

# WINDFAL Course

## Hypoglycaemia

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# Hypoglycaemia

- What it is
- Why it happens in Type 1 diabetes
- Why it can become a problem

# What is Hypoglycaemia?

- How should hypoglycaemia be defined?  
Not as obvious as it sounds!

Symptoms?

With or without confirmation on blood glucose test?

Low blood glucose value without symptoms?

# Why it happens

- Too much insulin for your body's needs.
- Because of:
  - Too little carbohydrate for the insulin dose
  - Exercise
  - Insulin action not always ideal
  - Alcohol
  - Impaired responses to falling blood glucose in Type 1 diabetes

# Why is it important?

- Your brain relies on glucose as a fuel.
- The brain can't store much fuel (glycogen) unlike muscles etc.
- Brain needs constant supply of glucose from the bloodstream.
- If glucose drops too low brain function is affected (once blood glucose below about 2.8mmol/l).

# Response to hypoglycaemia in people without diabetes

- Multiple defences against hypoglycaemia
- Only one hormone **lowers** blood glucose
- Several different hormones can help **raise** blood glucose.
- Response to falling glucose triggers characteristic hierarchy of responses.
- Some of the responses cause symptoms.

# Hierarchy of Responses to hypoglycaemia in people without diabetes

1. Shut off insulin release from pancreas. Happens at blood glucose  $\sim 4.6\text{mmol/l}$
2. Glucagon released from pancreas causing release of glucose from liver. Occurs at blood glucose  $\sim 3.8\text{mmol/l}$ .
3. Adrenaline released at blood glucose  $\sim 3.8\text{mmol/l}$ . Triggers release of glucose from liver & muscle.

All the above happens within normal blood glucose range.

# Hierarchy of Responses to hypoglycaemia in people without diabetes

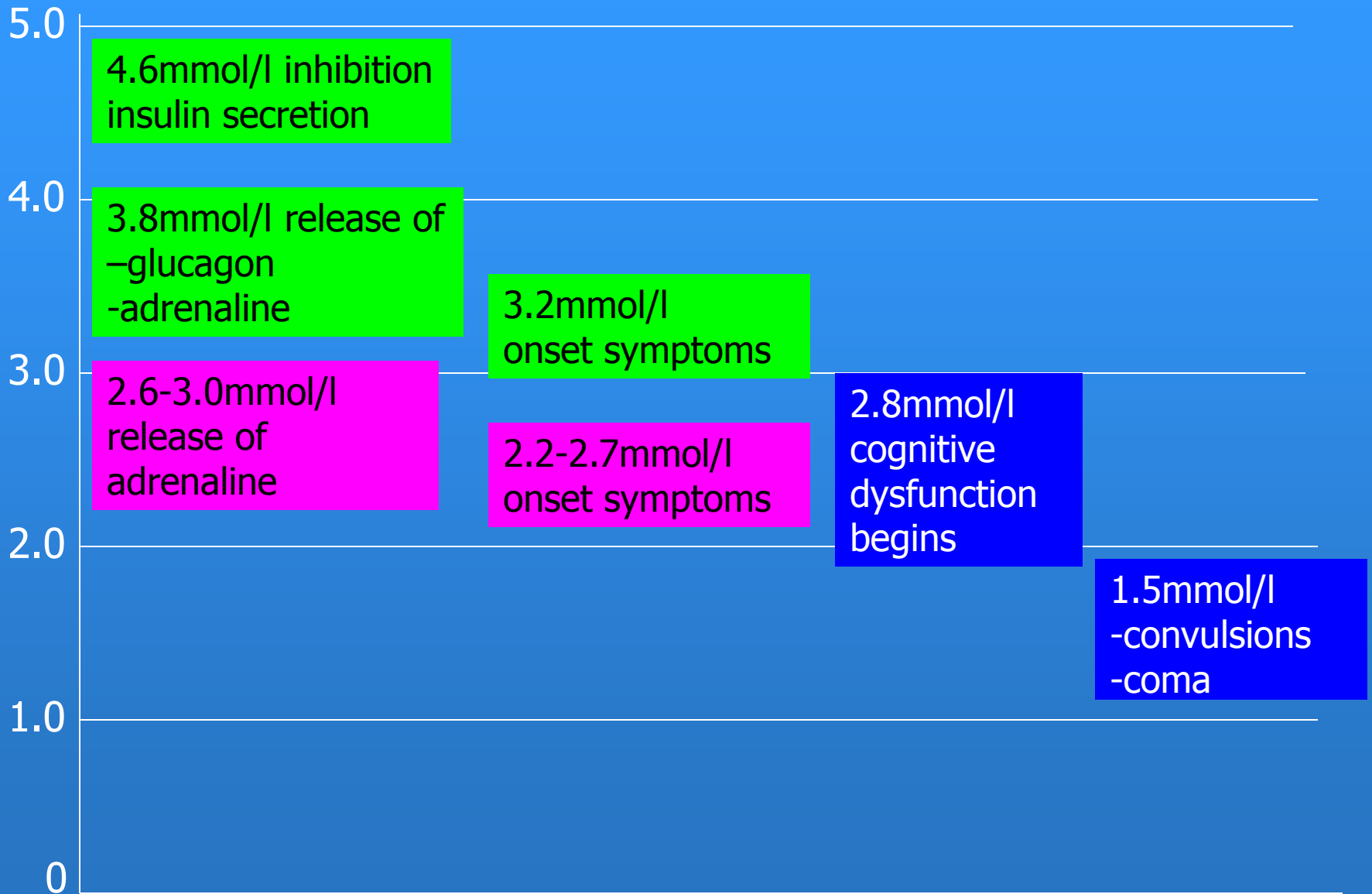
4. Symptoms due to adrenaline start at about 3.2mmol/l.
5. Cognitive dysfunction begins at about 2.8mmol/l – increased reaction times and decreased accuracy.
6. Worsening brain function as glucose drops further. Eventually fits and coma



No diabetes

Intensive control T1DM

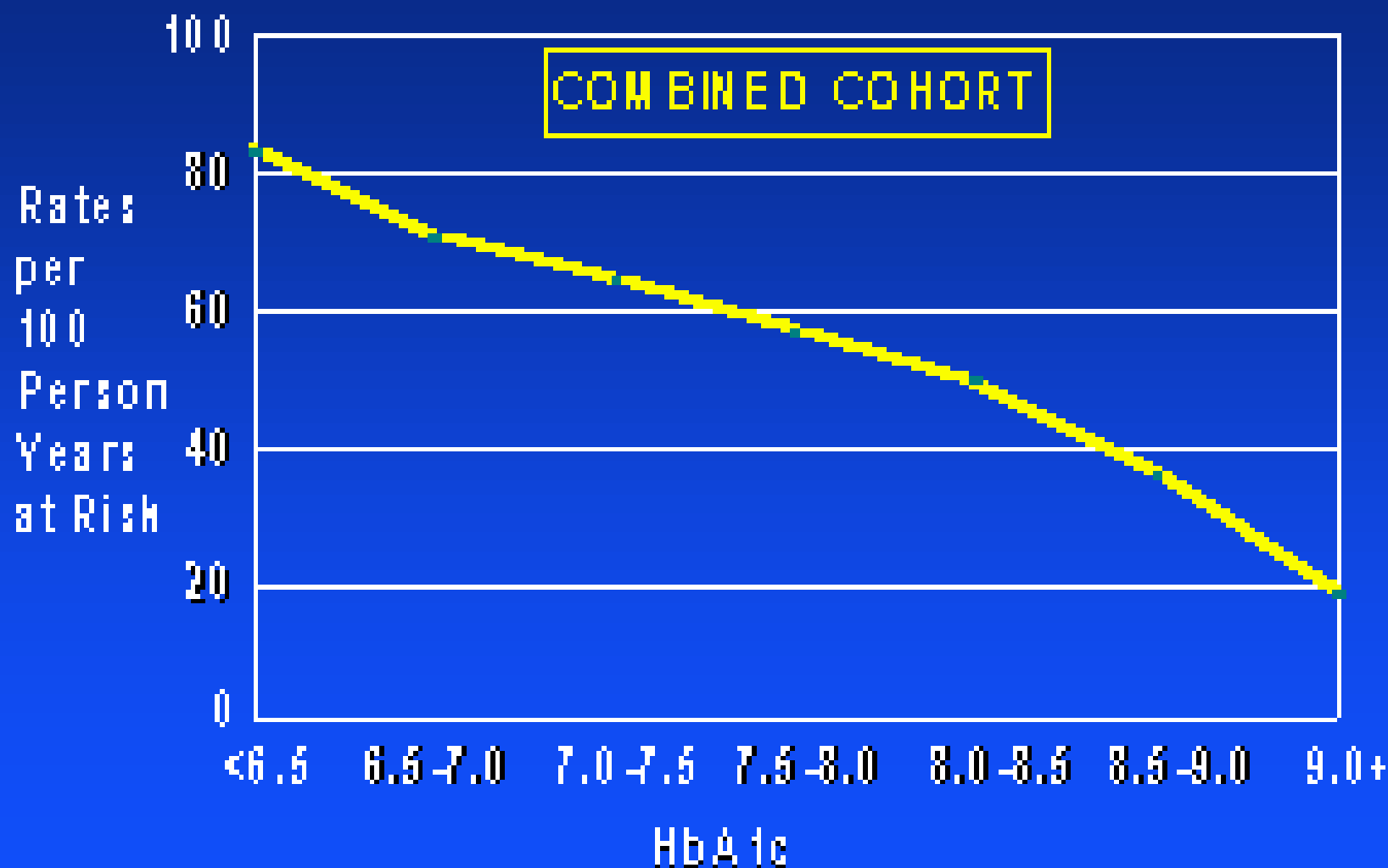
All subjects



# What happens in Type 1 diabetes

- Unregulated insulin levels – has been injected so no possibility to reduce.
- Loss of glucagon response within 5-10yr of developing diabetes.
- Impaired adrenaline response. Happens at lower blood glucose and less adrenaline is released.  
More likely after frequent hypos – avoidance of hypos can help improve adrenaline response.
- Results in **hypoglycaemia unawareness**
- 25x risk of severe hypoglycaemia.

# ASSOCIATION BETWEEN SEVERE HYPOGLYCEMIA AND MOST RECENT HbA1c: INTENSIVE THERAPY



# Reducing hypo risk and maintaining hypo awareness

- Optimise insulin regimen  
Basal bolus using insulin analogues causes fewest hypos.  
(Insulin pumps when necessary).
- Education programmes (eg WINDFAL) may help.
- Frequent blood glucose monitoring.
- Use of continuous blood glucose monitoring systems can help identify asymptomatic hypos.