

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. This has been the management strategy for over a decade in the South Thames region although it is not part of the national BSPED guideline. Alternatively, local teams may use their local protocol using 0.9% sodium chloride and 5% glucose/ 10% glucose.

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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		
Date	Change details, since approval	Approved by
Nov 2020	Philosophy and procedures identical New diagram, text and example to improve clarity of info Target of 6-14 mmol/L (previous guideline did not specify target) Statement added referencing BSPED guidance	ELCGC December 2020
June 2024	Reviewed and no amendments made	ELCGC June 2024
November 2024	Amendments made to ensure the addition of potassium to both fluid bags clearer for users.	ELCGC Nov 2024

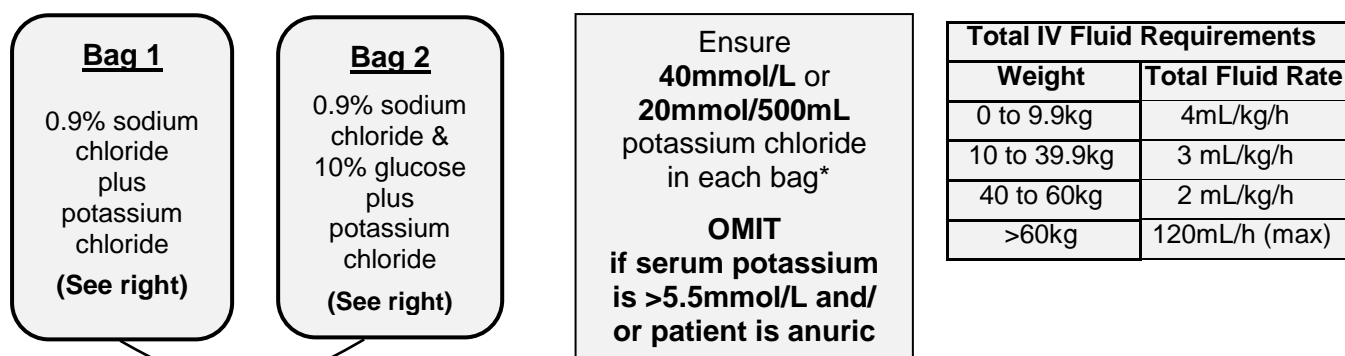
Paediatric Critical Care:

Two bag technique to control blood sugar in Diabetic Ketoacidosis

Preparation:

Prepare two bags for maintenance fluid:

- 1st Bag: 0.9% sodium chloride with no added glucose plus potassium chloride (**Bag 1**) - see below
- 2nd Bag: 0.9% sodium chloride with 10% glucose plus potassium chloride (**Bag 2**) - see below



Aim:

*Ideally use pre-made bags rather than adding potassium

- To allow a steady and gradual fall in blood glucose on commencement of insulin therapy in DKA. This is achieved by **titrating** the glucose-free fluid (Bag 1) with glucose-containing fluid (Bag 2).
- The total volume of maintenance fluid remains **constant**; the glucose intake can be varied by altering the **proportion** of Bag 2 relative to Bag 1 according to changes in the patient's blood glucose
- The insulin infusion rate remains **constant**, this minimises the need to keep changing the insulin infusion rates in response to changes in blood glucose
- Blood glucose must be monitored at least hourly
- Add potassium chloride to each bag **omit** if serum potassium is >5.5mmol/L and/ or patient is anuric

Method:

- Start Bag 1 (0.9% sodium chloride) on commencement of DKA therapy when blood glucose is likely to be >15mmol/L
- Avoid a rapid fall in blood glucose (**aim for rate of fall in blood glucose of 1 mmol/L per hour**). Start insulin as per DKA guidance 1 hour after fluid resuscitation rather than immediately as this helps to prevent a rapid fall in blood glucose.
- Blood glucose will fall following the use of insulin. In order to avoid changes in the dose of insulin, start Bag 2 (0.9% sodium chloride & 10% glucose) when blood glucose <15mmol/L.
- Increase the proportion of Bag 2 relative to Bag 1 to keep blood glucose within target range: typically 6-14 mmol/L. **The total volume of maintenance fluid must remain constant.**
- As ketoacidosis resolves a point may be reached where all fluid is Bag 2. **Do not stop insulin** when glucose falls: decrease insulin only when blood ketones <1 mmol/L or Anion Gap <18 mEq/L.
- If the anion gap is still high (ongoing ketoacidosis) then the % glucose in Bag 2 can be increased to a maximum of 12.5% glucose via a peripheral venous line

Example in a 20kg patient with DKA: Total fluid intake is 3mL/kg/h = 60mL/h

Blood Glucose	30mmol/L	15mmol/L	10mmol/L	8mmol/L
Bag 1: 0.9% sodium chloride	60mL/h	30mL/h	20mL/h	0mL/h
Bag 2: 0.9% sodium chloride & 10% glucose	0mL/h	30mL/h	40mL/h	60mL/h
Total Fluid: (mL/h)	60mL/h	60mL/h	60mL/h	60mL/h

PLEASE NOTE: The above proportions of Bag 1 and Bag 2 are just examples. Fluid ratios between the bags can vary from patient to patient but can be worked out rapidly by titrating Bag1 with Bag 2 to achieve the desired blood glucose value. Blood glucose must be monitored at least hourly and sometimes more frequently.