



Hypoglycemia and Glucagon

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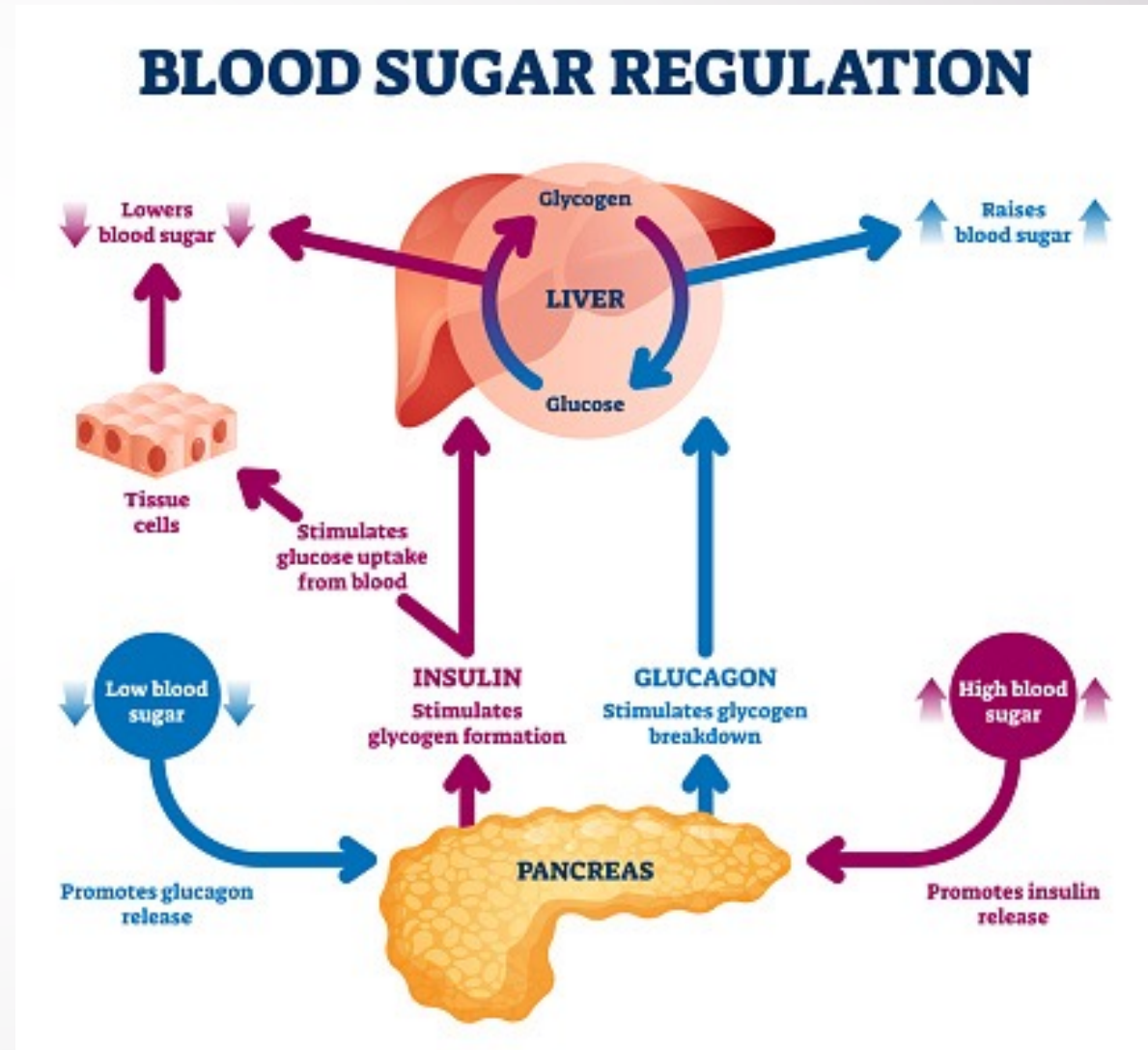
Objectives



- ▶ Describe pathophysiology of hypoglycemia and what patients are at risk
- ▶ Know the clinical signs of hypoglycemia
- ▶ How to treat hypoglycemia
- ▶ Where to find Patient education resources

Pathophysiology

- ▶ Too much insulin
- ▶ Reduced glycogenesis
- ▶ Destruction on pancreatic cells
- ▶ Increased uptake of glucose into tissues



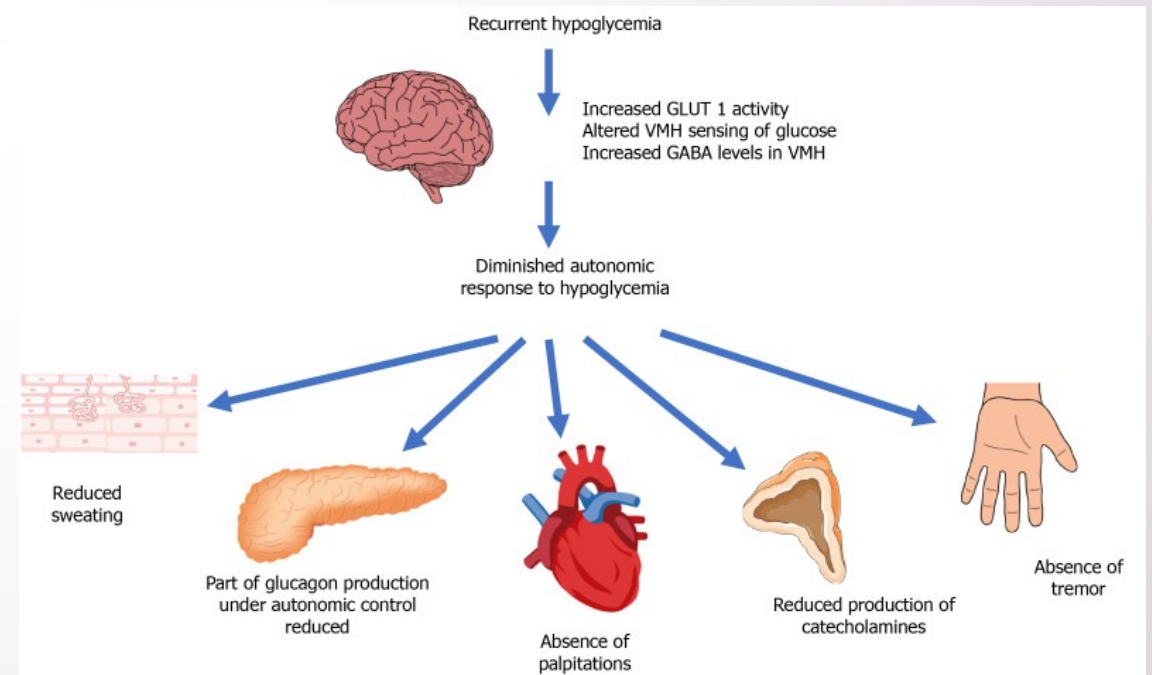


Hypoglycemia and Risk Factors

- ▶ Condition where blood glucose concentration is low
 - ▶ Level 1: plasma blood glucose <70 mg/dL but >54 mg/dL
 - ▶ Level 2: plasma blood glucose <54 mg/dL that requires immediate intervention
 - ▶ Level 3: event that causes impairment or change in mental status that requires another person to correct level
- ▶ Risk Factors
 - ▶ Patients with diabetes that are being treated with certain medications
 - ▶ Insulin, sulfonylureas, glinide
 - ▶ Certain lifestyle modifications (diet, exercise, alcohol consumption)
 - ▶ Drop insulin production due to additional medical conditions

Hypoglycemia Unawareness

- ▶ Described as an decreased autonomic response to low blood sugar
- ▶ Occurs when patients has frequent low blood sugar
- ▶ More common in type 1 diabetics
- ▶ Can be dangerous for patients



Clinical Symptoms

- Sweating
- Shaking
- Rapid heart rate
- Blurred vision
- Dizzy
- Hungry
- Headache
- Weakness
- Irritability
- Feeling anxious
- Altered mental status
- Unconscious


CHANGINGlife
WITHDIABETES

Hypoglycemia (Low Blood Glucose)

Causes: Too little food or skipping a meal; too much insulin or diabetes pills; more active than usual.

Onset: Often sudden.

Some Symptoms:



SHAKY

FAST HEARTBEAT

SWEATING

DIZZY

ANXIOUS

HUNGRY

BLURRY VISION

WEAKNESS OR FATIGUE

HEADACHE

IRRITABLE

IF LOW BLOOD GLUCOSE IS LEFT UNTREATED, YOU MAY PASS OUT AND NEED MEDICAL HELP.

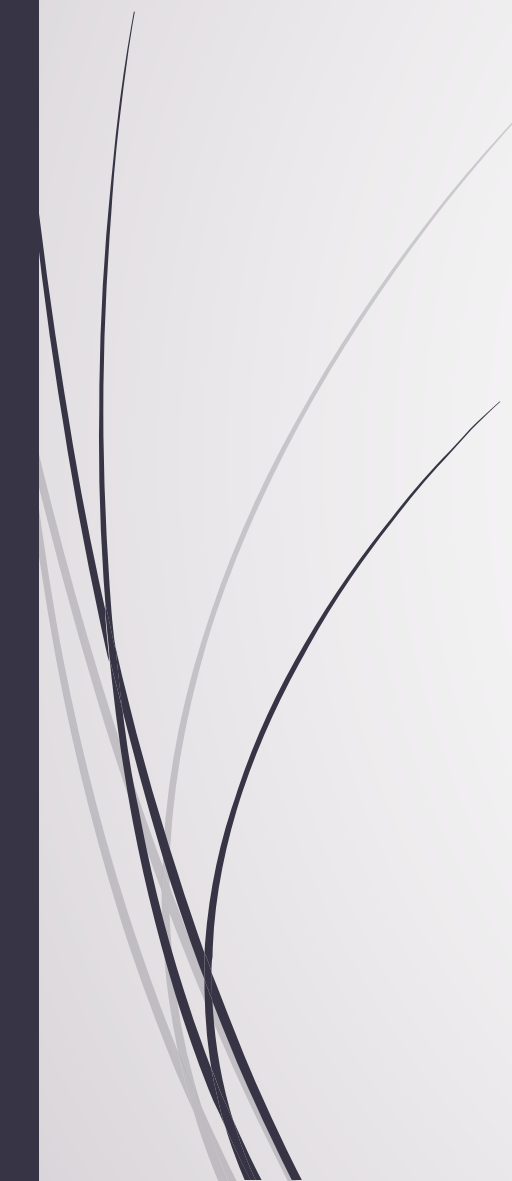


Relative hypoglycemia

- ▶ Patient has symptoms of hypoglycemia but blood glucose is above 70 mg/dL
- ▶ Occurs when patient has chronic hypoglycemia
- ▶ Treatment is not necessary
 - ▶ May treat to help alleviate some of the symptoms



Impact of hypoglycemia

- ▶ Frequent events put patients at risk for hypoglycemia unawareness
 - ▶ Among children, one study found that hypoglycemia can reduce cognitive function
 - ▶ Hypoglycemic events in older adults have increased risk of developing dementia
 - ▶ Epidemiology study showed a significant increase for cardiovascular events and mortality for patients who had severe hypoglycemia
 - ▶ Severe prolonged episode can lead to death
- 



Treatment of Hypoglycemia

- ▶ Treatment of level 1 hypoglycemia (BG between 55 and 70)
 - ▶ Use the 15-15 rule → 15 grams of carbs then recheck blood glucose in 15 minutes
 - ▶ Repeat if blood glucose still below 70
 - ▶ Oral glucose is best option
- ▶ Treatment of level 2 and 3 hypoglycemia (BG below 55)
 - ▶ Use glucagon
 - ▶ Person should wake within 15 minutes after glucagon use
 - ▶ If second dose is needed emergency services should be contacted



Treatment of Hypoglycemia

- ▶ Available treatment options
 - ▶ Glucose oral tablets
 - ▶ Glucose oral gel
 - ▶ Glucagon injection kit
 - ▶ Nasal powered glucagon (Baqisimi)
 - ▶ Auto-injector pen (Gvoke HypoPen)
 - ▶ Prefilled syringe (Gvoke PFS)
- ▶ The IHS core formulary requires an “oral glucose, any formulation” to be on formulary
 - ▶ Also supports addition of glucagon for severely hypoglycemia

Oral Glucose tablets or Gel

- ▶ Many different options available
- ▶ Are over the counter
- ▶ Approved for use in adults and children
- ▶ Contraindications and Warnings
 - ▶ Inability to swallow
 - ▶ Allergy to any component
- ▶ Cost:
 - ▶ Prime vendor: \$1.99 for 6 tubes of 10 tablets
 - ▶ AWP: \$ 9.23
 - ▶ Over the counter prices is from \$ 3 -7 per tube of 10 tablets



Glucagon Injection Kit



- ▶ Approved for all age groups
- ▶ Dosage:
 - ▶ Adult or child 6 years or older with known weight >25 kg → 1 mg
 - ▶ Child < 25 kg or child younger than 6 with unknown weight → 0.5 mg
- ▶ Approved for SC, IV and IM use
- ▶ Warnings and precautions
 - ▶ Use with pheochromocytoma ■
 - ▶ Use with insulinoma ■
 - ▶ Hypersensitivity to components ■
 - ▶ Lack of efficacy in patients with decreased hepatic glycogen
- ▶ Most common side effects
 - ▶ Injection site swelling, nausea, vomiting, decreased blood pressure, and headache



Glucagon Injection Kit

- ▶ Drug interactions:

- ▶ Beta-blockers
- ▶ Indomethacin
- ▶ Warfarin

- ▶ Cost:

- ▶ Prime vendor: \$154.99 for 1 mg vial/syringe kit
- ▶ AWP: \$ 336.00

Glucagon Injection Kit



Step 1. Using your thumb, flip the orange plastic cap off the Glucagon vial.



Step 2. Pick up the prefilled syringe containing sterile water. Hold the syringe with 1 hand and with your other hand pull the needle cover off the syringe. **Do not remove the plastic backstop from the syringe.**



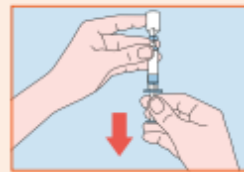
Step 3. Pick up the Glucagon vial. Hold the vial of dry powder with 1 hand and with your other hand push the needle of the prefilled syringe through the center of the rubber stopper.



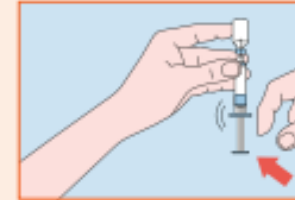
Step 4. Hold the vial and syringe together, with the needle still inserted into the vial. Carefully turn the vial and syringe together right side up. Slowly push the plunger down until the syringe is empty. **Do not take the syringe out of the vial.**



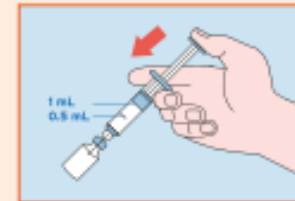
Step 5. Hold the entire unit (the vial and syringe) in 1 hand and gently shake the vial until the powder is completely dissolved. Do not use if it is cloudy or if you see particles in the solution. **Do not take the syringe out of the vial.**



Step 6. Firmly hold the vial and syringe together, with the needle still inserted into the vial. Carefully turn the vial and syringe together upside down. Gently pull down on the plunger and slowly withdraw all of the liquid into the syringe. **Do not pull the plunger out of the syringe.**



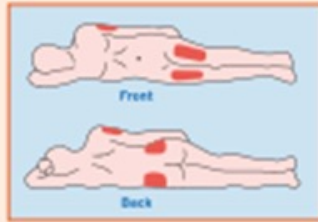
Step 7. Keep the needle inside the vial. Check the syringe for air bubbles. If you see bubbles, tap the syringe until the bubbles rise to the top of the syringe. Gently push on the plunger to move only the air bubbles back into the vial.



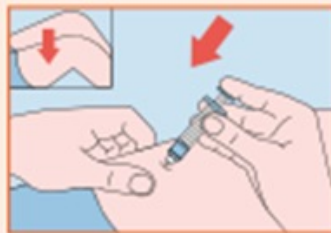
Step 8. Hold the vial and syringe as shown. Take the syringe and needle out of the vial when the correct dose of glucagon is in the syringe.

Glucagon Injection Kit

Giving Glucagon dose



Step 9. Choose the injection site. Common injection sites for Glucagon are upper arms, thighs, or buttocks. Patient does not need to be laying down to administer the medication as long as the common injection sites can be easily accessed.



Step 10. With one hand gently pinch the skin at the injection site. With your other hand insert the needle into the skin and push the plunger down until the syringe is empty.

After Giving Glucagon dose



Step 11. Pull the needle out of the skin and press on the injection site. Use a gauze pad or cotton ball (not included in the kit) if needed to press the injection site to make sure there is no direct contact with the skin. Throw away your used syringe with the needle attached and any Glucagon you did not use.

See **“How should I dispose of (throw away) used Glucagon prefilled syringes”** at the end of these instructions.

Step 12. Turn the person on their side. When an unconscious person awakens, they may vomit. Turning the person on their side will lessen the chance of choking.

Step 13. Call for emergency medical help right away. If the person does not respond after 15 minutes, another dose may be given, if available.

Step 14. Feed the person as soon as they are awake and able to swallow.

Give the person a fast acting source of sugar (such as a regular soft drink or fruit juice) and a long acting source of sugar (such as crackers and cheese or a meat sandwich).

Step 15. Even if the Glucagon for Injection treatment wakes the person, tell their doctor right away. The doctor should be told whenever a severe drop in blood sugar (hypoglycemia reaction) happens. The person’s dose of diabetes medicine may need to be changed.

Nasal Powder glucagon (Baqsimi)

- ▶ Approved for ages 4 years and older
- ▶ Dosage: 3 mg for all ages
- ▶ Intranasal use only, use in only one nostril
- ▶ Warnings and Precautions
 - ▶ Pheochromocytoma ■
 - ▶ Insulinoma ■
 - ▶ Hypersensitivity to components ■
 - ▶ Lack of efficacy in patients with decreased hepatic glycogen
- ▶ Most common side effects
 - ▶ Nausea, headache, vomiting, upper respiratory irritation
- ▶ Cost:





Nasal Powder glucagon (Baqsimi)

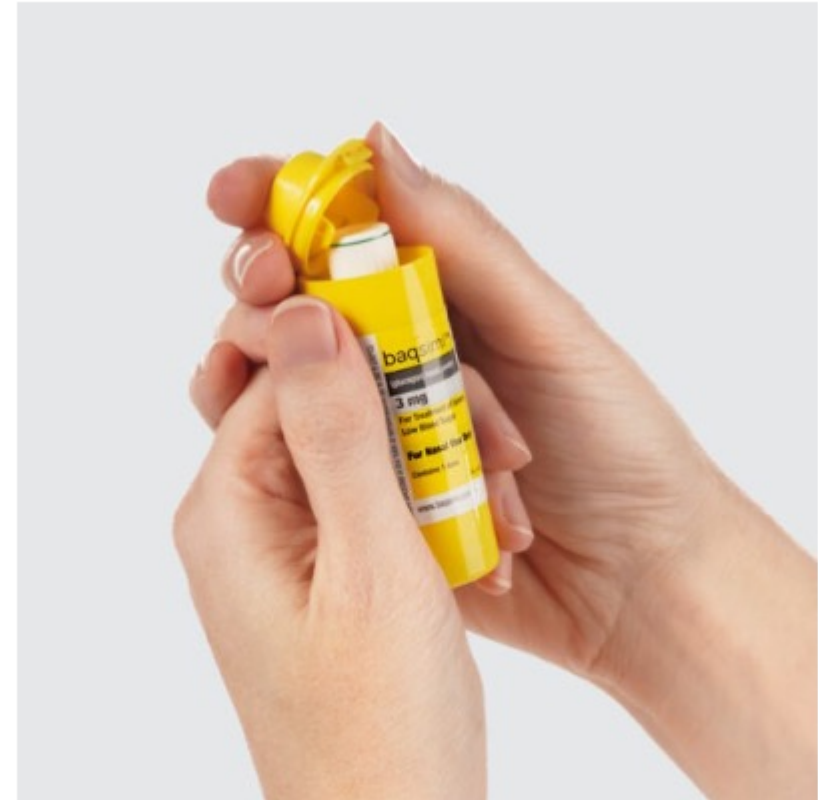
- ▶ Drug interactions:
 - ▶ Beta-blockers
 - ▶ Indomethacin
 - ▶ Warfarin
- ▶ Cost:
 - ▶ Prime Vendor: \$ 182.80 for 1 Baqsimi device
 - ▶ AWP: \$ 336.96

Nasal Powdered Glucagon (Baqsimi)

Preparing Glucagon dose



Remove the Shrink Wrap by pulling on the red stripe.



Open the Lid and remove the Device from the Tube.

Caution: Do not press the Plunger until ready to give the dose.

Nasal Powdered Glucagon (Baqsimi)

Giving Glucagon dose

1



Hold Device between fingers and thumb.
Do not push Plunger yet.

2



Insert Tip gently in one nostril until finger(s)
touch the outside of the nose.

3



Push Plunger firmly all the way in. **Dose is complete when the Green Line disappears.**

After Giving Glucagon dose

- **Call for emergency medical help right away**
- If the person is unconscious, turn the person on their side
- **Throw away the used Device and Tube**
- Encourage the person to eat as soon as possible. When they are able to safely swallow, give the person a fast-acting source of sugar, such as juice. Then encourage the person to eat a snack, such as crackers with cheese or peanut butter
- If the person does not respond after 15 minutes, another dose may be given, if available

Auto-injector Glucagon Pen (Gvoke HypoPen)



- ▶ Approved for ages 2 years and older
- ▶ Dosage:
 - ▶ Ages 2 to 12 years old Weight < 45 kg → 0.5 mg
 - ▶ Ages 2 and older with weight > 45 kg → 1 mg
- ▶ Subcutaneous Injection only
- ▶ Warnings and precautions
 - ▶ Pheochromocytoma ■
 - ▶ Insulinoma ■
 - ▶ Known hypersensitivity ■
 - ▶ Necrolytic Migratory Erythema
- ▶ Most common side effects
 - ▶ Nausea, vomiting, injections site edema, and headache
- ▶ Cost:



Auto-injector Glucagon Pen (Gevoke HypoPen)

- ▶ Drug interactions:
 - ▶ Beta-blockers
 - ▶ Indomethacin
 - ▶ Warfarin
- ▶ Cost
 - ▶ Prime vendor: \$ 195.22 for 1 mg Gevoke HypoPen
 - ▶ AWP: \$ 736.42
 - ▶ Prime vendor: \$ 391.13 for 0.5 mg 2 pack Gevoke HypoPen
 - ▶ AWP: 736.42

Auto-injector Glucagon Pen (Gvoke HypoPen)

Preparing and Giving Glucagon dose

Gvoke HypoPen[®]
(glucagon injection)

1 mg per 0.2 mL

NDC 72065-121-11 Rx Only

Contains 1 Single-Dose Auto-Injector

FOR LOW BLOOD SUGAR EMERGENCY

1. Prepare **2. Inject** **3. Assist**

Tear Open Pouch at Dotted Line. Remove Auto-Injector.

Pull off Red Cap.

Choose Injection Site and Expose Skin.
Front View Back View
Lower Abdomen, Outer Thigh, or Outer Upper Arm

Push Down on Skin to Start. Hold Down for 5 Seconds.
Wait for Window to Turn Red.

Hold Down for 5 Sec.

Turn Patient on Side. Call Emergency Medical Help.

After the Injection, Put the Used Pen in a Safe Place Until It Can Be Disposed of Into a FDA Cleared Sharps Container.

Red Cap Needle End Gvoke HypoPen[®] (glucagon injection)

Prefilled Syringe Injection (Gvoke PFS)

- ▶ Approved for ages 2 years and older
- ▶ Dosage:
 - ▶ Ages 2 to 12 years old Weight < 45 kg → 0.5 mg
 - ▶ Ages 2 and older with weight > 45 kg → 1 mg
- ▶ Subcutaneous Injection only
- ▶ Warnings and precautions
 - ▶ Pheochromocytoma ■
 - ▶ Insulinoma ■
 - ▶ Known hypersensitivity ■
 - ▶ Necrolytic Migratory Erythema
- ▶ Most common side effects
 - ▶ Nausea, vomiting, injections site edema, and headache





Prefilled Syringe Injection (Gevoke PFS)

- ▶ Drug interactions:
 - ▶ Beta-blockers
 - ▶ Indomethacin
 - ▶ Warfarin
- ▶ Cost:
 - ▶ Prime vendor: \$ 195.07 single 1 mg syringe
 - ▶ AWP: \$ 368.21
 - ▶ Prime vendor: \$390.09 two pack of 0.5 mg syringe
 - ▶ AWP: 736.49

Prefilled Syringe Injection (Gevoke PFS)

Preparing and Giving Glucagon dose

Gvoke[®] PFS
(glucagon injection)

1 mg per 0.2 mL

NDC 72065-131-11

Rx Only

Contains 1 Single-Dose Pre-Filled Syringe

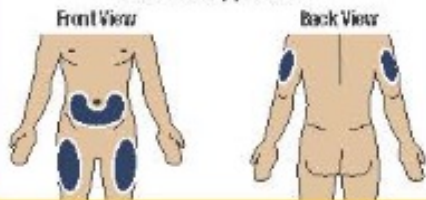
FOR LOW BLOOD SUGAR EMERGENCY

1. Prepare

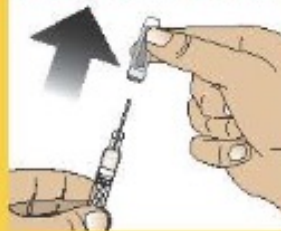
Tear Open Pouch at Dotted Line. Remove Syringe.



Choose Injection Site and Expose Skin.
Lower Abdomen, Outer Thighs, or Outer Upper Arm

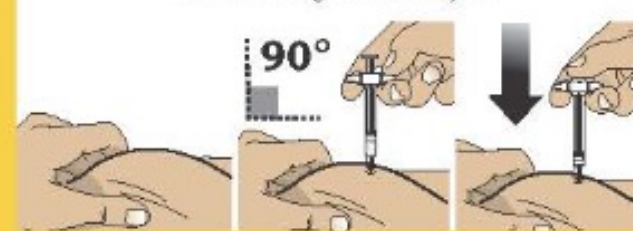


Pull off Needle Cap. **Do NOT remove air bubbles.**



2. Inject

Pinch the Skin. **Insert the Needle at 90 degrees.** Push the Plunger Down to Inject.

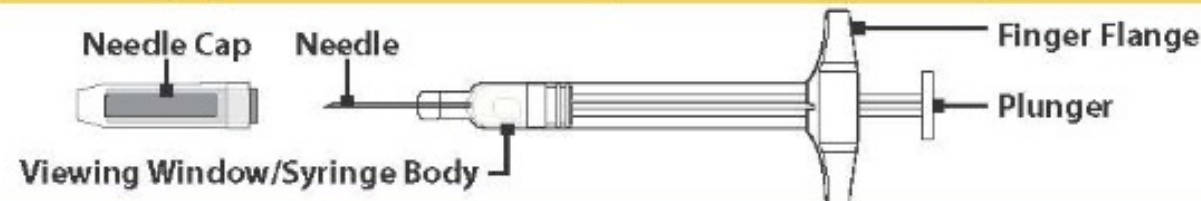


3. Assist

Turn Patient on Side. Call Emergency Medical Help.



After the Injection, Put the Used Syringe in a Safe Place Until It Can Be Disposed of Into a FDA Cleared Sharps Container. **Do Not** Recap the Syringe.





Resources



1. Nakhleh A, Shehadeh N. Hypoglycemia in diabetes: An update on pathophysiology, treatment, and prevention. *World J Diabetes*. 2021;12(12):2036-2049. doi:10.4239/wjd.v12.i12.2036
2. Lin A, Northam EA, Rankins D, Werther GA, Cameron FJ. Neuropsychological profiles of young people with type 1 diabetes 12 yr after disease onset. *Pediatr Diabetes*. 2010;11(4):235-243. doi:10.1111/j.1399-5448.2009.00588.x
3. Yaffe K, Falvey CM, Hamilton N, et al. Association between hypoglycemia and dementia in a biracial cohort of older adults with diabetes mellitus. *JAMA Intern Med*. 2013;173(14):1300-1306. doi:10.1001/jamainternmed.2013.6176
4. International Hypoglycaemia Study Group. Hypoglycaemia, cardiovascular disease, and mortality in diabetes: epidemiology, pathogenesis, and management [published correction appears in *Lancet Diabetes Endocrinol*. 2019 Jun;7(6):e18]. *Lancet Diabetes Endocrinol*. 2019;7(5):385-396. doi:10.1016/S2213-8587(18)30315-2
5. Instructions for use for injection 1 mg/ML - glucagon emergency kit. September 2019. Accessed October 18, 2023. https://glucagonemergencykit.com/wp-content/uploads/2019/12/Glucagon_IFU_191122.pdf.
6. How to use Baqsimi. Baqsimi. October 5, 2023. Accessed October 18, 2023. <https://www.baqsimi.com/how-to-use-baqsimi/>.
7. Glucagon efficacy for preventing hypoglycemia in adult and pediatric patients: GVOKE® (Glucagon Injection). Gvoke. August 21, 2023. Accessed October 19, 2023. <https://www.gvokeglucagon.com/hcp/about-gvoke/#how-to-use>.
8. 1. Rapid overview for diagnosis and treatment of hypoglycemia in adolescents and children (other than neonates) in the Emergency Department. UpToDate. Accessed October 23, 2023. <https://www.uptodate.com/contents/image?imageKey=PEDS%2F83485#!>