



ThinkAskLearn
Health Professional Education

The Highs and Lows of Diabetic Emergencies The Case of the Dodgy Chicken

David Corkill
Emergency Nurse Educator
MEmergN, MAdvPrac (Hth Prof Edu), BN, Dip App Sc
www.thinkasklearn.com.au



1

The Dodgy Chicken

- Sunday morning at triage
- 6 yr old boy presents with Mum
- Up all night vomiting
- Dad also unwell this morning with vomiting
- Both Dad and Son had 'dodgy takeaway chicken' yesterday for lunch
- Mum did not eat the chicken



2

The Dodgy Chicken

- Good story, doesn't look too unwell
- Mild dehydration
- Rehydrate with oral fluids
- Sit in WR until review
- Finally gets picked up
- Someone does a BSL
- It reads HI HI HI



3

Another case

- 13 year old boy
- Presents with Mum from GP
- Has AXR shows constipation
- Poor diet, little fruit, eats lots of bread
- Given Movicol with effect
- Observed for 6 hours in department
- D/c Home
- Represents 12 hours later shocked flat and in extremis
- BSL and ABG show DKA



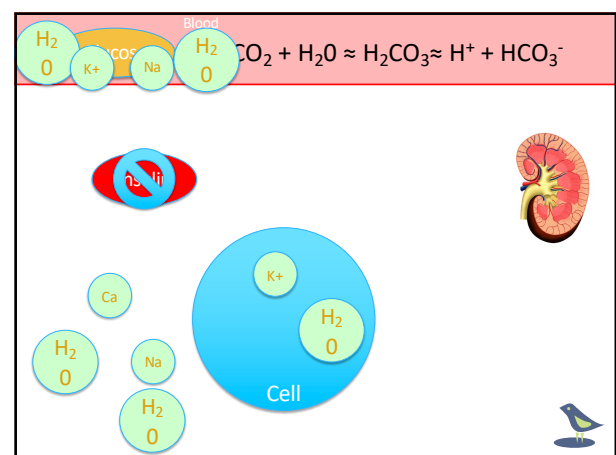
4

Diabetic KetoAcidosis DKA

- Insulin deficiency
- Glucose rises
- Renal System attempts to compensate
- Fails
- Acidosis ensues
 - Oxygen transport and capacity – Hypoxia



5



6

Signs and Symptoms

- Patient is unwell
- BSL >15mmol, often 20+mmol or HiHiHi
- Polyuria
 - Large amount of urine production
- Polydipsia
 - Increased Thirst
- Kussmaul Breathing
 - Deep laboured breathing – Blowing off CO₂



7

Diagnosis

- No definitive criteria for the diagnosis of DKA
- DKA is defined by the triad of:
 - Hyperglycaemia (glucose > 14 mmol/L)
 - Ketosis (usually determined on urinalysis)
 - Acidosis (pH < 7.35; low HCO₃: high anion gap)
- (Hence the name, diabetic-keto-acidosis!)



8

In Hospital Treatment

- Undertake Blood Gas!
- Find source
 - Infection, Non compliance, other
- Fluid replacement
- Give insulin
- Replace electrolytes
- Admit to hospital - usually ICU
- Follow Protocol ?which one



9

Queensland Government
Management of diabetic ketoacidosis in adults (age 16 years and over)

This clinical protocol is a general guide and does not replace clinical judgement. Care should be individualised to meet the specific needs of each patient. Medical officer to tick each step as it is initiated.

(After identification label here)

UIN: _____
Family name: _____
Given name(s): _____
Address: _____
Date of birth: _____ Sex: ☐ M ☐ F ☐ I

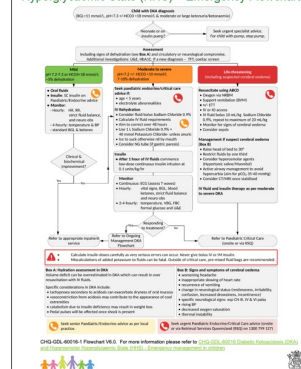
Facility: _____ Date: ____/____/____ Time commenced: ____:____:____ hrs Initiating MO: _____ Initiating MO to print patient name: _____

| Immediate management - hour 1 | Ongoing management - hour 2-4 | Subsequent management - hour 5+ | Discharge planning |
|--|---|---|---|
| Step 1 - Initial investigation <input type="checkbox"/> Full blood count <input type="checkbox"/> U&Es, LFT, BSL, venous blood gas (VBG) <input type="checkbox"/> Finger prick ketones at stage and end of hour 1 <input type="checkbox"/> Blood cultures Step 2 - Fluid replacement (canula 1) <input type="checkbox"/> 10-15% sodium chloride 1000ml/hr. Repeat if systolic BP < 100 Step 3 - Start IV insulin (canula 2) <input type="checkbox"/> F < 5.5mmol/L, continue insulin infusion intravenously at 0.1 units/kg/hr (insulin starting dose 10 units/hr) <input type="checkbox"/> F < 3.5mmol/L, replace K ⁺ (canula 3), recheck levels and continue insulin infusion once K ⁺ > 3.5mmol/L Step 4 - Other actions <input type="checkbox"/> Prescribe/monitor patient's usual long acting insulin <input type="checkbox"/> Check pH/CO ₂ and lactate enzymes if indicated <input type="checkbox"/> Investigate acute onset and treat infection appropriately if present <input type="checkbox"/> Fluid balance chart and neurological observations <input type="checkbox"/> If patient is using a continuous subcutaneous insulin infusion (CSII) pump - remove it <input type="checkbox"/> Consider whether cardiac monitoring is required <input type="checkbox"/> IVT prophylaxis <input type="checkbox"/> Prescribe electrolytes DKA or BSL <input type="checkbox"/> If not enough, start 10% glucose at 100 ml/hr Step 5 - Control according to protocol <input type="checkbox"/> Control consultant Time Accepting consultant Dr: _____ | Step 1 - Further investigations <input type="checkbox"/> Hourly BSL <input type="checkbox"/> U&Es & VBGs at end of hour 2 and hour 4 <input type="checkbox"/> Finger prick ketones at end of hour 2 <input type="checkbox"/> Blood cultures <input type="checkbox"/> CXR <input type="checkbox"/> ECG <input type="checkbox"/> CT head and then LP if indicated Step 2 - Fluid replacement (canula 1) <input type="checkbox"/> Continue 10-15% sodium chloride at 1000ml/hr until patient is fluid replete or euvolaemic Step 3 - Insulin replacement (canula 2) <input type="checkbox"/> Continue 0.1% sodium chloride infusion at 1000ml/hr until patient is fluid replete or euvolaemic <input type="checkbox"/> Continue K ⁺ replacement to maintain within reference range and continue to monitor K ⁺ as above with U&Es and VBGs Step 4 - Continuation of IV insulin (canula 3) <input type="checkbox"/> Continue insulin at variable rate to maintain BSL < 5.5mmol/L. Be aware that the rate will need to be decreased at the point to maintain BSL < 5.5mmol/L <input type="checkbox"/> Allow oral intake if no clinical evidence of fluid, bowel obstruction or acute abdomen. If eating but still requiring IV insulin, consider giving appropriate doses of short-acting subcutaneous insulin Step 5 - Transition to subcutaneous insulin <input type="checkbox"/> The patient is ready to transition to the regular insulin regimen when the following criteria are met: - Patient eat and swallowing - Serum pH is normal - Serum K ⁺ < 4.5mmol/L - Long acting insulin has been given for at least 2 hours (NPH or peak recommended if relevant) - Insulin mid point/previous acetone if above criteria are met and there is hypoglycaemia. IV insulin and glucose can now be ceased and normal subcutaneous dosing can be continued. | Step 1 - Further investigations <input type="checkbox"/> Hourly BSL, and IV insulin infusion ceased <input type="checkbox"/> U&Es & VBGs every 12 hours as required <input type="checkbox"/> Finger prick ketones at end of hour 4 <input type="checkbox"/> Blood cultures Step 2 - Fluid replacement (canula 1) <input type="checkbox"/> Continue 0.1% sodium chloride infusion at 1000ml/hr until patient is fluid replete or euvolaemic Step 3 - Insulin replacement (canula 2) <input type="checkbox"/> Continue K ⁺ replacement to maintain within reference range and continue to monitor K ⁺ as above with U&Es and VBGs Step 4 - Continuation of IV insulin (canula 3) <input type="checkbox"/> Continue insulin at variable rate to maintain BSL < 5.5mmol/L. Be aware that the rate will need to be decreased at the point to maintain BSL < 5.5mmol/L <input type="checkbox"/> Allow oral intake if no clinical evidence of fluid, bowel obstruction or acute abdomen. If eating but still requiring IV insulin, consider giving appropriate doses of short-acting subcutaneous insulin Step 5 - Transition to subcutaneous insulin <input type="checkbox"/> The patient is ready to transition to the regular insulin regimen when the following criteria are met: - Patient eat and swallowing - Serum pH is normal - Serum K ⁺ < 4.5mmol/L - Long acting insulin has been given for at least 2 hours (NPH or peak recommended if relevant) - Insulin mid point/previous acetone if above criteria are met and there is hypoglycaemia. IV insulin and glucose can now be ceased and normal subcutaneous dosing can be continued. | Step 1 - Refer for specialist review before discharge <input type="checkbox"/> Refer to specialist to determine cause of DKA episode <input type="checkbox"/> Need for diabetes education and review of knowledge and understanding of condition Step 2 - Discharge preparation <input type="checkbox"/> Patient not to be discharged until: - Metabolic, clinical, and anion gap normal - Eating normally and established on routine insulin regimen - Given written advice about sick day management Step 3 - Follow up <input type="checkbox"/> Arrange appropriate follow up contact with diabetes educator and dietitian within one week of discharge <input type="checkbox"/> Consider the need for a referral to the mental health team. From the one DKA admission in 12 months <input type="checkbox"/> Ensure patient has a formal clinic appointment <input type="checkbox"/> Ensure that a copy of patient discharge letter is sent to patient's GP and diabetes care team Refer to supplementary notes for further information |

DEPARTMENT OF HEALTH AND COMMUNITY SERVICES
QUEENSLAND GOVERNMENT

10

Diabetic Ketoacidosis (DKA) and Hyperosmolar Hyperglycaemic State (HHS) – Emergency Flowchart



11

Fluid Replacement

- 20ml/kg N/S appropriate for Shocked Adults
- 10-20ml/kg N/S over 1-2 hrs for shocked Kids then reassess level of dehydration
- 0.45% N/S – no evidence for use
 - Some protocols still recommend
- Switch to 5%/10% Dextrose once BSL < 14mmol



12

Potassium

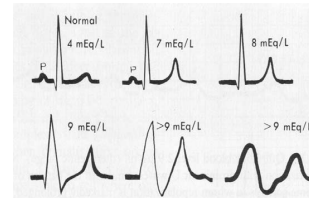
- High and Low at same time
- Serum Hyperkalaemia whilst Total Body Deficit
- Serum K^+ will fall with fluid resus, insulin and correction of acidosis
- As glucose is driven into cells, K^+ follows
- Many Protocols, Many options



13

Hyperkalaemia

- Withhold KCl if patient is anuric, $[K^+] > 6.0$, or ECG changes of peaked T waves or broad QRS



14

Insulin Regime

- Always start fluids before starting insulin
- Fluids will decrease BSL
- Insulin causes fluid movement: Risk of Hypokalaemia
- Never start insulin if $K^+ < 3.0$ mmol
- Kids
 - 0.1u/kg/hr until BSL < 14 mmol 1 hour after fluids
- **Check your local policy**



15

Key Points with Insulin

- Insulin **should always be double checked**
 - Serious errors have occurred
- **NO** rush to commence insulin in kids
 - planned to commence after 1 hour of initial fluids
- A syringe pump **must always** be used
- **Clearly labeled "INSULIN"**
- Run as a sideline to the rehydrating fluid



16

What about cerebral oedema?

- Rare-ish
- Kids and adolescents are at greatest risk
- 0.7%-3% of kids with DKA
- Morbidity – 21%-35%
- Mortality – 21%-24%
- Bolus of insulin before fluid replacement
 - (now recommended start 1-2 hours after fluids)
- Rapid fluid replacement
 - (10-20ml/kg over 1-2 hrs now recommended)



17

Management of Cerebral Oedema

- Presents with headache, decreased ALOC
- Nurse all kids with DKA at 30°
- IV Mannitol infusion/3% hypertonic saline
- ABCD – Airway protection
- CT Head
 - Maybe precipitating event
- Refer to ICU



18

The Opposite Way

- Hypoglycaemia
- Usually too much insulin or lack of food or misadventure with insulin!!
- Hard to die from Hypoglycaemia – Sort of....
- Common yearly in diabetics (27%)
- Defined as BSL <4mmol/l but S+S common under 2.6mmol/l



19

Signs and Symptoms

- Maybe minimal to extreme
- Paleness
- Shakiness
- Headache
- Sweating
- Feeling hungry
- Dizziness
- heart pounding
- Irritability, change in mood
- Lack of concentration
- Confusion
- Vagueness
- Crying
- Weakness



20

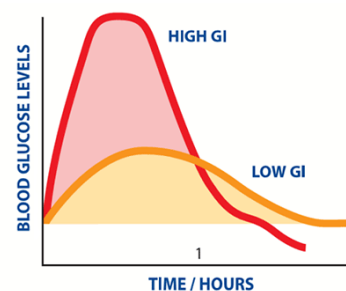
Treatment options

- ABCD approach
- Treat if BSL is less than 4mmol/l
- Give some high GI carbohydrate (sugar) to raise the blood glucose quickly
 - Jelly babies
 - Simple sugars
 - Lemonade
- Overtreatment is a problem



21

What sugar to give



22

Treatment options

- After allowing for sugars to be absorbed, provide further glucose
 - Banana/Apple
 - Sandwich
 - Biscuits/Crackers
 - Milk



23

Unconscious Hypoglycaemia

- ABCD approach
- Call for help – trip to ED
- Airway supportive maneuvers
- Oxygen
- Check BSL (look for other causes)
- Provide IV glucose (2ml/kg of 10%D) or IM glucagon (prehospital)



24

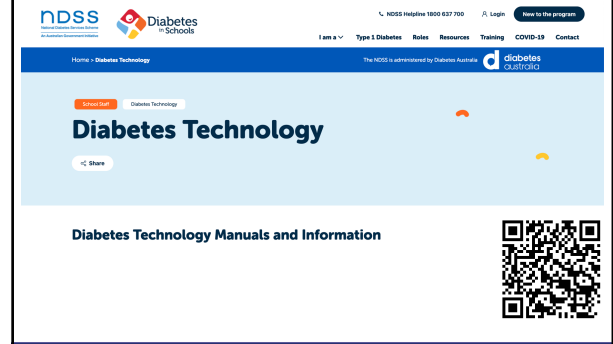
Caution with Discharge

- Observe for 2-4 hours
- Find the cause
- Admit to hospital all unknown causes of hypoglycaemia



25

Insulin Pumps and more...



26

Conclusion

- BSL is a simple test that should be done often
- DKA is life threatening
 - Replace Fluids
 - Give some insulin later
 - Replace potassium losses
 - Refer to ICU early
- Hypoglycaemia is more common than you think



27