GUIDELINES FOR THE MANAGEMENT OF HYPERGLYCAEMIA AND STEROID (GLUCOCORTICOID) THERAPY

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Summary of updates

Section/Page	Update

INDEX

References

Joint British Diabetes Societies for in-patient care. Management of Hyperglycaemia and Steroid (Glucocorticoid) Therapy. (Revised June 2022).

JBDS_08_Management_of_Hyperglycaemia_and_Steroid_(Glucocorticoid)_Therapy_June_2022.pdf (abcd.care)

This guideline aims to assist the management of steroid induced diabetes (without prior history of diabetes) and steroid induced hyperglycaemia (with pre-existing diabetes) in hospital in-patients and following discharge. Any patient presenting with DKA should be referred to the Diabetes Specialist Team. The following is recommended for patients on steroid therapy in hospital.

1. Glucose targets

The recommended glucose target level for hospital in-patients is 6 - 10mmol/l, accepting a range of 4 - 12mmol/l. However, certain patient groups do not require such tight control and individualised targets and appropriate care plans should be documented mindful of symptomatic hyperglycaemia. These groups would include:

- Patients with dementia
- Confused patients
- The frail older patient
- People at risk of falls
- Those with variable appetite and dietary intake

2. Glucose Monitoring

- All patients started on supraphysiological doses of steroid (>5mg Prednisolone or equivalent dose of alternative synthetic glucocorticoid) should have blood glucose (BG) tested every 6 hours (clinical vigilance is required with lower steroid doses)
- **Aim to keep blood glucose < 10 mmol/l**
- If after 48 hours all **BGs are < 10 mmol/l,** reduce monitoring to once daily, ideally at 5-6pm in patients without a previous diagnosis of diabetes. Those with diabetes should **continue 6 hourly** monitoring.
- If blood glucose is **between 10.0 - 12.0 mmol/l** continue to monitor BG 6 hourly.
- If blood glucose **> 12.0 mmol/l** on two occasions within 24 hours consider treatment options below.

3. Diabetes Treatment Options

In acutely unwell hospital in-patients with significant hyperglycaemia, start variable rate intravenous insulin infusion (VRIII) with review by diabetes team.

3.1 Patients on once daily steroid therapy

3.1.1 Non insulin therapies

Short acting sulphonylurea like gliclazide can be started at dose of 40-80mg and titrated to a maximum dose of 240mg in the morning. An evening dose of gliclazide may also be initiated to achieve a maximum daily dose of 320mg.

3.1.2 Insulin therapies

Morning administration of basal human insulin (Humulin I). To start give 10 units of Humulin I with a daily increase of 10% to 20% (up to 40%), titrated to the blood glucose level.

3.2 Patients on multiple daily doses (e.g. IV hydrocortisone or oral dexamethasone)

3.1.1 Non insulin therapies

These are unlikely to be effective. A trial of gliclazide 40mg bd may be indicated and titrated to a maximum of 160mg bd.

3.1.2 Insulin therapies

Morning administration of basal human insulin (Humulin I) or twice daily premixed insulin (Novomix 30).

To start give 10 units of Humulin I with a daily increase of 10% to 20% (up to 40%), titrated to the blood glucose level. It is likely that once daily basal insulin will not achieve euglycaemia and diabetes teams will need to be contacted to start insulin mixtures. Start Novomix 30, 6-8 units bd with daily increase of 10% to 20% (up to 40%), titrated to fasting and postprandial glucose levels. If BG still not controlled contact diabetes team for basal bolus or more complex insulin regimens.

4. Treatment - for patients new to insulin therapy

4.1 Novorapid correction doses – should be given as a maximum 4 hourly if BG > 12.0mmol/L. No more than four correction doses to be given over 24 hours.

- Correction doses of insulin (Novorapid) depends on the level of hyperglycaemia and body weight which is typically around 2-8 units per dose (see table below).

Blood glucose (mmol/l)	Novorapid dose (units) according to weight			Remember
	<50kg	50-100kg	>100kg	
12.0-14.9	2 units	2 units	4 units	**Check ketones if BG > 12.0mmol/L.** **If ketones > 1.5** mmol/L- seek doctor review. **If ketones > 3.0** mmol/L- **doctor to exclude** DKA and check pH, bicarbonate, lab glucose, U&E's.
15-16.9	2 units	3 units	5 units	
17-18.9	3 units	4 units	5 units	
19-20.9	3 units	5 units	6 units	
21.0-24.9	4 units	6 units	7 units	
> 25.0	5 units	8 units	9 units	

- Repeat BG after 4 hours if BG remains > 12.0 mmol/L and give an additional correction dose.

4.2 Starting basal insulin (Humulin I) in patients new to insulin

- Commence basal insulin **(Humulin I),** calculating the total daily dose as per the table below and give 2/3 with breakfast and 1/3 with the evening meal. **Review and titrate basal insulin daily.**

If > 70 years, frail or eGFR < 30 ml/min/1.73m^2 start 0.15 units/kg/24hrs e.g. 70 kg patient 0.15 x 70kg = 10.5 units Commence **Humulin I** 2/3 pre-breakfast and 1/3 pre-evening meal e.g. 7 units breakfast and 3 units evening meal **Maximum suggested starting dose 16 units and 8 units**	**If < 70 years start 0.30 units/kg/24hrs** e.g. 70 kg patient 0.3 x 70 kg = 21 units Commence **Humulin I** 2/3 with breakfast and 1/3 evening meal e.g. 14 units breakfast and 7 units evening meal **Maximum suggested starting dose 20 units and 10 units**

4.3 Titrating basal insulin (Humulin I) in patients new to insulin

- The basal insulin dose should be reviewed and titrated daily aiming for BG values of < 12.0 mmol/l.

Glucose level (mmol/l)	For glucose level taken before the morning Humulin I dose	For glucose level taken before the evening Humulin I dose
< 4.0	Treat hypoglycaemia*, give morning dose and reduce **evening** insulin 20%	Treat hypoglycaemia* give evening dose and reduce **morning** insulin 20%
4.1-6.0	Reduce **evening** insulin 10%	Reduce **morning** insulin 10%
6.0-12.0	No change	No change
12.1-18.0	Increase **evening** insulin 10%	Increase **morning** insulin 10%
>18.0	Increase **evening** insulin 20%	Increase **morning** insulin 20%

*Hypoglycaemia should be managed as per Health Board guidance 'CID208 Inpatient treatment of hyperglycaemia in adults with diabetes'.

5. Patients already on insulin prior to starting steroids

- This may be a basal, pre-mixed or basal and meal time rapid insulin. Increase the basal or premixed insulin by 20%. It may subsequently need further increase and titration, usually by 10% increments. If persistent hyperglycaemia continues seek review by the diabetes specialist team.

6. Ongoing management

- **For persistent hyperglycaemia please ensure early specialist input regarding ongoing management as a** variable rate intravenous insulin infusion (VRII) may be needed.

7. Stopping steroids

- For patients who were commenced on Insulin due to steroid induced hyperglycaemia, once the steroids have been stopped, the insulin dose can be reduced by 50% and be down titrated further according to glucose levels. Hyperglycaemia may take a few days to fully settle.
- For patients established on insulin prior to admission, stop steroids and reduce insulin to pre admission doses if known, otherwise, reduce by 50% and review according to blood glucose levels.
- For those on oral diabetes therapy prior to admission (who required steroids and insulin), recommence oral therapy and stop the insulin.
- Any patient admitted with/or developed DKA during the admission then they must be reviewed by diabetes specialist team.

8. Discharge Advice

- Inform both GP and patient that they have been on insulin therapy and there is the potential for variation in blood glucose following discontinuation of steroids. Therefore, these patients should be reviewed in Primary Care within 1-2 weeks.
- If patients were previously monitoring their glucose levels, they should continue to do so after discharge. If patients are new to insulin or receiving a sulphonylurea (e.g. gliclazide), and are being discharged on these medications, they should be referred to the diabetes specialist team for education and advice on glucose monitoring.

For patients who are on oral anti hyperglycaemic therapy, (excluding a sulphonylurea) they do not require ongoing glucose monitoring but should still be reviewed by their GP within the next 1-2 weeks (patient leaflets are available on COIN CID3664).

References

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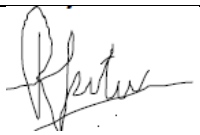
Sign to confirm that the document has been authorised by an approved governance process in a specialty or delivery unit.	 Dr. Rajesh Peter, Consultant Physician (Diabetes)
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