SURVIVE & THRIVE · EXERCISE SERIES

Exercise on MDI — managing glucose around activity with injections

EXERCISE FRAMEWORK

The three variables that decide almost everything

IOB

Insulin on Board is variable #1

Recent bolus insulin is the dominant driver of exercise hypo risk. On MDI, that's your most recent rapid-acting injection.

BOLUS REDUCTION	CARB UTILISATION	BEDTIME SNACK
25-75%	**1.5 g/kg/h**	**0.4 g/kg**
pre-exercise meal · Rabasa-Lhoret	sustained aerobic · Riddle 2000	after evening exercise · Campbell 2015

Ref: Rabasa-Lhoret 2001 · West 2011 · Moser/Zaharieva 2024 EASD/ISPAD · Campbell 2015 · Riddle 2000 · Shetty 2016.

THE THREE MAJORS

- ✓ **1 · Insulin on Board (IOB).** Most important. Your last rapid-acting bolus drives exercise hypo risk more than anything else.
- ✓ **2 · Starting glucose.** Where you start shapes where you land. Above 8 mmol/L behaves differently from below 6.
- ✓ **3 · Trend arrows.** Direction and speed. Numbers without direction are incomplete.
- ✓ **MDI specific - basal insulin matters.** Degludec, Tresiba, Lantus run 24h+. You cannot reduce basal for a morning run.
- ✓ **Two levers: bolus reduction + carbs.** Neither alone is enough. Combined, they're the backbone.

PRE-EXERCISE · THE MEAL BEFORE

Bolus reduction by intensity + duration (Rabasa-Lhoret 2001)

INTENSITY	30 MIN	60 MIN
Light (walking, easy cycling)	-25%	-50%
Moderate (jogging, swimming)	-50%	-75%
Heavy (hard running, hills)	-75%	consider skipping meal bolus

Meal-bolus reduction works if exercise is within 90 minutes of the meal. Beyond that, the bolus is largely cleared and the reduction no longer protects you. Switch to carb intake instead.

PRE-EXERCISE · STARTING GLUCOSE

What to do before you start

GLUCOSE AT START	ACTION (MODERATE AEROBIC, 30-60 MIN)
< 5.0 mmol/L	15-30 g carb, re-test before starting
5.0-7.0	10-20 g carb, start with caution
7.0-10.0	Start as planned. Likely ideal range.
10.0-15.0	Start. Check ketones if glucose has been high for hours.
> 15.0	Delay if ketones present. Light activity only if ketones negative.

FASTED EXERCISE · A DIFFERENT PROBLEM

Morning runs before breakfast

With minimal IOB, the glucose-lowering effect of moderate exercise is attenuated (McCaugh 2021). Carbohydrate timing dominates - not bolus reduction.

- **Basal insulin is your IOB.** You cannot adjust it for a morning run on MDI.
- **Start at 7-9 mmol/L** for most comfortable aerobic sessions.
- **Short fasted session (< 45 min) at 6-8 mmol/L** often needs no carbs.
- **Longer session - carbs from the start.** 10-15 g every 20-30 min for sustained aerobic work beyond 45 min.

TREND ARROWS BEFORE STARTING

What your arrow tells you pre-exercise

- **Rising arrow** - start as planned; glucose will likely peak and fall during exercise.
- **Flat arrow** - baseline scenario. Follow the table opposite.
- **Falling arrow** - add 10-15 g carb even if glucose is in range. Exercise amplifies the fall.
- **Two arrows down** - treat as pre-hypo. Delay exercise, retest in 15 min.

SURVIVE & THRIVE · EXERCISE SERIES

Exercise on MDI — during, after, and overnight

DURING EXERCISE · CARBS IN

How much, how often

Fast-acting carbs - glucose tablets, Lift shots, sports gels, juice. Aim to match carbs to duration and intensity.

- **Light 30-60 min:** 10-15 g every 30 min if glucose trending down.
- **Moderate 30-60 min:** 15-30 g every 30 min.
- **Heavy / prolonged > 60 min:** up to 1 g/kg body weight per hour (Riddle 2000 upper bound).
- **Anaerobic / sprint intervals:** glucose may rise. Less carbs during, more attention to the post-exercise drop.

NON-CARBOHYDRATE COUNTER-REGULATION

The 10-second sprint trick

A brief maximal sprint after moderate exercise attenuates the post-exercise glucose drop without extra carbs. Bussau et al. 2006: 10-second all-out sprint at end of session reduced the fall in glucose over the following hours.

Real-world application. Finish a 30-min moderate session with 10 seconds of maximal effort. Sprint, stairs, skipping. Useful when you want to avoid extra carbs but mitigate the drop.

POST-EXERCISE & OVERNIGHT · THE LATE DROP

Where MDI hypos happen most

The post-exercise glucose dip arrives 4-14 hours later. Moderate-intensity daytime exercise drives overnight hypoglycaemia risk on MDI more than anything except missed basal.

- **Evening meal - reduce bolus by 25-50%** after afternoon/evening exercise.
- **Bedtime snack 0.4 g/kg** of slowly absorbed carbs after daytime exercise (Campbell 2015).
- **Mixed-macronutrient snack** (milk + oat biscuit) outperforms quick carbs for overnight stability (Kalergis 2003).
- **Set a 3am alarm** for the first few sessions of a new activity - know your personal pattern before relaxing.

MAJOR IN THE MAJORS · THE TWO ACTIONS

Model before you act

ACTION 1 — **Exercise IOB - carbs for 30 min exercise**
How much insulin is still on board, how many carbs you'll need to cover it. →

ACTION 2 — **Exercise Planning Explorer**
Full before / during / after planner - bolus reduction + carb intake modelled to your session. →

GO DEEPER

GNL explorers, guides & podcasts

GUIDE — **Full Exercise Guide - 5-part series**
Aerobic, mixed, anaerobic and AID + exercise. →

EXPLORER — **Activity Explorer - 10, 20, 30 min walking**
When exercise is the treatment for a high. →

ASK — **Grace - evidence-backed Q&A**
Rabasa-Lhoret, Moser/Zaharieva 2024 consensus, Cambridge pregnancy data. →