ED Pitfalls Series

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Case A

- A 29 year-old female pregnant (GA 28 wks) was brought to ED after a traffic accident.
- Vital signs: GCS E3M6V4 BP 112/70 mmHg, PR 90 bpm, RR 20/min, BT 37.2ºC, SpO2 95%.
- PMH: G1P1, Nil
- ABG: pH 7.350 PaO2 88 PaCO2 40 HCO3 20.2

Physiologic changes in pregnant woman

- Cardiovascular system

1. Heart:
   move upward, hypertrophy of cardiac muscle
2. Cardiac Output
   increase by 30%, reach to peak at 32nd –34th week
3. Blood pressure
   early or mid pregnancy Bp ↓ . late pregnancy Bp↑ .Supine hypotensive syndrome

Physiologic changes in pregnant woman

- Hematology

1. Blood volume
1) Increase by 30%-45% at 32nd –34th (peak)
2) Relatively diluted
2. Composition
1) Red cells
   Hb:130→110g/L, HCT:38%→ 31%.
2) White cells: slightly increase
3) Coagulating power of blood: ↑
4) Albumin: ↓, 35 g/L

Physiologic changes in pregnant woman

- The Respiratory system

1. R rate: slightly ↑
2. vital capacity: no change
3. Tidal volume: ↑ 40%
4. Functional residual capacity: ↓
5. O_2 consumption: ↑ 20%

Physiologic changes in pregnant woman

- The urinary system

1. Kidney
1) Renal plasma flow (RFP): ↑ 35%
2) Glomerular filtration rate (GFR): ↑ 50%
2. Ureter
   Dilated (P ↑)
3. Bladder
   Frequent micturation

Physiologic changes in pregnant woman

- Gastrointestinal system

1) Gastric emptying time is prolonged→ nausea.
2) The motility of large bowel is diminished → constipation
3) Liver function: unchanged

Physiologic changes in pregnant woman

- Endocrine

1. Pituitary (hypertrophy)
1) LH/FSH: ↓
2) PRL: ↑
3) TSH and ACTH: ↑
2. Thyroid
1) enlarged (TSH and HCG ↑)
2) thyroxine ↑ and TBG ↑ → free T_3 T_4 unchanged

Case A

- Normal Lab values
  - Hct 32% -42%
  - WBC count 5,000-12,000/L
  - Arterial pH 7.40-7.45
  - Bicarbonate 17-22 mEg/L
  - PaCO2 25-30 mmHg

Case A

- Respiratory alkalosis is normal in late pregnancy, whereas “normal” CO2 partial pressure (a PaCO2 35-40 mmHg) may indicate CO2 retention, even impending respiratory failure.

Case B

- A 70 year-old male complains of general weakness for 1 day.
- Vital signs: BP 112/70 mmHg, PR 61 bpm, RR 22/min, BT 39.9ºC, SpO2 95%. GCS E4M6V5
- PMH: Hypertension with medications

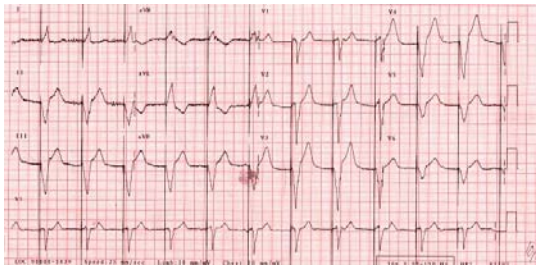
Case B

- Different vital signs should be integrated together instead of reading separately!
- Everyone’s normal range may not be the individual’s “normal range”.
- In case 1, TTAS II → Should be modified as Triage I

Case C

- A 77 year-old female has been noted tarry stool for 1 day.
- Vital signs: BP 106/78 mmHg, PR 69 bpm, RR 24/min, BT 36.2ºC, SpO2 96%. GCS E3M6V3-4
- PMH:
  - Dementia for 5 years
  - some kind of heart problem (according to her Indonesia care-giver)

Case C

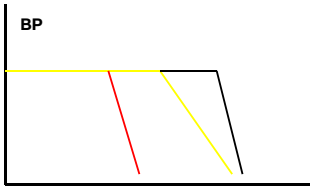


Case C

- Those who lack adequate compensation mechanisms
  - Known sympathovagal imbalance
  - Diabetes: sympathovagal imbalance
  - Drugs: Beta-adrenergic agents
  - Extreme elderly
  - Pacemaker for symptomatic bradycardia
  - Heart transplant recipients

Case C

- Those who have too good compensation mechanisms
  - Little kids
  - Athlete



Triage Decision Scheme (Trauma)

- STEP 1: Measure Vital Signs and Level of Consciousness
  - GCS<14
  - SBP<90
  - RR<10 or >29 (<20 for infant less than 1y)
  - RTS<11
  - PTS<9

Triage Decision Scheme

- STEP 2: Anatomic and Physiologic Approach
  - All penetrating injuries to head, neck, torso, and extremities proximal to elbow and knee
  - Flail chest
  - Two or more proximal long-bone fractures
  - Crush, degloved, or mangled exremity
  - Amputation proximal wrist/ankle
  - Pelvic fractures
  - Open and depressed skull fractures
  - Limb paralysis
  - Combined with burn

Triage Decision Scheme

- STEP 3: Trauma Mechanisms
  - Falls
    - Adults: >20 ft (1 story = 10 ft)
    - Children: >10 ft or 2 or 3 times the height of the child
  - High-risk auto crash
    - Intrusion into passenger compartment >12 inches (30cm); occupant site: > 18 in, any site
      - Major auto deformity >20 inches (50cm)
      - Extrication time > 20 minutes
    - Ejection (partial or complete) from auto
    - Death in same passenger compartment
    - Vehicle telemetry data consistent with high risk of injury (Initial speed >40mph (64 kph))
    - Auto vs. Pedestrian / bicyclist thrown, run over, or with significant (>20 mph) impact
      - Auto-pedestrian injury with > 5mph (8kph) impact
      - Motorcycle crash > 20 mph (32 kph) or with separation of rider and bike

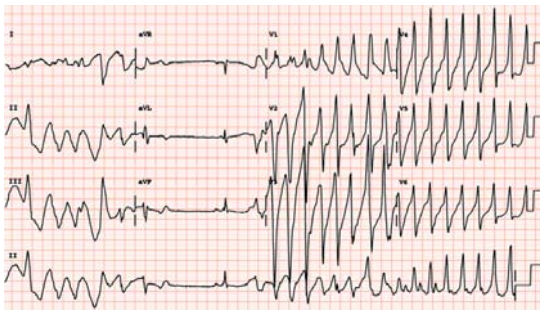
Triage Decision Scheme

- STEP 4: Special Patient or System Considerations
  - Age
    - Older adults: Risk of injury / death increases after age 55
    - Children: Should be triaged preferentially to pediatric-capable trauma centers (<5 y)
  - Anticoagulant and bleeding disorders
  - Time-sensitive extremity injury
  - Pregnancy >20 wks
  - EMS provider judgment
  - End-stage renal disease requiring dialysis
  - Immunosuppressed patients
  - Cardiac disease; respiratory disease
  - Insulin-dependent diabetes; cirrhosis; morbid obesity

Case D

- A 26-year-old female has found falling down 20 minutes ago. She regained consciousness 3 minutes later.
- Vital signs: BP 120/68, PR 62, RR 20, BT 35.8, SpO2 98% GCS E4M6V5
- PMH: PID/leukorrhea under treatment

Case D



Case D

- Long QT syndrome (LQTS)

Type of LQTS	Chromosomal Locus	Mutated Gene	Ion Current Affected
LQT1	11p15.5	*KVLQT1*, or *KCNQ1* (heterozygotes)	Potassium (I_{Ks})
LQT2	7q35-36	*HERG*, *KCNH2*	Potassium (I_{Kr})
LQT3	3p21-24	*SCN5A*	Sodium (I_{Na})
LQT4	4q25-27	*ANK2*, *ANKB*	Sodium, potassium and calcium
LQT5	21q22.1-22.2	*KCNE1* (heterozygotes)	Potassium (I_{Ks})
LQT6	21q22.1-22.2	*MiRP1*, *KNCE2*	Potassium (I_{Kr})
LQT7 (Andersson syndrome)	17q23.1-q24.2	*KCNJ2*	Potassium (I_{K1})
LQT8 (Timothy syndrome)	12q13.3	*CACNA1C*	Calcium ($I_{Ca-Lalpha}$)
LQT9	3p25.3	*CAV3*	Sodium (I_{Na})
LQT10	11q23.3	*SCN4B*	Sodium (I_{Na})
LQT11	7q21-q22	*AKAP9*	Potassium (I_{Ks})
LQT12		*SNTA1*	Sodium (I_{Na})
JLN1	11p15.5	*KVLQT1*, or *KCNQ1* (homozygotes)	Potassium (I_{Ks})

Case D

- Acquired long QT
  - Antibiotics
  - Antidepressants
  - Antifungals
  - Antihistamines
  - Diuretics
  - Heart medications
  - Lipid-lowering medications
  - Oral hypoglycemics (for diabetes)
  - Psychotropic medications

Case D

- Medications that triggers TdP in inherited LQTS
  - Appetite suppressants
  - Bronchodilators
  - Catecholamines
  - Certain common antibiotics (e.g., erythromycin)
  - Decongestants
  - Uterine relaxants
  - Vasoconstrictors

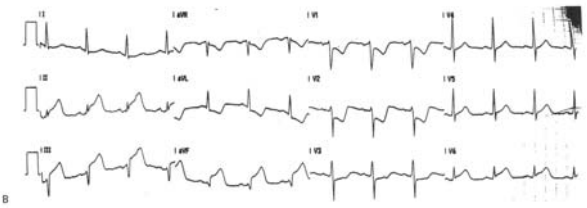
Case D

- Conscious Change
  - GCS 14-15 → TTAS Triage III-V
  - GCS 9-13 → TTAS Triage II
  - GCS 3-8 → TTAS Triage I
- Syncope right now or just before
  - Always implicates Triage I
    - TTAS Triage III-V (can be modified as Triage I)

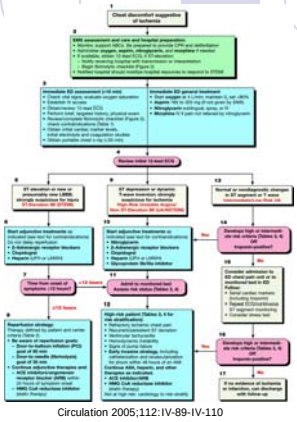
Case E

- A 45-year-old male complains of chest pain and cold sweating for 30 minutes
- Vital signs: BP 140/82, PR 80, RR 18, BT 36.5, SpO2 97% GCS E4M6V5
- PMH: smoking

Case E



Case E



Circulation 2005;112:IV-89-IV-110

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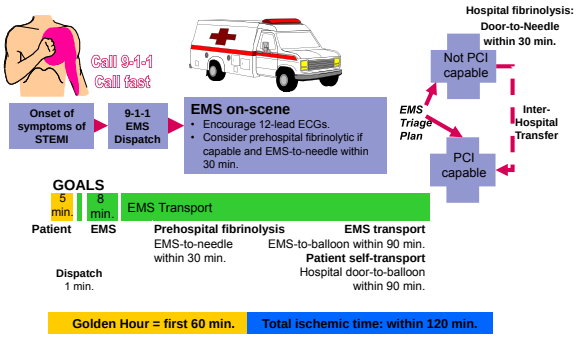
Options for Transport of Patients With STEMI and Initial Reperfusion Treatment



Antman EM, et al. *J Am Coll Cardiol 2008.* Published ahead of print on December 10, 2007. Available at http://content.onlinejacc.org/cgi/content/full/j.jacc.2007.10.001. Figure 1.

ESC STEMI Guidelines 2012

PG Steg (Hôpitaux de Paris, France)

ESC 2012

- The new document supplants the guidelines released in 2008 and complements the non-STEMI treatment guidelines released at the ESC 2011 Congress.
- It is hoped that better coordination and organization of STEMI care will reduce delays in the treatment of this urgent population.
- The new standard for time from medical contact to ECG is 10 minutes, and target time to primary PCI should be 60 minutes. Two hours is the limit of acceptable delay for a patient transferred from a non-PCI center to a PCI center, but the target should be 90 minutes.
- If PCI within two hours of presentation appears to be impossible, then fibrinolysis should be administered within 30 minutes.
- If fibrinolysis succeeds, angiography can begin with the expectation of PCI within three to 24 hours. If fibrinolysis fails, the interventionalist should consider PCI immediately.

New ESC STEMI Guidelines

Further guideline recommendations:

- Interventionalists should monitor and report their performance, including door-to-balloon times and any other treatment delays.
- Implanting drug-eluting instead of bare-metal stents in patients who are not contraindicated for dual antiplatelet therapy and are likely to stick to their prescribed regimen. The guidelines advise newer antiplatelet drugs, such as prasugrel or ticagrelor, over clopidogrel.
- The guidelines also support employing transradial catheterization rather than the transfemoral approach, but only in the hands of experienced operators.
- Areas in need of further research are identified in the guidelines—such as questions about early prehospital care to long-term management.

ESC STEMI Guidelines 2012: Commentary*

"[The new guidelines] emphasize the need to have geographic networks to care for patients so that the decisions and protocols are not simply coordinated at one site or one department, but across geographic regions between the various stakeholders.

"[They are] much more demanding [than the 2008 guidelines] in terms of delays. The new standard for time from medical contact to ECG is 10 minutes, and the fact that you use primary PCI should not lead to complacency about the delays. You should target 60 minutes.

"If I had to pick one area as the most critical, I'd highlight the challenge of integrating the various concomitant drug therapies, especially triple therapy in stent recipients who have to have anticoagulation. That's a vexing clinical problem for which we have very little data."

- Dr Gabriel Steg

*All comments from *New European STEMI guidelines emphasize care coordination* (http://www.theheart.org/article/1438277.do)

Case E

- Role of Emergency Physician on STEMI
  - Prompt and Correct Diagnosis
    - Atypical presentations: DM, Female, Elderly, medical modifications
    - Unusual ECG findings: hyperacute T, BBB
  - Successful Resuscitation for Witnessed VF/VT (Cardiac Arrest)
    - Peak of VF/VT vs. AMI
  - Always implicates Triage I
    - TTAS Triage II (can be modified as Triage I)

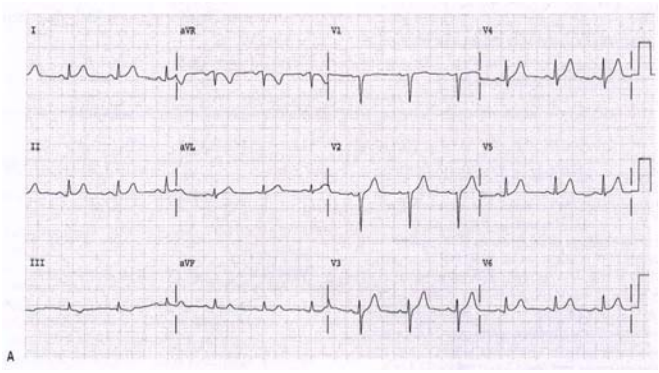
Case E

- Role of Cold Sweating
  - Excess Activation of Sympathetic Tone
  - Extreme Physical Stress
  - Atypical Presentations: Masking by Underlying Conditions or Medications
  - Always implicates Triage I
    - TTAS Triage II (can be modified as Triage I)

Case F

- A 60-year-old female complains sudden onset of epigastralgia 30 minutes ago
- Vital signs: BP 126/74, PR 75, RR 22, BT 36.3, SpO2 95% GCS E4M6V5
- PMH: diabetes under OHA for 7 years

Case F



Case F

- Unusual presentations
  - Sudden onset
  - Severe symptoms that never experienced
  - Extreme gaps between symptoms and signs
  - Sense of dying (or end of the world)
  - Illusion or hallucination of ghosts / gods
- Esp. in
  - those with atypical presentations
  - Low socio-economic status or special culture background

Case G

- A 25-year-old female complains gradual onset of headache and general weakness for 1 hour. She found her cat also sick.
- Vital signs: BP 98/54, PR 98, RR 22, BT 36.3, SpO2 98% GCS E4M6V5
- PMH: Nil

Case G

- Limitations for Pulse Oximetry
  - motion artifact
  - abnormal hemoglobins (primarily carboxyhemoglobin [COHb] and met-hemoglobin [metHb])
  - intravascular dyes
  - exposure of measuring probe to ambient light during measurement
  - low perfusion states
  - skin pigmentation
  - nail polish or nail coverings with finger probe
  - inability to detect saturations below 83% with the same degree of accuracy and precision seen at higher saturations
  - inability to quantitate the degree of hyperoxemia present
  - Hyperbilirubinemia has been shown *NOT* to affect the accuracy of SpO2 readings

Case G

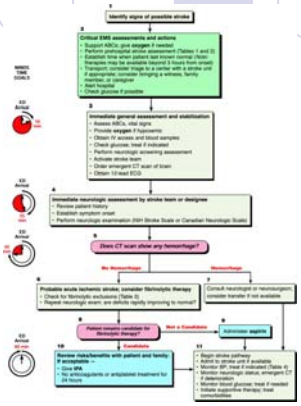
- Hypoxia
  - Hypoxemia (reduced arterial oxygen content)
    a. Reduced PaO2
    b. Reduced SaO2
    c. Reduced hemoglobin content (anemia)
  - Reduced oxygen delivery
    a. Reduced cardiac output
    b. Lefttoright systemic shunt (e.g., septic shock)
  - Decreased tissue oxygen uptake
    a. Mitochondrial poisoning (e.g., cyanide)
    b. Leftshifted hemoglobin dissociation curve (e.g., abnormal hemoglobin structure)

Case H

- A 68-year-old male was noted to have acute onset of right-sided weakness and speech difficulty 45 minutes ago.
- Vital signs: BP 170/122, PR 64, RR 22, BT 36.0'C, SpO2 96% GCS E4M6V5
- PMH: Nil

Case H

Seven D's



Circulation 2005;112:IV-111-IV-120

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Learn and Live

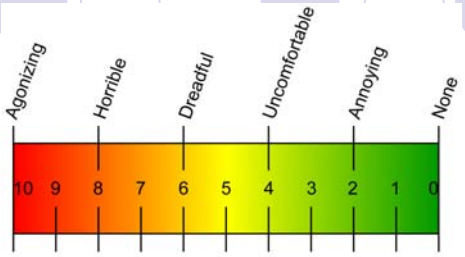
Case I

- A 21-year-old female complains sudden onset of severe headache (grade 10/10) for 1 hour.
- Vital signs: BP 140/96, PR 70, RR 24, BT 36.5'C, SpO2 98% GCS E4M6V5
- PMH: Nil

Case I

Pain Scale is Usually Under-estimated!

Case I



Task _____

Date _____ *Start* _____ *End* _____

Case I

- Life-Threatening Pain
  - AMI, DAA, PE, Cardiac Tamponade, Tension Pneumothorax, Esophageal Rupture
  - Hollow organ perforation, SMA Occlusion, Internal Hernia
  - Necrotizing Fasciitis
  - SAH
- Organ-Threatening Pain
  - Glaucoma
  - PAOD

Case J

- A 45-year-old female was injured by her husband 1 hour ago. Multiple bruising over her trunk and left forearm deformity were noted.
- Vital signs: BP 122/68, PR 95, RR 22, BT 35.6'C, SpO2 98% GCS E4M6V5
- PMH: Nil

Case J

- Social Indication as Triage I
  - Domestic Violence
  - Child Abuse
  - Sexual Assault
  - Attempted Homicide
- Highly Clinical Suspicion
- Usually Under-triaged

Case J

- Child Abuse
  - Screening
    - More than 3 episodes of trauma from ED recordings
    - Inconsistent medical history
    - Inconsistence between history and physical findings
    - Delayed transportation / consultation
    - Any fracture or head injury for those < 1y

Case J

- Child Abuse
  - Physical Findings
    - Skin: Blunt Injury, Burn, Bite
    - Face: Raccoon Eye, ENT, Teeth, Lip, Hair
    - Head: Abusive Head Injury, Shaken Baby
    - Abdomen: Liver Laceration, Duodenal Hematoma, Traumatic Pancreatitis, Mesentery Laceration
    - Fracture:
      - Much younger; Multiple; Varying stages; Spiral or Oblique
      - Eg: post. ribs; scapula; sternum; complex skull

Case J

- Child Abuse
  - High Specificity (for example)
    - Metaphyseal fractures
    - Rib fractures
    - Scapular fractures
    - Fractures of the outer end of the clavicle
    - Fractures of differing ages
    - Vertebral fractures or subluxation
    - Digital injuries in non-mobile children
    - Bilateral skull fractures
    - Complex skull fractures

Case K

- A 70-year-old patient was transferred to our ED under the diagnosis of ACS. His present chief complaint is SOB for more than 2 days (R1 recorded). He consulted another ED and has gotten the treatment of Clexane for 2 days.
- BP 136/72, PR 100/min, RR 18/min, SpO2 97%, GCS E4M6V5
- PMH: Hypertension

Case K

Case K

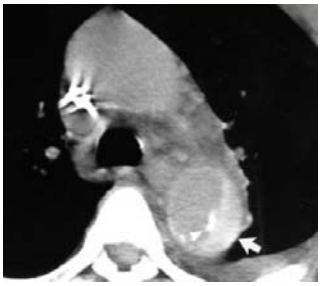
- MONA
- ECG Monitoring
- Continue Bokey, Clexane

Case K

- Review his history, sudden-onset unexperienced chest pain that radiated from anterior chest to middle back with cold sweating was noted initially 3 days ago.

Case K

Case K



Crescent Sign

Case K

- Inter-Hospital Transfer
  - Usually treated as Triage I
  - Over-triage rather than Under-triage
- Complete history taking
  - From the very beginning
    - Chief complaint at the 1st visit
  - Complete exclusion or NOT
    - Life-threatening chest pain
      - ACS
      - DAA
      - PE
      - Tension pneumothorax
      - Cardiac tamponade
      - Esophageal rupture

Case L

- A 63-year-old male suffered from sudden onset of left eye blindness.
- BP 158/92, PR 84/min, RR 20/min, SpO2 96%, GCS E4M6V5
- PMH: DM and Hypertension for 10 years

Case L

- Amaurosis Fugax
  - Embolic and hemodynamic origin
    - Atherosclerotic carotid artery
    - Atherosclerotic ophthalmic artery
    - Cardiac emboli due to (1) atrial fibrillation, (2) valvular abnormalities including post-rheumatic valvular disease, mitral valve prolapse, and a bicuspid aortic valve, and (3) atrial myxomas.
    - Temporary vasospasm
    - Giant cell arteritis
    - Systemic lupus erythematosus
    - Periarteritis nodosa
    - Eosinophilic vasculitis
    - Hyperviscosity syndrome
      - Polycythemia
    - Hypercoagulability
      - Protein C deficiency
      - Antiphospholipid antibodies
        - Anticardiolipin antibodies
        - Lupus anticoagulant
    - Thrombocytosis
    - Subclavian steal syndrome
    - Malignant hypertension
    - Drug abuse-related intravascular emboli
    - Iatrogenic

Case L

- Amaurosis Fugax
  - Occular origin
    - Iritis
    - Keratitis
    - Blepharitis
    - Optic disc drusen
    - Posterior vitreous detachment
    - Closed-angle glaucoma
    - Transient elevation of intraocular pressure
    - Intraocular hemorrhage
    - Coloboma
    - Myopia
    - Orbital hemangioma
    - Orbital osteoma
    - Keratoconjunctivitis sicca
  - Neurological origin
    - Optic neuritis
    - Compressive optic neuropathies
    - Papilledema
    - Multiple Sclerosis
    - Migraine
    - Pseudotumor cerebri
    - Intracranial tumor
    - Psychogenic

Case M

- A 12-year-old boy was sent to ED due to progressive dyspnea for several hours. He was just discharged 1 week ago after successful extubation.
- BP 110/66, PR 120/min, RR 28/min, SpO2 92%, GCS E4M6V5. No wheezing
- PMH: Asthma