Paediatric Intensive Care Unit

Management of Hyperglycaemia on PICU (non DKA)

Staff relevant to:	UHL PICU Medical & Nursing staff
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Written by:	Ted Artley & Hazel Perrett
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1. Introduction and Who Guideline applies to

This guideline applies to patients admitted to PICU who are diagnosed with hyperglycaemia **who are not known or suspected of having diabetes mellitus.**
Transient hyperglycaemia in critically unwell children is common, and may be related to their illness or their treatment.
This may present as part of an inflammatory stress response, for example in severe illness such as sepsis or post major surgery/trauma.
Alternatively, this may be a result of glucose in maintenance fluid therapy, TPN, or due to therapeutic use of steroids and catecholamines.

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Background

Prolonged hyperglycaemia in children admitted to PICU has been shown to be related with increased duration of stay, morbidity and mortality. However, it is unclear whether Hyperglycaemia is a marker of critical illness or an aetiological factor.[1]

Research has demonstrated that a tight glucose control aiming between 4-7mmol is associated with increased incidence of hypoglycaemia and nil clinical improvement. Whereas management to keep blood glucose <12mmol may be associated with improved outcome.[2] **Currently there is nil consensus on blood glucose targeting, empirically the target is between 6-10 mmol/L.**

Related documents;

Insulin Use on NNU UHL Neonatal Guideline C25/2006

2. Definition of Hyperglycaemia

Blood Glucose >12mmol on two consecutive measurements over at least 30 minutes apart

Ideally, the blood sample should be capillary or arterial in nature, and can be assessed via the blood gas machine (standard in event of uncertainty), bedside analyser or lab sample.

2.1 Management of Hyperglycaemia

1. Ensure the patient is not receiving excessive glucose
2. Ensure the samples are valid (see above)
3. Follow the insulin infusion guide as directed (Flowchart 1)

2.2 Flowchart 1: Insulin Infusion Guide for Hyperglycaemia on PICU

If **NOT** fluid restricted:
<10kg Using an insulin syringe draw up 5 units/kg of Actrapid® and dilute up to a total volume of 50ml with sodium chloride 0.9%. This provides **1ml/hour = 0.1 units/kg/hour**
≥10kg Using an insulin syringe draw up 50 units of Actrapid® and dilute up to a total volume of 50ml with sodium chloride 0.9% or select a prefilled syringe with 50units in 50ml sodium chloride 0.9%
This provides **1ml/kg/hour = 1 unit/kg/hour**

If fluid restricted:
All weights Draw up 50 units of Actrapid® and dilute up to a total volume of 50ml with sodium chloride 0.9% or select a prefilled syringe with 50units in 50ml sodium chloride 0.9% Then **1ml/kg/hour = 1 unit/kg/hour**

Blood glucose >12mmol
Start 0.05 units/kg/hr

Blood glucose >15mmol
Start 0.1 units/kg/hr

Check blood glucose within 30 minutes of starting infusion & as directed

Work out difference between previous level and current level = _____

Difference between two levels / Previous level X100 = %

For example:
20mmol drop to 15mmol = 5, then 5 divided by original value (20) x 100 = 25% decrease

Or 12mmol increased to 16mmol = difference of 4 = 4 divided by 12 x100 = 33.33 % increase

Note: if the level has increased then the percentage will be an increase, if the level has decreased then the percentage will be a decrease.

>50% Drop	**>12 mmol**	**Reduce insulin infusion by 50%**	**Recheck within 45 minutes**
	10-12mmol	**STOP insulin infusion**	**Recheck within 45 minutes**
	<10mmol	**STOP insulin infusion**	**Recheck within 1 hour**
	<2.5mmol	**STOP insulin infusion & give 3ml/kg 10% Glucose**	**Recheck every 15 minutes until normalised**
≥*25* -50% Drop	**>12 mmol**	**Reduce insulin infusion by 25%**	**Recheck within 45 minutes**
	10-12mmol	**STOP insulin infusion**	**Recheck within 45 minutes**
	<10mmol	**STOP insulin infusion**	**Recheck within 1 hour**
	<2.5mmol	**STOP insulin infusion & give 3ml/kg 10% Glucose**	**Recheck every 15 minutes until normalised**
<25% Drop/Increased	**> 17 mmol**	**Increase insulin infusion by 0.1 unit/kg/hr (2 mls/hr)**	**Recheck within 45 minutes**
	15-17 mmol	**Increase insulin infusion by 0.05 units/kg/hr (1ml/hr)**	**Recheck within 45 minutes**
	12-15 mmol	**Increase insulin infusion by 0.025 units /kg /hr (0.5 ml/hr)**	**Recheck within 45 minutes**
	DO NOT INCREASE RATE WITHIN 2 HOURS OF STARTING INFUSION		
	10-12 mmol	**STOP insulin infusion**	**Recheck within 1 hour**
	2.5-10 mmol	**STOP insulin infusion**	**Recheck within 1 hour**
	<2.5 mmol	**STOP insulin infusion & give 3ml/kg 10% Glucose**	**Recheck every 15 minutes until normalised**

When insulin is finished with, flush with 5ml sodium chloride 0.9% over 30 minutes. Recheck blood glucose 30 minutes after.

3. Education and Training

We recommend that all healthcare professionals who prescribe, handle, prepare or administer insulin undertake all either face to face training on the safe use of insulin or undertake the relevant e-learning module available via HELM.

4. Supporting References

1. Faustino EV, Apkon M. Persistent hyperglycemia in critically ill children. J Pediatr 2005;146:30-4.
2. Duncan Macrae, F. R. et al (2014). A Randomized Trial of Hyperglycemic Control. NEJM, 107-118.

5. Keywords

Blood glucose, Insulin

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.
As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

Contact and review details	
Guideline Lead (Name and Title) E Artley Edward - Specialty Trainee Doctor H Perrett - Deputy Sister Charge Nurse	**Executive Lead** Chief medical officer
Details of Changes made during review: 2.2 Flowchart 1 10% Glucose bolus changed from 2ml/kg to 3ml/kg	