

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

<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				

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			

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		

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)

<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				

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)

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				

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 HCO ₃ > 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	HCO ₃	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:

INTRAVENOUS INSULIN, CBG AND KETONES MONITORING RECORD SHEET

Guide:

Only use for patients on intravenous insulin regimen (use different chart for patients on subcutaneous insulin)

Make sure the patient's hands are clean

Check CBG hourly

Check capillary blood ketone hourly until DKA resolved

ADDRESSOGRAPH
LABEL

DATE	Time	Blood glucose	Blood ketones	Hourly infusion rate (units/hr)	Volume left in syringe (ml)	Volume infused in one hour (ml)	Total volume infused (ml)	Signatures	KEY EVENTS / NOTES