Adult Diabetic Ketoacidosis Emergency Care Pathway

Print the whole document and use in the case notes for this episode. (NOT to be used for HHS (HONK**) and NOT to be used for those less than 18 years old, even if they have DKA)**

ADDRESSOGRAPH LABEL

These guidelines are based on the Joint British Diabetes Societies DKA Guidelines (Dhatariya 2013)
This chart is designed so that prescription and relevant observations can be recorded together.
Doctor: All prescriptions for insulin and fluids must be signed.
Nurse: All entries must be signed.

Site: **Ward:** **Consultant:** **Date:**

ENTRY (diagnostic) CRITERIA: (Tick boxes if criteria present, all must be ticked to establish diagnosis)

- Established or new diagnosis of diabetes mellitus **and one or more of** ☐
- Capillary blood ketonaemia on Trust approved ketone meter of ≥3mmol/L ☐
- Or ketonuria ++ or more on Ketostix® (ONLY for diagnostic purposes, not management)
- **AND** Venous bicarbonate <15mmol/L (use venous blood in analyser) **OR** venous pH <7.3 *** ☐

***The standard of care is venous blood gases. Measure arterial blood gases ONLY if patient has a reduced conscious level or low oxygen saturations; increased respiratory rate is not respiratory distress *per se* because an acidosis increases respiratory rate

EXIT CRITERIA

- Resolution of ketonaemia <0.6 mmol/L **and** ☐
- Venous bicarbonate >15 mmol/L **and** ☐
- Diabetes controlled with subcutaneous insulin **and** ☐
- Patient eating and drinking **and** ☐
- Patient has been seen by diabetes team, or there is a plan to do so ☐
- **OR** Exit from pathway has been recommended by the diabetes team ☐

New principles in the management of DKA:

1. Aim to treat the cause of the acidosis, i.e. the ketonaemia
2. Insulin is to be given as a standard dose per kg until the ketones are cleared
3. Use bedside meters (Trust approved only) for glucose and ketone measurements
4. Use blood gas machines on HDU/EAU for venous pH (there no significant difference from arterial pH), venous HCO_3^-, and U&Es.
5. Use 0.9% sodium chloride solution for resuscitation, not colloid. Do not use Hartmann's (however, ITU patients may differ).
6. Only use a variable rate intravenous insulin infusion with 10% glucose when the blood glucose is <14mmol/L
7. Give both 0.9% sodium chloride and glucose together if ketones are present (>1.0mmol/L and glucose <14mmol/L)
8. Patients should be seen by the diabetes specialist team within one working day of admission
9. Upon discharge patients should be offered appropriate outpatient follow up, have access to psychological support and be offered structured education

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DKA pathway: Guidance for use

Initial results and guidance for use of the pathway:

ESSENTIAL INITIAL RESULTS, ALL MUST BE DOCUMENTED	
Blood ketones _____mmol/L Blood glucose _____mmol/L Venous bicarbonate _____mmol/L Venous (or arterial) pH_____ Potassium _____mmol/L [Beware initial low K^+, if low (<3.5 mmol/L) call for senior immediately] Creatinine _____µmol/L	
EARLY MANAGEMENT – 1st hour fluids / potassium / insulin	

Intravenous fluid	• If systolic BP < 90mmHg:
	  • Give 1 litre of 0.9% sodium chloride solution over 15 minutes
	  • If systolic BP remains < 90mmHg repeat and call senior medical colleague for advice
	  • Consider septic shock / heart failure as a potential cause
	  • Consider calling the critical care outreach team from HDU/ITU
	  Do NOT use plasma expanders
	
	• If the systolic BP is > 90mmHg
	The rate of fluid replacement depends on the age / fitness / dehydration of the patient. Plan fluid replacement and use clinical judgment
	
	Typically though:
	• 0.9% sodium chloride 1L with potassium chloride over next 2 hours
	• 0.9% sodium chloride 1L with potassium chloride over next 2 hours
	• 0.9% sodium chloride 1L with potassium chloride over next 4 hours
	
	• Add 10% glucose given at 125ml/hr if the blood glucose falls below 14mmol/l
	
	More cautious fluid replacement should be considered in young people aged 18-25 years, elderly, pregnant, heart or renal failure. (Consider HDU and/or central line)
	
	Reduce the rate of fluid replacement in the elderly / cardiac disease / mild DKA (bicarbonate >10 mmol/l). More rapid infusion increases risk of respiratory distress syndrome and cerebral oedema

Potassium
NB: Low potassium KILLS
	Serum potassium is often normal or high initially but total body potassium is low
	• Add potassium using pre-prepared bags only as follows:
	  ○ >5.5mmols/L - none
	  ○ 3.5 – 5.5mmol/L - 10 mmol in each 500 ml (i.e. 20 mmol/L)
	  ○ <3.5mmol/L - senior advice is required and possible pharmacy involvement. In addition the patient MUST be looked after in a High Care Area
	
	Anticipate a fall in potassium and replace, once the first plasma potassium result is known SEE APPENDIX 1

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Insulin	DO NOT STOP subcutaneous NPH insulin (Insulatard®, Humulin I®, Insuman Basal®), or analogue (Lantus®, Levemir® or Tresiba®). DO disconnect Continuous Subcutaneous Insulin Infusion (CSII) pump and DO NOT attempt to use it without diabetes specialist team input under any circumstances. A Fixed Rate Intravenous Insulin Infusion (FRIVII) is to be used at 0.1 U/Kg of patient weight Add 50 units of soluble insulin made up to 50ml with 0.9% sodium chloride solution in a 50ml syringe Weigh or estimate patient weight in Kg, if pregnant, use their current pregnant weight Infuse intravenous insulin using Trust–approved syringe driver Paradigm / ethos is to drive ketones down aggressively by at least 0.5 mmol/l per hour. A variable rate intravenous insulin infusion is NOT to be used until blood ketones are < 0.6 mmol/l.
Other Important Notes and Measures	Call the diabetes specialist team or diabetes inpatient specialist nurse as soon as possible If ketone and / or glucose levels do not fall as expected, call for senior advice High Care Area (HDU or dedicated beds) care is needed if: • Hypokalaemia is present on admission (K^+ <3.5mmol/L) • Young (18 - 25 years old) • Pregnant. Call for urgent senior obstetric involvement. KETONES KILL BABIES, NOT GLUCOSE • GCS <12 • Shocked: pulse >100bpm or systolic BP <90mmHg Consider urinary catheter if no urine passed after 2 hours or incontinent Consider naso-gastric tube and aspiration if the patient does not respond to commands (NB protect airway) Consider thromboprophylaxis with low-molecular weight heparin in elderly or high risk patients unless it is contraindicated. If the patient is in a “hyperosmolar“ state, fully anticoagulate with low-molecular weight heparin unless contraindications exist; see BNF and consider referring to the National Guideline on the Management of HHS Screen for infection and give antibiotics if clinical evidence of infection (NB The WBC is not helpful because it may be markedly raised from DKA alone) Continue the FRIII and fluids until the acidosis is reversed and the VRIII until the patient is ready to eat and drink Discontinue the VRIII 30-60 minutes after the subcutaneous insulin has been given
Bicarbonate administration	In most cases bicarbonate is **NOT** helpful and is potentially dangerous If bicarbonate is being considered, the patient should be in a level 2 (HDU / ITU) environment Only consider after discussion with the consultant in charge of the patient’s care
Re-starting subcutaneous insulin	If you are confident enough, re-start subcutaneous insulin without diabetes specialist team input as follows (firstly ensure that the long acting analogue, if the patient was previously on it, was not stopped): • Allow the patient to eat • If no sickness, inject normal meal time insulin and stop intravenous insulin 30-60 minutes later Otherwise await the input of the diabetes specialist team

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MULTIDISCIPLINARY TEAM PROGRESS NOTES

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MULTIDISCIPLINARY TEAM PROGRESS NOTES

DKA Pathway: Fluid Balance Chart (print as many sheets as required for this admission)

Add potassium using pre-prepared bags only as follows:

- **Greater than 5.5mmols/L - none**
- **Between 3.5 – 5.4mmol/L - 10 mmol in each 500 ml**
- **Less than 3.5mmol/L - call for senior advice and consider contacting pharmacy for K+ supplement**

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Fluid balance Ward_____ Date_____

Previous day's intake (mls)		Previous day's output (mls)		Balance	

THE INTAKE RECORD <u>MUST ONLY</u> DETAIL <u>COMPLETED</u> VOLUMES OF DRINKS/INFUSIONS

Intake/Input		**Output**
	Device no.	
1……	……	
2……	……	1……
3……	……	2……
4……	……	3……

	INTAKE (mls)							**OUTPUT (mls)**					
Brought forward													
Time	Oral						Running Total	Urine					Running Total
01.00													
02.00													
03.00													
04.00													
05.00													
06.00													
07.00													
08.00													
09.00													
10.00													
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17.00													
18.00													
19.00													
20.00													
21.00													
22.00													
23.00													
24.00													
24hr TOTAL													

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Ward_____ Date_____

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DKA Pathway: Fixed Rate Intravenous Insulin Infusion (FRIII)

(Print as many sheets as required for this admission)

Patients weight (or estimated weight in Kg)…….. If estimated tick box

Fixed Rate Intravenous Insulin Infusion to use whilst the patient is still ketotic or acidotic (ketones greater than 0.6mmol/L and/or HCO_3^- less than 15mmol/L
Add 50 units soluble insulin (Actrapid®/Humulin S®) made up to 50 mls with 0.9% sodium chloride solution in a 50 ml syringe
Use a new column and delete the previous prescription each time the insulin prescription is changed

PRESCRIPTION				**ADMINISTRATION**				
Ketone/Bicarbonate	Insulin	Insulin units/hour	Alternative Insulin rate, doctor to sign	Batch number	Start time	Signature	Finish time	Signature
If Blood Ketones >0.6 mmol/L and/or HCO_3^- <15 mmol/L	0.1 Units/Kg per hour (e.g. For a 80 Kg man give 8 units per hour							
Signature								
Bleep number								
Date								
Time								

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Ward_____ Date_____

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DKA pathway insulin syringe infusion control document

TO BE COMPLETED BY THE NAMED NURSE							
SYRINGE DRIVER CONTROLLED INSULIN INFUSION (record hourly)							
Date and time	Blood Glucose mmol/l	Blood Ketone mmol/l	Rate units/ hour	Volume left in syringe (ml)	Volume infused in one hour (ml)	Total volume infused (ml)	Signature

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DKA pathway bedside and laboratory results

Bedside and laboratory Results

Check creatinine, electrolyte and venous bicarbonate at 2 hours then 2 to 4 hourly until venous bicarbonate >15 mmol/L

Date and time	Ketones	Sodium	Potassium	Creatinine	Bicarbonate	Glucose	Signature

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Ward_____ Date_____

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DKA Pathway: Variable Rate Intravenous Insulin Infusion (VRIII)

(Only use when the ketone levels are less than 0.6mmol/l and then stop using the FRIII)

Variable Rate Intravenous Insulin Infusion to use once the patient is no longer ketotic or acidotic (ketones less than 0.6mmol/L and/or HCO_3^- greater than 15mmol/L
Add 50 units soluble insulin (Actrapid®/Humulin S®) made up to 50ml with 0.9% sodium chloride solution in a 50ml syringe.
Use a new column and delete the previous prescription each time the insulin prescription is changed

PRESCRIPTION				**ADMINISTRATION**				
Blood glucose (mmol/L)	Insulin units/hour	Insulin units/hour	Insulin units/hour	Batch number	Start time	Signature	Finish time	Signature
>14	6							
12.1 – 14	4							
10.1 – 12	3							
7.1 – 10	2							
4 – 7	1							
<4	0.5							
Signature								
Bleep number								
Date								
Time								