Glucagon in EMS: Should it be Gluca-gone?

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Called to the scene of a diabetic patient “acting crazy”.

Arrive to find patient confused, combative, staggering, diaphoretic

Fingerstick blood sugar = “low”

On first IV attempt, patient pulls his arm away, screams and curses, and swings at the paramedic (misses)

He refuses further IV attempts, begins to stagger out the door, yelling that you’re trying to kill him
Another Case

- Called to “medical problem”
- Arrive to find unconscious patient, diaphoretic
- Fingerstick blood sugar = “low”
- Immediately begins violent tonic/clonic seizure
- Unable to start IV
- Hint: intranasal Versed won’t help
Hypoglycemia: 
Usual Suspects

- Diabetics
  - Too much insulin/oral hypoglycemics
  - Too little food/too much activity/exercise
  - “Diabetic emergency”

- Non-diabetics
  - OD on insulin/oral hypoglycemics
Treatment Choices?

- Oral glucose (soda/candy/food/paste)
  - Awake patient, able to swallow and protect airway

- Dextrose: D50 / D10
  - Requires IV (or IO?)
  - Tough if seizing/confused/combative

- Glucagon: IM/IV
  - Easy to administer
  - Expensive!
Glucagon

- Mobilizes stored glycogen in the liver, converting it to glucose, which raises blood sugar
- Minimally effective if patient malnourished (starvation hypoglycemia)
- Time to effect:
  - IV/IM glucagon: 10-20 min
  - IV/IO dextrose: 5-10 min
- Can be lifesaving
Glucagon

- Comes as lyophilized powder which must be reconstituted
- 1 mg (usual dose): $100 - $300
- Expiration: 2 years
- Much of the drug carried by EMS expires prior to use
- Has been recently on the drug shortage list nationally
  - Some people weren’t too sad about that, actually…
“Doc, Do We Have to Carry This Stuff?”

“Why wouldn’t you?” I ask, naively.
“Because it’s expensive and budgets are tight.”
“Because we never use it.”
“Because it expires and we have to throw it away.”

“Hmmm,” I say, thoughtfully. “Good question. Let me check with the smartest EMS people on the planet.”
So, Who’s Using It?

- Eagles Lightening Survey!
- 33 Agency Medical Directors responded
  - 30 are carrying and using it
    - Many regularly throw away expired drug
  - 2 agencies no longer carry it and 1 is planning on stopping soon
    - These agencies use D50 or D10 IO instead: “Drill and Fill”
How Often Is It Used?

Glucagon uses per 1000 total runs

- Nationally (NEMSIS Data 2013): 1.2/1000
- Utah (2013): 0.9/1000
- Eagles range: 1.2 – 2.3/1000
  - One outlier with 4/1000
- Not commonly, but not exactly rarely, used
How Often is it Wasted?

One agency:
- It has thrown away 3X more often than it has used
- The expense for the WASTED glucagon was 1/3 of total drug budget
Options to Glucagon?

- **Intraosseous dextrose:** “Drill and Fill”
  - 2 agencies doing this, 1 planning to
  - D50 very hypertonic: toxic to marrow?
  - D10 may be better choice
  - “No complaints, except from the ED nurses”
  - Two medical directors (NOT doing IO) said: “If I was hypoglycemic and someone drilled my leg instead of using glucagon, I would be PISSED!”

- **Nasogastric tube instillation of D50**
  - Aspiration risk
  - Tough in seizing or combative patient
Sidebar: D50 vs. D10

- D50 very hyperosmolar
  - Caustic if extravasated
  - Overshoots euglycemic goal (usually >200mg/dl)

- D10 less osmolar
  - Less caustic
  - Can be given as IV drip
  - Less overshoot

- **Time to GCS 15: 8 minutes for both groups**

- Recent good results in Contra Costa County EMS with 100 ml D10 rather than D50 push

Moore C, Em Med J 2005;22(7):512
Kiefer M, Prehosp Disaster Med 2014;29(2):190
Options to Glucagon?

- OK, I need another orifice…
- Rectal dextrose!! Brilliant idea, Sir!!
- But, does it work?
- It’s been studied:
  - 1984: It didn’t work in 8 children in a pediatric clinic
  - 1985: It didn’t work in adults
  - 2003: It worked in a bunch of rats in the lab (a little)
- Dang, such an interesting idea…

Attvall S, *Diabetes Care* 1985;4:412
Conclusions

- My opinion: Glucagon is worth carrying because it saves lives, even though it’s not frequently used and is too damned expensive
  - 1-2 uses/1000 runs
- No great options without venous access except IO
- IO glucose: Your opinion?
- Would YOU want YOUR leg drilled if hypoglycemic vs. getting an expensive IM drug?
- Future good news: There is a cheaper, *intranasal*, formulation of glucagon coming that may relieve the price burden a bit
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