

# Modern Management of Type 1 Diabetes

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# Management Issues

- ▶ Insulin choice and treatment
- ▶ Blood glucose monitoring
- ▶ Self-management of diabetes
- ▶ Education content and delivery
- ▶ Clinical review and monitoring

# Type 1 Diabetes

- Auto-immune destruction of pancreatic  $\beta$ -cells
- Onset usually before age 40y (most <20y)
  - ▶ ...but can occur at any age (I've seen 98y!!)
- Rapid onset, dramatic symptoms
  - ▶ Prone to ketoacidosis
- Absolute insulin deficiency
  - ▶ ...may experience short 'honeymoon period'
- Exogenous insulin always required
  - ▶ Full 24 hour insulin coverage essential

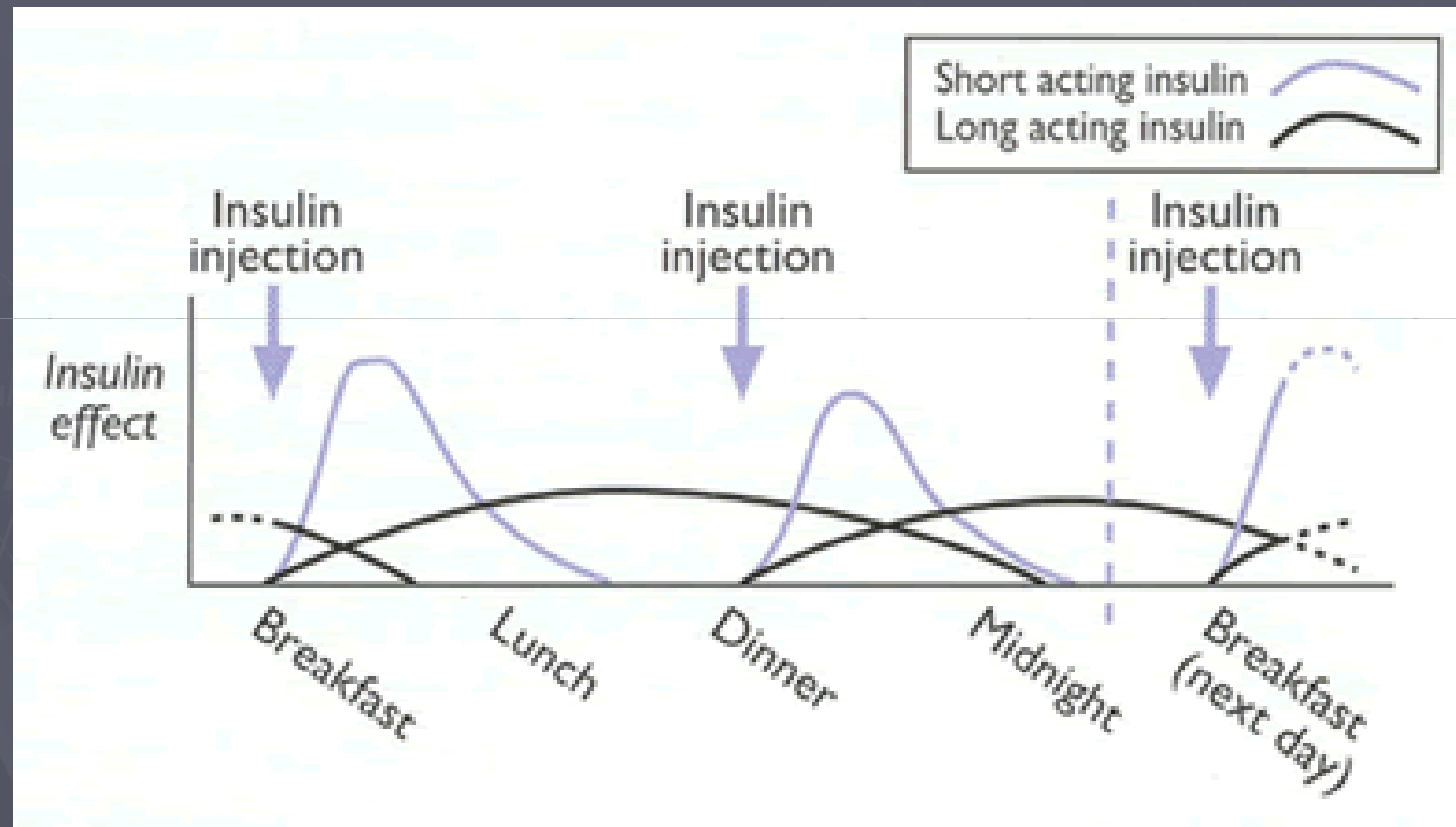
# Newly-Diagnosed T1DM

- ▶ 22 year old female University student
- ▶ Recent thirst/polyuria – otherwise well
- ▶ Glucose 23.4mmol/l – ketonuria +
- ▶ BMI 20.5 kg/m<sup>2</sup> – recent weight loss
- ▶ No family history of diabetes
- ▶ On combined oral contraceptive only

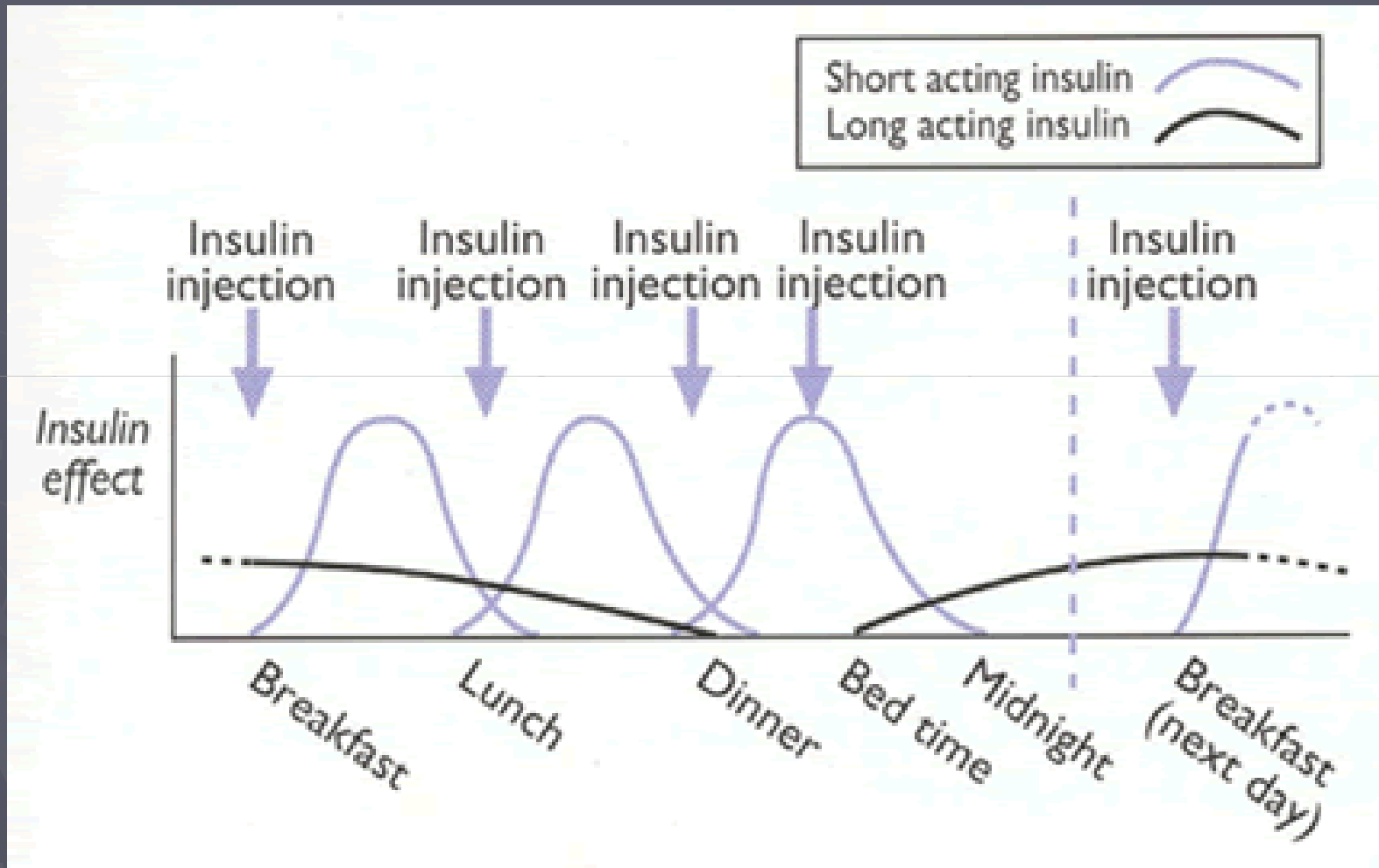
# Newly-Diagnosed Type 1

- ▶ Does she need hospitalisation?
  - NO unless there are other issues
  - Out-patient introduction of insulin is safe
  - Helps to minimise the trauma of the diagnosis
- ▶ What are the insulin regimen options?
  - Many different insulins but only 2 regimens
    - ▶ Twice daily short + medium acting insulin
    - ▶ Basal-bolus (basal medium/long-acting + mealtime short-acting insulin)

# Twice-Daily Insulin Regimen



# Basal-Bolus Insulin Regimen



# Insulin Pharmacology

## ▶ Short-acting insulins

- 'soluble' (= regular) human insulin
  - ▶ Onset 15-30mins, duration 4-6 hours
- Short-acting insulin analogues
  - ▶ Insulin aspart (Novorapid®)
  - ▶ Insulin glulisine (Apidra®)
  - ▶ Insulin lispro (Humalog®)
  - ▶ Onset almost immediate, duration 3 hours
    - All three are insulin monomer in solution
    - All three therefore have an identical time-action profile



# Insulin or Analogue?

- ▶ Soluble insulins are usually cheaper
- ▶ Analogues do not always give better HbA1c
- ▶ Analogues may solve some problems
  - Avoid need to leave a gap before eating
  - May reduce late hypos (and avoid snacks)
  - Useful in some younger/newly-diagnosed patients
- ▶ Analogues may cause some problems
  - Too rapid onset of action (?take after food)
  - Too short duration of action (late hyperglycaemia)
- ▶ No right or wrong answer – treat the patient

# Insulin Pharmacology – 2

## ▶ Medium-acting insulins

- Isophane/NPH insulin
- Insulin detemir (Levemir<sup>®</sup>)
- Onset 2-3 hours, duration 14-18 hours
- Once or twice daily depending on other insulin

## ▶ Insulin or analogue

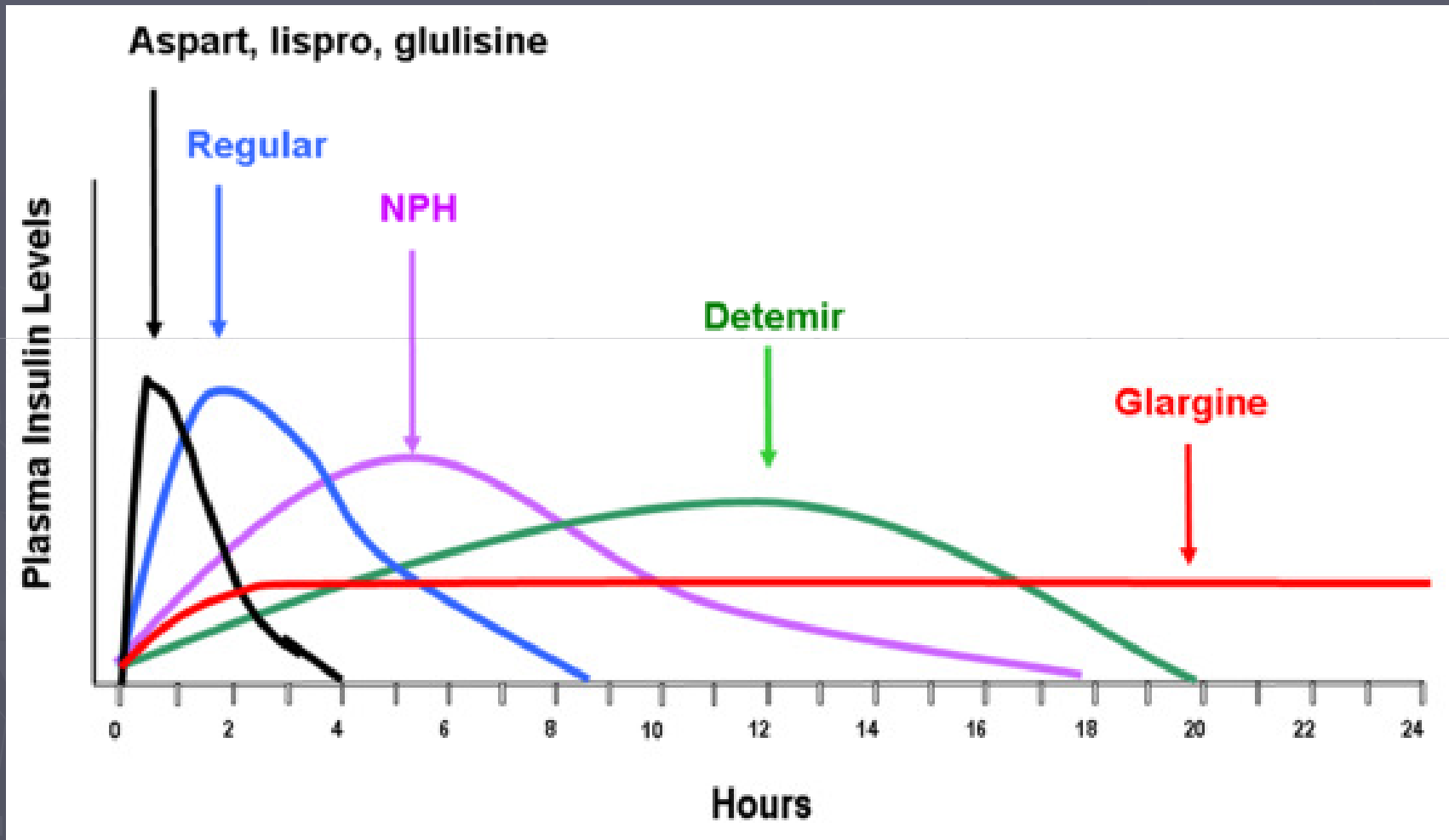
- Isophane insulins are cheaper
- Detemir may cause less weight gain and less overnight hypos (less mid-action peak)
- Use detemir to solve specific problems

# Insulin Pharmacology – 3

## ▶ Long-acting insulin

- Insulin glargine (Lantus<sup>®</sup>)
- Once-daily administration
- Provides a fairly flat basal insulin profile in a basal-bolus regimen
- Timing of administration usually not important
- Does provide good 24-hour cover in most patients

# Insulin Time-Action Profiles



# Twice-daily or Basal-Bolus?

- ▶ Little evidence that one gives better HbA1c
- ▶ Twice-daily is easier
  - ...and demands less from the patient
- ▶ Basal-bolus offers more flexibility...
  - Meal amounts and timing
  - Exercise
- ▶ ...but does need more patient involvement
- ▶ Treat the patient (and involve them)
  - The decision is not for all time!!

# Insulin Pump Therapy

- ▶ External pump with short-acting insulin
- ▶ Continuous basal infusion + manual mealtime boluses
- ▶ Much more costly than injection regimens
- ▶ Useful in very well-motivated patients
  - May reduce hypoglycaemia
  - May improve HbA1c
- ▶ Not the answer (and even dangerous) if motivation/self-management the problem

# Newly-Diagnosed Patient

- ▶ Commenced on twice-daily pre-mixed insulin
  - Humulin M3 by durable pen injection device
- ▶ Switched after 6 weeks to basal-bolus
  - Humulin S 3 x daily before meals
  - Insulin glargine at bedtime
  - Durable pen injector for both insulins

# Blood Glucose Monitoring

- ▶ Essential in Type 1 diabetes
- ▶ Ideally 4-7 times daily
  - ...but very hard to sustain in the long term
  - 2-4 times daily more usual (different times of day)
- ▶ Benefits only achieved as part of a larger self-management approach to care
- ▶ Useful to detect and treat hypoglycaemia



# Self-Management of T1DM

- ▶ Manage the diabetes round the patient, not the patient round the diabetes
- ▶ Almost anything is possible!
- ▶ Pro-active management of diet, exercise and insulin guided by blood glucose
  - Patient learns about their own diabetes
  - Patient controls diabetes (not the other way round!)
- ▶ May make heavy demands on the patient
  - ...so may sometimes have to use in a limited way

# Education Inputs - 1

- ▶ Self-management methods
  - One-to-one or group education
  - Customised or a proven package/system
    - ▶ Dose Adjustment for Normal Eating (DAFNE)
    - ▶ A means of delivering self-management education, not a new or different approach to care
- ▶ Healthcare issues
  - Pregnancy and contraception
  - Management of intercurrent illness

# Education Inputs – 2

- ▶ Lifestyle issues
  - Smoking - alcohol
  - Exercise - reduce insulin dose (30-50%)
- ▶ Employment issues
  - Working patterns, hypo risks
  - Employer may also need some education!
- ▶ Social issues
  - Family and/or partner needs education too
  - Hypoglycaemia management
  - Social and psychological support very helpful

# Clinical Review and Monitoring

- ▶ Intensive input at diagnosis
  - Input paced to patient's ability to learn
  - "Much to learn but a lifetime to do it"
- ▶ Long-term follow-up
  - HbA1c every 4-6 months
  - Annual checks for retinopathy, microalbuminuria, neuropathy + renal function and lipids
  - Educational updates 'as required'
    - ▶ ..and as lifestyle/employment change

# Aims of Management

- ▶ HbA1c <7% and no severe hypoglycaemia
- ▶ Minimal interference with desired lifestyle
- ▶ Successful pregnancy outcome(s)
- ▶ Absence of clinically significant diabetes complications
- ▶ Minimised impact on lifespan
  - Current data suggest average lifespan reduced by 15-20 years – can we do better?