EMERGENCY GUIDELINES
for Managing the Child with Type 1 Diabetes

DIABETIC KETOACIDOSIS

**HISTORY** — some or all of
- Polyuria
- Polydipsia
- Weight loss
- Abdominal pain
- Tiredness
- Vomiting
- Confusion
- Difficulty breathing

**CLINICAL SIGNS** generally include
- Deep sighing respirations — (Kussmaul breathing) with no wheeze or rhonchi
- Smell of ketones on breath
- Lethargy/drowsiness
- Dehydration — mild to severe

**Urine ketones/glucose**
- Capillary glucose STAT in ER
- Venous blood — glucose, gases, electrolytes, urea or creatinine
- Other as indicated

**DKA CONFIRMED**
- Ketonuria
- Glucose >11 mmol/L
- pH <7.3
- Serum Bicarbonate <18 mmol.L
- Referral to Pediatrician if available

**HYPOTENSION (<5 percentile for age)**
- <4y <70/30
- 4-10y <80/40
- 10-13y <85/40
- >13y <90/45

**VASCULAR DECOMPENSATION** (with or without coma)
- Hypotension (see box)
- Decreased level of consciousness

**NO VASCULAR DECOMPENSATION**
RESUSITATION
- Airway/NG tube — if otherwise needed
- NS 10 ml/kg over 1/2-1 hour to expand vascular space
  then
  • Decrease to 5 ml/kg/hr
- IF pH <7 infuse Sodium Bicarbonate 1–2 meq/kg over 1 hour

ACIDOSIS NOT IMPROVING (in 3-4 hours)
- Check insulin delivery system
- Consider sepsis
- Contact Tertiary Pediatric Diabetes Centre

ACIDOSIS IMPROVING
Blood glucose <15 mmol/L
OR
Blood glucose falls >5 mmol/L/h
Change IV to D5/normal saline
Decrease insulin to 0.04-0.05 U/kg/hr = 0.4-0.5 ml/kg/hr of standard solution as above
Blood glucose <10mmol/L change to D10/normal saline

• 20% Mannitol 5 cc/kg over 20 minutes
• If [Na] has declined administer 2-4 ml/kg of 3% saline over 10-20 min. then normal saline @ maintenance IV rate
• Decrease insulin to 0.04-0.05 U/kg/hr = 0.4-0.5 ml/kg/hr of standard solution as above
• Contact Tertiary Pediatric Diabetes Centre
• Admit to ICU

• Improvement
  Clinically well
  Tolerating oral fluids
  Ph >7.3
  HCO3 >18 mmol/L
  Start SC insulin
  Stop IV insulin 1/2 hour after SC dose of Humalog or 1 hour after SC dose of regular insulin
  Determine cause of DKA
  Contact regional pediatric diabetes education centre

OBSERVATION AND MONITORING
- Hourly blood glucose (capillary)
- Aim for a decrease in blood glucose of 5 mmol/L/h
- Hourly documentation of fluids input/output
- Hourly, at least, assessment of neurological status
- 2-4 hours after start of IV — electrolytes, venous gases — then q2-4h
- Follow Effective Osmolality = (2X measured Na + measured blood glucose)
- Avoid a decrease of >2-3 mmol/L/hr in effective osmolality by increasing IV sodium concentration

NEUROLOGICAL DETERIORATION
Headache, irritability, decreased level of consciousness, decreased HR
First rapidly exclude hypoglycemia by capillary blood glucose measurement
THEN
Treat for cerebral edema

• Minimally dehydrated
  Tolerating fluids orally
  Normal bowel sounds

• NS 7 ml/kg over 1st hour
  Then 3.5-5 ml/kg/hr (including insulin infusion below)

• If history of voiding within last hour and [K+] <5.5 mmol/L
• Add 40 meq/L of KCl to IV fluid
• Aim to keep [K+] between 4-5 meq/L
• Continuous insulin infusion 0.1 units/kg/hr = 1 ml/kg/hr (of solution of 25 units of Regular Insulin in 250 cc NS)

• DO NOT GIVE BOLUS OF INSULIN

RESUSITATION
- Airway/NG tube — if otherwise needed
- NS 10 ml/kg over 1/2-1 hour to expand vascular space

• If history of voiding within last hour and [K+] <5.5 mmol/L

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• DO NOT GIVE BOLUS OF INSULIN
**HYPOGLYCEMIA (MODERATE OR SEVERE)**

**HISTORY**
Recent hypoglycemic event requiring treatment by another person with glucagon or oral glucose especially if:
- Confusion
- Consciousness

**CLINICAL SIGNS**
- Seizures
- Hemiparesis
- Any localizing neurological findings
- Altered state of consciousness

Obtain a blood glucose (capillary)
Electrolytes & gases not usually necessary

If child active, alert, and tolerating oral fluids well then encourage glucose containing drinks at least at maintenance fluid rate

**OTHERWISE**
Start IV — at least 5% glucose in saline at maintenance rate, regardless of blood glucose level

If drowsy, and any neurologic impairment, localized or generalized
IV Bolus of 0.25-0.5 grams/kg of 50% glucose (0.5-1.0 ml/kg) OR 25% glucose (1-2 ml/kg)

Continue IV glucose until:
- child has no further neurologic signs **AND**
- is no longer drowsy, confused, irrational or restless
May take up to 12 hours if hypoglycemic encephalopathy is present
Aim to maintain blood glucose above 8 mmol/L
Then change to oral sugar containing fluids

**DISCHARGE ONLY** when child is:
- fully alert
- tolerating oral fluids, and
- free of neurologic signs

**OBSERVATION AND MONITORING**
- Determine cause and arrange for follow-up
- Decrease all insulin doses by 20% for next 24 hours
- Renew prescription for glucagon if used
INTERCURRENT ILLNESS

**Discharge**
- Tolerating oral fluids
- No other reason for hospitalization
- Replace usual meal plan with carbohydrate containing fluids

**Observation and Monitoring**
- Input & Output Q4h
- Blood glucose Q2-4h (keep within 4-10)
- Urine for Ketones

**IV Fluids**
- SeVERELY dehydrated — NS (10 ml/kg) over 1 hour
- If glucose >20 mmol/L then NS at maintenance volumes
- If glucose <20 mmol/L then D5W/NS at maintenance volumes
- Once voiding add KCl

**Hyperglycemic**
- Do not omit insulin
- Use SC insulin unless acidotic (see DKA guidelines)
- If glucose >11 mmol/L and mod-large ketones then give usual insulin plus extra Reg or Humalog q4h [10-20% of TOTAL (N&R or H) daily dose]

**Hypoglycemic**
- Do not omit insulin
- Decrease next scheduled insulin dose by 10-20%
- If not tolerating oral fluids then follow IV as per hypoglycemia guidelines
- Otherwise encourage carbohydrate containing fluids

**Maintenance IV Fluids**
- 4 cc/kg/hr for first 10 kg
- 2 cc/kg/hr for next 10 kg
- 1 cc/kg/hr for next 10 kg