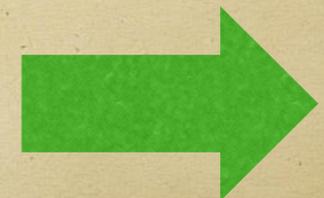


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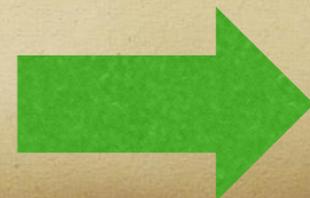
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Commitee



1. A 38-yr-old male with status epilepticus was treated by EMS with IM midazolam. The patient does not appear to be seizing anymore but he is not waking up in the ED. Next step will include ALL except

- A. CT Scan
- B. Lumbar puncture
- C. EEG
- D. Reverse midazolam with flumazenil
- E. Check blood sugar

next question



A. CT Scan

CT scan may be indicated to diagnose new lesions, subdural or extramural hematoma if seizures resulted in traumatic brain injury or cerebral edema from prolonged seizures

Incorrect

[Try again](#)

Metter RB, Rittenberger JC, Guyette FX, Callaway CW. Association between a quantitative CT scan measure of brain edema and outcome after cardiac arrest. *Resuscitation*. 2011;82:1180–5.

B. Lumbar puncture

- Lumbar puncture should be performed in patients who are febrile and there is suspicion of central nervous system infection after initial CT scan.

Incorrect

➤ [Try again](#)

➤

C. EEG

- ⌘ EEG is necessary to diagnose non-convulsive seizures. Prolonged seizures can result in neuronal injury and must be controlled. Hence immediate diagnosis of ongoing electrical seizures must be obtained.

Incorrect

⌘ [Try again](#)

D. Reverse midazolam with flumazenil



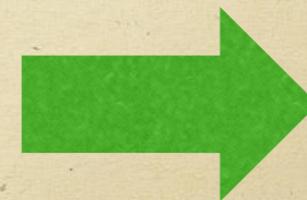
- Reversing midazolam effect will be life threatening especially if the patient has ongoing non-convulsive seizures. Respiratory depression may occur secondary to benzodiazepine administration and patients must be closely observed in a monitored setting.

Correct answer

- Back to the question



next question



E. Check blood sugar

- ↳ Hypoglycemia must be ruled out as soon as possible. Hypoglycemia could be the reason for status epilepticus or the reason the patient is not waking up after termination of seizures with first line therapy (benzodiazepines) and second line therapy (anti- epileptic drugs)

Incorrect

↳ [Try again](#)

2. A 55- yr-old male suddenly collapsed at the mall. He was in V- fib cardiac arrest and was rapidly resuscitated with return of spontaneous circulation

Therapeutic hypothermia would be contraindicated in all EXCEPT

- A. Patient had arrested 12 hours ago
- B. DNR status
- C. Patient needs coronary angiography and stenting
- D. Widespread malignancy
- E. Active bleeding

Next question



A. Patient had arrested 12 hours ago

- Patients who have suffered cardiac arrest more than 12 hours ago are less likely to benefit from induced therapeutic hypothermia. The patients should however be kept normothermic and fever must be controlled

Incorrect

[Try again](#)

Kuboyama K, Safar P, Radovsky A, Tisherman SA, Stezoski SW, Alexander H. Delay in cooling negates the beneficial effect of mild resuscitative cerebral hypothermia after cardiac arrest in dogs: a prospective, randomized study. Crit Care Med. 1993;21: 1348–58.

B. DNR status

- ⤵ DNR status in any patient must be respected and is an absolute contraindication for therapeutic hypothermia after cardiac arrest

Incorrect

- ⤵ [Try again](#)



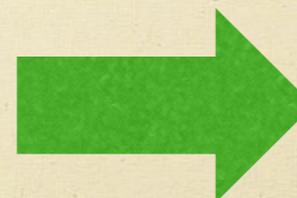
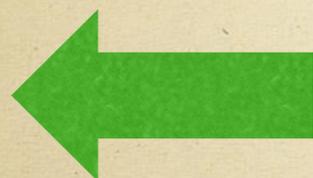
C. Patient needs coronary angiogram and stenting

Patients with coronary occlusion may suffer from V- fib arrest. Therapeutic hypothermia is not a contraindication for administration of anti-platelet or anti-coagulant medications. Mild hypothermia does not increase risk of cardiac arrhythmias

Correct answer

Back to the question

next question



Dumas F, Cariou A, Manzo-Silberman S, et al. .Immediate per-cutaneous coronary intervention associated with better survival after out of hospital cardiac arrest: insights from the PROCAT registry. Circ Cardiovasc Interv 2010; 3: 200-7

D. Widespread malignancy

- In patients with widespread malignancy or any illness that precludes meaningful recovery or preclusion to ICU admission, therapeutic hypothermia is contraindicated

Incorrect

➤ [Try again](#)

E. Active bleeding

- Therapeutic hypothermia post cardiac arrest is contraindicated in the presence of active bleeding, since bleeding may worsen after induction of hypothermia

Incorrect

[Try again](#)

3. In a patient with induced therapeutic hypothermia, EEG monitoring is essential before administration of

- ⤵ A. Midazolam
- ⤵ B. Magnesium
- ⤵ C. Neuromuscular blockade
- ⤵ D. Fentanyl
- ⤵ E. Propofol

Next question



A. Midazolam

- ⌘ Judicious use of sedation is recommended prior to and during therapeutic hypothermia. Inadequate sedation allows the breakthrough of shivering and the patient is unable to attain target temperature. Midazolam is used for sedation when systolic blood pressure is less than 100 mm Hg

Incorrect

- ⌘ [Try again](#)

B. Magnesium

- Shivering is the most common side effect of therapeutic hypothermia. Magnesium is used to control shivering in addition to sedation, analgesia and paralysis.

Incorrect

[Try again](#)

Polderman KH, Herold I. Therapeutic hypothermia and controlled normothermia in the intensive care unit: practical considerations, side effects, and cooling methods. Crit CareMed. 2009;37:1101–20.

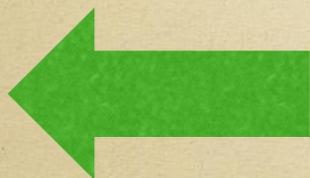
C. Neuromuscular blockade



- Patients may manifest status epilepticus following cardiac arrest. Muscle relaxants obscure seizure activity when used to prevent the shivering response to hypothermia. Continuous EEG monitoring must be used prior to use of neuromuscular blockade to diagnose early non convulsive status epilepticus as part of neurological evaluation

Correct answer

Back to the question



next question



- Rittenberger JC, Popescu A, Brenner RP, Guyette FX, Callaway CW. Frequency and timing of non-convulsive status epilepticus in comatose post cardiac arrest patients treated with hypothermia. Neuro Crit Care 2012; 16 :114-22

D. Fentanyl

- Fentanyl is commonly used to prevent shivering after induction of therapeutic hypothermia following cardiac arrest. In addition to analgesic effects, drugs with opiate properties, suppress shivering

Incorrect

➤ [Try again](#)

E. Propofol

- Propofol is the drug of choice for sedation in patients who are hemodynamically stable(systolic BP >100) following induction of therapeutic hypothermia after cardiac arrest.
- Propofol is metabolized rapidly and allows for neurological exam after stopping the infusion

Incorrect

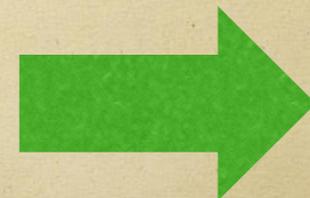
[Try again](#)

- Marik PE. Propofol: therapeutic indications and side-effects. Curr Pharm Des. 2004;10:3639–49.

4. Induction of therapeutic hypothermia after cardiac arrest causes all of the following EXCEPT

- ⌘ A. Hypokalemia
- ⌘ B. Insulin sensitivity
- ⌘ C. Hypophosphatemia
- ⌘ D. Hypomagnesemia
- ⌘ E. Bacterial translocation

Next question



A. Hypokalemia

- During induction of hypothermia, hypokalemia may occur, secondary to cold diuresis and shift of potassium from extra cellular to intra cellular space.

Incorrect

[Try again](#)

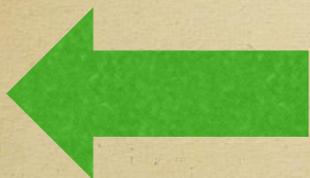
B. Insulin sensitivity



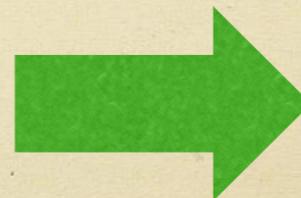
Insulin resistance occurs during induced therapeutic hypothermia. Often diabetic patients require large doses of insulin. However during rewarming, insulin sensitivity increases and blood glucose must be monitored closely

Correct answer

Go back to question



next question



Polderman KH. Mechanisms of action, physiological effects, and complications of hypothermia. Crit Care Med. 2009;37:S186– 202.

C. Hypophosphatemia

- ⌘ Hypophosphatemia occurs during therapeutic hypothermia due to cold diuresis. Electrolytes must be monitored and repleted continuously

Incorrect

[Try again](#)

D. Hypomagnesemia

- ↳ Hypomagnesemia may occur during induced hypothermia secondary to forced diuresis. Magnesium is often administered during therapeutic hypothermia to prevent shivering. If the patient develops hypomagnesemia, the aim is to raise serum magnesium > 2 mg/dl. If used to prevent shivering higher serum levels (> 5 mg/dl) are accepted

Incorrect

[Try again](#)

E. Bacterial translocation

- Induced hypothermia reduces gastric motility and cause mucosal breakdown. This causes bacterial translocation. Early enteral feeds are recommended early following rewarming.

Incorrect

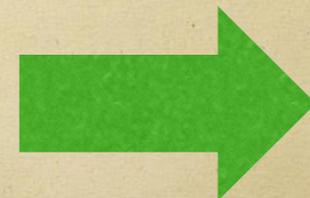
➤ [Try again](#)

➤ Gaussorgues P, Gueugniaud PY, Vedrinne JM, Salord F, Mercatello A, Robert D. Bacteremia following cardiac arrest and cardiopulmonary resuscitation. Intensive Care Med. 1988;14:575-7.

5. A 25-yr-old athlete who had suffered a V-fib arrest, with successful return of spontaneous circulation is not waking up. He was treated with induced therapeutic hypothermia. His vital signs are HR- 34/min, MAP- 80 mm Hg, temperature 32 deg C. Next step is:

- ⤵ A. Atropine
- ⤵ B Isoproterenol
- ⤵ C. Cardiac pacing
- ⤵ D. Do nothing
- ⤵ E. Discontinue therapeutic hypothermia

Back to Q 1



A. Atropine

- Atropine is ineffective for treatment of bradycardia secondary to induced hypothermia

Incorrect

[Try again](#)

B. Isoproterenol

- Isoproterenol may be considered for treatment of hypothermia induced bradycardia if the patient is unstable

Incorrect

[Try again](#)

C. Cardiac pacing

- Cardiac pacing is not required. The patient is in sinus rhythm and the BP is stable

Incorrect

[Try again](#)

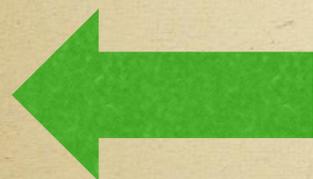


D. Do nothing

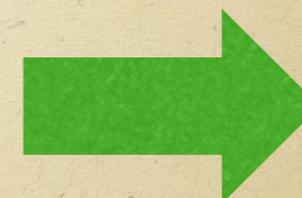
No treatment is necessary. Normal HR is 34-40 when the patient's core temperature is 32 Degree C.

Correct answer

Go back to question



Back to Q 1



Polderman KH. Mechanisms of action, physiological effects, and complications of hypothermia. Crit Care Med. 2009;37:S186– 202.

End of set



E. Discontinue therapeutic hypothermia

- Therapeutic hypothermia should not be discontinued. The aim is maintain a MAP > 80 mm Hg which is required for adequate cerebral perfusion. Auto regulation is frequently disturbed following cardiac arrest. Bradycardia with HR of 34-40 is normal during induced hypothermia to 32 deg C.

Incorrect

[Try again](#)

- Sundgreen C, Larsen FS, Herzog TM, Knudsen GM, Boesgaard S, Aldershvile J. Autoregulation of cerebral blood flow in patients resuscitated from cardiac arrest. Stroke JCereb Circ. 2001;32:128-32