

CP3 lecture: Management of Diabetes and its complications (part 2)



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ACUTE COMPLICATIONS

Diabetes Emergencies



Diabetic ketoacidosis



Diabetic Ketoacidosis (DKA)

- * Life threatening diabetes emergency
- * Usually T1DM (new or existing diagnosis)
- * Significant mortality (historically 7.96%, recent data 0.67%)
- * Causes of death- cerebral oedema (paediatric, young adults), hypokalaemia, ARDS, co-morbid conditions
- * Mortality increases with age

DKA pathogenesis

Progressive metabolic disturbance due to

- Insufficient insulin
- Contributory effects of counter-regulatory hormones



DKA Precipitants

- * New diagnosis
- * Non compliance
- * Inter current illness
- * Insulin/equipment issues



Clinical features

- * Osmotic symptoms
- * Weight loss
- * Breathlessness – Kussmaul resps
- * Abdo pain – children in particular
- * Leg cramps
- * Nausea and vomiting
- * Confusion
- * Drowsiness



Diagnosis of DKA

DIAGNOSIS

All three required

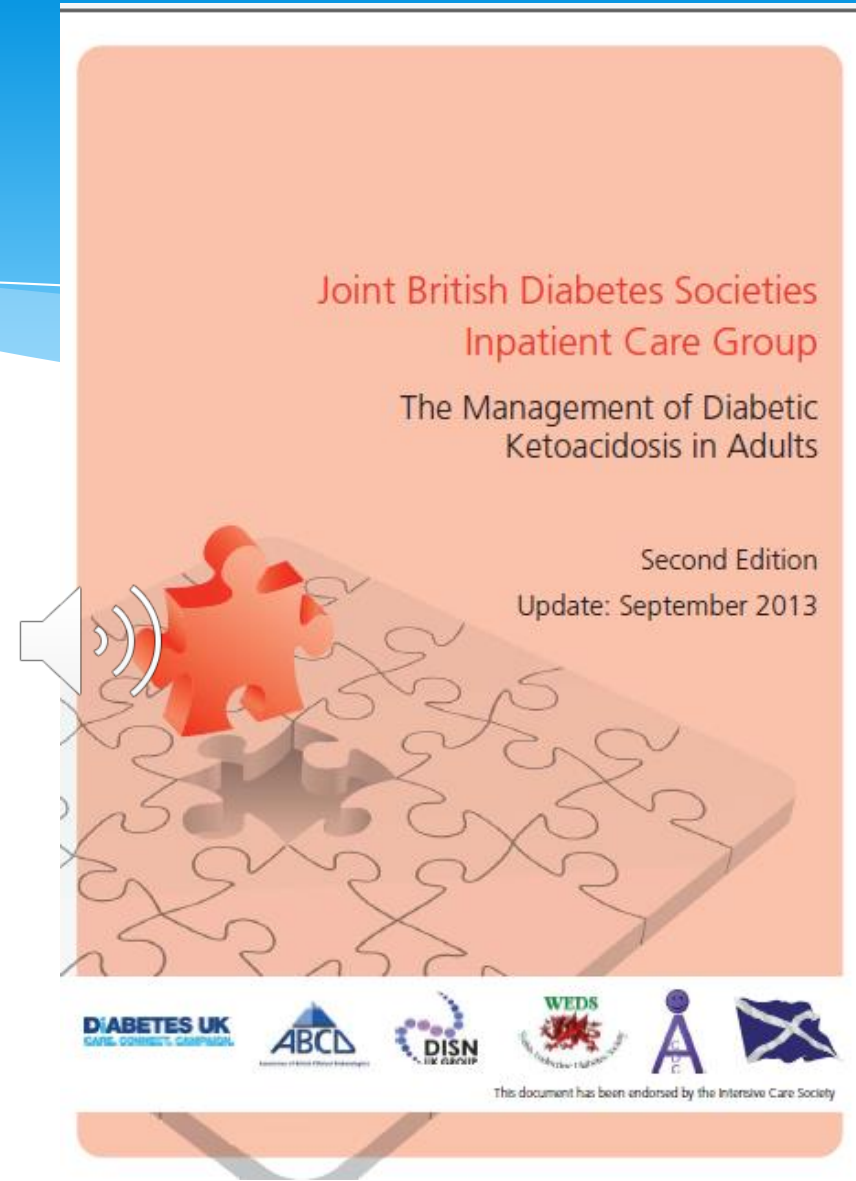
1. Raised blood glucose $>11\text{mmol/L}$ or known diabetes
2. Capillary ketones $> 3\text{mmol/L}$ (or Ketones $>2+$ in urine)
3. Venous pH < 7.3 or venous bicarb $< 15\text{mmol/L}$

Ketone meters for bedside ketone testing.



Management

- * IV insulin – fixed rate 0.1 unit/kg/hour
- * IV fluid replacement
- * IV electrolyte replacement (potassium)
- * Careful monitoring
- * Specialist team input



https://abcd.care/sites/abcd.care/files/resources/2013_09_JBDS_IP_DKA_Adults_Revised.pdf

HYPEROSMOLAR HYPERGLYCAEMIC STATE (HHS)



Definition and diagnosis

Progressive metabolic disturbance:



*Characteristic features of a person
with HHS:*

Hypovolaemia


+

Marked hyperglycaemia (>30 mmol/L)
without significant hyperketonaemia (<3.0
mmol/L) or acidosis (pH>7.3, bicarbonate
>15 mmol/L)

+

Osmolality >320 mosmol/kg

HHS

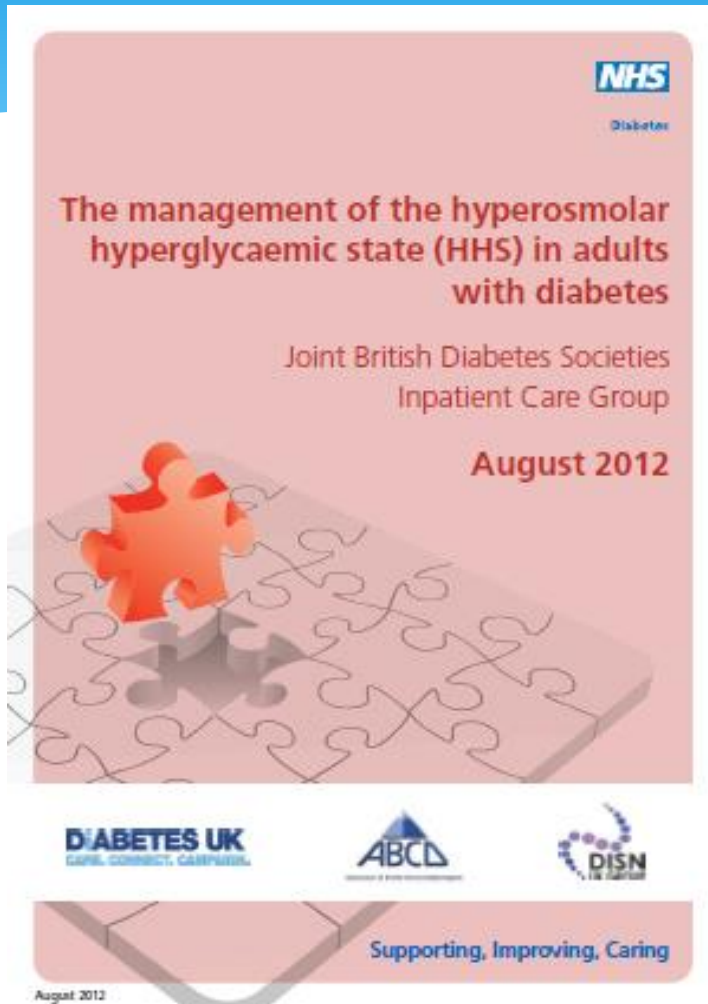
- * Typically elderly
- * Seen increasingly in younger adults and teenagers
- * 3-14 day history of osmotic symptoms
- * Symptoms/signs of intercurrent infection 
- * Severe dehydration (25% ↓ in ICF & ECF)
- * CNS presentation common
 - * Seizures, Aphasia, Hemianopia, Unilateral hyperreflexia, Extensor babinski, Myoclonic jerks, Nystagmus
- * Conscious level correlates with osmolality
 - * $2(\text{Na}) + \text{glucose} + \text{urea}$
 - * $> 340 \text{ mOsm/kg}$ associated with impairment of consciousness

HHS Mortality

- * Higher mortality than DKA
- * Vascular complications
 - * MI
 - * CVA
 - * Arterial thrombosis
- * Other complications
 - * Seizures
 - * Cerebral oedema
 - * Osmotic demyelination
- * At risk of foot complications



Management of HHS

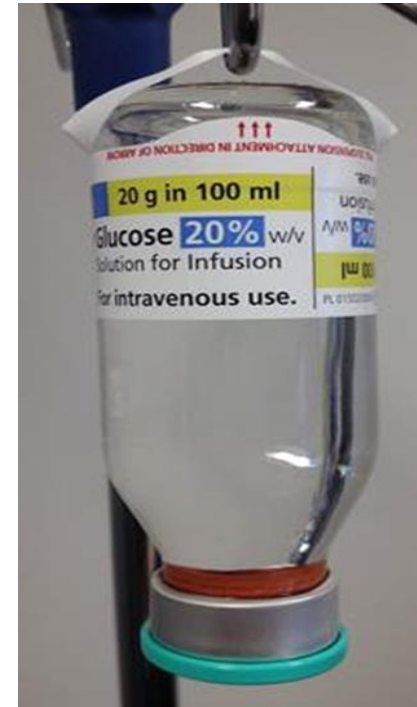
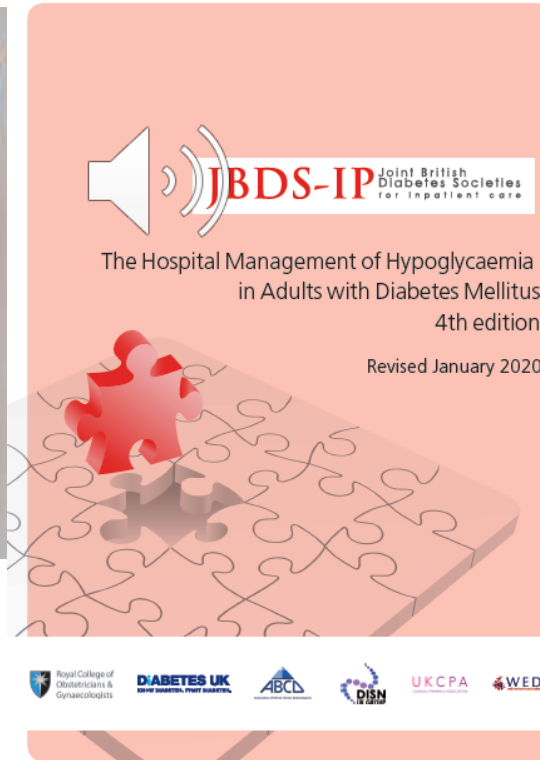


General principles

- *  fluid replacement
- * IV electrolyte replacement
- * IV insulin
- * Prophylactic LMWH
- * Careful monitoring/level 2 care

https://abcd.care/sites/abcd.care/files/resources/JBDS_IP_HHS_Adults.pdf

HYPOGLYCAEMIA



Hypoglycaemia

- * Commonest side effect of Insulin and sulphonylurea therapy
- * Imbalance between glucose supply, utilisation and current insulin levels
- * Exclude in any person with diabetes who is:
 - * Acutely unwell
 - * Drowsy
 - * Agitated
 - * Unconscious
 - * Fitting/Seizures

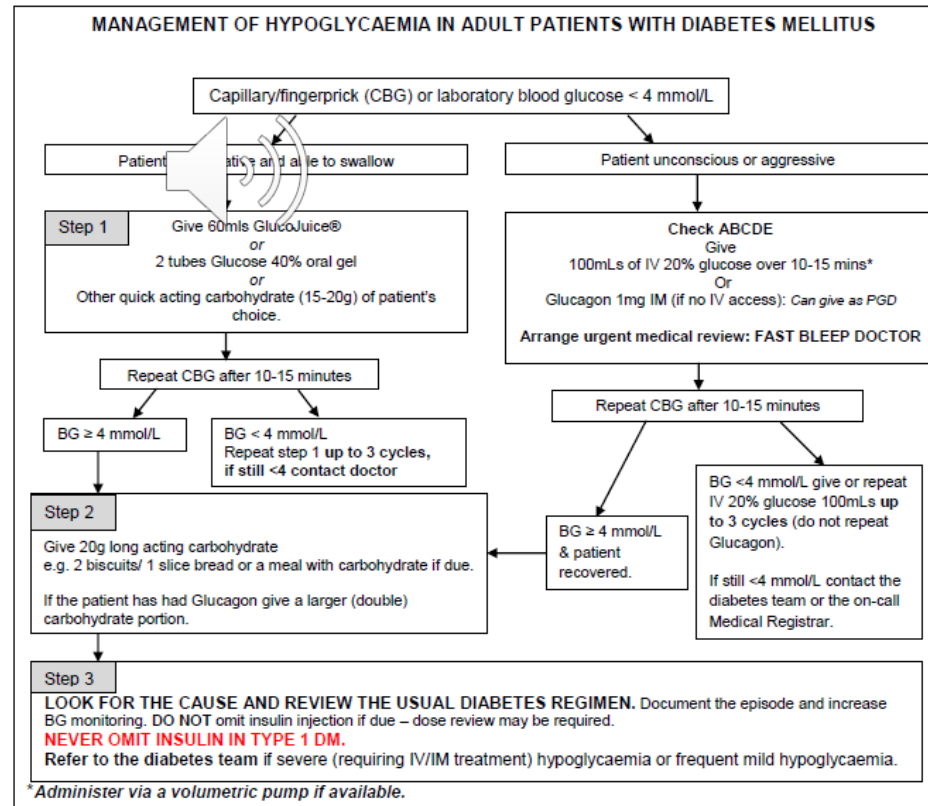
Causes hypoglycaemia in hospital

- * Missed meals
- * Reduced appetite
- * Nil by mouth
- * AKI
- * Prescription errors:
doses, timing, type of insulin



Name	Dose					
NOVOMIX 30	300	6				
Additional Information	Route	8				
FLEX PEN	S/C	12				
Signature	Date	14				
J Bloggs	1/01/11	18				
Name and contact		22				
J BLOGGS 1234						fastbleep))

NUH Hypoglycaemia flow chart



Patient co-operative and able to swallow

- * Give 15-20g quick acting carbs
 - * 60mls/ 1 bottle Glucojuice/LIFT
 - * 2 tubes glucose gel
 - * Patient's usual hypo treatment



Repeat CBG after 10-15 minutes. Treatment can be repeated up to 3 times.



- * Once glucose > 4.0, give long-acting Carbs

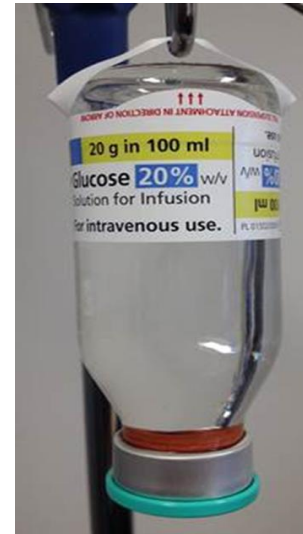


Patient unconscious/aggressive/un-cooperative: Treatment options

- * Glucagon 1mg IM
 - * Takes ~ 15 min to act
 - * Less effective in;
 - * malnourished
 - * those with prolonged starvation
 - * severe liver disease



- * 100mls 20% glucose over 15 minutes IV




Treatment can be repeated up to 3 times



* Once glucose > 4.0, give long-acting Carbs



When hypoglycaemia is successfully treated

- * Identify risk factors or cause of hypo : Not eating, wrong dose, wrong medication, prescription errors, renal dysfunction 
- * Take measures to avoid in future
- * Do not omit insulin : Review dose, reduce insulin dose by 10-20%

CHRONIC COMPLICATIONS



Chronic complications

Microvascular

- * Retinopathy
 - * Background
 - * Pre-proliferative
 - * Proliferative
 - * Maculopathy
- * Nephropathy
- * Neuropathy
 - * Peripheral
 - * Autonomic
 - * Other

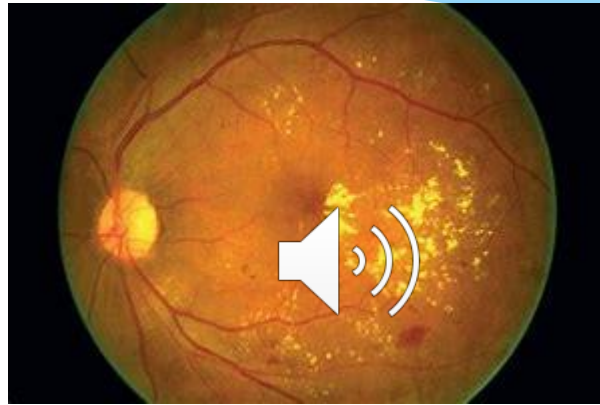
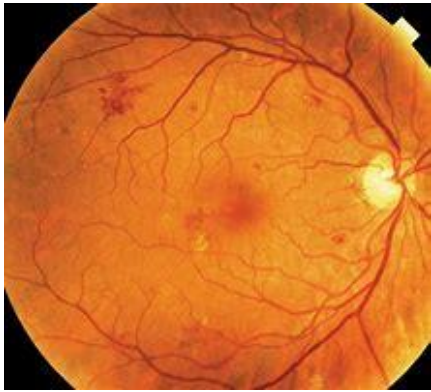
Foot Disease

Macrovascular



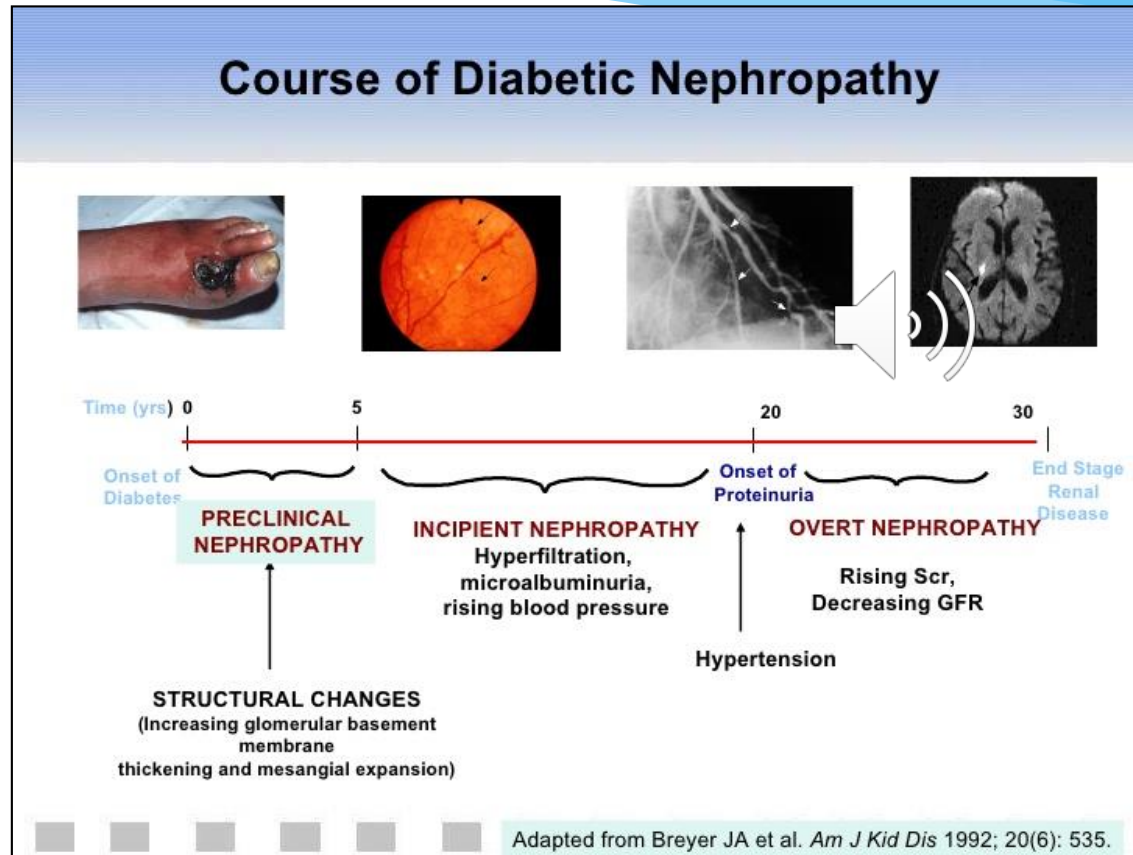
- * Cerebrovascular disease-
 - * CVA
 - * TIA
 - * Cognitive impairment/vascular dementia
- * Ischaemic heart disease, hypertension
- * Peripheral vascular disease

Retinopathy



Diabetes is responsible for 5% of all UK sight loss. Leading cause of preventable sight loss in the UK

Nephropathy



Management

- * ACR screening for early detection
- * BP control
- * Glycaemic control
- * ACE inhibitors/ARBs
- * (SGLT-2 inhibitors)
- * Early referral into renal services
- * Dialysis/transplant for ESRF

- * In UK 5 those with diabetes are 5x more likely to need dialysis or transplant.
- * 1/3 individuals needing dialysis or transplant have DM

Neuropathy

- * **Peripheral neuropathy**

- * Classic glove and stocking distribution
- * Often painful – NICE guidance for treatment
- * Neuropathic foot ulceration/Charcot joints

- * **Others**

- * Mononeuropathy e.g III or VI nerve palsies
- * Radiculopathy
- * Diabetic amyotrophy

- * **Autonomic neuropathy**

- * Postural hypotension
- * Tachycardia
- * Bowel and bladder dysfunction
- * Gastroparesis
- * Erectile dysfunction
- * Sweating- gustatory, anhidrosis





Macrovascular complications

Heart attacks, stroke and cardiovascular disease

Infographics available

1 Compared to people without diabetes, people with diabetes are



nearly 2.5 times more likely to have a heart attack



more than 2.5 times more likely to experience heart failure



2 times more likely to have a stroke.



Heart attacks, stroke and cardiovascular disease

Infographics available

2 Compared to people without diabetes, people with Type 1 diabetes are



More than 4 times as likely to have a heart attack



4.5 times more likely to experience heart failure



3.5 times more likely to have a stroke.

3 Every year diabetes causes more than



27,000 heart attacks and almost 100,000 cases of heart failure



35,600 strokes.

Foot disease

- * Vascular, neuropathic or mixed aetiology ulcers




Amputations

Infographics available

- 1 Diabetes leads to more than **8,500** leg, toe, or foot amputations every year.

That's more than **160** a week.

- 2  Someone with diabetes is **20 times more likely** to experience an amputation than someone without diabetes.



Amputations

Infographics available

- 3 **Around half** of all people who experience a major amputation will die within two years.

- 4 **More than four in 10** people who have a foot ulcer will die within five years.

- 5 Studies suggest that between **70,000 and 90,000** people with diabetes have a foot ulcer in any given week.

6

Diabetes causes:



2018

8,793

amputations **per year**



169

amputations **per week**



24

amputations **per day**



1

amputation **per hour.**



Time for a break