# The after sales services



## After initiation

**Dr Chee Khoo** 

## Hypoglycaemia

**Definition: BSL < 4.0 mmol/L** Types of Hypoglycaemia

- Severe ("Major") Hypoglycaemia
- Minor Hypoglycaemia
- Noctunal hypoglycaemia
- Relative Hypoglycaemia



Impaired Hypoglycaemia Awareness (IAH)

What are the initial symptoms of hypoglycaemia? Sympathetic/Adrenergic/Autonomic Pale Sweating Hunger **Palpitations** Anxiety Shakes Tremor

## What are the *later* symptoms of hypoglycaemia?

Neuroglycopaenic Irritable Weakness Confusion Poor concentration **Blurred vision** Coma Death



## hypoglycaemia unawareness – a better term?

### Impaired awareness of hypoglycaemia

- Define as a diminished ability to perceive the <u>onset</u> of acute hypoglycaemia
- Clinical assessment should be based on subjective experience when <u>awake</u>
- Syndrome may include reduced symptom intensity and number, altered symptom profile, and/or failure to interpret symptoms
- Preferred terminology to "hypoglycaemia unawareness"

Frier. In: Hypoglycaemia in Clinical Diabetes. 3rd ed, Frier, Heller, McCrimmon, Eds. 2014; pp114–44

## Hypoglycaemia

## Effect of antecedent (episodic) hypoglycaemia on responses to subsequent hypoglycaemia



Diabetes 3° ed. Wiley-Blackwell 2014, pp 114-144

4. McCrimmon, Diabet Med 2017; 34: 148-55



## Patient Effects

Falls, Fractures & other injuries Driving and licencing issues Care issues Independence issues Treatment compliance



Physician Effects HbA1c target Interpreting HbA1c Medico-legal issues Carers involvement CV risk assessment

## More consequences

# Cognitive function in adults with type 1 diabetes with and without impaired awareness of hypoglycaemia

Edinburgh, Scotland: Adults with T1D and IAH performed less well with cognitive function tests, both at normoglycaemia and during hypoglycaemia<sup>1</sup>

Population study showed modest decline in intellectual function was associated with increasing IAH<sup>2</sup>

<u>Trondheim, Norway</u>: battery of cognitive tests applied to matched groups with and without IAH (n=33 in each group); IAH - history of more severe hypoglycaemia but similar diabetic complications

Participants with IAH had lower scores on:

- Lower verbal and object-location tests
- Pattern separation test
- Planning ability task (p=NS)

Impaired awareness of hypoglycaemia was associated with diminished learning, memory and pattern separation<sup>3</sup>; subtle deficits may represent impaired function of hippocampus

1. Hepburn et al., *Diabet Med* 1991; 8: 934–45; 2. MacLeod et al., *Diab Nutrition Metab* 1994; 7: 205–12; 3. Hansen et al., *Diabetes Care* 2017; 60: 971–9

## We expect hyperglycaemia to have adverse effects...





IL: Interleukin; NO: Nitric oxide; PKC: Protein kinase C; TNF: Tumour necrosis factor; VCAM: Vascular cell adhesion

## What about effects of hypoglycaemia?



hsCRP: high sensitive C-reactive protein; ICAM: Intercellular adhesion molecule; IL: Interleukin; tPA: tissue plasminogen activator; sCD40L: soluble CD40 Ligand; vWF: von Willebrand Factor; VCAM: Vascular cell adhesion molecule; VEGF: Vascular Endothelial Growth Factor

## **Blood vessels effects**

## Hypoglycaemia affects microvascular flow and function



## Hot off the press.

12 individuals with T2D and 11 matched controls Evaluate the effects of hypoglycemia on thrombosis risk and inflammation.

- In patients with T2D, following one episode of hypoglycaemia:
- Clot lysis times and clot maximum absorbance increased up to day 7
- Fibrinogen and complement C3 increased

"...enhanced prothrombotic effects of hypoglycemia in individuals with type 2 diabetes, suggesting potential mechanisms for increased risk for cardiovascular mortality"

Diabetes Care 2018 Oct;

## Who is more likely to get hypoglycaemia?

Previous hypoglycaemia High HbA1c Hypoglycaemic agents including SU **Renal impairment** Autonomic dysfunction Advanced T2D Polypharmacy Sepsis







## Impaired Awareness of Hypoglycaemia – who do you suspect?

Previous hypos Frequent Hypos Glucose variability HbA1c "too good" Elderly Beta blockers Neurotropic drugs Opioids



## Management

- High index of suspicion ask the patient or carer
- Ask for a glucose profile & correlate HbA1c with glucose profile
- Look for nocturnal hypoglycaemia
- Loosen tight control & individualise HbA1c target
- Choose the right insulin regimen
- Consider a GLP1- RA injectable
- Look for sepsis
- Medication review?

## Acute Management of Hypoglycaemia Episode

## **Check for patient safety - Rule of 15**

#### 1. 15 g of quick-acting carbohydrate that is easy to consume

- half a can of regular <u>non-diet</u> soft drink
- half a glass of fruit juice
- three teaspoons of sugar or honey
- six or seven jellybeans
- three glucose tablets

2. Wait 15 minutes and repeat blood glucose– if the level is not rising, need more carbs (from the above list)

#### 3. Longer acting carbohydrate if next meal is more than 15 mins away

- Sandwich
- One glass of milk or soy milk;
- One piece of fruit; 2-3 pieces of dried apricots, figs or other dried fruit;
- One tub of natural lowfat yoghurt;
- six small dry biscuits and cheese

#### 4. Test glucose every 1-2 hours for the next 4 hours.

## **Acute Management of Hypoglycaemia Episode**

#### **Check for patient safety**

- If unable to safely swallow or is unconscious, then administer 1 g glucagon imi or sci into thigh, buttock or arm
- If no glucagon is available, call for emergency medical assistance

## **In summary**

- Hypoglycaemia is not uncommon in patients on hypoglycaemic agents including insulin and sulphonyurea
- Detecting hypoglycaemia requires high index of suspicion
- Correlating HbA1c readings with glucose profile may uncover hypoglycaemia
- Patients with impaired hypoglycaemia awareness (IAH) are more likely to suffer the harmful consequences of hypoglycaemia
- There are subgroup of patients that are more likely to suffer from IAH
- Hypoglycaemia has both short term and long term consequencess
- Hypoglycaemia leads to major management changes for patients, their carers and the physician

## **Driving, Diabetes and the GP**

What are the issues What can GP sign off What can't GP sign off

**Dr Hamish Russell** 





## Assessing Fitness to Drive

for commercial and private vehicle drivers



Medical standards for licensing and clinical management guidelines a resource for health professionals in Australia October 2016

#### www.austroads.com.au

#### Figure 2: Relationships/interaction between patients/drivers, health professionals and the driver licensing authority (DLA)



Health professionals and DLAs do not normally communicate directly with each other, which protects patient confidentiality. However, with the driver's consent, DLAs may communicate with health professionals when clarification or further information is required in order to make a licensing decision. Health professionals may communicate directly with the DLA where patients who are known to be an imminent risk to road safety continue to drive contrary to repeated advice.

Some states/territories have mandatory reporting that requires doctors to report drivers with medical conditions likely to affect public safety.

## **Reporting responsibilities**

Patients should be made aware of the effects of their condition on driving and should be advised of their legal obligation to notify the driver licensing authority where driving is likely to be affected. The health professional may themselves advise the driver licensing authority as the situation requires (refer to pages 17 and 31).

Advise the patient that diabetes can affect their driving and advise that they inform the Roads and Maritime Service of their Diabetes.....

#### Figure 1: The driving task



#### 3.1.1 Effects of diabetes on driving

Diabetes may affect a person's ability to drive, either through a 'severe hypoglycaemic event' or from end-organ effects on relevant functions, including effects on vision, the heart and the peripheral nerves and vasculature of the extremities, particularly the feet. In people with type 2 diabetes, sleep apnoea is also more common (refer to section 8 Sleep disorders). The main hazard in people with insulin-treated diabetes is the unexpected occurrence of hypoglycaemia.

# Crash Risk in Drivers with Diabetes

- Tregear et al, 2011
  - Meta-analysis of 15 studies
    - Drivers with diabetes at 12-19% increased risk of crash compared with general population
    - i.e risk of 1.12-1.19 x

Monash University Accident Research Centre. Influence of chronic illness on crash involvement of motor vehicle drivers. 2<sup>nd</sup> edition, Nov 2010 ECRI. Diabetes and Commercial Motor Vehicle Safety, Plymouth Meeting, ECRI, 2011

# Is someone with diabetes ok to drive?

- Main concern is of hypos.
- Are they following a treatment plan that minimises the risk of hypoglycaemia?
- Recent severe hypoglycaemic episode?
- Reduced awareness of hypoglycaemia?
- Comorbidities and end- organ complications?
- Risk of driving with hyperglycaemia ??? risk (but should not be counselled to not drive if acutely unwell with unstable diabetes)

The Effects of Hypoglycaemia on Functional Abilities required for Driving

• Slower reaction time

## BSL < 3.6

- Slowed speed of performance in complex tasks
- Slowed speed of visual information processing
- Difficulty in rapid decision making
- Difficulty with sustained attention
- Difficulty with analysis of complex visual stimuli
- Impaired hand-eye coordination
- Impaired visual contrast sensitivity
- Difficulty with control of anger and irritability

# Navigating the guidelines

- Private vs Commercial ?
- Tablets vs Insulin ?
- Conditional or Unconditional Licence?

#### **Driver's Licencing**



## **Diet and Exercise only**



## **Non-insulin therapy**



### **Insulin therapy**



# Severe hypoglycaemia and driving

- 80% of episodes of severe hypoglycaemia affect ~ 20% of drivers with T1DM
- Only a small subgroup of drivers with T1DM account for majority of hypoglycaemia-related collisions

# Prevention of a severe hypoglycaemic event whilst driving- advice to patients

- complying with general medical review requirements as requested by their general practitioner or specialist
- not driving if their blood glucose is at or less than 5 mmol/L
- not driving for more than two hours without considering having a snack
- not delaying or missing a main meal
- self-monitoring blood glucose levels before driving and every two hours during a journey, as reasonably practical
- carrying adequate glucose in the vehicle for self-treatment
- treating mild hypoglycaemia if symptoms occur while driving including
- safely steering the vehicle to the side of the road
- turning off the engine and removing the keys from the ignition
- self-treating the low blood glucose
- checking the blood glucose levels 15 minutes or more after the hypoglycaemia has been treated and ensuring it is above 5 mmol/L (see Patient information on page 66)
- not recommencing driving until feeling well and until at least 30 minutes after the blood glucose is above 5 mmol/L.

# NDSS, Diabetes Australia





#### **Diabetes and Driving**



The National Diabetes Services Scheme (NDSS) is an initiative of the Australian Government administered by Diabetes Australia.

Stay 'above 5' at all times when driving

Carry a form of glucose on you and in the vehicle at all times

Test blood glucose before driving a vehicle and at least 2 hourly on long trips

If a hypo occurs, pull over safely and immediately treat it

Understand the interaction between insulin, and other glucose lowering medications, food and activity

Advise your Driving Licence Authority of your diabetes

Regularly consider your fitness to drive safely

Be a safe driver – consider the safety of your passengers, other road users and yourself





# Non-driving period after a severe hypo

#### Non-driving period after a 'severe hypoglycaemic event'

If a severe hypoglycaemic event occurs (as defined in section 3.2.1 Hypoglycaemia), the person should not drive for a significant period of time and will need to be urgently assessed. The minimum period of time before returning to drive is generally **six weeks** because it often takes many weeks for patterns of glucose control and behaviour to be re-established and for any temporary 'reduced awareness of hypoglycaemia' to resolve (see below). The non-driving period will depend on factors such as identifying the reason for the episode, the specialist's opinion and the type of motor vehicle licence. The specialist's recommendation for return to driving should be based on patient behaviour and objective measures of glycaemic control (documented blood glucose) over a reasonable time interval.

# 6 weeks off driving and then reassess...





#### Driving and recent severe hypoglycaemia

This sheet has been given to you by your health care professional because you have had a recent episode of severe hypoglycaemia (severe hypo). This can be life threatening for you, your passengers and other road users. The information is important to you because you drive a motor vehicle.

#### What is a severe hypo?

A severe hypo is a hypo that someone else has to help you to treat – either because you don't recognise the hypo or by the time you do, you aren't able to treat yourself. A severe hypo happens when low blood glucose affects brain function, your concentration, co-ordination or level of consciousness.

Having a recent severe hypo means you are at risk of further episodes, especially in the next few weeks. Severe hypoglycaemia is serious, especially when it occurs during driving. If it happens while you are driving, you could cause a motor vehicle crash.

#### What do you need to do?

#### 1. Stop driving

Wait until you have clearance to drive from your doctor (as per Assessing Fitness To Drive - www.austroads.com.au/aftd).

2. Thoroughly review your blood glucose testing and / or your diabetes treatment

Your doctor, dietitian and diabetes educator will help you with this. With them, you need to consider factors that may have contributed to the severe hypo, such as not enough carbohydrate or missing a meal, physical activity, alcohol intake, inadequate blood glucose testing and your diabetes treatment.

#### 3. Determine with your doctor whether you have "reduced hypoglycaemia awareness"

This means you do not always get enough early warning of hypos to treat them before they become severe hypos. Your doctor will advise you on how "reduced hypoglycaemia awareness" is managed. Importantly, you will need to do regular blood glucose checks and treat any low blood glucose levels, even if you feel fine.



To stay safe on the road – remember to ALWAYS

Check your blood glucose level before driving and every 2 hours during driving to ensure it is 5 mmol/L or more – 'Above 5 to drive'.

Carry fast acting carbohydrates eg. jelly beans on you and in your vehicle to treat any blood glucose levels below 5.

Take your blood glucose meter with you in your vehicle when you drive.

Treat mild hypoglycaemia urgently:

- > Steer safely to side of the road
- > Turn off the engine
- > Remove the keys from the ignition
- > Test your blood glucose
- > Treat the hypo with appropriate glucose and food
- > Recheck blood glucose after 15 minutes
- > Wait at least another 30 minutes before driving.
- > Only drive if you feel well and your blood glucose is above 5

If you experience a further severe hypo - whether or not it is associated with driving - notify your doctor as soon as possible so that you can receive further specialist care.

Patient Name	Signature	and date
This material is provided by your health care professional (		) on date
(it is suggested that a copy of this document be kept in the patient's medical file)		Published August 201