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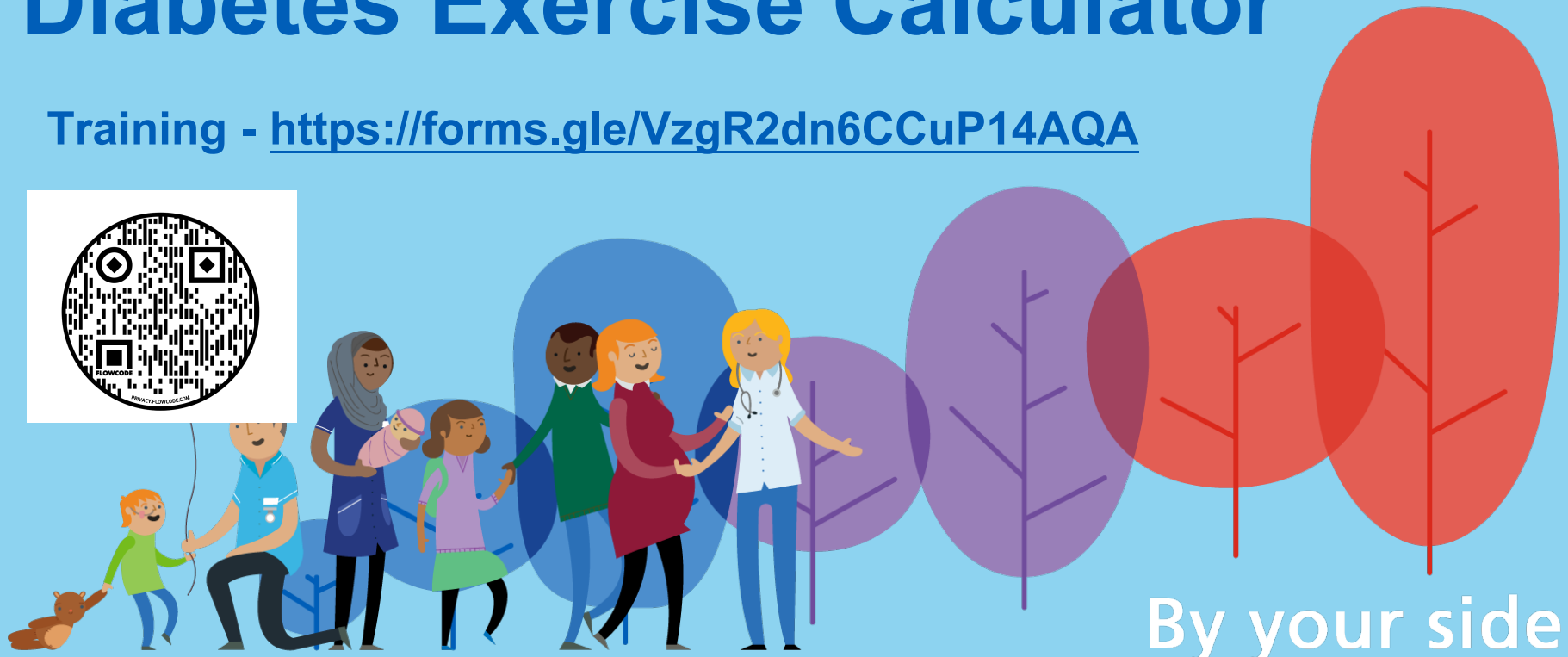
# Type 1 DEC
# Diabetes Exercise Calculator

Training - https://forms.gle/VzgR2dn6CCuP14AQA



# Introduction

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- Developed for BWC type 1 diabetes cohort
- Guidelines into practice (ISPAD, EASD, PEAK)
- Consistency in advice by all our team, not just the Dietitians
- A decent place to start
- Requires adaptation through trial and error
- We love geeking out!

# Disclaimer

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- For qualified diabetes professionals only
- Must complete this training and get 9/10 on competency
- https://forms.gle/VzgR2dn6CCuP14AQA
  - Check if qualified Diabetes professional
  - Email in 2-3 working days
  - Do not share the calculator
- Interpretation of guidelines
- Requires clinical expertise to interpret
- The plans are a guide:
  - Will require trial and error

# Must Read Papers!

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Diabetologia
https://doi.org/10.1007/s00125-020-05263-9

POSITION STATEMENT

## Glucose management for exercise using continuous glucose monitoring (CGM) and intermittently scanned CGM (isCGM) systems in type 1 diabetes: position statement of the European Association for the Study of Diabetes (EASD) and of the International Society for Pediatric and Adolescent Diabetes (ISPAD) endorsed by JDRF and supported by the American Diabetes Association (ADA)

Othmar Moser[1,2] · Michael C. Riddell[3] · Max L. Eckstein[1] · Peter Adolfsson[4,5] · Rémi Rabasa-Lhoret[6,7,8,9] · Louisa van den Boom[10] · Pieter Gillard[11] · Kirsten Nørgaard[12] · Nick S. Oliver[13] · Dessi P. Zaharieva[14] · Tadej Battelino[15,16] · Carine de Beaufort[17,18] · Richard M. Bergenstal[19] · Bruce Buckingham[14] · Eda Cengiz[20,21] · Asma Deeb[22] · Tim Heise[23] · Simon Heller[24,25] · Aaron J. Kowalski[26] · Lalantha Leelarathna[27,28] · Chantal Mathieu[11] · Christoph Stettler[29] · Martin Tauschmann[30] · Hood Thabit[27] · Emma G. Wilmot[31,32] · Harald Sourij[1] · Carmel E. Smart[33,34] · Peter G. Jacobs[35] · Richard M. Bracken[36] · Julia K. Mader[1]

**Moser at al (2020)**
Moser, O., Riddell, M.C., Eckstein, M.L. *et al.* Glucose management for exercise using continuous glucose monitoring (CGM) and intermittently scanned CGM (isCGM) systems in type 1 diabetes: position statement of the European Association for the Study of Diabetes (EASD) and of the International Society for Pediatric and Adolescent Diabetes (ISPAD) endorsed by JDRF and supported by the American Diabetes Association (ADA). *Diabetologia* (2020). https://doi.org/10.1007/s00125-020-05263-9

WILEY ISPAD

ISPAD CLINICAL PRACTICE CONSENSUS GUIDELINES

## ISPAD Clinical Practice Consensus Guidelines 2018: Exercise in children and adolescents with diabetes

Peter Adolfsson[1] | Michael C. Riddell[2] | Craig E. Taplin[3] | Elizabeth A. Davis[4] | Paul A. Fournier[5] | Francesca Annan[6] | Andrea E. Scaramuzza[7] | Dhruvi Hasnani[8] | Sabine E. Hofer[9]

**Adolfsson et al (2018)**
Pediatric Diabetes October 2018; 19 (Suppl. 27): 205–226.

## Exercise management in type 1 diabetes: a consensus statement

*Michael C Riddell, Ian W Gallen, Carmel E Smart, Craig E Taplin, Peter Adolfsson, Alistair N Lumb, Aaron Kowalski, Remi Rabasa-Lhoret, Rory J McCrimmon, Carin Hume, Francesca Annan, Paul A Fournier, Claudia Graham, Bruce Bode, Pietro Galassetti, Timothy W Jones, Iñigo San Millán, Tim Heise, Anne L Peters, Andreas Petz, Lori M Laffel*

**RIDDELL ET AL (2017)**
THE LANCET DIABETES & ENDOCRINOLOGY, 5 (5), P377-390

# To get started

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## Dexcom Type 1 DEC (Diabetes Exercise Calculator)

I agree: I am a qualified diabetes professional. I will not give this to a patient. I will only use the calculator after watching this **video** and achieving **competency**. I will not pass the calculator on to any other person. No

- Open in Adobe Acrobat Reader (click to get for free): **Computer** **Apple** **Android**
- For a new plan make sure the answers to both review questions read "Stayed in target"

**1.** What's your name?

**2.** What activity are you doing and what time are you doing it?

**3.** Are you using an insulin pump or multiple daily injections? Multiple daily injections

**4.** How many minutes before exercise are you eating and giving insulin?

**5.** How many minutes are you exercising for?

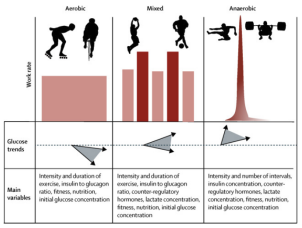
**6.** What is your weight in kilograms (kg)?

**7.** What is your exercise hypoglycaemia risk? Medium (Any of: 1. Exercise 1-2 times a week, 2. TBR 4-8%, 3. Aysmptomatic hypoglycaemia

**8.** What type of activity are you doing (see pictures)? Aerobic

**9.** What glucose units does your device use? mmol/L

**10.** At what glucose & ketone level should you stop exercise? ≥14.0mmol/L (250mg/dL) & ≥0.6mmol/L




Guidelines the Type 1 DEC is based on (click & read):

- **Moser et al (2020) EASD/ISPAD CGM& Exercise**
- **Adolfsson et el (2018) ISPAD Paediatric Exercise**
- **Riddell et al (2017) Type 1 Exercise Consensus** (where the graphic is from)

**Adapting the plan after trying the first trial:**

Glucose level during exercise? Stayed in target

Glucose level after exercise? Stayed in target

**Disclaimer**

- Plans must be made by a qualified diabetes professional
- Always consult a qualified diabetes professional before trying or adapting a plan

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# 10 questions

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**1.** What's your name?

John Pemberton

**2.** What activity are you doing and what time are you doing it?

Rowing 12:00

**3.** Are you using an insulin pump or multiple daily injections?

Insulin pump

**4.** How many minutes before exercise are you eating and giving insulin?

180

**5.** How many minutes are you exercising for?

45

**6.** What is your weight in kilograms (kg)?

95

**7.** What is your exercise hypoglycaemia risk?

Low (All of: 1. Exercise more than 2 times a week, 2. TBR less than 4%, 3. Hypo aware

**8.** What type of activity are you doing (see pictures)?

Mixed

**9.** What glucose units does your device use?

mmol/L

**10.** What glucose & ketone level should stop exercise for you?

≥14.0mmol/L (250mg/dL) & ≥0.6mmol/L

# Hypoglycaemia risk

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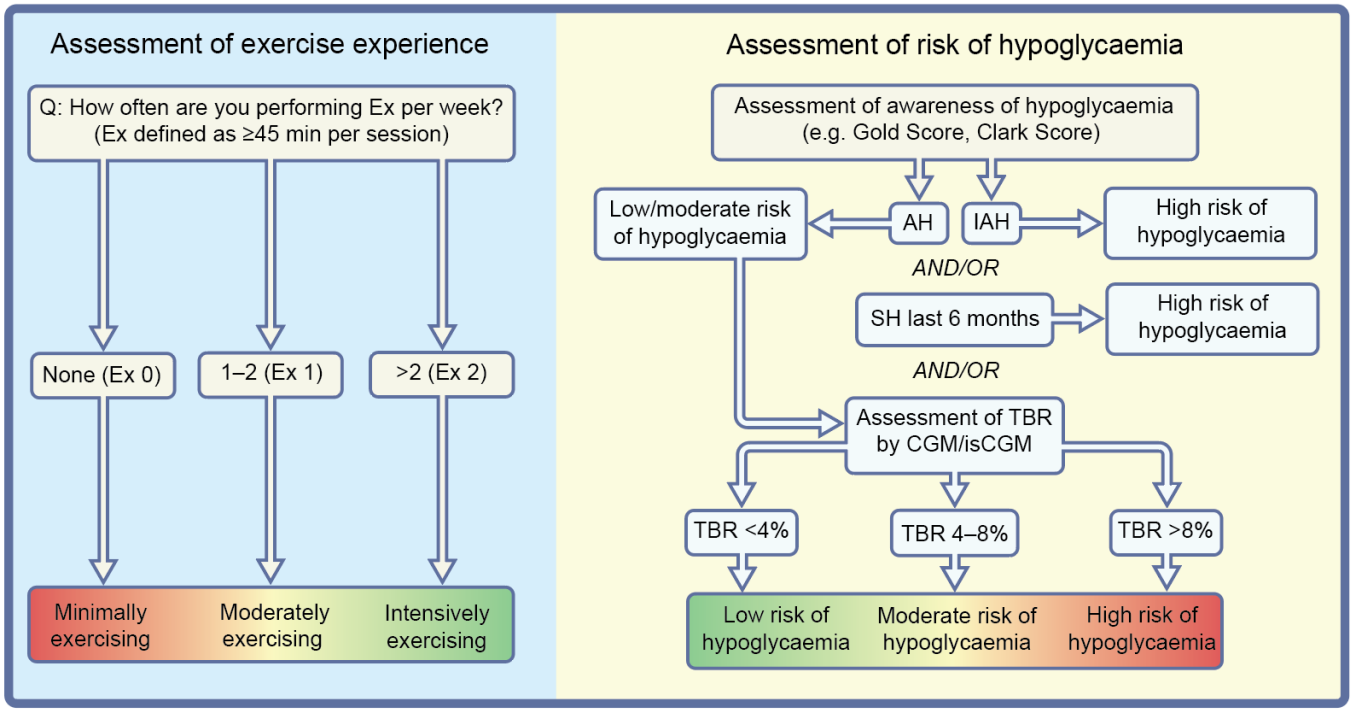


**Moser at al (2020)**

# Exercise types

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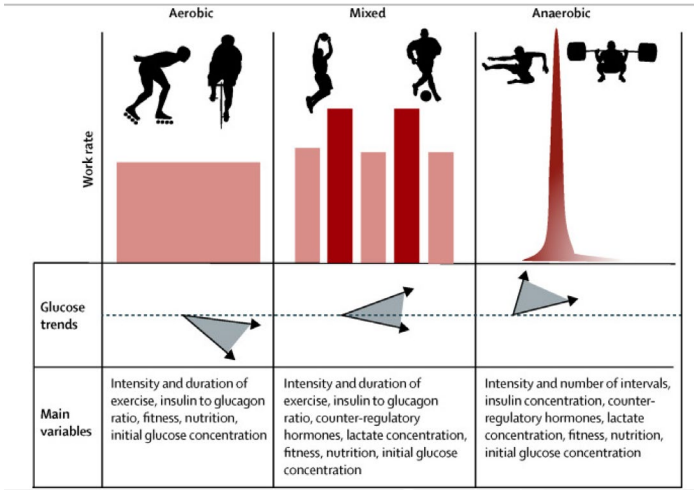
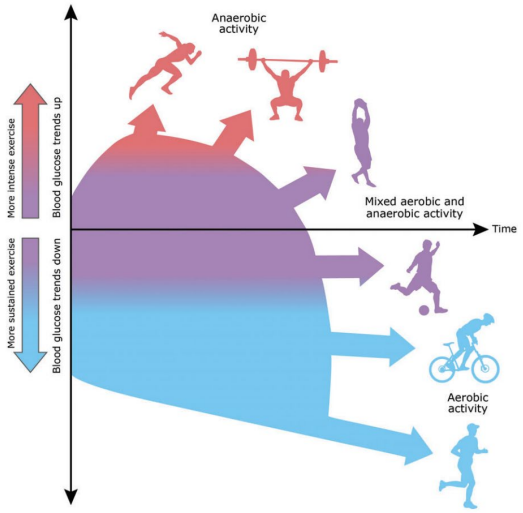
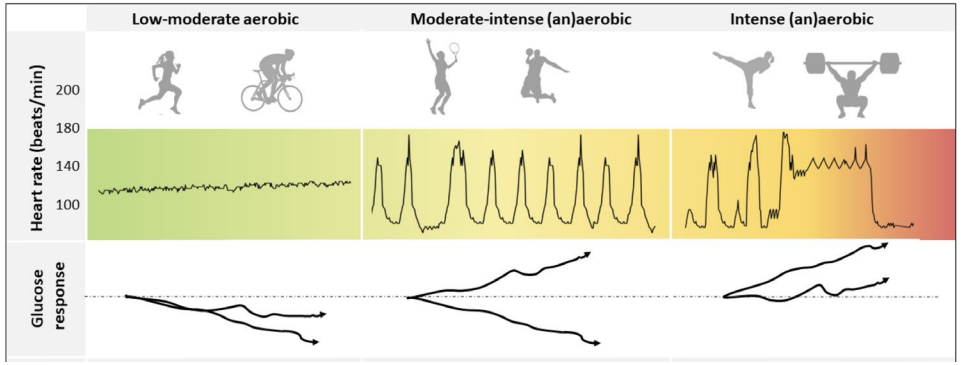



RIDDELL ET AL (2017)




Adolfsson et al (2018)




Moser at al (2020)

# Insulin reductions Before exercise

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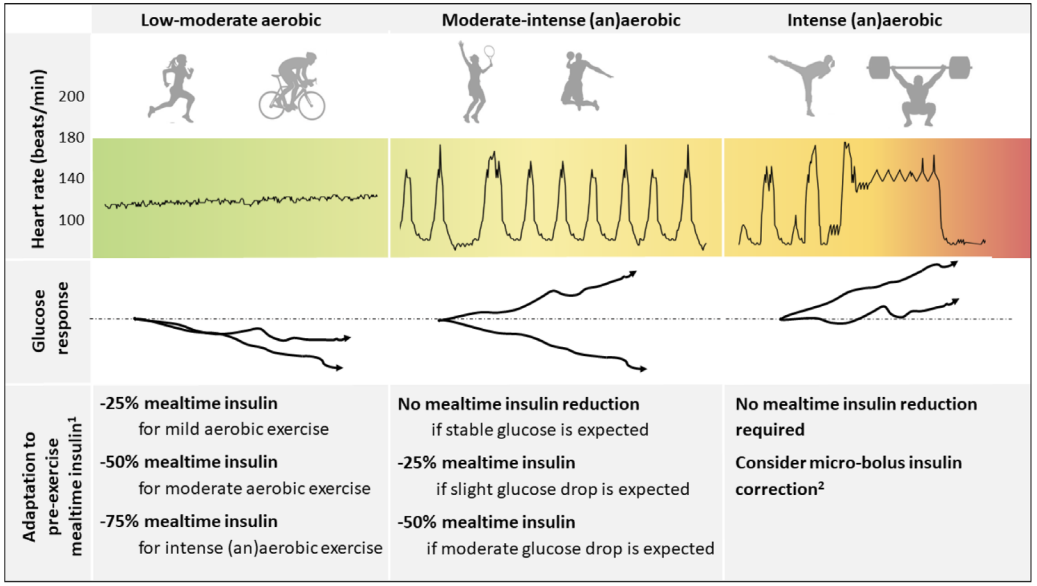
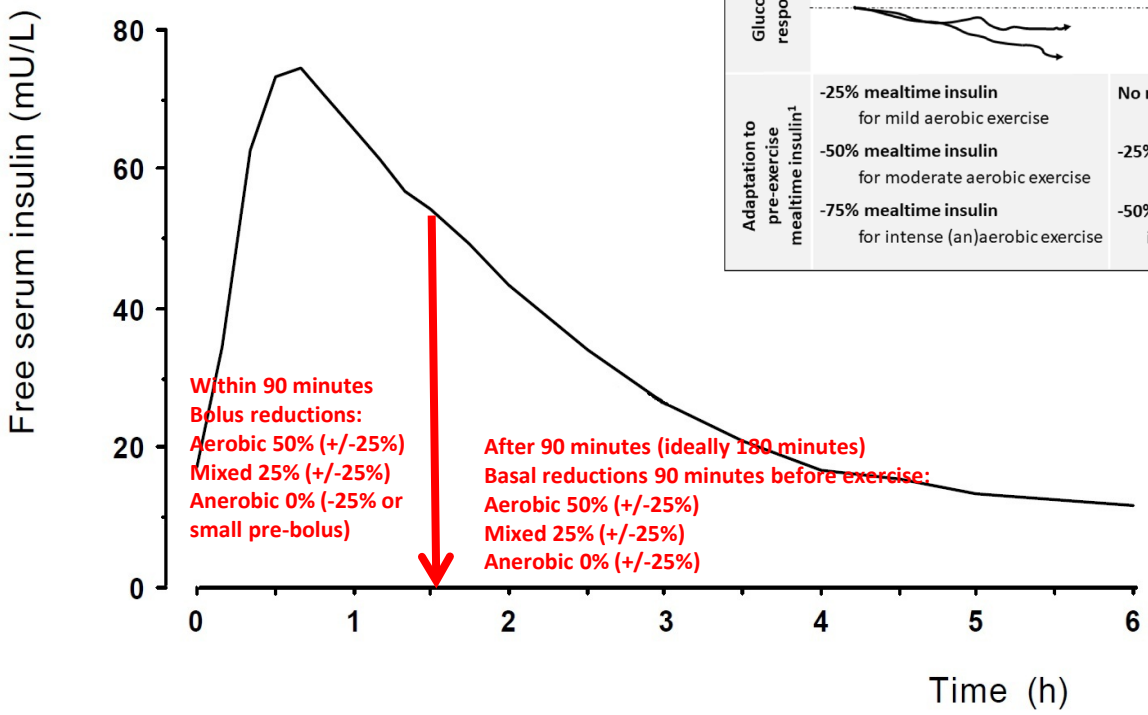



Moser at al (2020)



# Quick recap – After Exercise

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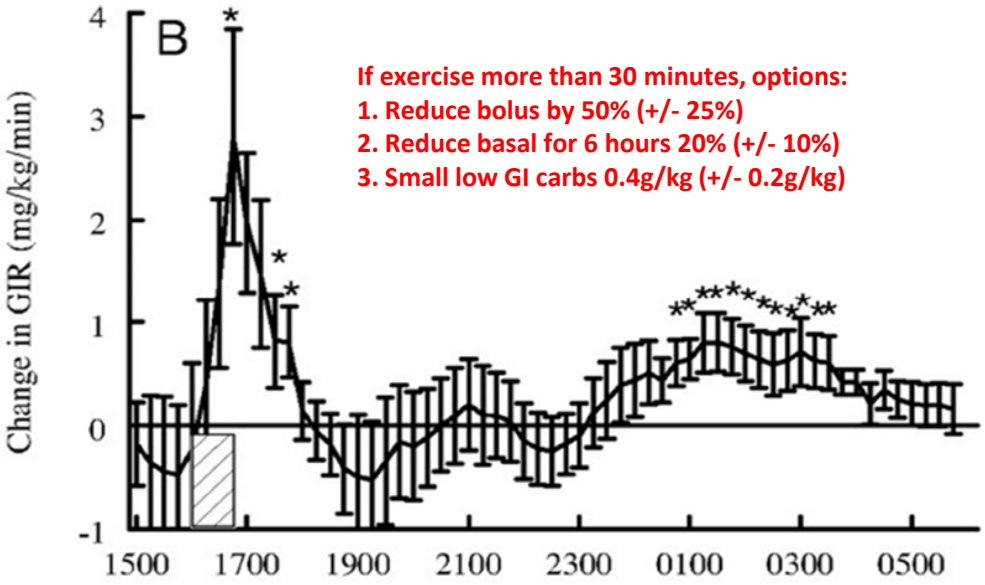


**If exercise more than 30 minutes, options:**
**1. Reduce bolus by 50% (+/- 25%)**
**2. Reduce basal for 6 hours 20% (+/- 10%)**
**3. Small low GI carbs 0.4g/kg (+/- 0.2g/kg)**

McMahon et al (2007) JCEM 92: 963-968

**Table 4** General insulin therapy and carbohydrate recommendations for exercise in children and adolescents with type 1 diabetes

| Type of therapy | Type/intensity of exercise Duration 30–45 min | Type/intensity of exercise Duration >45 min |
|---|---|---|
| MDI/CSII: mealtime bolus insulin dose reduction | −25% for mild aerobic<br>−50% for moderate aerobic<br>−50% for intense aerobic<br>−25% for mixed aerobic/anaerobic<br>Up to −50% post exercise | −50% for mild aerobic<br>−75% for moderate aerobic<br>−75% for intense aerobic<br>−50% for mixed aerobic/anaerobic<br>Up to −50% post exercise |
| MDI: basal insulin[a] | −20% for evening/late afternoon exercise | −20% for evening/late afternoon exercise<br>−30 to −50% for all-day/unusual activities[a] |
| CSII: basal insulin rate | Up to −50% 90 min pre exercise<br>Insulin pump suspension (<60 min)<br>−20% for post-exercise night time[b] | Up to −80% 90 min pre exercise<br>Insulin pump suspension (<60 min)<br>−20% for post-exercise night time[b] |
| General CHO intake[c] | 10–15 g CHO depending on IOB and sensor glucose level<br>1.5 g CHO per kg BW/h for intense exercise (regular IOB)<br>0.25 g CHO per kg BW/h for intense exercise (less IOB)<br>0.4 g CHO/kg BW pre-bed snack for evening/late afternoon exercise | 10–15 g CHO depending on IOB and sensor glucose level<br>1.5 g CHO per kg BW/h for intense and/or long-lasting exercise (regular IOB)<br>0.25 g CHO per kg BW/h for intense exercise (less IOB)<br>0.4 g CHO/kg BW pre-bed snack for evening/late afternoon exercise |

Moser et al 2020.

# Trend arrows

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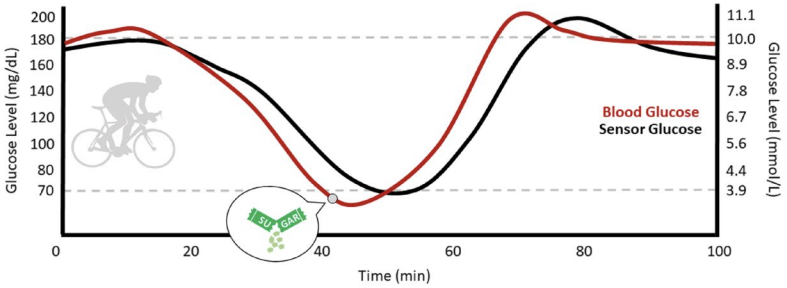
| Device | Trend Arrow | Interpretation within 15 min | Conforms with generic trend arrow as used in the position statement |
|---|---|---|---|
| Abbott Devices Senseonics Devices | ↑ | Increase >1.7 mmol/l (30 mg/dl) | ↑ |
| | ↗ | Increase 0.8–1.7 mmol/l (15–30 mg/dl) | ↗ |
| | → | Increase/decrease <0.8 mmol/l (15 mg/dl) | → |
| | ↘ | Decrease 0.8–1.7 mmol/l (15–30 mg/dl) | ↘ |
| | ↓ | Decrease >1.7 mmol/l (30 mg/dl) | ↓ |
| Dexcom Devices | ↑↑ | Increase >2.5 mmol/l (45 mg/dl) | ↑ |
| | ↑ | Increase 1.7–2.5 mmol/l (30–45 mg/dl) | |
| | ↗ | Increase 0.8–1.7 mmol/l (15–30 mg/dl) | ↗ |
| | → | Increase/decrease <0.8 mmol/l (15 mg/dl) | → |
| | ↘ | Decrease 0.8–1.7 mmol/l (15–30 mg/dl) | ↘ |
| | ↓ | Decrease 1.7–2.5 mmol/l (30–45 mg/dl) | ↓ |
| | ↓↓ | Decrease >2.5 mmol/l (45 mg/dl) | |
| Medtronic Devices[1] | ↑↑↑ | Increase >2.5 mmol/l (45 mg/dl) | ↑ |
| | ↑↑ | Increase 1.7–2.5 mmol/l (30–45 mg/dl) | |
| | ↑ | Increase 0.8–1.7 mmol/l (15–30 mg/dl) | ↗ |
| | | Increase/decrease <0.8 mmol/l (15 mg/dl) | → |
| | ↓ | Decrease 0.8–1.7 mmol/l (15–30 mg/dl) | ↘ |
| | ↓↓ | Decrease 1.7–2.5 mmol/l (30–45 mg/dl) | ↓ |
| | ↓↓↓ | Decrease >2.5 mmol/l (45 mg/dl) | |




**Moser at al (2020)**

# Carbohydrate just before & during exercise

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## 20 minutes before

| Pre-exercise sensor glucose for different groups in T1D | | | Trend arrow | Action | |
|---|---|---|---|---|---|
| Ex 2 and/or low hypo risk | Ex 1 and/or moderate hypo risk | Ex 0 and/or high hypo risk | Direction | Increase in sensor glucose expected | Decrease in sensor glucose expected |
| >15.0 mmol/l (>270 mg/dl ) AND >1.5 mmol/l blood ketones | | | ↑↗→↘↓ | No Ex, Insulin correction | |
| >15.0 mmol/l (>270 mg/dl) AND ≤1.5 mmol/l blood ketones | | | ↑↗ | Consider insulin correction[a], Can start AE | Consider insulin correction[a], Can start all Ex |
| | | | → | Consider insulin correction[a], Can start AE | Can start all Ex |
| | | | ↘↓ | Can start all Ex | |
| 10.1–15.0 mmol/l (181–270 mg/dl) | 11.1–15.0 mmol/l (199–270 mg/dl) | 12.1–15.0 mmol/l (217–270 mg/dl) | ↑↗ | Can start AE | Can start all Ex |
| | | | → | Can start all Ex | |
| | | | ↘↓ | | |
| 7.0–10.0 mmol/l (126–180 mg/dl) | 8.0–11.0 mmol/l (145–198 mg/dl) | 9.0–12.0 mmol/l (162–216 mg/dl) | ↑↗ | Can start all Ex | |
| | | | → | | |
| | | | ↘↓ | ~5 g CHO (0.2 g/kg), Can start all Ex | ~10 g CHO (0.3 g/kg), Can start all Ex |
| 5.0–6.9 mmol/l (90–125 mg/dl) | 5.0–7.9 mmol/l (90–144 mg/dl) | 5.0–8.9 mmol/l (90–161 mg/dl | ↑↗ | Can start all Ex | ~5 g CHO (0.2 g/kg), Can start all Ex |
| | | | → | ~5 g CHO (0.2 g/kg), Can start all Ex | ~10 g CHO (0.3 g/kg), Can start all Ex |
| | | | ↘ | ~10 g CHO (0.3 g/kg), Delay all Ex[b] | ~15 g CHO (0.4 g/kg), Delay all Ex[b] |
| | | | ↓ | Individual amount CHO ingestion, Delay all Ex[b] | |
| <5.0 mmol/l (<90 mg/dl) | | | Individual amount CHO ingestion, Delay all Ex[b] | | |

Moser at al (2020)

## Every 15-20 minutes during

| Pre-exercise sensor glucose for different groups in T1D | | | Trend arrow | Action | |
|---|---|---|---|---|---|
| Ex 2 and/or low hypo risk | Ex 1 and/or moderate hypo risk | Ex 0 and/or high hypo risk | Direction | Increase in sensor glucose expected | Decrease in sensor glucose expected |
| >15.0 mmol/l (>270 mg/dl ) AND >1.5 mmol/l blood ketones | | | ↑↗→↘↓ | No Ex, Insulin correction | |
| >15.0 mmol/l (>270 mg/dl) AND ≤1.5 mmol/l blood ketones | | | ↑↗ | Consider insulin correction[a], Can start AE | Consider insulin correction[a], Can start all Ex |
| | | | → | Consider insulin correction[a], Can start AE | Can start all Ex |
| | | | ↘↓ | Can start all Ex | |
| 10.1–15.0 mmol/l (181–270 mg/dl) | 11.1–15.0 mmol/l (199–270 mg/dl) | 12.1–15.0 mmol/l (217–270 mg/dl) | ↑↗ | Can start AE | Can start all Ex |
| | | | → | Can start all Ex | |
| | | | ↘↓ | | |
| 7.0–10.0 mmol/l (126–180 mg/dl) | 8.0–11.0 mmol/l (145–198 mg/dl) | 9.0–12.0 mmol/l (162–216 mg/dl) | ↑↗ | Can start all Ex | |
| | | | → | | |
| | | | ↘↓ | ~5 g CHO (0.2 g/kg), Can start all Ex | ~10 g CHO (0.3 g/kg), Can start all Ex |
| 5.0–6.9 mmol/l (90–125 mg/dl) | 5.0–7.9 mmol/l (90–144 mg/dl) | 5.0–8.9 mmol/l (90–161 mg/dl | ↑↗ | Can start all Ex | ~5 g CHO (0.2 g/kg), Can start all Ex |
| | | | → | ~5 g CHO (0.2 g/kg), Can start all Ex | ~10 g CHO (0.3 g/kg), Can start all Ex |
| | | | ↘ | ~10 g CHO (0.3 g/kg), Delay all Ex[b] | ~15 g CHO (0.4 g/kg), Delay all Ex[b] |
| | | | ↓ | Individual amount CHO ingestion, Delay all Ex[b] | |
| <5.0 mmol/l (<90 mg/dl) | | | Individual amount CHO ingestion, Delay all Ex[b] | | |

Moser at al (2020)

# Algorithm

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| | | Before exercise | | | | During exercise | After exercise | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Meal insulin | | Basal insulin | | Carbohydrate: 20 mins before every 20 mins during | Maximum of two options | | |
| Exercise type | Plan execution | Within 90mins of exercise | More than 90 minutes before exercise | If exercise is within 90mins of meal insulin | If exercise is more than 90mins since meal insulin. Change basal 90mins before (MDI) | See carbs chart for glucose level and trend arrows. Capped at 60kg dur to 1g/min max glucose absorption | Meal insulin | Basal insulin pump (MDI: Basal insulin if in evening) | Low GI carbs no insulin before bed. Capped at 60kg to prevent excessive intake |
| Aerobic | Went low first time | -75% | No change | No change | -75% (No change) | | -75% | -30% for 6 hrs (-30%) | 0.6g/kg |
| | **Starting plan** | **-50%** | **No change** | **No change** | **-50% (No change)** | | **-50%** | **-20% for 6 hrs (-20%)** | **0.4g/kg** |
| | Went high first time | -25% | No change | No change | -25% (No change) | | -25% | -10% for 6 hrs (-10%) | 0.2g/kg |
| Mixed | Went low first time | -50% | No change | No change | -50% (No change) | | -75% | -30% for 6 hrs (-30%) | 0.6g/kg |
| | **Starting plan** | **-25%** | **No change** | **No change** | **-25% (No change)** | | **-50%** | **-20% for 6 hrs (-20%)** | **0.4g/kg** |
| | Went high first time | No change | No change | No change | No change (No change) | | -25% | -10% for 6 hrs (-10%) | 0.2g/kg |
| Anaerobic | Went low first time | -25% | No change | No change | -25% (No change) | | -50% | -30% for 6 hrs (-30%) | 0.4g/kg |
| | **Starting plan** | **No change** | **No change** | **No change** | **No change (No change)** | | **-25%** | **-20% for 6 hrs (-20%)** | **0.2g/kg** |
| | Went high first time | No change and small bolus 15 mins pre-exercise | No change | No change | No change and small bolus 15 mins pre-exercise | | no change | No change | 0g/kg |

# Carbs 20 min before & every 20 min during

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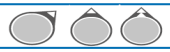
| Sensor glucose Levels | Trend arrow & action to take | Grams carb g/kg/20min (60min) - Aerobic | Grams carb g/kg/20min (60min) - Mixed | Grams carb g/kg/20min (60min) - Anaerobic |
|---|---|---|---|---|
| <4.0mmol/L | Treat hypo, re-check & follow below guidance | 0.5/kg | 0.5/kg | 0.5/kg |
| 4.0-4.9 mmol/L |  | 0.5 (1.5) | 0.45 (1.35) | 0.4 (1.2) |
| |  | 0.4 (1.2) | 0.35 (1.05) | 0.3 (0.9) |
| |  | 0.3 (0.9) | 0.25 (0.75) | 0.2 (0.6) |
| |  | 0.2 (0.6) | 0.15 (0.45) | 0.1 (0.3) |
| |  | 0.1 (0.3) | 0.05 (0.15) | 0 (0) |
| E2: 5.0-6.9 mmol/L E1: 5.0-7.9 mmol/L E0: 5.0-8.9 mmol/L |  | 0.5 (1.5) | 0.45 (1.35) | 0.4 (1.2) |
| |  | 0.4 (1.2) | 0.35 (1.05) | 0.3 (0.9) |
| |  | 0.3 (0.9) | 0.25 (0.75) | 0.2 (0.6) |
| |  | 0.2(0.6) | 0.1 (0.3) | 0 (0) |
| E2: 7.0–10.0mmol/L E1: 8.0-11.0mmol/L E0: 8.0-12.0mmol/L |  | 0.3 (0.9) | 0.25 (0.75) | 0.2 (0.6) |
| |  | 0 (0) | 0 (0) | 0 (0) |
| |  | 0 (0) | 0 (0) | 0 (0) |
| 13.9 mmol/L | All Arrows | 0 (0) | 0.0 (0) | 0.0 (0) |
| >13.9 mmol/L & ketones <0.5mmol/L |  | Ok to exercise: No carbohydrate needed for 20 minutes | | |
| |  | Ok to exercise: No carbohydrate needed for 20 minutes, may need 50% of correction dose | | |
| ketones >0.5mmol/L | All Arrows | No exercise: Requires corrective dose of insulin to get ketones less than 0.6mmol/l before starting exercise | | |

Capped at 60kg due to glucose absorption limit of 1g/min for glucose and 1.5g/kg for mixed fast acting carb sources – Jeukendrup (2014) *Sports Med* **44,** 25–33

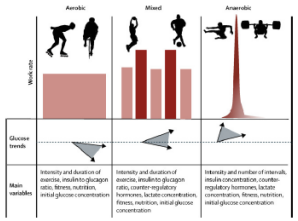
# BWC Type 1 DEC

## Dexcom Type 1 DEC (Diabetes Exercise Calculator)

I agree: I am a qualified diabetes professional. I will not give this to a patient. I will only use the calculator after watching this **video** and achieving **competency**. I will not pass the calculator on to any other person. I will only use the calculator with Adobe Acrobat Reader? Yes

- Open in Adobe Acrobat Reader (click to get for free): Computer Apple Android
- For a new plan make sure the answers to both review questions read "Stayed in target"

1. What's your name? JP
2. What activity are you doing and what time are you doing it? Football 18:00
3. Are you using an insulin pump or multiple daily injections? Multiple daily injections
4. How many minutes before exercise are you eating and giving insulin? 60
5. How many minutes are you exercising for? 60
6. What is your weight in kilograms (kg)? 50
7. What is your exercise hypoglycaemia risk? Low (All of: 1. Exercise more than 2 times a week, 2. TBR less than 4%, 3. Hypo aware
8. What type of activity are you doing (see pictures)? Mixed
9. What glucose units does your device use? mmol/L
10. At what glucose & ketone level should you stop exercise? ≥14.0mmol/L (250mg/dL) & ≥0.6mmol/L




Guidelines the Type 1 DEC is based on (click & read):

- Moser et al (2020) EASD/ISPAD CGM& Exercise
- Adolfsson et el (2018) ISPAD Paediatric Exercise
- Riddell et al (2017) Type 1 Exercise Consensus (where the graphic is from)

**Adapting the plan after trying the first trial:**

Glucose level during exercise? Stayed in target

Glucose level after exercise? Stayed in target

**Disclaimer**

- Plans must be made by a qualified diabetes professional
- Always consult a qualified diabetes professional before trying or adapting a plan

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JP

| Activity<br>How long for<br>How long after meal | Before Activity:<br>Meal before<br>Basal before | During Activity | After activity options:<br>Choose a maximum of two |
|---|---|---|---|
| Football 18:00<br><br>for 60 minutes<br><br>starting 60 minutes after last meal | Reduce meal insulin by 25%<br><br>No basal change necessary | See the chart below for exercise action required for:<br>1. 20 mins before<br>2. Just before<br>3. Every 20 mins<br><br>For safety: set low alert at 5.6mmol/L | 1. Reduce meal insulin by 50%<br>2. If evening exercise: Reduce night basal insulin by 20%<br>3. 20 grams low/medium GI carbs before bed without insulin<br><br>For safety: 50% of correction doses for 90 mins & set low alert at 4.4mmol/l until the morning |

| Sensor glucose Levels | Trend arrow & action to take | Carbohydrate grams needed for 20 mins | Dextrose (3g | Lucozade Sp |
|---|---|---|---|---|
| <4.0mmol/L | <3.0mmol/L: NO exercise | 25 Treat & re-check in 20 minutes | 8 | 385 |
| 4.0-4.9 mmol/L | ↓↓ | 23 & delay exercise for 20 minutes | 8 | 346 |
| | ↓ | 18 & delay exercise for 20 minutes | 6 | 269 |
| | ↘ | 13 & delay exercise for 20 minutes | 4 | 192 |
| | → | 8 & delay exercise for 20 minutes | 3 | 115 |
| | ↑↑ | 3 & delay exercise for 20 minutes | 1 | 38 |
| 5.0-6.9 mmol/L | ↓↓ | 23 & start exercise check in 20 mins | 8 | 346 |
| | ↓ | 18 & start exercise check in 20 mins | 6 | 269 |
| | ↘ | 13 & start exercise check in 20 mins | 4 | 192 |
| | ↓↘→ | 5 & start exercise check in 20 mins | 2 | 77 |
| 7.0-10.0 mmol/L | ↓↘→ | 13 & start exercise check in 20 mins | 4 | 192 |
| | ↘ | 0 & start exercise check in 20 mins | | |
| | ↓↘→ | 0 & start exercise check in 20 mins | | |
| 10.1-13.9 mmol/L | All Arrows | 0 & start exercise check in 20 mins | | |
| ≥14.0mmol/L & ketones <0.6mmol/L | ↓↓↘↑ | OK to exercise: No carbohydrate for 20 minutes | | |
| | ↓↘→ | OK to exercise: Consider 50% of correction dose before starting | | |
| ≥14.0mmol/L & ketones ≥0.6mmol/L | All Arrows | No exercise: Correction dose & ketones <0.6mmol/L before starting exercise | | |

# Type 1 DEC

## Libre Type 1 DEC (Diabetes Exercise Calculator)

I agree: I am a qualified diabetes professional. I will not give this to a patient. I will only use the calculator after watching this **video** and achieving **competency**. I will not pass the calculator on to any other person. I will only use the calculator with Adobe Acrobat Reader? Yes

- Open in Adobe Acrobat Reader (click to get for free): **Computer** **Apple** **Android**
- For a new plan make sure the answers to both review questions read "Stayed in target"

**1.** What's your name? Joe Bloggs

**2.** What activity are you doing and what time are you doing it? Running 17:00

**3.** Are you using an insulin pump or multiple daily injections? Insulin pump

**4.** How many minutes before exercise are you eating and giving insulin? 240

**5.** How many minutes are you exercising for? 50

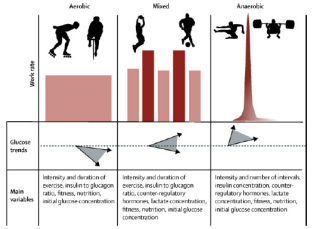
**6.** What is your weight in kilograms (kg)? 70

**7.** What is your exercise hypoglycaemia risk? High (Any of: 1. Exercise less than once a week, 2. TBR>8%, 3. Impaired awareness of hypoglycaemia

**8.** What type of activity are you doing (see pictures)? Aerobic

**9.** What glucose units does your device use? mmol/L

**10.** At what glucose & ketone level should you stop exercise? ≥14.0mmol/L (250mg/dL) & ≥0.6mmol/L




Guidelines the Type 1 DEC is based on (click & read):

- **Moser et al (2020) EASD/ISPAD CGM& Exercise**
- **Adolfsson et el (2018) ISPAD Paediatric Exercise**
- **Riddell et al (2017) Type 1 Exercise Consensus** (where the graphic is from)

**Adapting the plan after trying the first trial:**

Glucose level during exercise? Stayed in target

Glucose level after exercise? Stayed in target

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Joe Bloggs

| Activity<br>How long for<br>How long after meal | Before Activity:<br>Meal before<br>Basal before | During Activity | After activity options:<br>Choose a maximum of two |
|---|---|---|---|
| Running 17:00<br>for 50 minutes<br>starting 240 minutes after last meal | No meal insulin reduction<br>Reduce basal insulin by 50% 90 minutes before exercise | See the chart below for exercise action required for:<br>1. 20 mins before<br>2. Just before<br>3. Every 20 mins | 1. Reduce meal insulin by 50%<br>2. If evening exercise: reduce basal rate by 20% for 6 hours<br>3. 24 grams low/medium GI carbs before bed without insulin<br>For safety: 50% of correction doses for 90 mins & scan at 2-3am |

| Sensor glucose Levels | Trend arrow & action to take | Carbohydrate grams needed for 20 mins | Dextrose (3g) | Lucozade |
|---|---|---|---|---|
| <4.0mmol/L Check BG | <3.0mmol/L: NO exercise | 30 Treat & re-check in 20 minutes | 10 | 333 |
| 4.0-4.9 mmol/L | ↓ | 30 & delay exercise for 20 minutes | 10 | 333 |
| | ↘ | 24 & delay exercise for 20 minutes | 8 | 267 |
| | → | 18 & delay exercise for 20 minutes | 6 | 200 |
| | ↗ | 12 & delay exercise for 20 minutes | 4 | 133 |
| | ↑ | 6 & delay exercise for 20 minutes | 2 | 67 |
| 5.0-8.9 mmol/L | ↓ | 30 & start exercise check in 20 mins | 10 | 333 |
| | ↘ | 24 & start exercise check in 20 mins | 8 | 267 |
| | → | 18 & start exercise check in 20 mins | 6 | 200 |
| | ↗ ↑ | 12 & start exercise check in 20 mins | 4 | 133 |
| 9.0-12.0 mmol/L | ↘ ↓ | 18 & start exercise check in 20 mins | 6 | 200 |
| | → | 0 & start exercise check in 20 mins | | |
| | ↗ ↑ | 0 & start exercise check in 20 mins | | |
| 12.1-13.9 mmol/L | All Arrows | 0 & start exercise check in 20 mins | | |
| ≥14.0mmol/L (Check BG) & ketones <0.6mmol/L | → ↘ ↓ | OK to exercise: No carbohydrate for 20 minutes | | |
| | ↗ ↑ | OK to exercise: Consider 50% of correction dose before starting | | |
| ≥14.0mmol/L & ketones ≥0.6mmol/L | All Arrows | No exercise: Correction dose & ketones <0.6mmol/L before starting exercise | | |

# Live demo

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## Watch the training videos

https://forms.gle/VzgR2dn6CCuP14AQA

# Competency

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- Click the competency link
  - https://forms.gle/VzgR2dn6CCuP14AQA
- Must score 9/10 to get the Type 1 DEC by email
- Make sure you use with Adobe Acrobat Reader
- Use with clinical expertise and experience
- All feedback both good and for improvements welcome:
  - johnpemberton@nhs.net
- Massive thanks to the professionals in creating the guidance:
  - ISPAD