

Session Title: Optimizing Medication Use in the Resuscitation Bay

ACLS Updates

- 1) **Lidocaine or Amiodarone for Ventricular Fibrillation, Pulseless/Polymorphic Ventricular Tachycardia.** A 2018 AHA Focused Update re-introduced lidocaine as an equally weakly recommended alternative to amiodarone (Class IIb; Level of Evidence B-R) ([Panchal 2018](#)). This holds true in the 2020 full guidelines ([Panchal 2020](#)). The AHA continues to acknowledge that an antidysrhythmic medication is unlikely to cardiovert VF or pVT into normal sinus rhythm. Read more about the lidocaine and other medication-related updates in the focused guideline update. ([PharmERToxGuy blog 2019](#))
- 2) **Highlights of the 2020 Guidelines.** Now that the AHA is releasing focused updates in the 5-year period between guidelines, I anticipate fewer major changes when the full guidelines are published. Here is a three-part summary of the medication-related guideline recommendations.
 - a) [Vasopressors and Non-Vasopressors in Cardiac Arrest](#)
 - b) [Management of Specific Arrhythmias](#)
 - c) [Toxicology](#)
- 3) **Esmolol.** is an additional option to consider for refractory VF ([PharmERToxGuy blog 2016](#)). Here is an [infographic](#) from the blog.

Treating Hyperkalemia with Insulin ([Lindner 2020](#))

- How insulin works
 - Temporarily shifts potassium intracellularly through a complex process of activating Na⁺-K⁺ ATPase and by recruitment of intracellular pump components into the plasma membrane. Insulin binding to specific membrane receptors results in extrusion of Na⁺ and cellular uptake of K⁺. ([Hundal 1992](#))
- The right insulin dose
 - 5 unit boluses up to 20 unit/hr infusions have been used ([Blumberg 1988](#), [Finder 2022](#)). Most common dose is 5 or 10 units IV regular insulin bolus (lowers K⁺ ~ 0.5-1 mEq/L).
- Preventing hypoglycemia
 - Incidence of hypoglycemia
 - A 10 unit dose of IV regular insulin has an onset of action ~5-10 minutes, peaks at 25-30 minutes, and lasts 2-3 hours. IV dextrose lasts < 1 hour.
 - Overall incidence of hypoglycemia appears to be 10-20% ([Allon 1990](#); [Schafers 2012](#); [Apel 2014](#), [Scott 2019](#), [Jacob 2017](#))
 - Risk factors for developing hypoglycemia ([Apel 2014](#))
 - No prior diagnosis of diabetes
 - No use of diabetes medication prior to admission
 - Lower pretreatment glucose (104 mg/dL vs 162 mg/dL, P = 0.04)
 - Renal dysfunction (insulin may be partially renally metabolized) ([Dickerson 2011](#), [Coca 2017](#), [Pierce 2015](#))
 - Higher insulin dose ([LaRue 2017](#))
 - Strategies for avoiding hypoglycemia

- Here is a [suggested strategy](#) for administering enough dextrose to counter the initial insulin bolus of 10 or 20 units. It is loosely based on the Rush University protocol. ([Apel 2014](#), [Harel 2016](#))
- Consider starting with 5 units in most patients ([LaRue 2017](#), [Moussavi 2021](#))
- ISMP highlighted this issue in a [February 2018 Safety Alert](#)

Naloxone

- Patients often receive 2-4 mg in the prehospital setting, a dose much too high for patients chronically taking opioids that can precipitate withdrawal.
- With fentanyl (and fentanyl derivatives) mixed with heroin, standard naloxone doses are effective ([Carpenter 2020](#), [Bell 2019](#), [Hill 2022](#))
- A more conservative strategy is to start with 0.04 mg and administer 0.04-0.08 mg increments to achieve desired respiratory rate ([Kim 2016](#), [Wong 2019](#), [Carpenter 2020](#))
- Here is a [trick-of-the-trade](#) for preparing the naloxone to give these smaller doses

Cardiac Arrest Dosing of tPA

This is a tough question in the middle of a critical resuscitation. A full summary of the data is available on [Academic Life in EM blog](#), last updated in 2016.

- The dose of tPA in cardiac arrest is somewhere between 50-100 mg given as a bolus +/- infusion.
 - We generally give 50 mg as an IV push and often repeat with the other 50 mg in 10-15 minutes, if indicated.
- According to the AHA Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, "Ongoing CPR is not an absolute contraindication for fibrinolysis."
- Some studies suggest allowing 15 minutes of CPR for drug to work ([Konstantinides 2020](#)).
- Evidence is 'best' for PE; data does NOT support for undifferentiated cardiac arrest.
- Anticoagulants, such as heparin, were used in most studies along with the fibrinolytic.

Sedation Guidance for Intubated COVID-19 Patients

Patients requiring intubation secondary to SARS-CoV-2 infection typically require more sedation than we use normally. Based on our experience in Boston, we provide a suggested strategy [here](#) with a corresponding [infographic](#). Key points:

- 1) Consider initiating a norepinephrine infusion prior to intubation. These patients tend to drop blood pressure.
- 2) Consider adding an additional sedative agent along with induction (ketamine or etomidate). We use midazolam 4 mg.
- 3) At the initiation of an opioid (or midazolam) infusion and with rate changes, we must bolus too. The importance of boluses is discussed [here](#).
- 4) Neuromuscular blockade may be needed, along with heavy sedation, to improve ventilator compliance.

Ketamine and Post-Intubation Hypotension

We traditionally think of ketamine as a hemodynamically-neutral induction agent. Data from the National Emergency Airway Registry (NEAR) registry suggests that ketamine may be about the same as etomidate in terms of its effect on blood pressure ([April 2020](#)). A meta-analysis and others reached a similar conclusion ([Sharda 2022](#), [Stanke 2021](#), [Foster 2022](#), [Leede 2021](#)). The bottom line is that we should always plan for post-intubation hypotension, particularly in patients with a shock index > 0.9. Etomidate or ketamine are probably about the same in terms of blood pressure. For more in-depth discussion on the new data, check out the [PharmERToxGuy](#) and [Critical Care Now](#) summaries.