

Medical
VideoReview



July
2017

Erin

Hoehn

Brad

Sobolewski

low & slow

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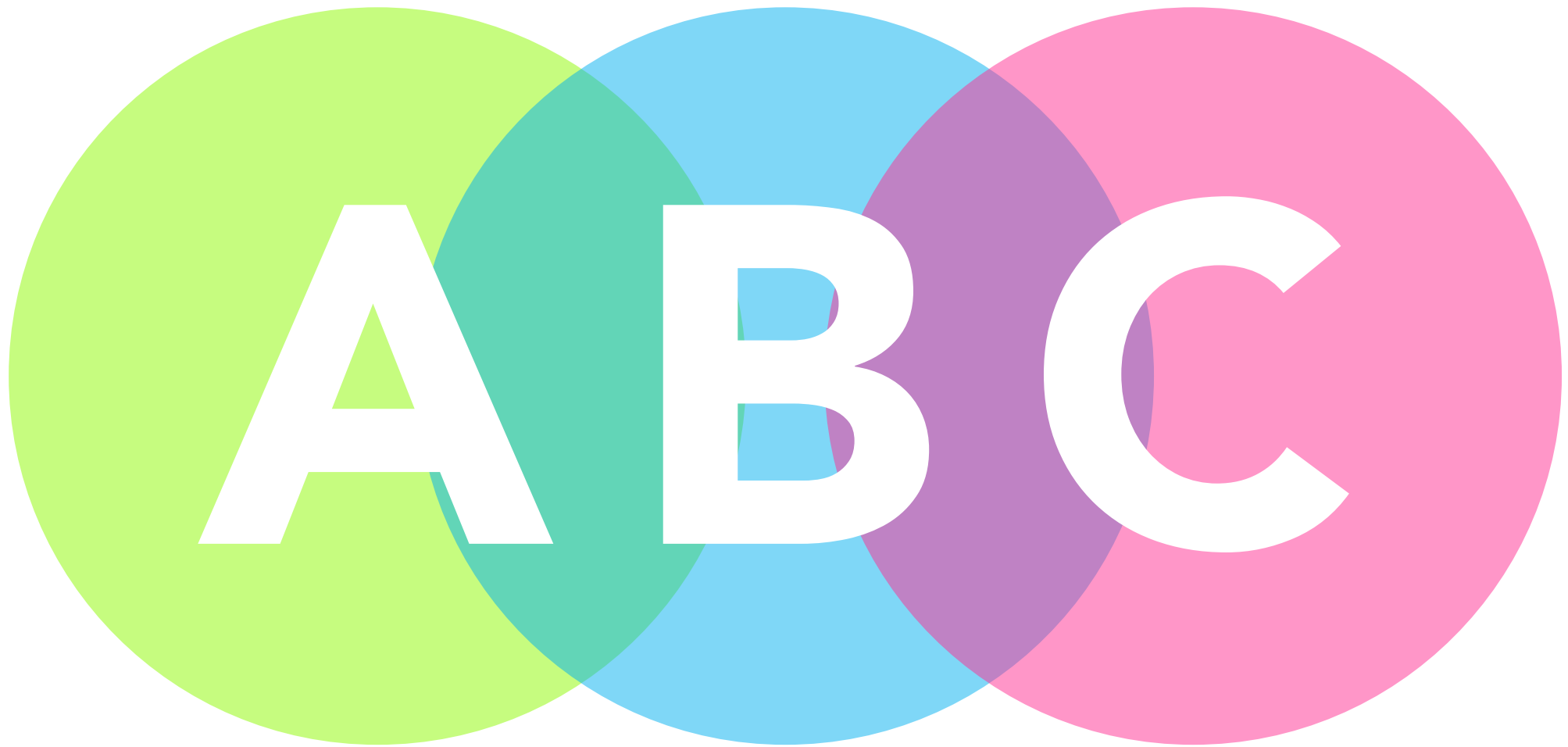
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5 year old girl
unresponsive
hypothermic
possible seizure



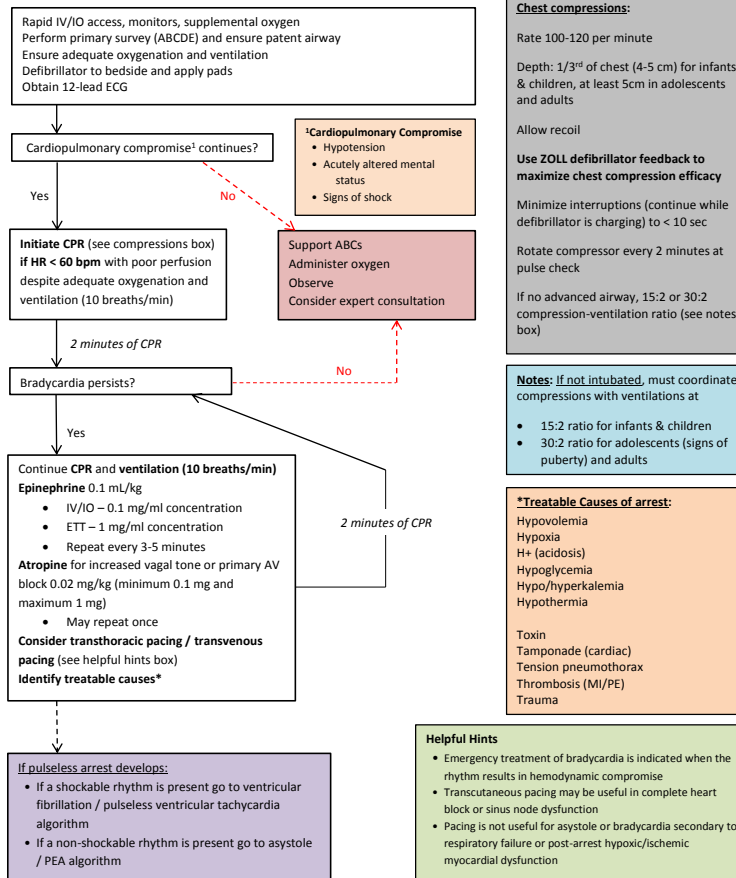
A

B

C

slow

PALS Bradycardia with a pulse and poor perfusion



Adapted from 2015 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. This is a guideline only and has been developed by the Medical Resuscitation Committee of the Division of Emergency Medicine. Last updated 4/2016.

slow

Epinephrine

- Alpha and Beta- Agonist
- Bradycardia - Acts on B1 receptors on the heart to Increases HR and cardiac output
- Hypotension - Acts on alpha 1 receptors vasoconstriction
- Cardiac arrest – goal is to increase coronary perfusion pressure

slow

Atropine

- Blocks acetylcholine at parasympathetic sites
- Help if cause of bradycardia is increased vagal tone

slow

Bradycardia in the STS

- Impaired perfusion and altered mental status
- Is it?
 - Tox
 - Sepsis
 - CNS
 - Primary cardiac – known CHD, myocarditis

slow

Causes of Bradycardia

Sinus Bradycardia or Junctional Rhythm	Complete AV Block
Respiratory: Hypoxia, Hypoventilation	Cardiac: Inherited AV block, Long QT, CHD
Cardiac: Sinus node dysfunction, CHD	Infection: myocarditis, endocarditis, Lyme disease, RMSF
Neurocardiogenic: Increased vagal tone	Metabolic
Neurologic: Increased Intracranial pressure	Miscellaneous: Muscular dystrophy, eosinophilic cardiomyopathy
Endocrine: Hypothyroid	Immunologic: Lupus, Sjogren Syndrome
Toxicology: B-block, α 2 agonist	
Miscellaneous: Hypothermia, Electrolyte abnormality	

Bradycardia with a pulse

- Common arrhythmia prior to arrest
- Multiple pathways can lead to bradycardia prior to arrest
 - Respiratory failure
 - Cardiovascular collapse
 - Herniation
- CPR for bradycardia with a pulse has better survival than PEA/Asystole

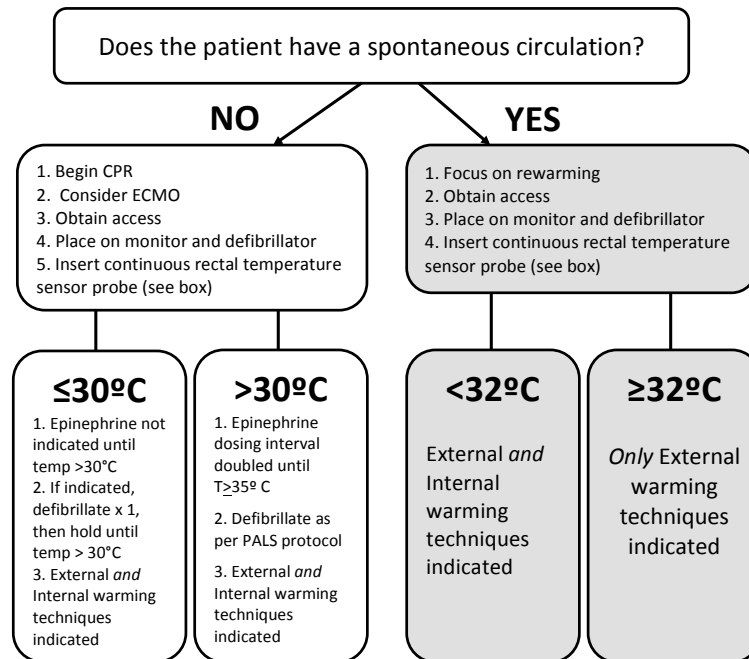
Source: Donoghue A, Berg RA, Hazinski MF, Praestgaard AH, Roberts K, Nadkarni VM; American Heart Association National Registry of CPR Investigators. [Cardiopulmonary resuscitation for bradycardia with poor perfusion versus pulseless cardiac arrest.](#) Pediatrics. 2009 Dec;124(6):1541-8.

slow

video

low

STS Management of Hypothermia-Induced Arrest



How to monitor continuous rectal temperature in hypothermia:

1. Obtain temperature sensor probe from drawer #2 of the bedside trauma cart.
2. Connect sensor probe to monitor cable. Extra monitor cables located in trauma Pyxis.
3. Insert sensor probe 2 inches into rectum, and secure with tape to buttocks and outer thigh.
4. Continuous temperature should automatically read out in lower right corner of monitor screen.

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Hypothermia (<35 C)

- Affects all organ systems
 - Decreased cardiac pacemaker activity leading to bradycardia – not vaguely mediated – possibly atropine refractory
 - This leads to decreased MAP and CO
 - CNS depression decreases linearly with temp drop - <33 brain activity abnormal
 - Core temp after drop – when rewarming a patient you get peripheral vasodilation which allows cool extremity blood to circulate back to the core

low

Hypothermia and infection

- Typical response to infection is a rise in body temp
- Hypothermia may be...
 - A marker of impaired immune response to infection
 - Associated with increased severity

low

Hypothermia and infection

- Hypothermia is ominous – adult lit
 - Clemmer et al Crit Care Med 1992 – 9% in a prospective cohort had temp <35 C. Mortality 62% vs 26% - also more rapid progression to death
 - Arons et al Crit Care Med 1999 – 10% hypothermic, mortality 2x (70% vs 35%)
 - Kushimoto et al Critical Care 2013 – cohort of 624 adults and severe sepsis temp <36.5 higher ISS, higher in hospital and 28d mortality rates
- Overall higher organ failure rates
- In elderly and neonates may be initial sign of sepsis

low

Why is this patient cold?

- This patient has **secondary hypothermia** – lowering of the body's temperature set point
- The hypothalamus regulates body temp
 - Controls heat *conservation* (vasoconstriction peripherally + behavior response) and heat *production* (shivering and incr thyroxine and epinephrine)
 - Threshold for shivering is 1 degree lower than vasoconstriction – “last resort” mechanism to maintain temp
 - CNS derangement impairs these normal functions

low

Why is this patient cold?

- Poor perfusion
- CNS dysfunction
 - Dysregulated inflammatory cytokine responses, as well as physiological alterations of temperature regulation centers in the hypothalamus
 - Pyrogens secreted the bacteria
 - CNS/sympathetic instability
- Low glycogen stores

low

This is a
challenging
case!

**5 year old with
respiratory failure,
bradycardia and
impending cardiac arrest**

is it
sepsis?

- Poor perfusion
 - Cold shock?
- History of one week of illness
- Cardiac dysfunction

is it
tox?

- Bradycardia
- Altered mental status

is it
trauma?

- Altered mental status
- Bradycardia
- Hypothermia
- No obvious external signs of injury

Back to the patient

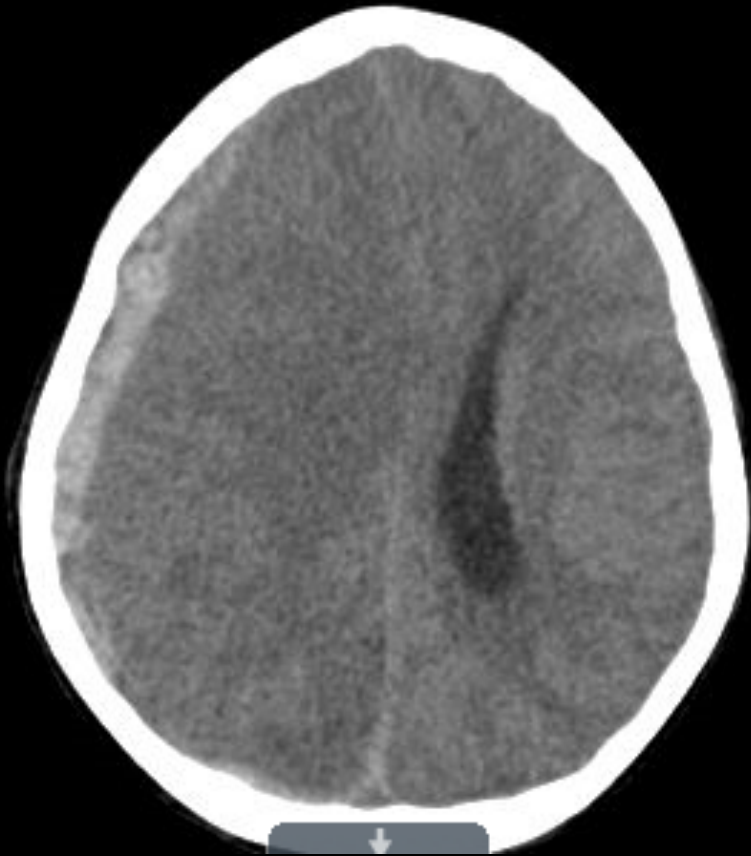
- 2 doses of epi
- Compressions stopped when HR > 60
- 80mL/kg fluid, then started on epi drip
- Gas: 7.28/42/ -7

Intubation

- RSI with ketamine and succinylcholine
- 4 attempts by ED personnel
- Anesthesia was ultimately successful
- Airway was anterior and patient was micrognathic



A



H



ST



Back to the patient

- Head CT showed subdural hematoma, uncal/subfalcine herniation and ischemic injury (PCA)
- Taken to OR with Neurosurgery
 - Hemicraniectomy for evacuation of acute subdural hematoma
 - Right frontal lobe parenchymal ICP monitor
 - Subgaleal drain
- Additional diagnoses included C1-C2 ligamentous injury seen on MRI

Back to the patient

- Admitted to Rehab
- She is walking and talking!
- Ward of Hamilton County, awaiting Foster Care placement upon discharge
- Her father admitted to having caused her injuries

The team
saved this
child's life!

Back to the patient

- Why this wasn't sepsis
 - Hypothermia, bradycardia but not acidotic
- If not sepsis then trauma?
 - In retrospect would this be an appropriate upgrade to a trauma STAT?
- Other interventions the team may have considered
 - C spine protection, especially during intubation
 - HOB 30 degrees and other ICP therapies like hypertonic saline

Back to the patient

- If not sepsis then trauma?
 - In retrospect would this be an appropriate upgrade to a trauma STAT?
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key points

Bradycardia

- Bradycardia with poor perfusion is an indication for CPR, Epi and atropine
- Relative bradycardia to the situation at hand should make you think of intracranial pathology

Hypothermia

- The algorithm is for hypothermic arrest only – generally this means environmental exposure
- Secondary hypothermia is due to cytokines, infection and/or hypothalamic dysfunction
- Hypothermia in the septic patient is an ominous sign

Trauma

- Check the pupils!
- The history is rarely suggestive
- Always keep NAT in mind

The end

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