

Glucagon in EMS: *Should it be Gluca-gone?*

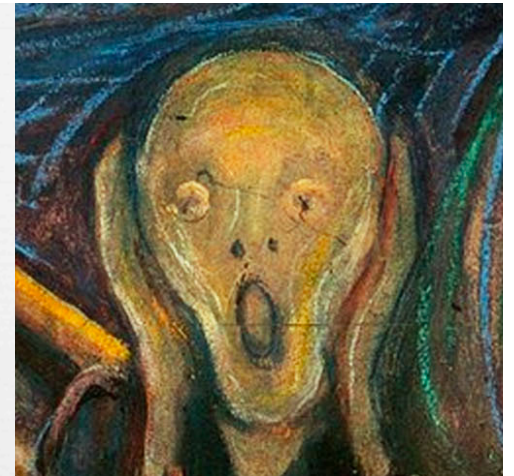


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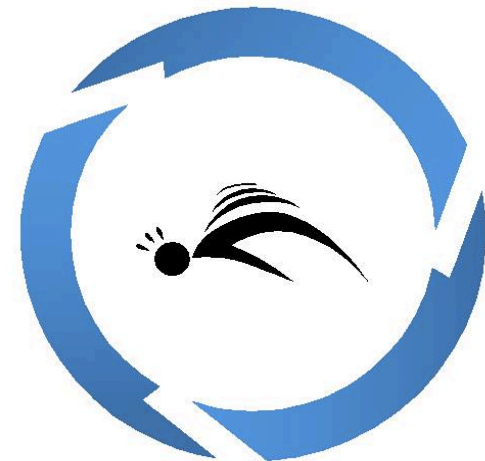
A Case



- ❧ Called to the scene of a diabetic patient “acting crazy”.
- ❧ Arrive to find patient confused, combative, staggering, diaphoretic
- ❧ Fingertick 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
- ❧ Fingertick 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?



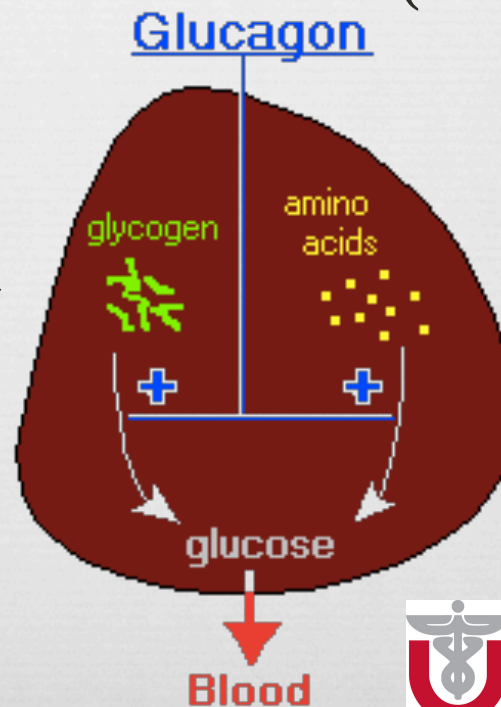
- ❧ Oral glucose (soda/candy/food/paste)
 - ❧ Awake patient, able to swallow and protect airway
- ❧ Dextrose: D50 / D10
 - ❧ Requires IV (or IO?)
 - ❧ Tough if seizing/confused/combatative
- ❧ Glucagon: IM/IV
 - ❧ Easy to administer
 - ❧ Expensive!



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 (NEMESIS 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?



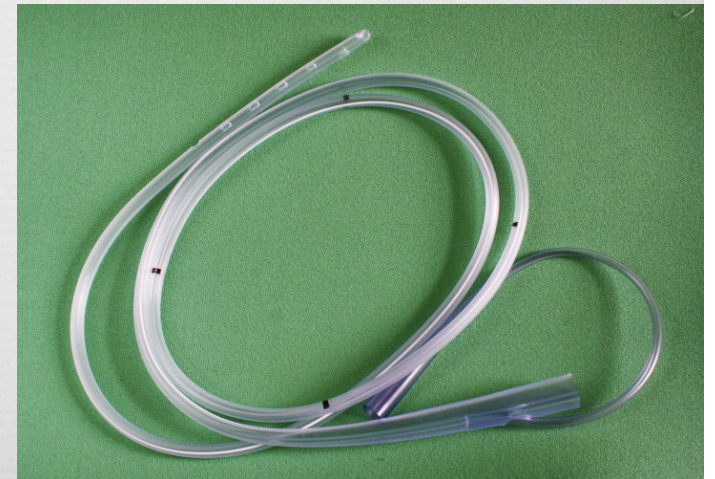
❧ **Intraosseous dextrose: “Drill and Fill”**

- ❧ 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



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...



McGee D, *J Emerg Med* 2003;24(3)253
Aman J, *Act Ped Scand* 1984;4:560
Attvall S, *Diabetes Care* 1985;4:412



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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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