

# Principles of peri-operative management

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# Dangers of hyperglycemia

- Impairment of wound healing
- Increase risk of infection; glucose levels above 13.9 mmol/L may impair leukocyte functions
- Increase risk of abnormal coagulation
- Exacerbate ischemic brain damage and precipitate cardiac ischemia
- Increase risk of hyperglycemic emergencies

# Presurgical evaluation

- Current level of metabolic control  
( glycemic control, bp control and lipid status )
- Presence of diabetic complications especially cardiac status , renal function and autonomic neuropathy
- Any history of hyperglycemic emergencies in the past

# Presurgical evaluation

- Elective surgery
- Emergency surgery

# Glycaemic goals for diabetes control

	<b>ADA</b>	<b>IDF</b>	<b>AACE</b>
HbA1c %	<7.0	$\leq 6.5$	$\leq 6.5$
Fasting / preprandial	5.0 – 7.2	< 5.6	< 6.1
2H postprandial	< 10.0	< 7.5	< 7.8

# MANAGEMENT OF TYPE 2 DIABETES MELLITUS

(4<sup>th</sup> Edition)



<b>HBA1C</b>	<b>6.5%</b>
<b>FPG</b>	<b>4.4 - 6.1</b>
<b>PPG</b>	<b>4.4 - 8.0</b>

	<b>Levels</b>
<b>Glycaemic Control</b>	
<b>Fasting</b>	<b>4.4 – 6.1 mmol/l</b>
<b>Non-fasting</b>	<b>4.4 – 8.0 mmol/l</b>
<b>HbA1c</b>	<b>&lt; 6.5 %</b>
<b>Lipids</b>	
<b>Triglycerides</b>	<b>≤ 1.7 mmol/l</b>
<b>HDL cholesterol</b>	<b>≥ 1.1 mmol/l</b>
<b>LDL cholesterol</b>	<b>≤ 2.6 mmol/l</b>
<b>Exercise</b>	
	<b>150 mins / week</b>
<b>Blood Pressure</b>	
<b>Normal Renal Function</b>	<b>≤ 130/80 mmHg</b>
<b>Renal Impairment /Gross Proteinuria</b>	<b>≤ 125/75 mmHg</b>

# CURRENT THOUGHTS ON A1C TARGETS ?

- Keep A1C < 6.5% for newly diagnosed young diabetics with no overt co-morbidities
- In general, aim for A1C <7.0%
- For elderly diabetics or patients with high tendency develop hypoglycemia or patients with co-morbidities or patients who are very difficult to control; target should aim for <8.0%

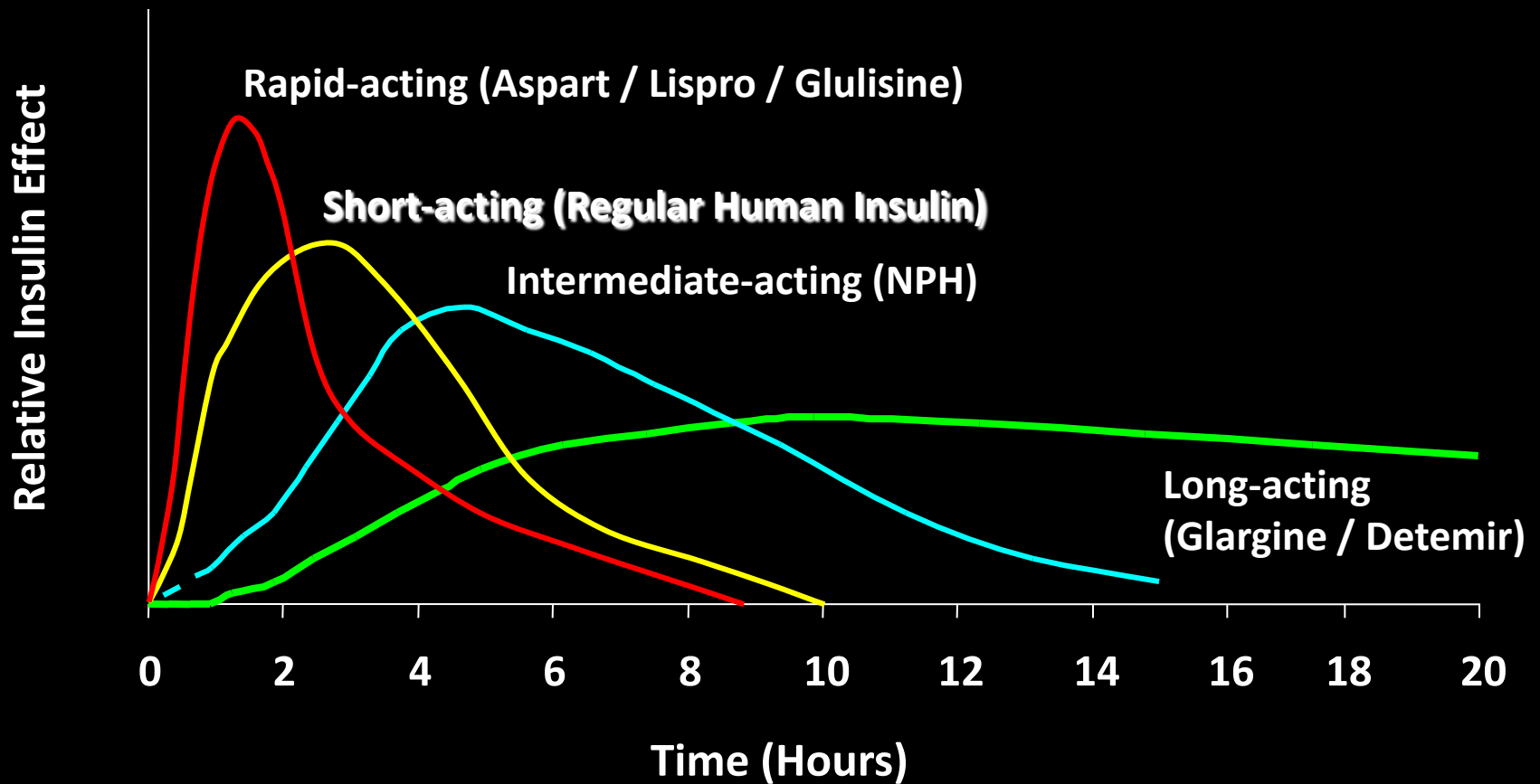


# INSULIN PREPARATIONS

Types	Conventional	Analogue
<b>Prandial</b>	Short-acting - Actrapid® - Humulin R®	Rapid-acting - Novorapid® (Aspart) - Humalog® (Lispro) - Apidra® (Glulisine)
<b>Basal</b>	Intermediate-acting or Neutral Protaminated Hagedorn (NPH) Insulin - Insulatard® - Humulin N®	Long-acting - Lantus® (Glargine) - Levemir® (Detemir)
<b>Premixed</b>	Combination of short & intermediate-acting: 30% regular insulin+70% NPH - Mixtard® 30 - Humulin® 30/70	Combination of rapid-acting & protaminated analogue - Novomix® 30 (30% aspart + 70% aspart protamine) - Humalog® Mix 25 (25% lispro+75% lispro protamine)

# Insulin Time Action Curves

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# Short term use of insulin therapy in T2DM

May be considered in the following situations

- Acute illness, surgery, stress and emergencies
- Pregnancy
- Breast-feeding
- As initial therapy in T2DM with marked hyperglycemia
- Severe metabolic decompensation (eg. DKA, HHS)

# T1DM going for surgery

- Continuous insulin infusion is recommended for emergency operation ( rate of infusion is between 0.05u to 0.1u per hour keeping blood glucose levels between 6 to 10 mmol/L )
- If blood sugar has been stable and patient is going for elective procedures pre-existing SC basal bolus insulin regime may be continued.

# T2DM going for emergency surgery

- All patients going for emergency surgery are recommended to go on continuous insulin infusion ( rate of infusion between 0.05u to 0.1u per hour to keep blood glucose levels between 6 to 10 mmol/L )
- All OHAs must be stopped promptly and assessment for lactic acidosis must be made if the patient has been on METFORMIN

# T2DM going for elective surgery

- Patients should be admitted at least 1 day before op to have glucose stabilisation
- METFORMIN must be stopped 1 day before op
- SULPHONYLUREAS / other OHAs or GLP-1 analogue injection should be omitted on the morning of surgery if glucose levels are between 6 to 10 mmol/L preoperatively

# T2DM going for elective surgery

- If glucose levels are persistently above 10 mmol/L , consider basal bolus insulin prior to surgery
- Initiation dose is 0.1u tds bolus insulin and 0.2u of basal insulin
- Omit insulin on the morning of surgery and monitor glucose levels

# Post-operatively

- All T1DM should be on insulin
- If NBM or on artificial feeding can be on basal insulin only



# Post-operatively

- For T2DM if blood glucose levels are between 6 to 10 mmol/L , can observe glucose levels if NBM
- If NBM and blood glucose levels are persistently above 10 mmol/L can use basal insulin
- If allowed orally and blood glucose levels are persistently above 10 mmol/L can use basal bolus insulin regime

# Post-operatively

- For T2DM if blood glucose levels are between 6 to 10 mmol/L , can restart OHAs once patients are taking well orally.
- If blood glucose levels are persistently high despite OHA consider insulin
- Make a point to have the latest HbA1c result pre-operatively to assist decision making upon discharge.

# HYPOGLYCEMIA

(Low Blood Glucose)

**Causes:** Too little food or skip a meal; too much insulin or diabetes pills; more active than usual.

**Onset:** Often sudden; may pass out if untreated.

## SYMPTOMS:



SHAKY



FAST HEARTBEAT



SWEATING



DIZZY



ANXIOUS



HUNGRY



BLURRY VISION



WEAKNESS OR FATIGUE



HEADACHE



IRRITABLE

WHAT CAN YOU DO?



CHECK

TREAT



CHECK



**HYPOGLYCEMIA CAN KILL**

# CASE 1



- 50 year old Indian gentleman
- Lorry driver
- T2DM for 10 years on 2 OHAs and a statin
- Heavy smoker
- Admitted for infected right foot abscess

# CASE 1



- Given IV antibiotics but the abscess needing incision and drainage
- Normotensive with regular heart rate
- Peripheral pulses in both feet → not well felt (needing vascular review); reduced sensation in both feet
- In the ward blood glucose → persistently  $\geq 15$ mmol/L (ketones negative)
- Counseled for intensive insulin regime

# CASE 1



- Agreeable for basal bolus regime
- Weight is 85 kg
- Started on SC Actrapid 8u tds and SC Insulatard 16u ON
- After 48 hours he managed to go for incision and drainage
- Post-operatively the patient was negotiating for less injections

# CASE 1



- Potential case of peripheral artery disease and peripheral neuropathy
- Recovering from right foot abscess
- High risk for coronary artery disease
- “High risk” occupation for insulin
- What are your thoughts ?

# CASE 1



- Needs tight glycemic control for wound healing and reducing risk of further complications
- Very important to avoid hypoglycemia especially when he returns to work
- Essential to know his meal patterns to assist decision making on insulin regime
- Cessation of smoking is mandatory



# CASE 1



- In this case newer insulin analogues can be considered
- If agreeable for 4 injections can give novorapid-detemir combination or lispro-lantus combination
- If agreeable for 3 injections can give pre-mixed like Novomix 30/ 70 or Humalog mix 25/75

## CASE 2

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- ◉ 60 year old Malay lady
- ◉ House wife
- ◉ T2DM for 15 years
- ◉ On 2 OHA, 1 bedtime insulin and 1 statin
- ◉ Also on 2 anti hypertensives

## CASE 2

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- Admitted in septicemic shock
- Source of infection was infected L foot ulcer which was noted to be ascending above ankle
- Dstix was high with elevated blood ketones
- ABG showed evidence of metabolic acidosis
- Patient was rehydrated (CVP guide) and insulin infusion was started at 5u per hour ( estimated weight of 50 kg )

## CASE 2

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- Patient needed ventilatory support in ICU
- Vital signs were stable but she needed CVVH
- Eventually decision was made with family members to amputate ( left BKA) as fever persisted and infection appeared to ascend and evidence of foot osteomyelitis
- Patient was stable on insulin infusion 2u per hour (blood glucose between 7 to 11 mmol/L)
- Fever settled 48 hours after left BKA

## CASE 2

- Patient was extubated but requires artificial feeding 3 hourly in view of poor gag reflex
- She was noted to have right hemiparesis ( CT brain showed evidence of left internal capsule infarct )
- She was converted to SC Actrapid 5u 6hourly to complement the 3 hourly feeding
- When she was more stable , she was changed to SC Insulatard 10u bd in preparation for discharge
- Acute on chronic renal impairment improved to creatinine clearance 40 ml/min

## CASE 2

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- If there were issues with 2 injections per day, the patient could be offered basal insulin analogues like Lantus or detimir
- If swallowing assessment permitted the patient to resume oral feeding, Insulatard bd can be changed to Mixtard bd

# SUMMARY

- For peri-operative diabetics, safe targets for blood glucose levels are 6 to 10mmol/L
- Insulin provide the most physiological way of stabilising blood glucose in peri-operative patients