Nottingham University Hospitals NHS



CoMET Diabetic Ketoacidosis in Children and Young People

This guideline is for use by healthcare staff, at CoMET undertaking critical care retrieval, transport and stabilization of children, and young adults.

CoMET is a Paediatric Critical Care Transport service and is hosted by the University Hospitals of Leicester NHS trust working in partnership with the Nottingham University Hospitals NHS Trust.

The guidance supports decision making by individual healthcare professionals and to make decisions in the best interest of the individual patient.

This guideline represents the view of CoMET, and is produced to be used mainly by healthcare staff working for CoMET, although, professionals, working in similar field will find it useful for easy reference at the bedside.

We are grateful to the many existing paediatric critical care transport services, whose advice and current guidelines have been referred to for preparing this document. Thank You.

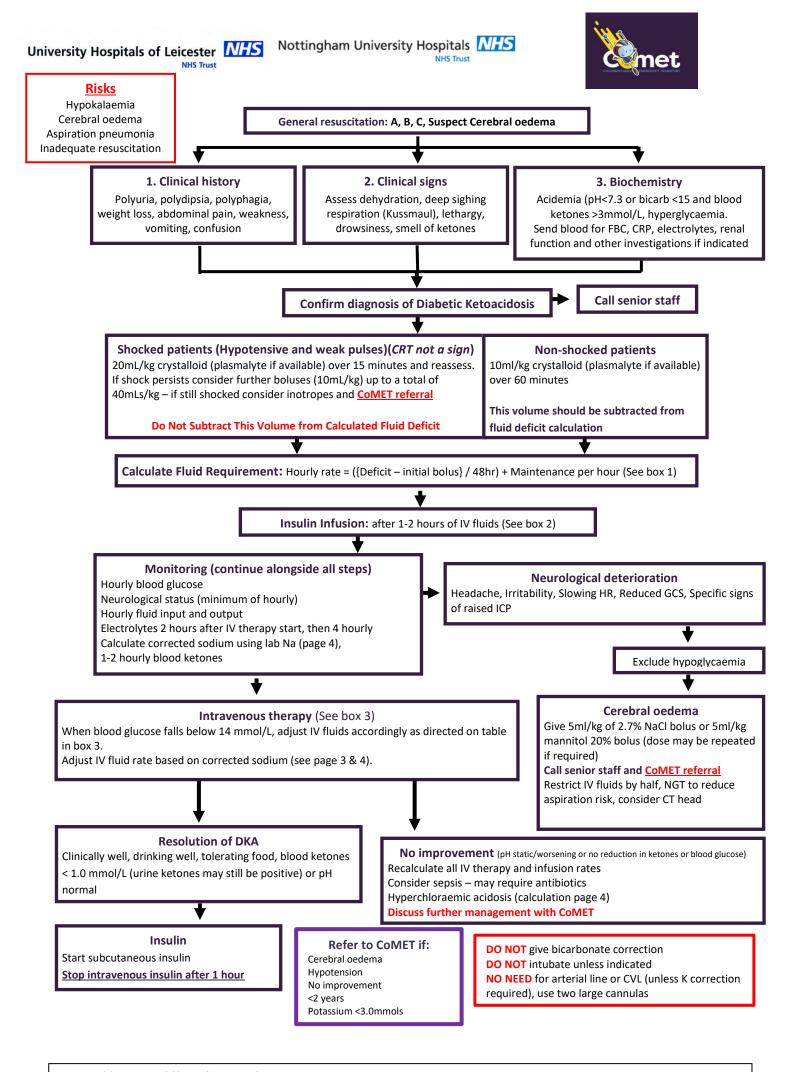
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Date of Latest Approval:	19 May 2023 – Trust ref: B13/2023
Version:	1
Next Review Date:	May 2025

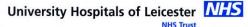
Education and Training

- 1. Annual Transport team update training days
- 2. Workshops delivered in Regional Transport Study days/ Outreach

Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Incident reporting	Review related Datix	Abi Hill – CoMET Modern Matron abi.hill@uhl-tr.nhs.uk	Monthly	CoMET Lead Governance Meeting
Colleague Feedback Forms	Feedback Forms Audit	Abi Hill – CoMET Modern Matron abi.hill@uhl-tr.nhs.uk	Monthly	CoMET Lead Governance Meeting





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Box 1:

Fluid Deficit = % Dehydration x Weight (kg) x 10

pH < 7.2-7.29 &/or bicarb <15 = Mild DKA (5% dehydration) pH <7.1-7.19 &/or bicarb <10 = Moderate DKA (7% dehydration) pH <7.1 &/or bicarb <5 = Severe DKA (10% dehydration)

Fluid requirement

< 10kg 100ml/kg/day

10 – 20kg 1000 mls + 50ml/kg for the next 10 to 20 kg > 20kg 1500 mls + 20ml/kg/day for each additional kilogram

above 20kg (maximum 75kg)

Calculating hourly rate

Hourly rate = ({Deficit - bolus} / 48hr) + Maintenance per hour

Do Not Subtract Fluid Bolus' Given For Shock

Rehydrate over 48 hours

Must be calculated and checked separately by two individuals

Box 2:

Insulin infusion

50 units of soluble Actrapid in 50mls of 0.9% NaCl (50 units of soluble insulin in 49.5mls 0.9% NaCl) 0.05-0.1units/kg/hr starting 1-2 hours after starting IV fluids

- Older children may have a higher insulin requirement)
- <5yrs use 0.05units/kg/hr, severe DKA 0.1units/kg/hr

DO NOT BOLUS

Stop insulin pump, consider continuing long acting s/c insulin if known diabetic

Corrected sodium

Calculate (page 4) 4 hourly alongside laboratory bloods Try to ensure corrected sodium does not fall with therapy, should rise by 3-5mmol/L in 12 hours

Rise

>5mmol/L in 4-8 hrs suggests too much fluid loss – increase fluids by 1ml/kg/hr

Fall:

>5mmol/L in 4-8 hrs too much fluid gain – decrease fluids by 1ml/kg/hr

Examples:

20kg non-shocked 5 year old child with pH 7.2 (moderate DKA, 7% deficit) will receive a fluid bolus of 10ml/kg (200ml) over 60 minutes.

Deficit	7% (deficit) x 20 (weight) x 10 = 1400
Fluid requirement	1000 (10kg) + 500 (10kg) + 1500
Hourly rate	1400 (deficit) – 200 (fluid bolus) = 1200 /
	48hr = 25ml/hr
	1500 (maintenance) / 24 = 62ml/hr
Total	25 + 62.5 = 87.5ml/hr total rate

Laboratory blood results are back

Time	Glucose	Na	K	Cl
0500	41.6	145	5.5	106
0900	27.8	144	5.0	100

Calculate the corrected sodium:

0500: 145 + (41.6 - 5.6) = 145 + 36 = 181 / 3.5 = 51.7 0900: 144 + (27.8 - 5.6) = 144 + 22.2 = 166.2 / 3.5 = 47.4

= fall >5mmol/L in 4 hours

Action: decrease fluids and high risk of cerebral oedema

Box 3: Intravenous therapy: Continuing fluid management

Blood Glucose	Blood Ketones	Insulin Infusion	IV Fluids
> 14 mmol/l	> 3.0 mmol/l	Maintain 0.05-0.1 units/kg/hr	0.9% sodium chloride with 20 mmol potassium chloride in 500ml bag
> 14 mmol/l	< 3.0 mmol/l	Maintain 0.05-0.1 units/kg/hr	0.9% sodium chloride with 20 mmol potassium chloride in 500ml bag
< 14 mmol/l	> 3.0 mmol/l	0.1 units/kg/hr	0.9% sodium chloride with 10% glucose and 20 mmol potassium chloride in 500ml bag
< 14 mmol/l	< 3.0 mmol/l	0.05 units/kg/hr	0.9% sodium chloride with 5% glucose and 20 mmol potassium chloride in 500ml bag
< 6 mmol/l	> 1.0 mmol/l	0.05 units/kg/hr	0.9% sodium chloride with 10% glucose and 20 mmol potassium chloride in 500ml bag
< 4 mmol/l	N/A	Stop for 1 hour	Give 10% glucose bolus 2ml/kg stat. Increase glucose concentration. 0.9% sodium chloride with 10% glucose and 20 mmol potassium chloride in 500ml bag
< 14 mmol/l	< 1.0 mmol/l	Stop infusion after 30 minutes	Clinically well, drinking well, pH normal, start SC insulin

Next review: May 2025

University Hospitals of Leicester



Comet

Name:	Date:
Date of birth:	DKA identified at:
NHS number:	Weight: Known diabetic: Y/N

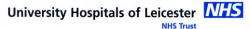
	Time (Hourly)																							
	Rate mls/hr																							
	Bag 1: 0.9% NaCl & 20 mmol/L KCL																							
IV Therapy	Bag 2: 0.9% NaCl, 10% Glucose & 20 mmol/L KCL																							
	Bag 3: : 0.9% NaCl, 5% Glucose & 20 mmol/L KCL														'I									-
	Total/hr																							
	Insulin mls/hr																							
	Insulin units/hr																							
	Urine Output																							
3Gs	Glucose																							
and E	Ketones																							
Electrolytes and BGs	Sodium (Na)																							
ctroly	Potassium (KCL)																							
Ele	Chloride (Cl)																							
	pH / pCO2													7	/					/				
(0)	HCO3 / BE					<u> </u>		2	2	2		/							/		_	/		
Lab bloods	Urea / Creatinine		//		//	\mathcal{T}	77				/	$\overline{/}$	$\overline{//}$	7		$\overline{}$	$\overline{}$		/		/			
Lab b	Phosphate																	·			/			
	Corrected Sodium																							

Calculations:

Corrected sodium (mmol/L) = measured sodium + $\underline{\text{(glucose} - 5.6)}$

Hyperchloraemic metabolic acidosis: Base Excess due to Chloride = (Sodium – Chloride) - 32

Anion gap = (Na + k) - (Cl + HCO3)



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References

- UHL. 2020. Diabetes in Childhood Guideline. [2.2]. [Online]. Leicester: University Hospitals of Leicester. [Accessed 30/05/2022]. Available from: http://insitetogether.xuhl-tr.nhs.uk/pag/pagdocuments/Diabetes%20(Including%20Diabetic%20Ketoacidosis)%20UHL%20Childrens%20Hospital%20Guideline.pdf
- 2. BSPED. 2021. BSPED Guideline for the Management of Children and Young People under the age of 18 years with Diabetic Ketoacidosis 2021. BSPED. [Accessed 30/05/2022]. Available from: https://www.bsped.org.uk/media/1959/dka-guidelines.pdf
- 3. South Thames Retrieval Service. 2020. *Paediatric Critical Care: Diabetic Ketoacidosis (DKA)*. Evelina London: Guys and St Thomas NHS Foundation Trust. [Accessed 30/05/2022]. Available from: https://www.evelinalondon.nhs.uk/resources/our-services/hospital/south-thames-retrieval-service/diabetic-ketoacidosis-jan-2018.pdf

Next review: May 2025