



University of Exeter

Medical School

Live Long and Prosper: Living Well into Older Age with Diabetes

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Conflict of interest

I have received speaker honoraria, conference sponsorship, unrestricted educational grants and/or attended meetings sponsored by:

- AstraZeneca, Bayer, Boehringer Ingelheim, Colgate Palmolive, Glaxo SmithKline, Napp, Novartis, Novo Nordisk, Pfizer, Servier, Takeda, Vifor

I currently chair the British Medical Association's Board of Science and Academic Staff Committee and am supported by the NIHR Exeter Clinical Research Facility

- All opinions expressed are my own, and do not represent the views of the NHS, NIHR or BMA

Disclaimer

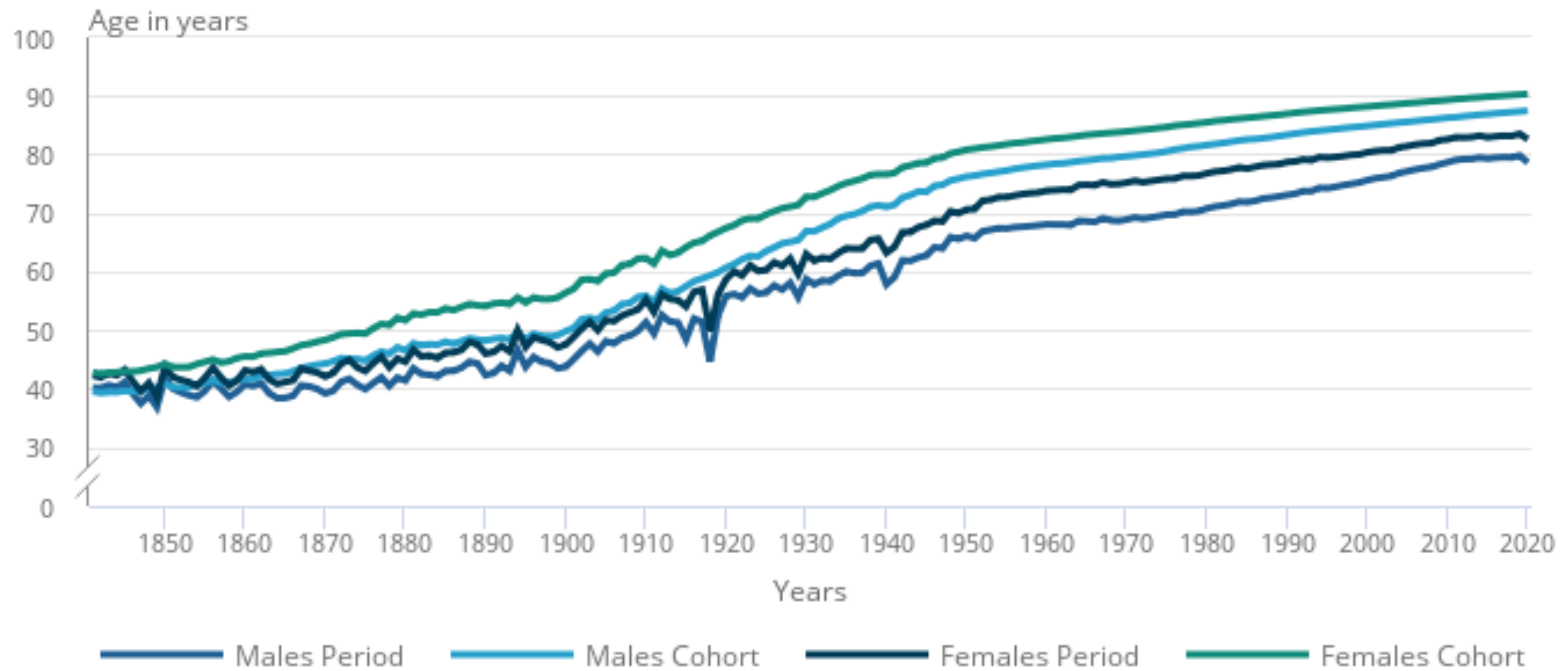
“

I would never allow a scientist to partake in my government – Give them a new piece of information and they are liable to change their mind

”

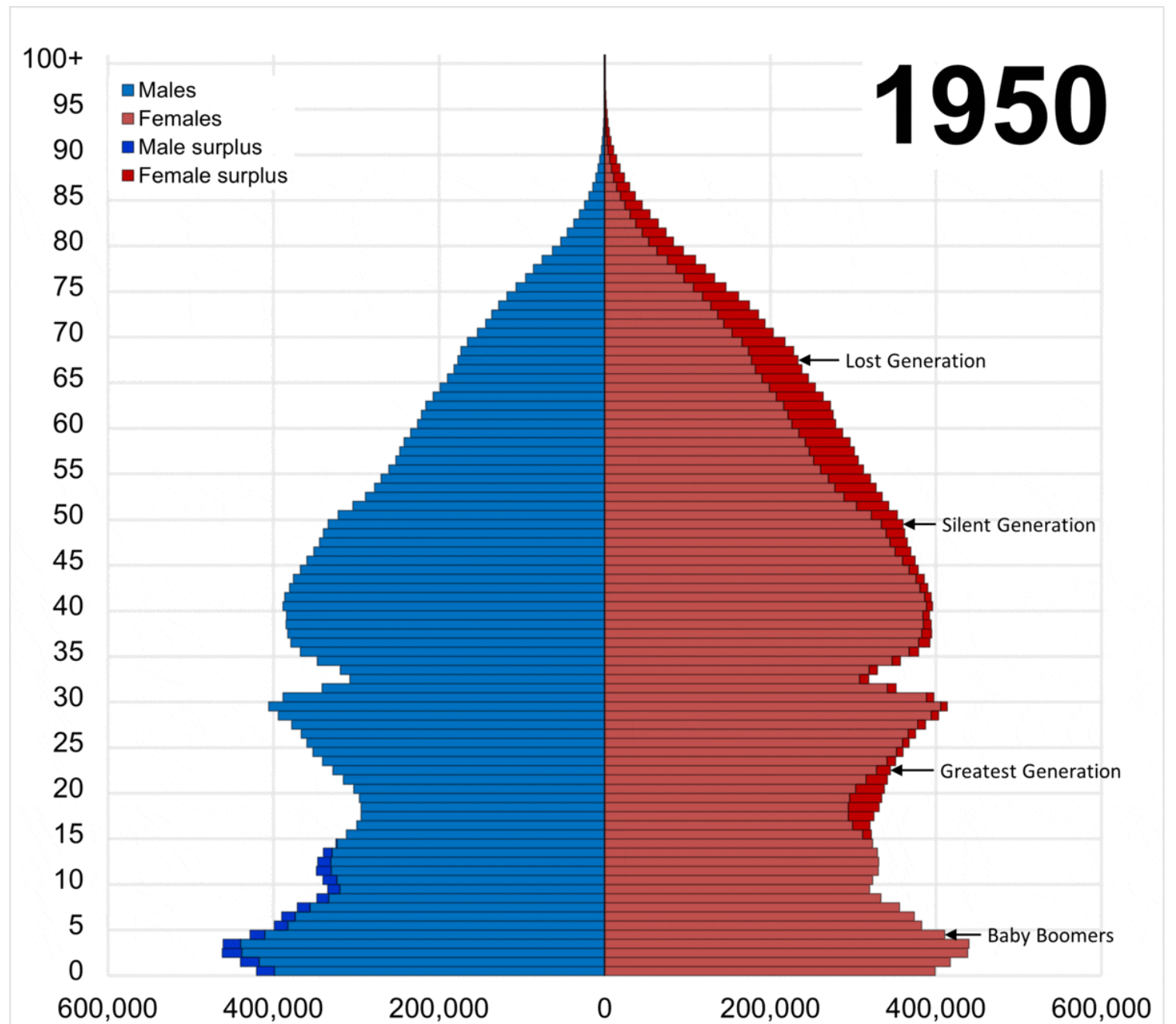
Abraham Lincoln
16th President of the United States

Life Expectancy in England and Wales



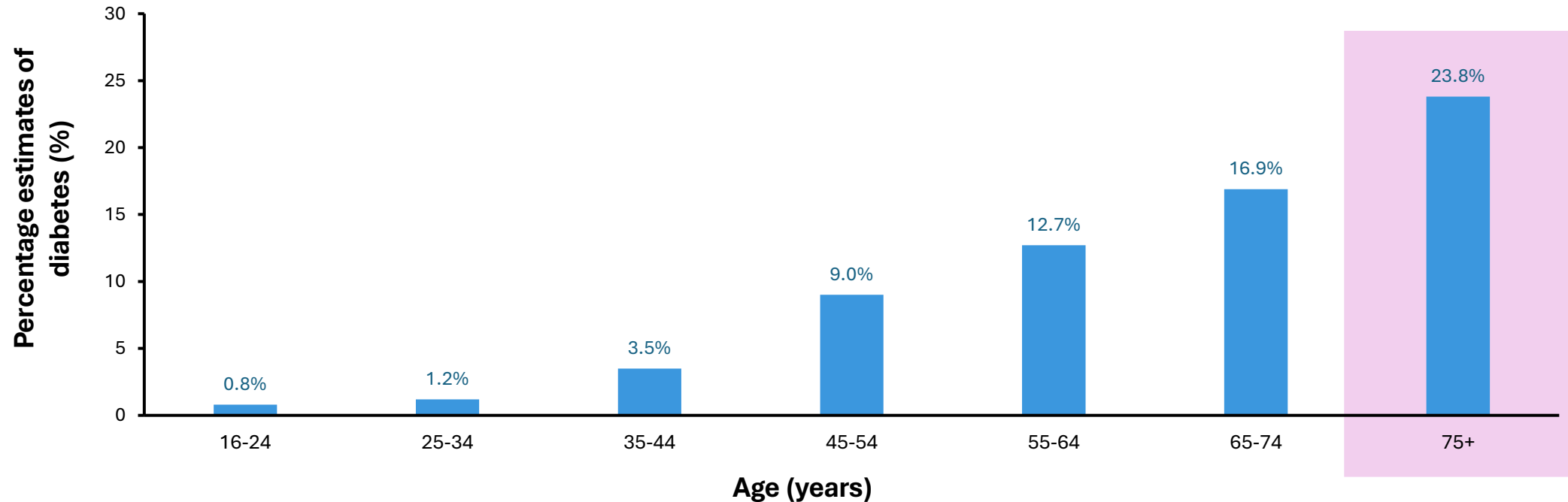
Source: Office for National Statistics - Life tables, principal projection, England and Wales

Changing Demographics



Prevalence of T2D increases with age in England

Public Health England: Diabetes prevalence model* data (aged 16–75+ years)



Adapted from Public Health England 2016.

Almost 1 in 4 people over the age of 75 have T2D

*Model was developed using data from Health Surveys for England, 2012, 2013 and 2014. Estimates include diagnosed and undiagnosed and take into account age, sex and ethnic group distribution, as well as deprivation of the area. Estimates are created using resident and general practitioner-registered populations

T2D, type 2 diabetes

Public Health England 2016; PHE publications gateway number: 2016243.

So what...They're just a bit older...



Little person gets bigger



Fundamental changes in physiology

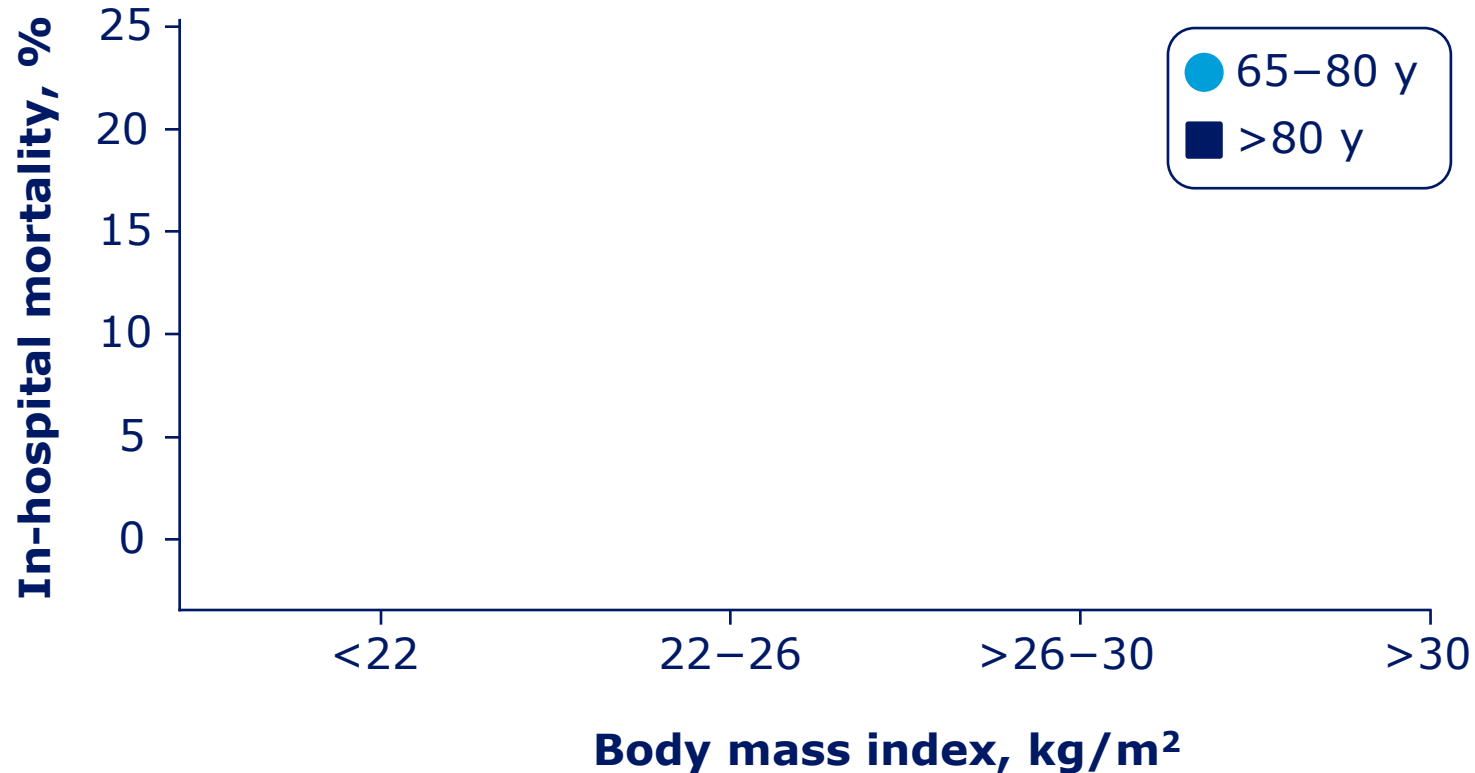


Kidneys, liver, heart, brain, autonomic nervous system, endocrine system, all start to fail



Mortality and weight in older adults

In-hospital mortality vs BMI in young elderly vs. very elderly

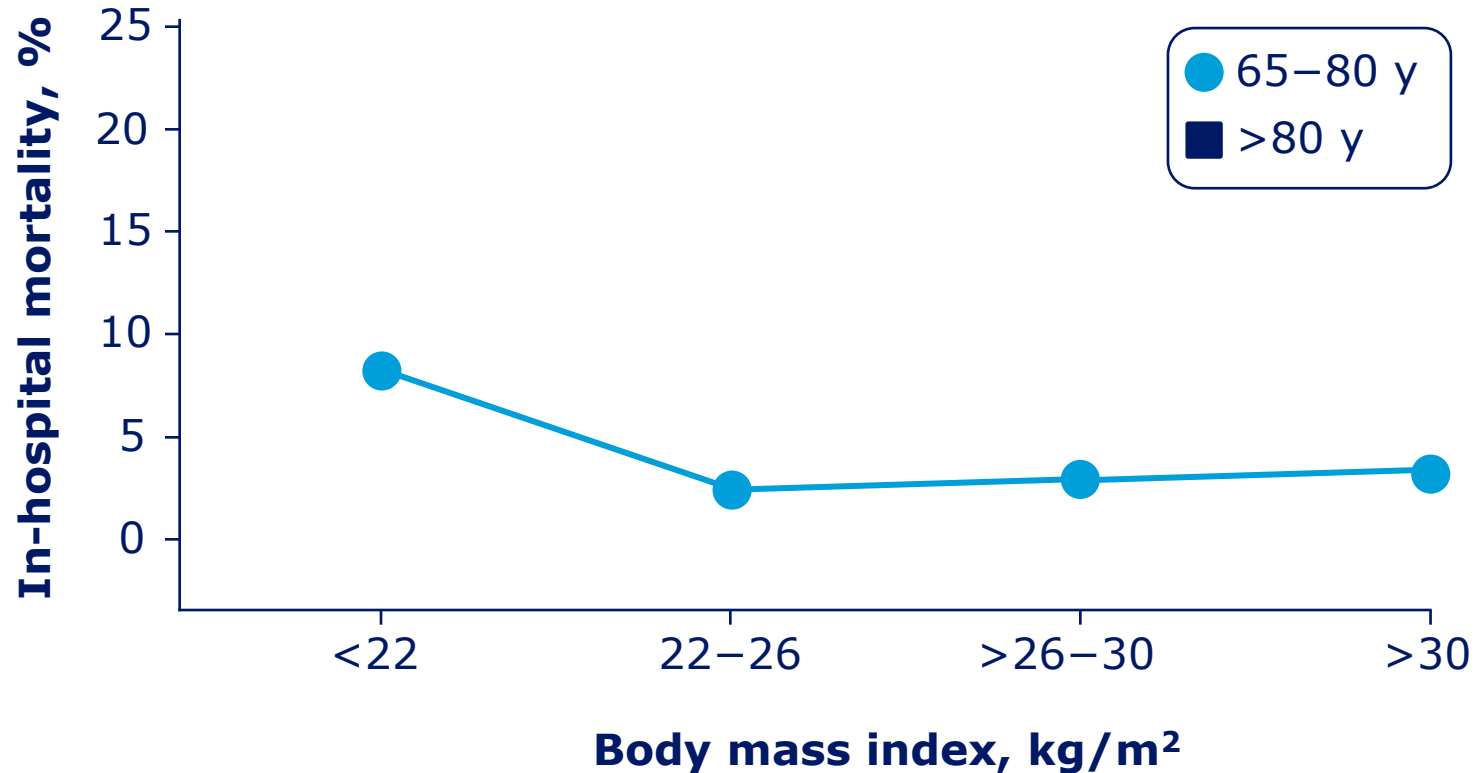


- In people <65 years there is a general recognition that high BMI is a poor prognostic indicator
- In people >65 the association is not as clear cut
- In those >80 there is a paradoxical protective effect offered by obesity

In hospital mortality vs. BMI in young elderly vs. very elderly

Mortality and weight in older adults

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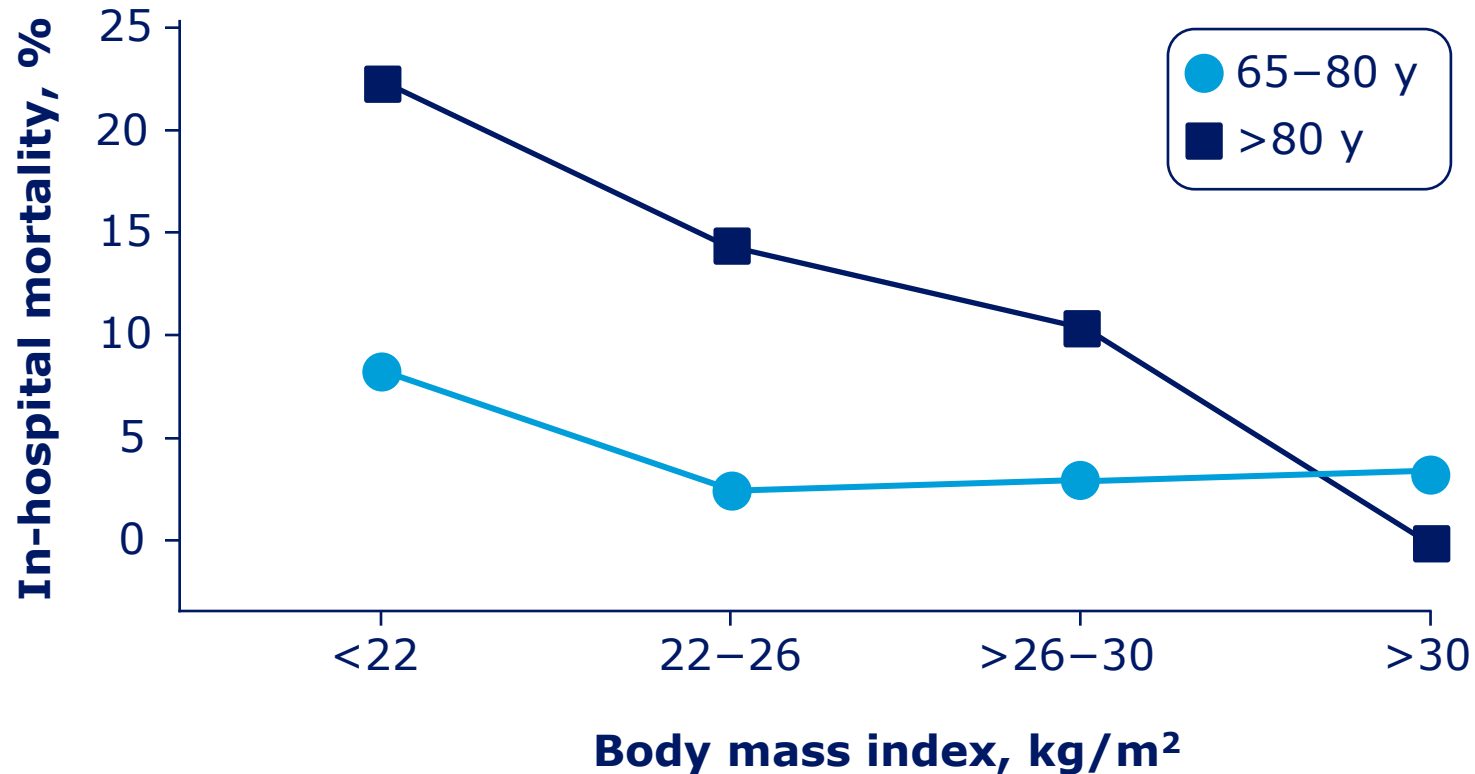


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In hospital mortality vs. BMI in young elderly vs. very elderly

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In-hospital mortality vs BMI in young elderly vs. very elderly



- In people >65 the association between mortality and BMI is not clear cut (using the reference for the graph)
- In those >80 there is a paradoxical protective effect offered by obesity (again reference from the graph)

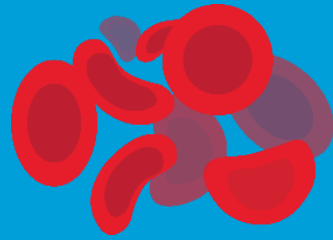
In hospital mortality vs. BMI in young elderly vs. very elderly

HbA_{1c} differs for older adults

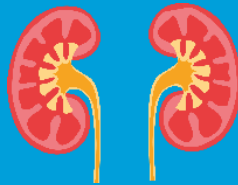
Possible explanation

Older vs younger adults

Lower red blood cell (RBC) count¹



Decreased secretion of EPO due to decline in renal function¹



EPO, erythropoietin; Hb, haemoglobin; HbA_{1c}, glycated haemoglobin

1. Wu L et al. PLoS ONE 2017;12(9): e0184607.; 2. Yau CK et al. J Am Geriatr Soc 2012;60(7):1215–21; 3. Presented at ADA 2018, S.R. Heller et al abstract: 107-OR

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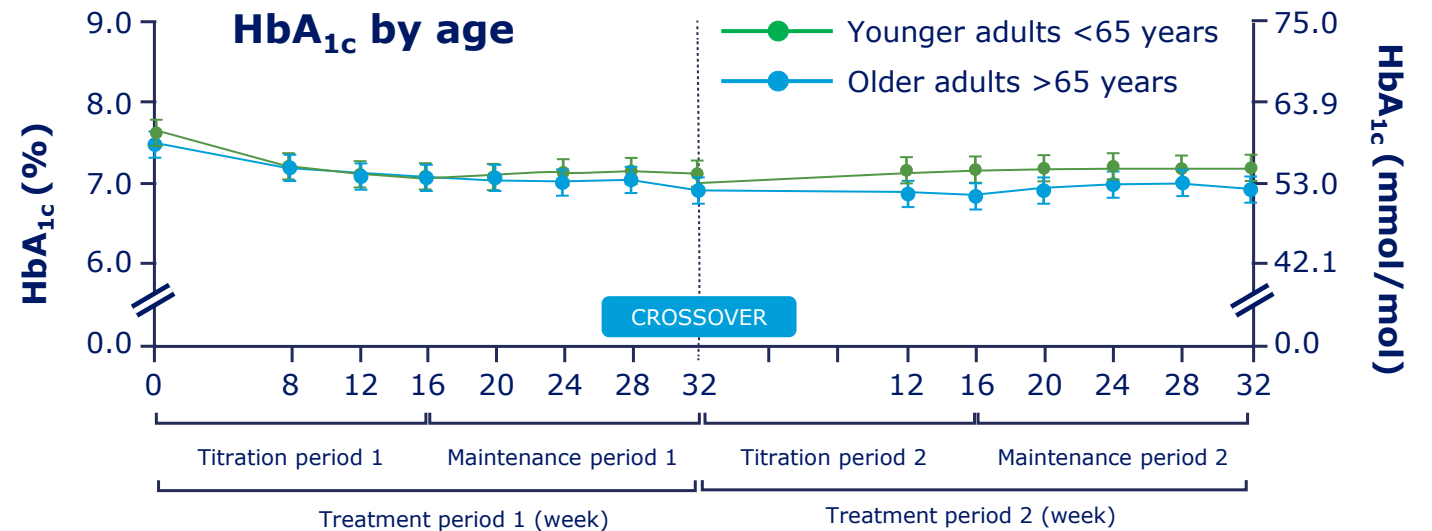
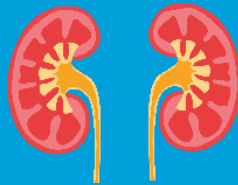
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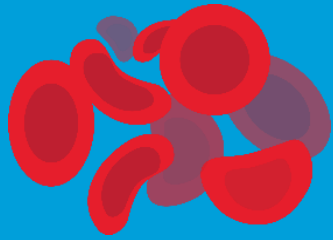
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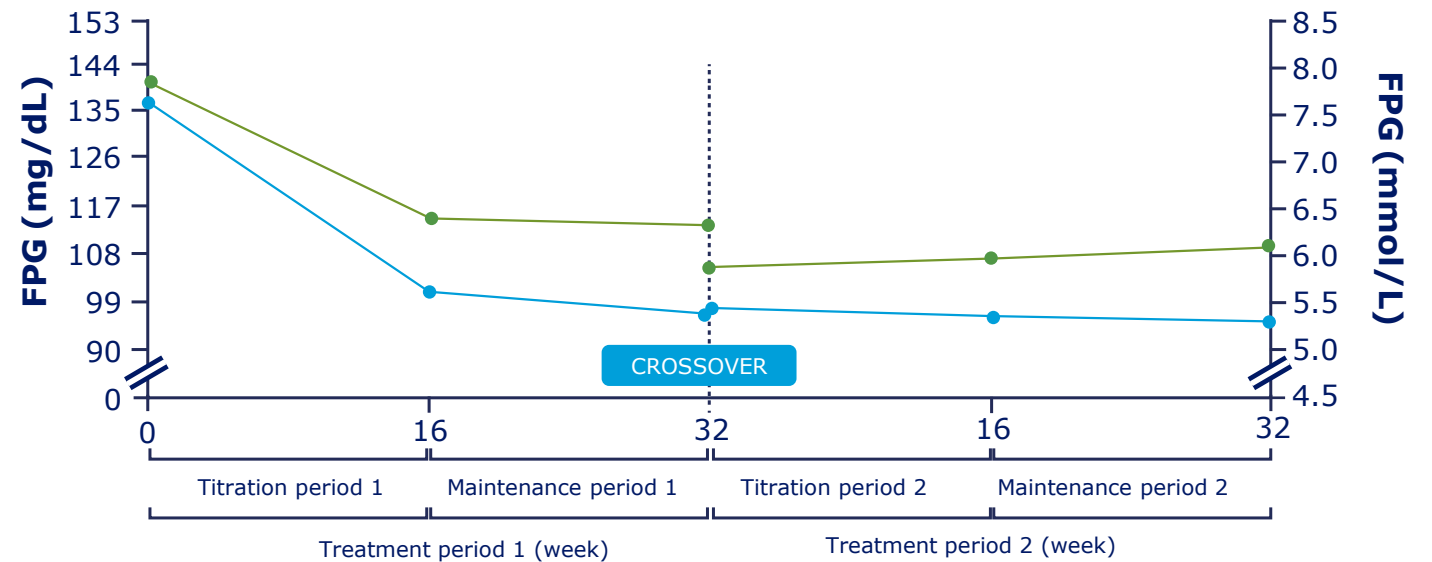
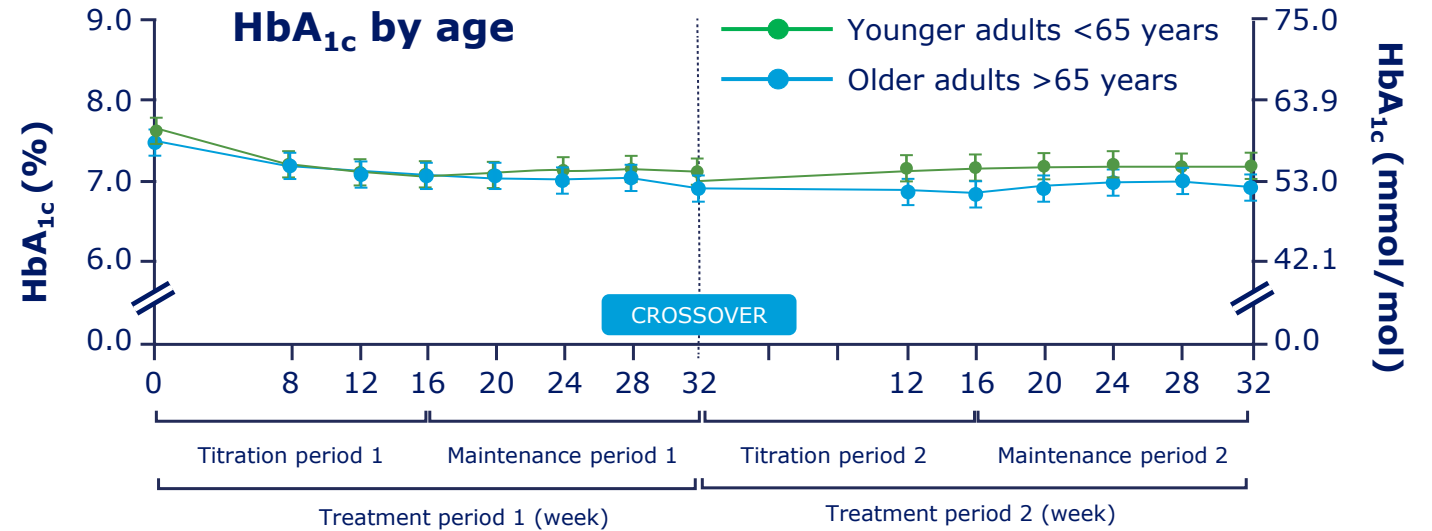
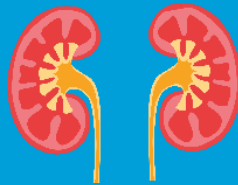
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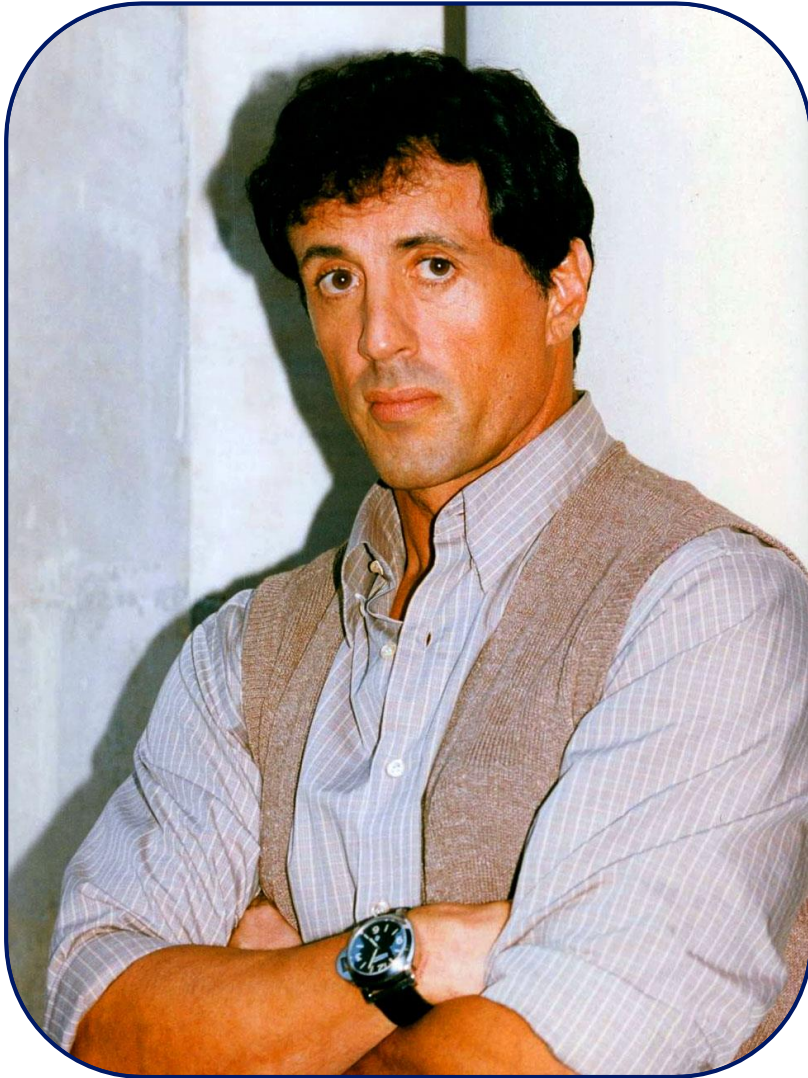
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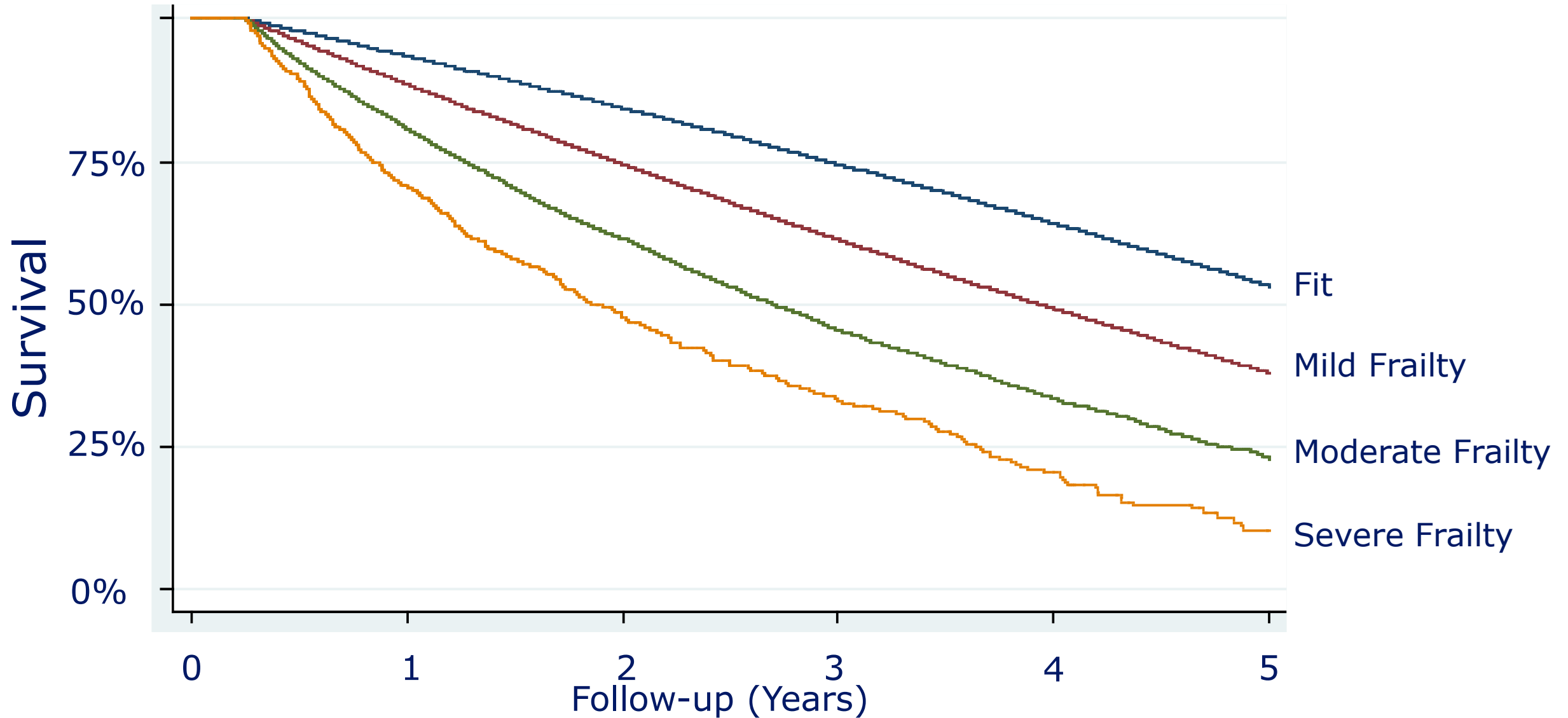
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What is old: chronology versus physiology



Both of these actors are the same age

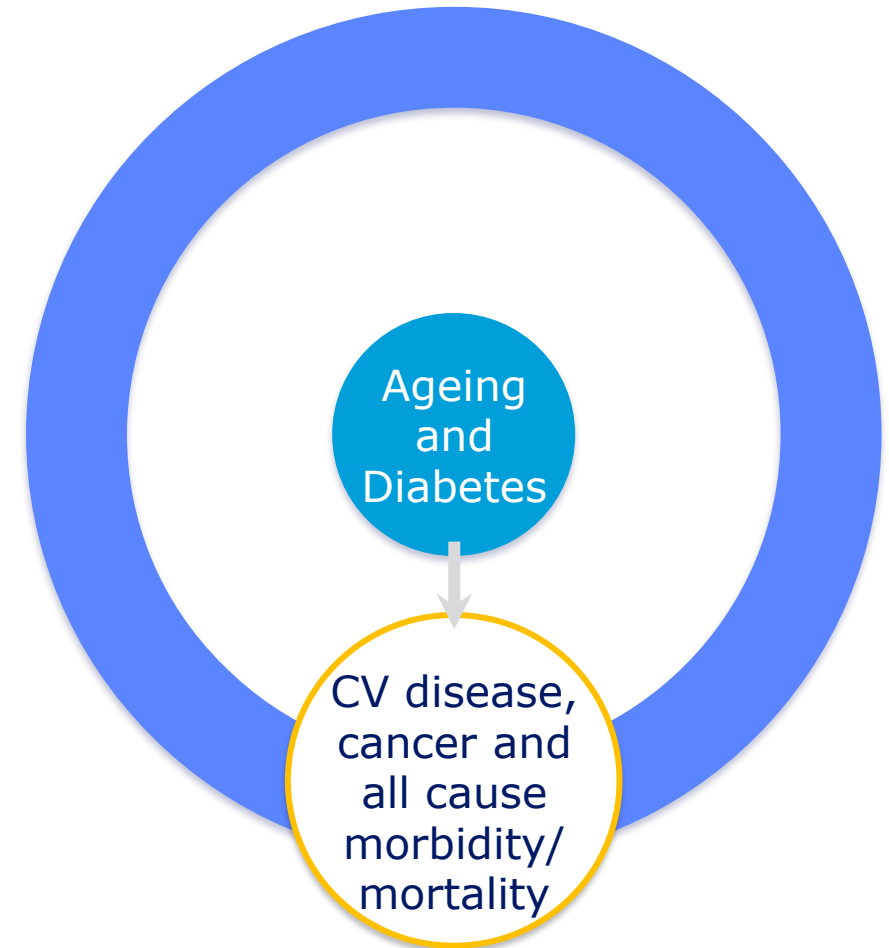
Mortality of those who survive 6 months stratified by Frailty status



The frail, elderly patient with diabetes¹

Older persons with diabetes are at higher risk than those without diabetes of:

- Usual complications of diabetes...



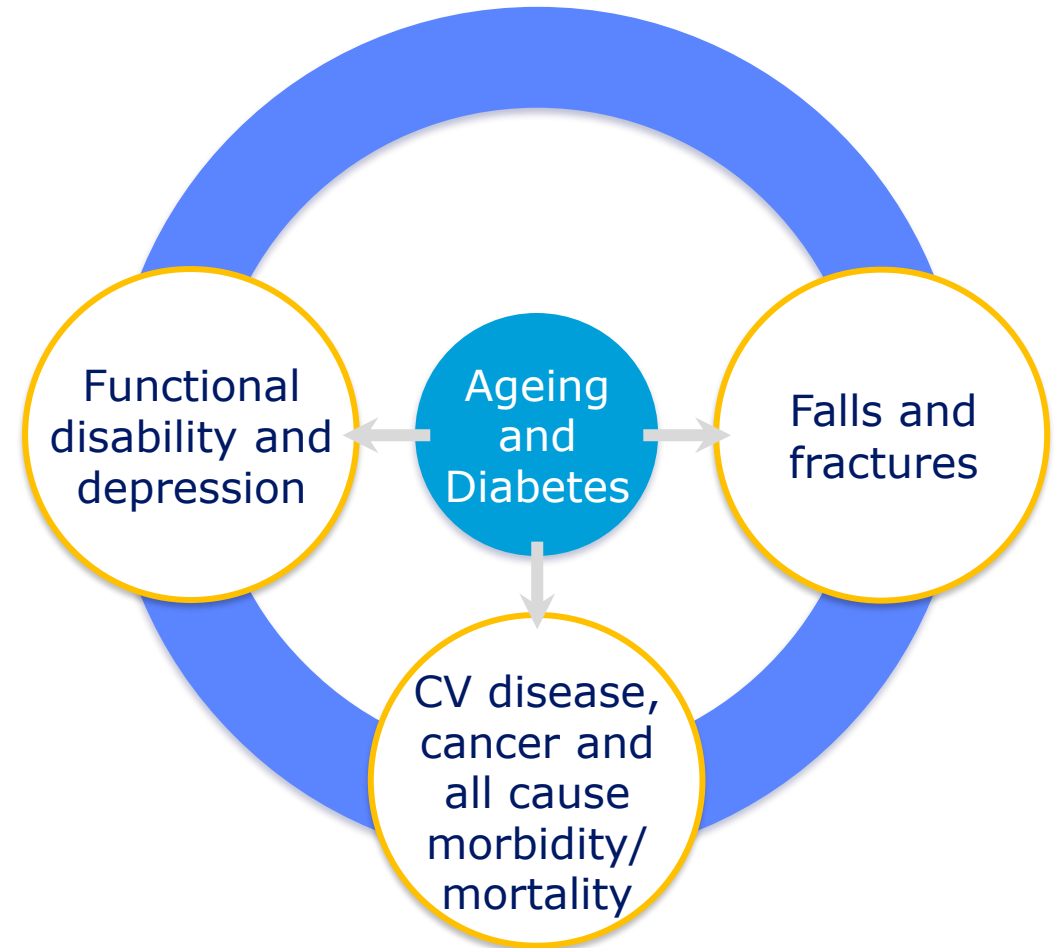
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- Usual complications of diabetes...

But Also

- Functional disability
- Geriatric syndromes: depression



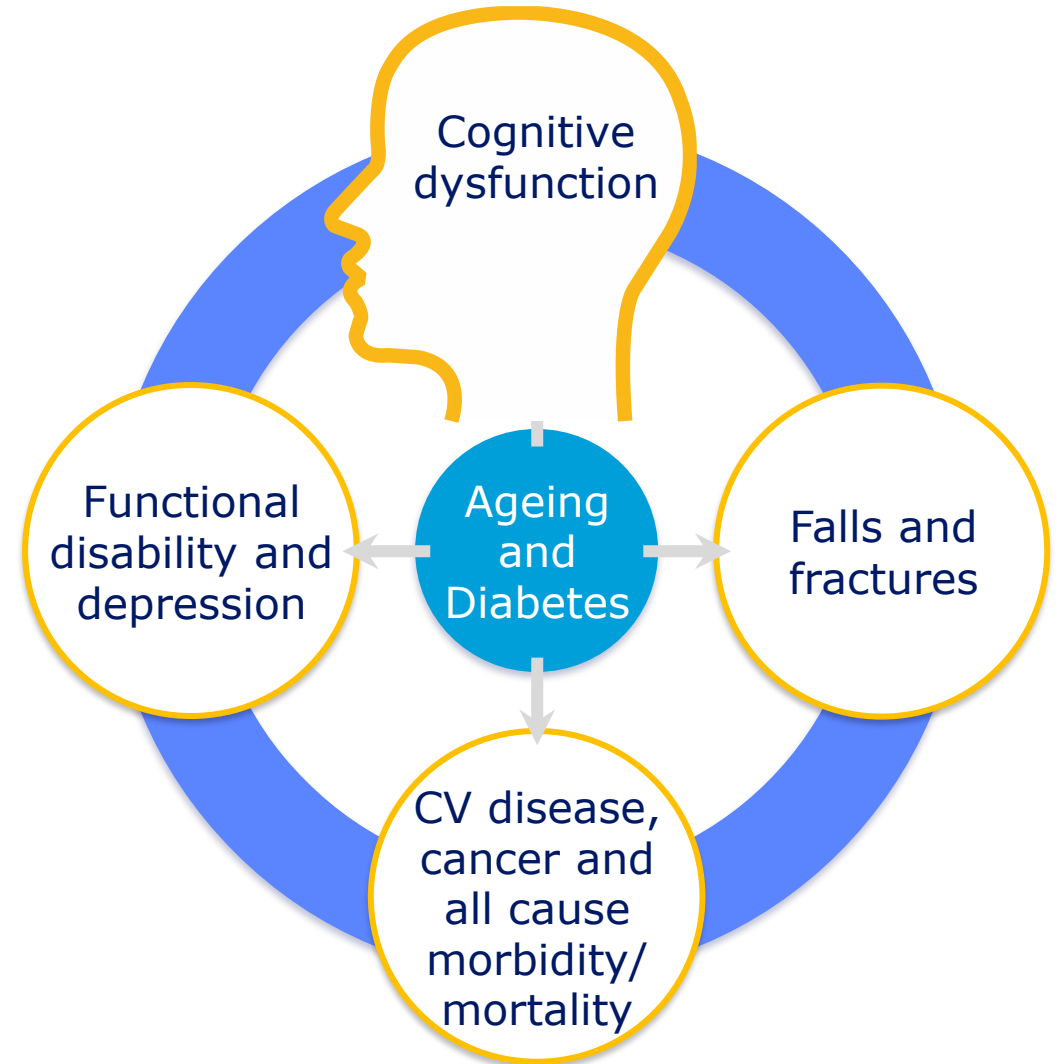
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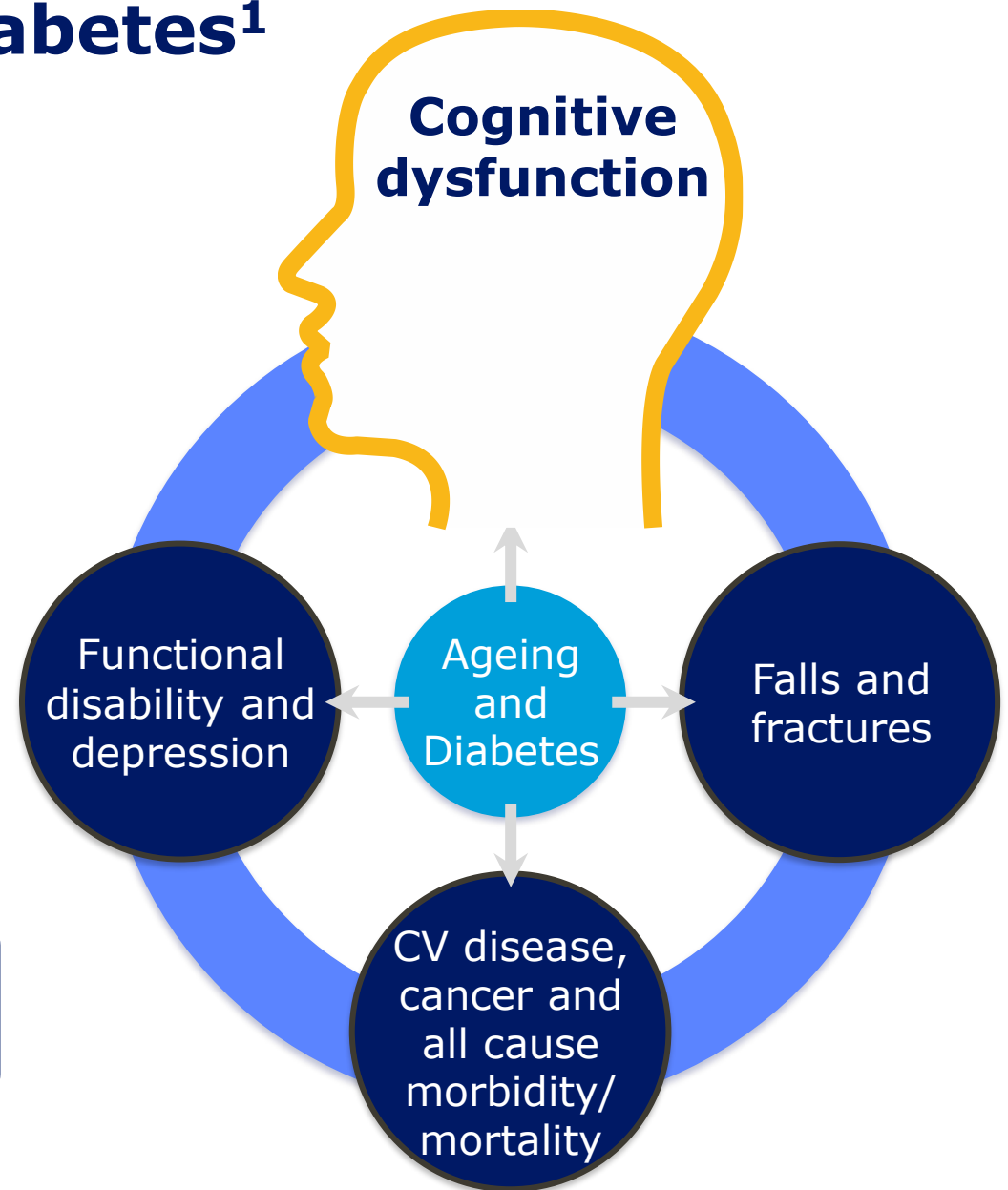
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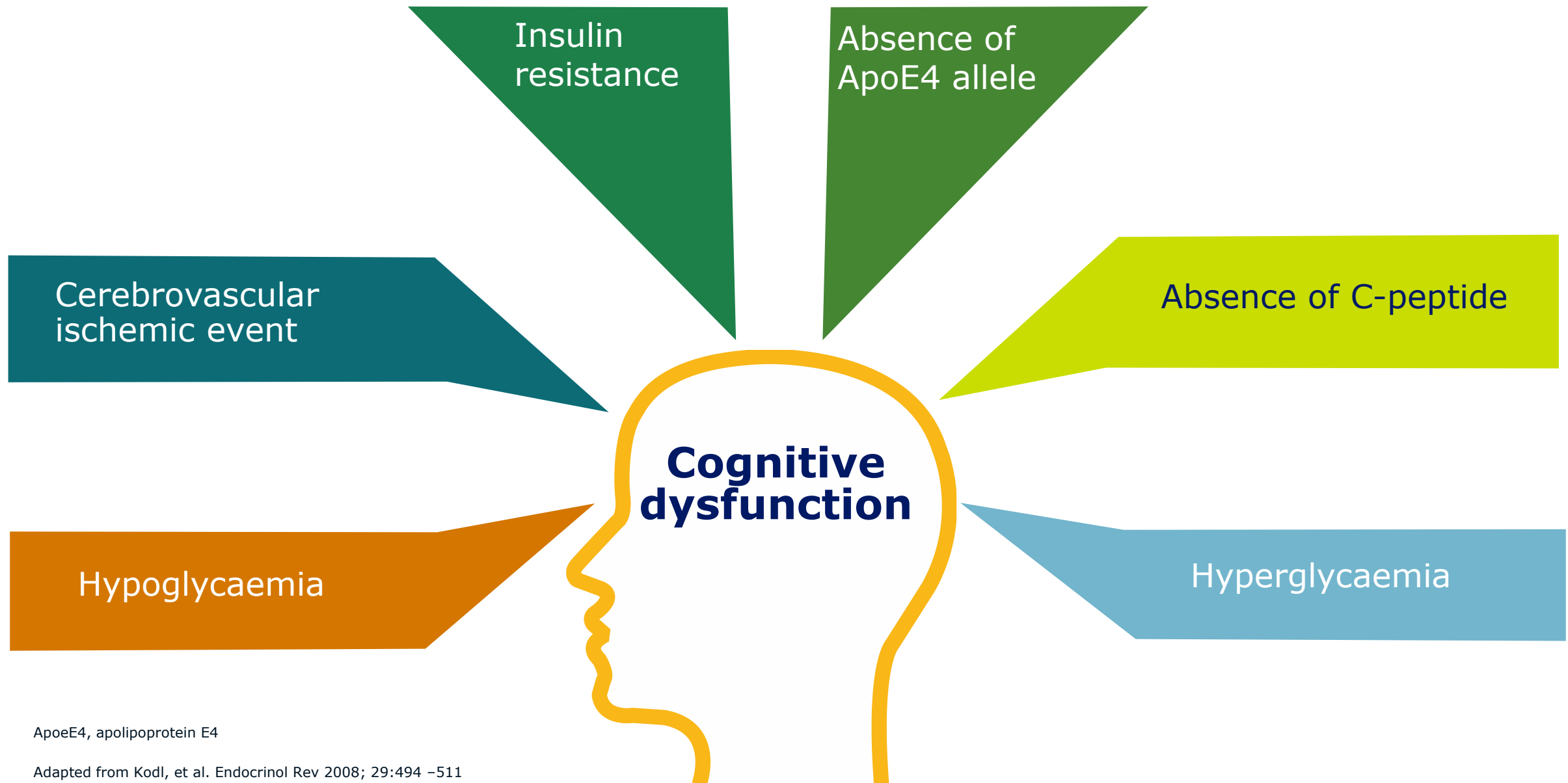
But Also

- Functional disability
- Geriatric syndromes: depression
- **Geriatric syndromes: cognitive impairment**



Cognitive dysfunction should be added to the list of the complications of diabetes, along with retinopathy, neuropathy, nephropathy and cardiovascular disease.

Pathophysiology – diabetes and dementia



ApoE4, apolipoprotein E4

Adapted from Kodl, et al. Endocrinol Rev 2008; 29:494 –511

The physiology of hypos¹

Glucose falls

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 rises

The physiology of hypos¹

Glucose falls

Normal glucose suppresses insulin at 4.6 mmol/L

Normal physiological homeostasis

↑Glucagon (3.8±0.3 mmol/L)

↑Adrenaline (epinephrine) (5.7±0.3 mmol/L)
2.8 mmol/L

↓**BRAIN GLUCOSE UPTAKE(3.4 MMOL/L)**

↑Growth hormone (5.4 mmol/L)
1.9 mmol/L

↑Cortisol (5.0 mmol/L)

↓**COGNITION(2.8 MMOL/L)**

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

Comatose (1.9 mmol/L)

Glucose rises

Therefore the symptoms of hypoglycaemia are non-specific in older adults

Neuroglycopenic:¹

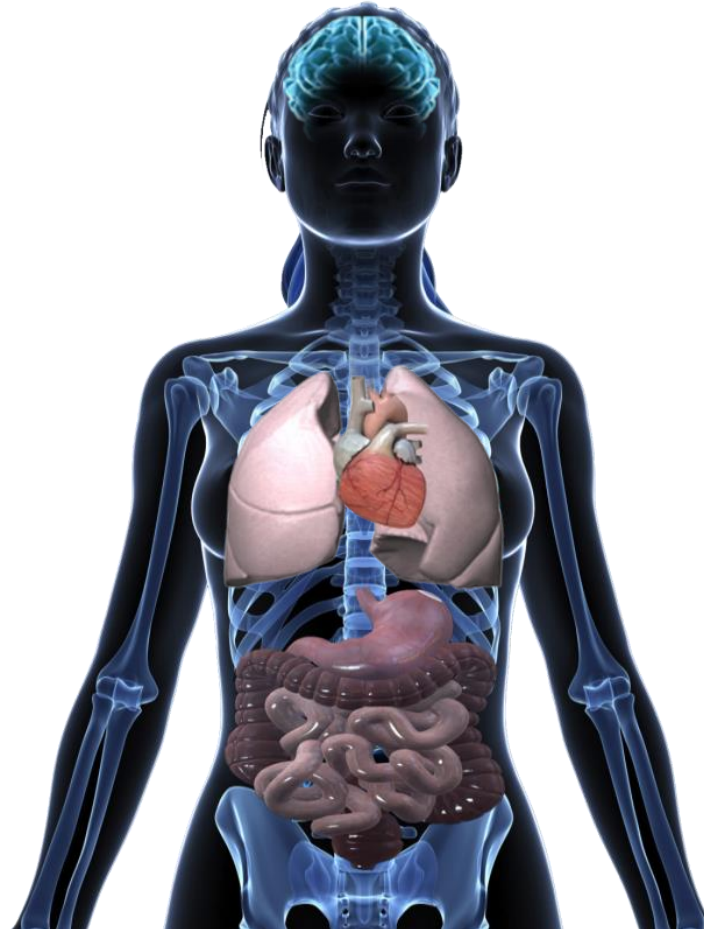
Fatigue Irritability
Confusion Dizziness
Drowsiness Coma

~~Autonomic:¹~~

~~Palpitations
Sweating
Anxiety~~

Particularly in older adults:

Unsteadiness
Lightheadedness



All of these are also common in older adults without diabetes and vary between individuals¹⁻³

Repeated asymptomatic episodes can reduce awareness of the onset of a severe hypoglycaemia event⁴

Frailty assessment pathway in diabetes

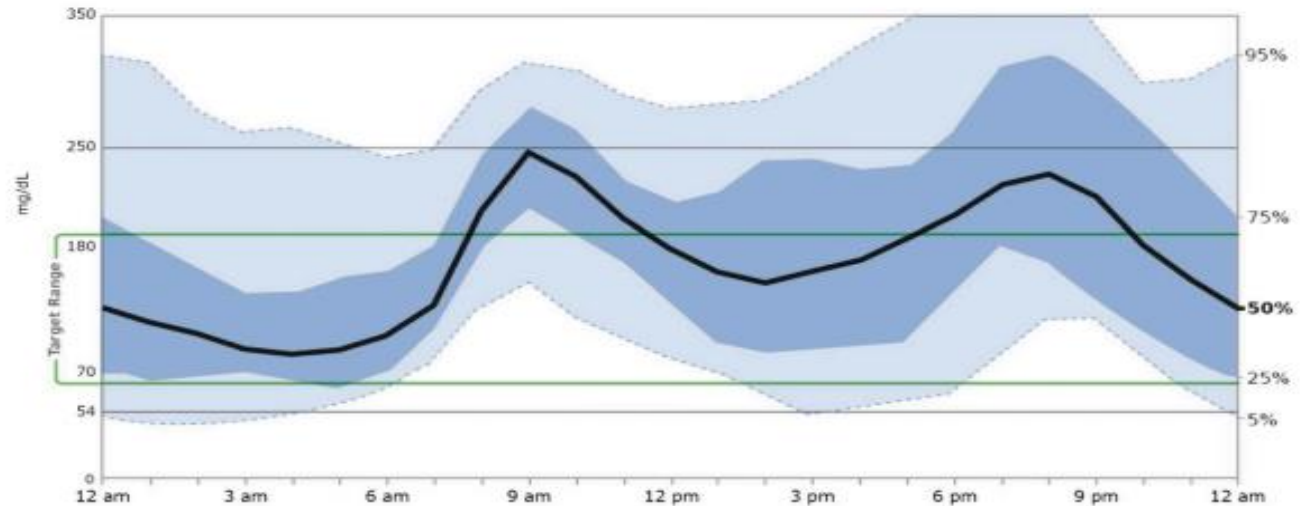
Treatment escalation and de-escalation thresholds¹

Patient type	Treatment targets	Target
Healthy	58 mmol/mol (7.5%)	4-9mmol/L
Complex <i>or</i> intermediate	64 mmol/mol (8.0%)	5-11mmol/L
Very complex <i>or</i> in poor health	70 mmol/mol (8.5%)	7-13mmol/L <1% below 4mmol/L

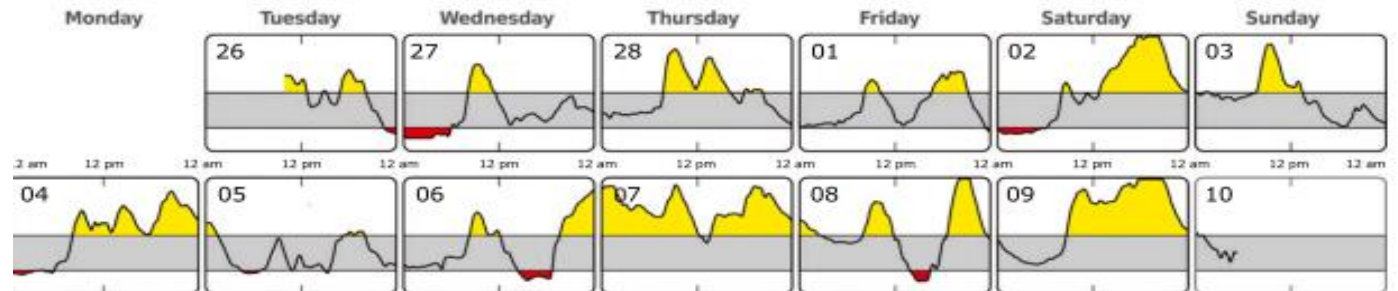
CGM and Time in Range

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.

DIGITAL HEALTHCARE AT HOME

Rechargeable Transmitter



Disposable Skin patch sensor

Using arrows to avoid hypoglycaemia

- Rules of thumb:
- 6 mmol/l ↘ 4-5 grams e.g. 1 jelly baby
- 6 mmol/l ↓ 8-10 grams e.g. 2 jelly babies
- However, the action needed will depend on a number of factors including insulin on board, recent activity etc.



Avoidance of Hypos becomes a greater priority

Treatment escalation and de-escalation thresholds¹

Patient type	Treatment targets	De-escalation threshold
Healthy	58 mmol/mol (7.5%)	53 mmol/mol (7.0%)
Complex <i>or</i> intermediate	64 mmol/mol (8.0%)	58 mmol/mol (7.5%)
Very complex <i>or</i> in poor health	70 mmol/mol (8.5%)	64 mmol/mol (8.0%)

But Diabetes is far more than just medications

Healthy Eating Habits:

- Importance of a balanced diet rich in whole grains, lean proteins, fruits, and vegetables
- Portion control and tips for meal planning
- How to avoid blood sugar spikes and manage carbohydrate intake



Stress

MIND, THE LEADING MENTAL HEALTH CHARITY STATE THAT:

1 in 4 people will experience a mental health problem of some kind each year in the U.K.

1 in 5 people have suicidal thoughts

Only 1 in 8 adults are getting treatment for their mental health problems

Type 2 Diabetes Statistics

MIND ALSO STATE THAT:

“One of the main causes of mental health problems is “physical health” or a “chronic health condition”

- It has been found that Pre Diabetes / Type 2 Diabetes has negative effects on quality of life and social contacts.
- Depression is more prevalent among people living with Pre Diabetes / Type 2 Diabetes compared with those who are not and increases the risk of premature death.
- People with diabetes are 2 to 3 times more likely to have depression than people without Diabetes.
- Elevated stress levels as a result of becoming aware of a Pre Diabetes / Type 2 Diabetes diagnosis may be an underlying cause of worsening mental health.

The fight or flight response



OXYGEN

The fight or flight response is the body's short term response to stress.

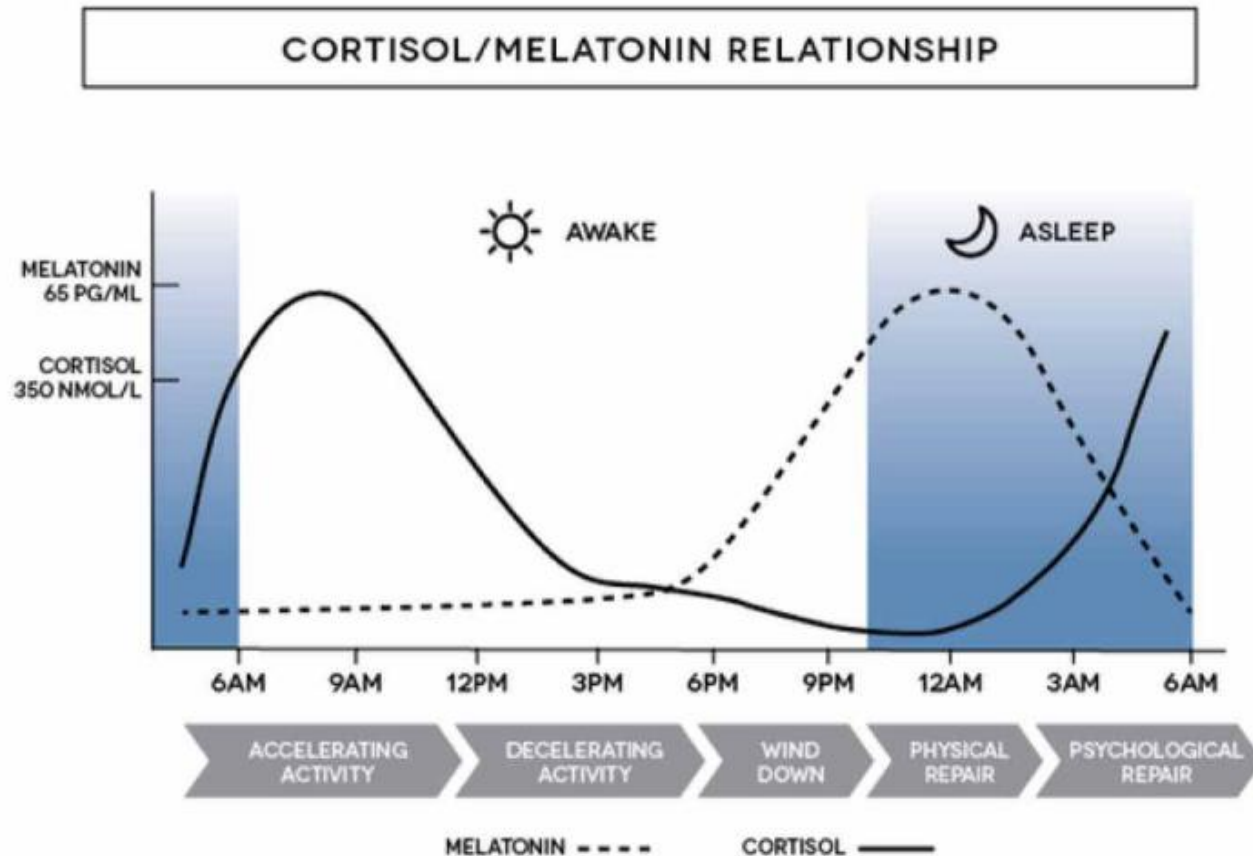
This short term response is good as it is our own built in alarm system to protect ourselves. It is also the reason exercises like cold baths/ showers are recommended as this process of shock promotes an increase in metabolism, the immune system and circulation.

However, when we are constantly stressing, our body thinks this issue is something it constantly needs to get away from and therefore, it keeps on giving us this increase in oxygen and cortisol.



CORTISOL

Improving Sleep



TO GET A GOOD NIGHTS SLEEP:

- Aim to get into a routine to promote the sleep- wake cycle
- Reduce screen time
- Avoid stimulants after 12pm
- Avoid naps
- Exercise – but not within 3 hours of going to sleep
- Avoid large meals and foods very high in carbohydrates / sugars in the evening
- Avoid alcohol and smoking as these are stimulants
- Do meditation before bed

Smoking Increases Type 2 Diabetes Risk

CHEMICALS

Chemicals in cigarette smoke cause inflammation of the body

This is because the chemicals injure cells which can interfere with proper cell function

This causes the cells to stop responding to insulin

NICOTINE

Nicotine can also change and interfere with cells, causing them to stop responding to insulin, which increases blood glucose levels leading to Pre Diabetes / Type 2 Diabetes

Smoking has also been found to affect fat distribution around the body, causing smokers to accumulate more visceral fat which is a risk factor for Pre-Diabetes / Type 2 Diabetes

Within 20 minutes of not smoking your blood pressure returns to normal, reducing your CVD risk

After 2 days, chemicals such as carbon monoxide are no longer present, allowing your cells to work properly

Between 2 and 12 weeks, your circulation drastically improves. Blood pumps through your body much more easily

After 1 year, your chance of suffering from a heart attack reduces by 50%

After 10 years of being smoke free, your risk of Diabetes reduces to that of someone who has never smoked

Quitting Reduces Risk Quickly



CHEMICALS

Chemicals in cigarette smoke cause inflammation of the body

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Alcohol



- Alcohol forms part of the wider social culture of the Mediterranean diet
- Red wine associated with health properties in moderation
- BUT high in calories
- Stops the liver from producing glucose so potential for hypoglycaemia if heavy drinking with diabetes
- Advise to test blood glucose after drinking

Physical Activity:

- Regular exercise Bbenefits blood sugar control, mobility, and heart health
- Safe, low-impact exercises (walking, swimming, yoga)
- Adapting exercise routines to physical limitations or chronic pain



Coping Planning and Identifying Barriers

COPING PLANNING IS THE PROCESS OF IDENTIFYING BARRIERS THAT COULD PREVENT YOU FROM MEETING YOUR GOAL.

- Barriers will always crop up, however the more prepared we are for these, the more equipped we will be to overcome them.
- Often, the same barriers crop up time and time again. Having a way of coping with this will prevent the client from being derailed.

How to create healthier habits

Encourage people to think about their WHY

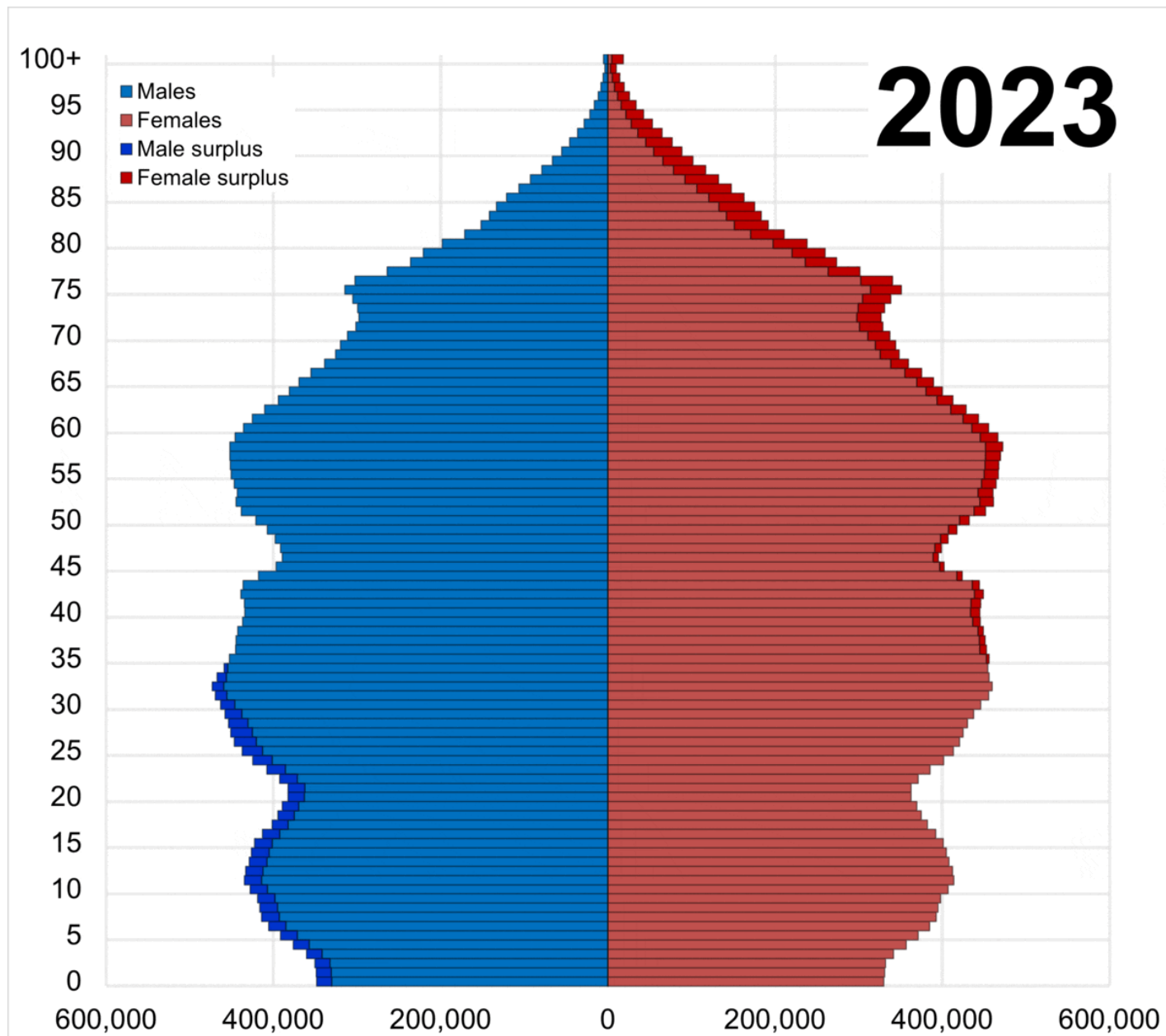
- Why are you here?
- What do you want to achieve?
- Why do you want to make these changes?

Get into the right mindset

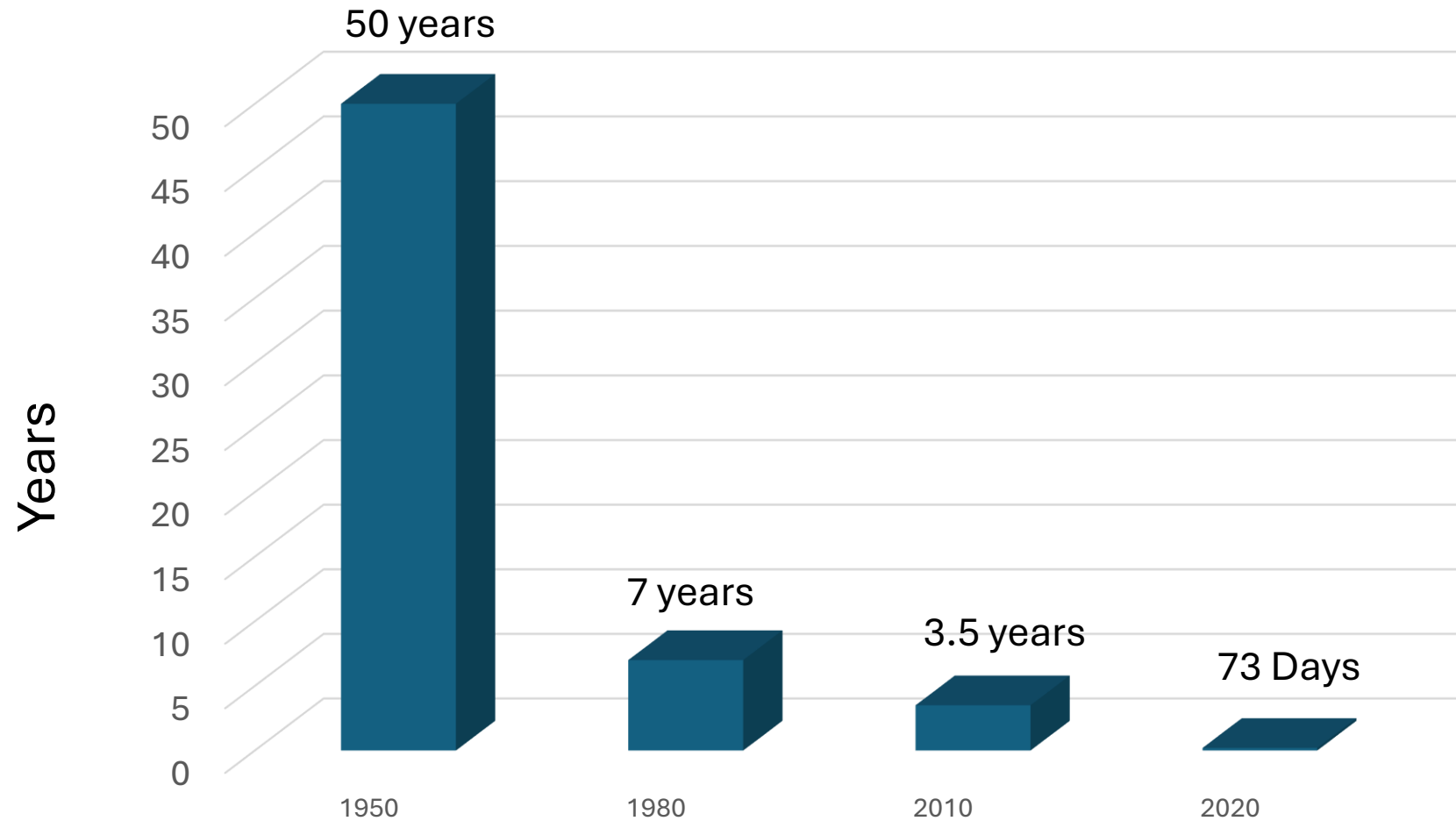
- Sustainable lifestyle change instead of a quick fix
- Being patient



The Future



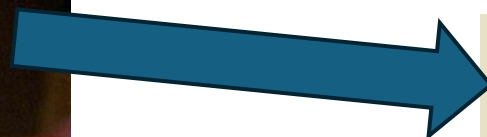
Doubling time of Medical Knowledge



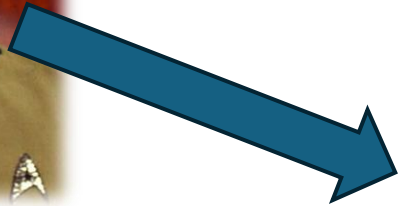
Technology of the future, today: Communication



Technology of the future, today: Eyes



Technology of the future, today

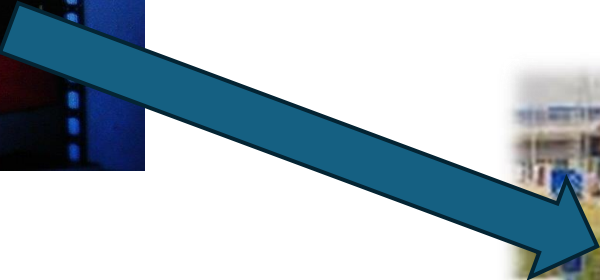
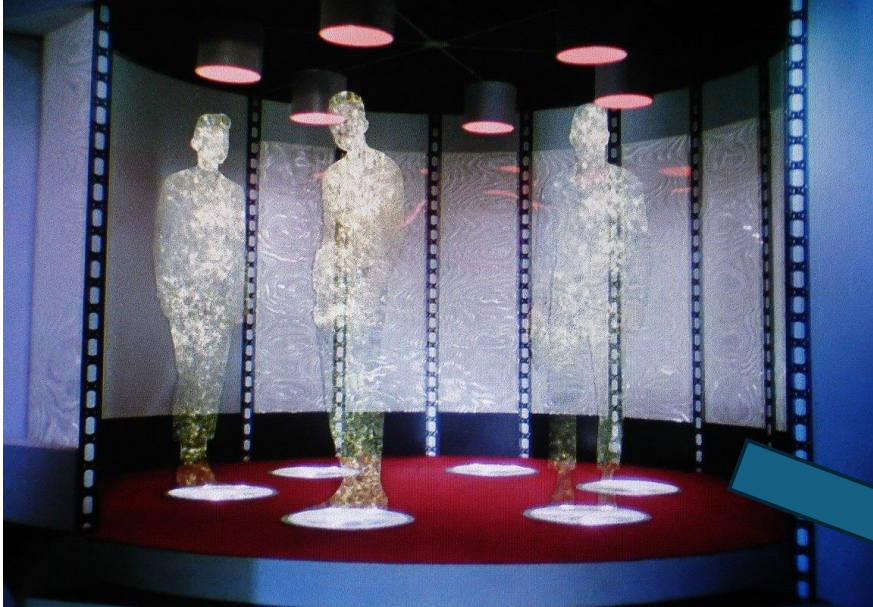


EZIAUTOJECTOR[®]

NEEDLE-FREE **INSULIN** DELIVERY DEVICE
FOR TYPE 1 & TYPE 2 DIABETES



Technology of the future, today: Transport



Conclusion and Takeaways

Key Takeaways:

- Managing diabetes effectively can support healthy ageing and improve quality of life
- Importance of regular monitoring, healthy habits, and adjusting your care plan as you mature

Encouragement:

- You can lead a full, active life with diabetes by staying informed and proactive
- Reach out to healthcare providers for support when needed

Enjoy the day!