The Sydney children's Hospitals Network
care, advocacy, research, education

DIABETES MANAGEMENT AND INSULIN ADMINISTRATION

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

- This document is written for the management of all diabetes patients requiring insulin including type 1 diabetes, type 2 diabetes, cystic fibrosis related diabetes (CFRD) and steroid induced diabetes.
- Mandatory adherence to the NSW Health directives on Sharps Injury Protection and the *Infection Prevention and Control Policy.*
- Mandatory adherence to correct sharps disposal as per Section 3 of the NSW Health Infection Prevention and Control policy.
- Insulin can be kept at room temperature whilst in use. The date must be annotated on the label and it must be used within 28 days of opening. Store in a cool place away from direct light.
- Any insulin cartridge/insulin pen device in use must have a patient ID label attached and must only be used for the patient specified. All other insulin cartridges/insulin pen devices are to remain in the ward/unit refrigerator.
- Insulin kept in the refrigerator is best removed 30 minutes before administration as cold insulin will sting.
- Glargine (Optisulin) and Detemir (Levemir) are clear, long-acting insulins which cannot be mixed with any other insulins and therefore need to be given using a separate device.
- Insulin syringes/pen devices may be used by patients, parents or relatives of patients under Nursing Supervision and/or under the direction of the Diabetes Team. The recommendation is to avoid the use of insulin syringes, except when there is no other delivery device available. This is to avoid dosing errors.
- A side effect of insulin is hypoglycaemia – all patients on insulin require a regular blood glucose monitoring regimen and prompt treatment of hypoglycaemia as per Hypoglycaemia Management in Paediatric Diabetes Practice Guideline.
- It is important to rotate insulin injection sites, using both the abdomen and/or the buttocks (it's not recommended to use other sites for insulin injections in paediatrics).

Approved by:	SCHN Policy Procedure and Guideline Committee	
Date Effective:	1st September 2021	**Review Period**: 3 years
Team Leader:	Manager Diabetes Clinical Services	**Area/Dept**: Endocrinology

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CHANGE SUMMARY

- Patient group broadened to include type 2 diabetes, cystic fibrosis related diabetes (CFRD) and steroid induced diabetes.
- Recommendation to avoid the use of insulin syringes, except when there is no other delivery device available.
- Minor changes made throughout: recommend to re-read the entire guideline.

READ ACKNOWLEDGEMENT

- All medical and nursing staff caring for children with diabetes requiring insulin should read and acknowledge they understand the contents of this document.
- In-services are available for nursing education on skills required to use the new insulin delivery devices and glucose meters. Contact the Diabetes & Endocrinology Department (ext 53169-Westmead or 21456- SCH).
- All pharmacists and pharmacy technicians

TABLE OF CONTENTS

1 Patients wearing a Continuous Glucose Monitoring system

A continuous glucose monitoring system (**CGM**) is a small, self-inserted sensor worn on the body in areas that have subcutaneous fat (e.g. sites include abdomen, upper buttocks and upper arm as per device recommendations/TGA approval). CGM transmits interstitial glucose levels to an insulin pump screen, or receiver device (e.g. smartphone) about current sensor glucose status. Graphs and trend arrows show the direction of glucose values and rate of change, providing users additional information to help with their diabetes management. It is important to note that the sensor measures the interstitial glucose level, not the blood glucose level.

The guidelines for hospitalised patients are:

- Sensor glucose values via CGM cannot be used for clinical decisions while an inpatient (e.g. insulin administration, dose adjustment and hypoglycaemia management). In these instances, a blood glucose level is required (finger stick) using a standard hospital blood glucose meter. Exceptions to this need to be approved by the endocrinology team.
- Remove the sensor and transmitter from the patient before Magnetic Resonance Imaging (MRI), Computed Tomography (CT) scan, or high-frequency electrical heat (diathermy) treatment.
- Remove the sensor and transmitter from the patient prior to surgery. Medical and nursing staff are required to continue blood glucose monitoring (finger stick) using a standard hospital blood glucose meter during surgery to guide clinical decisions.
- CGM has not been evaluated or approved in persons on dialysis or in critically ill patients. It is not known how different medical conditions or medications common to the critically ill population may affect performance of CGM. Sensor glucose levels may be inaccurate in critically ill patients. Medications containing paracetamol/acetaminophen can give a false high reading and there is limited data about the effect of other medications on CGM accuracy.
- In some circumstances, following team discussion and with the approval of the treating endocrinologist, CGM may be used in the hospital setting to provide information in addition to finger stick blood glucose levels. In these situations, the frequency of finger stick blood glucose monitoring should be stated by the treating endocrinologist and the decision to use CGM should be reviewed at least daily and also at the addition of any new medications or change in clinical situation.

2 Blood Glucose Monitoring

Introduction

The target range for BGLs for a child with diabetes is 4 mmol/L – 10 mmol/L (this may be adjusted according to individual circumstances).

The aim of diabetes management is for all children with diabetes to have the majority of their BGLs within target range to promote healing, reduce risk of infection and minimise the

development of long term complications. Ideally blood glucose levels should not be done within 2 hours after eating. The reason for this is it may be too close to the carbohydrate intake to provide accurate information on which to make further clinical decisions.

Blood glucose levels (BGLs) are measured using the finger stick method. Blood glucose monitoring is a cornerstone of diabetes management and the frequency typically includes:

- Before all main meals
- Before morning and afternoon tea (or 2hrs post-main meals)
- At bedtime
- At 3 am
- Anytime a 'hypo' is suspected
  (Unless otherwise advised by Endocrine Team)

Equipment

- Lancet device (single use or reusable lancet device)
- Blood glucose meter
- Blood glucose strip
- swab/tissue to control bleeding post-sample
- Gloves

Procedure

1. Explain procedure to patient.
2. Set up equipment.
3. Wash hands.
4. Have child wash hands in warm water and dry thoroughly.
5. Insert the blood glucose strip.
6. Using a lancet device, pierce area along the side of the finger. Avoid the pad of the finger and the tip. Rotate finger usage – as area will harden with repeated use.

7. Lower hand below the heart and gently squeeze the finger to obtain an adequate drop of blood.
8. Touch the blood drop to the sample area at the tip of the glucose strip. The blood will be drawn into the strip via capillary-like action.
9. The blood glucose meter will count down, note the BGL as it appears on display screen.
10. Remove blood glucose strip from the blood glucose meter and discard into contaminated waste bin.
11. Discard disposable lancet device in sharps container or place reusable lancet device in a container at patient's bedside (marked with a patient label)Document BGL result in patient records and encourage family to document in BGL logbook (once skill has been taught by a diabetes educator).

Ward Meter Quality Control Report

Quality Control Solutions

- The blood glucose meter is kept in a meter station in the wards and unit areas and must be checked daily using the High and Low Control solutions.

3 Blood Ketone Monitoring

Introduction

The hospital blood glucose meters have a feature to test for Beta-hydroxybutyrate (ketone test) from capillary blood. The clinical purpose for this method is to detect and monitor for ketosis, a sign of under-insulinisation and, potentially, the development of Diabetic Ketoacidosis (DKA). This is indicated in any child with diabetes that is unwell or hyperglycaemic. Check ketones if blood glucose is > 15 mmol/L unless advised otherwise by Endocrine team.

Equipment

- Lancet device ((single use or reusable lancet device)Blood glucose meter
- Ketone strips
- swab/tissue to control bleeding post-sample
- Gloves

Procedure

1. Explain procedure to patient.
2. Set up equipment.
3. Wash hands.
4. Have child wash hands in warm water and dry thoroughly.
5. Insert ketone test strip into the glucometer or blood glucose meter.
6. Put on gloves.
7. Using a Lancet device, pierce area along the side of the finger (as per picture on page 3). Avoid the pad of the finger and the tip. Rotate finger usage as areas are likely to harden with repeated use.
8. Check expiry date on ketone strips
9. Lower hand below the heart and gently squeeze the finger to obtain an adequate drop of blood.
10. Touch the blood drop to the sample area at the tip of the ketone strip. The blood will be drawn into the strip with a capillary-like action. The sensor display will give you a blood ketone reading in 10 seconds.
11. Remove strip from meter and discard into contaminated waste bin.

12. Discard disposable lancet device in sharps container or place reusable lancet device in a container at patient's bedside (marked with a patient label)
13. Document ketone result in patient records and encourage family to document in logbook (once skill has been taught by a diabetes educator).
14. Unless otherwise advised, contact Endocrine Registrar if ketones are > 0.6 mmol/L as an additional dose of rapid-acting insulin may be required.

Interpretation of Results

The ketone results will show:

Blood Ketones (mmol/L)	Action
• **0.0 – 0.6 mmol/L (Negative or trace ketones)**	Check BGL as per policy and contact Endocrine Team when BGL >15 mmol/L and ketones are ≥ 0.6 mmol/L
• **0.7 – 1.5 mmol/L (MODERATE)**	Check BGL and contact Endocrine Team. Monitor BGL and Ketones 2 hourly
• **Greater than 1.5 mmol/L (LARGE)**	Check BGL and contact Endocrine Team. Monitor BGL and Ketones hourly

4 Insulin Administration

Introduction

Insulin:

- Is usually administered via subcutaneous injection.
- Some exceptions obviously exist such as: ICU, DKA where an IV insulin infusion may be used
- Can be administered via an insulin syringe, an insulin pen device or insulin pump.
- If using an insulin syringe, ensure needle is as small as possible (eg. 8mm).
- Should be kept in a locked fridge between 2-8ºC until opened for individual patient use.
- Insulin expires 4 weeks after opening or removal from fridge. Once taken out of fridge, it should be stored at ambient temperature and not returned to the fridge.
- Insulin cartridges and other insulin delivery devices in use must have a patient identification label attached. All other insulin cartridges/insulin delivery devices not in use are to remain secured in the ward/unit refrigerator. See Appendix 1.
- Insulin kept in the fridge is best removed and kept at ambient temperature for 30 minutes before administration as cold insulin 'stings'.

Note:

Insulin ***glargine*** (Optisulin)is a clear, long-acting insulin which cannot be mixed with any other insulin due to its acidity and therefore needs to be given in a separate syringe/insulin delivery device.

Insulin ***detemir*** (Levemir) must also be administered separately and not mixed with any other insulin.

Insulin Administration with a Pen Device

- A pen device should be used by all patients with diabetes and/or their carers to administer insulin providing they have been educated about correct technique using insulin pen device.
- Whilst an inpatient, this method of insulin administration must occur under nursing supervision
- Insulin in use should be stored in a patient specific medication tray in ward medication room and must NOT be kept at the bedside to reduce the potential for unwitnessed administration.
- Insulin penfills/vials will be supplied as a default.
- **At SCH** please arrange with Pharmacy to supply the insulin pens when parents/carers are ready for education.
- **At CHW** the endocrine team will write external PBS scripts and families are educated to get script filled at local pharmacy

Equipment

- Insulin Pen device
- Pen needle (4mm)
- Insulin cartridge/penfill/pre filled pen if required

Procedure

1. Wash hands
2. Check medication order for prescribed insulin type, dose, route of administration and frequency/time of administration
3. Choose correct insulin pen, and check that there is enough insulin in the pen for the dose.
4. If administering intermediate-acting (cloudy) insulin, the pen should be inverted 10-20 times to re-suspend the cloudy solution.
5. Twist appropriate pen needle onto pen. Avoid recapping using small cap to reduce risk of needle stick injury. Retain large cap to protect needle until ready to administer injection or to remove the needle from the insulin pen device.

6. Dial up at least 2 units of insulin and expel via an air shot to prime needle and ensure that you see insulin come out of the needle. Repeat priming steps until insulin is visible at the end of the needle tip.
7. Dial up prescribed dose.
8. Explain procedure to patient.
9. Choose injection site in the abdomen or the buttocks, remembering to rotate injection sites.
10. If patient very lean gently fold skin between two fingers and insert pen needle completely at a 90 degrees angle (especially if using an insulin syringe)
11. Keep the skin folded and inject insulin by pushing pen button down slowly until it cannot be pushed further. Slowly release skin keep needle inserted for 10 seconds and then withdraw needle.
12. Dispose of used needle in the sharps container.

Note: The cartridge/penfill in use can remain in the pen.

Insulin cartridges, penfills and disposable insulin pens must be discarded within 28 days of opening.

Note: Insulin may only be stored at room temperature (at or below 30ºC) for up to 28 days and then must be discarded, even if unopened.

5 Telephone Orders only when electronic order in Powerchart is not possible

Note: A medical officer or the diabetes nurse practitioner must prescribe insulin therapy.

1. A medical officer or diabetes nurse practitioner employed by the hospital must prescribe the insulin.
2. Two registered nurses (RN) must be present to take the telephone order.
3. The prescribing medical officer must specify the patient's name, MRN, date of birth, the insulin type, route of administration, dose and indicate that it is for a single dose and specify the timing of the dose. This must be repeated to a second registered nurse for confirmation. The registered nurse receiving the telephone order must read back orders to the prescriber and record the prescription (across the SCHN this must be performed in eMM where possible). This must be completed at the time of the telephone call with the prescriber.
4. The prescriber must confirm the telephone prescription by checking and counter-signing the entry within twenty-four hours. This telephone procedure must be followed if a prescriber wishes to change the insulin therapy prescribed, or the prescribed dose, where access to a prescriber who is able to place a new order is not practicable.

References and Associated Documents

1. NSW Health Policy Directive (PD2017_013). Infection Control Policy. http://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2017_013.pdf (accessed September 2017)
2. Product Information Optisulin Insulin Glargine, Sanofi Group, Dec 2019: on-line: http://www.guildlink.com.au/gc/ws/sw/pi.cfm?product=swpoptis11219 (accessed Nov2020)
3. Product Information Levemir Penfill and FlexPen: online: http://www.novonordisk.com.au/media/PIs/Levpi5a.pdf (accessed March 2017)
4. SCHN Safe Prescribing practice guideline http://webapps.schn.health.nsw.gov.au/epolicy/policy/4169 (Accessed 18 August 2021)
5. NSW Health Policy Directive (PD2013_043). Medication Handling in NSW Public Health Facilities. http://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2013_043.pdf (Accessed September 2017)
6. https://www.mimsonline.com.au.acs.hcn.com.au/

Appendix 1 Insulin Labelling

Children's Hospital Westmead

Labelling of Insulin Penfills and Vials (CHW)

ALL insulin penfills and vials will have a small plastic bag provided by pharmacy (photo adjacent)

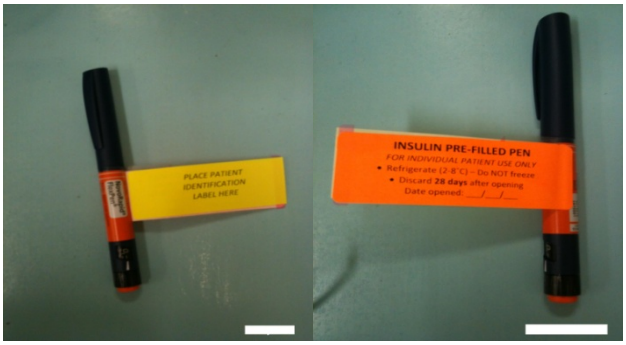
- This will be supplied with the penfills/vials and placed in the fridge.
- This will assist to more clearly:
    - **identify** which patient the penfill/vial is for (insulin penfills/vial cannot be shared between patients, as per NSW Health Infection Prevention and Control Policy PD2017_013 and Medication Handling in NSW Public Health Facilities PD2013_043.)
    - document the **date** the penfill/vial was opened
    - (insulin has a 28-day expiry once opened)
- When a penfill/vial is required for a patient, the person taking it from the original container needs to :
    - complete the date opened and discard date sticker
    - place the Patient Identification Label on the bag (if insulin is dispensed from pharmacy it will already have patient details on the dispensing label)
    - store the penfill/vial in the zip-lock bag

Labelling of Insulin Pens (CHW)

Insulin Pens will be labelled by pharmacy with labels as below. When an insulin pen is required for a patient, and is obtained from imprest, the person taking it from the original container needs to:

- complete the date opened and discard date on the label
- place the Patient Identification Label on the appropriate side of the flag label

(Photo below- same pen, different sides of flag label)



Sydney Children's Hospital

Labelling of Insulin Penfills and Pens (SCH)

Insulin vials or penfills are available on select SCH wards as imprest items and will be stored in the medication room refrigerator.

Once removed from the refrigerator the registered nurse will label insulin vials with:

- the patient's identification label

  A label documenting the date the vial was opened or taken out of refrigerator (discard within 28 days from this date)

When an insulin penfill is inserted into a reusable pen, the above labels should be present on the reusable pen. The penfill should be discarded within 28 days from insertion date.

Opened insulin vials or penfills should be separated from other insulin stock on the ward and stored in a patient specific medication tray. Care should be taken to ensure insulin is protected from light.

Insulin vials or penfills *supplied by SCH Pharmacy* will arrive to the ward in a box labelled with the patient's name and medical record number and pre-labelled with a 28 day expiry. This expiry date and the patient's identification label should be present on the reusable pen once inserted with the supplied penfill, the insulin should be separated from other insulin stock on the ward and stored in a patient specific medication tray. Insulin is to be kept within the box supplied from Pharmacy to ensure it is protected from light.

Disposable prefilled insulin pens are provided by the diabetes nurses. The registered nurse will label the pen with the patient's identification label, the expiry or opening date will be documented on the label (according to the supply method above). The insulin pen will be stored in a patient specific medication tray in the medication room. Pen devices protect insulin from light.