



SETTING Norfolk and Norwich University Hospitals Foundation Trust

FOR STAFF Medical and Nursing staff

PATIENTS Children and young people with diabetes up to 18th birthday

Local diabetes teams need to take on the responsibility of ensuring that any staff in their Trust who are expected to use these guidelines are given training in how to use them.

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1. Management of diabetes during illness in children and adolescents

Management of children and young people (>6 months old – 18th birthday) with diabetes during illness

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East of England CYP Diabetes Network, Shared Guidelines Group: Management of diabetes during illness in children and young people August 2023 (Review Date 2026)



1.1 Scope

For the use by all health care professionals to manage illness and high blood glucose levels for all children and young people between the ages of 6 months and 18 years with type 1 diabetes.

1.2 Purpose

- To enable health professionals to provide safe advice to children and families on managing diabetes during illness. National Institute for Clinical Excellence (NICE) guidelines recommend that clear guidance should be available to children and young people with type 1 diabetes for management during periods of illness.
- To prevent children and young people becoming unwell with diabetic ketoacidosis (DKA), but also reduce the need for hospital admission during periods of illness.

1.3 Introduction

- Many illnesses, especially those associated with fever, raise blood glucose levels because higher levels of stress hormones promote gluconeogenesis and insulin resistance. This effect leads to insulin deficiency, causing an increase in ketone production.
- Illness associated with vomiting and diarrhoea may lower blood glucose with the possibility of hypoglycaemia. Decreased food intake, malabsorption, and slower emptying of the stomach during gastroenteritis may contribute to the hypoglycaemia. **Significant ketones may still be produced with hypoglycaemia during gastroenteritis.**
- There can be increased insulin requirements during the incubation period of an infection for a few days before the onset of the illness. The increased need for insulin may persist for a few days after the illness has passed due to insulin resistance.
- Ketogenesis is common in some clinical situations, such as disordered eating behaviours, use of SGLT1/2 inhibitors, and low carbohydrate diets. Frequent ketone and glucose monitoring along with sick day management is necessary to prevent DKA.

2. General principles during illness:

- **Never stop or omit insulin** – the dose may need adjustment depending on the glucose and blood ketone levels.



- **Check – blood/sensor glucose** levels every 2 hours, including through the night. Aim for glucose target of 4-10mmols/L during illness stabilisation.
- **Check – blood ketone levels** whenever a child is ill, regardless of glucose levels. If blood ketone levels are >0.6mmols/L, repeat the test 2 hourly.

- **Give additional fast acting insulin** if glucose level is above target **or** ketones are high (See flowchart 1 on Page 6 for CYP on injections, page 8 for CYP on pumps & page 9 for CYP on hybrid closed loop systems).
- **Hydration and nutrition**
 - Drink plenty of fluids.
 - Water or sugar-free fluids are best if glucose levels are normal or high.
 - Sugary fluids are necessary if glucose levels are low.
 - Carbonated drinks should be avoided or left to go flat.
 - If unable to eat or appetite is reduced, it is important to drink plenty of fluids.
 - Inform the diabetes team as soon as possible to seek advice and treat the underlying condition where appropriate.
 - Consider admission to hospital more urgently where there are comorbid conditions besides diabetes which make illness management more complex, e.g. Down's syndrome, disordered eating behaviours, mental health concerns, epilepsy, inflammatory bowel disease etc.

2.1 Capillary blood glucose monitoring (BG) vs sensor glucose monitoring

- Frequent monitoring facilitates optimal diabetes management during illness.



- Glucose levels should be monitored at least every 4 hours and sometimes every 1-2 hours, particularly if ketones are raised or additional doses of insulin have been given. If a patient is using continuous glucose monitoring (CGM)/glucose sensors such as Dexcom or Libre, there is potential for inaccurate readings at extremes of glucose levels. Due to the risk of DKA during illness, it is pertinent to confirm CGM results with capillary blood glucose monitoring to ensure timely delivery of insulin and avoid progression to DKA. As a guide, any sensor/CGM reading of 4.0mmol/L or below, and 14mmol/L or above should be confirmed with a capillary blood glucose.
- As an inpatient ward, ensure that blood glucose levels are used for making insulin dose decisions. For observations and monitoring in between, sensor readings and directional arrows can be used as guidance, as advised by your diabetes team.

2.2 Blood ketones (BK)

- Ketones (beta-hydroxybutyrate, acetoacetate and acetone) are produced by the liver for two reasons:
 - a) When glucose levels are low (starvation ketones)
 - b) When insulin is lacking to initiate the transport of glucose from the blood stream into the cells (ketones act as an alternative energy source for the cells).
- N.B. **Blood ketone** measurement is superior to urine and should be used for illness management. Urine ketone checks must not be used for management.

BLOOD KETONE LEVEL	ADVICE
Below 0.6 mmol/L	Readings in normal range.

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	No further action.
Between 0.6 and 1.5 mmol/L	CAUTION If blood glucose level is > 14mmol/L with a blood ketone level in this range, it may indicate the development of a problem. See pages 6, 8 and 9 for advice
Above 1.5 mmol/L	ACTION If blood glucose level is > 14mmol/L with a blood ketone level in this range, child/young person is at risk of developing ketoacidosis (DKA). See page 6, 8 and 9 for advice

Interpretation of blood ketone results and actions: For CYP on insulin injections – see Flowchart 1 on page 6; For CYP on insulin pump therapy – see Flowchart 2 on page 8; For CYP on hybrid closed loop – see page 9

2.3 Maintaining hydration

- Hyperglycaemia, fever, excessive glycosuria and ketonuria increase fluid losses.
- Elevated levels of ketones, whether associated with low glucose (starvation) or high glucose (insulin deficiency), contribute to nausea and vomiting, leading to decreased food and fluid intake, further elevated ketones, dehydration, and ketoacidosis.
- Liquids for hydration should contain salt and water and not just plain water if there are ongoing losses like vomiting or diarrhoea (e.g. Dioralyte). If appetite is decreased or glucose is falling below 5mmols/L, sugar containing fluids should be considered to avoid starvation ketosis (e.g. Sports drinks, diluted fruit drinks, normal usual soft drinks). It is best to shake the bubbles out of the sugar containing carbonated drinks to minimise indigestion and advise patients to take sips rather than a large amount at a time (little and often).
- If nausea, vomiting, or diarrhoea are persistent, intravenous fluids may be required (see IV Fluids and VR III on pages 16-17).

2.4 Specific Medical Management:

- Shock and/or dehydration:
 - Admit
 - Treat shock with a bolus of 10ml/kg of 0.9% sodium chloride and review need for further boluses [as per your local policy](#).
 - Correct dehydration



- The underlying illness should, if known, be treated as it would be for a child without diabetes, i.e. UTI, tonsillitis, gastroenteritis, etc.
 - Consider sugar free antipyretics to manage fever, malaise, headaches, and pain.
 - Unknown or uncertain alternative medicine co-prescription should be avoided.
-
- **NB:** Children and young people who have poor oral intake or are unable to tolerate any oral fluids during illness and are NOT ketoacidotic, may still have ketonaemia
 - **Euglycaemic Diabetic Ketoacidosis (EDKA) can occur in patients with euglycaemia (glucose levels in, or slightly above target range). Any CYP with euglycaemia, elevated blood ketones and sudden onset of headache, nausea, vomiting, abdominal pain or difficulty in breathing should be assessed urgently at local A&E.**

3. Management of hyperglycaemia (high blood glucose levels)

Hyperglycaemia is any blood glucose level above 7mmol/L on fasting or before meals, and above 9mmols/L post meals. However, in illness often the blood glucose is much higher.

- Additional doses of rapid acting insulin (e.g. Humalog®, Novorapid®, Apidra®, Fiasp®, Lyumjev®) are required with careful monitoring to prevent ketoacidosis.
- Dose and frequency of insulin administration will depend on the glucose and blood ketones.
- Most CYP use their bolus advisor apps or meters to calculate the doses of rapid acting insulin for corrections of high glucose levels. If they do not have a bolus advisor app or meter, or the CYP is under the care of general paediatric staff, the insulin sensitivity factor (ISF) / correction factor or '100 rule' should be used – page 7.
- If pre-mixed insulin is used and patient does not have rapid acting insulin – admit for correction with rapid acting insulin using the 100 rule.
- Consider increasing the usual amount of insulin during the course of the illness.
- Pump patients - If glucose levels are high, make the standard checks on the pump i.e. check for occlusions, disconnection, battery failure, suspended delivery, pump delivery mode, etc.



NOTE: If blood ketones ≥ 3.0 mmol/L there is immediate risk of developing DKA. After extra insulin has been given, the blood ketone level may temporarily increase by 10 – 20% for the first hour but should be expected to decrease thereafter. If CYP has nausea, vomiting, abdominal pain, headache or is unable to eat or drink, advise to attend local A&E as soon as possible. If CYP has altered level of consciousness, laboured breathing or there are immediate concerns for safety call 999.



3.1 Flowchart 1: Management of glucose levels of 4mmol/L & above, with blood ketones during illness for CYP ON INJECTIONS. NB: if the CYP is an inpatient any insulin dose adjustments must be made using the blood glucose reading obtained from the Trust calibrated (Point of Care) Blood glucose (BG) meter.

	Blood ketones less than 0.6 mmol/L	Blood ketones 0.6 – 1.5mmol/L	Blood ketones above 1.5mmol/L
Blood glucose level 4.0 – 10.0 mmol/L	<ol style="list-style-type: none"> No need to worry, no extra insulin needed. Continue with the usual insulin regime. If unable to eat, encourage sips of sugary drink (little and often). 	Likely Starvation ketones. Extra carbs needed. <ol style="list-style-type: none"> Give usual dose of rapid acting insulin for the carbs + correction dose as per bolus advisor app/meter. If bolus advisor not available to patient, use '100 rule' to work out the correction dose. If not able to eat, sip a sugary drink. Continue with usual insulin regime. 	Likely Starvation ketones. Extra carbs needed. <ol style="list-style-type: none"> Give usual dose of rapid acting insulin for the carbs + correction dose as per bolus advisor app/meter. If bolus advisor not available, give 5-10% of total daily dose (TDD) or 0.05-0.1units/kg. If not able to eat, sip a sugary drink. Continue with usual insulin regime.
Check BG & Ketones every 2 hours - use the glucose & ketone levels at each check to follow the insulin dose advice from the appropriate row & column in this table.			
Blood glucose level 10.1 – 14.0 mmol/L	<ol style="list-style-type: none"> Give correction dose of rapid acting insulin as per bolus advisor app/meter, using the illness function if available; OR use '100 rule' to work out correction dose. Drink sugar free fluids. Continue with usual background insulin. Give usual dose of rapid acting insulin with food as normal. 	<ol style="list-style-type: none"> Give correction dose of rapid acting insulin as per bolus advisor app/meter, using the illness function if available; OR 5-10% of total daily dose (TDD) or 0.05-0.1units/kg. Encourage sugar free fluids (little and often). Continue with usual background insulin. Give usual dose of rapid acting insulin with food as normal. 	<ol style="list-style-type: none"> Give correction dose of rapid acting insulin as per bolus advisor app/meter, using the illness function if available; OR 10% of total daily dose (TDD) or 0.1units/kg. Encourage sugar free fluids (little and often). Continue with usual background insulin. Give usual dose of rapid acting insulin with food as normal.
Check BG & Ketones every 2 hours - use the glucose & ketone levels at each check to follow the insulin dose advice from the appropriate row & column in this table.			
Blood glucose level above 14.1mmol/L	<ol style="list-style-type: none"> Give correction dose of rapid acting insulin as per bolus advisor app/meter, using the illness function if available; OR 5-10% of total daily dose (TDD) or 0.05-0.1units/kg. Encourage sugar free fluids (little and often). Continue with usual background insulin. 	<ol style="list-style-type: none"> Give correction dose of rapid acting insulin as per bolus advisor app/meter, using the illness function if available; OR 10 – 20% of total daily dose (TDD) or 0.1 – 0.2units/kg. Encourage sugar free fluids (little and often). Continue with usual background insulin. Give usual dose of rapid acting insulin with food as normal. 	<ol style="list-style-type: none"> Give correction dose of rapid acting insulin as per bolus advisor app/meter, using the illness function if available; OR 20% of total daily dose (TDD) or 0.2units/kg. Encourage sugar free fluids (little and often). Continue with usual background insulin. Give usual dose of rapid acting insulin with food as normal.

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	4. Give usual dose of rapid acting insulin with food as normal.		
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Check BG & Ketones every 2 hours - use the glucose & ketone levels at **each check** to follow the insulin dose advice from the appropriate row & column in this table.

NOTE: If blood ketones $\geq 3.0\text{mmol/L}$ there is immediate risk of developing DKA. After extra insulin has been given, the blood ketone level may temporarily increase by 10 – 20% for the first hour but should be expected to decrease thereafter. If CYP has nausea, vomiting, abdominal pain, headache or is unable to eat or drink, advise to attend local A&E ASAP. If CYP has altered level of consciousness, laboured breathing or there are immediate concerns for safety call 999. Add appendix 3 for your local 24hr/escalation policy.



To calculate the total daily dose (TDD):

For those on insulin injections – add up all the insulin given on a daily basis (basal and bolus)

For those on insulin pumps – TDD can be found in the pump memory function

To calculate the insulin sensitivity factor using the '100 rule'

Divide 100 by total daily dose

(i.e. total basal (long-acting) + total bolus (rapid-acting) insulin). Use at least one week's insulin doses.

For example, if total daily dose is 50 units, ($100 \div 50 = 2$). This means that 1 unit of rapid acting insulin (Humalog® or NovoRapid® or Apidra®), would drop glucose by 2mmol/L. (i.e. Insulin Sensitivity Factor (ISF) = 2).

Aim to drop glucose to 7 mmol/L for known diabetics

For CYP with newly diagnosed diabetes the target blood glucose maybe glucose of 10mmol/L as they are more sensitive (discuss with local diabetes team)

Example:

If BG= 17, target BG =7 and ISF=2 (Actual BG – Target BG) ÷ ISF
 $(17 - 7) \div 2 = 5$

Patient would need 5 units of rapid acting insulin to drop glucose from 17 to 7mmol/L. *Always check glucose 2 hours after the correction dose of rapid acting insulin to ensure glucose levels are reducing.*

NB: Rapid-acting insulin doses MUST be 2 hours apart. Bolus doses for intake of carbohydrates may be given sooner than two hours.



3.2 Flowchart 2: Management of glucose levels 4mmol/L & above, with blood ketones >0.6mmol/L for CYP on INSULIN PUMPS (CSII), not hybrid closed loop. NB: if the CYP is an inpatient any insulin dose adjustments must be made using the blood glucose reading obtained from the Trust calibrated (Point of Care) BG meter.

	Blood ketones less than 0.6 mmol/L	Blood ketones 0.6 – 1.5mmol/L	Blood ketones above 1.5mmol/L
Blood glucose level 4.0 – 10.0 mmol/L	<ol style="list-style-type: none"> 1. Encourage carbohydrate containing food or fluid (as tolerated) with normal insulin dose if BG >5mmol or without insulin for BG <5mmol. 2. If unable to eat, encourage sips of sugary drink (little & often). 3. If BG 4-5mmol, and CYP unable to eat, consider starting a reduced temp basal of 5-10% (90-95%) to prevent hypos. 	<p>Likely starvation ketones. Extra carbs needed.</p> <ol style="list-style-type: none"> 1. Encourage carbohydrate containing food or fluid (as tolerated) with insulin if BG >5mmol and without insulin for BG <5mmol. 2. If unable to eat, encourage sips of sugary drink (little & often). 3. If BG >5mmol, consider starting a temp basal of +5-10% (105-110%) 	<p>Likely starvation ketones. Extra carbs needed.</p> <ol style="list-style-type: none"> 1. Encourage carbohydrate containing food or fluid (as tolerated) with insulin. 2. If unable to eat, encourage sips of sugary drink (little & often). 3. If BG >5mmol, start a temp basal of +5-10% (105-110%)
Check BG & Ketones every 1-2 hours - use the glucose & ketone levels at each check to follow the insulin dose advice from the appropriate row & column in this table.			
Blood glucose level 10.1 – 14.0 mmol/L	<ol style="list-style-type: none"> 1. Check pump for suspended delivery, occlusions, disconnection, battery failure, insulin in cartridge etc. 2. Give correction dose of insulin through the pump as advised by the pump bolus advisor. 3. Consider starting a temp basal of +20% (120%). 4. Encourage sugar free fluids (little & often). 	<ol style="list-style-type: none"> 1. Give correction dose of rapid acting insulin by PEN as calculated by pump bolus advisor, OR 5-10% of total daily dose (TDD) or 0.05-0.1units/kg. 2. Change the entire pump set system (new reservoir, infusion set and cannula, or pod) and restart the pump 3. Start a temp basal of +25% (125%) for 2 hours. 4. Encourage sugar free fluids (little & often). 	<ol style="list-style-type: none"> 1. Give correction dose of rapid acting insulin by PEN as calculated by pump bolus advisor OR 10% of total daily dose (TDD) or 0.1units/kg. 2. Change the entire pump set system (new reservoir, infusion set and cannula, or pod) and restart the pump 3. Start a temp basal of +25% for 2 hours. 4. Encourage sugar free fluids (little & often).
Check BG & Ketones every 1-2 hours - use the glucose & ketone levels at each check to follow the insulin dose advice from the appropriate row & column in this table.			
Blood glucose level above 14.1mmol/L	1. Give correction dose	1. Give correction dose of rapid acting insulin by PEN :	1. Give correction dose of rapid acting insulin by PEN



	<p>of rapid acting insulin by PEN as calculated by pump bolus advisor OR 10% of total daily dose (TDD) or 0.1units/kg.</p> <p>2. Change the entire pump set system (new reservoir, infusion set and cannula, or pod) and restart the pump</p> <p>3. Start temp basal of +25% (125%) for 2 hours.</p> <p>4. Encourage sugar free fluids (little & often).</p>	<p>10 – 20% of total daily dose (TDD) or 0.1 – 0.2units/kg.</p> <p>2. Change the entire pump set system (new reservoir, infusion set and cannula, or pod) and restart the pump</p> <p>3. Start temp basal of +50% (150%) for 2 hours.</p> <p>4. Encourage sugar free fluids (little & often).</p>	<p>20% of total daily dose (TDD) or 0.2units/kg.</p> <p>2. Change the entire pump set system (new reservoir, infusion set and cannula, or pod) and restart the pump</p> <p>3. Start temp basal of +50% (150%) for 2 hours.</p> <p>4. Encourage sugar free fluids (little & often).</p>
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Check BG & Ketones every 1-2 hours - use the glucose & ketone levels at each check to follow the insulin dose advice from the appropriate row & column in this table. If no change in BG or ketones, increase the temp basal to +75% (175%) (can increase to max of +100% (200%) every 2 hours)

NOTE: If blood ketones ≥ 3.0mmol/L there is immediate risk of developing DKA. After extra insulin has been given, the blood ketone level may temporarily increase by 10 – 20% for the first hour but should be expected to decrease thereafter. If CYP has nausea, vomiting, abdominal pain, headache or is unable to eat or drink, advise to attend local A&E ASAP. If CYP has altered level of consciousness, laboured breathing or there are immediate concerns for safety call 999. Add in your local version if applicable - appendix 3 for your local 24hr/escalation policy.

3.3 Flowchart 3: Management of glucose levels 4mmol/L & above, with blood ketones >0.6mmol/L for CYP on HYBRID CLOSED LOOP (HCL) PUMPS

NB: if the CYP is an inpatient any insulin dose adjustments must be made using the blood glucose reading obtained from the Trust calibrated (Point of Care) BG meter

	Blood ketones less than 0.6 mmol/L	Blood ketones 0.6 – 1.5mmol/L	Blood ketones above 1.5mmol/L
Blood glucose level 4.0 – 10.0 mmol/L	<p>Keep Auto-Mode ON</p> <p>1. Encourage carbohydrate containing food or fluid (as tolerated) with normal insulin dose if BG>5mmol or without insulin for BG <5mmol. If unable to eat, encourage sips of sugary drink (little & often).</p> <p>2. If BG 4-5mmol only, and CYP unable to eat, set the HCL as below: <u>Cam APS FX</u> – Activate 'EASE OFF' mode; <u>Medtronic</u> – Set 'temp target'; <u>T-Slim Control IQ</u> – Set 'exercise/activity' target, until BG are above 5mmol.</p>	<p>1. Hybrid Closed Loop system: <u>Cam APS FX</u> - turn OFF Auto-Mode; <u>MEDTRONIC</u> – turn OFF Smartguard; <u>T-SLIM</u>– turn OFF Control IQ</p> <p>Likely starvation ketones. Extra carbs needed.</p> <p>2. Encourage carbohydrate containing food or fluid (as tolerated) with insulin if BG >5mmol and without insulin for BG <5mmol.</p> <p>3. If unable to eat, encourage sips of sugary drink (little & often). If BG >5mmol, consider starting a temp basal of 5-10% (105-110%).</p>	<p>Likely starvation ketones. Extra carbs needed.</p> <p>2. Encourage carbohydrate containing food or fluid (as tolerated) with insulin.</p> <p>3. If unable to eat, encourage sips of sugary drink (little & often). If BG >5mmol, start a temp basal of 5-10% (105-110%).</p>
Check BG & Ketones every 1-2 hours - use the glucose & ketone levels at each check to follow the insulin dose advice from the appropriate row & column.			
Blood glucose level 10.1 –	<p>1. Hybrid Closed Loop System: <u>Cam APS FX</u> - turn OFF Auto-Mode; <u>MEDTRONIC</u> – turn OFF Smartguard; <u>T-SLIM</u> – turn OFF Control IQ</p> <p>2. Check pump for suspended delivery, occlusions, disconnection, battery failure, insulin in cartridge etc.</p>	<p>2. Check pump for suspended delivery, occlusions, disconnection, battery failure etc.</p>	<p>2. Give correction dose of rapid acting insulin by PEN as calculated by pump bolus advisor OR 10%</p>



14.0 mmol/L	<ol style="list-style-type: none"> 3. Give correction dose of insulin through the pump as advised by the pump bolus advisor. 4. Consider starting a temp basal of 25% (125%). 5. Encourage sugar free fluids (little & often). 	<ol style="list-style-type: none"> 3. Give correction dose of rapid acting insulin by PEN as calculated by pump bolus advisor, OR 5-10% of total daily dose (TDD) or 0.05-0.1units/kg. 4. Start a temp basal of 25% (125%) for 2 hours. 5. Encourage sugar free fluids (little & often). 	<p>of total daily dose (TDD) or 0.1units/kg.</p> <ol style="list-style-type: none"> 3. Change the entire pump set system (new reservoir, infusion set and cannula, or pod) and restart the pump 4. Start a temp basal of 25% (125%) for 2 hours. 5. Encourage sugar free fluids (little & often).
6. Check BG & Ketones every 1-2 hours - use the glucose & ketone levels at each check to follow the insulin dose advice from the appropriate row & column			
Blood glucose level above 14.1mmol/L	<ol style="list-style-type: none"> 2. Give correction dose of rapid acting insulin by PEN OR 10% of total daily dose (TDD) or 0.1units/kg. 3. Change the entire pump set system (new reservoir, infusion set and cannula, or pod) and restart the pump 4. Start a temp basal of 25% (125%) for 2 hours. 5. Encourage sugar free fluids (little & often). 	<ol style="list-style-type: none"> 2. Give correction dose of rapid acting insulin by PEN: 10 – 20% of total daily dose (TDD) or 0.1 – 0.2units/kg. 3. Change the entire pump set system (new reservoir, infusion set and cannula, or pod) and restart the pump 4. Start a temp basal of 50% (150%) for 2 hours. 5. Encourage sugar free fluids (little & often). 	<ol style="list-style-type: none"> 2. Give correction dose of rapid acting insulin by PEN 20% of total daily dose (TDD) or 0.2units/kg. 3. Change the entire pump set system (new reservoir, infusion set and cannula, or pod) and restart the pump 4. Start a temp basal of 50% (150%) for 2 hours. 5. Encourage sugar free fluids (little & often).
6. Check BG & Ketones every 1-2 hours - use the glucose & ketone levels at each check to follow the insulin dose advice from the appropriate row & column in this table. If no change in BG or ketones, increase the temp basal to +75% (175%) (can increase to max of +100% (200%) every 2 hours).			
7. Once ketones remain below 0.6mmol and BG are below 14 for 4 hours, stop temp basal and turn ON Auto-mode/Smartguard/ontrol IQ			
NOTE: If blood ketones ≥ 3.0 mmol/L there is immediate risk of developing DKA. If CYP has nausea, vomiting, abdominal pain, headache or is unable to eat or drink, advise to attend local A&E ASAP. If CYP has altered level of consciousness, laboured breathing or there are immediate concerns for safety call 999. Add appendix 3 for your local 24hr/escalation policy.			



4. Management of hypoglycaemia during illness, e.g. gastroenteritis

- Hypoglycaemia is defined as a glucose level of $<4\text{mmol/L}$. It is categorised as:
 - a. mild/moderate, if the child or young person is alert and able to tolerate oral fluids/glucose 40% gel.
 - b. severe hypoglycaemia, if the child or young person is unable to swallow, unconscious or fitting.
- Illnesses associated with nausea and vomiting with or without diarrhoea can lead to hypoglycaemia. Replacing meals with frequent small volumes of sugary drinks and monitoring BG carefully helps to avoid hypoglycaemia. Give parents alternatives for carbohydrate like sugary drinks if child is unable to tolerate food
- Reduction in boluses with meals may be required if oral intake is reduced. However, if doses are lowered too much, there is a risk of developing insulin deficiency leading to ketosis and ketoacidosis. Ensure adequate basal insulin delivery to prevent hyperglycaemia and hyperketonaemia.
- Check ketones regularly to see that the CYP has sufficient carbohydrate/sugar intake. Ketones associated with gastrointestinal illness and hypoglycaemia usually reflect inadequate energy supply rather than insulin deficiency (i.e. starvation ketones). Monitor glucose levels 2 hourly and encourage fluids containing sugar. When ketone levels are elevated, priority is to give extra insulin irrespective of the BG level (for insulin dose advice see page 12-13)
- If oral fluids cannot be tolerated and glucose level is $<4\text{mmols/L}$, the child or young person should be admitted. If they are drowsy or conscious level is reduced, then call 999 for an ambulance and advice to give IM Glucagon if available – see table 3 on page 14 for dose, OR if already in hospital see page 13.



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4.1 Table 1 - Management of ketones with hypoglycaemia (i.e. glucose < 4.0mmol/L) during illness e.g. gastroenteritis. NB: if the CYP is an inpatient any treatment decisions must be made using the blood glucose reading obtained from the Trust calibrated (Point of Care) BG meter.

- CHECK GLUCOSE EVERY 15 MINUTES INITIALLY until BG >4mmols. Then reduce to 1-2 hourly.
- CHECK BLOOD KETONE LEVELS EVERY 2 HOURS or until vomiting/diarrhoea stops, or CYP can tolerate carbohydrates & blood ketones are below 0.6mmols/L
- **NEVER STOP or OMIT INSULIN** – the dose may need to be reduced as per the table below.
- If the CYP is unable to tolerate carbohydrate either fluid or solid or unable to maintain CBG >4mmol/L, has abdominal pain, or headache advise them to attend local A&E ASAP. Admit and consider IV 0.9% saline + 5% glucose solution.
- If child has altered level of consciousness, laboured breathing or there are immediate concerns for safety call 999. Add appendix 3 for your local 24hr/escalation policy.

NOTE: If ketones are ≥ 3.0mmol/L with a rise in CBG to above 14.0mmol/L there is immediate risk of developing DKA - PLEASE SEE page 6.

Glucose level below 4mmol/L	Blood ketones <0.6mmol/L	Blood ketones 0.6 – 1.5mmol/L	Blood ketones >1.5mmol/L
For all insulin delivery methods: Injections (MDI), pumps (CSII) and hybrid closed loop (HCL)	1. Treat hypoglycaemia as per tables 2 or 3 on (page 13 - 14). 2. CYP MUST get enough carbs to get insulin, especially for those on small insulin doses to prevent ketonaemia. <ul style="list-style-type: none"> • Encourage carbohydrate intake. Give carbohydrate in liquid form if unable to tolerate solid food. • NB: Units may want to add fluid challenge guidance here as a guide for the table. • Then follow guidance below based on CYP's insulin delivery method 	1. Treat hypoglycaemia as per tables 2 or 3 on (page 13 - 14). 2. CYP MUST get enough carbs to get insulin, especially for those on small insulin doses to prevent ketonaemia. <ul style="list-style-type: none"> • Encourage carbohydrate intake. Give carbohydrate in liquid form if unable to tolerate solid food. • NB: Units may want to add fluid challenge guidance here as a guide for the table. • Then follow guidance below based on CYP's insulin delivery method 	1. Treat hypoglycaemia as per tables 2 or 3 on (page 13 - 14). 2. CYP MUST get enough carbs to get insulin, especially for those on small insulin doses to prevent ketonaemia. <ul style="list-style-type: none"> • Encourage carbohydrate intake. Give carbohydrate in liquid form if unable to tolerate solid food. • NB: Units may want to add fluid challenge guidance here as a guide for the table. • Then follow guidance below based on CYP's insulin delivery method
INJECTIONS (MDI)	<ul style="list-style-type: none"> • Consider reducing basal or intermediate insulin dose by 5 - 10%. • Consider reducing next meal bolus by 20-50%. • Check BG and ketones at least 2 hourly - use the ketone levels at each check to follow the insulin dose advice from the appropriate column in this table • Once CYP has not vomited/had diarrhoea 30 – 60 minutes post carbohydrate intake, give normal bolus dose of rapid acting insulin with the next meal or snack, as per bolus advisor app/meter. 	<ul style="list-style-type: none"> • Consider reducing the next meal bolus by 10 - 20%. • Check BG and ketones at least 2 hourly - use the ketone levels at each check to follow the insulin dose advice from the appropriate column in this table • Once CYP has not vomited/had diarrhoea 30 – 60 minutes post carbohydrate intake, give normal bolus dose of rapid acting insulin with the next meal or snack, as per bolus advisor app/meter OR give 5% of total daily dose (TDD)/0.05 units/kg 	<ul style="list-style-type: none"> • Do not reduce intermediate or basal insulin • Consider reducing the next meal by 20-50% • Check BG and ketones at least 2 hourly - use the ketone levels at each check to follow the insulin dose advice from the appropriate column in this table • Once CYP has not vomited/had diarrhoea 30 – 60 minutes post carbohydrate intake, give normal bolus dose of rapid acting insulin with the next meal or snack, as per bolus advisor app/meter OR give 5-10% of total daily dose (TDD)/0.05 – 0.1units/kg



Glucose level below 4mmol/L	Blood ketones below 0.6mmol/L	Blood ketones 0.6 – 1.5mmol/L	Blood ketones >1.5mmol/L
PUMPS (CSII) – not hybrid closed loop	<ul style="list-style-type: none"> Consider reducing temporary basal rates by 20 -50% for 2 hours Check BG & ketones 1-2 hourly - use the ketone levels at each check to follow the insulin dose advice from the appropriate column in this table. Once CYP has not vomited/had diarrhoea 30 - 60 minutes post carbohydrate intake, give normal bolus dose of rapid acting insulin as per pump bolus advisor with the next meal or snack 	<ul style="list-style-type: none"> Consider reducing temporary basal rates by 20% for 2 hours. Check BG & ketones 1-2 hourly - use the ketone levels at each check to follow the insulin dose advice from the appropriate column in this table. Once CYP has not vomited/had diarrhoea 30 - 60 minutes post carbohydrate intake, give normal bolus dose of rapid acting insulin as per pump bolus advisor with the next meal or snack 	<ul style="list-style-type: none"> Do not reduce basal insulin Consider reducing the next meal dose by 10 – 20% Check BG & ketones 1-2 hourly - use the ketone levels at each check to follow the insulin dose advice from the appropriate column in this table. Once CYP has not vomited/had diarrhoea 30 - 60 minutes post carbohydrate intake, give normal bolus dose of rapid acting insulin as per pump bolus advisor with the next meal or snack
HYBRID CLOSED LOOP	<ul style="list-style-type: none"> CamAPS FX – Activate 'EASE OFF' mode; Medtronic – Set 'temp target'; T-Slim Control IQ – Set 'exercise/activity' target. Check BG & ketones 1-2 hourly - use the ketone levels at each check to follow the insulin dose advice from the appropriate column in this table. Once CYP has not vomited/had diarrhoea 30-60 minutes post carbohydrate intake, give normal bolus dose of rapid acting insulin with the next meal or snack, as per pump bolus advisor, and: CamAPS FX – deactivate 'EASE OFF' Medtronic – turn off 'temp target' Control IQ – turn off 'exercise/activity' target 	<p>In hybrid closed loop, the pump may stop basal insulin delivery several times to prevent hypos. This may result in ketonaemia.</p> <ul style="list-style-type: none"> TURN OFF: Auto-mode on CamAPS FX; Smartguard on Medtronic; Control IQ on T-slim Consider starting a reduced temp basal of 10 – 20% (80 - 90%) Consider reducing the next meal dose by 10 – 20% Check BG & ketones 1-2 hourly - use the ketone levels at each check to follow the insulin dose advice from the appropriate column in this table. Once CYP has not vomited/had diarrhoea 30 - 60 minutes post carbohydrate intake, give normal bolus dose of rapid acting insulin as per pump bolus advisor with the next meal or snack, and: CamAPS FX – turn ON Auto-mode Medtronic – turn ON Smartguard Control IQ – turn ON Control-IQ 	

4.2 Table 2 – In HOSPITAL Hypoglycaemia management

Assess	Conscious, co-operative & ABLE to tolerate oral treatment	Conscious but unco-operative and REFUSES oral treatment	Unconscious or fitting (or not responded to treatment in amber boxes).
Signs and Symptoms	Pale, feels wobbly, headache, unsteady, irritable	Combative, poor concentration, confusion, irritable, weakness, drowsy, unsteady, headache, difficulty focusing and speaking	Unconscious, in and out of consciousness, seizures
Treatment	<p>ADMINISTER FAST ACTING GLUCOSE</p> <p>See table on page 14 for type and amount</p>	<p>ADMINISTER FAST ACTING GLUCOSE IN THE FORM OF GLUCOSE GEL (GLUCOSE 40% oral gel) as below:</p> <p>As per BNFC</p> <ul style="list-style-type: none"> ▪ <5yrs – ½ tube (5g) ▪ 5-11yrs – 1 tube (10g) ▪ ≥ 12yrs – 1 ½ tube (15g) <p>Administer gel into side of cheek and massage gently from outside to enable absorption</p> <p>DO NOT give Glucose gel to an unconscious or fitting child/ young person</p>	<p>Follow local resus policy eg. danger, response, shout for help and place 2222/999 call, ABCDE assessment, measure glucose to confirm hypo, then:</p> <p>ADMINISTER FAST ACTING GLUCOSE by IV or IM as below:</p> <ul style="list-style-type: none"> ▪ Gain IV access and give bolus of IV 10% glucose of 2ml/Kg (to a maximum of 5ml/Kg). ▪ If IV access is not achieved quickly, give IM injection of Glucagon: <ul style="list-style-type: none"> • 1month – 8 years or weight up to 25Kg: 0.5mg (0.5ml = ½ a syringe) • ≥ 9 years or weight ≥ 25Kg: 1mg (1ml = full syringe) <p>If no response within 10 mins IV glucose MUST be given – inform/update senior doctor.</p>

Reassess	<p>Wait 15 minutes if using BG, or 20 minutes if using sensor glucose then recheck glucose level. If level still below 4mmol/L, repeat treatment.</p> <p>(BG MUST be above 5mmol/L if young person is driving)</p>	<p>Wait 15 minutes if using BG, or 20 minutes if using sensor glucose then recheck glucose level. If level still below 4mmol/L, repeat treatment.</p> <p>(BG MUST be above 5mmol/L if young person is driving)</p>	<p>Check blood glucose (do not use sensor glucose) after 5 minutes, 15 minutes and then every 30 minutes until BG is stable above 4mmol/L. If CYP not improving call senior doctor. Consider repeat IV bolus.</p> <p>If BG above 4mmol/L and CYP is able to tolerate oral fluids offer clear fluids and simple carbohydrates e.g. toast/ plain biscuits.</p>
Good to go!	<p>When blood glucose level is at least 4.0mmol/L (or above 5mmol/L if driving) and patient has recovered, give a long-acting carbohydrate 10-15g snack. E.g. a slice of toast, a medium sized apple, a plain biscuit or a glass of milk (200mls) if it is more than 1-2 hours before the next meal.</p> <p>Long-acting carbohydrate may NOT be necessary following treatment of hypoglycaemia for CYP who use an insulin pump.</p> <p>NOTE: insulin should NEVER be omitted following an episode of hypoglycaemia but dose adjustment may be necessary.</p> <p style="text-align: center;">INFORM CYP DIABETES TEAM OF ADMISSION</p>		

4.3 Table 3 – At HOME Hypoglycaemia management

Assess	Co-operative & ABLE to tolerate oral treatment	Unco-operative but conscious and REFUSES oral treatment	Unconscious or fitting (or not responded to treatment in amber boxes).
Signs and Symptoms	Pale, feels wobbly, headache, unsteady, irritable	Combative, poor concentration, confusion, irritable, weakness, drowsy, unsteady, headache, difficulty focusing and speaking	Unconscious, seizures
Treatment	ADMINISTER FAST ACTING GLUCOSE See table on page 14 for type and amount	ADMINISTER FAST ACTING GLUCOSE IN THE FORM OF GLUCOSE GEL (GLUCOSE 40% oral gel) as below: <ul style="list-style-type: none"> ▪ <5yrs – ½ tube (5g) ▪ 5-11yrs – 1 tube (10g) ▪ ≥ 12yrs – 1 ½ tube (15g) Administer gel into side of cheek and massage gently from outside to enable absorption DO NOT give Glucose gel to an unconscious or fitting child/ young person	Place CYP on their side. Call 999 Check glucose level if able to do so quickly. ADMINISTER GLUCAGON if it is available and parent/carer is confident to do so as below: GLUCAGEN Hypokit <ul style="list-style-type: none"> • 1month – 8 years or weight upto 25Kg: 0.5mg (0.5ml = ½ a syringe) • ≥ 9 years or weight ≥ 25Kg: 1mg (1ml = full syringe) OGLUO: <ul style="list-style-type: none"> • 2-5years, weight up to 25Kg give 0.5mg pen • 2yrs and over, <u>25Kg and above</u>, give 1mg pen

<p>Reassess</p>	<p>Wait 15 minutes then recheck glucose level.</p> <p>If level still below 4mmol/L or if no clinical improvement, repeat treatment.</p> <p>(BG MUST be above 5mmol/L if young person is driving).</p>	<p>Wait 15 minutes then recheck glucose level. If level still below 4mmol/L or if no clinical improvement, repeat treatment.</p> <p>(BG MUST be above 5mmol/L if young person is driving).</p>	<p>Check blood glucose after 5 minutes, 15 minutes and then every 30 minutes until BG is stable above 4mmol/L.</p> <p>If CYP not improving after 20 mins and ambulance not arrived, give a second Glucagon dose if available.</p> <p>If BG above 4mmol/L and CYP is able to tolerate oral fluids, offer clear fluids and simple carbohydrates e.g. toast/ plain biscuits.</p> <p style="text-align: center;">Admit to hospital for observation</p>
<p>Good to go!</p>	<p>When blood glucose level is at least 4.0mmol/L (or above 5mmol/L if driving) and patient has recovered, give a long-acting carbohydrate 10-15g snack. e.g. a slice of toast, a plain biscuit or a glass of milk (200mls) if it is more than 1-2 hours before the next meal.</p> <p>Long-acting carbohydrate is NOT necessary following treatment of hypoglycaemia for CYP who use an insulin pump.</p> <p>NOTE: insulin should NEVER be omitted following an episode of hypoglycaemia but dose adjustment may be necessary.</p>		

4.4 Table 4 – Examples of carbohydrates (CHO) for hypoglycaemia treatment. The most effective hypo treatments are highlighted pink in the left hand column of the table above. Always check the labels as carb content may be different, amounts below are just a guide. This list is not exhaustive, let the CYP use their personal preference if available/appropriate.

	Conscious but unco-operative and REFUSES oral treatment								
WEIGHT UP TO:	20kg	30kg	40kg	50kg	10kg	20kg	30kg	40kg	50kg
g CHO REQUIRED (0.3g/Kg)	6g	9g	12g	15g	3g	6g	9g	12g	15g
LIFT GLUCOSE TABLETS 3.7g/tablet	1.5	2.5	3.5	4					
LIFT GLUCOSE SHOTS 15g/ 60ml	25ml	35ml	50ml	60ml					
GLUCOGEL 10g CHO/tube	½ tube	1 tube	1 ½ tube	2 tubes	½ tube	1 tube	1 tube	1 ½ tube	1 ½ tube
DEXTROSE TABS 3g/tablet	2	3	4	5	Squirt tube content in the side of each cheek evenly and massage gently from outside enabling the glucose to be swallowed and absorbed DO NOT give Glucose 40% gel to an unconscious or fitting child/ young person				
FRUIT JUICE (11g per 100ml)	60ml	90ml	120ml	150ml					
LUCOZADE Energy original (8.9g/100ml)	65ml	100ml	135ml	165ml					
LUCOZADE Sport orange (6.3g/100ml)	95ml	140ml	185ml	235ml					
COCA COLA (10.6g/100ml)	50ml	90ml	130ml	140ml					
HARIBO STARMIX 12g/mini pack	½ pack	¾ pack	1 pack	1 ¼ pack					
JELLY BABIES 5g/sweet	1	2	3	3					
SKITTLES 1.1g/sweet	5	8	11	14					
FRUIT PASTILLES 3g/sweet	2	3	4	5					



5.0 Management in hospital upon admission

5.1 Maintenance IV fluids/variable rate insulin infusion (VRIII) if CYP unable to tolerate oral fluids in any form

The choice of IV fluids depends on the CYP's glucose levels. Usual fluid is 5% glucose in 0.9% sodium chloride with 10mmol (0.15%) KCL in 500mls.

The previously used term 'Sliding scale' for IV insulin has been replaced by the term Variable Rate Intravenous Insulin Infusion (VRIII). The insulin infusion used here is significantly less than the one used in the BSPED DKA guideline because these children and young people are not in ketoacidosis. If they are ketoacidotic, then the BSPED paediatric DKA pathway (May 2022) should be followed.

Aim and principles of VRIII

Aim:

- To maintain the blood glucose level 5 -10mmol/L. It is important that patients with diabetes have a constant level of insulin to prevent ketosis.

Indications:

- For an unwell CYP with diabetes. If CYP is in DKA use BSPED paediatric DKA pathway May 2022 ([BSPED |BSPED DKA Guidelines](#)) (**failure to do this is a critical incident**). For CYP admitted for surgery refer to the EoE CYPDN managing surgery in CYP with diabetes guidance.

Principles:

- When an intravenous insulin infusion is used, fluids containing dextrose (Appendix 1) should be infused continuously until the patient is eating and drinking.
- The initial insulin infusion rate is determined by the BG (see Table 4, page 17).



- The BG should be monitored at least hourly.
- The rate of fluid must be set to deliver the hourly fluid requirements.

5.2 Safe Preparation and administration of VRIII:

- An insulin syringe must be used to measure and prepare insulin for an intravenous infusion. Add soluble insulin (Actrapid®) 50 units to 49.5ml of 0.9% sodium chloride, making a solution of 1 unit insulin/ml.
- The mobile drip stand must always be present to promote stabilisation.
- Delivery of the glucose solution and the VRIII must be via a single cannula with appropriate one- way and anti-siphon valves. This is to prevent the cannula occluding due to the low infusion rate of the insulin.

50 ml luer-lock Syringe



Insulin Syringe



50ml luer lock Syringe



49.5ml Sodium Chloride 0.9% + 50 Units Actrapid Insulin = Final volume 50ml (1 unit insulin / ml)

- Start VRIII according to the CGB as in the table below:

Table 4 – VRIII rates:



CBG	Insulin infusion rate
5 – 7.9mmol/L	0.025ml/kg/hr (i.e. 0.025units/kg/hr)
8 – 11.9mmol/L	0.05ml/kg/hr (i.e. 0.05units/kg/hr)
12 – 14.9mmol/L	0.075ml/kg/hr (i.e. 0.075units/kg/hr)
≥15mmol/L	0.1ml/kg/hr (i.e. 0.1unit/kg/hr)

Monitor CBG hourly while on IV fluids and VRIII

- If BG is < 6mmols/L, infuse 10% dextrose in 0.9% sodium chloride with 10mmol of KCL in 500mls
- If BG is <4mmol/L give 2 ml/kg of 10% dextrose over 5 minutes. Retest BG after 15 minutes to ensure that the level of blood glucose is safe, otherwise repeat 10% dextrose bolus as above. Consider reducing the insulin infusion to 0.01units/kg/hr (0.01ml/kg/hr), particularly in a very young child, if BG continues to be below 5mmols/L despite the boluses
- If BG continue to drop and are low, consider using 10% glucose with 0.9% sodium chloride and 10mmol KCL in 500mls. (**Ensure fluids/ insulin are running accurately, discuss with Consultant and consider replacing all infusions**)
- If BG is >14mmols/L, use 0.9% sodium chloride with 10mmol KCL in 500ml and increase the insulin infusion rate. Once BG has dropped below 14mmols/L, change the fluids to 5% dextrose with 0.9% sodium chloride and 10mmols KCL in 500mls.
- Monitor electrolytes daily to avoid hyponatraemia. If hyponatraemia develops, always discuss with the consultant. There is evidence that the risk of acute hyponatremia may be



increased when using hypotonic parental maintenance fluid (i.e. < 0.9% saline) in hospitalised children. If hypernatremia, discuss with the consultant and plan appropriate fluid management.

- When fluids and food are tolerated, start the usual subcutaneous insulin regime as below.

5.3 Transferring from VRIII to subcutaneous insulin:

- Once the patient is able to tolerate food orally give S/C insulin. **Discontinue the insulin infusion 30 minutes** after the subcutaneous dose if using rapid acting, mixed (biphasic) insulin (**Appendix 2**) or 60minutes after recommencing insulin pump therapy. Discontinue the insulin infusion **60 minutes** after the subcutaneous dose if using basal insulin (**Appendix 2**).

Consult the diabetes team if the BG is outside the acceptable range (5-10mmol/L) despite adjustment of the VRIII rates as above

References:

1. ISPAD Clinical Practice Consensus Guidelines 2022. Assessment and management of hypoglycaemia in children and adolescents with diabetes
https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/guidelines2022/2nd/Ch._12_-_Pediatric_Diabetes_.pdf
2. NICE Clinical Guideline NG 18: Diagnosis and management of Type 1 diabetes in children and young people, May 2023 (NG.18). <https://www.nice.org.uk/guidance/ng18>
3. ACDC - Management of Type 1 Diabetes Mellitus during illness in children and young people under 18 years (Sick Day Rules), March 2021 <https://www.a-c-d-c.org/wp-content/uploads/2012/08/Management-of-Type-1-Diabetes-Mellitus-During-Illness-in-Children-and-Young-People-under-18-years-Sick-Day-Rules-2.pdf>
4. ISPAD Clinical Practice Consensus Guidelines 2022: Sick day management in children and adolescents with diabetes
https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/guidelines2022/Ch_13_Pediatric_Diabetes_-_2.pdf
5. DAFNE - Sick day rules for Pump DAFNE, February 2020 <https://dafne.nhs.uk/wp-content/uploads/2020/03/HG.01-003-v3-Sick-day-rules-Pump.pdf>

Appendix 1: Parenteral maintenance fluids (PMF)

Choice of intravenous fluid

- These recommendations are modified from the results of a recently conducted randomised control trial¹² and from ISPAD clinical practice consensus guidelines. Hospital acquired hyponatraemia is common, and children undergoing surgery are at particular risk. It is recognised that hyponatraemia is associated with severe neurological morbidity.
- Those in favor of isotonic PMF argue that it supports the role of sodium during illness by maintaining plasma tonicity, whereas hypotonic PMF results in excess electrolyte free water (EFW) in patients with an already impaired ability to excrete EFW. Those who favour hypotonic PMF argue that hyponatraemia results from excessive PMF volume (as opposed to type of PMF) and there are risks with isotonic PMF, such as hyperchloremic metabolic acidosis.
- Our consensus for this guideline is that the standard intravenous fluid to run alongside the VRIII is 5% dextrose in 0.9% saline with 10mmol/500ml KCl. Monitor electrolytes daily to avoid hyponatremia. The fluid infusion rate is calculated according to body weight using the Holliday-Segar nomogram¹³. The fluid infusion rate is calculated according to body weight using the Holliday- Segar nomogram (100ml/kg/day for the 1st 10kg body weight, 50ml/kg/day for th2nd 10kg of weight, 20ml/kg/day for the remaining weight or (4ml/kg/hr for the 1st 10kg body weight, 2ml/kg/hr for the 2nd 10kg of weight, 1ml/kg/hr for the remaining weight).). (Max 2 litres in females and 2.5 litres in males as per BNFC).

Appendix 2: Commonly used insulin preparations

COMMONLY USED INSULIN PREPARATIONS

Rapid acting insulin analogues

Insulin Lispro (Humalog®); Insulin Aspart (NovoRapid®); Insulin Glulisine (Apidra®); Insulin Fiasp®

Short acting Insulin

Regular [Soluble] (Actrapid®/or Humulin S®)

Intermediate acting

Insulatard®/or Humulin I®/or Insuman®

Long acting basal insulin analogue

Insulin Glargine (Lantus®); Insulin Detemir (Levemir®);
Insulin Degludec (Tresiba)

Biphasic Insulins (Mixed insulin)

NovoMix 30®; Humulin M3®; Humalog Mix 25®; Humalog Mix 50®;
Insuman Comb 25®; Insuman Comb 50®

Biphasic insulins are pre-mixed insulin preparations containing various combinations of short acting or rapid acting and intermediate acting insulin. These preparations are normally used in 2 and 3 injections a day insulin regimens (see below).

Twice Daily Mix Insulin Regimen:

CYP on this regimen receive one injection of the Mixed (biphasic) insulin preparation in the morning and one at tea time or in the evening. In some centres patients are managed on 3 injections of Mixed (biphasic) insulin at breakfast, lunch and with tea.

Twice Daily Free Mix Insulin Regimen:

Rarely CYP take free mix injections of rapid acting e.g. Humalog[®], NovoRapid[®] and intermediate acting e.g. Insulatard[®], Humulin I[®].

Three Injections a Day Insulin Regimen:

CYP on 3 injections a day receive Mixed (biphasic) insulin with breakfast, rapid acting insulin with tea and basal insulin in the evening.

MDI Insulin Regimen:

CYP on MDI insulin regimen take once daily basal insulin in the morning or evening (and sometimes split the basal insulin in the morning and evening), and rapid acting insulin with each meal and for blood glucose correction.