Episode 13 - Diabetes and Emergency Surgery

Patients awaiting emergency surgery are either unwell, fasted or having an operation; more likely all three. In other words, there is physiological upset and their ability to regulate their blood glucose will be compromised. Almost 8% of all cases of DKA arise in hospital.

Measuring blood glucose in isolation can be a distraction from other considerations or falsely reassuring. Consider the patient's general condition, fluid and electrolyte balance, and the way in which insulin or lack of insulin is affecting these. Involve the diabetic team immediately upon admission to hospital.

Fasting times

Should be minimised. This might not be possible in emergency surgical patients unable to tolerate enteral intake. Patients should be continued on their long-acting insulin regimen but short acting insulin should only be given in consultation with the diabetic team. Any patient on insulin or who has previously been taking insulin secretagogues (Sulphonylureas, meglitinides, GLP1 agonists, DPP4 inhibitors) should have blood glucose monitored hourly.

Variable Rate Insulin Infusions (VRIIs)

Should be started: a) patient unwell, b) more than one missed meal (actual or predictable). These two reflect a disruption to the usual routine governing blood glucose control. Insulin is important not just for regulating blood glucose but for preventing lipolysis and the production of keto-acids. All diabetic patients (types 1 or 2) will need background insulin of some form or another.

Continued until the patient is eating and drinking and established on their normal insulin regimen. It should be running continuously throughout their hospital stay, surgery, transfers; it should not be stopped. Insulin has a half-life of about 5 minutes so within 30 minutes of stopping an infusion there will be no circulating insulin, which is dangerous.

Exogenous insulin administration carries inherent risks, to wit, hypoglycaemia.

VRII safe prescribing and administration	Notes
Dedicated cannula, non-return valves, no disconnections.	All other fluid and medication through separate cannula (risk of bolus or rapid administration).
Hourly blood glucose measurement. Regular ketone and potassium measurement.	
Insulin syringe driver (variable rate)	Soluble insulin 50 units in 50 ml sodium chloride. Pre-made syringes are best.
Glucose containing fluid (0.18% sodium chloride + 4% glucose + 0.15% potassium chloride) *	Fluid running at about 100 ml/hr. In fact it is really 1 ml/kg/hr with a maximum rate of 100 ml/hr.

Note: * fluids running alongside a VRII should always contain glucose, even if the plasma glucose readings are high. You should not prescribe bags of saline and bags of glucose to alternate depending on the blood glucose. The insulin will regulate the glucose. The glucose in the infusions is minimal (less than 1 mg/kg/min - basal metabolic requirement). Hyperglycaemia is due to unopposed action of counter-regulatory hormones, not because of the glucose administration.

Example VRII (adults - simplified version)

Glucose (mmol/L)	Monitoring interval	Insulin infusion rate (units/hour)
< 6	1 hour	0
6-10	2 hourly	1
10-15	1 hourly	2
15-20	1 hourly	4

The infusion rate can be halved for patients under 50 kg and doubled for patients over 100 kg.

Potassium

Potassium should be included in the infusion fluids. It comes as a 0.15% solution, which is the equivalent of 20 mmol/L.

Hyperglycaemia (if not on a VRII)

- Threshold for treatment blood glucose > 12 mmol/L
- Short acting subcutaneous insulin at a dose of 0.1 unit/kg
- For each unit of insulin you can expect a fall in blood glucose of about 3 mmol/L.

- Monitor glucose every hour.
- Repeat at 2 hours or start VRII
- Speak to diabetic team; consult guidelines

Hypoglycaemia (whether on VRII or not)

	Notes
Threshold for treatment	< 6 mmol/L (emergency if < 4 mmol/L)
Monitoring	Every 15 minutes (think about this as a medical emergency)
Enteral glucose	biscuit, fruit juice, Lucozade, glucose tablets, Glucogel - rubbed into cheek
Intravenous glucose (bolus)	Adults: 50-100 ml of 10% glucose solution Children: 2 ml/kg of 10% glucose solution
Intravenous glucose (infusion) Usually commenced after two or three boluses have been administered.	Adult: 100 ml/hr 10% of glucose solution Child: start at 5 mg/kg/min (3 ml/kg/hr 10% glucose solution) - about three times as high as for an adult.
Glucagon (intramuscular)	Adult: 1 mg Children: < 25 kg = 500 mcg, > 25 kg = 1 mg