

Continuous Subcutaneous Insulin Therapy

CSII: How, Why, What & Who?



Erica Richardson: Lead Diabetes Specialist Nurse
(In-patient Adult DSN) – Shrewsbury and Telford NHS Trust and Trend Advisor

Declaration of Interests

Erica Richardson

AstraZeneca, Novo Nordisk, MSD and NAPP Pharmaceuticals

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Contents

- How pump therapy works and why we might use it
- Review of equipment
- Common issues
- Management
- What the NICE guidance says
- Pros and cons – who would benefit
- Developments



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Insulin Pump

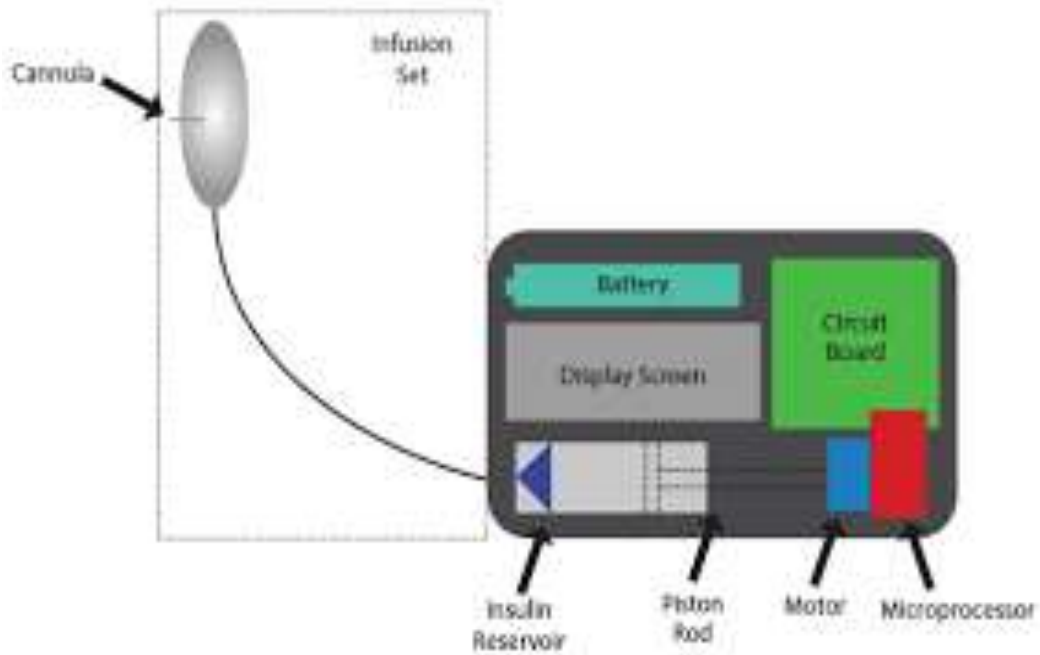
GET STARTED



Equipment



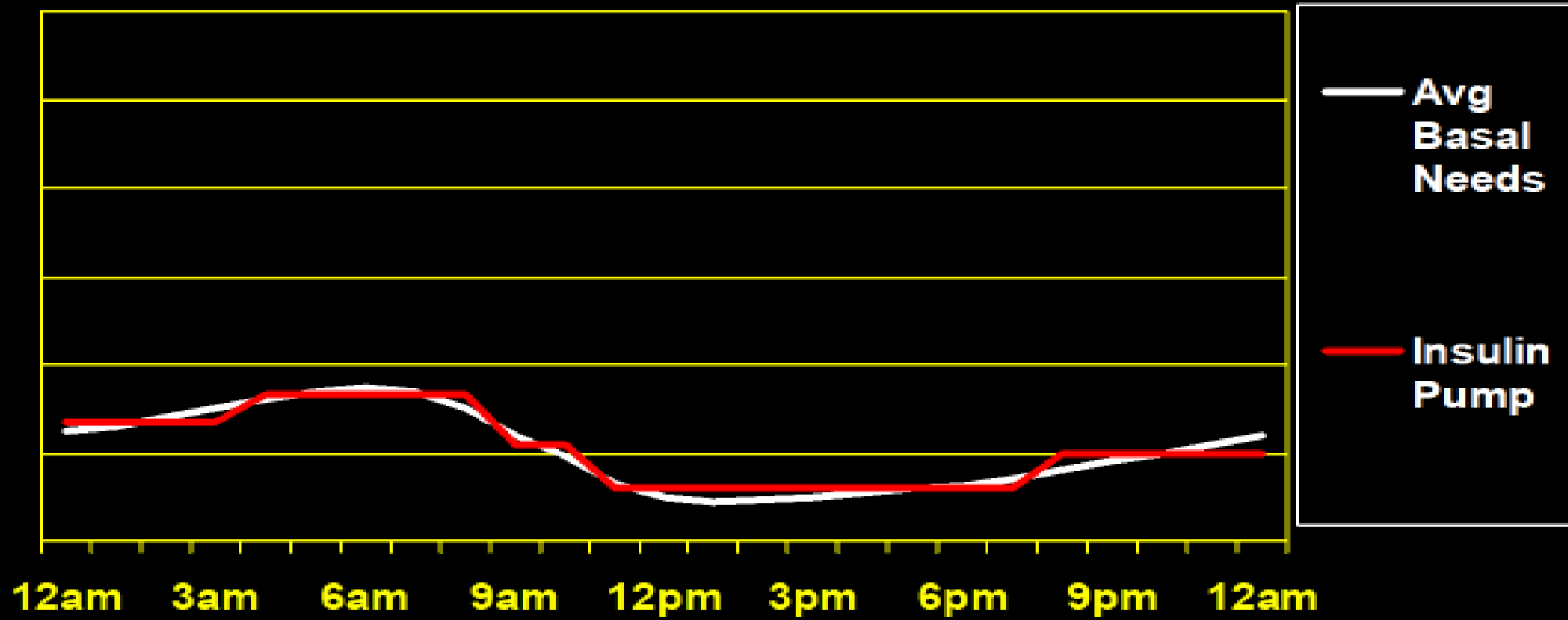
How Does It Work ?



- Insulin is pumped from a small reservoir Via the mechanism in the pump
- Down the tubing and through the cannula
- Delivered subcutaneously under the skin

How does it work?

Basal insulin infused by a pump can be adjusted to keep blood glucose level **STEADY** in the absence of food, exercise and bolus insulin!



Bolus Options

Bolus types

1. Normal (quick or standard) bolus—all at once

2. Square or extended wave bolus—gradually over time

3. Dual or multiwave bolus—a portion given immediately followed by the remainder over time

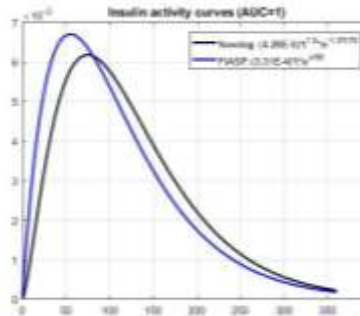
Food bolus for carbohydrates

Correction bolus for high glucose

Disconnect bolus



Insulin Sensitivity Factor (ISF)



The active insulin duration needs to be entered into pump settings

This helps provide an accurate active insulin calculation by:

- Preventing insulin stacking
- Improving bolus accuracy

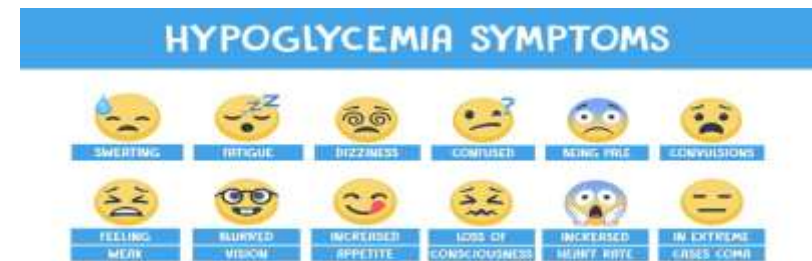
Treatment of Hypoglycaemia

MILD

- Keep pump running
- 10-20g glucose e.g. Dextrose tablets, fresh juice or full sugar drinks
- Check BM at 10 min, repeat above if $<4\text{mmol/l}$
- Usually do not need starchy food

SEVERE (requiring third party assistance)

- Stop/interrupt pump
- Glucogel (rubbed into gums)
- Avoid food which has to be swallowed
- Glucagon or dial 999



Causes of High Glucose Levels

Insufficient insulin:

- Miscalculation/omission of insulin
- Excess carbs for hypo
- Basal rate low
- Pump disconnected / stopped
- Pump failure

Increased insulin demand:

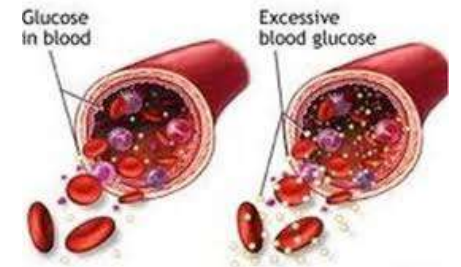
- Illness
- Reduced physical activity
- Stress, medication
- Hormonal changes

Cannula problems:

- Inflamed site
- Cannula blocked / kinked**
- Slipped cannula**
- Not changed (every 2-3 days)
- Inserted in scar / lipodystrophy

Infusion set problems:

- Air/blockage of infusion set
- Leakage of insulin
- Infusion set to cartridge connection problem



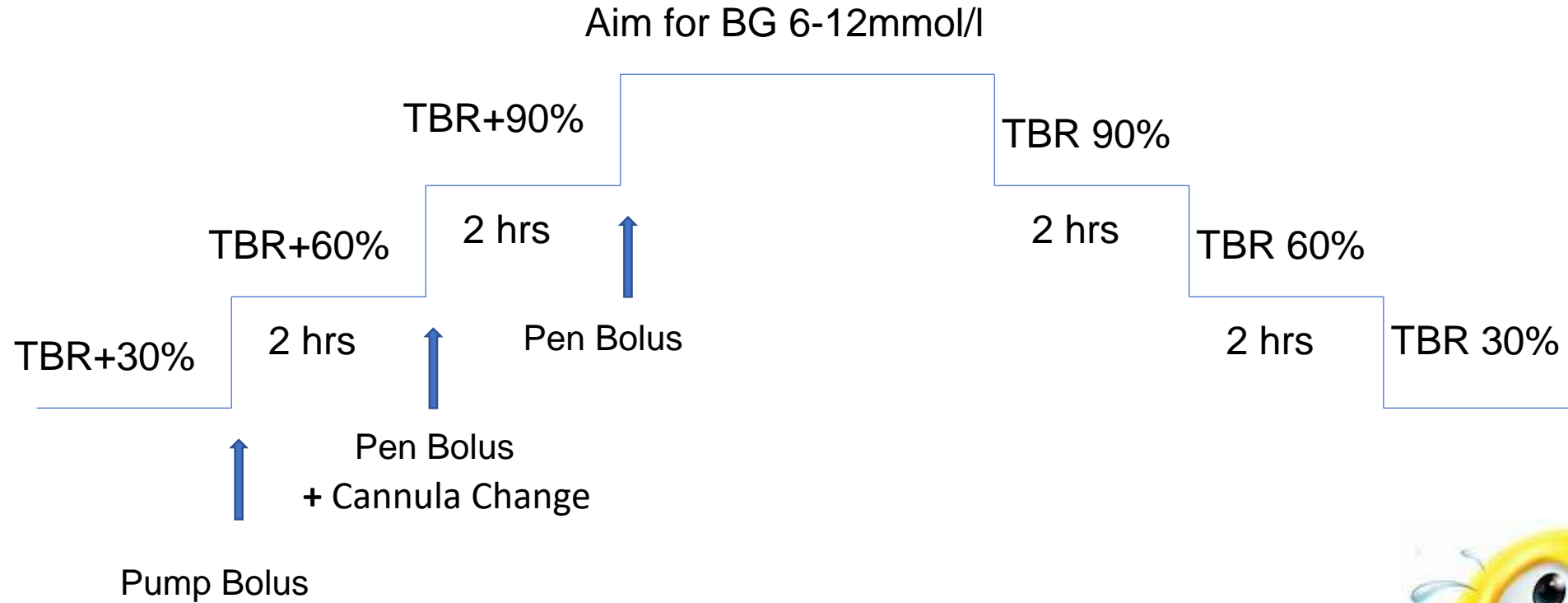
High Blood Glucose Due To Insulin

- Is it out of date?
- Does it look discoloured or congealed?
- Has it been left at room temperature for more than 28 days?
- Has it been left in a warm environment i.e. holiday or on a radiator
- Has the Insulin been in the cartridge more than 2-3 days?



If YES to any of the above you must advise the pump user to change the insulin immediately

Pump Management In Illness



Conversion to Injections

Essential in emergencies e.g. pump malfunction

- **Basal insulin:**
- Intermediate acting insulin must be re-suspended before injections
- Checked expiry dates

- **Rapid acting insulin:**
- Always carry in emergency pack!
- Aim glucose levels 4-10mmol/l



Travel

- Keep insulin / consumables in hand luggage
- Dextrose tablets
- Avoid X-rays / body scanners
- Travel letter's
- Spare pump
- Remember to adjust for time zones
- DVLA / insurance



More Considerations



Hot climates and sunbathing

Shield insulin pump/tubing with towel or clothes

Store insulin in fridge

Insulin / cartridge change every 2 days

Blood glucose monitoring: increased blood flow to peripheries (exercise and heat)

Swimming/water: Wash off salt water / chemicals



Winter sports

- Keep pump and tubing close to body
- Adjust basal rates for activities

Care of Pump

Remove pump:

- Magnets/strong radio waves e.g. MRI, rides with 'no pacemaker' sign or X-Rays/CT scan
- Diving/swimming ?
- Sauna/Jacuzzi/Steam

Consider:

- Mobile phones
- Pump insurance



NICE Guidance



Recommended therapy for adults and children >12 years when;

- All attempts to achieve HbA1C on MDI result in disabling hypoglycaemia (this may be unpredictable, cause anxiety or reduced quality of life)
- HbA1C remained high >69mmol/mol (8.5%) despite high level of care

Or <12 years when;

- MDI impractical or inappropriate
- It is also recommended all individuals with diabetes have a trial with MDI between the ages of 12-18 years

CSII is not recommended by NICE for the treatment of type 2 diabetes

NICE Recommendation

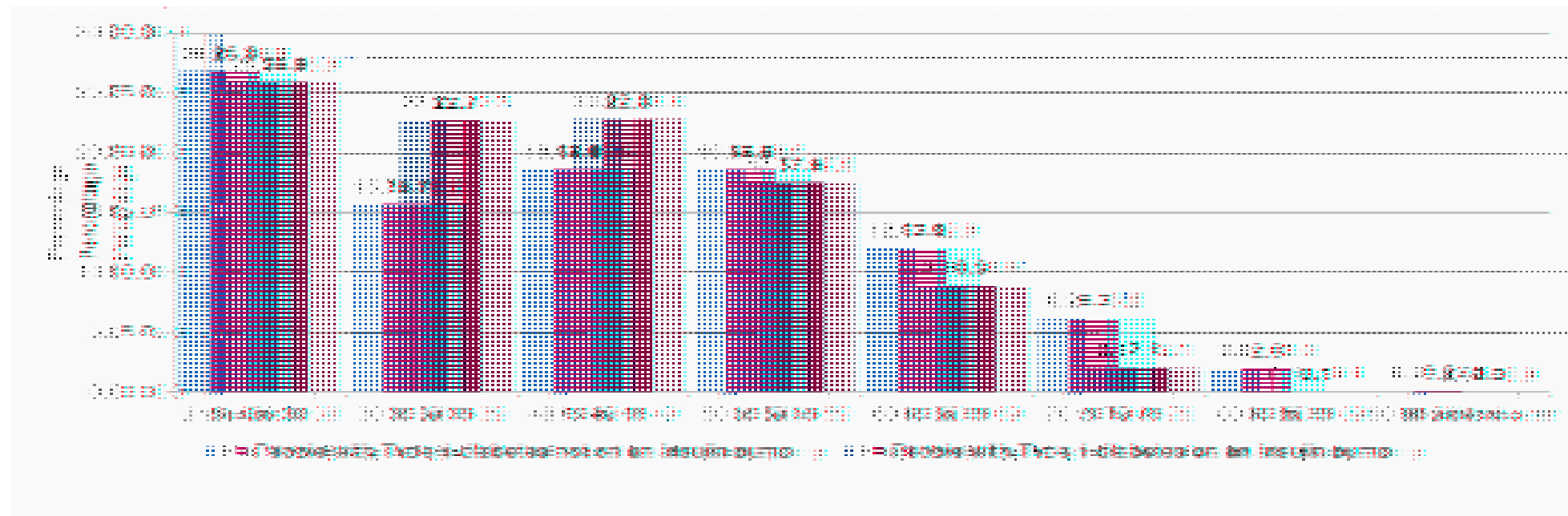
CSII therapy should be initiated only by a trained specialist team comprising:

- A physician with a specialist interest in insulin pump therapy
- A diabetes specialist nurse
- A dietician.



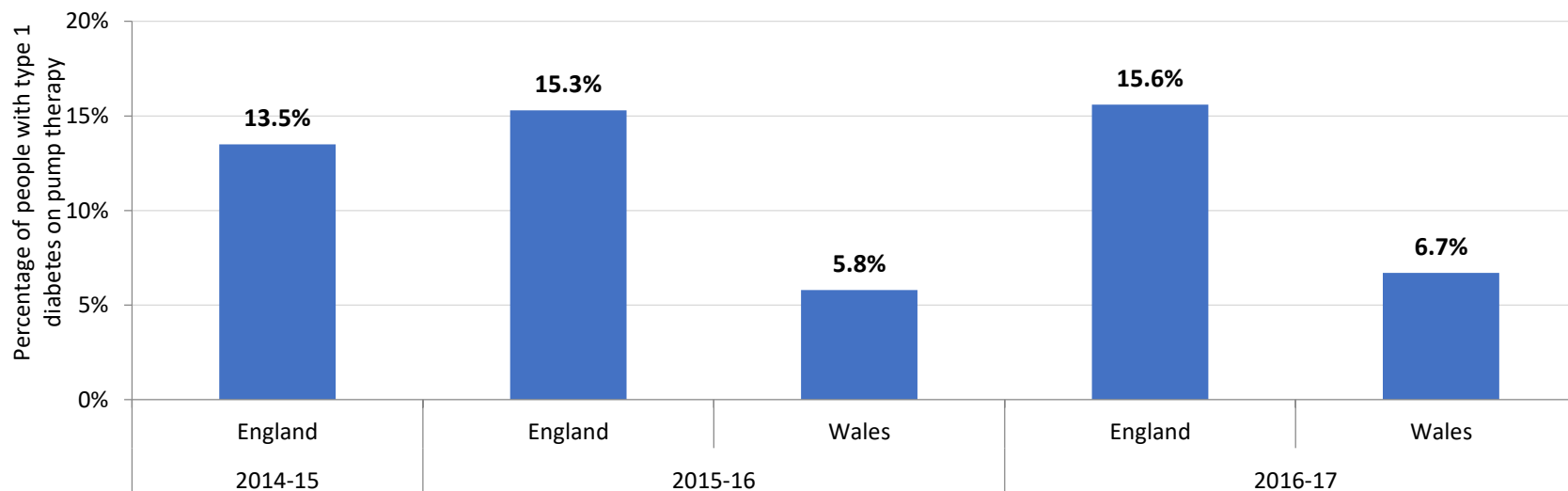
Stats and Facts

Insulin pump use by age : England and Wales 2016-2017



Proportion of CSII users in the UK

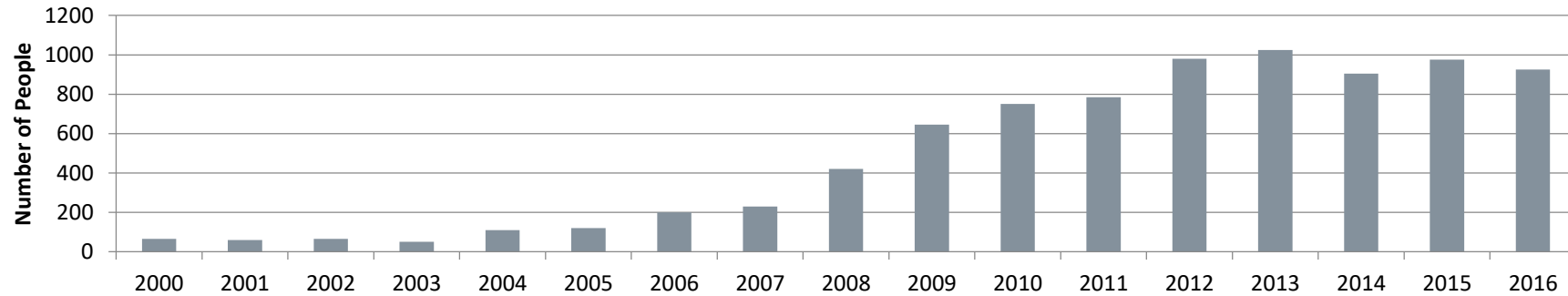
Percentage of people with Type 1 diabetes on an insulin pump, by audit year, England and Wales, 2014-2017



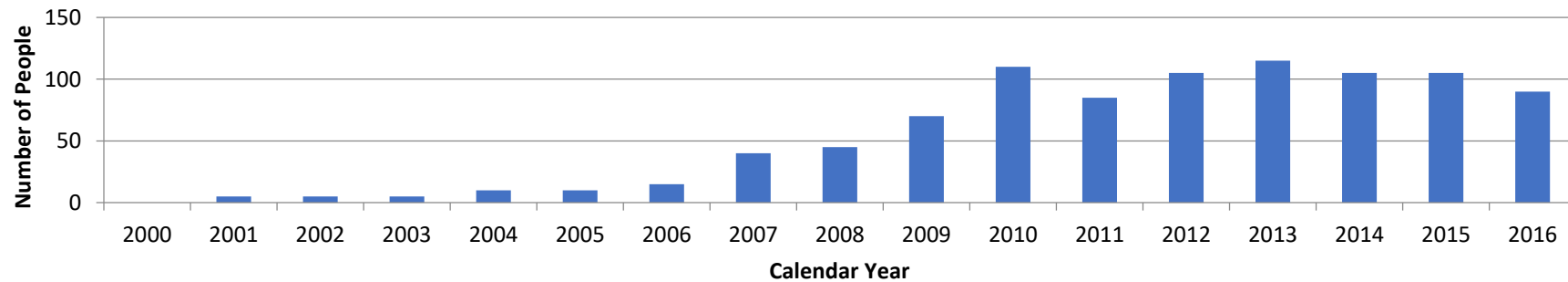
The apparent difference between England and Wales is likely to be due to submission arrangements. For England, the percentage is of those people with Type 1 diabetes being treated in a specialist service that participated in the pump audit. For Wales, the percentage is of all people with Type 1 diabetes in the local population, as pump information is submitted by Local Health Boards.

Growth In CSII Use Plateaued:

England

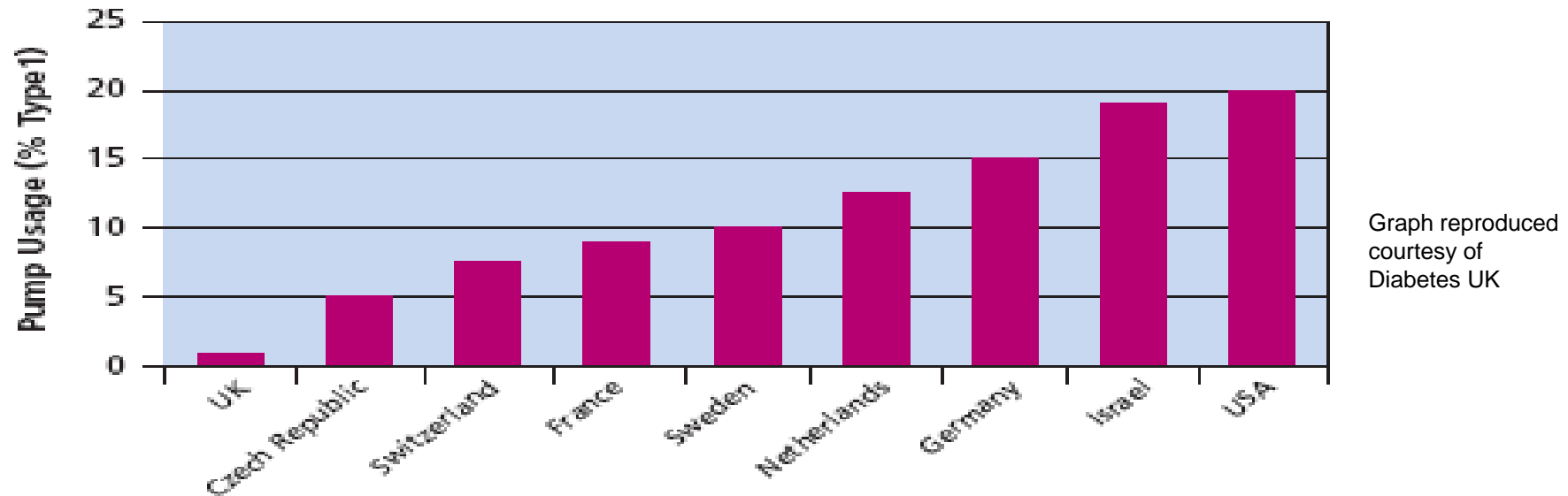


Wales



Background:

Estimated insulin pump usage in different countries (J Pickup)



What kind of people would be eligible:

- Elevated HbA1c despite intensive therapy and support (High Risk of complications)
- Frequent hypoglycaemic events
- Dawn phenomenon
- Exercise related glycaemic variance
- Pregnancy
- Paediatrics
- Gastroparesis



What kind of people would benefit:

- Able to cope with technology
- Frequent attender of appointments
- Desire to achieve better control
- Frequently testing BG levels
- Carbohydrate counting



Pros and Cons

Pros	Cons
Reduction in hypoglycaemic events (mild/ moderate and severe)	Increased risk of DKA no long acting insulin on board
Reduced BG variance	Need to change cannula regularly (can be complex)
Effective management of dawn phenomenon	Testing BG 6-8 times daily
Improved quality of life / flexibility/ time zone management / diet / shift patterns	Cannula site infections
Reduction in number of S/C injections	Pump malfunctions / tube blockage
Improved insulin absorption	Costly
Other Points To Consider	
Need to be able to use technology	
Need to persistently and consistently check BG levels	
Equipment has to be attached to body 23-24 hours a day	
Equipment Alarms	
Weight changes	

Reason for Withdrawal

- No evidence of reduction in HbA1C
- No Evidence in reduction in Hypoglycaemic events
- Safety concerns i.e.
 1. Absence of adequate BG testing (<4 x daily)
 2. Admissions with DKA
 3. Unable to self manage CSII
 4. None attendance to clinic
- User choice

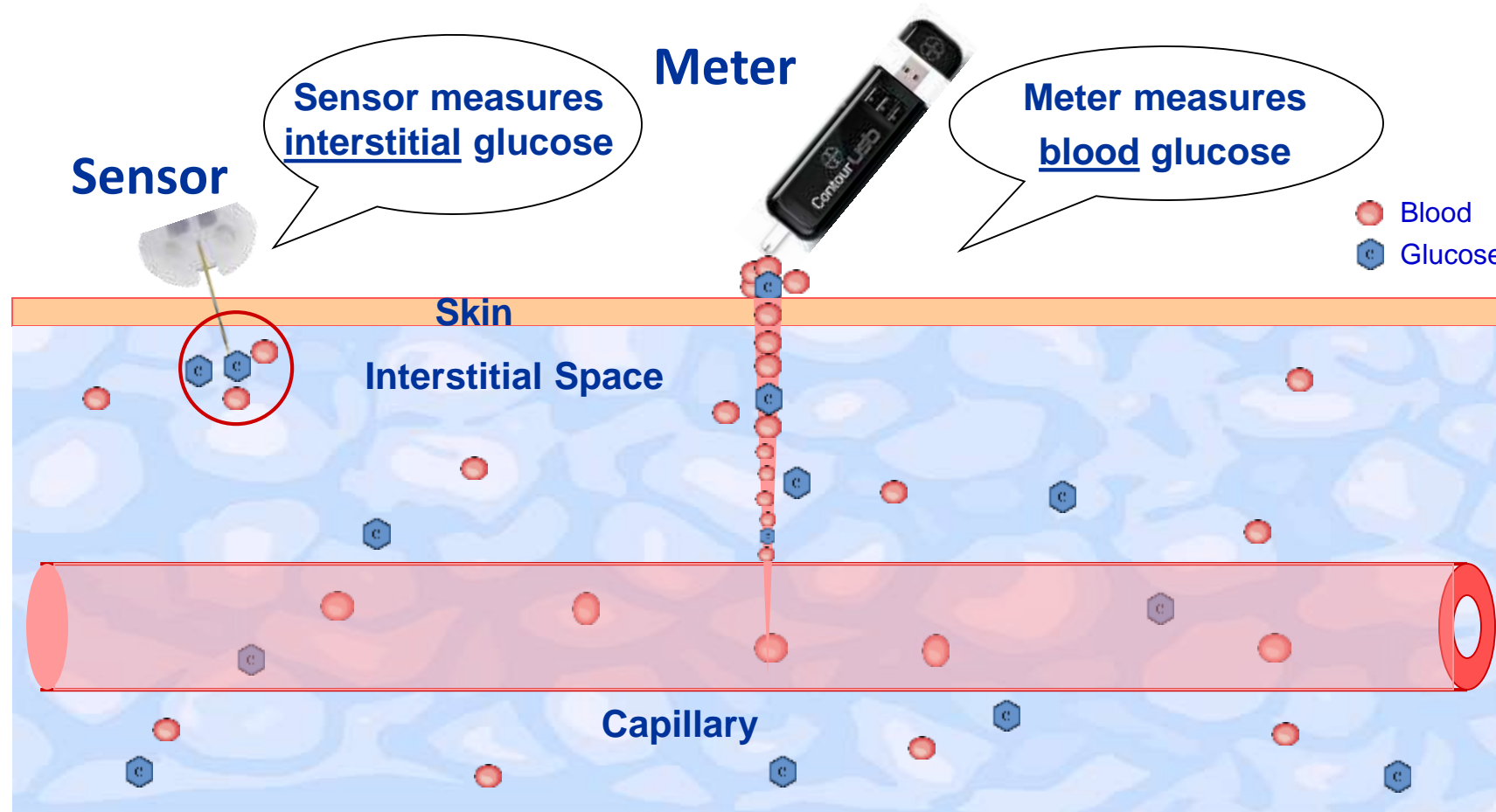


Developments



Remember

Sensors and BG meters measure Glucose from different places



ISIGs are “calibrated” with meter readings to calculate CGM values

Thank You For Listening



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