

This Medicines Information Leaflet is produced locally to optimise the use of medicines by encouraging prescribing that is safe, clinically appropriate and cost-effective to the NHS.

Blood Glucose Monitoring and Management of Hyperglycaemia in Adult Inpatients on Steroids (Glucocorticoids)

Steroid therapy, particularly at high doses, can affect glycaemic control and blood glucose levels should be monitored in the initial stages.

Hyperglycaemia is known to adversely affect patient outcomes, increase length of hospital stay and potentially progress to life threatening complications including hyperosmolar hyperglycaemic state.¹ The purpose of this MIL is to provide local consensus on the monitoring of blood glucose levels in inpatients, and following discharge for patients on steroids and to provide a framework for escalation. It is based on the Joint British Diabetes Societies for Inpatient Care (JBDS-IP) guidelines for the management of hyperglycaemia and steroid therapy.²

When to use this MIL

Reference to this MIL should be made when patients are on doses of steroids greater than physiological doses i.e. greater than 5mg Prednisolone daily or equivalent.

Steroid Equivalences and Duration of Action

Table 1: Steroid Equivalent Doses and Half Lives

Steroid (oral or IV)	Potency (equivalent dose)	Duration of action (hrs)
Hydrocortisone	20mg	8
Prednisolone	5mg	16-36
Dexamethasone	750 micrograms	36-54

Target Blood Glucose Levels

The Joint British Diabetes Societies for inpatient care (excluding maternity) recommend a target glucose level of 6-10mmol/L, accepting a range of **4-12mmol/L** for hospital inpatients. However, such tight control may not be appropriate for certain groups of patients, including those at the end of life and those who may be severely disabled by a hypoglycaemic event (e.g. a frail, older person at risk of falling). If the patient is in the last days of life, please refer to the 'Guideline for Management of Diabetes in the Last Days of Life' available on the palliative care intranet site.

<http://ouh.oxnet.nhs.uk/PalliativeCare/Pages/EndofLifeCare.aspx>

Definitions

Steroid induced diabetes	A rise in glucose related to steroid therapy occurring in people without a known diagnosis of diabetes
Steroid induced hyperglycaemia	Worsening glucose control related to steroids therapy in people with a pre-existing diagnosis of diabetes

Recommendations for Monitoring of Capillary Blood Glucose (CBG) in Inpatients on High Dose Steroids

Table 2: Frequency of Blood Glucose Monitoring in patient on High Dose Steroids

Patients not known to have diabetes	Check CBG 1-2 hours prior to evening meal	CBG level less than 12mmol/L – Continue to test once daily prior to evening meal and consider stopping if levels are less than 12 on 2 consecutive days
		CBG level more than 12mmol/L – Increase monitoring to 4 times a day*). If CBG more than 12mmol/L on two occasions in 24 hours then start treatment (as below)
Patients known to have diabetes	Check CBG 4 times a day**, irrespective of background control	CBG level more than 12mmol/L – on two occasions in 24 hours escalate treatment (as below).

*Four times a day = before meals and at bedtime

** Note that four times a day glucose monitoring may be inappropriate in frail, elderly or end of life care

Management of Hyperglycaemia

For inpatients whose blood glucose levels are consistently more than 12mmol/L, treatment should be commenced with the aim of treating hyperglycaemia. See Table 4, below, **Error! Reference source not found.** for the medicine management of hyperglycaemia secondary to high dose steroids.

If capillary blood glucose levels remain consistently more than 12mmol/L for 2 readings in 24 hours, despite the below measures, or if there are any concerns about treatment escalation, refer to the inpatient diabetes specialist team.

Table 3: Inpatient Diabetes Team Contact Details

Inpatient Diabetes Team	Bleep
John Radcliffe	4433
Churchill	6762
NOC	6761
Horton General Hospital	9912
Email: diabetessupportnurses@ouh.nhs.uk	

Table 4: Medicine Management of Hyperglycaemia secondary to High Dose Steroids

Hyperglycaemia in patients not known to have diabetes	Commence Gliclazide 40mg OM , titrating to a maximum of 240mg OM if there are no symptoms of hypoglycaemia	
	If no improvement on maximum morning dosage, consider adding an evening dose of gliclazide (up to a maximum total daily dose of 320mg) or adding intermediate acting insulin (Humulin I® kwikpen) 10 units daily in the morning	
Hyperglycaemia in patients known to have diabetes	Diet controlled or on oral anti-diabetic agents	Commence gliclazide 40mg OD or increase current dose, in increments of 40mg, to a maximum of 240mg in the morning if there are no symptoms of hypoglycaemia. Maximum total daily dose is 320mg (note this may mean that an evening dose of gliclazide may need to be reduced)
	Insulin Treated	Patients on once daily night time insulin: transfer dose to morning and Increase by 10-20%. If targets not achieved, consider BD or basal bolus regime – Refer to inpatient diabetes specialist team. Patients on twice daily insulin: Increase morning dose by 10-20% until target achieved. Patients on basal bolus regime: consider transferring evening basal dose to morning and increase short acting insulin by 10-20% until target achieved.

Table 5: Insulin Titration Frequency

<u>Insulin Type/ Name</u>	<u>Titration Frequency</u>	<u>Comments</u>
Tresiba	Do not titrate	Contact inpatient specialist diabetes team
Long acting basal insulin e.g. Lantus®, Abasaglar, Levemir, Toujeo®	Titrate every 3 days	
Intermediate, short, mixed and rapid fast acting insulin e.g. Humulin I®, Novorapid® or Novomix®	Titrate every 24 hours	

Stopping diabetes medication

If patients are started on diabetes medication as a result of hyperglycaemia associated with high dose steroids, it is important to remember to discontinue/ wean any additional diabetes medication as steroids are discontinued/ weaned.

Patients newly started on gliclazide	Decrease gliclazide dose at the same rate of decrease of steroids e.g. halve gliclazide dose if steroid dose halved.
Patients newly started on insulin:	Decrease insulin dose at the same rate of decrease of steroids e.g. half insulin dose if steroid dose halved
Patients previously on gliclazide:	Decrease ' additional ' gliclazide dose at the same rate of decrease of steroids e.g. halve ' additional ' gliclazide dose if steroid dose halved.
Patients previously on insulin	Decrease ' additional ' insulin dose at the same rate of decrease of steroids e.g. halve ' additional ' insulin dose if steroid dose halved

Discharge

Patients who are discharged on diabetes medication (oral or insulin) and steroids, should be supplied with a glucose monitor and counselled on how to use it and how frequently, if they do not possess one already.

Advice should be given about dosing of diabetes medicines with weaning of steroids. When at home, if capillary blood glucose levels are consistently more than 12 mmol/L, the patient should contact their medical team who commenced steroids or usual diabetes management team for advice.

A patient information leaflet (Monitoring Blood Glucose Levels after Discharge with High Dose Steroids) should be given to all patients who are started on anti-diabetic agents as a result of high dose steroids.

Ensure contact details are added to the patient information leaflet.

References

1. Leite et al, Impact of hyperglycaemia on morbidity and mortality, length of hospitalization and rates of re-hospitalization in a general hospital setting in Brazil, Diabetology and Metabolic Syndrome 2010
2. Management of Hyperglycaemia and Steroid (glucocorticoid) therapy, JBDS-08, October 2014.

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