EXERCISING INPATIENTS WITH DIABETES – SCH

PROCEDURE ©

DOCUMENT SUMMARY/KEY POINTS

- Inpatients with all types of diabetes, who are treated with subcutaneous insulin therapy, insulin pump therapy or oral hypoglycaemic agents may undertake exercise during their admission under supervision and this must be performed in a safe manner.
- Patients, parents/carers, physiotherapists and nurses all have a role in ensuring that the patient remains safe whilst exercising and after exercising
- This procedure outlines the key aspects of ensuring safety during exercise including
  - Understanding the impact of exercise on glucose levels
  - Preparing for exercise
  - Monitoring of symptoms and glucose levels prior to, during and after exercise

CHANGE SUMMARY

- Document due for mandatory review
- To align with international guidelines and SCHN hypoglycaemia practice guideline, the definition of hypoglycaemia has changed from <4.0mmol/L to <3.9mmol/L
- Additional information regarding the role of sensor glucose levels from continuous glucose monitoring systems (CGM) has been added.
- The scope of the policy has broadened to include children and adolescents with any form of diabetes which requires insulin therapy or oral hypoglycaemic agents.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st June 2025	**Review Period**: 3 years
Team Leader:	Physiotherapist	**Area/Dept**: Physiotherapy

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READ ACKNOWLEDGEMENT

- Training Required – Physiotherapists supervising exercise sessions in children with diabetes requiring insulin or oral hypoglycaemic agents
- Read Acknowledge Only – Nurses caring for children with diabetes requiring insulin or oral hypoglycaemic agents

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Background

Inpatients with diabetes that requires insulin may be required to attend the physiotherapy gym for supervised exercise as part of their inpatient care. In children with diabetes, there is a risk of inducing hypoglycaemia secondary to increased insulin sensitivity with exercise and increased uptake of glucose by muscles. It is the responsibility of the treating physiotherapist to assist in ensuring the risk is minimised where possible. Risk of hypoglycaemic episodes can be reduced by: monitoring glucose levels before, during and after physical activity, reducing basal (long acting) insulin, reducing mealtime insulin administered within two hours pre and post exercise, and eating appropriate amounts of carbohydrates before, during and after exercise.

The physiotherapist needs to be aware of the signs and symptoms of hypoglycaemia and be able to act accordingly as per the Hypoglycaemia Management in Paediatric Patients Guideline.

Hypoglycaemia occurs when the glucose level is less than 3.9mmol/L (with or without symptoms). Treatment of hypoglycaemia needs to be initiated immediately.

Symptoms of hypoglycaemia are:

Autonomic symptoms	**Neuroglycopaenic symptoms**
- Tremor	- Dizzy and/or unsteady gate
- Palpitations	- Difficulty concentrating or hearing
- Tingling around the mouth	- Visual disturbances
- Sweating	- Change in mood
- Tachycardia	- Slurred speech
- Hunger	- Confusion
- Irritability	- Weakness
- Nervousness	- Drowsiness
- Pallor	- Loss of consciousness
	- Seizure
	- Problems with short term memory

Purpose/Scope

This procedure relates to maximising the safety of inpatients with diabetes requiring insulin undertaking exercise at Sydney Children's Hospital Randwick.

Expected results

Risk of hypoglycaemic episodes in children with diabetes requiring insulin therapy will be reduced by following this procedure.

Responsibilities

Patients, parents/carers, physiotherapists and nurses all have a role in ensuring that the patient remains safe and the risk of hypoglycaemia during and after exercise is minimised.

Abbreviations and definitions

- Continuous Glucose Monitoring (CGM)
- Clinical Emergency Response System (CERS)

Related Documents

- Hypoglycaemia management in Paediatric Patients Practice Guidelines (SCHN Guideline No: 2017-137).
- Between The Flags (BTF): Clinical Emergency Response System (CERS) (SCHN Guideline No: 2013-7058

Equipment and supplies

- Glucometer
- Fingerpricker and glucose test strips
- Quick acting carbohydrate food – Up to 200mL fruit juice, 1 teaspoon honey, 7 jelly beans
- Continuous glucose monitoring system (CGM) and reader/phone if patient uses CGM.

Before attending the gym

Physiotherapist Role:

- Be aware of how stable the patient's glucose level has been over the course of the day.
- Be aware of how different types of exercise may impact glucose level (Appendix 1)
- Arrange for the nurse or patient to measure the child's glucose level before attending the gym
- Be aware of recommendations on how to proceed based on glucose level (Appendix 2)
- Check the patient has a glucometer and quick acting carbohydrate food available while off the ward

Nurse Role:

- Work with the patient to consider the site of insulin injection or site of insulin pump insertion pre-exercise. Insulin will have a greater uptake from exercising muscle, therefore, the abdomen or upper buttocks are the preferred injection sites.
- Measure the patient's glucose level if patient/carer is unable to do this themselves
- Record glucose level in medical record
- Be aware of recommendations of how to proceed based on glucose level in consultation with the physiotherapist (Table 2)

Patient Role (with assistance of parent/carer as appropriate):

- Measure glucose level if able and record result in their glucose level diary
- Be aware of recommendations of how to proceed based on glucose level (Table 2)
- Have a glucometer and a quick acting carbohydrate food with them before attending the physiotherapy department
- Consider site of insulin injection or insulin pump site pre-exercise. Insulin will have a greater uptake from exercising muscle, therefore, the abdomen or upper buttocks are the preferred injection sites.

During Exercise

Physiotherapist Role:

- Provide supervision of the patient at all times
- Be able to identify a hypoglycaemic episode and initiate appropriate patient management.
- Ensure a quick acting carbohydrate that is easy to consume is readily available, for example: glucose tablets/gels, juice, honey or sugar, lollies (e.g. jelly beans)
- If exercise is prolonged or strenuous, extra carbohydrate should be given during the session

Patient Role:

- If exercise is prolonged or strenuous, measure glucose level during the session and consume extra carbohydrate during the session
- Report any signs or symptoms of hypoglycaemia during the exercise session

If hypoglycaemia occurs (or is suspected) during exercise:

Mild to moderate hypoglycaemia (glucose level < 3.9mmol/L):

- The patient is to cease exercising
- Check glucose level and have the patient consume 15grams of quick acting carbohydrate.
    - For children 1-5 years old: Give approximately 60mL of fruit juice or 1 teaspoon of honey (1 portion pack) when juice is not available, or refused.
    - For children 5 years and older: Give 125-200mL of fruit juice or 7 jelly beans when juice is not available.
- If safe to do so, escort the patient back to their ward and provide handover to nursing staff to continue appropriate management as per Hypoglycaemia Management in Paediatric Patients Guideline.

Severe hypoglycaemia (glucose level < 3.9mmol/L with an altered mental state where the patient cannot assist in their own care)**:**

- If the patient has a reduced level of consciousness and is not able to safely swallow, do not give anything by mouth. Place the patient in a recovery position, maintain an airway and seek emergency assistance as per hospital CERS procedure.

After Exercise

Physiotherapist Role

- Return patient to the ward and alert nursing staff that the patient has returned.
- If hypoglycaemia has occurred during exercise, this needs to be handed over using ISBAR format and recorded in the medical record.
- Provide education to the patient that glucose level can decrease for up to 24 hours post exercise (especially strenuous exercise), therefore be aware of glucose levels during this time due to increased risk of hypoglycaemia.

Nurse Role

- Measure the patient's glucose levels if patient/carer is unable to do this themselves
- Record glucose level in medical record.
- If hypoglycaemia has occurred during the exercise session, continue to provide care and monitoring as per Hypoglycaemia Management in Paediatric Patients Guideline.
- If exercise has been prolonged or strenuous, glucose level should be checked pre-bed and overnight. This information should be included in nursing handover.

Patient Role (with assistance of parent/carer as appropriate):

- Measure glucose level following exercise if able and record result in their glucose level diary
- Be aware that following strenuous or prolonged exercise, glucose levels should be monitored pre-bed and overnight.

Additional Information:

- Monitoring glucose level patterns can help the patient and healthcare teams better understand responses to exercise and assist diabetes management in future.
- If there are repeated episodes of hypoglycaemia post-exercise despite consuming extra carbohydrate before and during exercise as per recommendations, insulin doses may need to be reduced pre-exercise or post-exercise in consultation with the endocrine team.

Continuous Glucose Monitoring (CGM) System

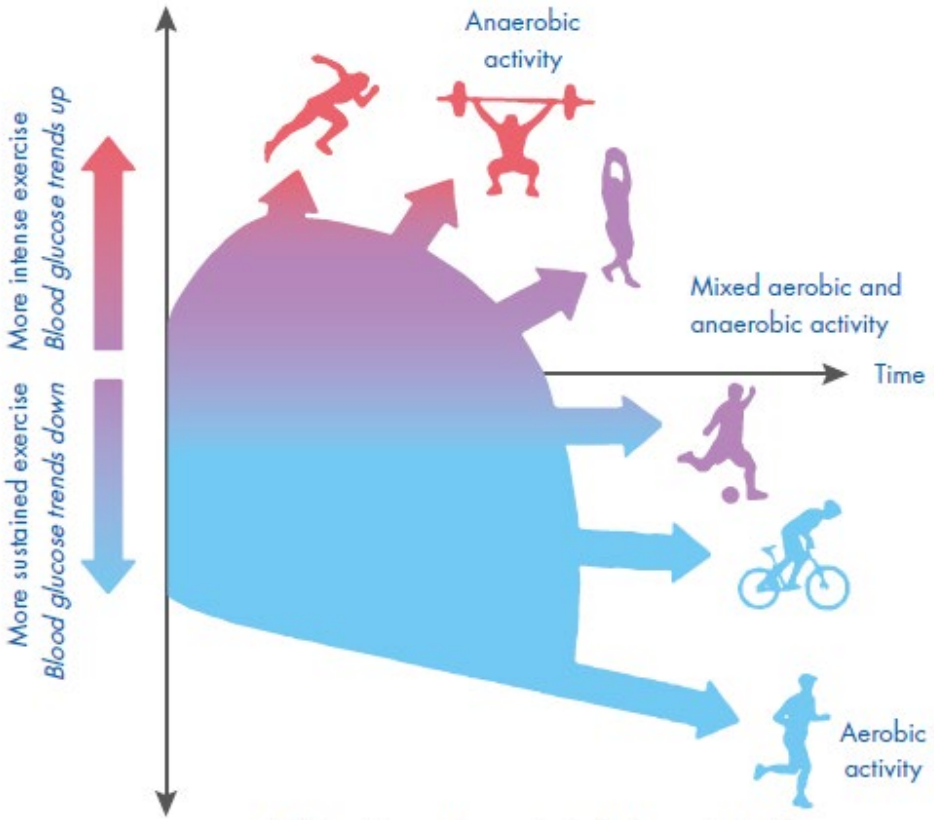
- Some patients will wear a continuous glucose monitor (CGM), which transmits interstitial glucose levels to an insulin pump screen, continuous glucose reader or mobile phone providing current sensor glucose status. Graphs and trend arrows show the direction of glucose values and rate of change, providing users with additional information to help with their diabetes management. It is important to note that the sensor measures the interstitial glucose level, which lags 5 minutes behind the blood glucose level.
- As per the SCHN hypoglycaemia management practice guidelines, sensor glucose levels via CGM cannot be used for clinical decisions for inpatients unless an exception to this has been approved by the endocrinology team and documented in the patient's medical record. However, sensor glucose and trend arrows may be helpful in determining if additional carbohydrate intake is required before, during and after exercise. Sensor accuracy deteriorates and lag time between sensor and blood glucose lengthens during exercise. A blood glucose level (fingerprick) should be measured if sensor glucose indicates impending or present hypoglycaemia.

References

1. SCHN Hypoglycaemia Management in Type 1 diabetes Practice Guidelines Guideline No: 2017-137 V3
2. Susan Bellman. Evidence Summary. Insulin: Administration. The Joanna Briggs Institute EBP Database, JBI@Ovid. 2017; JBI17084.
3. SPAD Clinical Practice Consensus Guidelines 2024 Diabetes Technologies: Glucose Monitoring. Karger Publishers. Dataset. https://doi.org/10.6084/m9.figshare.28069883.v1
4. ISPAD Clinical Practice Consensus Guidelines 2022: Exercise in children and adolescents with diabetes. Pediatr Diabetes. 2022;23(8):1341-1372. doi:10.1111/pedi.13452
5. ISPAD Clinical Practice Consensus Guidelines 2022: Assessment and management of hypoglycemia in children and adolescents with diabetes. Pediatr Diabetes. 2022;23(8): 1322-1340. doi:10.1111/pedi.13443

Appendices

Appendix 1: Understanding the impact of exercise on glucose levels



Different types of exercise including mutual differences in intensities and the way this affects glucose levels.

Illustration by Anne Greene, Senior Medical Illustrator Copyright © 2017 Duration and Intensity

Appendix 2: Preparing for exercise based on glucose levels

Initial glucose level	Action	Sensor glucose trend (CGM arrow)
< 3.9 mmol/L	Treat hypoglycaemia - give 15g of fast acting carbohydrate. Eg. juice, honey or jellybeans. Re-check glucose in 15 minutes and if still < 3.9mmol/L, repeat treatment. Delay exercise until BGL > 5mmol/L.	Confirm glucose with fingerprick; treat hypoglycaemia
3.9 – 7 mmol/L	Eat 10-20g of fast-acting carbohydrates For every 30 minutes of doing moderate to intensive exercise, eat 15-20g carbohydrate	Eat extra 10g fast acting carbohydrate for rapidly falling trend arrow
7.1 - 10 mmol/L	Good to go! For every 30 minutes – 1 hour of moderate to intensive exercise, eat 15-20g carbohydrate	Eat extra 10g fast acting carbohydrate for rapidly falling trend arrow
10.1 - 15 mmol/L	Good to go! For every 30 minutes – 1 hour of moderate to intensive exercise, eat 15-20g carbohydrate	
15 mmol/L	Check blood ketones and identify why glucose is elevated. If ketones are < 0.6mmol/L, can start light to moderate exercise. If ketones are > 0.6mmol/L do not exercise and seek advice from the Endocrine team.	