

HYPOGLYCEMIA MANAGEMENT

Intravenous D50W

Glucagon Review

next slide



HYPOGLYCEMIA MANAGEMENT

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Slide production, narration & animation

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Note: slides have no sound



MENU

START AT THE BEGINNING

LEARNING OUTCOMES

THE “SIX RIGHTS” OF DRUG ADMINISTRATION

DIFFERENTIAL DIAGNOSIS - HYPOGLYCEMIA

D50W

STANDING ORDER D50W & GLUCAGON

DOCUMENTATION - D50W

GLUCAGON & HYPOGLYCEMIA

GLUCOMETRY - PITFALLS

DOCUMENTATION - GLUCAGON

PRACTICE QUIZ



Learning outcomes

At the conclusion of this presentation, the learner will be able to:

- ❖ list and explain the “six right’s of medication administration
- ❖ surmise a differential diagnosis for hypoglycemia
- ❖ list and explain the etiologies of diabetes
- ❖ list and describe drug precipitants of hypoglycemia
- ❖ other than diabetes, list at least two other disease process that can cause hypoglycemia
- ❖ list signs, symptoms and historical information that would lead you to suspect hypoglycemia
- ❖ define the drug classifications of D50W and Glucagon
- ❖ List the indications for D50 W and/or Glucagon
- ❖ describe the pharmacokinetics and pharmacodynamics of D50W and Glucagon

Learning outcomes

At the conclusion of this presentation, the learner will be able to:

- ❖ list the contraindications, adverse effects and drug interactions (if any) for D50W and Glucagon
- ❖ perform the medical math to administer D50W or Glucagon
- ❖ in the classroom setting, demonstrate how a D50W pre-load is assembled and the desired volume is delivered
- ❖ in the classroom setting, demonstrate how a Glucagon is reconstituted and the desired volume is delivered
- ❖ demonstrate a thorough knowledge of the provincial standing orders for D50W and Glucagon
- ❖ in the classroom setting, demonstrate how the administration of medication is documented
- ❖ list the ways in which a glucometer can produce a false reading and explain the steps to reduce these errors

SIX “RIGHTS” OF DRUG ADMINISTRATION

- Right Patient ?
- Right Drug ?
- Right Dose ?
- Right Time ?
- Right Route ?
- Right to know ?



SIX “RIGHTS” OF DRUG ADMINISTRATION

.Right Patient ?

- prehospital: Is this drug indicated for this patient?
- even if there are indications for administering a drug, are there precautions or is this drug contraindicated because of allergies, drug interaction, heart rate, blood pressure, mental status, etc?
- is this the right patient for this drug?



SIX “RIGHTS” OF DRUG ADMINISTRATION

. Right Drug ?

- some drugs come in similar pre-load, ampoules, vials, nebulizers (e.g. epinephrine and morphine, D50W and Sodium Bicarbonate) – check the drug when you pull it out of the kit for the name, dose, concentration and for fluid clarity and expiry date. Check the drug again before administering it.
- syringes with left over medication (e.g. 5 mg of diazepam left in a syringe after first dose) must be labelled with the drug name and concentration per ml.
- a narcotic must, when possible, be checked by two people prior to administration



SIX “RIGHTS” OF DRUG ADMINISTRATION

Right Dose ?

- double check dosage calculation - have partner do the same whenever practical



SIX “RIGHTS” OF DRUG ADMINISTRATION

Right Time ?

- drugs need time to take effect and to reach peak effect. e.g. intranasal Lidocaine should be given 2-3 minutes prior to nasal intubation - not sooner and not later. Also remember that repeated doses of a drug may have an added or a synergistic effect. Timing is critical.
- Conversely, other drugs such as Adenosine, work within seconds to minutes
- check vital signs before and after giving a drug - **ALWAYS**



SIX “RIGHTS” OF DRUG ADMINISTRATION

Right route ?

- is the route appropriate for the drug and the treatment for which it is intended. e.g. Glucagon for hypoglycemia is most appropriate given SC or IM whereas Glucagon, when given to relax the esophagus and relieve an obstruction when a large FBO is obstructing the airway (compressing the posterior wall of the trachea), is best given in large dose intravenously.



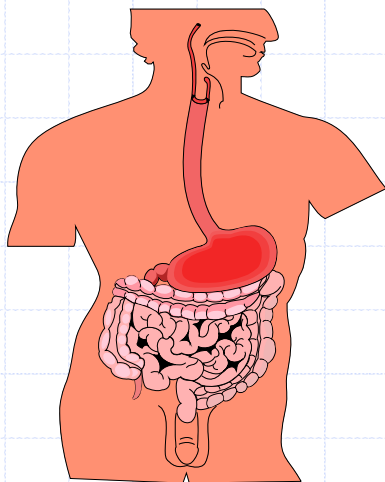
SIX “RIGHTS” OF DRUG ADMINISTRATION

Right to know ?

- the patient has a right to know about the drug, a right to sound medical advice and a right to refuse



Hypoglycemia



Differential diagnosis

Extensive: Many conditions may present like hypoglycemia

- ❖ diabetic hypoglycemia
- ❖ Stroke/TIA
- ❖ post-ictal
- ❖ insulinoma
- ❖ pheochromocytoma (usually presents with \uparrow BGL)
- ❖ ETOH effect
- ❖ sepsis
- ❖ hepatic encephalopathy
- ❖ etc



Diabetes Type I & II etiology

- ❖ Type I insulin dependant diabetes mellitus (IDDM) : autoimmune destruction of the pancreatic beta cells in the Islets of Langerhans
 - ❖ little to no insulin secretion

- ❖ Type II, NIDDM or IDDM: reduced insulin production from the beta cells
 - ❖ patient's pancreas produces *some* insulin
 - ❖ usually not insulin dependant (some type II diabetics require insulin)

- ❖ **Disease is characterized by chronic hyperglycemia**



Hypoglycemia: Precipitants

Drug precipitated hypoglycemia

- ❖ sulfonylureas may precipitate hypoglycemia in diabetics as they act to increase endogenous insulin secretion and thereby increase hepatic glucose uptake and peripheral tissue glucose disposal.
 - ❖ e.g. of sulfonylureas: Orinase (tolbutamide), Tolinase (tolazamide), Diabinese (chlorpropamide), Glucotrol (glipizide), Glucotrol XL (ext. rel. glipizide), Micronase, Diabeta (glyburide), Glynase (micronized gly.), Amaryl (glimepiride)



Hypoglycemia: Other causes

Pheochromocytoma

- ❖ a rare tumor of the adrenal gland - may cause hypoglycemia
- ❖ Glucagon is contraindicated as it may stimulate the adrenal gland/tumor to release excess amounts of catecholamines - this can lead to a hypertensive crisis and intra-cerebral hemorrhage



Hypoglycemia: Other causes

Insulinoma

- ❖ tumor in the pancreatic islet cells
- ❖ causes excessive secretion of insulin which leads to hypoglycemia
- ❖ tumor may secrete insulin in short bursts, causing wide fluctuations in blood sugar levels
- ❖ 12% have seizures
- ❖ Glucagon may increase the secretion of insulin in patients with insulinomas which may exacerbate hypoglycemia



Hypoglycemia: Other causes

Alcoholism, starvation

- ❖ Glucagon is of little to no benefit in conditions where glycogen stores are depleted
- ❖ Glucagon is only indicated for patients with a known diabetic history or where they are hypoglycemic but the past medical history is unobtainable



Signs & Symptoms

- ❖ diaphoresis
- ❖ palor
- ❖ cool to touch
- ❖ restlessness/combativeness/irritability
- ❖ confusion
- ❖ depressed CNS response
- ❖ Global or focal (stroke/TIA-like) neurological deficits

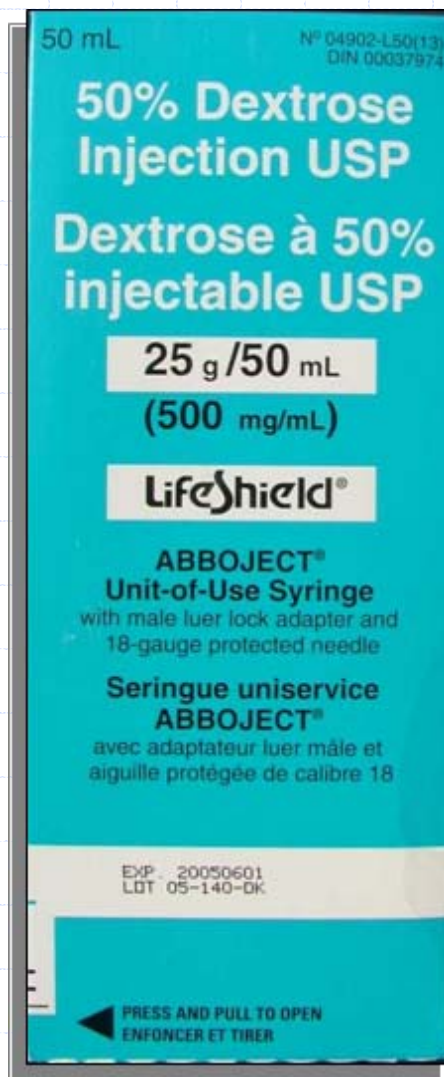


History

- ❖ IDDM or NIDDM?
- ❖ insulin or oral Rx?
- ❖ when did they take it? What/how much did they take?
- ❖ last meal? what was it?
- ❖ activity leading up to event?



D50W →



D50W

D50W: Drug Classification

- ❖ carbohydrate substrate



D50W

Indications for D50W

- ❖ suspected or known hypoglycemia
- ❖ altered level of responsiveness NYD
- ❖ coma or seizure NYD

Note: Indications and “standing order” indications/conditions are not synonymous



Rationale for D50W in hypoglycemia

- ❖ no absolute contraindications
- ❖ few relative contraindications or precautions
- ❖ fast acting
- ❖ inexpensive compared with the alternative glucagon



D50W

Pharmacokinetics

- ❖ Onset: immediate
- ❖ Peak: immediate
- ❖ Duration: unknown



D50W

Pharmacodynamics

- ❖ immediate source of glucose and H₂O for nutrient deprived cells
- ❖ transient osmotic diuretic



D50W

Contraindication

- ❖ no absolute contraindications

Note:

- ❖ may worsen neurological outcome in stroke or head injury
- ❖ extravasation may cause tissue necrosis
- ❖ D₅₀W may precipitate Wernicke's encephalopathy in thiamin deficient patients (e.g. alcoholics)

What is Wernicke's?



D50W

D50W Allergies / Sensitivities / Interactions

You should keep a drug reference guide in your pocket

- ❖ Drug-drug interactions: there are a number of drugs that can precipitate hypoglycemia (take responsibility to become familiar with them)



D50W



D50W is a viscous fluid & the pre-load has a small needle which makes it slow to push the drug – don't try to push it in too quickly or forcefully



D50W

Open the pre-load box

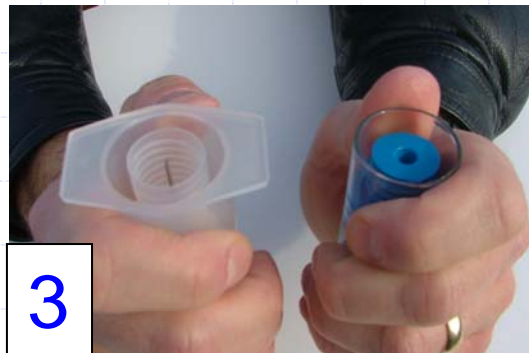


- ❖ Most pre-load boxes are the same
- ❖ Look for the “open” tab on the side
- ❖ Insert thumb and lift the top off



D50W

pre-load assembly



SCREW TOGETHER



D50W

Remove any air

Slide the plunger to the “0” mark

You're ready to go!



D50W

Injecting D50W

Push ampoule in this direction
until plunger reaches this mark

Plunger to "0"



BASED ON AN ADULT DOSE OF 25 g (50 ML)



D50W & Glucagon

Standing Order

See local and provincial standards
Appendix 2



D50W

Documentation

Procedure Code			Route	Treatment/Procedure/Medication									Result							Crew Mbr. Initials	Crew Mbr. No.		
				Pulse			Respirations			Blood Pressure			GCS			T O G C S	Pupils						
				R	Rh	V	R	Rh	V	Syst.	Diast.	Temp.	ECG Code	O ₂ Sat	CO ₂		E	V	M			R + -	L + -
3	5	2		<i>glucometry</i>									<i>BGL 2.4 mmol/L</i>							<i>RT</i>	<i>2</i>		
5	3	0	IV	<i>D50W 25 g IV push</i>									<i>GCS improved from 12 to 15</i>							<i>LM</i>	<i>1</i>		
0	1	0		82	R	F	20	R	F	118	74		40	100		4	5	6	15	3+	3+	<i>RT</i>	<i>2</i>
3	5	2		<i>glucometry</i>									<i>BGL 14.2 mmol/L</i>							<i>LM</i>	<i>1</i>		

Note: documentation of other assessments and procedures would precede the sample above



GLUCAGON & HYPOGLYCEMIA



Glucagon

Drug Classification

- ❖ glucose elevating agent (pancreatic hormone)
- ❖ insulin antagonist



Glucagon

DRUG: Indications

- ❖ Hypoglycemia in known diabetics
- ❖ *Alternative treatment when D50W is not available, or within the Paramedic's scope of practice to administer, or an IV cannot be established*



Glucagon

Contraindications

- ❖ allergy or hypersensitivity
- ❖ pheochromocytoma
- ❖ insulinoma (precaution)
- ❖ pregnancy, lactation (precaution)



Glucagon

Pharmacokinetics

- ❖ Onset: 8-10 minutes approximately
- ❖ Peak: 20-30 minutes
- ❖ Duration: 19-32 minutes



Glucagon

Pharmacodynamics

- ❖ accelerates the breakdown of glycogen (glycogenolysis) to glucose in the liver
- ❖ glucagon is naturally secreted by the alpha cells of the pancreas. It elevates blood glucose levels by increasing the breakdown of glycogen to glucose and inhibiting glycogen synthesis
- ❖ only effective in treating hypoglycemia if liver glycogen is available



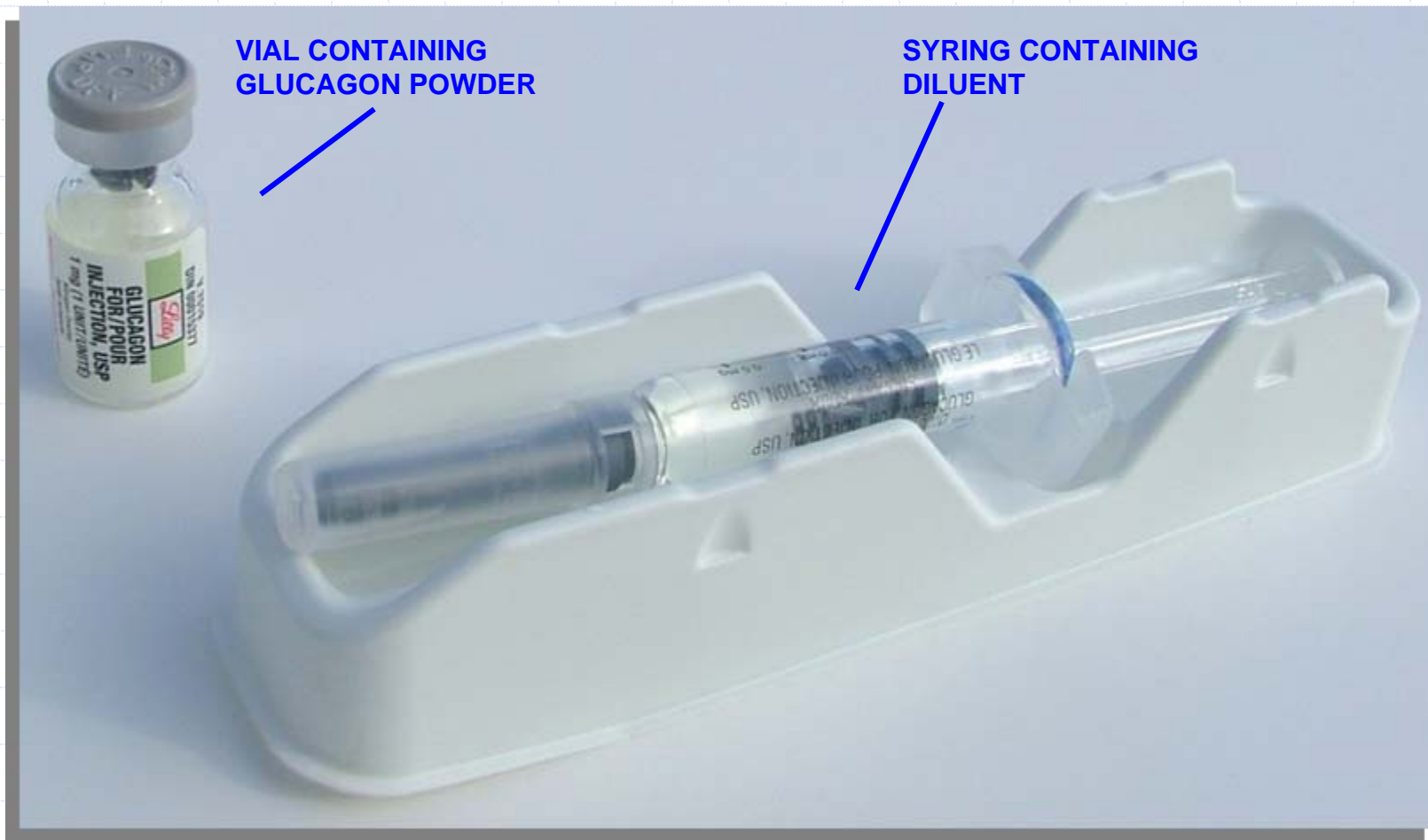
MENU

QUIT

Glucagon



Glucagon



Glucagon

Injecting glucagon



- Inject diluent into the vial
- Gently rotate the vial until powder changes to liquid
- Draw the glucagon into the syringe (syringe provided can be used for SC only. IM requires longer needle)
- Inject



Glucagon

Documentation (sample)

Procedure Code			Route	Treatment/Procedure/Medication									Result							Crew Mbr. Initials	Crew Mbr. No.			
				Pulse			Respirations			Blood Pressure			GCS			T O G A L	Pupils							
				R	Rh	V	R	Rh	V	Syst.	Diast.	Temp.	ECG Code	O ₂ Sat	CO ₂		E	V	M			R + -	L + -	
3	5	2		<i>glucometry</i>									<i>BGL 2.4 mmol/L</i>							<i>RT</i>	<i>2</i>			
5	6	0	<i>SC</i>	<i>Glucagon 1 mg (L) deltoid</i>									<i>↓ Restlessness, ↑ LOA</i>							<i>LM</i>	<i>1</i>			
0	1	0		82	R	F	20	R	F	118	74						4	5	6	15	3+	3+		<i>2</i>
3	5	2		<i>glucometry</i>									<i>BGL 8.3 mmol/L</i>							<i>LM</i>	<i>1</i>			

Note: documentation of other assessments and procedures would precede the sample above





Glucometry



Glucometry

Misleading readings

There are a number of reasons for obtaining a falsely low glucometer reading. These include:

- ❖ sample dilution from swabbing with alcohol
- ❖ squeezing the tip of the finger can cause serous fluid to mix with blood, diluting the sample - the recommended method of promoting blood flow is to milk the finger above the last joint
- ❖ the glucometer may need to be calibrated



Glucometry

Misleading readings

Clinical note:

- ❖ If you encounter a non-diabetic patient with a low BGL, you should have a high index of suspicion that it's a false low reading or that the patient has a condition for which D50W might be appropriate but Glucagon is likely contraindicated (at least where standing orders are concerned).
- ❖ It's not uncommon to see a higher than normal BGL in non-diabetics when they experience a sympathetic nervous system response – e.g. multi-system trauma, post-ictal patient, etc



QUIZ

(20 multiple choice questions)



Question #1

Which of the following best describes D50W?

- A** colloid
- B** substrate
- C** drug
- D** plasma

Question #2

What does 50% dextrose in water mean in terms of concentration?

A 500 g in 100 ml

B 100 g in 100 ml

C 50 g in 100 ml

D 20 g in 100 ml

Question #3

D50W is safe to administer in the setting of pheochromocytoma or insulinoma.

 A

true

 B

false

Question #4

Why is it that D50W is slow to push IV?

1. it is viscous
2. the syringe is large
3. the needle is relatively small
4. the IV catheter is small
5. the vein does not accommodate concentrated sugar well

A

1 and 3

B

1, 2, 3

C

1, 3, 4, 5

D

all of the above

Question #5

Which of the following best describes pheochromocytoma?

- A** tumor of the pancreas causing excess insulin secretion
- B** tumor of the liver causing glucagon suppression
- C** tumor of the epidermis
- D** tumor of the adrenal gland causing excess catecholamine release

Question #6

What is the dose of IV dextrose for an adult hypoglycemic?

A

50 g in 25 ml

B

100 g in 50 ml

C

25 g in 50 ml

D

25 g in 25 ml

Question #7

Wernecke's encephalopathy may be precipitated by the administration of D50W IV in which circumstance?

- A** pancreatitis
- B** thiamin deficiency
- C** vitamin E deficiency
- D** hunger

Question #8

You're presented with a 74 y/o NIDDM male with a history of dementia. c/c: "generally unwell and lethargic". Skin is dry. Despite being alert, his GCS is 14. BGL is 3.8 mmol/L. How will you treat this patient if you're unable to start an IV?

A

oral glucose

B

glucagon

Question #9

You respond to a 62 y/o IDDM female whose GCS is 12. She is agitated, diaphoretic and her BGL is 2.3 mmol/L

You're unable to start an IV. What will you do?

A

treat with Glucagon

B

wait until you get to the hospital where they can start an IV

Question #10

You're presented with a 24 y/o female who has had a syncopal episode. When you arrive, she's drowsy and denies any past medical problems. Skin is diaphoretic. Her GCS is 14. BGL is 3.6 mmol/L. How will you treat this patient if you're unable to start an IV?

A

oral glucose

B

glucagon

C

D50W SC

D

none of the above

Question #11

What BGL would you expect in a non-diabetic multi-trauma patient?

A

low

B

normal

C

high

D

I would never take a BGL on a trauma patient

Question #12

What BGL would you expect in a post-ictal patient?

A

low

B

normal

C

high

D

I would never take a BGL on a post-ictal patient

Question #13

What blood sampling technique(s) can give you a falsely low BGL?

A squeezing the proximal finger

B squeezing the distal finger

C using a venous sample

D B and C

Question #14

What is the onset of action of Glucagon?

A

2-4 minutes

B

8-10 minutes

C

15-20 minutes

D

20-30 minutes

MENU

QUIT

RE-START QUIZ

A FINAL WORD



YOU NEED TO KNOW 😊

*Standing Orders provide Paramedics with the means to begin treating patients in a quick and efficient manner. They **do not** include all the information you need to know to provide great patient care.*

To provide truly great patient care, it's important to do more than just follow algorithms. You need to understand algorithms. This means taking individual responsibility for acquiring a thorough and current knowledge of the drugs you administer and the procedures you perform. This is what distinguishes the clinician from the technician.



Thank you!
for participating in the
OBHG Education Subcommittee's
interactive slide show

Incorrect 😞

Sorry, that's not the correct answer

...but nice try!

Try again

