
Clinical Guidance

Paediatric Critical Care: Diabetic Ketoacidosis: Two bag technique

Summary

This guideline is for staff to use when utilising the two bag technique to optimise glucose control in children with diabetic ketoacidosis.

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<p>This clinical guideline has been produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children.</p> <p>This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.</p>	

Change History		
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Two bag technique to optimise glucose control in diabetic ketoacidosis



Prepare two bags for all maintenance/rehydration fluid: one without any glucose (bag1) and the other with added glucose (bag2):

Bag1 is 0.9% saline (do not add dextrose)

Bag2 is 0.9% saline with added dextrose (usually 10% DXT)

If K⁺ is low then KCL can be added to both bags (max concentration 40 mmol/L)

The aim of this technique is to allow a steady and gradual fall in blood glucose on commencement of insulin therapy in DKA. This can be done by TITRATING the glucose free fluid (bag1) with a glucose containing fluid (bag2) such that the total volume of maintenance/ rehydration fluid remains CONSTANT but the glucose intake can be varied by altering the PROPORTION of Bag2 relative to Bag1 according to changes in blood glucose. This will minimise the need to keep changing insulin infusion rates in response to changes in blood glucose.

1. Titrate the Bag1 and Bag2 to achieve a target glucose value Start Bag1 (0.9% saline) on commencement of DKA therapy when glucose is likely to be high (e.g. if glucose > 15 mmol/L). Avoid rapid fall in blood glucose (aim for rate of fall in glucose of 1 mmol/L per hour). Starting insulin 1 hr after fluid resuscitation rather than immediately may help prevent a rapid fall in glucose.
2. Glucose will fall following the use of insulin. In order to avoid changes in the dose of insulin, Bag2 (0.9% saline WITH 10% dextrose) can be introduced to keep the blood glucose level constant. Arbitrarily increase the proportion of Bag2 relative to Bag1 to aim for a target glucose value.
3. **NB: The total amount of fluid must remain constant (Bag1 + Bag 2 must be constant)**
4. As ketoacidosis resolves a point may be reached where all fluid is Bag2 (dextrose containing). Rarely 0.9% saline + 10% dextrose is not sufficient to maintain blood glucose. If the anion gap has resolved, then the insulin dose can be reduced. If the anion gap is still high (ongoing ketoacidosis) then the % dextrose in Bag2 can be increased to maximum 12.5% via a peripheral venous line.

E.g.: Theoretical example in a 10kg patient with DKA: total fluid intake = 4ml/kg/hr = 40 ml

	Start therapy	12 hrs	16 hrs	24 hrs
Blood glucose	30 mmol/L	15 mmol/L	8 mmol/L	8 mmol/L
Bag1 0.9% NS	40 ml	30 ml	20 ml	0 ml
Bag2 0.9%NS + 10%DXT	0 ml	10 ml	20 ml	40 ml
Total fluid (ml/hr)	40 ml	40 ml	40 ml	40 ml

Please note the above proportions of Bag1 and Bag2 are just examples. The correct proportions vary widely from patient to patient but can be worked out rapidly by titrating Bag1 with Bag2 to the desired blood glucose value every 15 minutes