GLUCAGON AND HIGH DOSE INSULIN FOR TREATMENT OF BETA BLOCKER/ CALCIUM CHANNEL BLOCKER OVERDOSE ADULTS ONLY

TARGET AUDIENCE	For use within NHS Lanarkshire ED / Critical Care only
PATIENT GROUP	Adults only

Clinical Guidelines Summary

- Collated information required in a high stress situation, for use with adult patients following beta blocker/ calcium channel blocker overdose.
- Administration and monitoring of glucagon and high dose insulin therapy within an observed and monitored ED / Critical Care area.
- Flow chart decision making tool based on Toxbase guidance

Glucagon Intravenous Infusion (Unlicensed) – Adults only

(For use within an observed and monitored ED / Critical Care area only)

Use as a poisoning antidote: log in to https://toxbase.org using your personal Toxbase username and password.

Serious cases of beta blocker overdose should be discussed with the National Poisons Information Service (**Tel: 0344 892 0111**).

Glucagon availability: **vials in the ITU treatment room fridge**, ED, and emergency drug cupboard. Liaise with pharmacy as soon as possible, if out of hours contact on call pharmacist through switchboard.

Beta-blocker overdose (unlicensed) IV injection:

- Give initial IV bolus of 5-10 milligrams (over 1-2 minutes).
- If after initial IV bolus haemodynamic stability is achieved, consider following with IV infusion using an infusion pump.
- Based on actual body weight (ABW) administer at a rate of 50-150 micrograms/kg/hour according to response.
- **Limited evidence for use of doses >10 milligrams/hour.**
- If haemodynamic stability is not achieved after initial IV bolus, an infusion is unlikely to be of benefit.
- **Adult example calculation table for glucagon infusion 50 micrograms/kg/hour in beta-blocker overdose, assuming the reconstituted solution (1 milligram in 1mL) is administered without further dilution.**

Weight (kg)	50 micrograms/kg/hr **Rate (mL/hr)**	100 micrograms /kg/hr **Rate (mL/hr)**	150 micrograms /kg/hr **Rate (mL/hr)**
40	2	4	6
50	2.5	5	7.5
60	3	6	9
70	3.5	7	10.5
80	4	8	12
90	4.5	9	13.5
100	5	10	15
≥110	5.5	11	16.5

****Allocate 1 person to solely focus on preparation of the infusion as multiple vials are required****

Preparation:

- Inject 1.1mL water for injections into the contents of the vial containing the glucagon to obtain a reconstituted solution containing glucagon 1milligram in 1mL. TOXBASE advises reconstituted solution can be used undiluted or diluted in 5% glucose.
- Shake the vial gently until the powder is completely dissolved and the solution is clear.
- Withdraw the solution back into the syringe.
- Wean IV infusion slowly and flush with 5% glucose **(unless there are other causes for shock)**. Follow local guidelines and guidance of medical staff.
- ***Use a central venous access device where possible to avoid potential venous irritation as the preparation has a low pH. Alternatively administer via a large peripheral vein while monitoring insertion site closely for irritation/extravasation.***

Lead Author	**Deborah Smith & Sarah Brady**	**Date approved**	**December 2025**
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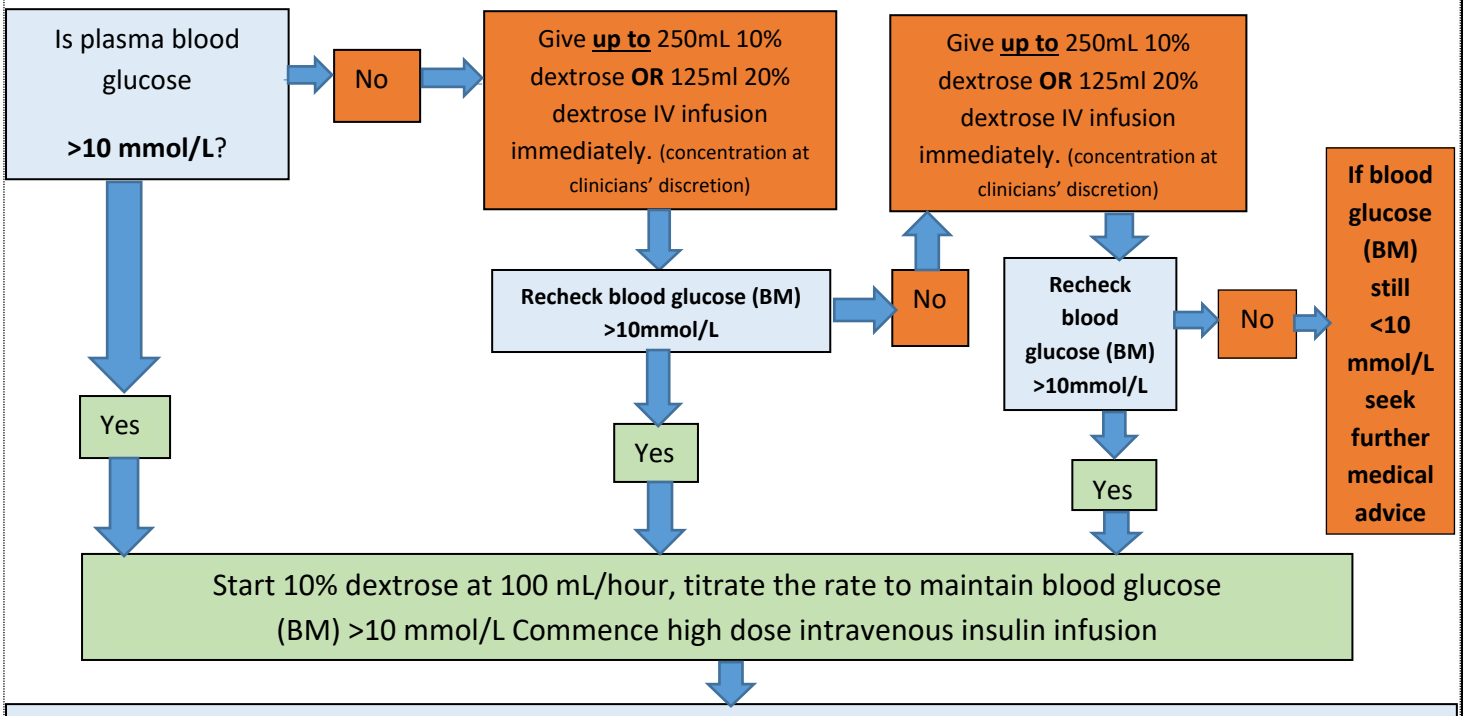
High Dose Insulin Euglycaemic Therapy – Adults only

(For use within an observed and monitored ED / Critical Care area only)

This is a life threatening emergency, correct hypokalaemia and check blood glucose



Take 500 units/5mL from a vial of Actrapid (100 units/mL) and dilute with 45mL sodium chloride 0.9% to a final volume of 50 mL **(final concentration 10 units/mL)**. ****Note high strength – label carefully ****

Commence therapy with a bolus of intravenous insulin: bolus Actrapid at 1.0 unit/kg intravenously over 2-3 minutes (see table overleaf)

Continue therapy with a continuous intravenous infusion of insulin: Start at 1.0 unit/kg/hour

Perform blood glucose (BM) every 10 minutes initially and following insulin infusion rate changes.
When on a stable dose check blood glucose (BM) every 30-60 minutes.

Measure serum potassium hourly if K+ <3.5mmol/L replace potassium to normal serum concentration

Titrate the insulin infusion by **1 unit/kg/hour every 15 minutes** to clinical response (aim systolic BP >90mmHg) (See table overleaf)

Stopping: Once clinically improved and haemodynamically stable, unless there are other causes for shock, wean vasopressor before discontinuation of insulin infusion under the guidance of medical staff.

- Halve the dose of the insulin infusion and observe for 2 hours. In the absence of a fall in blood pressure, stop the infusion.
- If blood pressure falls restart the infusion and attempt to wean at a later time.
- **High risk of rebound hyperkalaemia once infusion stopped.**
- **Continue to monitor blood glucose (BM) and potassium closely for 24 hours.**

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High Dose Insulin Euglycaemic Therapy – Adults only

****(For use within an observed and monitored ED / Critical Care area only)****

Check K+ prior to starting insulin, if K+ <3.5mmol/L ensure K+ IVI commenced prior to starting/ or when starting high dose insulin

Actrapid IV infusion 10 units/mL

Patients **actual body weight** (kg)	**Initial bolus dose** (1.0 unit/kg)	Initial **continuous infusion** (1.0 unit/kg/hour) mL/hour	**Titrate the continuous infusion dose up by 1.0 unit/kg/hour every 15 minutes to clinical response (systolic >90mmHg)**			
			(2.0 unit/kg/hr) If no clinical response **after 15 minutes** of commencing infusion increase to **(3.0 unit/kg/hr)** and check line	**(3.0 unit/kg/hr)** If no clinical response **after 30 minutes** of commencing infusion increase to **(4.0 unit/kg/hr)** and check line	**(4.0 unit/kg/hr)** If no clinical response **after 45 minutes** of commencing infusion increase to **(5.0 unit/kg/hr)** and check line	**(5.0 unit/kg/hr)** If no clinical response **after 60 minutes** of commencing infusion check line and seek further guidance if not already done so
40	40 units (4mL)	4 mL/hour	8 mL/hour	12 mL/hour	16 mL/hour	20 mL/hour
50	50 units (5mL)	5 mL/hour	10 mL/hour	15 mL/hour	20 mL/hour	25 mL/hour
60	60 units (6mL)	6 mL/hour	12 mL/hour	18 mL/hour	24 mL/hour	30 mL/hour
70	70 units (7mL)	7 mL/hour	14 mL/hour	21 mL/hour	28 mL/hour	35 mL/hour
80	80 units (8mL)	8 mL/hour	16 mL/hour	24 mL/hour	32 mL/hour	40 mL/hour
90	90 units (9mL)	9 mL/hour	18 mL/hour	27 mL/hour	36 mL/hour	45 mL/hour
100	100 units (10mL)	10 mL/hour	15 mL/hour	25 mL/hour	35 mL/hour	45 mL/hour
≥110	110 units (11mL)	11 mL/hour	22 mL/hour	33 mL/hour	44 mL/hour	55 mL/hour

Note high risk of rebound hyperkalaemia when high dose insulin stopped. Monitor K+ levels closely

References/Evidence

Adapted from TOXBASE protocol https://toxbase.org

Personal communication with TOXBASE professionals https://toxbase.org

Appendices

1. Governance information for Guidance document

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Responsible Person (if different from lead author)	

CONSULTATION AND DISTRIBUTION RECORD	
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CHANGE RECORD

Date	Lead Author	Change	Version
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10/07/2025	Deborah Smith & Sarah Brady	*Further alteration to allow for standardisation across NHSL ITU/ ED/ Adult Critical Care*	1.3
22/10/2025	Deborah Smith & Sarah Brady	*Further alteration to allow for standardisation across NHSL ITU/ ED/ Adult Critical Care*	1.4
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