

Diabetes Mellitus

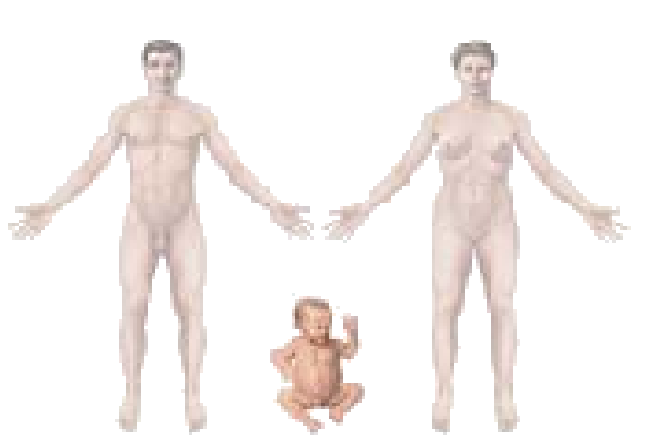
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Learning outcomes

- To be to understand what is diabetes/main types and other types of diabetes.
- To have a clear understanding of management/treatment of Type 1 and Type 2 diabetes.
- To understand the causes/risk factors/symptoms of diabetes.
- To be aware of different treatment use in the management of diabetes e.g. tablets/insulin/SGLT- 2/GLP-1.
- To develop an understanding on the correct procedure for insulin administration and techniques.
- To be able to have a clear understanding on the treatment and management of both hypoglycaemia & hyperglycaemia.
- To be aware of the risk of long term complications of diabetes.
- Discussion of case study and evaluation.

Main types of diabetes



Type 1 diabetes

Pancreas makes no insulin.
Treated with Insulin
injections.



Type 2 diabetes

Pancreas makes some insulin
and/or pancreas is unable to use
insulin properly.

Treated with diet, physical
exercise, weight loss, tablets and
or insulin.

Types 1 Diabetes Mellitus

- Type 1 diabetes mellitus
- 10% - 15% of diabetics
- Onset- young and sudden
- Total destruction of pancreas- autoimmune
- BMI- low to normal.
- Ethnicity- commonly white
- Treatment- always insulin.
- If BG>13, ketones in urine- if +, Ward Doctor to review and if $\geq 2+$ to refer to A&E.

Management of Type 1 DM

- Check whether patient using a Libre 2 sensor, if not
- Check capillary blood glucose four times a day before each meal, administration on insulin injection and before bed.
- If patient is not eating and drinking well, may need to check BG two hours after main meal and monitor his/her food/fluid intake on a chart
- Refer to a Dietitian if appropriate
- Omit/Delay rapid acting insulin if BG < 4.0 mmols/l and contact Ward Doctor/Diabetes Specialist Nurse
- Monitor for signs and symptoms of hypoglycaemia



Cont..

- Check blood ketone if blood glucose is greater or equal to 13.0 mmols/l, and refer to blood ketone guide.
- Monitor for signs and symptoms of DKA
- keep a small glass of juice in patient room and some Carbohydrate food at night just in case the patient feels unwell with a low blood sugar and unable to call for assistance

Type 2 Diabetes

- Type 2 diabetes mellitus
- 85% of all cases
- Develops when insulin- producing cells can't produce enough insulin or the insulin produce does not work properly – called insulin resistance
- Insulin resistance leads to high BG levels – can cause serious health problems
- Hyperosmolar Hyperglycaemia State (HHS) - BM>35 - 40mmol/l but normally indicate HI.. Hi.. on BG meter
- Onset- used to be 40 years old but younger age these days
- BMI- 25 +
- Ethnicity- 5x in South Asian and Afro-Caribbean, Black African
- Treatment-lifestyle, oral meds, injectables.

Management of Type 2 DM

- Check blood glucose as recommended by DSN/Ward Doctor e.g. before each meal/Two hours after and before administration of insulin injection
- Give medication as prescribed
- Omit/Delay rapid acting insulin if BG < 4.0 mmols/l and contact Ward Doctor/Diabetes Specialist Nurse
- Monitor for signs and symptoms of hypoglycaemia
- Check blood ketone if blood glucose is greater or equal to 17.0 mmols/l and inform ward Doctor/DSN
- Monitor for signs and symptoms of hyperglycaemia/HSS (Hyperosmolar Hyperglycaemic State)
- Monitor diet/fluid intake as per recommendation

Causes/risk factors of Diabetes

- Combination of lifestyle and genes that put people at risks of getting Type 2 diabetes
- **Age:** If 40 - or over 25 if you're African- Caribbean, Black African or South Asian
- **Weight:** If overweight/obese – particularly around the belly
- **Ethnicity:** If Black African, African-Caribbean, South Asian or Chinese
- **Family link:** If your parent, brother or sister with diabetes
- **People suffering from Mental illness**

Causes cont...

- Overweight, with a large waist size (over 80cm (31.5 inches) for women, 94cm (37 inches) for men, or 89cm (35 inches) for South Asian men)
- You're a woman with polycystic ovary syndrome and overweight
- If you're a woman and you've had gestational diabetes or given birth to a baby over 10 pounds

Previous Medical History:

- Has a history of high blood pressure
- Heart attack or strokes
- Gestational diabetes
- Mental illness

Symptoms of Diabetes

- Going to the toilet more often, especially at night
- Feeling more tired
- Feeling extremely thirsty
- Genital itching or thrush
- Blurred vision
- Loosing weight without trying
- Cuts and wounds taking longer to heal

Treatment

There are 3 main treatments

- Healthy eating, being physically active and keeping to a healthy weight
- Medication – tablets and insulin injections
- Weight loss surgery (bariatric surgery)

Medication/tablet

- Biguanides e.g. Metformin, Metformin SR
 - Sulphonylureas e.g. Gliclazide, Repaglinide
 - Thiazolidinedione's e.g. Pioglitazone
 - DPP-4 inhibitors e.g. Sitagliptin, Linagliptin etc.
 - SGLT-2 inhibitors e.g. Dapagliflozin, Canagliflozin, Empagliflozin etc.
-
- Incretin mimetics (GLP-1 analogues) inj – e.g. Liraglutide, Dulaglutide, Semaglutide etc. (injection only)

Biguanides

Metformin/Glucophage/Glucophage SR

- More effective in obese people and insulin resistance – diabetes
- Increases uptake of glucose into muscle cells more effectively.
- Helps to stop the liver produce glucose
- Does not encourage weight gain
- Can reduce the risk of cardiovascular complications like heart attacks
- No risk of hypoglycaemia in general but can happen rarely.

Side effects:

Can cause G.I. symptoms

Contra-indications:

NICE- stop Metformin if $eGFR < 30$

Do not start Metformin if $eGFR$ is between 30 - 45

Sulphonylureas

Gliclazide /Gliclazide MR tab

- Not recommended for people who are overweight or obese, as their mode of action (increase in insulin production and secretion) means that weight gain can be a relatively common side effects.

Main side effects:

- Can cause hypoglycaemia, weight gain, diarrhoea, abdominal pain

Contradictions:

Renal Impairment, warfarin

DPP- 4 Inhibitors or Gliptins

(Sitagliptin, Linagliptin, Saxagliptin, Vildagliptin)

- Used in Type 2 DM

- DPP- 4s help the pancreas to produce more insulin in response to an increase in BG and decrease glucagon output from the alpha- cells of the pancreas, resulting in decrease hepatic glucose output. It also reduce the amount of glucose being produced by the liver when it is not needed.

- DPP- 4s appear to yield benefits beyond improved glucose control – incl. lowering of postprandial glucose, without hypoglycaemia and weight gain.

- The mechanism of DPP-4 inhibitors is to increase incretin levels (GLP-1), which inhibit glucagon release, which in turn increases insulin secretion, decreases gastric emptying, and decreases BG levels.

DPP-4 Continu

Side effects:

Gastrointestinal problems:

Nausea, diarrhoea and stomach pain

Flu-like symptoms:

Headache, runny nose, sore throat

Skin reactions:

Painful skin followed by a red or purple rash

Contradictions:

Pancreatitis - severe pain in upper abdomen +/- nausea/vomiting: medical emergency

Hepatic impairment

moderate-to-severe heart failure.

SGLT- 2 (Sodium glucose Like co-transporter 2) inhibitors

Most common tablets:

Dapagliflozin, Canagliflozin and Empagliflozin

- used in Type 2 diabetes only
- Blocks the reabsorption of glucose from the nephrons
- Increase glucose excretion by kidneys so that it passes out in the urine , thus lowers blood glucose.



Side effects

Some common side effects:

Increase urination (polyuria)

Vaginal and Urinary tract infections (thrush)

Greater risk of infection in females

Men who are uncircumcised

- Can be used alone, with Metformin, Sulfonylureas, pioglitazone and insulin.

Contradictions:

Not use in Type 1 diabetes

Severe Renal impairment, Patients receiving dialysis, Pregnancy etc.

GLP-1 receptor agonist

- Increase insulin secretion from pancreatic beta cells, suppress glucagon secretion, delay gastric emptying, reduce hunger

Main Side effects:

- Nausea, vomiting, diarrhoea, headache, weakness, tiredness, gastrointestinal discomfort; gastrointestinal upset

Contradictions:

- Severe gastrointestinal disease e.g. if diabetic gastroparesis or inflammatory bowel disease

Renal impairment

Pancreatitis acute, pancreatic tumours etc.



Insulin therapy

Intermediate/Long acting

e.g. Insulin Glargine (Lantus) – 100 u/ml, 300 u/ml, Humulin I, Determir/Levemir,

Mix Insulin

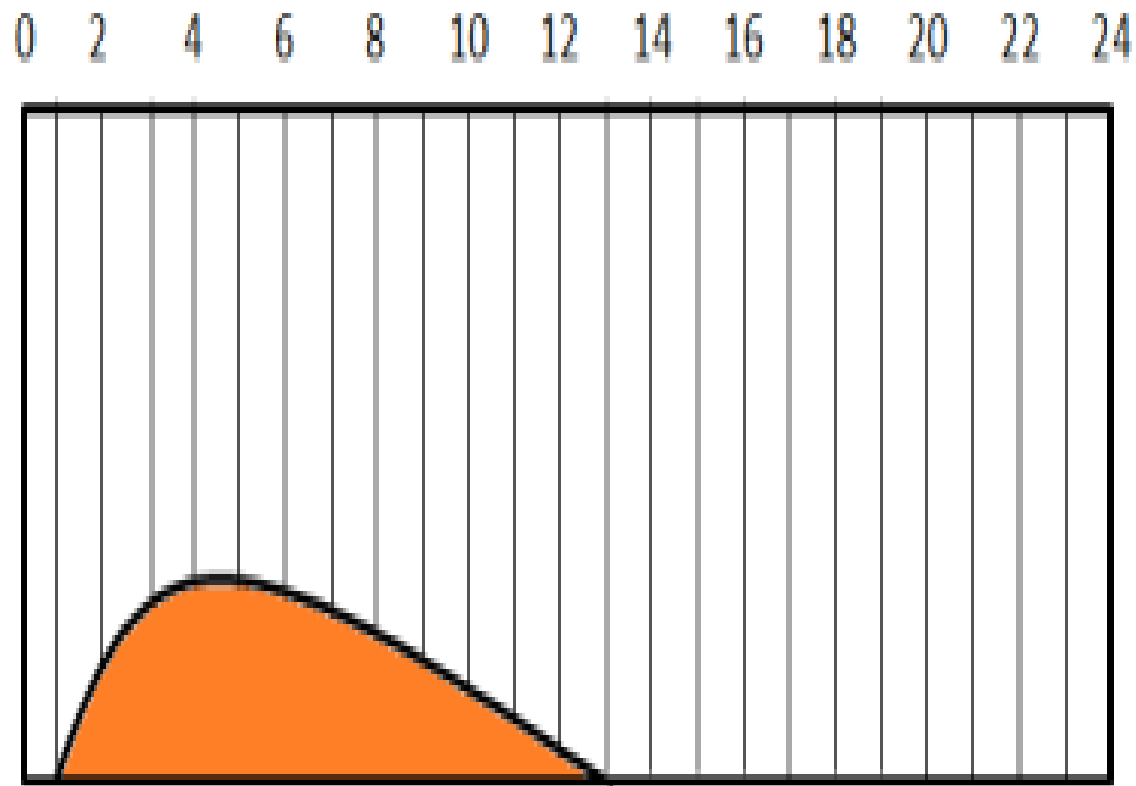
e.g. NoVoMix 30, Humulin M3, Humalog Mix 50 etc.

Rapid acting insulin

e.g. Novorapid, Humalog etc

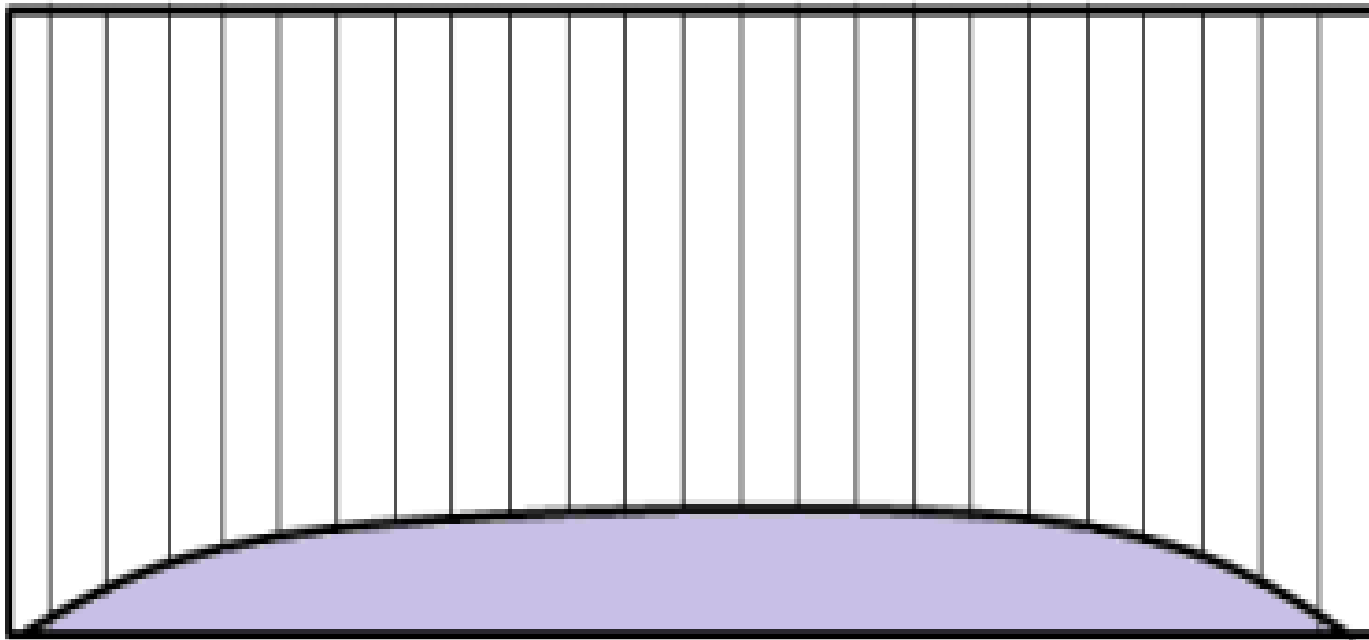


Humulin I Kwikpen



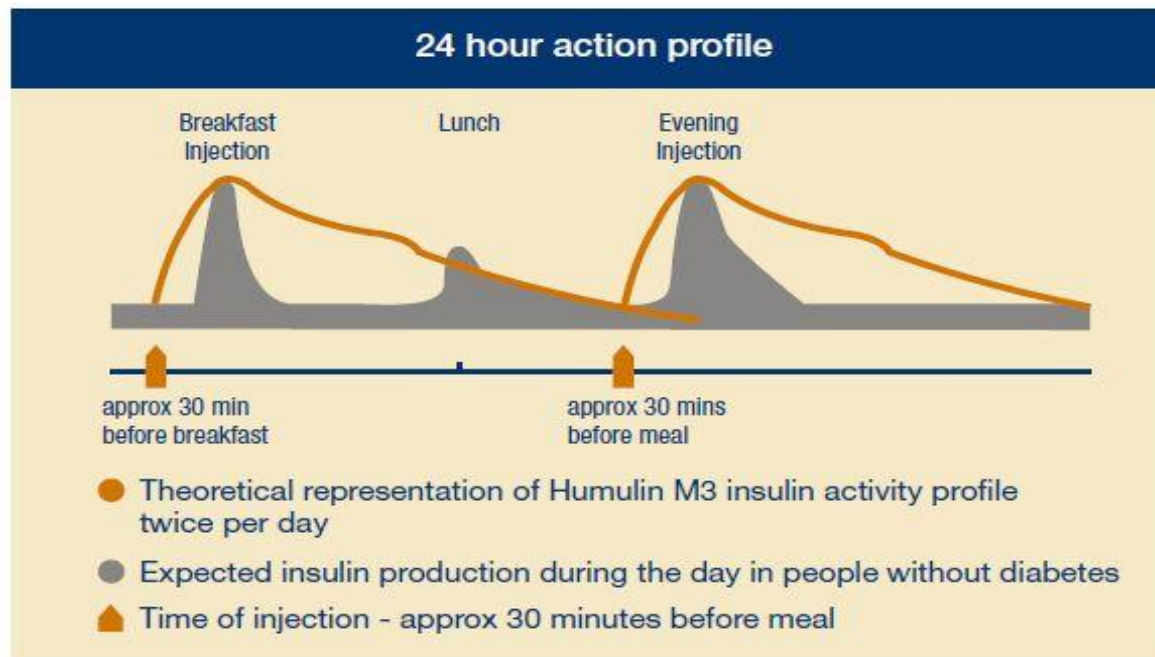
Insulin Glargine/Lantus Solo star

0 2 4 6 8 10 12 14 16 18 20 22 24

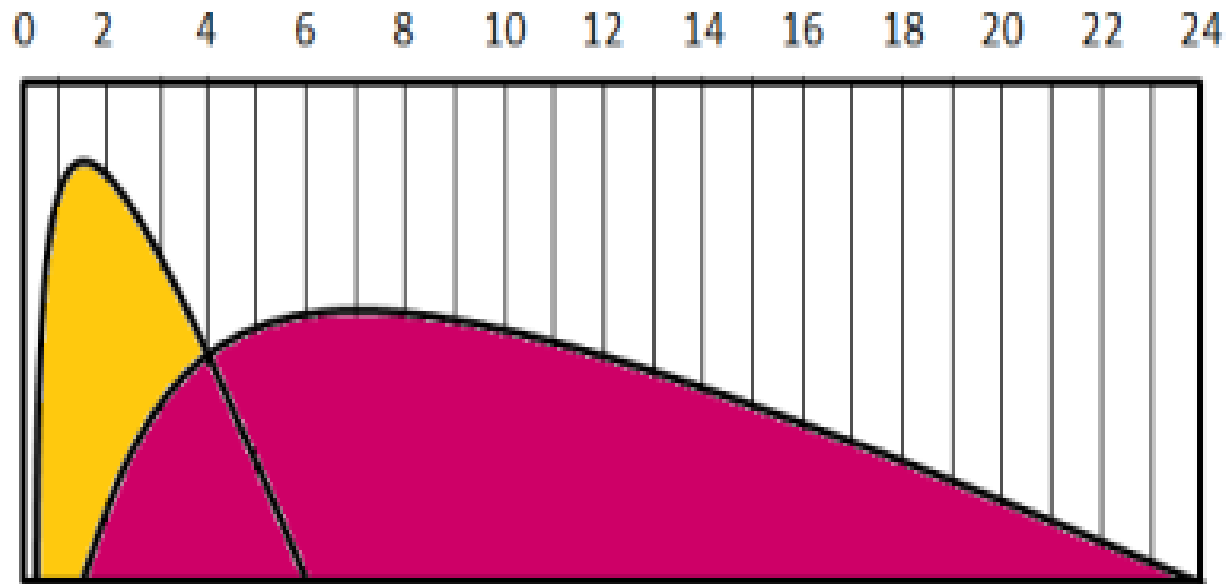


Humulin M3 Kwikpen

This is how the Humulin M3 works over a 24 hour period.

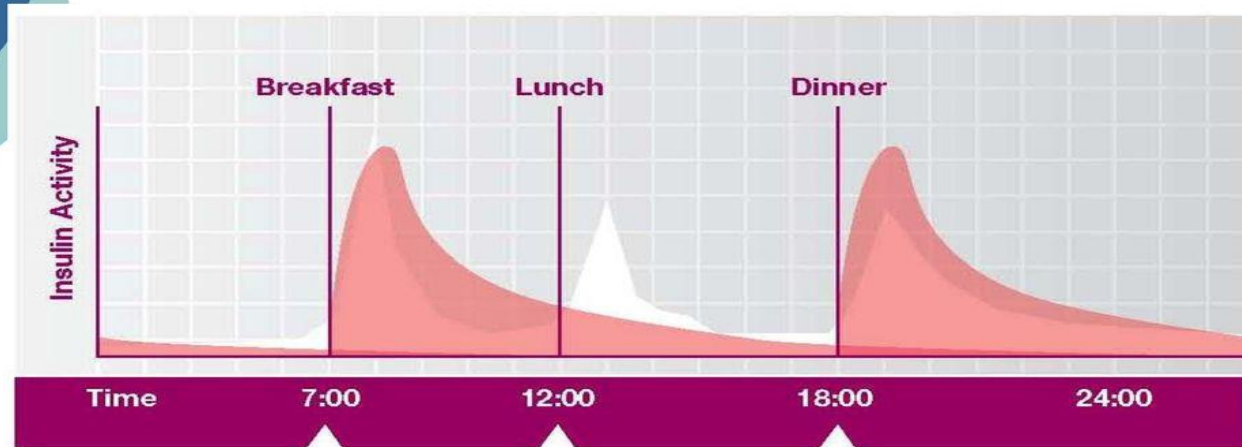


Insulin Novomix 30 Flexpen

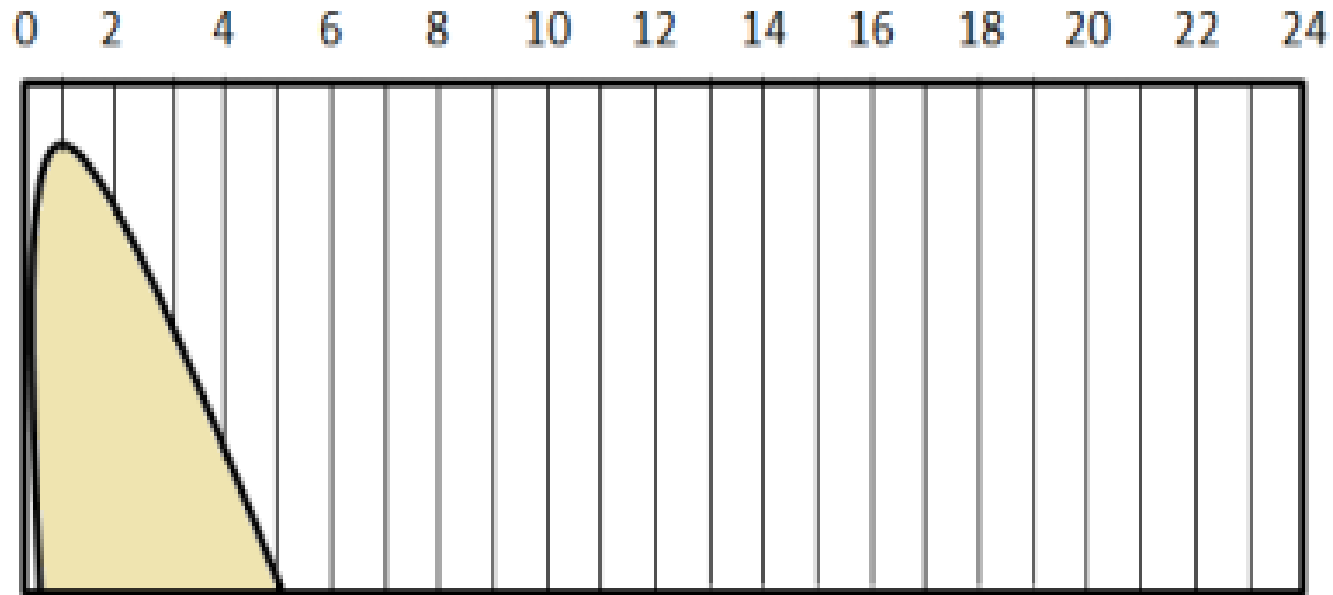


Humalog Mix 50 Kwikpen

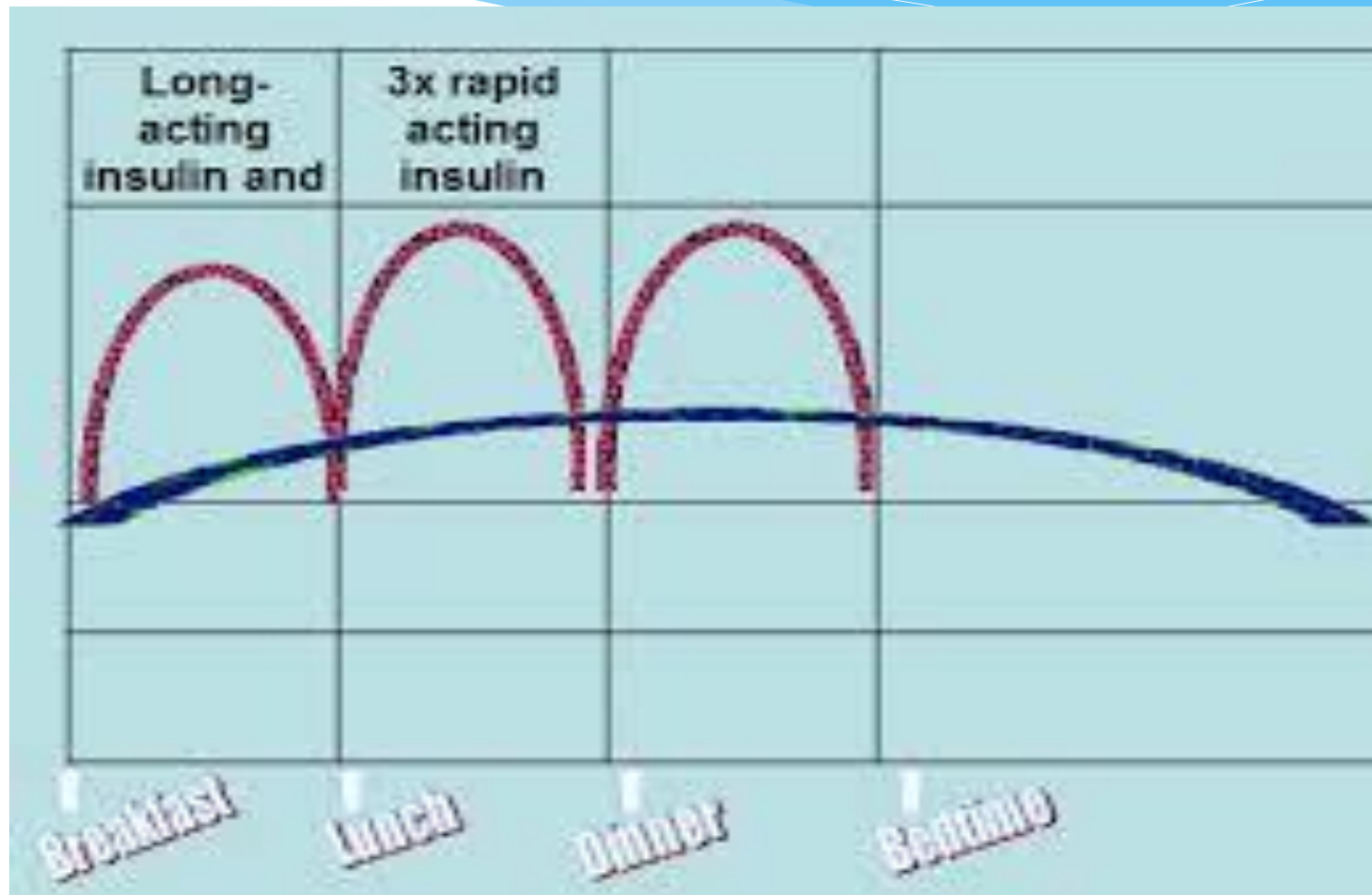
Humalog Mix 50 (Lilly)



Rapid acting/Novorapid Flexpen



Rapid acting and Basal insulin (Baso Bolus)



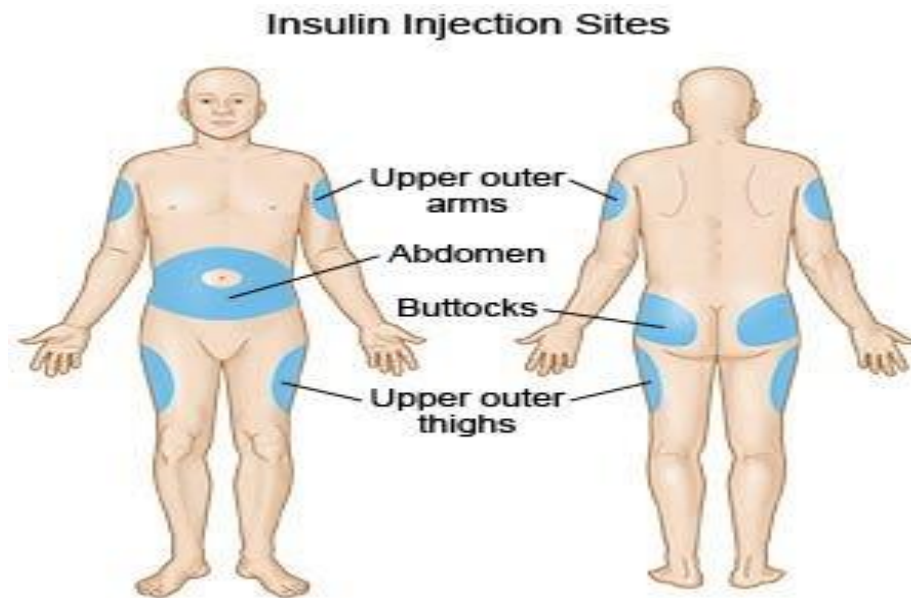
Type 1 and treatment

- No oral medications.
- Only insulin
- Basal + meal time/Quick acting insulin with meals
- Insulin sensitive
- Carb counting- 1 unit: 10g of carbs= 3 - 4 mmol/l/drop.
- BM before each meals- 5 to 7 mmol/l.
- Never stops insulin even when ill.
- If BM>13, check for ketones, if 1+, ask ward/On call doctor to review and if 2+ refer to A & E.

Injection techniques

- Needles- 4mm, 5 mm, 6mm, 8mm
- Room temperature
- Mixed insulin if cloudy insulin
- 2 units flush/air shot
- Subcutaneous injection.
- Rotation of injection site.
- 10 seconds count down.
- No rubbing.
- Don't inject in lumpy skin.

Injection sites



Lipohypertrophy & Lipoatrophy



Hypoglycaemia

- BG < 4 mmols/l
- Too much meds (e.g. tablet or insulin) than needed.
- Not enough Carbs
- Timing of meds.
- Missing or delaying meal or snack.
- Exercising more than normal- or if didn't plan to exercise
- Drinking alcohol on an empty stomach.

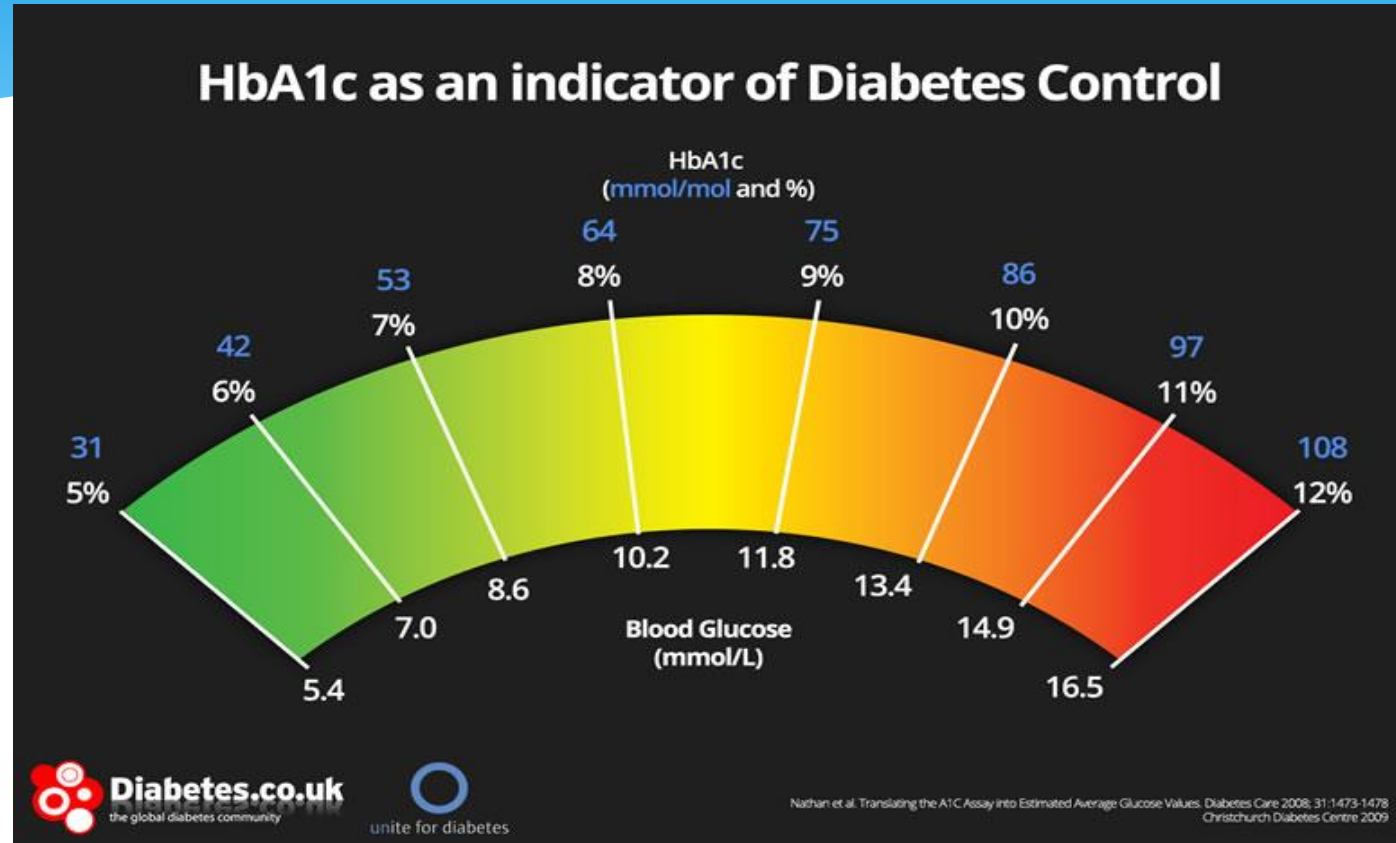
Symptoms of hypoglycemia



Blood glucose/Hba1c or IFCC Targets

- Fasting or before meals: 4 – 6 or 5-7 mmols/l
- Two hours after meals: < 8.5 or 10 mmols/l depending on age.
- HbA1c/IFCC: < 6.5% or 48 (depending on age of patients)

HbA1c/IFCC indicator



Hypoglycaemia

Treatment:

- If conscious:

15 gms of rapid acting carbs e.g 1 glucogel tube or 3 teaspoons of sugar in water or 100mls of normal coke, 180 mls of Lucozade.

- Recheck BM in 10 minutes if its has gone up please give 15 gms of slow acting carbs e.g 1 thick toast or 2 biscuits or a meal if it is mealtime.

- If BG still les than 4.0 repeat as above.

- Follow Trust Diabetes guidelines

- If unconscious, call your emergency care.

Hyperglycaemia

- Normally when BG is > 7.0 before each meal
- Above 8.5 two hours after a meal

Signs of hyperglycaemia:

- Weeing more than usual, especially at night
- Being very thirsty
- Headache
- Tiredness

Hyperglycaemia treatment

- Drinks lots of sugar-free fluid
- Have extra insulin- if you take it
- Seek medical advice straight if feeling ill- particularly if being sick
- If regular hypers refer to GP, DSN etc

Hyperglycaemia

HYPERGLYCEMIA (High Blood Sugar)

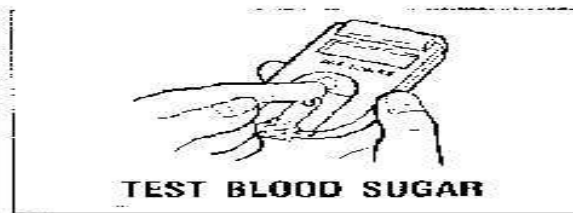


CAUSES: Too much food, too little insulin, illness or stress.

ONSET: Gradual, may progress to diabetic coma.

BLOOD SUGAR: Above 200 mg/dL.
Acceptable range: 115-200 mg/dL.

SYMPTOMS



Major complications of Diabetes

Major Complications of Diabetes

Microvascular

Eye

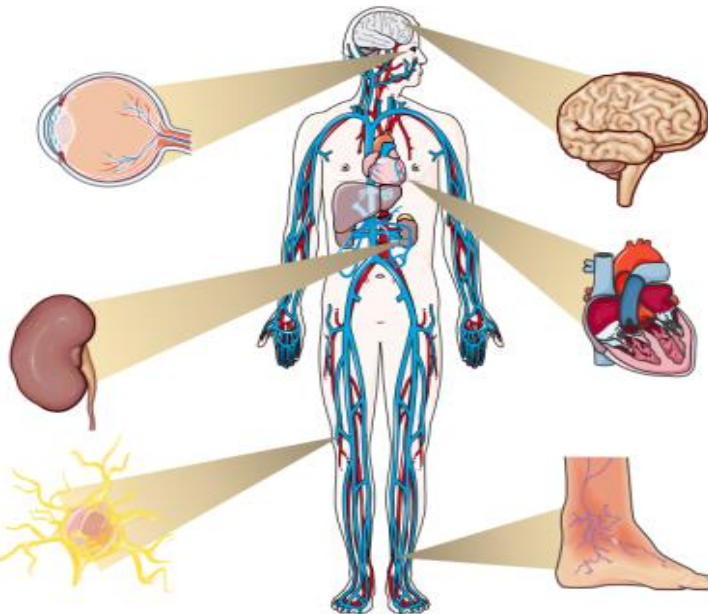
High blood glucose and high blood pressure can damage eye blood vessels, causing retinopathy, cataracts and glaucoma

Kidney

High blood pressure damages small blood vessels and excess blood glucose overworks the kidneys, resulting in nephropathy.

Neuropathy

Hyperglycemia damages nerves in the peripheral nervous system. This may result in pain and/or numbness. Feet wounds may go undetected, get infected and lead to gangrene.



Macrovascular

Brain

Increased risk of stroke and cerebrovascular disease, including transient ischemic attack, cognitive impairment, etc.

Heart

High blood pressure and insulin resistance increase risk of coronary heart disease

Extremities

Peripheral vascular disease results from narrowing of blood vessels increasing the risk for reduced or lack of blood flow in legs. Feet wounds are likely to heal slowly contributing to gangrene and other complications.

References/useful information's

- NICE – (NG: 28) National Institute for Health and Care Excellence for Type 2 diabetes in adults: management – Published 02/12/2015, Last updated: 31st March 2022
- NICE – (NG: 17) National Institute for Health and Care Excellence for Type 1 diabetes in adults: diagnosis and management – Published 02/12/2015, Last updated: 31st March 2022
- Independent Diabetes Trust- <https://www.iddt.org.uk>
- Diabetes UK – <https://www.diabetes.uk.org>

Any questions

Thank you for your attention.

Any Questions.

Please kindly complete this session evaluation form.