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How to manage exercise in people with diabetes using hybrid closed-loop systems

Exercise is one of the most powerful tools to improve the health and quality of life of people with diabetes. Therefore, it should occupy a central place in treatment and must be addressed through a specific and well-structured educational program (1).

This does not change with integrated systems, as exercise continues to pose challenges that require knowledge, planning, and experience. The goal remains clear: to practice exercise with confidence and enjoyment, minimizing risks and maximizing all its benefits. To achieve this, it is essential to work on the following points:

WORKING ON FEAR OVERCOMING PRACTICAL DIFFICULTIES

Many people who already exercise regularly feel uncertain about switching to these systems. Concerns include discomfort, impacts, the sensor or cannula becoming detached, or that it may complicate the activity. These fears are completely normal.

The key is to talk about them: ask what specific concerns they have, what sport they practice, and which situations worry them most. From there, solutions can be sought together. Nowadays, there are specific fixation systems, protective accessories, and even the possibility of disconnecting the device during activity in some cases. Listening to the experience of other people with diabetes who already exercise using these systems can greatly help overcome initial resistance. »



» UNDERSTANDING EXERCISE MANAGEMENT WITH INTEGRATED SYSTEMS

During exercise, glucose can behave in very different ways (2). Therefore, managing exercise well does not only mean trying to keep glucose within range. It also means knowing how to react quickly and safely if unexpected hypo- or hyperglycemia occurs.

Currently, integrated systems are the most advanced option for people with diabetes. They combine a continuous glucose monitoring sensor, an insulin pump, and an algorithm that automatically adjusts basal insulin according to sensor data. They also include a function called “exercise mode,” which raises the glucose target to reduce the risk of hypoglycemia, especially useful during physical activity.

Although each system has its own characteristics (*table 1*), there are general recommendations for managing exercise, especially in activities that tend to lower glucose (3).

✓ Before exercise

- Activate exercise mode 60–90 minutes beforehand.

✓ During exercise

- Keep exercise mode active.
- If desired, the system can be disconnected and infusion suspended.

✓ After exercise

- Observe glucose trends.
- Maintain exercise mode if there is a risk of hypoglycemia.
- Return to normal mode if glucose tends to rise.
- If the pump was disconnected, assess whether a correction bolus is needed.

Theoretically, this function allows for much easier activity management, but in reality, »

THE SYSTEM
MUST BE
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TO THE SPORT,
NOT THE SPORT
ABANDONED
BECAUSE
OF THE SYSTEM

MINIMED 780G (TEMPORARY TARGET)

- Raises the glucose target to 150 mg/dL.
- Reduces the amount of insulin delivered.
- Disables automatic correction boluses while active.
- Can be programmed from 30 minutes up to 24 hours.

TANDEM T:SLIM X2 WITH CONTROL-IQ (ACTIVITY)

- Maintains programmed infusion if the 30-minute prediction is between 140 and 160 mg/dL.
- Increases infusion if the 30-minute prediction is > 160 mg/dL.
- Delivers an automatic correction bolus if the 30-minute prediction is > 180 mg/dL.
- Decreases infusion if the 30-minute prediction is < 140 mg/dL.
- Stops infusion if the 30-minute prediction is < 80 mg/dL.

YPSOPUMP WITH CAMAPS FX (EASE-OFF)

- Raises the glucose target by 45 mg/dL.
- Increases insulin “sensitivity”.
- Can stop insulin delivery if glucose falls below a certain level.
- Can be programmed for up to 23:59 hours.
- Important: if the mobile device moves away during exercise, the pump may switch to manual mode and lose these settings if they are not specifically activated.

THE GREATER THE KNOWLEDGE, THE GREATER THE AUTONOMY, SAFETY, AND CONFIDENCE TO ENJOY EXERCISE

» outcomes with exercise are not better than with other treatments (4).

Therefore, to get the most out of these systems, it is essential to work not only on ideal situations that fit exercise mode. Other less ideal circumstances must also be trained: unexpected events, changes in plans, competitions, excursions, days with greater stress, inadequate decisions, etc.

These situations are not rare or exceptional (5). They are common in the daily life of most people with diabetes, which is why discussing them beforehand and having strategies for when they occur is so important (6).

Not activating “exercise mode” when glucose is high

When glucose levels are above target before starting activity, it is common not to activate exercise mode out of fear that glucose levels will rise further. However, with this function, the system does not stop correcting; it simply does so in a more conservative way.

In fact, not activating it leads to greater insulin infusion which, combined with the effect of physical activity, may cause hypoglycemia. It is always necessary to assess individually the level of hyperglycemia and the possible presence of ketone bodies in order to make appropriate decisions.

Forgetting to activate “exercise mode”

This may occur due to forgetfulness or because exercise was not planned. In the first case, programming this function may be considered in systems that allow it.

Even if it is activated right at the start, it must be taken into consideration that previously absorbed insulin will still have its effect on glucose. In these cases, it is usually necessary to take extra carbohydrates to compensate. Having alerts properly configured greatly helps to detect these situations early and act promptly.

Activating exercise mode but not reducing boluses

Sometimes activating exercise mode is not enough. If the activity takes place shortly after a meal or is intense, it may also be necessary to reduce boluses

(before, during, or even after exercise). Each person must adjust this according to their experience and the type of activity.

Using more “aggressive” infusion functions after exercise

After exercise, insulin sensitivity may remain increased for hours. Therefore, activating functions that increase infusion can be risky. Greater caution is required, as the risk of hypoglycemia persists even hours after finishing the activity.

Not activating exercise mode because the pump will be disconnected

Disconnecting the system, or suspending insulin infusion during exercise, creates a false sense of “safety” that often ends in hypoglycemia.

The insulin that was absorbed before disconnection continues to act. Therefore, the previously mentioned measures remain essential, even if the system is disconnected.

Not activating exercise mode in activities that “are not sport”

Activities such as active tourism, moving house, or spending the day walking extensively can lower glucose as much as or more than a training session. If exercise mode is not activated in these cases, unexpected hypoglycemia may occur.

ADAPTING SUPPLEMENTATION TO INTEGRATED SYSTEMS

Supplementation remains a basic strategy for exercise, but understanding how the system works is essential. If intake produces a very rapid rise in glucose, the system may respond by increasing insulin, which can result in a subsequent drop.

Therefore, it is usually safer to consume more slowly absorbed carbohydrates or to eat small amounts progressively. In this way, glucose will rise more gradually and the system's reactive infusion will be much lower. In intense exercise, it may sometimes be considered to temporarily suspend infusion to prevent the system from delivering insulin after intake.

In many systems, “announcing” these in- »

POST-EXERCISE REFLECTION IS WHAT TURNS EXPERIENCE INTO LEARNING

- » takes is not recommended, although some allow them to be registered as snacks so that their impact on infusion is reduced.

MANAGEMENT OF NON-HYPOGLYCEMIA-INDUCING EXERCISE

So far, we have mainly discussed activities that lower glucose. However, there are exercises (such as high-intensity or highly competitive ones) that can increase it. In these cases, the use of exercise mode changes considerably and depends largely on individual experience. In people who know that their glucose rises during this type of activity, exercise mode is often not activated before or during it. However, it is quite common to activate it after finishing to prevent subsequent hypoglycemia.

When starting a new activity, for safety reasons, it is usually recommended to activate exercise mode. Later, by reviewing the data, the strategy can be better personalized.

OTHER “NON-OFFICIAL” STRATEGIES

Beyond standard exercise mode, many people adjust their system based on personal experience. For example:

- If hypoglycemia still occurs despite exercise mode, it may be considered to switch to manual mode and use lower temporary basal rates or perform controlled disconnections.
- If exercise mode reduces insulin too much during mild activity and this leads to hyperglycemia, it may be preferable not to activate it and instead slightly increase the system's basal target and/or deactivate auto-corrections.

Of note, these changes remain active until they are modified again. Therefore, after finishing the activity, it is essential to return to the usual settings.

HOW TO TRULY OPTIMIZE STRATEGIES

Reviewing results on download platforms is key. Analyzing what happened during and after exercise allows learning and better decision-making next time.

Some platforms allow the review of specific days. Others allow comparison between several days of activity and more sedentary days, making it possible to observe, for example, whether there were more hypoglycemic events. **D**

CONCLUSIONS

Exercise remains one of the major challenges in type 1 diabetes, even in the era of hybrid closed-loop systems.

Integrated systems help significantly. However, the final outcome depends on the decisions made by the individual.

Post-exercise reflection is what turns experience into learning.

The greater the knowledge, the greater the autonomy, safety, and confidence to enjoy exercise.

Ultimately, that is the goal: for people with diabetes to be able to practice any sport they want, whenever they want, with the greatest possible peace of mind, and the key to achieving this lies in therapeutic education.

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