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<b>FIONA STANLEY HOSPITAL ADULT DIABETIC KETOACIDOSIS (DKA) GUIDELINES AND MANAGEMENT RECORD</b>		SURNAME		UMRN		
		GIVEN NAMES		DOB	GENDER	
		ADDRESS			POSTCODE	
						TELEPHONE
WARD _____						
DOCTOR _____						

  

<b>LINE 1: Intravenous 0.9% Sodium Chloride (With potassium as per instruction above)</b>	Date	Time	Fluid *	Additives/ Batch No	Volume	Rate mL/hr	Ordered By (Dr Sign)	Given By	Checked By	Pharmacist	
			Sodium Chloride 0.9%	NIL	1L	1000mLs/ hour					
	<b>If ketones are falling ≥ 0.5 mmol/L/hour</b> 1. Continue with current insulin infusion rate 2. Alert medical officer once ketones are less than ≤ 0.6 mmol/L										
	<b>If ketones NOT falling by 0.5 mmol/L/hr</b> 3. Stop fixed-rate DKA insulin infusion once ketones < 0.6 mmol/L 4. When fixed rate infusion ceased follow insulin advice in protocol										
	5. Increase insulin by 1 unit/hr (hrs 1-12) or 0.5 unit/hr (hrs 12-24) <input type="checkbox"/> Check insulin infusion pump is working and connected <input type="checkbox"/> Check insulin residual volume is correct										
	<b>Observation ▶</b> Date ▶ Time ▶ Remaining syringe volume (ml) Insulin infusion rate (ml/hr) Capillary Ketones (mmol/L) Glucose (mmol/L) Potassium (mmol/L) Venous pH Bicarbonate (mmol/L)										
	<b>0 to 6 hours</b>										
	0	1	2	3	4	5	6				
	7	8	9	10	11	12					
	<b>6 to 12 hours</b>										
<b>12-24 hours</b>											
Date	Time	Fluid	Additives/ Batch No	Volume	Rate mL/hr	Ordered By (Dr Sign)	Given By	Checked By	Pharmacist		
		Dextrose 10%	NIL	500 mL	125 mL/hr						

  

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HCHFSFMR836

FS550 09/14

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These guidelines are for the treatment of adults with diabetic ketoacidosis and are designed to allow both prescriptions and relevant observations to be recorded together. The guideline should be adapted to the clinical situation where necessary. Seek advice from senior clinician/diabetes specialty units in cases of uncertainty. This guideline should **not** be used in children (<18years) even if they have DKA, seek specialist advice.

**ENTRY (diagnostic) CRITERIA: (Tick boxes if criteria present, if none re-consider diagnosis).**

Glucose: >11mmol/L or known diabetes

Bicarbonate: <18mmol/L **and/or** venous pH <7.35\*

Ketones: ≥3mmol/L or urine ketones ≥2+

\*Note: The standard of care is venous bicarbonate. Arterial blood gases should ONLY be considered in patients with impaired consciousness

**EXIT (resolution) CRITERIA**

Resolution of ketonaemia (<0.6mmol/L). This should occur within 24 hours, **and**

Correction of acidosis (venous bicarbonate >18mmol/L), **and**

Patient eating and drinking normally, **and**

Treatment/resolution of underlying or precipitating cause (where appropriate), **and**

Discharge planning including planned diabetes review post-discharge

**New principles of management of DKA**

- Aim is to correct the cause of the acidosis, ie. the ketonaemia
- Insulin is given as a standard dose per kg until ketones are cleared (<0.6mmol/L)
- Aim to cease high-dose fixed rate insulin infusion as soon as ketones are cleared and convert to subcutaneous insulin (see reverse for guide). If intravenous insulin is still required (eg: not yet eating/drinking) convert to *Adult Intravenous Insulin Infusion Chart* (Guidelines on reverse of form) **with** dextrose as per separate protocol
- Monitor bedside capillary ketones and glucose with appropriate meters
- Use normal saline for resuscitation, not colloid
- Continue usual subcutaneous basal insulin in addition to IV insulin or start basal insulin at outset if newly diagnosed
- Give normal saline and dextrose together if ketones are still present (>0.6mmol/L) and glucose is <14mmol/L
- Where available, ensure early diabetes specialist team review and appropriate post-discharge follow-up

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**ESSENTIAL INITIAL RESULTS AND ASSESSMENT OF SEVERITY**

Blood ketones \_\_\_\_\_ mmol/L                      Blood glucose \_\_\_\_\_ mmol/L

Venous bicarbonate \_\_\_\_\_ mmol/L                      Venous (or arterial) pH \_\_\_\_\_

Potassium \_\_\_\_\_ mmol/L [*Beware initial low K<sup>+</sup>, if low (<3.5 mmol/L) call for senior advice immediately*]

Serum Osmolality \_\_\_\_\_ mosmol/kg                      Creatinine \_\_\_\_\_ μmol/L

Blood pressure \_\_\_\_\_ mmHg                      GCS \_\_\_\_\_

Severity ►	Mild to Moderate	SEVERE
<b>Parameter ▼</b>		<b>If any below present, early senior clinician advice MUST be sought for consideration of admission to critical care area</b>
Systolic blood pressure	>90 mmHg	<90 mmHg
Venous pH	7.1 – 7.35	<7.1
Capillary ketones	3 – 6 mmol/L	>6 mmol/L
Blood HCO <sub>3</sub>	10 – 18 mmol/L	<10 mmol/L
Glasgow Coma Scale	15	<15
Serum Potassium (K <sup>+</sup> )	> 3.5 mmol/L on admission	< 3.5 mmol/L on admission

**Initial management (1st Hour – Fluids/Potassium/Insulin)**

- Establish 2 large bore intravenous cannulas
- Administer 500-1000mL of normal saline over 15 minutes if systolic blood pressure <90mmHg
- If systolic BP remains <90mmHg repeat and call for senior clinician advice. Consider septic shock and heart failure as potential causes and ICU involvement
- If systolic BP >90mmHg, prescribe normal saline according to the table below. Adjust the rate of fluid replacement according to the age/fitness/dehydration state of the patient. Plan fluid replacement and use clinical judgement.
- Consider urinary catheter if no urine passed for 2 hours or incontinent
- Consider nasogastric tube and aspiration if conscious state impaired
- Consider thromboprophylaxis in the elderly or “high risk patient”
- Look for and treat likely precipitants of DKA. Screen for infection, silent ischaemia.  
*Note: WCC is often elevated in DKA and does not reflect infection.*
- Consider critical care (HDU/ICU) involvement if: severe DKA (as above); young (18–25 years old); pregnant; GCS <12; shocked

DO NOT WRITE IN MARGIN

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**Intravenous fluid and Potassium**

Initial potassium is often normal or high but total body potassium is low. Potassium levels will drop rapidly with fluid and insulin replacement. Replace early – low potassium KILLS

Add 10% dextrose at 125ml/hr if BGL <14mmol/l.  
Increase 10% dextrose rate to 187ml/hr if BGL <5mmol/l.

Reduce saline proportionately.  
Reduce the rate of fluid replacement in the young (18-25), elderly, pregnant or those with heart or renal failure.

Bag	Fluid	Potassium Concentration by Blood Level			Normal saline infusion rate	
		Greater than (>) 5.5 mmol/L	3.5–5.5 mmol/L	Less than (<) 3.5 mmol/L <i>Senior Review Required</i>	WITHOUT concurrent 10% dextrose (ml/hr)	WITH concurrent 10% dextrose (ml/hr)
1st	1L Normal saline	Nil	Nil	Nil	1000	875
2nd	1L Normal saline	Nil	40mmol	40mmol	500	375
3rd	1L Normal saline	Nil	40mmol	40mmol	500	375
4th	1L Normal saline	Nil	40mmol	40mmol	250	125
5th	1L Normal saline	Nil	40mmol	40mmol	250	125
6th	1L Normal saline	Nil	40mmol	40mmol	167	125

- Insulin**
- Add 50 units of Actrapid to 50mL of normal saline.
  - Commence fixed rate intravenous infusion at 0.1 units/kg/hour.**
  - Continue patients usual subcutaneous basal (long-acting) insulin or commence subcutaneous basal insulin in newly diagnosed (see over).
  - Disconnect ALL continuous subcutaneous insulin infusion (CSII) pumps. *DO NOT attempt to use the pump without specialist diabetes team input.*
  - Prescribe subcutaneous basal insulin.
- IMPORTANT**
- Continue fixed rate insulin until ketones are cleared (<0.6mmol/L). Then, if patient is eating and drinking convert to subcutaneous insulin (see over for instructions). If not yet eating, change to *Adult Intravenous Insulin Infusion Chart* (Guidelines on reverse of form) with dextrose to avoid hypoglycaemia.

**Ongoing management considerations**

- Measure capillary ketones and glucose hourly.
- Repeat VBG 1 hour after initial treatment and then 2 hourly until DKA resolved.
- Aim is to reduce ketones by 0.5mmol/hr.
- If ketones and glucose are not falling as expected check all infusion lines.
- Seek senior advice early.
- Bicarbonate is NOT helpful and is potentially dangerous and should only be used in ICU

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**Serious complications of DKA**

- Potassium** – both hyperkalaemia and hypokalaemia are potentially life-threatening. Monitor carefully. Expect a decline in K<sup>+</sup> with treatment. Seek advice early.
- Hypoglycaemia** – Glucose can fall rapidly with treatment. Use additional glucose (10% dextrose when BGL<14mmol/L) rather than reducing insulin infusion.
- Cerebral oedema** – especially younger patients, is rare but has a high mortality. Seek specialist advice early
- Pulmonary oedema** – is uncommon but cautious fluid resuscitation is necessary if co-existant cardiac or renal impairment

**Treatment of underlying precipitants**

- Note: Elevated WCC, fever and abdominal pain occur commonly on DKA and don't necessarily indicate the presence of infection or intra-abdominal pathology.
- Careful examination and screening for underlying causes and regular monitoring and re-evaluation is necessary.
- Consider underlying causes such as sepsis (including lower limb cellulitis, meningitis), silent ischaemia and toxins (alcohol).
- If infection is present refer to local antibiotic guidelines

**Conversion to subcutaneous insulin**

- Once ketones have been cleared, if patient **NOT** yet eating and drinking normally, continue variable rate IV insulin. Once patients are eating and drinking normally, transfer to subcutaneous insulin therapy.
- For patients with known diabetes on multiple daily injections:
    - Recommence usual bolus insulin with next meal
    - Cease IV insulin infusion 30 mins after injection
    - Note: if no basal insulin has been given for >24 hours aim to convert to subcut insulin with evening meal and give usual basal dose OR convert at breakfast with half usual basal dose and then give remainder of dose with evening meal.*
  - For patients on CSII (insulin pump) therapy:
    - Consider pump failure as a cause of DKA before restarting pump.
    - Seek advice from specialist diabetes team
    - If appropriate, recommence pump when ketones cleared and patient eating and drinking
    - Cease IV insulin infusion 30 mins after recommencing pump
  - For patients with newly diagnosed type 1 diabetes:
    - Commence basal insulin (eg: Lantus or Levemir 10 units once-a-day) on day of admission
    - Start bolus insulin with next meal
    - Cease IV insulin infusion 30 mins after injection
    - Suggested starting doses:
      - Bolus (meal-time) insulin – 4 to 6 units of rapid-acting insulin analogue
      - Basal (once-a-day) insulin – 10 units (Lantus or Levemir)