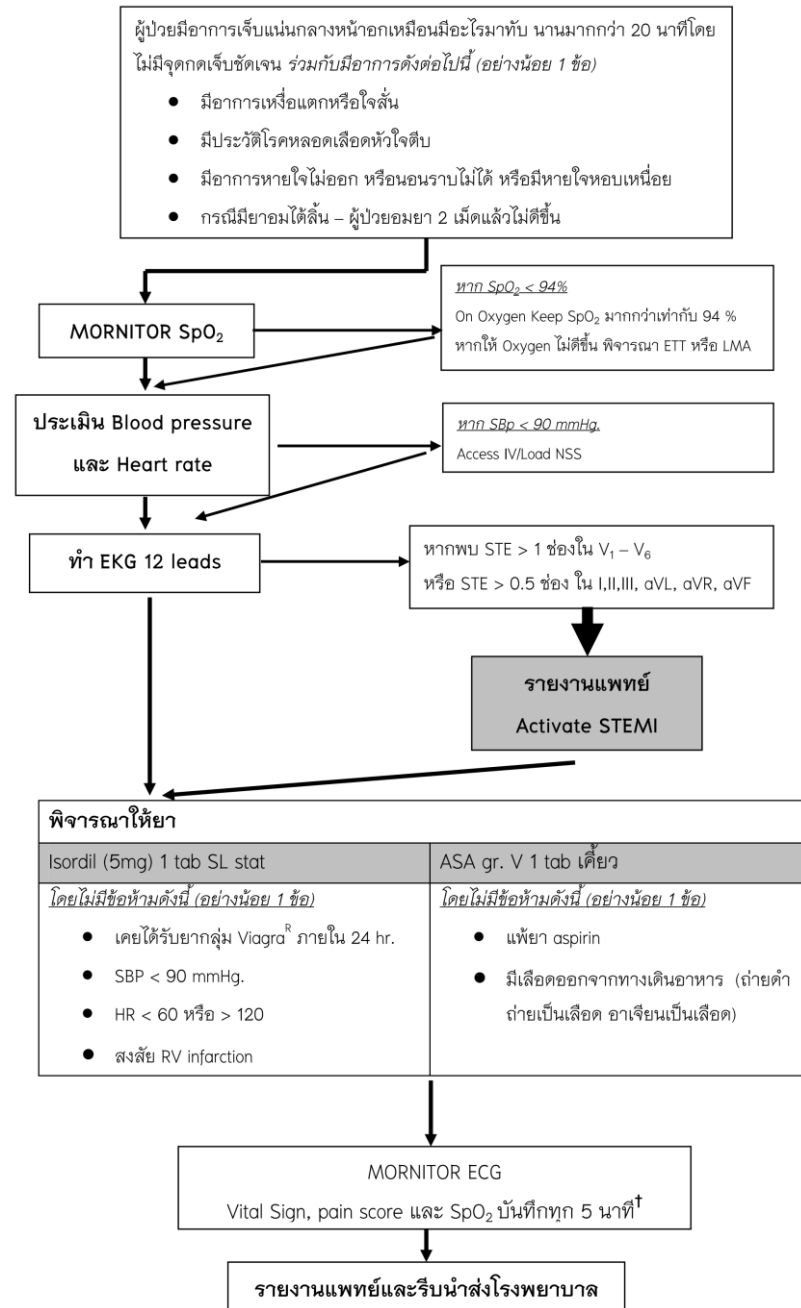


- Systolic BP >180 to 200 mm Hg or diastolic BP >100 to 110 mm Hg **YES** NO
- Right vs left arm systolic BP difference >15 mm Hg **YES** NO
- History of structural central nervous system disease **YES** NO
- Significant closed head/facial trauma within the previous 3 months **YES** NO
- Stroke >3 hours or <3 months **YES** NO
- Recent (within 2-4 weeks) major trauma, surgery (including laser eye surgery), GI/GU bleed **YES** NO
- Any history of intracranial hemorrhage **YES** NO
- Bleeding, clotting problem, or blood thinners **YES** NO
- Pregnant female **YES** NO
- Serious systemic disease (eg, advanced cancer, severe liver or kidney disease) **YES** NO



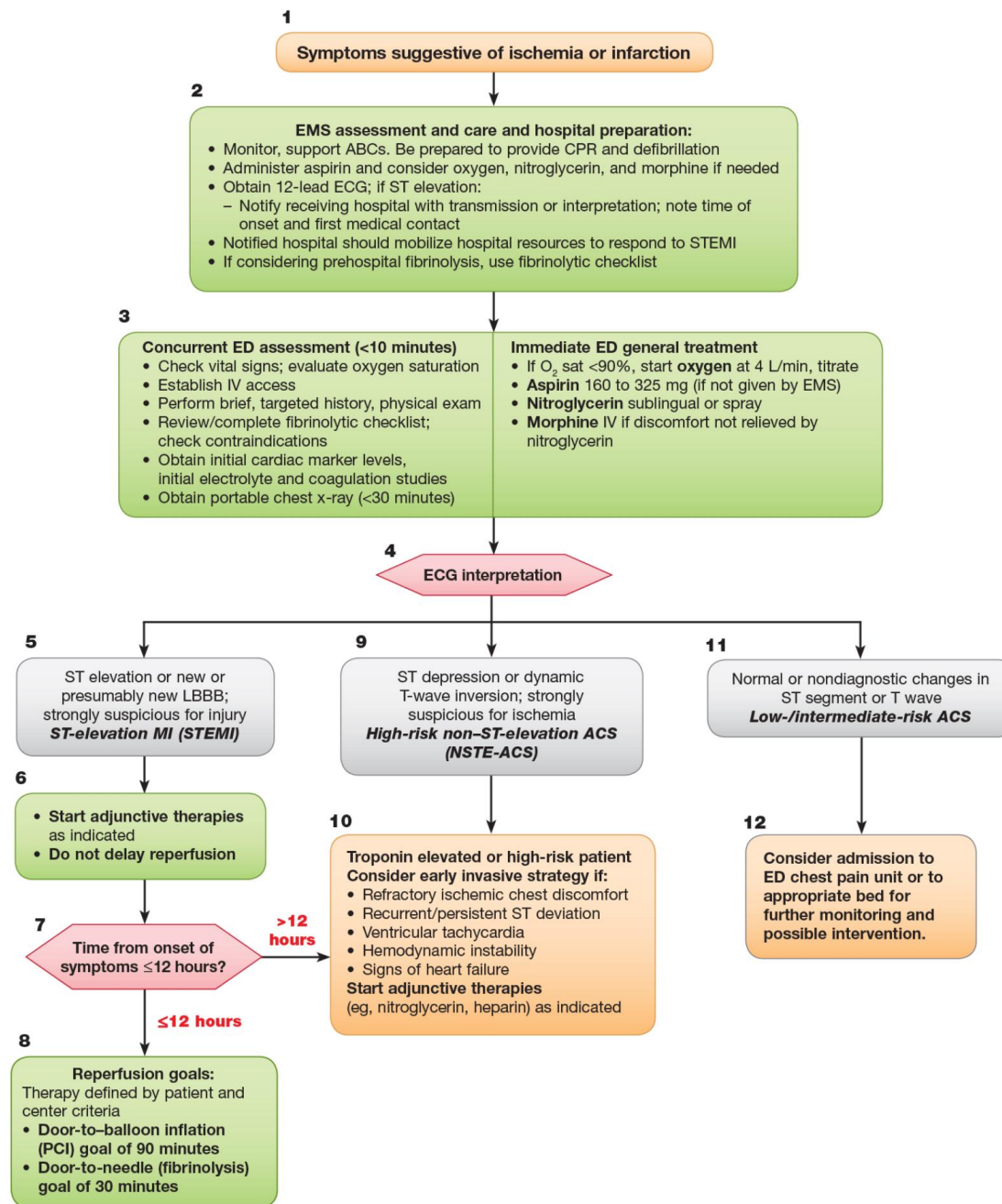
- Heart rate \geq 100/min AND systolic BP <100 mm Hg **YES** NO
- Pulmonary edema (rales) **YES** NO
- Signs of shock (cool, clammy) **YES** NO
- Contraindications to fibrinolytic therapy **YES**[†] NO
- Required CPR **YES** NO

แนวทางการดูแลผู้ป่วยโรคหลอดเลือดหัวใจนอกโรงพยาบาลนครเชียงใหม่



[†] ตรวจสอบข้อห้ามการให้ fibrinolytic กรณีเป็น STEMI

Acute Coronary Syndromes Algorithm—2015 Update



2015 Recommendations—ADP inhibition

- In patients with suspected STEMI intending to undergo PPCI, initiation of ADP inhibition may be reasonable in either the **prehospital or in-hospital setting** (Class IIb, LOE C-LD).

2015 Recommendations—Heparin

- We recommend that EMS systems that do not currently administer heparin to suspected STEMI patients do not add this treatment, whereas those that do administer it may continue their current practice (Class IIb, LOE B-NR).
- In suspected STEMI patients for whom there is a planned PPCI reperfusion strategy, administration of unfractionated heparin (UFH) can occur either in **the prehospital or in-hospital** setting (Class IIb, LOE B-NR).

2015 Recommendations—UFH

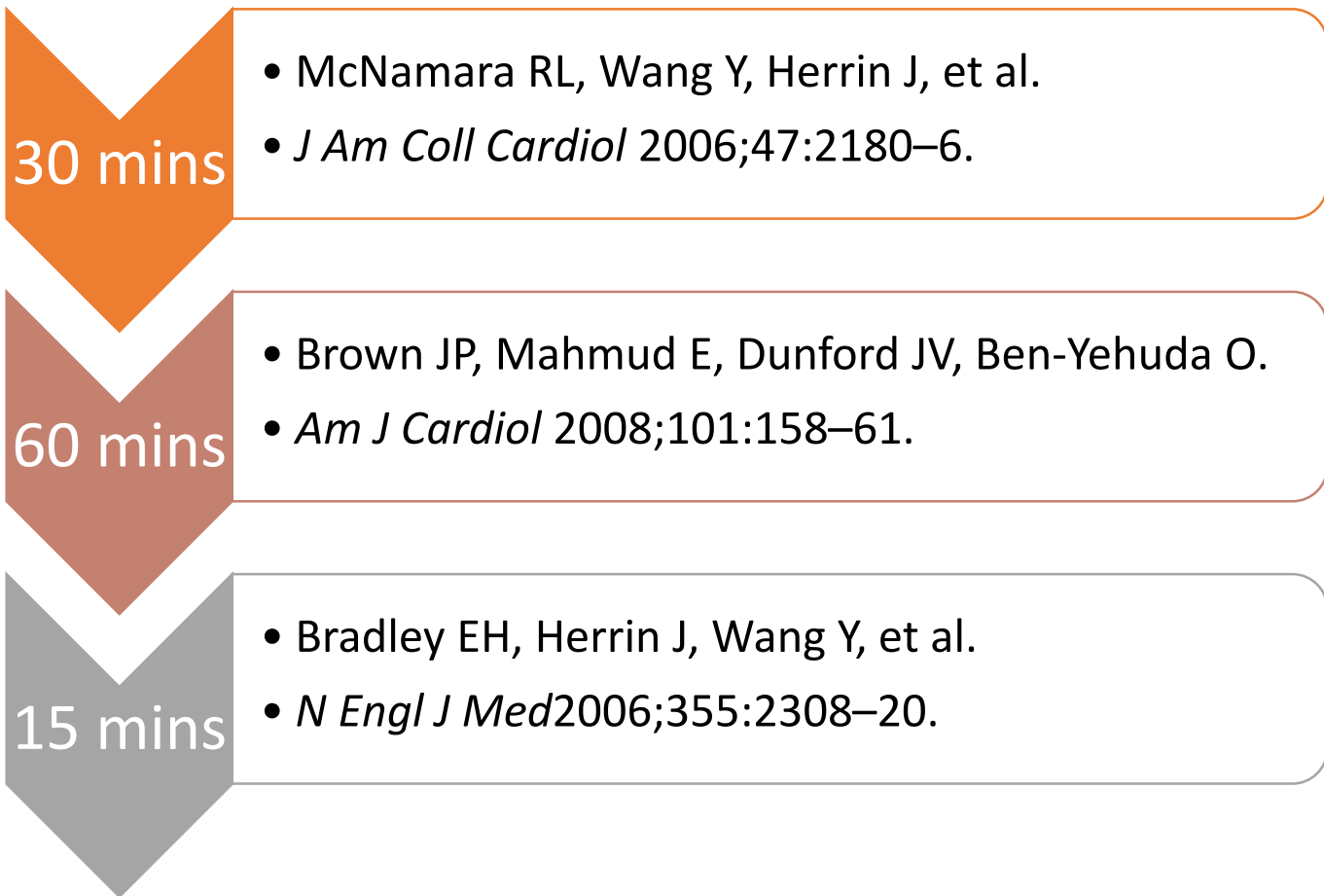
- It may be reasonable to consider the prehospital administration of UFH in STEMI patients or the prehospital administration of bivalirudin in STEMI patients who are at increased risk of bleeding (Class IIb, LOE B-R).
- In systems in which UFH is currently administered in the prehospital setting for patients with suspected STEMI who are being transferred for PPCI, it is reasonable to consider prehospital administration of enoxaparin as an alternative to UFH (Class IIa, LOE B-R).

2015 Recommendations—Fibrinolysis

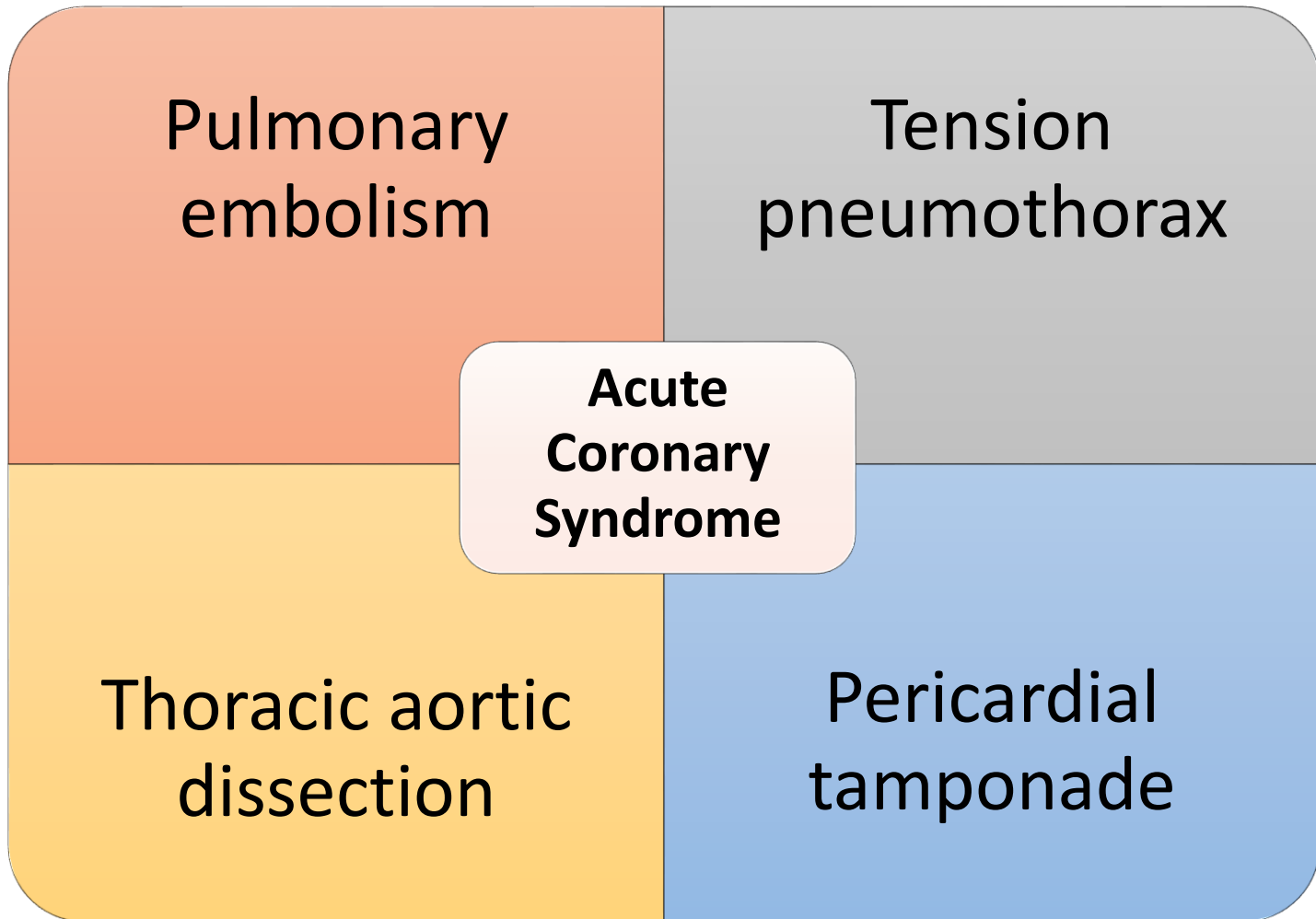
- Where prehospital fibrinolysis is available as part of a STEMI system of care, and in-hospital fibrinolysis is the alternative treatment strategy, it is reasonable to administer prehospital fibrinolysis when transport times are **more than 30 minutes** (Class IIa, LOE B-R).
- Where prehospital fibrinolysis is available as part of the STEMI system of care and direct transport to a PCI center is available, prehospital triage and transport directly to a PCI center may be preferred because of the small relative decrease in the incidence of intracranial hemorrhage without evidence of mortality benefit to either therapy (Class IIb, LOE B-R).

Prehospital notification and Field cardiac catheterization laboratory activation

- Shortening door-to-balloon time



Life threatening chest pain



SEPTIC SHOCK



Time is Mortality

**EARLY RECOGNITION AND
TREATMENT**





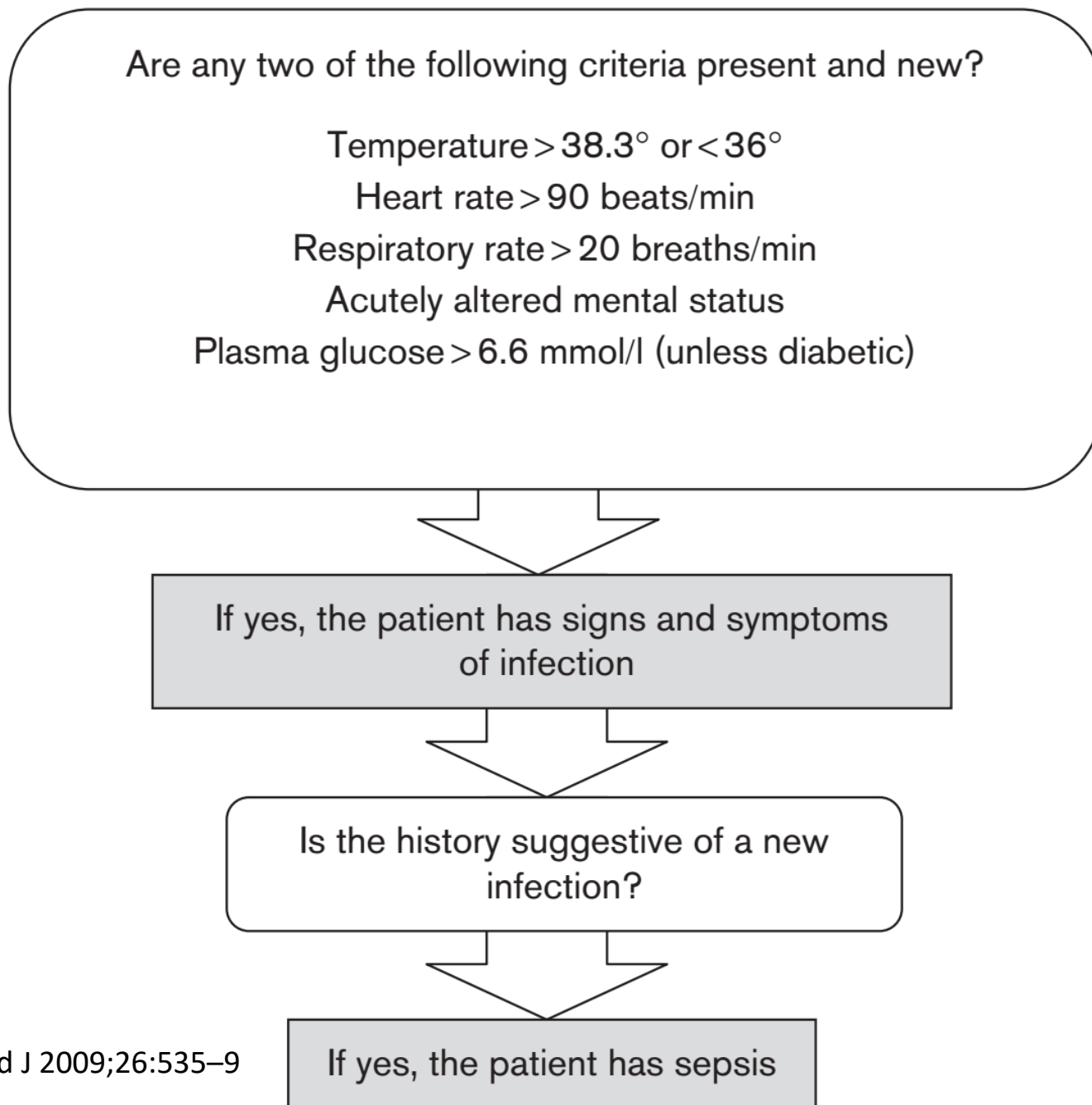
- Time to first antibiotics



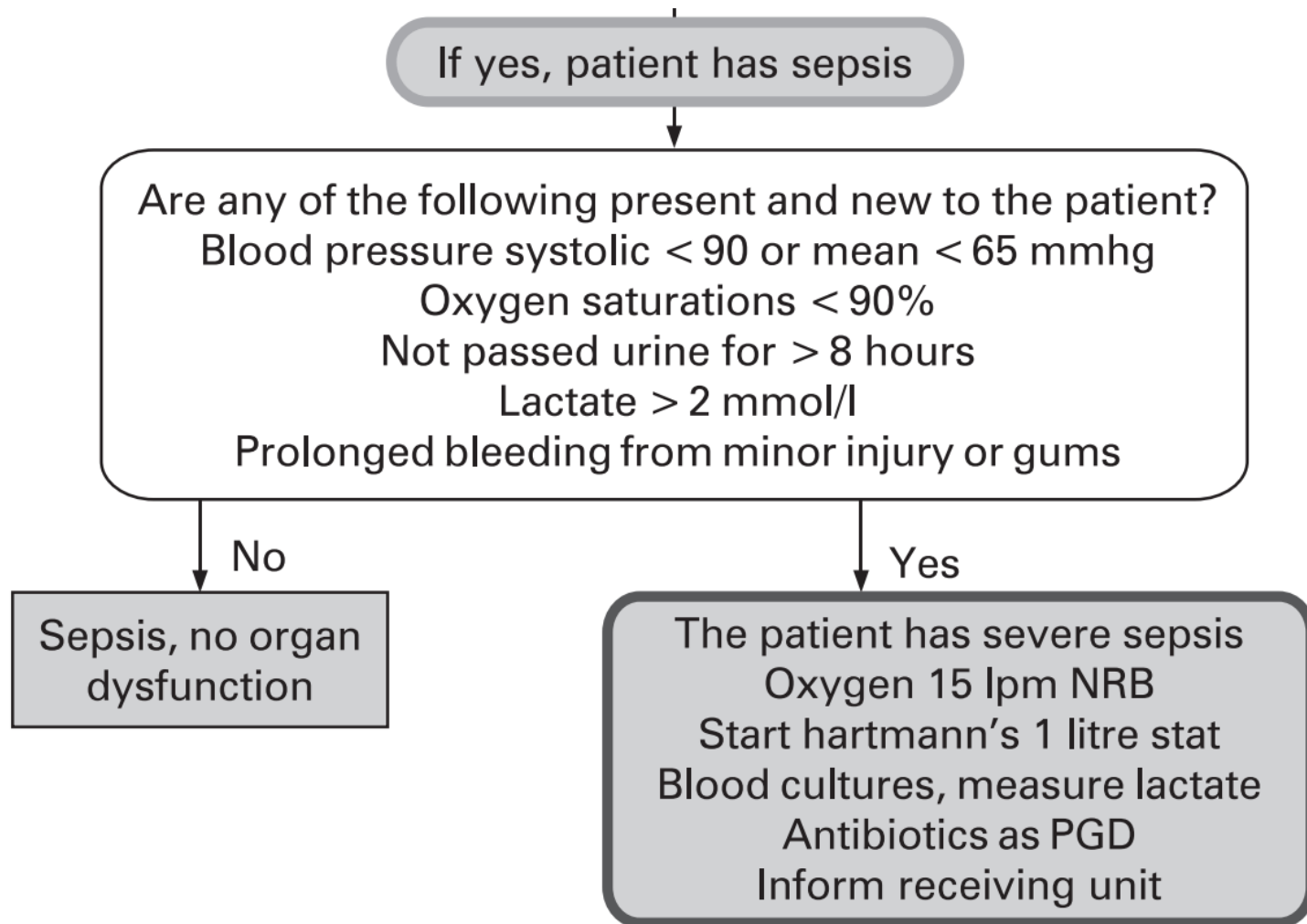
- Time from triage to EGDT initiation

- Studnek et al ,*Am J Emerg Med.* 2012;30(1):51–56.
- Roger A et al, *Acad Emerg Med.* 2011;18(9):934–940.

The Robson screening tool



The Robson screening tool



BAS 90-30-90

- systolic blood pressure <90 mmHg
- respiratory rate > 30 breaths/min
- oxygen saturation <90%

Ljungström L. A challenge to doctors of infectious disease: make the management of patients with acute severe bacterial infection as good as the management of acute coronary syndromes; 2005. Available at: http://www.mediahuset.se/Infektionslakaren/il405/en_utmaning.htm

Prehospital Early Sepsis Detection (PRESEP) score

Parameter	Score
temperature > 38°C	4
temperature < 36°C	1
HR > 90 beats/min	2
RR > 22 breaths/min	1
SaO ₂ < 92%	2
SBP < 90 mm Hg	2

Cutoff ≥ 4

Sepsis: sensitivity 85%, specificity 86%

Validity Measure	PRESEP Score ≥ 4	MEWS ≥ 4	BAS 90-30-90	Modified Robson Screening Tool
Sensitivity	0.85	0.74	0.62	0.95
Specificity	0.86	0.75	0.83	0.43
PPV	0.63	0.45	0.51	0.32
NPV	0.95	0.91	0.89	0.97

BAS 90-30-90 = acronym for sBP < 90 mm Hg; respiratory rate (Swedish: "Andningsfrekvens") > 30 breaths/min; SaO₂ < 90%⁴; NPV = negative predictive value; PPV = positive predictive value; MEWS = modified early warning score²; PRESEP = Prehospital Early Sepsis Detection; Modified Robson Screening Tool = altered mental state presented by GCS < 15.³

Sepsis Alert Protocol

Sepsis Alert will be instituted for patients meeting the following **3** criteria:

1. Suspected infection
2. Two or more of the following:
 - Temperature $> 38^{\circ} \text{C}$ OR $< 36^{\circ} \text{C}$
 - Respiratory Rate > 20 breaths/min
 - Heart Rate > 90 beats/min
3. $\text{ETCO}_2 \leq 25$ mmHg

Sepsis: sensitivity 69% specificity 67%

Severe Sepsis: sensitivity 90% specificity 58%

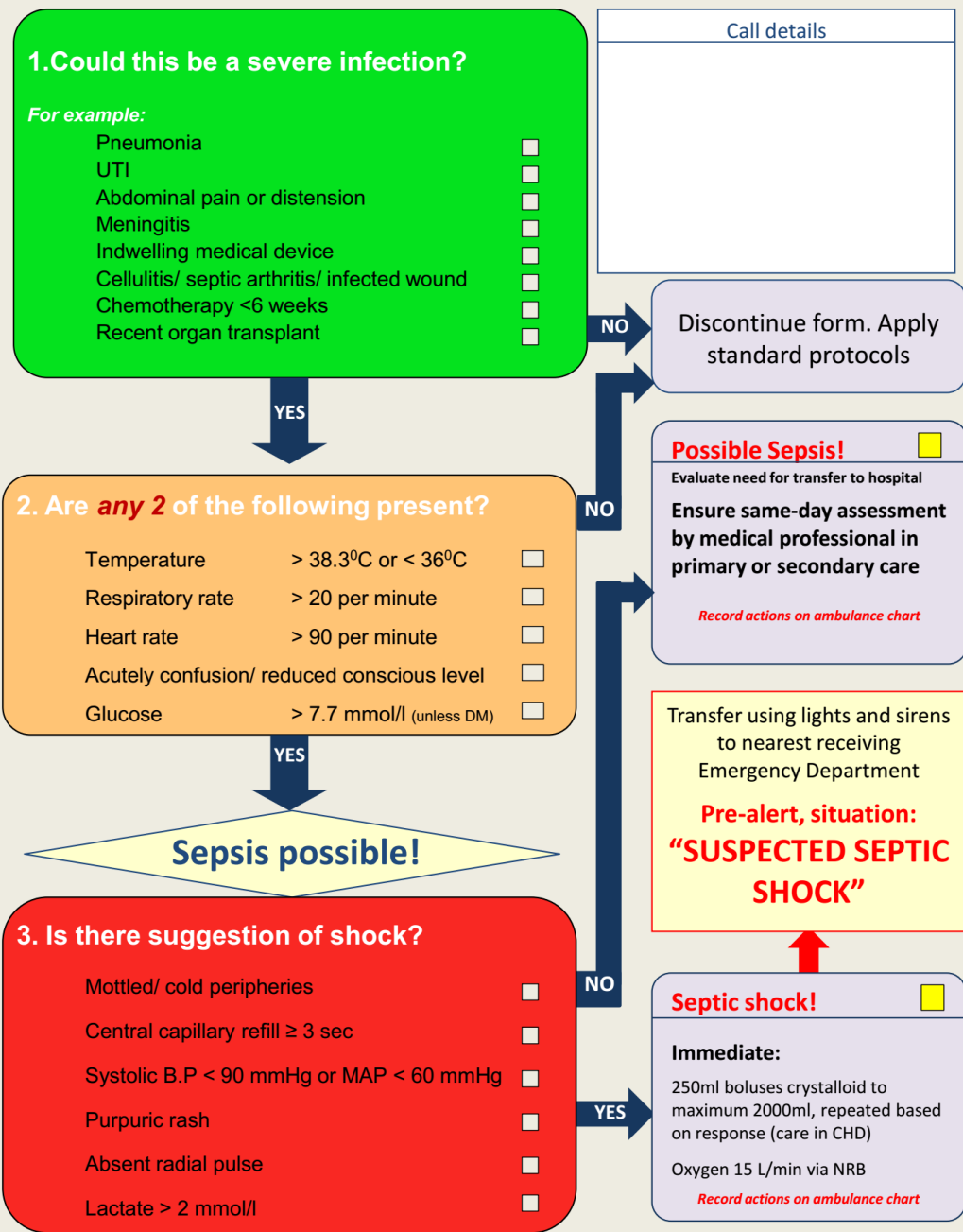
Prehospital Severe Sepsis Screening Tool

Pre-hospital Sepsis Screening Tool

Use for all adult (>16 years) patients who are not pregnant



If life is clearly immediately threatened, transport urgently with interventions en route



Paramedic Initiated Prehospital CMS Sepsis Core Measures

Jason Walchok NRP, FP-C

Training Coordinator, Greenville County EMS



Improving outcomes through education, training, and research

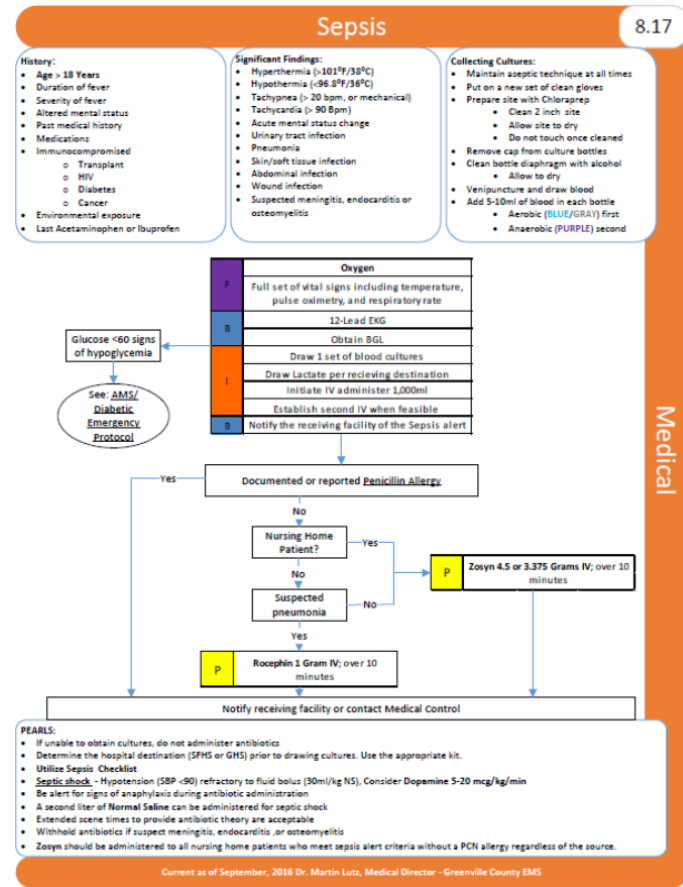
Greenville County EMS

- 80,000+ calls for service annually
- 29 ALS transport units
- 9 QRV's
- 32 Fire departments provide first response
- Over 200 field providers
- Coverage area of 800 sq. miles
- Dr. Martin Lutz Medical control
 - Dr. Tara Connolly Associate Medical Control



GCEMS Sepsis Protocol

- Identification of Sepsis
- Blood Culture Collection
- Blood collection for serum lactate
- Fluid resuscitation
- Broad spectrum antibiotic administration
- “SEPSIS Alert”



GREENVILLE HEALTH SYSTEM



BON SECOURS ST. FRANCIS HEALTH SYSTEM

GCEMS Sepsis assessment tool

Greenville County EMS
301 University Ridge Suite 1100 Greenville SC 29681

EMS Evaluation and treatment of Sepsis tool

Green Sepsis patient sticker

Date: _____ EMS Arrival Time: _____ Truck Number: _____

Lead Medic: _____ Culture Drawn by: _____

Evaluation for Sepsis

1. **Are any two of the following symptoms present AND new to the patient?**

- Hyperthermia (> 101°F or 38°C) or hypothermia (< 96.8°F or 36°C)
- Heart rate > 90 beats per minute
- Respiratory rate > 20 breaths per minute or mechanical ventilation
- Signs of poor perfusion (such as SBP < 90 mm/hg)

2. **Is the patient's presentation suggestive of any of the following infections?**

- | | |
|---|---|
| <input type="checkbox"/> Pneumonia (cough/thick sputum) | <input type="checkbox"/> Abdominal pain and/or diarrhea |
| <input type="checkbox"/> Urinary tract infection | <input type="checkbox"/> Wound infection |
| <input type="checkbox"/> Acutely AMS change | <input type="checkbox"/> Skin/soft tissue infection |
| <input type="checkbox"/> Blood stream/Catheter related | |

Temperature

Result: _____

Glucose

Result: _____ mg/dl

Normal Range 80-120 mg/dl

If positive for sepsis, call a sepsis alert and follow the directions on the back

GCEMS Sepsis assessment tool

GCEMS – both sides of this sheet must be copied and turned in or emailed to Jason Walchok

Treatment for sepsis

Confirm no PCN allergy – If PCN allergy DO NOT ADMINISTER ANTIBIOTICS

Draw Blood Culture (8cc-10cc of blood in each vial)

Time drawn: _____

- Prepare a 2 inch site area with chloraprep and allow to dry
- Disinfect the top of each culture bottle with alcohol and allow to dry
- Inoculate the aerobic (blue cap) bottle first and then the anaerobic (purple cap) bottle.
- Minimum of 3cc of blood in aerobic bottle is required to proceed with antibiotic therapy
- If unable to draw cultures **DO NOT ADMINISTER ANTIBIOTICS**

Draw point of care lactate (only good for 30 min)

Time Drawn: _____

Begin fluid resuscitation: **Normal Saline 1,000cc**

Total given: _____

Presumed sepsis from pneumonia: **Rocephin 1 Gram IV**

Time hung: _____

Presumed sepsis **not** from pneumonia: **Zosyn (3.375) 4.5 Grams IV**

Time hung: _____

Sepsis Kits



- Blood draw contents
 - Specific for each facility
- Prehospital assessment sepsis assessment tool
- Antibiotics
- Mini bag



ED arrival

- Pre hospital interventions are continued
- Patient is tracked by use of “Green sheet”
- Labs and blood cultures are sent to the laboratory
 - EMS Tech code
- CMS Core Measures:
 - EMS blood cultures
 - EMS administered ABX
 - EMS administered fluid



Outcomes

- Average time to ABX in the ED decreased
 - From 101 minutes prior to Sepsis Alert protocol
 - 46 minutes upon arrival after Sepsis Alert protocol implementation
- Lowest mortality rate in the history of Greenville Health System
- Fewer admissions to the ICU
- Significant savings in-hospital
- **Preliminary** data comparing historical (pre) sepsis patients and EMS administered antibiotics:
 - Decrease in mortality in EMS group
 - Severe sepsis and Septic shock



Meta-analysis was not performed high-quality studies are lacking

Prehospital management and identification of sepsis
by emergency medical services: a systematic review
Lane D, et al. Emerg Med J 2016;33:408–413

Evidence is current lacking

Impact of Prehospital Care on Outcomes in Sepsis
: A Systematic Review Smyth et al.
West J Emerg Med. 2016;17(4)427-437.

As Fast as you treat
Better outcome that you get

