Older adult 2: Grandad

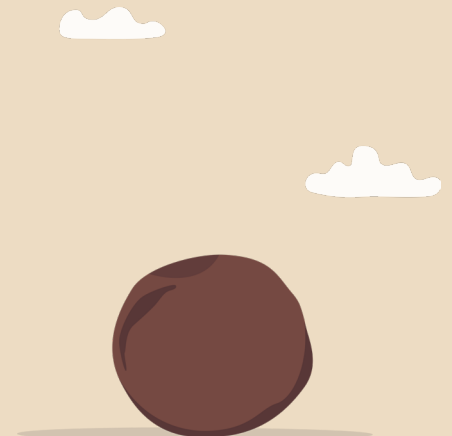Su Down | July 2025

Disclaimer/disclosure

Su Down

Diabetes Nurse Consultant, Somerset

Committee member, PCDOS

Disclosures: Over the last 3 years I have received funding for providing educational sessions and documents from the following: Abbott, Boehringer Ingelheim, Dexcom, Lilly, Novo Nordisk, Sanofi, Viatris,
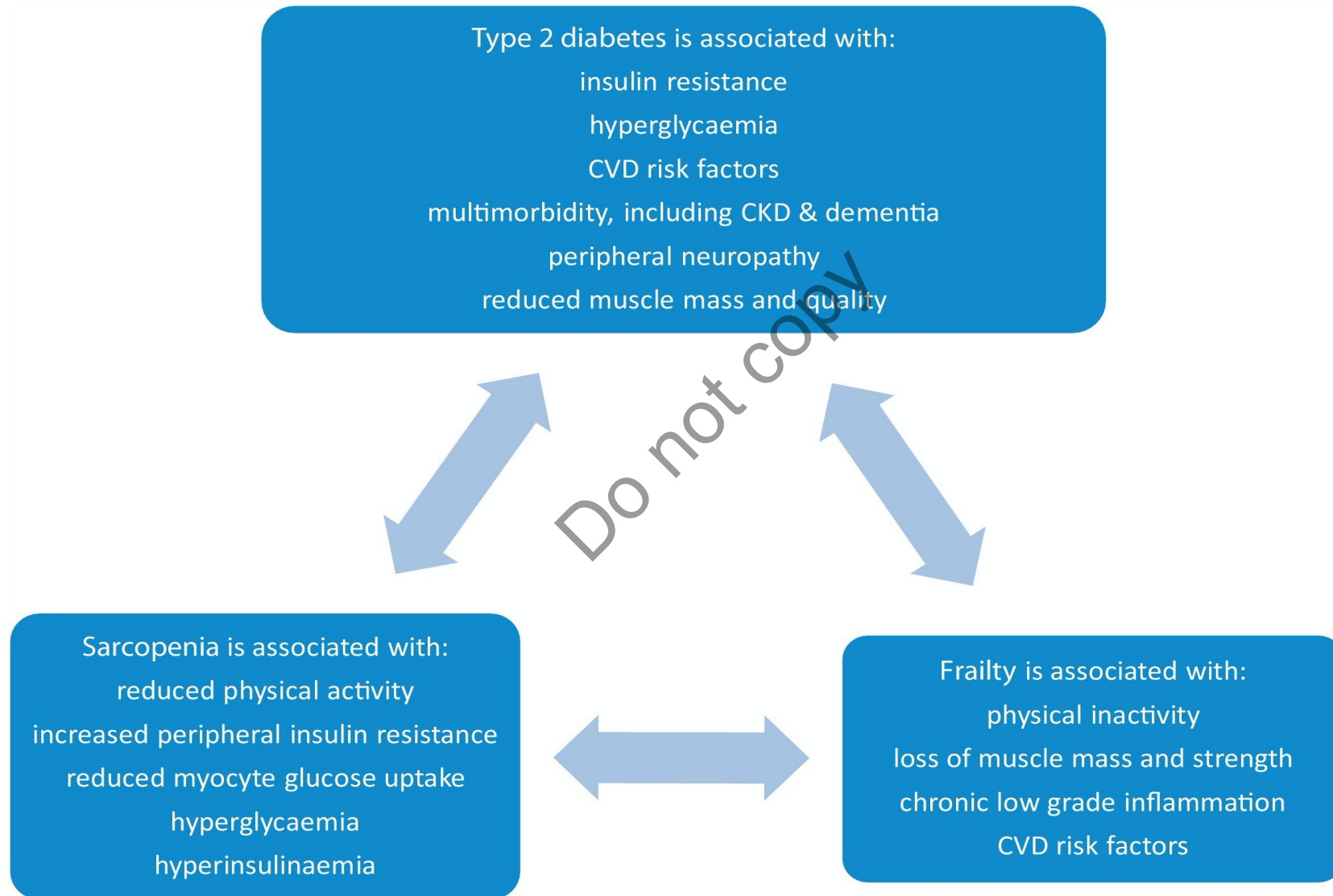
Frailty, CGM, Deprescribing, Polypharmacy

Diabetes is associated with an accelerated ageing process that promotes frailty

- Those with diabetes are up to 5x more likely to be frail

- Frailty and poor physical function overlap with obesity

- The importance of frailty in the management of type 2 diabetes in increasingly recognised

- In a systematic review of observational population-based studies, frailty is associated with a **poor survival** in a dose-response manner

Ahmed E et al. Diabetology. 2022; 3(1): 30-45.

Strain WD, et al. Diabetes Therapies. 2021; 12(5): 1227-1247

Sinclair AJ et al. Lancet Healthy Longev. 2021; 2(11): e683-e684

The triad of diabetes, sarcopenia and frailty creates a vicious cycle

Type 2 diabetes is associated with:

insulin resistance

hyperglycaemia

CVD risk factors

multimorbidity, including CKD & dementia

peripheral neuropathy

reduced muscle mass and quality

Sarcopenia is associated with:
reduced physical activity
increased peripheral insulin resistance
reduced myocyte glucose uptake
hyperglycaemia
hyperinsulinaemia

Frailty is associated with:
physical inactivity
loss of muscle mass and strength
chronic low grade inflammation
CVD risk factors

Maintaining muscle mass is important for healthy ageing

Sarcopenia contributes to frailty [1]

Additional contributing factors:

- Poor nutrition, dentition
- Low physical activity
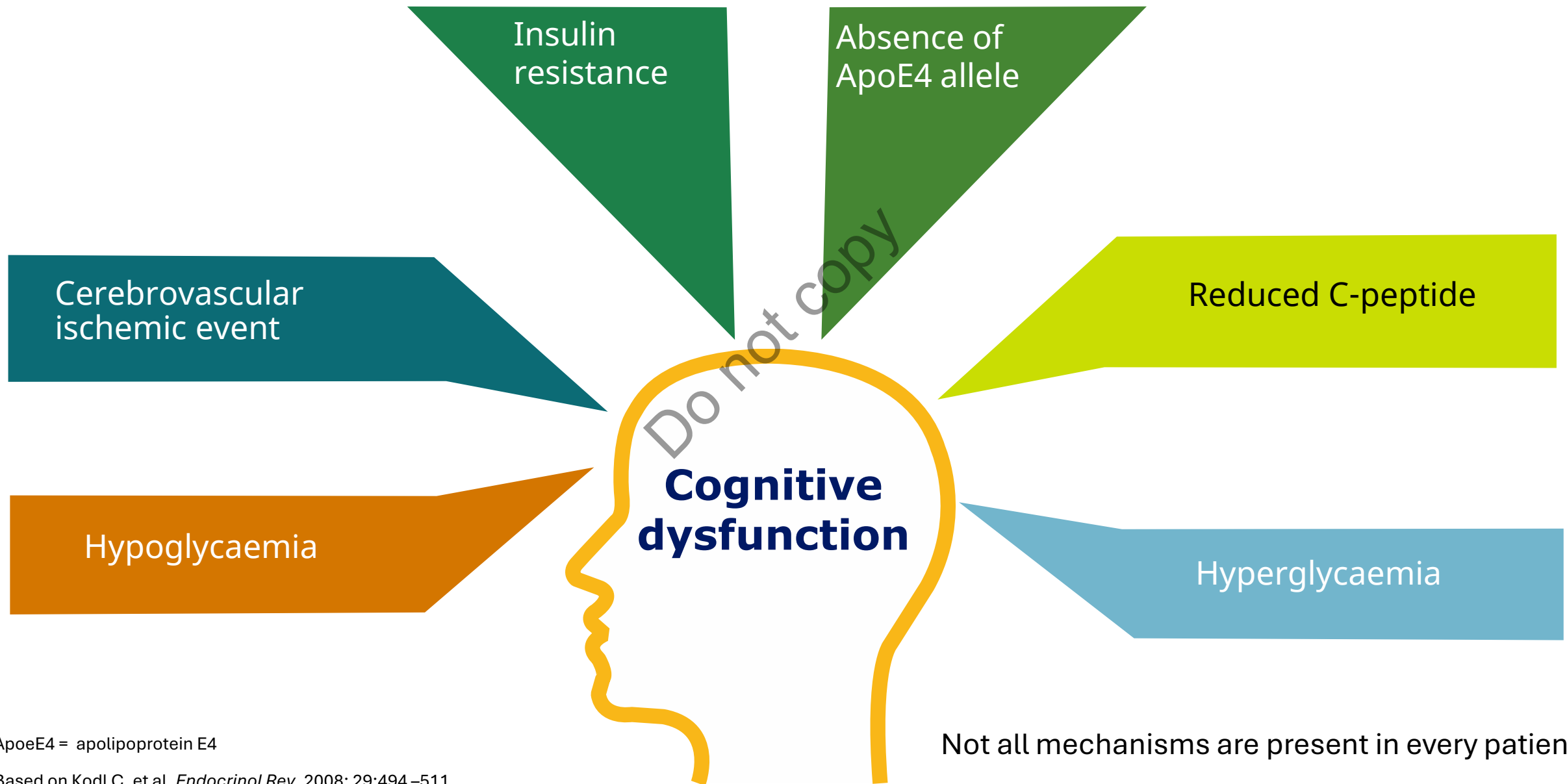- Complex relationship with weight [2,3]
- Hyper and hypoglycaemia [4]

1. Krentz, A. J. et al (2013) *Diabetic Medicine*, 30(5), pp. 535–548. doi: 10.1111/dme.12063.
2. Hubbard, RE et al (2010). *Journal of Gerontology Medical Sciences*, 65(4), 377–381. http://doi.org/10.1093/gerona/glp186
3. Mezuk et al (2016). *Obesity*, 24(8), 1643–1647. http://doi.org/10.1002/oby.21572
4. Abdelhafiz, A. H. et al (2015) *Aging and Disease*, 6(2), pp. 156–67. doi: 10.14336/AD.2014.0330

Pathophysiology – diabetes and dementia

Insulin resistance

Absence of ApoE4 allele

Cerebrovascular ischemic event

Reduced C-peptide

Hypoglycaemia

Cognitive dysfunction

Hyperglycaemia

ApoeE4 = apolipoprotein E4

Not all mechanisms are present in every patient

Based on Kodl C, et al. *Endocrinol Rev*. 2008; 29:494 –511.
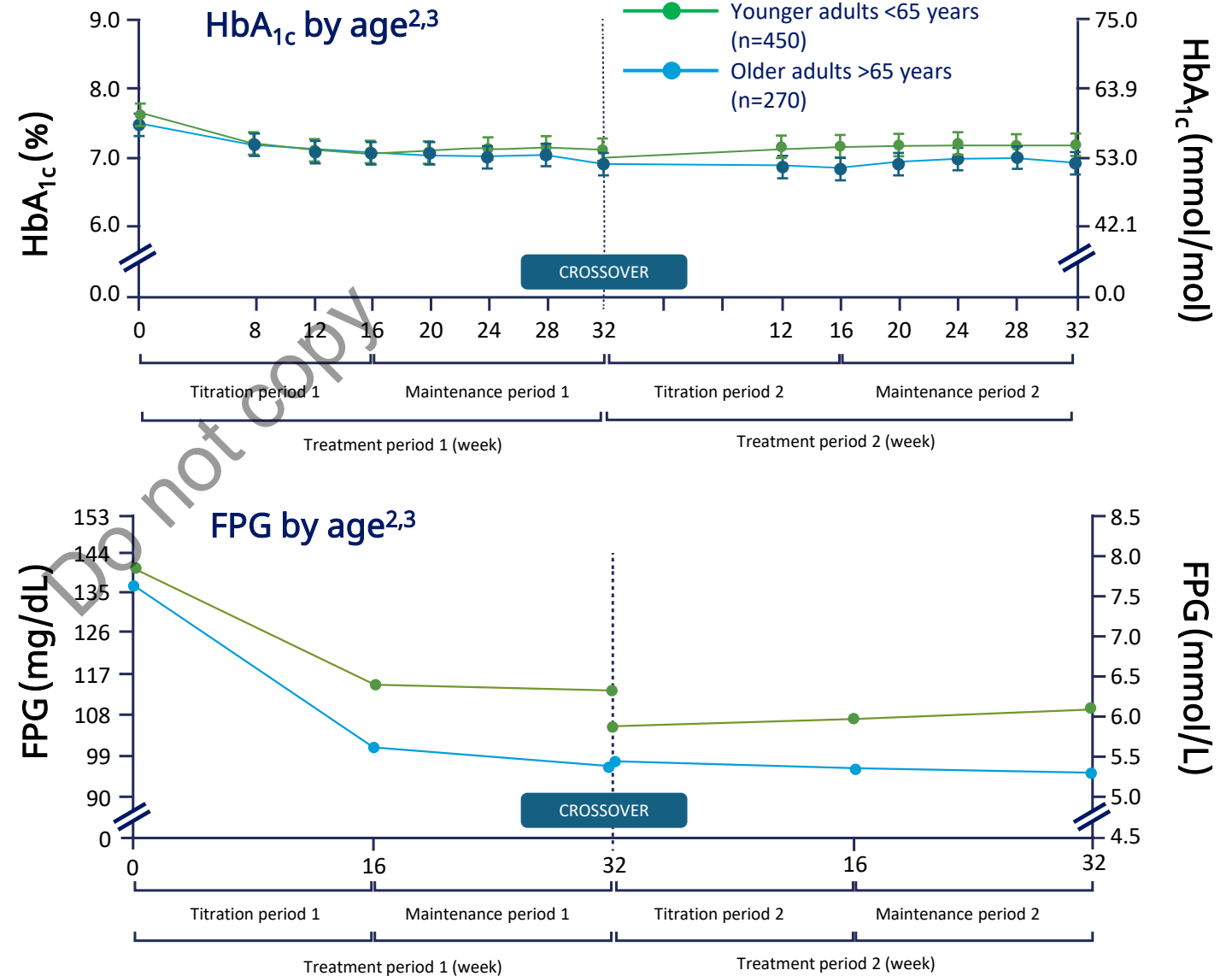
HbA$_{1c}$ differs for older adults

Possible explanation

Older vs younger adults

Lower red blood cell (RBC) count[1]
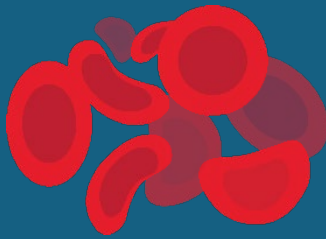
Cell membranes more friable and prone to glycosylation[1]

HbA$_{1c}$ by age[2,3]

— Younger adults <65 years (n=450)
— Older adults >65 years (n=270)

HbA$_{1c}$ (%): 9.0, 8.0, 7.0, 6.0, 0.0
HbA$_{1c}$ (mmol/mol): 75.0, 63.9, 53.0, 42.1, 0.0

CROSSOVER

Weeks: 0, 8, 12, 16, 20, 24, 28, 32 | 12, 16, 20, 24, 28, 32

Titration period 1 | Maintenance period 1 | Titration period 2 | Maintenance period 2
Treatment period 1 (week) | Treatment period 2 (week)

FPG by age[2,3]

FPG (mg/dL): 153, 144, 135, 126, 117, 108, 99, 90, 0
FPG (mmol/L): 8.5, 8.0, 7.5, 7.0, 6.5, 6.0, 5.5, 5.0, 4.5

CROSSOVER

Weeks: 0, 16, 32 | 16, 32

Titration period 1 | Maintenance period 1 | Titration period 2 | Maintenance period 2
Treatment period 1 (week) | Treatment period 2 (week)

FPG, fasting plasma glucose; HbA$_{1c}$, glycated haemoglobin

1 Kubota K et al. Nihon Ronen Igakkai Zasshi 1991;28(4):509–14; 2. Presented at ADA 2018, S.R. Heller et al abstract: 107-OR. 3. Heller et al. *Diabetes Obes Metab* 2019;21:1634-1641.

Hypoage Study –

Diabetes overtreatment and hypoglycaemia in older adults with type 2 diabetes on insulin therapy

Aims

To assess the accuracy of 'diabetes overtreatment' proxy definitions in predicting hypoglycaemia in older adults living with type 2 diabetes

Methods

- >65 years (134)
- type 2 diabetes, insulin treated
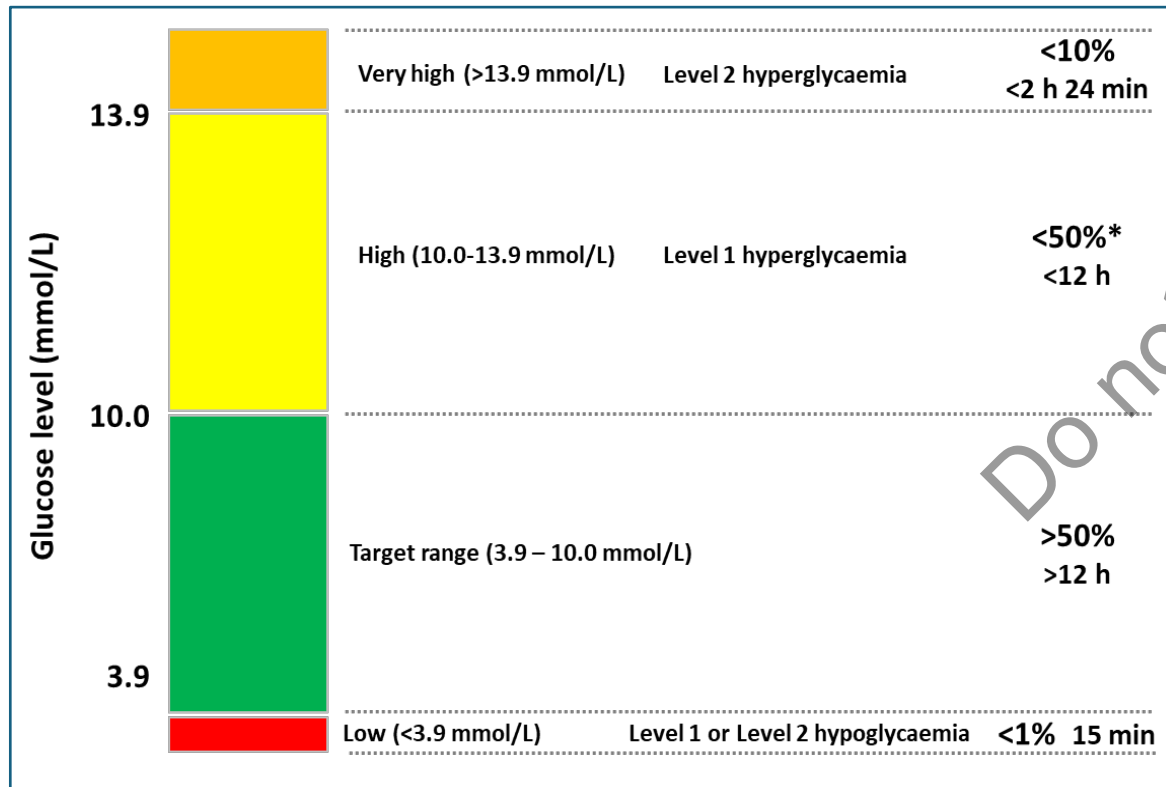- 28 days CGM

Definitions of 'Diabetes overtreatment'
a)   FIXED HbA1c <53mmol/mol
b)   INDIVIDUALISED HbA1c <53 - <58 - <64mmol/mol depending on frailty status (mild/moderate/severe)

Primary outcome Time below range (TBR) >1%

Do not copy

Conclusion

Proxy definitions of diabetes overtreatment poorly predict hypoglycaemia.
A new Proxy definition of diabetes overtreatment is needed

Targets for older people with type 1 or type 2 diabetes and those at high-risk from hypoglycaemia

Glucose level (mmol/L)

Very high (>13.9 mmol/L)	Level 2 hyperglycaemia	<10%	
		<2 h 24 min	
High (10.0-13.9 mmol/L)	Level 1 hyperglycaemia	<50%*	
		<12 h	
Target range (3.9 – 10.0 mmol/L)		>50%	
		>12 h	
Low (<3.9 mmol/L)	Level 1 or Level 2 hypoglycaemia	<1%	15 min

13.9
10.0
3.9

THINKING ABOUT INDIVIDUAL TARGETS

Emphasise the need to **prioritise hypoglycaemia avoidance, reducing the %TBR <3.9 mmol/L**

Recommendation is to keep %TBR <3.9mmol/L to **<1% or 15 min per day**

High risk

* Readings >13.9 mmol/L are also included in the <50% target

Images are for illustrative purposes only. Not real patient data.
1. Battelino T, Danne T, Bergenstal RM, et al. Clinical targets for continuous glucose monitoring data interpretation: recommendations from the international consensus on time in range. Diabetes Care. (2019);42(8):1593-1603.

Estimate of HbA1c for a given TIR level

Data from randomized clinical trials involving adults with Type 1 or Type 2 diabetes have shown that TIR is correlated with laboratory-measured HbA1c.

TIR	ANALYSIS BY BECK ET AL[1] HbA1c CORRELATE % (mmol/mol)	ANALYSIS BY VIGERSKY ET AL[2] HbA1c CORRELATE % (mmol/mol)
90 %	6.0 (42)	5.1 (32)
80 %	6.5 (48)	5.9 (41)
70 %	7.0 (53)	6.7 (50)
60 %	7.4 (57)	7.5 (58)
50 %	7.9 (63)	8.3 (67)
40 %	8.4 (68)	9.0 (75)
30 %	8.9 (74)	9.8 (84)
20 %	9.4 (79)	10.6 (92)

Every 5% (~1 hour 12 mins per day) increase in Time in Range is associated with clinically significant benefits[3]
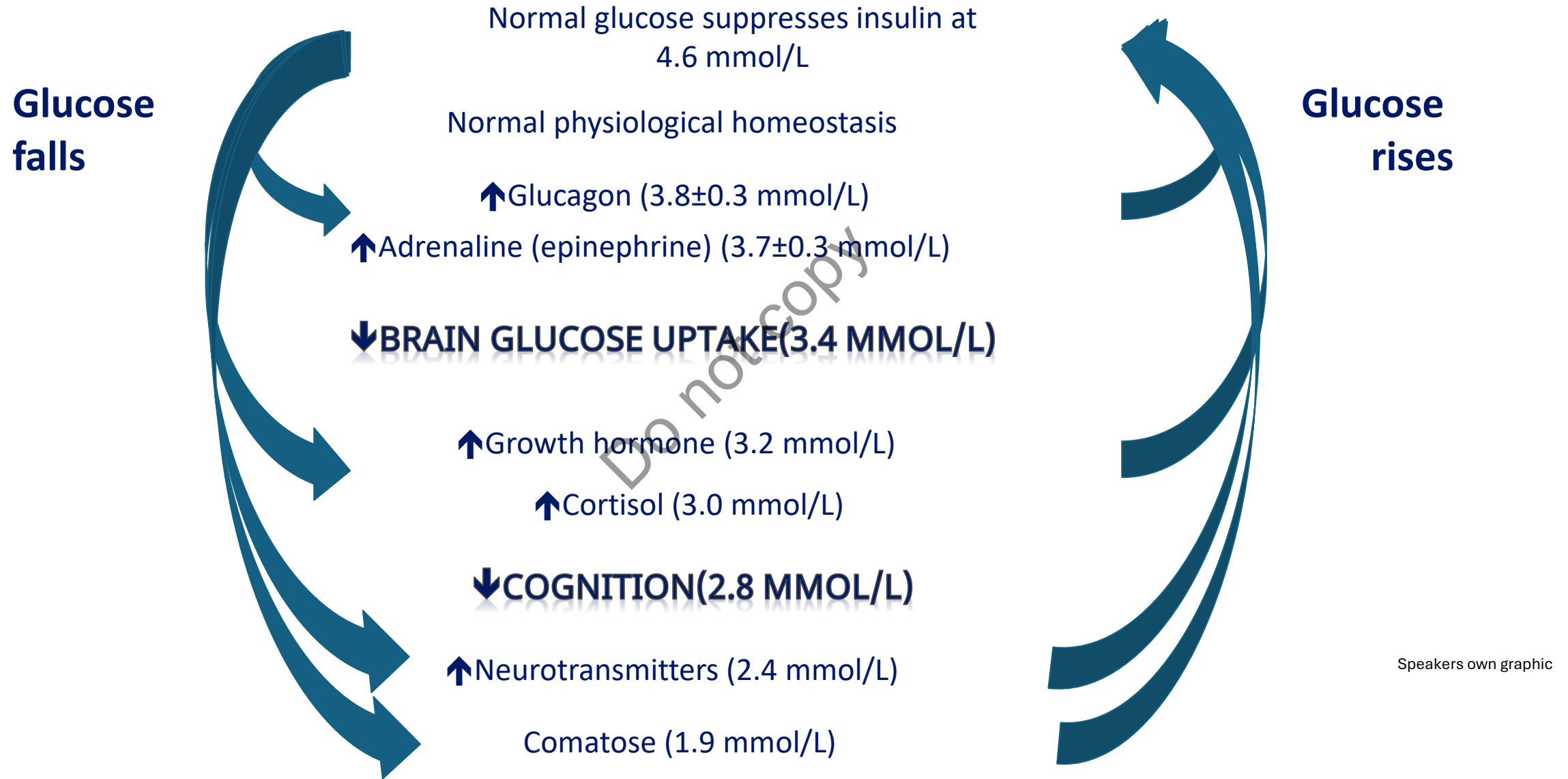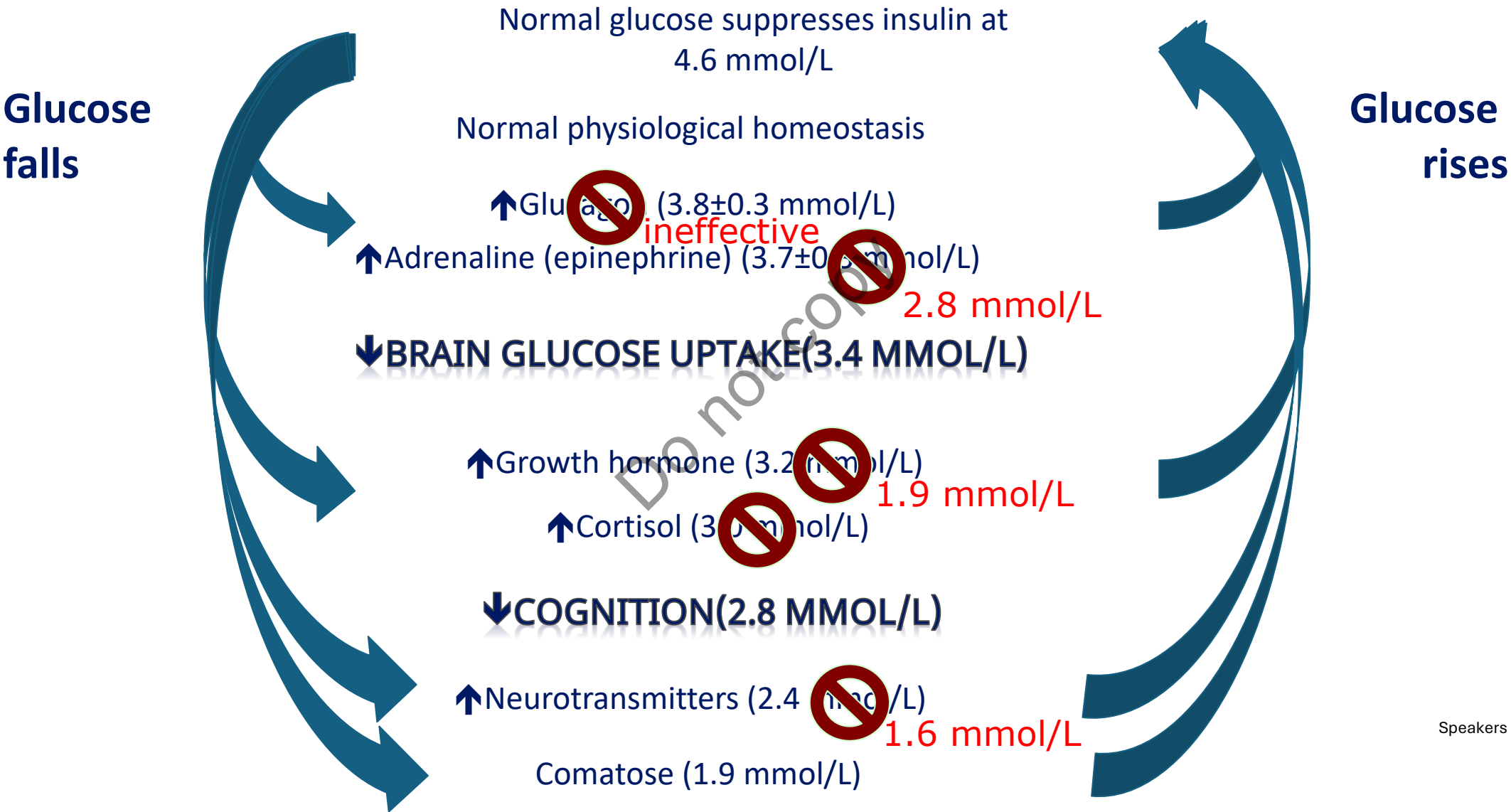
THE RELATIONSHIP BETWEEN TIR AND HbA1c[1]
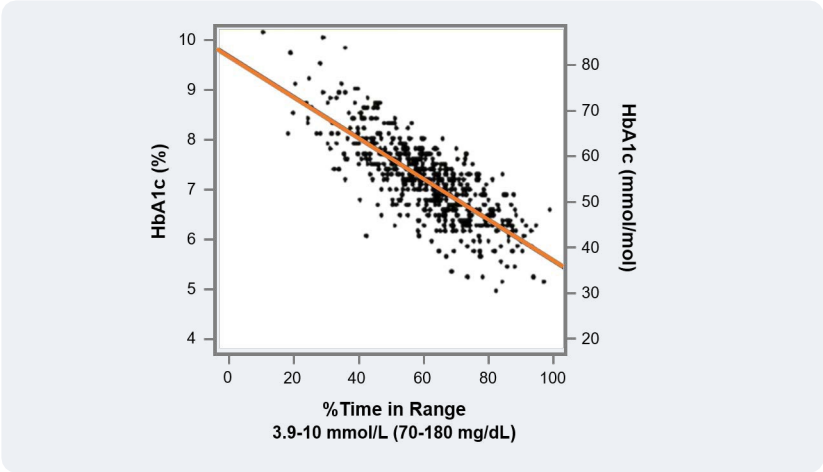
Key insights

- There is an **inverse correlation** –as TIR increases, HbA1c decreases
- Although highly correlated, a wide range of HbA1c values can be associated with a specific TIR and vice versa

* Correlations of %TIR with HbA1c for target glucose range 3.9-10 mmol/L (70-180 mg/dL). Analysis by Beck et al is based on data in T1D, analysis by Vigersky & McMahon includes data in T1D and T2D
1. Beck RW, et al. J Diabetes Sci Technol. 2019; 13:614-626. **2.** Vigersky RA and McMahon C. Diabetes Technol Ther. 2018; 21:81–85. **3.** Battelino T, et al. Diabetes Care. (2019);42(8):1593-1603.

The physiology of hypos

Normal glucose suppresses insulin at 4.6 mmol/L

Normal physiological homeostasis

↑Glucagon (3.8±0.3 mmol/L)

↑Adrenaline (epinephrine) (3.7±0.3 mmol/L)

↓BRAIN GLUCOSE UPTAKE(3.4 MMOL/L)

↑Growth hormone (3.2 mmol/L)

↑Cortisol (3.0 mmol/L)

↓COGNITION(2.8 MMOL/L)

↑Neurotransmitters (2.4 mmol/L)

Comatose (1.9 mmol/L)

Glucose falls

Glucose rises

Speakers own graphic

Zammitt NN and Frier BM. *Diabetes Care*. 2005;28:2948–61.

The physiology of hypos

Normal glucose suppresses insulin at 4.6 mmol/L

Normal physiological homeostasis

↑Glucagon (3.8±0.3 mmol/L) ineffective

↑Adrenaline (epinephrine) (3.7±0.1 mmol/L) 2.8 mmol/L

↓BRAIN GLUCOSE UPTAKE(3.4 MMOL/L)

↑Growth hormone (3.2 mmol/L) 1.9 mmol/L

↑Cortisol (3.0 mmol/L)

↓COGNITION(2.8 MMOL/L)

↑Neurotransmitters (2.4 mmol/L) 1.6 mmol/L

Comatose (1.9 mmol/L)

Glucose falls

Glucose rises

Speakers own graphic

Zammitt NN and Frier BM. *Diabetes Care*. 2005;28:2948–61.

Symptoms of hypoglycaemia are non-specific in older people

Autonomic:[1]

Palpitations

Sweating

Anxiety

Neuroglycopenic:[1]

Fatigue   Irritability

Confusion   Dizziness

Drowsiness   Coma

Particularly in older people (≥ 70 years):[2]

Unsteadiness

Light-headedness

All these are also common in older people without diabetes

1. Deary IJ et al. *Diabetologia*. 1993;36:771–77; 2. Jaap AJ et al. *Diabet Med*. 1998;15:398–401.

THE 4S PATHWAY

International Geriatric Diabetes Society 2025

SEEK TRIGGERS – look for signs, symptoms or factors that should act as triggers to re-evaluate treatment goals and strategies

SHARED DECISION MAKING – with the person or their care partner

SET OR RESET GOALS – which are individualised and take into account preferences and values

ensure SIMPLER AND SAFER TREATMENT – (avoiding hypoglycaemia)

Areas of Concern – possible 'triggers'

Elderly living alone

- Falls
- Poor nutrition/Medication compliance
- Declining renal function
- Long overnight fasts

Care provided by district nursing or social care services

- Timing of medication/taking of medication
- Diet

Inpatient care, Nursing and Residential homes

- Timing of medication
- Steady decline in weight and HbA1c levels no reduction in medications

This slide presents the speakers professional expertise

Assessing for frailty

Rockwood Clinical Frailty Scale
(Non-diabetes specific)

1 Very Fit – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2 Well – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.

3 Managing Well – People whose **medical problems are well controlled**, but are **not regularly active** beyond routine walking.

4 Vulnerable – While **not dependent** on others for daily help, often **symptoms limit activities**. A common complaint is being "slowed up", and/or being tired during the day.

5 Mildly Frail – These people often have **more evident slowing**, and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6 Moderately Frail – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

7 Severely Frail – Completely dependent for personal care, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8 Very Severely Frail – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9. Terminally Ill - Approaching the end of life. This category applies to people with **a life expectancy <6 months**, who are **not otherwise evidently frail.**

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal. In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting. In **severe dementia**, they cannot do personal care without help.

How did we find the elderly frail at hypo risk?

Simple audits of practice registers can find those at risk:

- Over 75 on SU and/or insulin with HbA1c <58
- All patients on SU and/or insulin with HbA1c <58
- All those on SU over 80 years age

- Greater than 1% Time Below Range on CGM

The easy-to-do audit series
Glycaemic control in older people with type 2 diabetes

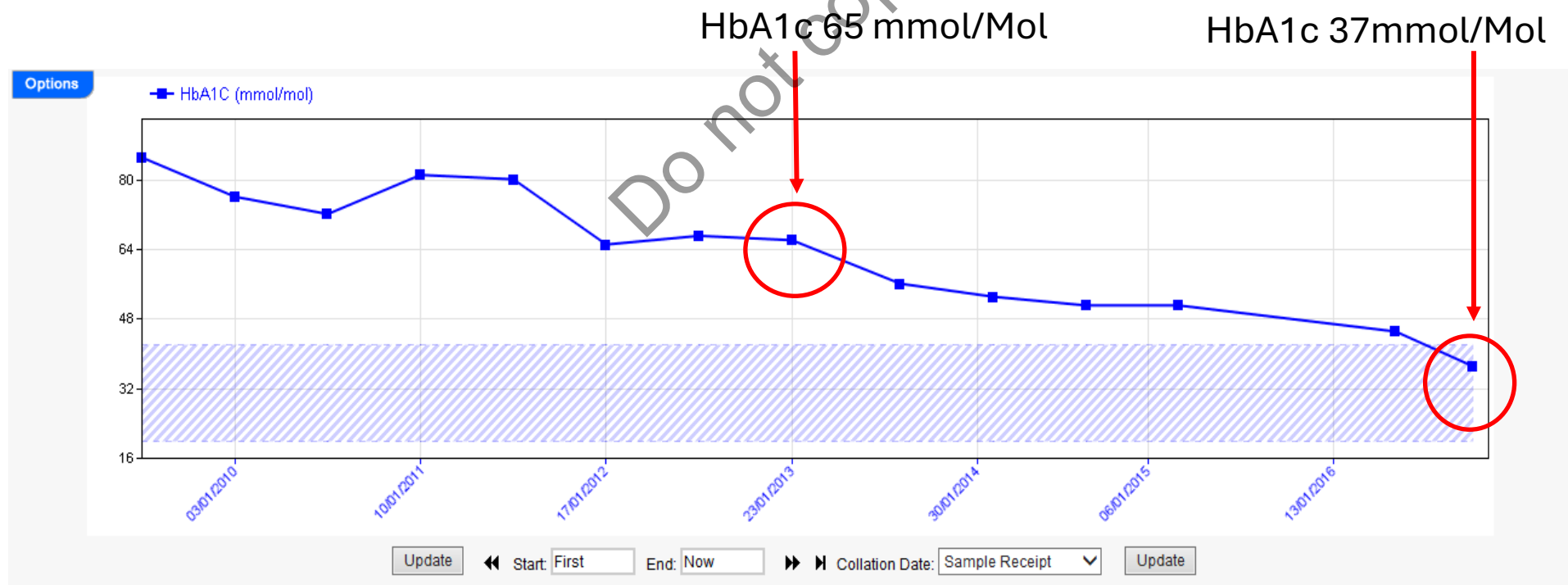| Instructions to complete the audit |
|---|
| **Aim** |
| The aim of the audit is to review the glycaemic targets of older people with type 2 diabetes. |
| **Audit method** |
| This will be a two-step completed audit to be carried out in primary care centres in the UK. The first data collection will be done between 1st May and 30th June 2016, and a follow-up data collection will be completed 6 months later to allow for appropriate interventions at the local or practice level to be put in place and take effect. |
| **Criterion** |
| People who are 70 years of age or above with type 2 diabetes must not have an HbA1c less than 53 mmol/mol (7%). |
| **Standard** |
| A 90% target is to be considered to allow for non-attendance, death, relocation of patients and difficult-to-reach patient groups. |
| **N.B**. Set a reminder on the practice's electronic calendar to repeat the audit 6 months later |

Diabetes & Primary Care. 2016; 18/2: 18-20

Meet George - referred after multiple ambulance call outs

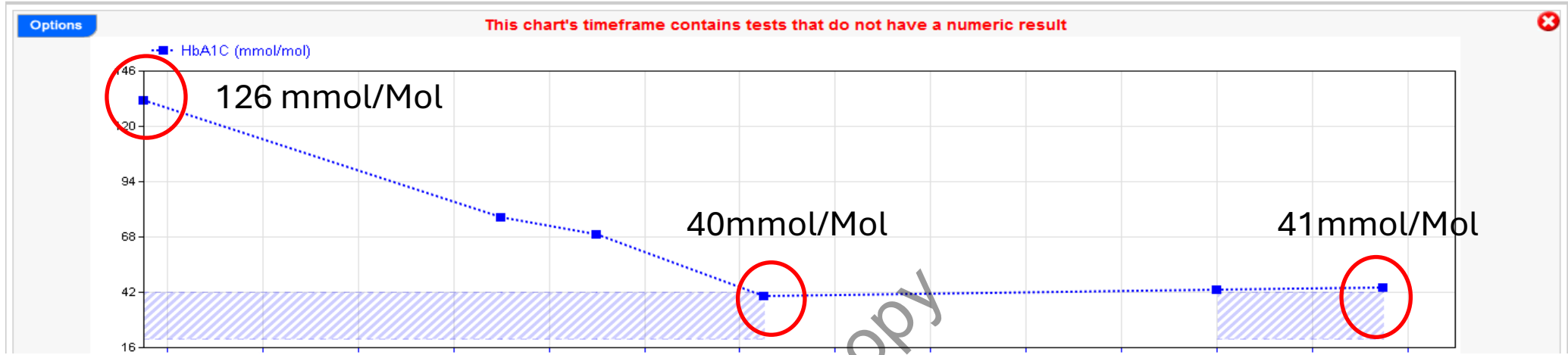84 year old gentleman, living at home as carer for his wife
In the last 6 months he has been investigated for ?TIA/CVE following falls and collapses at home - all investigations negative

He has lost 12kg over a two year period since his wife has had a stoke

On Humulin M3 twice daily 56 + 28 units

HbA1c 65 mmol/Mol   HbA1c 37mmol/Mol

Care home patient

The chart shows HbA1C (mmol/mol) over time with data points labelled:
- 126 mmol/Mol
- 40mmol/Mol
- 41mmol/Mol

89 year old, resident of nursing home for 5 years.
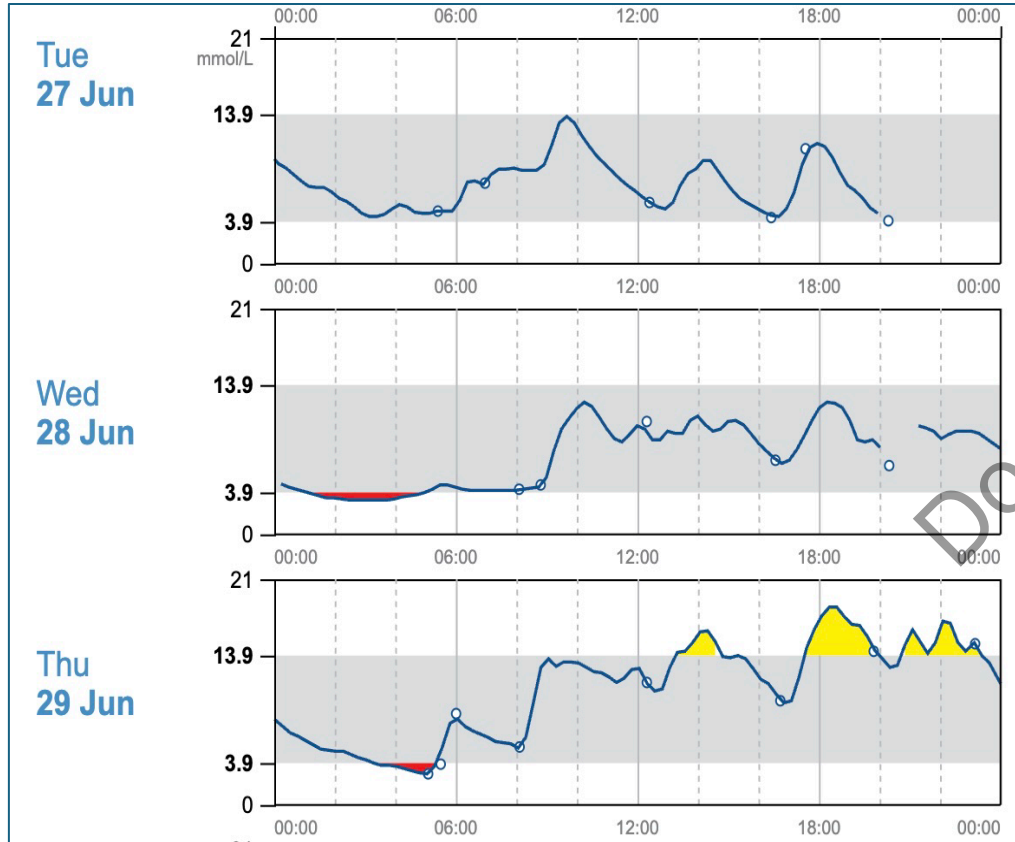
Medications on entering home:
Metformin 1g twice daily
Gliclazide 80mgs twice daily

Appetite is waning
Increasingly frail & unsteady on feet in-fact they spend most of the day asleep!!

94 year old gentleman

Type 2 diabetes for 30 years

On multiple insulin injections:

Tresiba 42 units

Current HbA1c 67mmol/mol

Severe Frailty

GLUCOSE STATISTICS AND TARGETS

27 June 2023 - 10 July 2023	14 Days
Time sensor active:	96%

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 3.9-10.0 mmol/L	Greater than 70% (16h 48min)
Below 3.9 mmol/L	Less than 4% (58min)
Below 3.0 mmol/L	Less than 1% (14min)
Above 10.0 mmol/L	Less than 25% (6h)
Above 13.9 mmol/L	Less than 5% (1h 12min)
Each 5% increase in time in range (3.9-10.0 mmol/L) is clinically beneficial.	

Average Glucose	9.1 mmol/L
Glucose Management Indicator (GMI)	7.2% or 56 mmol/mol
Glucose Variability	41.0%

Defined as percent coefficient of variation (%CV); target ≤36%

TIME IN RANGES

Very High >13.9 mmol/L	**11%**	(2h 38min)
High 10.1 - 13.9 mmol/L	**27%**	(6h 29min)
Target Range 3.9 - 10.0 mmol/L	**57%**	(13h 41min)
Low 3.0 - 3.8 mmol/L	**5%**	(1h 12min)
Very Low <3.0 mmol/L	**0%**	(0min)

AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.

DAILY GLUCOSE PROFILES

Each daily profile represents a midnight to midnight period with the date displayed in the top-left corner.

Where would we start?

Navigation Menu

- AGP Report
- Glucose Pattern Insights
- Monthly Summary
- Daily Log
- **Snapshot**
- Mealtime Patterns
- Weekly Summary
- Device Details
- Daily Patterns

Patient thresholds

Target range

| 6.0 | to | 13.9 | mmol/L |

Low Glucose Threshold

3.9 mmol/L

High Glucose Threshold

15.0 mmol/L

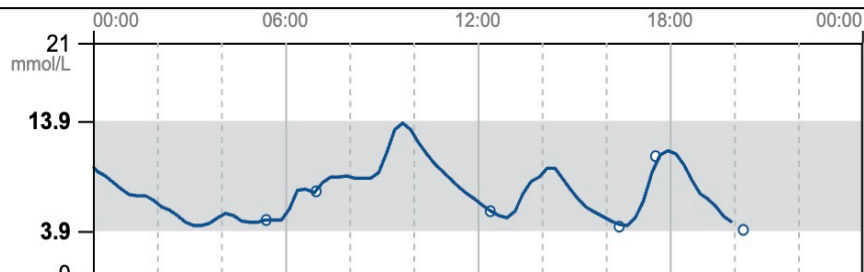**AVERAGE GLUCOSE** **9.1** mmol/L

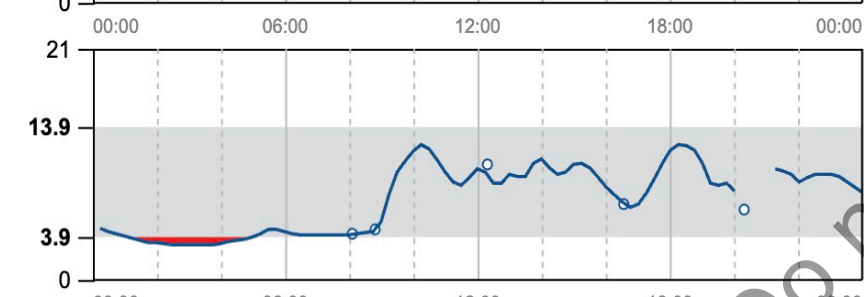| % above target | 11 % |
| % in target | 65 % |
| % below target | 24 % |

Average Glucose
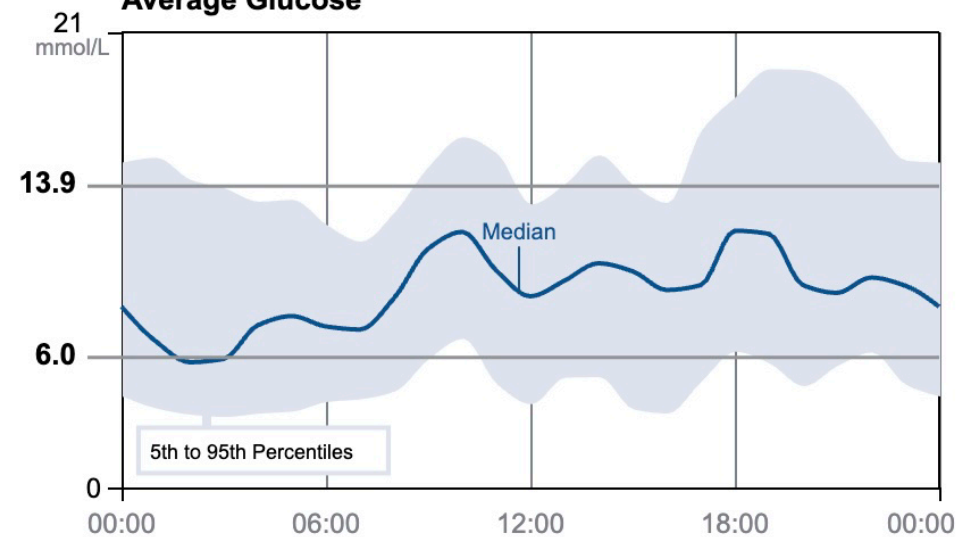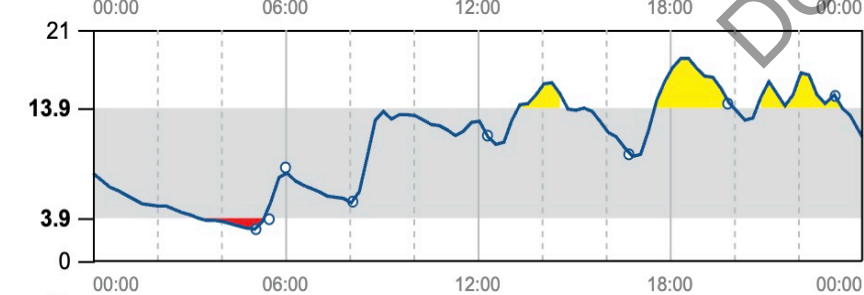
21 mmol/L

13.9

6.0

0

5th to 95th Percentiles

Median

00:00   06:00   12:00   18:00   00:00
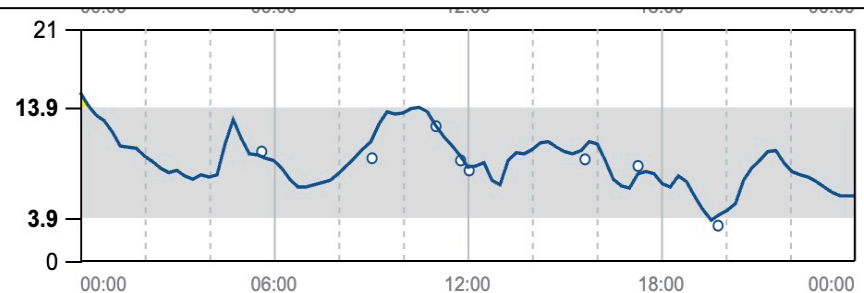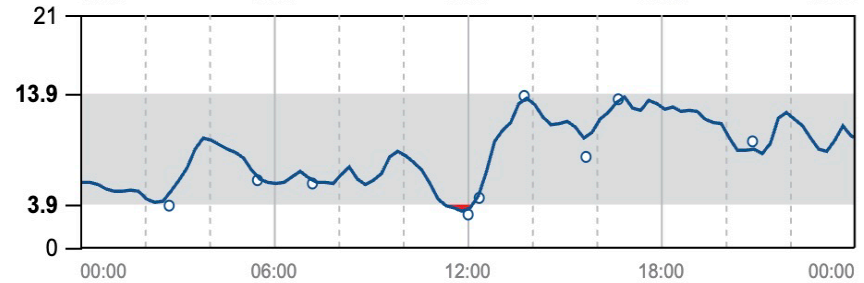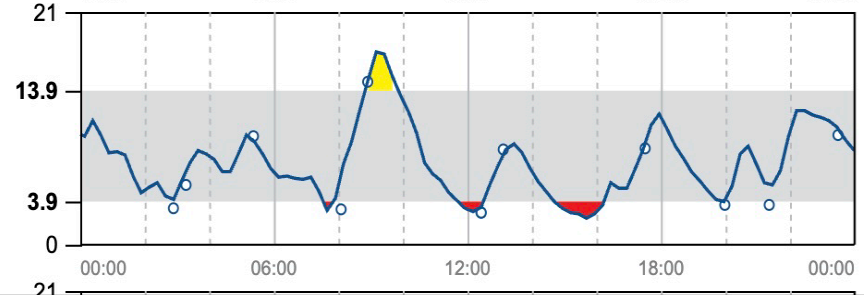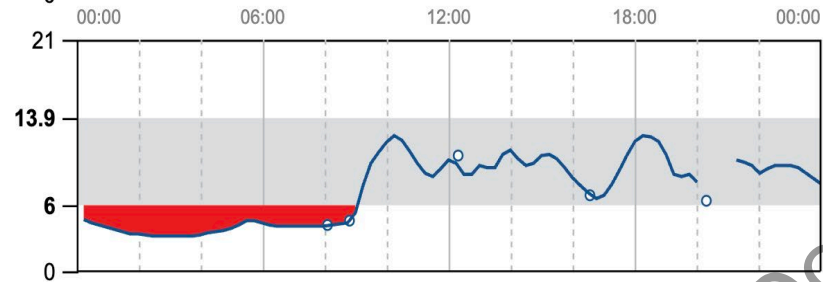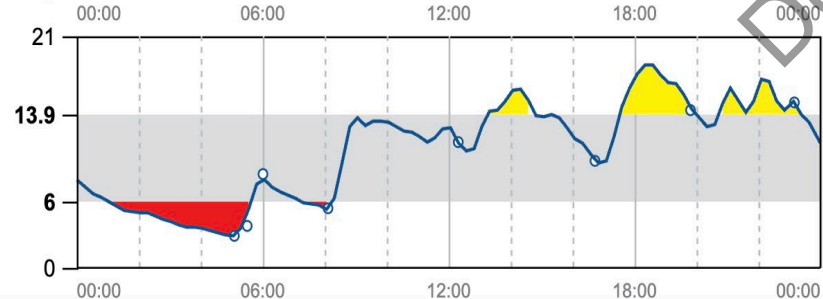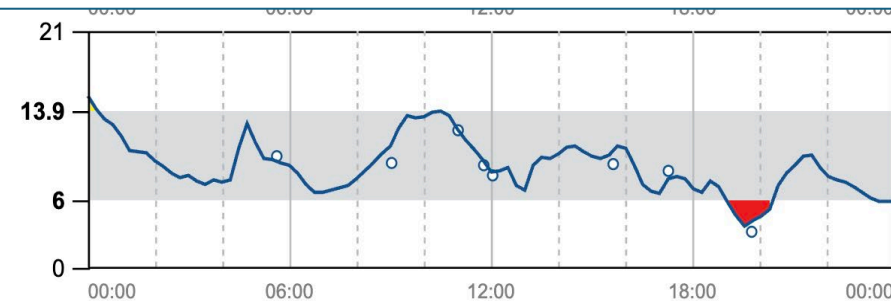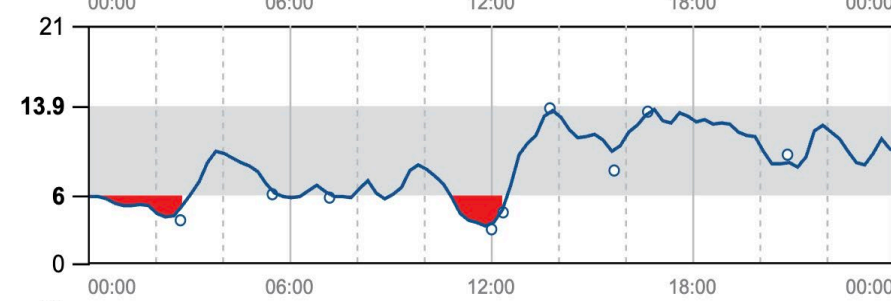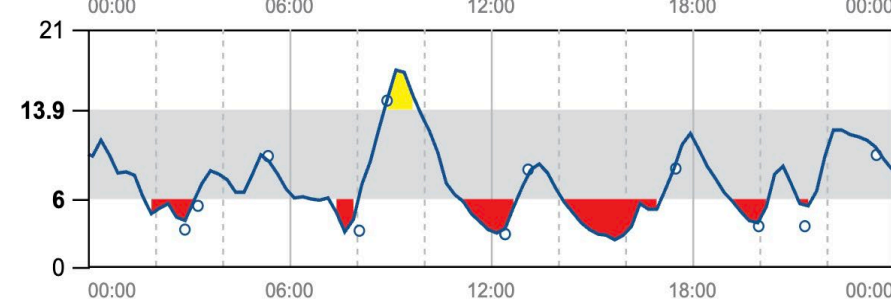
How to manage diabetes in later life

by Clare Hambling, GP, West Norfolk

Take home messages

1. Recognise risks and assess for frailty
2. Seek triggers, especially significant life events
3. Avoid hypoglycaemia by de-escalating therapy

Thank you.

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