

# Glucagon

## Newborn Use Only

2018

<b>Alert</b>									
<b>Indication</b>	<p>Management of neonatal hypoglycaemia:</p> <ul style="list-style-type: none"> <li>• Refractory to intravenous glucose infusions;</li> <li>• When glucose infusion is unavailable.</li> </ul> <p>Management of hyperinsulinaemic hypoglycaemia (e.g. congenital hyperinsulinism). Adjunctive treatment of beta-blocker overdose.</p>								
<b>Action</b>	Glucagon stimulates hepatic gluconeogenesis and glycogenolysis. Glucagon has a positive inotropic action.								
<b>Drug Type</b>	Polypeptide hormone – hyperglycaemic agent								
<b>Trade Name</b>	GlucaGen HypoKit 1 mg/mL								
<b>Presentation</b>	1 mg/mL vial. 1 unit of glucagon = 1 mg (1000 microgram) glucagon								
<b>Dosage/Interval</b>	<p><b>IV bolus/IM/SC:</b> 200 microgram/kg/dose. Do not exceed 1 mg/dose. IV glucose is to be administered as soon as possible.</p> <p><b>IV infusion:</b> 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.</p> <p><b>Beta-blocker overdose:</b> Refer to evidence summary.</p>								
<b>Route</b>	IV, IM, SC								
<b>Maximum Dose</b>	Maximum stat dose: 1 mg (1000 microgram)								
<b>Preparation/Dilution</b>	<p><b>IV bolus/IM/SC:</b> 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.</p> <p><b>IV infusion</b> <b>SINGLE STRENGTH infusion:</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Infusion rate</th> <th style="width: 50%;">Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 10 microgram/kg/hour</td> <td>0.5 mg/kg (0.5 mL/kg) glucagon to make up to 50 mL</td> </tr> </tbody> </table> <p>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. <b>Infusing at 1 mL/hour = 10 microgram/kg/hour.</b></p> <p><b>DOUBLE STRENGTH infusion</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Infusion rate</th> <th style="width: 50%;">Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 20 microgram/kg/hour</td> <td>1 mg/kg (1 mL/kg) glucagon to make up to 50 mL</td> </tr> </tbody> </table> <p>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. <b>Infusing at 1 mL/hour = 20 microgram/kg/hour.</b></p>	Infusion rate	Prescribed amount	1 mL/hour = 10 microgram/kg/hour	0.5 mg/kg (0.5 mL/kg) glucagon to make up to 50 mL	Infusion rate	Prescribed amount	1 mL/hour = 20 microgram/kg/hour	1 mg/kg (1 mL/kg) glucagon to make up to 50 mL
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<b>Administration</b>	<p>Do not use the reconstituted solution unless it is clear.</p> <p><b>IV bolus:</b> Administer 0.2 mL/kg of the reconstituted solution (to a maximum 1 mL) over 3 to 5 minutes.</p> <p><b>IM:</b> Inject into the anterolateral thigh (preferred) or the ventrogluteal areas [1, 2].</p> <p><b>SC:</b> Inject into the area over the deltoid muscle or over the anterolateral thigh [1, 3].</p> <p><b>Continuous IV infusion:</b> Via syringe driver.</p>								
<b>Monitoring</b>	Blood glucose concentrations (watch for rebound hypoglycaemia). Consider cardiorespiratory and blood pressure monitoring.								

	Electrolytes (for continuous infusion).
<b>Contraindications</b>	Phaeochromocytoma [4-6], glucagonoma. Hypersensitivity to glucagon or any component.
<b>Precautions</b>	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].
<b>Drug Interactions</b>	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].
<b>Adverse Reactions</b>	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 (erythematous squamous skin lesions) has been reported with prolonged glucagon infusion.
<b>Compatibility</b>	Fluids: Glucose 5% and 10%, sodium chloride 0.9%. Y-site: Naloxone.
<b>Incompatibility</b>	Fluids: Solutions that contain calcium. Y-site: No information.
<b>Stability</b>	Discard any unused solution. IV infusion solution is stable for 24 hours.
<b>Storage</b>	Store below 25°C. Do not freeze. The sealed container should be protected from light.
<b>Special Comments</b>	
<b>Evidence summary</b>	<p><b>Efficacy</b></p> <p><b>Treatment of hypoglycaemia:</b> The data are mainly derived from case series and case reports [10-13]. A single bolus dose of glucagon (200 microgram/kg) caused a rapid rise in hepatic glucose production rate in newborns with hypoglycaemia [12]. (LOE IV) Glucagon infusion (0.5–1 mg/day = 20–40 microgram/hour) resulted in a significant rise in blood glucose concentration within 4 hours of infusion in newborn infants irrespective of the cause of hypoglycaemia [13]. (LOE IV, GOR C). Glucose production in response to a glucagon 100 microgram/kg bolus was comparable in preterm, Appropriately Grown for Age and Small for Gestational Age infants [14]. (LOE IV). Glucagon infusion (20–40 microgram/hour) has been used to treat refractory hypoglycaemia in sick preterm infants (mean birth weight 1814 g and gestational age 32 weeks) [11]. (LOE IV)</p> <p><b>Treatment of low-output heart failure associated with beta-blocker overdose:</b> A case report of a preterm infant with low output heart failure after maternal labetalol use who responded to repeated use of intravenous glucagon 0.3 to 0.6 mg/kg [15] (LOE IV GOR C). This is consistent with doses in case reports of glucagon use for adult beta-blocker overdose. [16].</p> <p><b>Safety</b></p> <p>Hyponatraemia has been variably reported with glucagon infusion [13, 17, 18] although it may be explained by other factors including glucose infusion. (LOE IV GOR D) Thrombocytopenia has been reported [13, 17] although a case series found increasing platelet counts during infusion [11]. Erythema necrolyticum migrans (erythematous squamous skin lesions) has been reported with prolonged glucagon infusion [19, 20]. Glucagon has been reported to induce hypertension in patients with phaeochromocytoma [8, 10, 11]. Adverse cardiovascular events attributable to glucagon have not been reported in newborns.</p> <p><b>Pharmacodynamics</b></p> <p>An effect on blood glucose is usually seen within 5–20 minutes after IV, IM or SC administration [11]. Response to an intravenous bolus persists for at least 45 minutes [13].</p> <p><b>Pharmacokinetics</b></p> <p>Adult data report half-life of 8–18 minutes.[7]</p>

References	
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