Ashford and St. Peter's Hospitals
NHS Foundation Trust

Protocol for advising on insulin dose adjustment and teaching the skills of insulin dose adjustment to Children and Young People with Type 1 Diabetes Mellitus by members of the Paediatric Diabetes Team.
To include Diabetes Nurses (Band 6/7) and Registered Dietitians.

Author: **Dr Shailini Bahl, Consultant Paediatrician**
Nicola Ward, Paediatric Diabetes Specialist Nurse
Sarah Pearson, Specialist Paediatric Dietitian

Executive Lead: **Dr Shailini Bahl, Consultant Paediatrician**
Nicola Ward, Paediatric Diabetes Specialist Nurse
Sarah Pearson, Specialist Paediatric Dietitian

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Ratified by: Drugs and Therapeutics Committee

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History

Issue	Date Issued	Brief Summary of Change	Author
1	December 2019	New Clinical Guideline	SB, NW, SP
2			

For more information on the status of this document, please contact:	
Policy Author	Dr Shailini Bahl, Nicola Ward, Sarah Pearson
Department/Directorate	Paediatrics Diabetes
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Ratified by	
Audience	Paediatrics Diabetes Team Members

Executive summary

Children & Young People with diabetes who are treated with insulin, are encouraged to self-manage their diabetes (with their Carers) by making systematic changes to their insulin doses. Registered Dietitians (RD) Band 6/7 and Diabetes Specialist Nurses Band 7 to include Diabetes Nurses Band 6 (DSN) (also known as Associates) have a key role in educating patients how to make these adjustments safely.

This guideline is aimed at giving consistent advice to Children & Young People with Type 1 diabetes in Ashford and St Peter's Hospitals and to support RDs and DSNs when advising patients on insulin dose adjustment. The guideline includes advising on insulin dose adjustment and teaching Children & Young People self-management skills of insulin dose adjustment in an inpatient, outpatient or group education setting. The guideline covers patients with type 1 diabetes mellitus.

Contents

SECTION **Page**

Appendices

Supporting Documents

See also: Any relevant trust policies/guidelines or procedures

1. Introduction

Children & Young People with diabetes, who are treated with insulin, are encouraged to self-manage their diabetes (with their Carers) by making systematic changes to their insulin doses. Registered Dietitians (RD) Band 6/7 and Diabetes Specialist Nurses Band 7 to include Diabetes Nurses Band 6 (DSN) (also known as Associates) have a key role in educating patients how to make these adjustments safely.

These professionals also have a role in advising on appropriate dose adjustments in a clinic setting. This guideline is aimed at giving consistent advice to Children & Young People with Type 1 diabetes in Ashford and St Peter's Hospitals and to support RDs and DSNs when advising patients on insulin dose adjustment. The guideline includes advising on insulin dose adjustment and teaching Children & Young People self-management skills of insulin dose adjustment in an inpatient, outpatient or group education setting. The guideline covers patients with type 1 diabetes mellitus. Dietitians will be advising on specific dose adjustments for outpatients. For inpatients, DSNs will only make recommendations to the prescriber and will not alter inpatient prescriptions themselves unless they are a qualified, non-medical prescriber.

Part 1

2. Principles of the guideline

- This guideline applies to patients with Type 1 diabetes mellitus requiring insulin.
- This guideline is for clinician guidance only.
- When giving instructions to patients, dose changes may be expressed as a percentage of the insulin dose e.g. 10 - 20% or expressed as a number of units.
- To avoid insulin errors 'units' should always be written in full and not abbreviated to 'u'.

This guideline is for use by the following staff groups:

Registered Dietitians with experience working with diabetes and Diabetes Specialist Nurses Band 6/7 working within the diabetes team who do not hold independent and supplementary prescribing qualifications.

The staff listed below are to have grandfather rights*

Name	Role	Signature
Nicola Ward	PDSN	
Maria Roberts	PDSN	
Sophie Clark	PDSN	
Sarah Pearson	Specialist Paediatric Dietitian	

Cara Ratief	Specialist Diabetes Dietitian	

A **grandfather clause (or **grandfather** policy) is a provision in which an old rule continues to apply to some existing situations while a new rule will apply to all future cases. Those exempt from the new rule are said to have **grandfather rights** or acquired **rights**, or to have been grandfathered in.*

3. Description of treatment

Each patient will be assessed individually and recommendations tailored according to their food preferences, lifestyle and physiological requirements. The role of this document is to provide staff with a structure to support their role in recommending insulin dose adjustments to patients with diabetes treated with insulin. This will enable the patient to be educated to take control of their own diabetes when shown how to adjust insulin doses safely. The aim is to ensure that patients are assessed and treated effectively, efficiently and that a high standard of care is delivered at all times.

This guideline authorises a RD or DSN to make insulin dose recommendations to the patient in order to:

- Match food insulin boluses more closely to the carbohydrate content of meals to resolve post-meal hyperglycaemia and hypoglycaemia
- Promote normal growth & blood sugar levels, minimise hypoglycaemia, hyperglycaemia
- Enable exercise and activity by appropriate insulin manipulation
- Manage illness appropriately
- Improve diabetes control overall by adjusting insulin doses

Adjustment to insulin already prescribed to the patient and covered by this document will include all insulins on the ASPH pharmacy formulary or equivalent.

4. Blood Glucose monitoring

Blood glucose (BG) targets need to be individually tailored to the individual patient.
NICE have set a target for HbA1c of 48mmol/mol.

5. Records

Patients should receive written confirmation of advice via email or clinic letter. A note of recommended doses will also be recorded on the diabetes database.

Part 2

6. Guidance for diabetes Specialist Nurses and registered Dietitians adjusting insulin doses

Each DSN/RD is responsible for ensuring their knowledge and skills are kept up to date and training attended as relevant.

This can be through attendance at relevant meetings, education seminars/conferences (national or local), critical appraisal of new evidence, annual and ongoing appraisal (KSF)

- The e-learning tool on the safer use of insulin must have been completed
- Additional training will have been completed in insulin pump therapy before advising on insulin dose adjustment for people using an insulin pump

All learning for those new or returning to the post and for existing staff should be recorded as per professional CPD and KSF requirements.

All staff will be required to include the competencies related to dose adjustment in their KSF PDP and may be used for revalidation purposes

7. Patient Assessment

The DSN/RD should encourage patients to use a systematic approach to analysing their blood glucose.

- What is the problem?
- What is the appropriate target for this patient?
- Which capillary blood glucose readings are out of target?
- What are the possible causes of the problem?

8. Practical considerations

- Has hand washing been carried out?
- Are the blood glucose meter strips in date?
- Have the strips been kept appropriately? (pots must be securely closed)
- Has the blood glucose meter been calibrated correctly?
- Has the weather been particularly hot or cold?
- Any other factors?

9. Medical considerations

The following are some of the causes of variable blood glucose:

- Intercurrent illness

- Carbohydrate estimation
- Snacks
- Alcohol
- Exercise
- Overnight hypoglycaemia
- Overtreatment of hypoglycaemia
- Stress
- Psychological factors including depression
- Knowledge of diabetes self-management and other medication currently taken

Prior to dose adjustment, the DSN/RD will where possible, have considered the following:

- Be clear about what has been (or not been) administered recently
    - When?
    - Where?
    - How?

- Be aware of any adjustments that have been made recently
- Wait 48 hours to look for patterns
- Which insulin(s) may be responsible?
- Review the action profile of the insulin(s) in relation to the out of range blood glucose.
- Adjust the responsible insulin as below
- Review blood glucose over at least the next 48 hours to ensure that the insulin dose change was appropriate
- Take into account the impact of any hypoglycaemia or hyperglycaemia and the responses to these (include counter-regulation and actions taken by the patient)

Part 3

10. Insulin dose adjustment - Assumptions

Insulin adjustments are made based on the insulin action profile. The following assumptions are made when adjusting insulin doses:

- Knowledge of insulin time action profile
- Knowledge of insulins on ASPH formulary – Lantus, Levemir, Tresiba, Novorapid, Humalog.
- There has been a thorough assessment of the patient (see 7-8)

11. Insulin dose adjustment – Basal insulin

If blood glucose before breakfast is higher than set target, increase basal insulin by 0.5 – 2 units depending on age of patient.

At least 3 days should usually be left between insulin adjustments unless the adjustments are being advised for exercise or intercurrent illness.

This applies in the absence of ketones or need for sick day rules. In the presence of ketones, dose increases may be suggested as per Sick Day Rules guidelines.

Consider the following:

- If on once daily basal insulin taken in the morning, consider whether the insulin may not be lasting 24 hours. Consider changing the time of injection

- If hypoglycaemia is verbally described or blood glucose reported (nocturnal or dawn hypoglycaemia) basal insulin may be reduced by 10% - 20%

- A 3am blood glucose test should be advised to rule out the possibility of night time hypoglycaemia before an increase in background insulin is made

- If the trend is for blood glucose pre breakfast to be 1 or 2 mmol/L lower than pre bed, or if bedtime snacks are regularly required, then basal insulin may be reduced by 10 - 20%

- If people have to snack to prevent hypoglycaemia, insulin doses need to be reduced

- When background insulin doses are reduced, quick acting insulin may need to increase - often in line with more accurate carbohydrate counting

Be aware of repeated adjustments that have been made previously by other members of the Diabetes MDT. Refer to medical notes in Evolve/DIAMOND before making adjustments.

12. Adjusting Mealtime Insulin Doses (bolus dose) – see formulary for quick acting insulins

- Review food diary/assess carbohydrate intake and blood glucose to confirm whether insulin doses need adjustment
- Dose adjustments should be based on trends in blood glucose results and not one-off readings
- If blood glucose is out of range before lunch/dinner/bed consider:

    - Post previous meal blood glucose levels
    - Snacks
    - Background insulin rate
    - Exercise
    - Illness

- If patients are carbohydrate counting, insulin to carbohydrate ratios are expressed as **X** units per **Y** grams of carbohydrate:

  1 unit to 10 grams carbohydrate
  Alternatively 1:10g

- Different insulin to carbohydrate ratios may exist across the day
- Carbohydrate awareness may be more appropriate than carbohydrate counting for some people.

13. Carbohydrate meal test

Meal time insulin is assessed on pre and post prandial blood glucose readings. Post prandial readings should be made 2 hours after insulin administration. If the rise in blood glucose level is consistently greater than 2 - 3mmol/l then a change in the amount (dose) of mealtime insulin maybe required.

The dose of insulin a patient gives for a meal should take into account a number of factors:

- Which insulin is being used
- Effect of background (basal) insulin
- Insulin sensitivity
- Pre-meal blood glucose
- Total amount of carbohydrate in the meal
- Monitor the impact of insulin on weight. If overweight could the carbohydrate portions be reduced?
- Impact of meal factors on digestion (total carbohydrate plus fat, fibre, protein)
- Secondary digestive disorders (gastroparesis, enteral feeding, coeliac disease)
- Exercise – pre or post meal
- Alcohol
- Injection technique
- Injection site rotation, location and presence of lipohypertrophy or atrophy
- Likelihood of pre-meal blood glucose being affected by hypoglycaemia or rebound hyperglycaemia
- Take into account the impact of any hypoglycaemia or hyperglycaemia and the responses to these (include counter-regulation and actions taken by the patient)

Be aware of repeated adjustments that have been made previously by other members of the Diabetes MDT. Refer to medical notes in Evolve/DIAMOND before making adjustments.

14. Correction doses

- Additional quick acting insulin may be given at mealtimes to correct high pre-meal blood glucose
- If no known correction factor, calculate using 100/Total Daily Dose of Insulin
- The impact of using correction doses should be carefully monitored
- If corrections are regularly required, this demonstrates that the insulin doses need to be recalculated
- Correction doses should only be given at bedtime with extreme caution and if the following are taken into account:
    - Background insulin doses are correct (blood glucose stable between bedtime and pre breakfast)
    - Absence of alcohol and exercise
    - Bedtime is at least 3-4 hours after the evening meal/previous dose of quick acting insulin

Be aware of repeated adjustments that have been made previously by other members of the Diabetes MDT. Refer to medical notes in Evolve/DIAMOND before making adjustments.

15. Dose adjustment for exercise

- This needs to be individually discussed with patients
- Insulin adjustments will be guided by patients own blood glucose individual responses and fitness levels
- Type and duration of patients exercise
- Environment
- Training or competitive level
- Time of day
- If exercise is planned within 90 minutes of a meal, it is possible to reduce the preceding quick acting insulin dose in preparation for exercise

- If exercising immediately before a meal, the insulin dose for this meal may need to be reduced

16. Dose adjustment for Sick Days

Additional quick acting insulin may be required during illness especially with Type 1 diabetes mellitus when ketones are present.

See Trust Paediatric Diabetes Guidelines and send Sick Day Rules leaflet.

Be aware of repeated adjustments that have been made previously by other members of the Diabetes MDT. Refer to medical notes in Evolve/DIAMOND before making adjustments.

17. Insulin dose adjustments for patients on continuous subcutaneous insulin infusion (CSII)

Patients with Type 1 diabetes might be using an insulin pump (CSII) in accordance with NICE criteria. Each patient will have received specific pump training. The insulin pump is filled with short acting insulin, which is administered as a basal rate to provide continuous insulin (in place of long acting insulin) and also boluses of insulin when required e.g. mealtimes.

If the pump is removed, insulin should be given immediately in another form e.g. basal bolus on a temporary or permanent basis.

- Further training in insulin pump therapy is required before advising on dose adjustment for patients on CSII.
- Insulin should be adjusted in appropriate increments after reviewing the patient's blood glucose levels and assessing the following areas:
    - Pattern of blood glucose pre and post prandial
    - Individual target blood glucose
    - Established insulin to carbohydrate ratios (I:C)
    - Insulin sensitivity factor (ISF) and response to correction doses

- Episodes of hypoglycaemia

18. Assessing and adjusting Basal Rates (to include temporary Basal Rate adjustments)

- Basal rates may be adjusted based on fasting basal rate testing in the absence of any apparent trend
- If hypoglycaemia is occurring and it appears to be due to the basal rates (e.g. occurring overnight or just before mealtimes), the basal rate should be reduced
- With hyperglycaemia, which is proven to be due to insufficient basal insulin, basal rates should be increased

19. Assessing and Adjusting Bolus Doses

The following can be done to verify if the insulin : carbohydrate ratio is correct.

This **should not** be done on a day that the patient feels unwell, stressed, premenstrual, has drunk alcohol or more exercise than usual has been undertaken. This may need to be performed on several occasions for each meal as each meal may need a different insulin to carbohydrate ratio.

- An insulin bolus should not be given during the previous 2 hours before a meal
- Test blood glucose pre–meal
- Ensure the carbohydrate (CHO) value in the meal is correctly counted. A high fat meal should be avoided for this test
- Use the usual insulin to carbohydrate ratio to calculate insulin bolus
- Check blood glucose at 2 hours post meal
- The 2 hour post meal blood glucose should be no more than 2.8 mmol/L higher than the pre-meal value
- If the blood glucose is out of target, review the insulin to carbohydrate ratio
- The CHO per 1 unit of insulin is increased or decreased by 1 or 2 grams depending on change in blood glucose pre to post meal
- If at any stage during the test, the blood glucose drops below 4 mmol/L, stop the test and treat the hypoglycaemic episode

- This testing should be repeated to confirm any changes are appropriate

20. Adjusting Bolus Doses

- Bolus doses should be adjusted after the above have been taken into account
- Response to the bolus doses being used (includes post meals blood glucose, hypoglycaemia, response to correction doses and assessment of the carbohydrate counting)
- Consider the response of insulin taken for meals and use of different bolus functions on the particular type of insulin pump. For example: health events function, extended bolus, multiwave bolus

Be aware of repeated adjustments that have been made previously by other members of the Diabetes MDT. Refer to medical notes in Evolve/DIAMOND before making adjustments.

Part 4

21. Staff Competencies

New members will need to gain and prove this knowledge and it is the responsibility of all staff to keep up to date with new developments and to keep evidence. All staff who have achieved competency will follow maintenance schedule and this includes the staff with grandparenting rights as detailed on Page xx.

22. Maintaining Competencies

New and existing staff will be required to provide and demonstrate evidence of continued competence to adjust insulin to enable them to continue to work within ASPH policy.

Formats for achieving this:

Clinical Supervision

- It is the responsibility of the professionals covered by this policy to seek clinical supervision on an on-going basis and to discuss any specific patients who deviate from this guideline. This should be undertaken a minimum of 4 times/year

- This can be used as documentation for revalidation reflection purposes

Clinical supervision should be obtained from the:

  - Consultant Diabetologist
  - Senior DSN
  - Senior RD
  - Pharmacist (if appropriate)

Clinical supervision can occur at team meetings or on a 1:1 basis as required.

23. References

- An integrated career and competency framework for Diabetes Nursing produced by the Diabetes UK professional education working group and TREND in 2011 (Updated 2013).
- An integrated career and competency framework for Dietitians and frontline staff produced by the Diabetes UK professional education working group in 2011.
- NICE Type 1 Diabetes guidelines July 2016
- NICE Type 2 Diabetes guidelines May 2017
- NICE Diabetes and Pregnancy guidelines 2015
- NICE Children & Young People Type 1 Diabetes Mellitus Guidelines
- ISPAD
- BSPED

24. Monitoring compliance with this Policy

Measurable Policy Objective	Monitoring/ Audit method	Frequency of monitoring	Responsibility for performing the monitoring	Monitoring reported to which groups/ committees, inc responsibility for reviewing action plans
e.g. All policies will be reviewed by their authors at least annually to ensure that they remain valid and in date	Compliance audit of sample of policies (including Review History)	Annual	Associate Director of Quality	Management Executive

Appendix 1: Knowledge and skills required by DSN/RD advising on the adjustment of insulin dose

Competencies checklist

Knowledge	Achieved
An in-depth understanding of the causes of diabetes	
An in-depth understanding of the impact of nutrition and physical activity on diabetes stress	
An in-depth understanding of inter-relation of diet, medication and biochemistry	
An in-depth understanding of the carbohydrate content of food	
An in-depth understanding of significance of tests used in patient care	
An in-depth understanding of normal and abnormal blood glucose and HbA1C values	
An in-depth understanding of how to interpret blood glucose and HbA1C values	
A working understanding of the importance and effects of patient education and self-management	
An in-depth understanding of how to gather information from patients about their health	
An in-depth understanding of how to reduce risk of and manage hypoglycaemia	
An in-depth understanding of the medications used to manage diabetes	
A critical understanding of the effects of insulin on diabetes	
An in-depth understanding of the types of insulin	
An in-depth knowledge and understanding of current theories for calculating CHO: insulin ratios	
A working understanding of behavioural change/motivational interviewing to assist patients self -manage their diabetes	

Signatures

Supervisor: Date:

Staff member: Date:

- Clear documentation
- Documented rationale for adjustments recommended
- Demonstration of evaluation of treatment outcome and care
- Demonstration of changes recommended communicated to relevant health professionals

SUPPORTING DOCUMENT 1: EQUALITY IMPACT ASSESSMENT

Equality Impact Assessment Summary

Name and title:
Policy: Protocol for advising on insulin dose adjustment and teaching the skills of insulin dose adjustment to Children and Young People with Type 1 Diabetes Mellitus by members of the Paediatric Diabetes Team.

Background • Who was involved in the Equality Impact Assessment
Dr Shailini Bahl Nicola Ward Sarah Pearson
Methodology • A brief account of how the likely effects of the policy was assessed (to include race and ethnic origin, disability, gender, culture, religion or belief, sexual orientation, age) • The data sources and any other information used • The consultation that was carried out (who, why and how?)
Key Findings • Describe the results of the assessment • Identify if there is adverse or a potentially adverse impacts for any equalities groups
Conclusion • Provide a summary of the overall conclusions
Recommendations • State recommended changes to the proposed policy as a result of the impact assessment

• Where it has not been possible to amend the policy, provide the detail of any actions that have been identified • Describe the plans for reviewing the assessment

SUPPORTING DOCUMENT 2 – FINANCIAL IMPACT ASSESSMENT

To be completed by the key document author and attached to key document when submitted to the appropriate committee for consideration and approval.

	Title of document	Yes/No
1.	**Does the implementation of this document require any additional Capital resources?**	No
2.	**Does the implementation of this document require additional revenue?**	No
3.	**Does the implementation of this document require additional manpower?**	No
4.	**Does the implementation of this document release any manpower costs through a change in practice?**	No
5.	**Are there additional staff training costs associated with implementing this document which cannot be delivered through current training programmes or allocated training times for staff?**	No
	Other comments:	

If the response to any of the above is yes, please complete a business case which is signed by your Finance Manager and Directorate Manager for consideration by the Accountable Director before progressing to the relevant committee for approval.

SUPPORTING DOCUMENT 3 - CHECKLIST FOR THE REVIEW AND APPROVAL OF DOCUMENTS

To be completed (electronically) and attached to any document which guides practice when submitted to the appropriate committee for approval or ratification.

Title of the document: Protocol for advising on insulin dose adjustment and teaching the skills of insulin dose adjustment to Children and Young People with Type 1 Diabetes Mellitus by members of the Paediatric Diabetes Team.
Policy (document) Author:
Executive Director:

		Yes/No/ Unsure/ NA	Comments
1.	**Title**		
	Is the title clear and unambiguous?		
	Is it clear whether the document is a guideline, policy, protocol or standard?		
2.	**Scope/Purpose**		
	Is the target population clear and unambiguous?		
	Is the purpose of the document clear?		
	Are the intended outcomes described?		
	Are the statements clear and unambiguous?		
3.	**Development Process**		
	Is there evidence of engagement with stakeholders and users?		
	Who was engaged in a review of the document (list committees/ individuals)?		
	Has the policy template been followed (i.e. is the format correct)?		
4.	**Evidence Base**		
	Is the type of evidence to support the document identified explicitly?		
	Are local/organisational supporting documents referenced?		
5.	**Approval**		
	Does the document identify which committee/group will approve/ratify it?		
	If appropriate, have the joint human resources/staff side committee (or equivalent) approved the document?		
6.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how		

		Yes/No/ Unsure/ NA	Comments
	this will be done?		
	Does the plan include the necessary training/support to ensure compliance?		
7.	**Process for Monitoring Compliance**		
	Are there measurable standards or KPIs to support monitoring compliance of the document?		
8.	**Review Date**		
	Is the review date identified and is this acceptable?		
9.	**Overall Responsibility for the Document**		
	Is it clear who will be responsible for coordinating the dissemination, implementation and review of the documentation?		
10.	**Equality Impact Assessment (EIA)**		
	Has a suitable EIA been completed?		

Committee Approval (insert name of Committee)			
If the committee is happy to approve this document, please complete the section below, date it and return it to the Policy (document) Owner			
Name of Chair		**Date**	
Ratification by Management Executive (if appropriate)			
If the Management Executive is happy to ratify this document, please complete the date of ratification below and advise the Policy (document) Owner			
Date: n/a			