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| **Guideline**  **Title: Insulin management guide for healthcare professionals** | | | |
| **Classification:** | Guideline | | |
| **Authors Name:** | Inpatient Diabetes Team | | |
| **Authors Job Title:** | Melanie Kennedy  Lead DSN/Diabetes Inpatient Specialist Nurse | | |
| **Authors Division:** | Medicine | | |
| **Departments/ Groups this**  **Document Applies to:** | Adult inpatients on medical/surgical wards | | |
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| **Approval Group:** | TEC | **Last Review:** |  |

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| **Scope:** | | | **Document for Public Display:** No | |
| **To be read in conjunction with the following documents:**  CPOC (December 2022) Guideline for peri-operative care for people with diabetes undergoing elective and emergency surgery  JBDS-IP (March 2023) The management of Diabetic Ketoacidosis in Adults  JBDS-IP (February 2022) The Management of Hyperosmolar Hyperglycaemic State (HHS) in Adults  JBDS-IP (January 2023) The hospital management of Hypoglycaemia in Adults with Diabetes Mellitus  Diabetes Diagnostic Aid [Diabetes-Diagnostic-Aid.pdf (mkuh.nhs.uk)](https://www.mkuh.nhs.uk/wp-content/uploads/2022/01/Diabetes-Diagnostic-Aid.pdf)  Variable rate insulin infusion [Trust Documentation Site - Variable rate Intravenous insulin infusion (VRiii).pdf - All Documents (sharepoint.com)](https://mkuhcloud.sharepoint.com/sites/TrustDocumentation/Trust%20Documentation%20%20policies%20guideslines%20patient/Forms/AllItems.aspx?id=%2Fsites%2FTrustDocumentation%2FTrust%20Documentation%20%20policies%20guideslines%20patient%2FDiabetes%20and%20Endocrinology%2FGuidelines%20and%20policies%2FVariable%20Rate%20Insulin%2FVariable%20rate%20Intravenous%20insulin%20infusion%20%28VRiii%29%2Epdf&parent=%2Fsites%2FTrustDocumentation%2FTrust%20Documentation%20%20policies%20guideslines%20patient%2FDiabetes%20and%20Endocrinology%2FGuidelines%20and%20policies%2FVariable%20Rate%20Insulin) | | | | |
| **Required CQC (Care Quality Commission) evidence?** | | **Key CQC Question:**  Safe/Effective/Responsive/Caring | | |

**Disclaimer –**

Since every patient's history is different, and even the most exhaustive sources of information cannot cover every possible eventuality, you should be aware that all information is provided in this document on the basis that the healthcare professionals responsible for patient care will retain full and sole responsibility for decisions relating to patient care; the document is intended to supplement, not substitute for, the expertise and judgment of physicians, pharmacists or other healthcare professionals and should not be taken as an indication of suitability of a particular treatment for a particular individual.

The ultimate responsibility for the use of the guideline, dosage of drugs and correct following of instructions as well as the interpretation of the published material **lies solely with you** as the medical practitioner.

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# Guideline Statement

This guideline is to support clinicians to safely manage hyperglycaemia, rule out diabetes emergencies (DKA/HHS) and guide the titration of insulin doses for adult inpatients at MKUH (Milton Keynes University Hospital).

For the following areas please also refer to the relevant guidelines on Trust Documentation or DiAPPbetes.

* For dose adjustment of insulin prior to surgical procedures, (CPOC guideline)
* For patients with hyperglycemia secondary to steroid use or Covid positive patients requiring dexamethasone treatment
* For patients requiring Variable rate insulin infusion (VRiii). Please use the PowerPlan on eCARE
* Patients requiring DKA (Diabetic Ketoacidosis), or HHS (Hyperosmolar Hyperglycaemic State) management please use the PowerPlan on eCARE.

# Executive Summary

# This guideline seeks to support clinical decision making in patients experiencing hyperglycaemia by helping to rule out diabetes emergencies such as DKA/HHS, guiding ‘correction doses’ of insulin and titrating the patient's own insulin regimen to prevent complications of hyperglycaemia for adult patients with diabetes on medical and surgical wards.

# Roles and Responsibilities:

# If there is uncertainty after reviewing this guideline you must escalate concerns to a senior member of your team or the Diabetes MDT (Multi-Disciplinary Team).

# All Healthcare professionals who prescribe, dispense and/or administer insulin must complete the mandatory insulin safety module on ESR (Electronic Staff Record)

# The DISN Team work Monday to Friday 8-4pm. Saturday and Sunday 8-12:15. No bank holidays.

# 2.0 Implementation and dissemination of document

# The guideline will be added to Trust Documentation and the DiAPPbetes page. It will be communicated via the weekly newsletter and a laminated chart sent to all wards by the DISN team.

# Abbreviations

BNF – British National Formulary

CBG – Capillary Blood Glucose

CIG – Clinical Improvement Group

CPOC – Centre for Perioperative Care

CSii – Continuous Subcutaneous Insulin Infusion pump

DAFNE – Dose Adjustment For Normal Eating

DKA – Diabetic Ketoacidosis

DISN – Diabetes Inpatient Specialist Nurse

ESR – Electronic Staff Record

FRiii – Fixed rate intravenous insulin infusion

HHS – Hyperosmolar Hyperglycaemic State

MDT – Multi-Disciplinary Team

PRN – Pro rate nata

SGLT2i – Sodium-glucose Transport Protein 2

T1DM – Type 1 Diabetes Miletus

VBG – Venous Blood Glucose

VRiii – Variable Rate Intravenous Insulin Infusion

The guidelines will be available on the Trust intranet and in the departmental guidelines folder for easy access.

# Processes and procedures

**Management of Hyperglycaemia- High Capillary Blood Glucose (CBG) Levels in Adult inpatients with Diabetes**

Standard capillary blood glucose (CBG) target for inpatients with diabetes is 6-10mmol/L (4-12mmol/L is acceptable)

Conservative CBG target for frail patients 6-15mmol/L and patients at end of life <20mmol/L (please see End of Life care diabetes guideline)

If capillary blood glucose is above individualised target, review patient and CBG readings for the last 48 hours (if available). Check CBG pre-meal and bedtime (10pm) as minimum.

Check for ketones (capillary) in ANY patient known to have diabetes who is clinically unwell or in patients who are clinically well if CBG >18mmol/l (have a lower threshold for checking ketones in patients with T1DM, patients taking SGLT2i medications or are symptomatic of ketoacidosis)

For patients **without** a pre-existing diagnosis of diabetes refer to the Diagnostic Aid on Diappbetes ([DIAPPBETES - Milton Keynes University Hospital (mkuh.nhs.uk)](https://www.mkuh.nhs.uk/diappbetes) or Trust Documentation

Look for the cause – consider dehydration, inter-current illness, sepsis, missed/incorrect dose of oral hypoglycaemic agents or insulin/steroids/NG feeds.

# Doctors are to review the patient and advise treatment according to flowcharts/guidance below.

**All insulin adjustments are usually made by increasing or decreasing the dose by 10-20% dependent on severity of hyper/hypoglycaemia.**

# 

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**PRN Insulin dose guidance for patients with CBG >18mmol/L**

* Standard CBG target for inpatients with diabetes is 6-10mmol/L (4-12mmol/L acceptable)
* Conservative CBG target for frail patients 6-15mmol/L and patients at end of life <20mmol/L (see End of life guideline)
* Guidance for PRN insulin doses given in table (right)
* For patients with conservative target range consider reducing PRN insulin dose to avoid hypoglycaemia

NOTE/CAUTION: As a guide 1 unit of Novorapid will reduce CBG by 2-3mmol/L

Some patients with T1DM, particularly if slim, newly diagnosed (see diagnostic aid) or on very small amounts of regular insulin, can be very sensitive to insulin. Review PRN insulin doses in context of their usual insulin doses and usual correction doses (if known)

Prescribe Novorapid PRN 4-6 units via subcutaneous route at maximum frequency of 4 hourly on ECARE.

Nursing staff: Document actual dose given on ECARE, check CBG at 2 and 4 hours. Check capillary ketones if CBG >18mmol/L (lower threshold for checking in patients with T1DM and if symptoms of ketoacidosis)

CBG (mmol/L)

PRN Insulin dose

18.1-25

4 Units

>25.1

6 Units

If no PRN doses required in 48-hour period STOP PRN Novorapid Insulin

If >1 PRN doses given in 24-hour period continue PRN Novorapid insulin and review daily

If multiple daily PRN doses of Novorapid given

Review usual insulin (see titration tool) and other diabetes medication (BNF)

Refer to DISN team via eCARE or extension 86018

Do not discharge patients with PRN Novorapid unless patient has received education

**Insulin dose titration tool for adult in-patients with diabetes**

**Purpose**

* To provide a clear approach to safely titrating insulin doses for all adult inpatients admitted to medical and surgical wards at MKUH.

**Before titrating insulin:**

* Do not act on a single CBG reading. Review the glucose profile of the last 48 hours before making a change. CBG outside of target should be monitored pre-meal and pre-bed (10pm).
* Ensure the insulin has been given at the correct times. For example: quick acting or biphasic insulins being given 10 minutes before or with meals.
* Check the patient’s injection sites for signs of lipohypertrophy (lumps or hardened areas of skin at the injection sites) - this will affect the absorption of insulin and can result in variable blood glucose levels. If lipos are present, insulin may need to be reduced by at least 20% before using a fresh site.

Hypoglycaemia episodes (CBG <4mmol/L regardless of symptoms) must be treated according to Trust guidance and documented using /diaHypo. See [DIAPPBETES - Milton Keynes University Hospital (mkuh.nhs.uk)](https://www.mkuh.nhs.uk/diappbetes)

If staff are unsure regarding safe titration of insulin despite referral to the guidance, then they should seek advice from the specialist diabetes team or a senior colleague. Please complete the annual insulin safety module on ESR if you have not done so.

The Diabetes Inpatient Specialist Nurse (DISN) team can be contacted Mon-Fri 8am-4pm, Saturday and Sunday 8-12:15pm, No bank holidays. All referrals should be sent via eCARE. Telephone advice on 86018. For patients using CSii (Continuous Subcutaneous Insulin Infusion pump) please read ‘managing patients on pumps’ document on DiAPPbetes and refer to the DISN team for further advice and support. Follow up for young adults, pregnant patients with pre-existing diabetes or Insulin pump users please refer to [TDSNT@mkuh.nks.uk](mailto:TDSNT@mkuh.nks.uk)

**Basal Bolus Insulin Regimen**

**Quick acting insulin with meal**

*(Novorapid/Humalog/Apidra/Fiasp/Actrapid/Humulin s)*

**Once or twice daily basal/background insulin**

*(Lantus/Levemir/Tresiba/Toujeo/Abasaglar/Humulin I/Insulatard)*

If the patient is carbohydrate counting e.g., DAFNE trained and competent to self-manage their diabetes, allow them to self-adjust their doses

**If patient is on fixed subcutaneous doses, follow flowchart below**

**Hyperglycaemia pre-breakfast**

**Hyperglycaemia pre-lunch/dinner or pre- bed**

**Hypoglycaemia pre-breakfast**

**Hypoglycaemia pre-lunch/dinner or pre-bed**

Increase bedtime basal insulin by 10-20% ensuring no more than 2mmol/L overnight drop in CBG

Increase the preceding mealtime insulin by 10-20%

Reduce the bedtime basal insulin by 10-20% depending on severity of hypo event

Reduce the preceding mealtime insulin by 10-20%

**Twice Daily Biphasic (pre-mixed) Insulin Regimen**

**Twice daily (sometimes three times daily) MEALTIME injections**

*Novomix 30, Humalog Mix 25 or 50, Humulin M3*

**(Number refers to percentage amount of quick acting insulin in each injection)**

If patient self manages at home and is able to do so, let them adjust own doses. If on fixed doses, follow flowchart below

**Hyperglycaemia pre-bed AND pre-breakfast**

**Hyperglycaemia pre-lunch/pre-evening meal**

**Hypoglycaemia overnight/ prebreakfast**

**Hypoglycaemia pre-lunch/pre-evening meal**

Increase evening Insulin by 10-20% ensuring no more than 2mmol/L drop in CBG overnight

Increase morning insulin by 10-20%

Reduce evening insulin dose by 10-20% depending on severity of hypo event

Reduce breakfast insulin dose by 10-20% (or preceding dose if on TDS dosing)

**Once or Twice Daily Basal Insulin Regimen**

# Diagram Description automatically generated

## Sepsis, reduced mobility, stress, steroids, and supplementary feeding can all have an effect and may increase blood glucose levels.

**For patients who are clinically unwell refer initially to the Hyperglycaemia Decision support tool and ensure DKA/HHS excluded.**

## Once the patient is well, doses may need reducing back to their pre-admission doses to prevent hypoglycaemia at home.

Ensure medication has been given as prescribed and the patient is compliant with the regimen

Ensure the correct insulin is being administered at the correct time. Insulin is a time-critical medication

**Remember the 6 R’s**

* **Right person**
* **Right Insulin**
* **Right time**
* **Right place**
* **Right dose**
* **Right device**

Exclude any mechanical issues with the insulin pen device. Has it been stored correctly? If in doubt discard the pen and start a new one.

Label the insulin pen for individual use

Biphasic/Isophane insulins are cloudy, these need gently mixing using a rock and roll method.

**Never draw insulin from a pen device and if using a vial always use an insulin syringe, otherwise this can result in an insulin overdose.**

4.0 **Statement of evidence/references**

Tables adapted from UHL Hyperglycaemia in adult inpatients Diabetes decision tool and insulin dose titration guide for adult inpatients.

ABCD DTN-UK (2018) Clinical Guideline: Guidelines for managing continuous subcutaneous insulin infusion (CSII, or ‘insulin pump’) therapy in hospitalised patients [Online] Available from: <https://abcd.care/sites/abcd.care/files/CSII_DTN_FINAL%20210218.pdf> (Accessed 10 March 2023)

Alam U (2022) Type 2 Diabetes Mellitus Management in Older Adults [Online] Available from: https://www.clinicalkey.com/#!/content/clinical\_overview/67-s2.0-v1009 (Accessed 10 March 2023)

Cheisson G, et al (2018) Perioperative management of adult diabetic patients. Intraoperative period, Anaesthesia Critical Care & Pain Medicine, Volume 37, Supplement 1, June 2018, Pages S21-S25 [Online] Available from: https://www.sciencedirect.com/science/article/pii/S2352556817302965 (Accessed 10 March 2023)

CPOC (December 2022) Guideline for peri-operative care for people with diabetes undergoing elective and emergency surgery [Online] Available from: https://cpoc.org.uk/sites/cpoc/files/documents/2023-02/CPOC-Diabetes-Guideline-Updated2022\_0.pdf (Accessed 10 March 2023)

Elsevier Point of Care (2023) Diabetes Mellitus Type 1 in Adults [Online] Available from: https://www.clinicalkey.com/#!/content/clinical\_overview/67-s2.0-66fa155b-2e72-4cb6-87eb-b1f0b20002bb (Accessed 10 March 2023)

Elsevier Point of Care (2022) Diabetes Mellitus Type 2 in Adults [Online] Available from: https://www.clinicalkey.com/#!/content/clinical\_overview/67-s2.0-52bcd52e-425c-4167-ae97-d1f5f7238eeb (Accessed 10 March 2023)

Holt RIG, et al (2021) The Management of Type 1 Diabetes in Adults. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD), Diabetes Care, 2021;44(11):2589–2625 [Online] Available from: https://diabetesjournals.org/care/article/44/11/2589/138492/The-Management-of-Type-1-Diabetes-in-Adults-A (Accessed 10 March 2023)

Inpatient Diabetes Training and Support (2019) Insulin and Insulin Safety [Online] Available from: https://www.inpatientdiabetes.org.uk/insulin-and-insulin-safety (Accessed 28 March 2023) JBDS-IP (March 2023)

The management of Diabetic Ketoacidosis in Adults [Online] Available from: https://abcd.care/sites/abcd.care/files/site\_uploads/JBDS\_Guidelines\_Current/JBDS\_02\_DKA\_Guideline\_March\_2023.pdf (Accessed 10 March 2023) JBDS-IP (February 2022)

The Management of Hyperosmolar Hyperglycaemic State (HHS) in Adults [Online] Available from: <https://abcd.care/sites/abcd.care/files/site_uploads/JBDS_Guidelines_Current/JBDS_06_>

The\_Management\_of\_Hyperosmolar\_Hyperglycaemic\_State\_HHS\_%20in\_Adults\_FINAL\_0.pdf (Accessed 10 March 2023) JBDS-IP (January 2023) The hospital management of Hypoglycaemia in Adults with Diabetes Mellitus [Online] Available from: https://abcd.care/sites/abcd.care/files/site\_uploads/JBDS\_Guidelines\_Current/JBDS\_01\_Hypo\_Guideline\_January\_2023.pdf (Accessed 10 March 2023)

Milton Keynes University Hospital NHS Foundation Trust (2021) DIAPPETES [Online] Available from: https://www.mkuh.nhs.uk/diappbetes (Accessed 10 March 2023) National Institute for Health and Care Excellence (2015, updated 2022)

Type 1 diabetes in adults: diagnosis and management. NICE guideline [NG17] [Online] Available from: https://www.nice.org.uk/guidance/ng17 (Accessed 10 March 2023) National Institute for Health and Care Excellence (2015, updated 2022)

Type 2 diabetes in adults: management. NICE guideline [NG28] [Online] Available from: https://www.nice.org.uk/guidance/ng28 (Accessed 10 March 2023)

Trend Diabetes (2022) Injection technique matters [Online] Available from: https://trenddiabetes.online/injection-technique-matters (Accessed 10 March 2023)

# Governance

## Record of changes to document

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Version number**: | | | **Date:** | | |
| **Section Number** | **Amendment** | **Deletion** | | **Addition** | **Reason** |
|  |  |  | |  |  |

## Consultation History

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Stakeholders Name/Board** | **Area of Expertise** | **Date Sent** | **Date Received** | **Comments** | **Endorsed Yes/No** |
| TEC |  | 5/5/23 |  | Will be noted at next TEC meeting, but advised document can be used. |  |
| TDC |  | 26/3/23 | 20/4/23 | Minor amendments | Yes |
| Tina Worth | Clinical Governance | 6/2/23 | 7/2/23 | Formatting changes | Yes |
| Pharmacy CIG | Pharmacy | 27/03/23 | 24/5/23 | Wording PowerPlan, clinical groups included, | Yes |
| Library | References | 13/4/23 | 28/04/23 |  | Yes |
| Internal CIG |  | 24/3/23 | 24/3/23 | Approved. Send to Pharmacy CIG, TDC and library | Yes |
| Diabetes consultants  Dr A Humayun  Dr A Ali  Dr S Chandran | Diabetes | 29/6/21 | 29/6/21 | Adjustments to wording on titration of Biphasic insulin  Font and colour of tables. Typos  Title | Yes |
| DISN team  K Hodgson  S Franklin  J Alin | Diabetes Inpatient care | June 2021 | June 2021 | Wording with CBG-adjusted | Yes |
| Pharmacy  J Corbett | Pharmacy program manager | 20/5/22 | 7/9/22 | Spelling. Clarifying instructions.  Guidance over titration.  Sites/lipos |  |
| Junior doctor | Inpatient care | 14/10/22 | 29/11/22 | Found it helpful. | Yes |

## Audit and monitoring

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Audit/Monitoring Criteria** | **Tool** | **Audit Lead** | **Frequency of Audit** | **Responsible Committee/Board** |
| Reviewed at CIG (Clinical Improvement Group) |  | Diabetes inpatient MDT | 2 yearly | Internal medicine CIG |
|  |  |  |  |  |

## Equality Impact Assessment

This document has been assessed using the Trust’s Equality Impact Assessment Screening Tool. No detailed action plan is required. Any ad-hoc incident which highlights a potential problem will be addressed by the monitoring committee.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Equality Impact Assessment** | | | | | | | | | |
| Division | | Medicine | | | | | Department | | Diabetes |
| Person completing the EqIA | | M Kennedy | | | | | Contact No. | | 86018 |
| Others involved: | |  | | | | | Date of assessment: | | 17/2/2023 |
| Existing policy/service | | Yes | | | | | New policy/service | | No |
|  | | | | | | | | | |
| Will patients, carers, the public or staff be affected by the policy/service? | | | | Yes | | | | | |
| If staff, how many/which groups will be affected? | | | | *Doctors, nurses, pharmacists* | | | | | |
|  | | | | | | | | | |
| Protected characteristic | | | Any impact? | | | Comments | | | |
| Age | | | N | | |  | | | |
| Disability | | | N | | |
| Gender reassignment | | | N | | |
| Marriage and civil partnership | | | N | | |
| Pregnancy and maternity | | | N | | |
| Race | | | N | | |
| Religion or belief | | | N | | |
| Sex | | | N | | |
| Sexual orientation | | | N | | |
|  | | | | | | | | | |
| What consultation method(s) have you carried out? | | | | | | | | | |
| *For example: focus groups, face-to-face meetings, PRG, etc.* | | | | | | | | | |
| How are the changes/amendments to the policies/services communicated? | | | | | | | | | |
| *For example: email, meetings, intranet post, etc* | | | | | | | | | |
| What future actions need to be taken to overcome any barriers or discrimination? | | | | | | | | | |
| What? | Who will lead this? | | | | Date of completion | | | Resources needed | |
|  |  | | | |  | | |  | |
|  |  | | | |  | | |  | |
|  |  | | | |  | | |  | |
| Review date of EqIA groups |  | | | | | | | | |