

**Intravenous Insulin Prescription and Fluid Protocol
FOR DIABETIC KETO-ACIDOSIS (DKA)**

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|--|-----------------|-------------------|---------------------|--|
| <p>For use for ALL ADULT (over 18 years) patients with a diagnosis of DKA NOT FOR USE IN CHILDREN NEVER use an IV syringe to draw up insulin ALWAYS draw up insulin using an insulin syringe ALWAYS continue subcutaneous intermediate* or basal insulin** *Intermediate: Insulatard®, Humulin I®, Insuman Basal® **Basal: Lantus® (glargine), Levemir® (detemir), Tresiba® (degludec), Toujeo® (long acting glargine) Doctor: All prescriptions for insulin and fluids must be signed Nurse: All entries must be signed</p> | Ward | Consultant | Admission Date: | |
| | | | Discharge Date: | |
| | Surname | | First Name | |
| | Hospital Number | | Date of Birth / Age | |
| | NHS Number | | | |
| Address | | | | |

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| ENTRY (diagnostic) CRITERIA (ALL must be ticked to establish diagnosis) |
| Established or new diagnosis of diabetes mellitus <input type="checkbox"/> |
| Capillary blood ketonaemia on Trust approved ketone meter of ≥ 3 mmol/L or ketonuria ++ or more on standard urine sticks <input type="checkbox"/> |
| Venous bicarbonate <15 mmol/L and/or venous pH <7.3 <input type="checkbox"/> |
| If patient satisfies all ENTRY CRITERIA, commence insulin therapy (see BOX 1); intravenous fluid management (see BOX 2, BOX 3 and BOX 4); and intravenous fluid prescription (see BOX 5) If patient has ketonaemia WITHOUT acidosis (pH>7.3 or HCO ₃ >15 mmol/L, intravenous insulin therapy may not be required BUT intravenous fluid hydration and subcutaneous insulin dose correction may be necessary |

| | | | | | | |
|---|--|--|-----------------|-------------------------|-----------------------|--|
| BOX 1: INTRAVENOUS INSULIN THERAPY AND PRESCRIPTION | Weight/insulin dose reference Guide | | | | | |
| A Fixed Rate Intravenous Insulin Infusion (FRIII) calculated on 0.1 units/kg body weight is recommended (see Weight/insulin dose Reference Guide) It may be necessary to estimate the weight of the patient | Weight (in kg) | Insulin dose/hr (Units) | Weight (in kg) | Insulin dose/hr (Units) | | |
| Patient's Weight: _____ kg (Actual/Estimated) | *50-59 | 5 | 100-109 | 10 | | |
| Insulin dose per hour: _____ units Date: _____ | 60-69 | 6 | 110-119 | 11 | | |
| Print Name: _____ Signature: _____ | 70-79 | 7 | 120-129 | 12 | | |
| If blood ketones not falling by at least 0.5 mmol/L/hr OR venous bicarbonate not rising by at least 3 mmol/L/hr OR CBG not falling by at least 3 mmol/L/hr- increase insulin infusion rate by 1.0 unit/hr until falling at target rates | 80-89 | 8 | 130-139 | 13 | | |
| | 90-99 | 9 | >140 | * | | |
| Date | Time | Adjusted dose (units/hr) | Prescriber Name | Prescriber Signature | Bleep | * <50kg or >140kg: seek advice from the Diabetes Specialist Team |
| | | | | | | |
| | | | | | | |
| Drug (approved name) | Dose | Volume | Route | Prescriber's Signature | Prescriber Print name | Date |
| Actrapid® | 50 UNITS | Made up to 50ml with NaCl 0.9% (1 UNIT per mL) | IV | | | |

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| BOX 2: INTRAVENOUS FLUID MANAGEMENT (Saline regime) CAUTION: Slower in young people aged 18-25 years, elderly, pregnant, heart or renal failure | BOX 3: INTRAVENOUS FLUID MANAGEMENT (Dextrose regime) Once CBG<14 mmol/L, or in the event of non-hyperglycaemic DKA presenting with CBG <14 mmol/L: | |
| 0.9% sodium chloride 1 litre (no KCl) | Over 1 st hour | Give 10% Dextrose to run at 125 mls/hr AND |
| 0.9% sodium chloride 1 litre (check K+) | Over next 2 hours | Continue saline as per Saline regime (see BOX 2) |
| 0.9% sodium chloride 1 litre (check K+) | Over next 2 hours | Run through Saline and Dextrose regime in 2 separate lines at the SAME time |
| 0.9% sodium chloride 1 litre (check K+) | Over next 4 hours | |
| 0.9% sodium chloride 1 litre (check K+) | Over next 4 hours | Run Dextrose regime and insulin therapy in the same line via a three way non-return valve |
| Anticipate a fall in potassium and replace (see BOX 4) | | |
| Re-assessment of cardio-vascular status at 12 hours is mandatory, further fluid may be required | | |

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|------------------------------|------|--------------|--------------|---|--|
| SYRINGE PREPARATION | | | | BOX 4: POTASSIUM REPLACEMENT | |
| Prepared and administered by | Date | Time started | Time stopped | Add potassium as per guidance below EXCEPT for the first Saline (1 hour) bag ONLY use pre-prepared bags | |
| | | | | >5.5 mmol/L | None |
| | | | | 3.5 – 5.5 mmol/L | 40 mmol KCl per litre (see rate in Box 2) |
| | | | | <3.5 mmol/L | 40 mmol KCl per litre (senior review if additional potassium needs to be given- See rate in Box 2) |

Intravenous Insulin Prescription and Fluid Protocol
FOR HYPEROSMOLAR HYPERGLYCAEMIC STATE (HHS)

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|--|-----------------|-------------------|---------------------|--|
| <p>For use for ALL ADULT (over 18 years) patients with a diagnosis of HHS NOT FOR USE IN CHILDREN NEVER use an IV syringe to draw up insulin ALWAYS draw up insulin using an insulin syringe ALWAYS continue subcutaneous intermediate* or basal insulin** *Intermediate: Insulatard®, Humulin I®, Insuman Basal® **Basal: Lantus® (glargine), Levemir® (detemir), Tresiba® (degludec), Toujeo® (long acting glargine) Doctor: All prescriptions for insulin and fluids must be signed Nurse: All entries must be signed</p> | Ward | Consultant | Admission Date: | |
| | | | Discharge Date: | |
| | Surname | | First Name | |
| | Hospital Number | | Date of Birth / Age | |
| | NHS Number | | | |
| Address | | | | |

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|--|
| ENTRY (diagnostic) CRITERIA (ALL must be ticked to establish diagnosis) |
| Hypovolaemia <input type="checkbox"/> |
| Marked hyperglycaemia (>30 mmol/L) without significant hyperketonaemia (<3.0 mmol/L) or acidosis (pH >7.3, bicarbonate >15) <input type="checkbox"/> |
| Osmolality >320 mosmol/kg Venous bicarbonate <15 mmol/L and/or venous pH <7.3 <input type="checkbox"/> |
| If patient satisfies all ENTRY CRITERIA, commence intravenous fluid management (see BOX 2) ONLY commence intravenous insulin therapy IF patient has significant ketonaemia (blood ketones >1.0 mmol/L or ketonuria (urine ketones >+)) (see BOX 1) |

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|---|------|--------------------------|--|----------------------|--|--|----------------|-------------------------|
| BOX 1: INTRAVENOUS INSULIN THERAPY AND PRESCRIPTION | | | | | Weight/insulin dose reference Guide | | | |
| A Fixed Rate Intravenous Insulin Infusion (FRIII) calculated on 0.05 units/kg body weight is recommended (see Weight/insulin dose Reference Guide) It may be necessary to estimate the weight of the patient | | | | | Weight (in kg) | Insulin dose/hr (Units) | Weight (in kg) | Insulin dose/hr (Units) |
| Patient's Weight: _____ kg (Actual/Estimated) | | | | | 50-59* | 2.5 | 100-109 | 5 |
| Insulin dose per hour: _____ units Date: _____ | | | | | 60-69 | 3 | 110-119 | 5.5 |
| Print Name: _____ Signature: _____ | | | | | 70-79 | 3.5 | 120-129 | 6 |
| | | | | | 80-89 | 4 | 130-139 | 6.5 |
| | | | | | 90-99 | 4.5 | >140 | * |
| Date | Time | Adjusted dose (units/hr) | Prescriber Name | Prescriber Signature | Bleep | * <50kg or >140kg: seek advice from the Diabetes Specialist Team | | |
| | | | | | | | | |
| | | | | | | | | |
| Drug (approved name) | | Dose | Volume | Route | Prescriber's Signature | Prescriber Print name | Date | |
| Actrapid® | | 50 UNITS | Made up to 50ml with NaCl 0.9% (1 UNIT per mL) | IV | | | | |

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|---|---------------------------|---|--|
| BOX 2: INTRAVENOUS FLUID MANAGEMENT (Saline regime) CAUTION: Slower in young people aged 18-25 years, elderly, pregnant, heart or renal failure | | BOX 3: INTRAVENOUS FLUID MANAGEMENT (Dextrose regime) Once CBG < 14 mmol/L | |
| 0.9% sodium chloride 1 litre (no KCl) | Over 1 st hour | Give 10% Dextrose to run at 125 mls/hr AND | |
| 0.9% sodium chloride 1 litre (check K+) | Over next 2 hours | Continue Saline as per Saline regime (see BOX 2) | |
| 0.9% sodium chloride 1 litre (check K+) | Over next 2 hours | Run through Saline and Dextrose regime in 2 separate lines at the SAME time | |
| 0.9% sodium chloride 1 litre (check K+) | Over next 4 hours | Run Dextrose regime and insulin therapy in the same line via a three way non-return valve | |
| Anticipate a fall in potassium and replace (see BOX 4) | | | |
| Re-assessment of cardio-vascular status at 12 hours is mandatory, further fluid may be required | | | |

| | | | | | |
|------------------------------|------|--------------|--------------|--|---|
| SYRINGE PREPARATION | | | | BOX 4: POTASSIUM REPLACEMENT | |
| Prepared and administered by | Date | Time started | Time stopped | Add potassium as per guidance below EXCEPT for the first Saline (1 hour) bag ONLY use pre-prepared bags | |
| | | | | >5.5 mmol/L | None |
| | | | | 3.5 – 5.5 mmol/L | 40 mmol KCl per litre |
| | | | | <3.5 mmol/L | 40 mmol KCl per litre (senior review as additional potassium needs to be given) |

BOX 5: INTRAVENOUS FLUID PRESCRIPTION

For information on dilutions, infusion rates, compatibilities and monitoring parameters, consult the:

Injectable Medicines Guide or contact Medicines Information

CAUTION: Slower in young people aged 18-25 years, elderly, pregnant, heart or renal failure

| Date | Solution | Volume | Additives and dose Check potassium Refer to BOX 4 | | Rate | Duration | Route | Prescriber Signature & Bleep | Batch No. | Given by 2 nd check | Time started | Time stopped | Pharm and supply notes |
|------|--------------|---------|---|-------|-------------|----------|-------|---------------------------------|--------------|--|-----------------|-----------------|---------------------------|
| | 0.9% NaCl | 1 litre | KCl | None | 1000 mls/hr | 1 hr | IV | | | | | | |
| | 0.9% NaCl | 1 litre | KCl | | 500 mls/hr | 2 hrs | IV | | | | | | |
| | 0.9% NaCl | 1 litre | KCl | | 500 mls/hr | 2 hrs | IV | | | | | | |
| | 0.9% NaCl | 1 litre | KCl | | 250 mls/hr | 4 hrs | IV | | | | | | |
| | 0.9% NaCl | 1 litre | KCl | | 250 mls/hr | 4 hrs | IV | | | | | | |
| | 0.9% NaCl | 1 litre | KCl | | 166 mls/hr | 6 hrs | IV | | | | | | |
| | 10% Dextrose | 1 litre | | | 125 mls/hr | 8 hours | IV | | | | | | |
| | 10% Dextrose | 500 mls | KCL | 0.15% | 50 mls/hr | 10 hours | IV | | | | | | |

| SWITCH FROM FIXED RATE INTRAVENOUS INSULIN INFUSION TO VARIABLE RATE INTRAVENOUS INSULIN INFUSION (VRIII) with 10% Dextrose with 0.15% KCl at 50 mls/hr IF: DKA: CAPILLARY BLOOD KETONES < 0.6 mmol/L and HCO3 > 15 mmol/L and STILL not eating and drinking HHS: Biochemical markers have normalised and STILL not eating and drinking | | | | Bedside and laboratory results Check creatinine, electrolyte and venous bicarbonate and pH at 2 hours then 2 to 4 hourly until venous bicarbonate >15 mmol/L | | | | | | | EXIT CRITERIA (ALL must be ticked) | | |
|---|------------------|------------------|------------------|---|------------|------|----|------------|-----------|--|------------------------------------|--|--|
| Date | Time | Ketones | Na+ | K+ | Creatinine | HCO3 | pH | Osmolality | Signature | | | | |
| | | | | | | | | | | | | | |
| PRESCRIPTION | | | | | | | | | | | | | |
| CBG mmol/L | Insulin units/hr | Insulin units/hr | Insulin units/hr | | | | | | | | | | |
| > 14 | 6 | | | | | | | | | | | | |
| 12.1 – 14 | 4 | | | | | | | | | | | | |
| 10.1 - 12 | 3 | | | | | | | | | | | | |
| 7.1 – 10 | 2 | | | | | | | | | | | | |
| 4 - 7 | 1 | | | | | | | | | | | | |
| < 4 | 0.5 | | | | | | | | | | | | |
| Signature | | | | | | | | | | | | | |
| Bleep No. | | | | | | | | | | | | | |
| Date | | | | | | | | | | | | | |
| Time | | | | | | | | | | | | | |

- DKA:**
 Blood ketones <0.6 mmol/L **and**
 Venous bicarbonate >15 mmol/L **and**
 Eating and drinking
HHS:
 Osmolality normalised **and**
 Eating and drinking
Transfer to subcutaneous insulin regime

Notes:
 Maintain IV insulin infusion for 30 minutes after re-starting original insulin regime- IV insulin has a 5 minute half-life
ALWAYS continue subcutaneous basal insulin
 Refer to the Diabetes Specialist Team
 Seek and treat precipitating factors
 Consider prophylactic or full anticoagulation
 Other issues:

