

Don't Get Amped up Over your Hypoglycemics: Alternative Treatment Strategies



Kim D. McKenna PhD(c) RN EMT-P



St. Charles County Ambulance District



46-year-old man found by wife at 5am unresponsive

- Initial BGL 13 mg/dL
- EMS established IV in RAC
 - Administered 2 amps of D50W
- Repeat BGL 46 mg/dL
 - Administered 1 mg glucagon
- Patient regained consciousness
 - Repeat BGL 126 mg/dL
- At ED complained of pain in his right arm
 - IV site grossly infiltrated
 - Right arm significantly swollen & painful





**Should you be worried?
What should be done next?**

Dextrose 50%

- Acidic (pH 3.5-5)
- Hyperosmolar
- Considered a vesicant drug if concentration is $>10\%$
- When normal fluids infiltrate – called infiltration
- When vesicants infiltrate, called extravasation



Extravasation of Vesicants

- Complications can include:
 - Skin & soft tissue injury



Extravasation of Vesicants

- Complications can include:
 - Skin & soft tissue injury
 - Loss of limb



Extravasation of Vesicants

- Complications can include:
 - Skin & soft tissue injury
 - Loss of limb
 - Death



Steps after vesicant extravasation

Stop the infusion

Aspirate fluid from catheter

Remove the IV catheter

Pull on the syringe as catheter withdrawn

Mark the infiltrated areas

Notify receiving facility

Report as adverse drug event

Supportive care



- Elevate affected limb
- Apply cold compresses to area Q 15-30 min for 24-48 hr
 - Vesicant infiltrations need cold as compared to warm compresses with a typical infiltration
- Antidote administered SubCut in hospital is hyaluroidase (Hylenex)

HOME

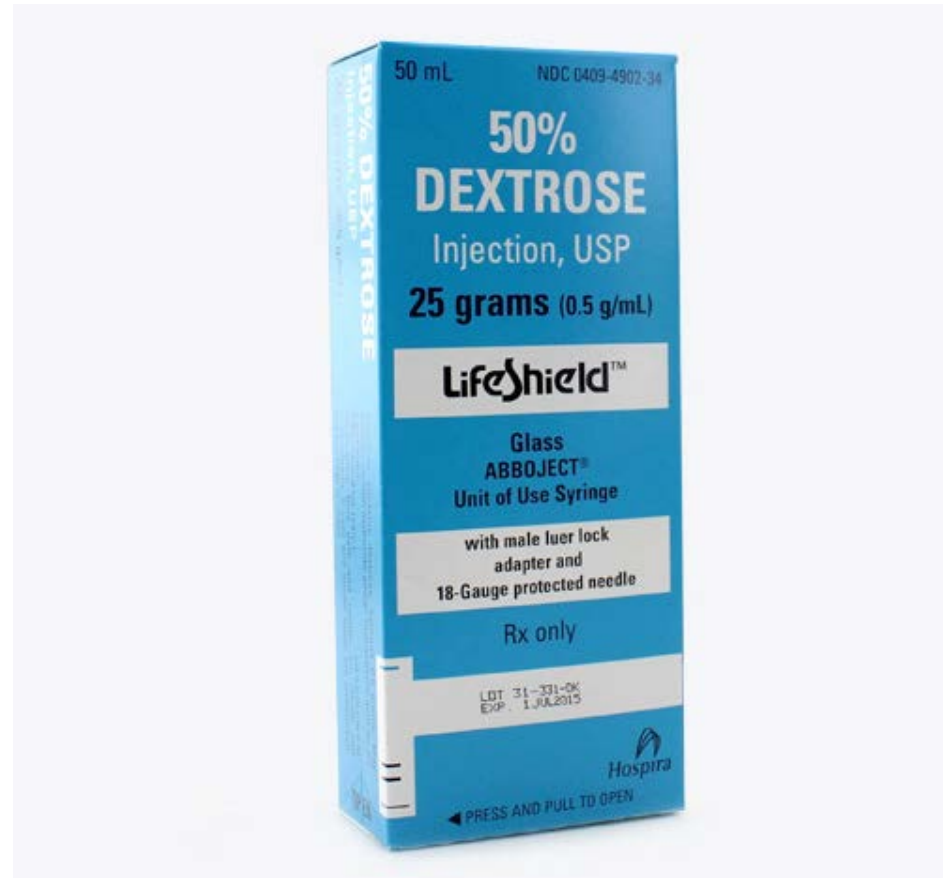
- This patient received the recommended protocol for vesicant extravasation
- Monitored for an additional 5 hours
 - Swelling and redness decreased substantially before discharge
- Returned to ED for follow-up in 24 hours
 - Arm appeared normal with normal function

Prevention

- Use large straight vein (avoid joint)
- Inspect site prior to D50% W for signs of infiltration
 - Assess for blood return
- Monitor the site continuously
- Do not give D50W if you are not sure the IV is good
- Consider using D10W instead of D50W

Why else shouldn't we give D50W?

- Some evidence that D50W can cause harm
 - Especially post cardiac arrest
 - Stroke
- Hyperglycemia may cause neurologic problems in kids



Nehme, 2009)

Dextrose 50% prefilled
syringe

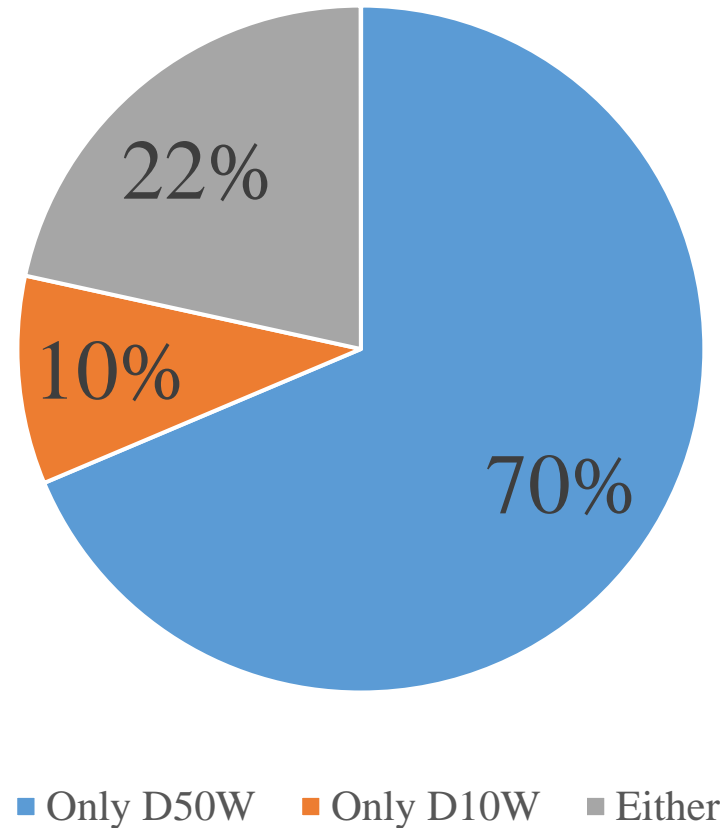
• \$12.99

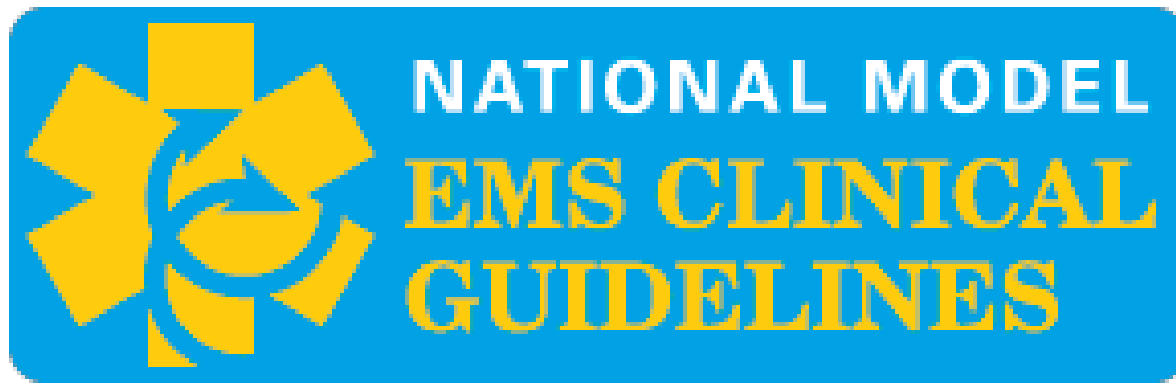


Dextrose 10% 250 mL
& Macro drip set \$7.44

So how do we treat hypoglycemia?

- Protocol review of EMS systems in 50 largest cities (185 EMS agencies)





- Dextrose IV

- Adult

- 50 mL of 50% dextrose
 - 250 mL of 10% dextrose

- Pediatric

- 2-4 mL/kg of 25% dextrose

- Glucagon

- Adult

- 1 mg IM/IN

- Pediatric

- 1 mg IM/IN >20 kg (>5 yo)
 - 0.5 mg IM/IN <20 kg (< 5 yo)

Is D10W safe in the field?

- Randomized control study in Wales
- 51 patients >18 y/o (25 in D10 group/26 in D50 group)
 - No significant differences in groups
- Gave 5 g of D10W (50 mL) or 5 g of D50W (10 mL)
 - Repeated every minute
- End-point GCS 15 or 25 g administered



Outcome

- No significant differences between groups in
 - time to GCS 15
 - Repeat hypoglycemic episode in 24 hr.
- Scene time higher for 10% dextrose group (NS)
- Paramedics thought 10% dextrose easier to give (NS)
- Total dose of glucose given (median 15 g) & post-treatment BGL significantly higher in D50W group (median 58 mg/dL)
- Two patients reported easier time to regulate BGL after incident than in the past

Trial related to drug shortage

- Prospective observational study of 164 hypoglycemic adult patients over 18 weeks in 2013
 - Initial dose of 100 mL (10 g) D10W given
 - 18% needed a second dose (one needed a third)
- Little decay in dextrose levels over 30 minutes





Randomized, crossover, noninferiority trial

- 75 adult type 1 diabetics given insulin until BGL 40-59 mg/dL
- Randomly assigned to received glucagon 1 mg IM or 3 mg IN
- 1-4 weeks later each participant got the other treatment

Avg. time to BGL 70 mg/dL 13 min IM and 16 min IN

Rickels et al., 2015

Alternative treatment strategies for the future?

Blood sugar was low



Friend gave me diet coke

References

- Lawson, S. L., Brady, W., & Mahmoud, A. (2013). Identification of highly concentrated dextrose solution (50% dextrose) extravasation and treatment - a clinical report. *Am J Emerg Med*, 31(5), 886. doi:10.1016/j.ajem.2012.12.010
- Moore, C., & Woollard, M. (2005). Dextrose 10% or 50% in the treatment of hypoglycaemia out of hospital? A randomised controlled trial. *Emerg Med J.*, 22(7), 512-515.
- Nehme, Z., & Cudini, D. (2009). A review of the efficacy of 10% dextrose as an alternative to high concentration glucose in the treatment of out-of-hospital hypoglycaemia. *Australasian Journal of Paramedicine*, 7(3), 5.
- Piché, C. A., Dulude, H., Sherr, J. L., . . . Beck, R. W. (2015). Intranasal glucagon for treatment of insulin-induced hypoglycemia in adults with type 1 diabetes: A randomized crossover noninferiority study. *Diabetes Care*.
- Rostykus, P., Kennel, J., Adair, K., Fillinger, M., Palmberg, R., Quinn, A., . . . Daya, M. (2016). Variability in the treatment of prehospital hypoglycemia: A structured review of EMS protocols in the United States. *Prehosp Emerg Care*, 20(4), 524-530. doi: