### Alert
- Management of neonatal hypoglycaemia:
  - Refractory to intravenous glucose infusions;
  - When glucose infusion is unavailable.
- Management of hyperinsulinaemic hypoglycaemia (e.g. congenital hyperinsulinism).
- Adjunctive treatment of beta-blocker overdose.

### Action
- Glucagon stimulates hepatic gluconeogenesis and glycogenolysis. Glucagon has a positive inotropic action.

### Drug Type
- Polypeptide hormone – hyperglycaemic agent

### Trade Name
- GlucaGen HypoKit 1 mg/mL

### Presentation
- 1 mg/mL vial.
- 1 unit of glucagon = 1 mg (1000 microgram) glucagon

### Dosage/Interval
- **IV bolus/IM/SC:**
  - 200 microgram/kg/dose. Do not exceed 1 mg/dose. IV glucose is to be administered as soon as possible.
- **IV infusion:**
  - 5–20 microgram/kg/hour.
  - Consider starting dose of 20 microgram/kg/hour and decrease carefully, monitoring blood glucose, until the minimum effective dose is reached.

### Route
- IV, IM, SC

### Maximum Dose
- Maximum stat dose: 1 mg (1000 microgram)

### Preparation/Dilution
- **IV bolus/IM/SC:**
  - Reconstitute 1 mg (1000 microgram) vial with 1 mL of diluent provided (WFI) to make a solution containing 1 mg/mL (1000 microgram/mL) of glucagon.

#### IV infusion
- **SINGLE STRENGTH infusion:**
  - Infusion rate
    - 1 mL/hour = 10 microgram/kg/hour
    - Prescribed amount
      - 0.5 mg/kg (0.5 mL/kg) glucagon to make up to 50 mL
  - Add 1 mL of diluent provided (WFI) to the 1 mg vial (1000 microgram of glucagon).
  - Draw up 0.5 mL/kg (0.5 mg/kg of glucagon) and make up to a final volume of 50 mL with glucose 5% with a concentration of 10 microgram/kg/mL.
  - Infusing at 1 mL/hour = 10 microgram/kg/hour.

- **DOUBLE STRENGTH infusion**
  - Infusion rate
    - 1 mL/hour = 20 microgram/kg/hour
    - Prescribed amount
      - 1 mg/kg (1 mL/kg) glucagon to make up to 50 mL
  - Add 1 mL of diluent provided (WFI) to the 1 mg vial (1000 microgram of glucagon).
  - Draw up 1 mL/kg (1 mg/kg of glucagon) and make up to a final volume of 50 mL with glucose 5% with a concentration of 20 microgram/kg/mL.
  - Infusing at 1 mL/hour = 20 microgram/kg/hour.

### Administration
- Do not use the reconstituted solution unless it is clear.
- **IV bolus:** Administer 0.2 mL/kg of the reconstituted solution (to a maximum 1 mL) over 3 to 5 minutes.
- **IM:** Inject into the anterolateral thigh (preferred) or the ventrogluteal areas [1, 2].
- **SC:** Inject into the area over the deltoid muscle or over the anterolateral thigh [1, 3].
- **Continuous IV infusion:** Via syringe driver.

### Monitoring
- Blood glucose concentrations (watch for rebound hypoglycaemia).
- Consider cardiorespiratory and blood pressure monitoring.
| **Glucagon**  
**Newborn Use Only** |

| **Contraindications** | Phaeochromocytoma [4-6], glucagonoma.  
Hypersensitivity to glucagon or any component. |
|-----------------------|--------------------------------------------------------------------------------|
| **Precautions**       | Hypertension.  
Insulinoma: Glucagon has been used to treat hypoglycaemia caused by insulinoma. However, it should be used cautiously because of the propensity to release insulin [7]. |
| **Drug Interactions** | Drug interactions largely unreported in newborn infants.  
Glucagon has a positive inotropic action which may counteract effect of beta-blockers. Beta-blockers may reduce hyperglycaemic effect of glucagon [8].  
Warfarin: Increased effect of warfarin resulting in increased risk of bleeding.[9]  
Indomethacin: Glucagon may lose its ability to raise blood glucose or paradoxically may even produce hypoglycaemia [7]. |
| **Adverse Reactions** | Generally well tolerated.  
Transient increase in blood pressure and pulse rate. [7]  
Anaphylaxis or hypersensitivity reactions have been reported in adults. [7]  
Very rare: Hypertension, hypotension, vomiting. [7]  
Erythema necrolyticum migrans (erythematousquamous skin lesions) has been reported with prolonged glucagon infusion. |
| **Compatibility**     | Fluids: Glucose 5% and 10%, sodium chloride 0.9%.  
Y-site: Naloxone. |
| **Incompatibility**   | Fluids: Solutions that contain calcium. Y-site: No information. |
| **Stability**         | Discard any unused solution.  
IV infusion solution is stable for 24 hours. |
| **Storage**           | Store below 25°C. Do not freeze. The sealed container should be protected from light. |
| **Special Comments**  | Evidence summary: Refer to full version.  
References: Refer to full version. |

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