Aneurin Bevan University Health Board

The Hospital Management of Hypoglycaemia in Adult Patients with Diabetes Mellitus

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Contents:

1 Summary

The joint British Diabetes Societies In Patient Care Group include representation from the Association of British Clinical Diabetologists, Diabetes Inpatient Specialist Nurse (DISN) Group, Diabetes UK and the Diabetes UK user group; Joint British Societies Inpatient Care Working Group, NHS Diabetes (England); NHS Institute of Improvement and Innovation, ThinkGlucose team and the Welsh Endocrine and Diabetes Society. In March 2010 the joint British Societies Inpatient Care Group developed and approved a management guideline for the hospital management of hypoglycaemia in adults with diabetes mellitus. The guidelines were based on the review of current evidence where possible and accumulated professional experience. This guideline was revised in September 2013 and the guidelines that follow are based on the updated document.

In ABHB every clinical department has an orange HYPOBOX available containing the traffic light algorithm for guidance of how to treat hypoglycaemia along with glucose tablets, glucose liquid blast drinks and glucogel. Glucagon (licensed for the treatment of insulin induced hypoglycaemia) remains available in the emergency drug cupboard.

1.1 Scope of Policy

All adult (> 18 years) patients with diabetes on either insulin and/or sulphonylurea treatment experiencing hypoglycaemia in hospital.

The JBS guidelines can be accessed on
http://www.diabetologists-abcd.org.uk/subsite/JBDS_IP_Hypo_Adults_Revised.pdf

1.2 Essential Implementation Criteria

Education and training of staff caring for patients with diabetes who may experience hypoglycaemia in hospital occurred at the point of introduction of the hypoboxes to all clinical areas across the health board in 2010. The treatment algorithm is also on the Insulin Prescription Charts which are in use across the health board.

2 Aims

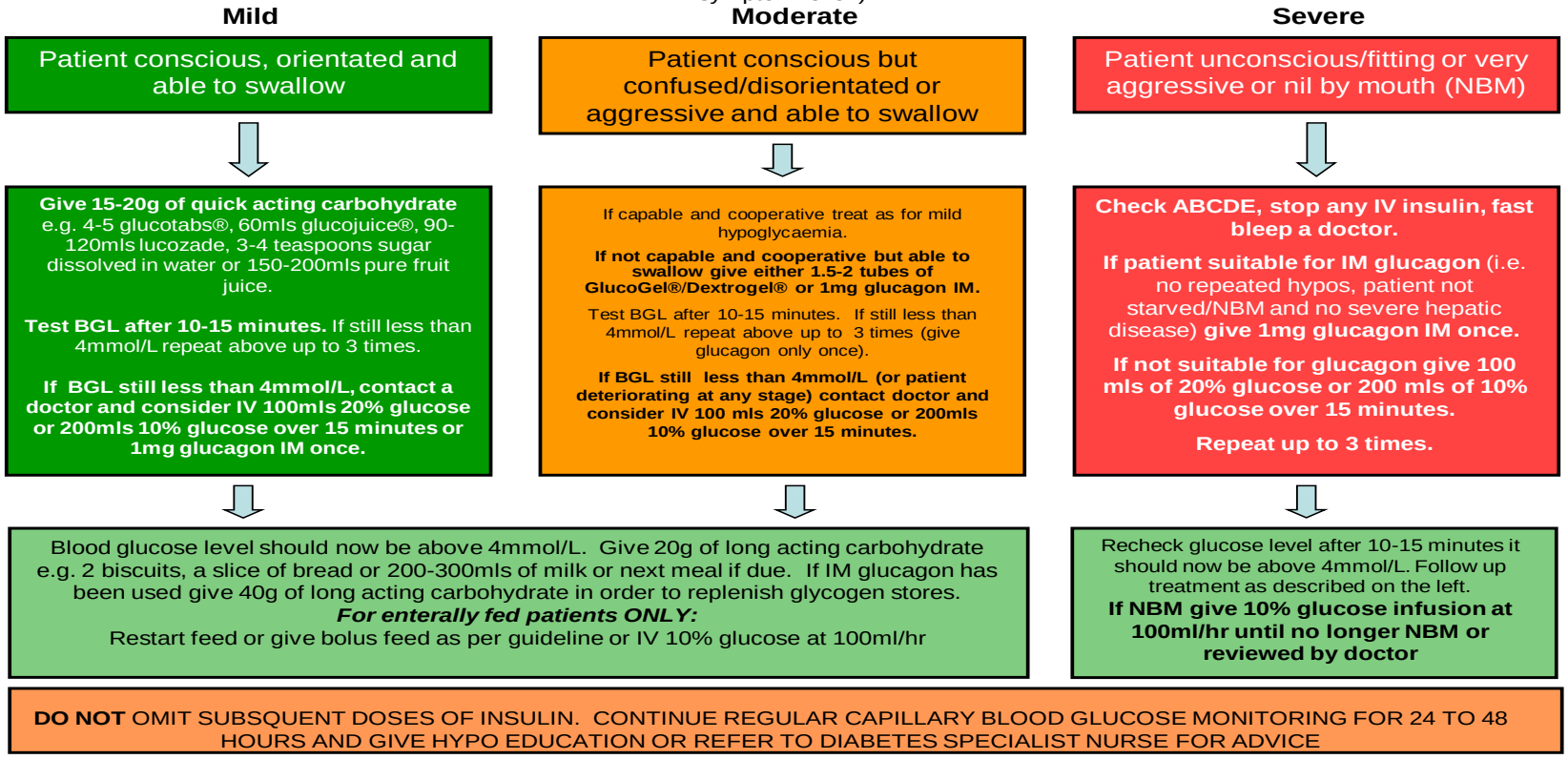
To achieve safe, effective and consistent management of hypoglycaemia in adult patients with diabetes in the hospital setting.

To promote use of the nurse led protocol using the hypobox according to the algorithm below:

3 Treatment Algorithm Quick Reference Guide

Algorithm for the Treatment of Hypoglycaemia in Adults with Diabetes in Hospital

Hypoglycaemia is defined as blood glucose of less than 4mmol/L (if not less than 4mmol/L but symptomatic give a small carbohydrate snack for symptom relief)



For full guidance please refer to ABHB0683 Hospital Management of Hypoglycaemia in Adult Patients with Diabetes Mellitus available on the clinical policy intranet page

BGL = blood glucose level

4 The "Hypobox"

There is an orange "hypobox" in every clinical environment across ABHB which contains the quick reference traffic light guide to the treatment of hypoglycaemia in hospital along with glucotabs, glucose liquid blast drink and glucogel. Glucagon remains on the crash trolley.

5 Background

Hypoglycaemia is the commonest side effect of insulin and oral sulphonylurea treatment in diabetes. It is greatly feared by patients and their carers alike and is a significant barrier to satisfactory long term diabetes control. Metformin, thiazoldinediones, DPP-IV inhibitors, GLP-1 analogues and SLGT-2 inhibitors do not usually cause hypoglycaemia without the concomitant use of either insulin or sulphonylureas.

Hypoglycaemia is common in patients with diabetes in hospital with 20% of in patients with diabetes experiencing episodes of hypoglycaemia and around 15% of all hospital in patients across all specialties have a diagnosis of diabetes (National Diabetes In Patient Audit UK Data). Hypoglycaemia results in increased length of stay and mortality rates (Turchin et al 2009)

Hypoglycaemia occurs when there is an imbalance between glucose supply, glucose utilisation and insulin levels. Hypoglycaemia should be suspected in any person with diabetes who is acutely unwell, drowsy, confused or unable to co operate, aggressive, drowsy or unconscious or presenting with seizures or focal neurology.

6 Definition of Hypoglycaemia

For the purposes of people with diabetes requiring hospital admission any blood glucose of less than 4.0 mmol/l should be treated. "4 is the floor". All patients experiencing an episode of hypoglycaemia either as a reason for admission or during an admission should be referred to the diabetes team.

7 Risk of Hypoglycaemia

Hypoglycaemia is defined as "severe" if assistance of a third party is necessary. Severe hypoglycaemia represents a significant clinical problem in type 1 diabetes and frequency of episodes of

hypoglycaemia increases threefold with tighter glycaemic control (DCCT & Stockholm Diabetes Intervention Trial). Fear and past experience of hypoglycaemia is associated with poor metabolic control in diabetes (Irvine and Saunders 1989) and if untreated or unrecognised loss of consciousness feared by patients (Pramming et al 1991). Severe hypoglycaemia is less common in those patients with insulin treated type 2 diabetes but still represents a significant clinical problem.

After many years of diabetes the awareness of hypoglycaemia can be diminished contributing to a lack of recognition of decreasing blood glucose level (Cryer et al 2003) combined with less effective counter-regulation and therefore increased risk of severe hypoglycaemia (Amiel 1998).

Sulphonylurea therapy is associated with an increased risk of admission to hospital for hypoglycaemia and is often prolonged due to the duration of action of the tablets. The elderly and those with renal impairment are particularly at risk. This group will usually require admission for 24 to 48 hours to ensure adequate treatment of potentially protracted hypoglycaemia and should be reviewed by the diabetes team prior to discharge.

In the context of acute illness and the hospital setting where patient's autonomy to manage their diabetes and usual dietary intake is altered there is a significant risk of hypoglycaemia occurring. Often the original reason for admission can be unrelated to the patient's diabetes.

8 Hypoglycaemia and driving

Loss of hypo awareness has implications for driving, if an episode of hypoglycaemia requiring bystander assistance is experienced or hypo awareness is diminished specific advice from a diabetologist should be sought prior to discharge. The "at a glance guide" on the DVLA website has the full guidance: http://www.dft.gov.uk/dvla/medical/aag.aspx.

9 Clinical presentation & symptoms: The Edinburgh Hypoglycaemia Scale

Autonomic	**Neuroglycopenic**	**General**
Sweating	Confusion	Headache
Palpitations	Drowsiness	Nausea
Shaking	Odd Behaviour	
Hunger	Speech Difficulty	
	In coordination	

(Deary et al 1993)

10 Risk Factors for hypoglycaemia

10.1 Medical:

- Tight glycaemic control
- Previous history of severe hypoglycaemia
- Undetected nocturnal hypoglycaemia
- Long duration of diabetes
- Poor injection technique
- Impaired awareness of hypoglycaemia
- Preceding hypoglycaemia
- Severe hepatic dysfunction
- Renal dialysis therapy
- Impaired renal function
- Inadequate treatment of previous hypoglycaemia
- Terminal illness
- Malabsorption
- Cognitive impairment
- Bariatric Surgery involving bowel resection

10.2 Lifestyle/Other Factors:

- Increased exercise
- Irregular lifestyle
- Increased age
- Alcohol
- Early pregnancy
- Breast feeding
- Lipohypertrophy (lumpy injection sites)
- Lack of blood glucose monitoring
- Erratic eating

10.3 Medication

- Concurrent use of warfarin, quinine, salicylates, sulphonamides, MAOIs, NSAIDS, probenecid, somatostatin analogues, SSRIs. DO NOT stop or withhold these medicines, discuss with the diabetes team.

10.4 Other Co-existent Medical Conditions:

- Addison's/adrenal insufficiency, growth hormone deficiency/hypopituitarism, hypothyroidism.
- Malabsorption due to underlying GI disease

11 Causes of inpatient hypoglycaemia

11.1 Medical

- Insulin prescription error

  Misreading and unclear prescription e.g. U used for units misread as 0 (4U becoming 40) all insulin should be prescribed on the ABUHB insulin chart

  Confusing the name with the dose e.g. Humalog mix 25 becoming Humalog 25 units

- Inappropriate use of "stat" or PRN quick acting insulin
- Regular insulin or sulphonylurea doses being given in hospital where they are not routinely taken at home
- IV insulin without glucose infusion
- Inappropriate use of iv insulin
- Incorrect insulin prescribed and administered
- Steroid withdrawal
- Major amputation of a limb
- Enteral feeding
- Recovery from acute illness/mobilisation after acute illness

11.2 Carbohydrate intake

- Missed/delayed/different meal
- Lack of access to usual snacks
- Prolonged starvation time e.g. procedures
- Reduced appetite/reduced oral intake/less carbohydrate
- Vomiting

12 Addressing the cause of in patient hypoglycaemia

If your patient has had an episode of hypoglycaemia it is important to look for a cause and take appropriate action to modify the existing medication/cause and seek advice from the diabetes team. It is also important to identify if the cause is temporary and if adequate treatment has been given and the blood glucose re-checked. If there is a risk of further hypoglycaemia consider the use of a 10% glucose solution at 100mls/hr.

13 Recommended changes in management compared to existing practice

There are some minor updates to the 2010 hypoglycaemia guidelines consistent with the Joint British Diabetes Societies Hypoglycaemia Guideline update 2013. The recommendation has been standardised to give 100 mls of 20% glucose over 15 minutes **or** 200mls 10% glucose over 15 minutes initially and repeat as required. This solution can still cause phlebitis and is best administered via a large bore cannula and flushed with saline afterwards.

14 Management of hypoglycaemia- a medical emergency

People experiencing hypoglycaemia require quick acting carbohydrate to return their blood glucose to the normal range. This should then be followed by giving long acting carbohydrate as a meal or snack to maintain the correction. Hypoglycaemia is a medical emergency and should be treated without delay. Untreated it can cause seizures and coma. If hypoglycaemia is prolonged it can cause permanent neurological deficit. Normal blood glucose levels in people without diabetes are 3.5 to 7 mmol/l. However, to avoid hypoglycaemia, Diabetes UK has recommended a policy of "make 4 the floor" i.e. 4mmol/l is the lowest acceptable blood glucose in people with diabetes.

15 Treatment of hypoglycaemia - use the hypobox when necessary.

15.1 Adults who are orientated, conscious and able to swallow

1. Give 15-20g quick acting carbohydrate of the patient's choice e.g.
   4-5 glucotabs® (in hypobox)
   60 ml Glucojuice® (in hypobox)
   90-120mls Lucozade®
   3-4 heaped teaspoons of sugar dissolved in water
   150-200 mls pure fruit juice

2. Repeat capillary blood glucose measurement 10-15 minutes later. If still less than 4 mmol/l repeat step 1 up to 3 times.

3. If blood glucose remains < 4 mmol/l after 3 cycles contact a doctor. Consider IV 200mls of 10% glucose over 15 minutes or 100mls of 20% glucose over 15 minutes. Use a large bore cannula as phlebitis can occur. Consider 1mg glucagon im (may be less effective in patients on sulphonylurea therapy). This should only be administered once.

4. Once blood glucose is above 4.0 mmol/L and the patient has recovered give a long acting carbohydrate of the patient's choice e.g.
   -two biscuits
   -one slice of bread/toast
   -200-300 ml glass of milk
   - normal meal with carbohydrate if due

DO NOT OMIT INSULIN IF DUE (DOSE REVIEW MAY BE REQUIRED)
CONTINUE TO MONITOR CAPILLARY BLOOD GLUCOSE FOR 24 TO 48 HOURS
REFER TO/INFORM THE DIABETES TEAM

N.B If glucagon has been administered a larger portion of long acting carbohydrate will be required to replenish glycogen stores. This is approximately double the above amount.

15.2 Adults who are conscious but confused, disorientated, unable to cooperate, aggressive but are able to swallow.

1. If the patient is capable follow section 15.1 above in its entirety.

2. If the patient is not capable and/or uncooperative but is able to swallow give either 1.5-2 tubes of GlucoGel® squeezed into the mouth between the teeth and gums OR give Glucagon 1mg IM once (this may be ineffective for patients on sulphonylurea therapy/patients under the influence of alcohol).

3. Repeat capillary blood glucose level after 10-15 minutes. If it remains less than 4.0 mmol repeat steps 1 and/or 2 up to 3 times (glucagon should only be given once)

4. If blood glucose level remains less than 4mmol/mol after 3 cycles or for longer than 30-45 minutes CONTACT A DOCTOR. Consider IV 200mls 10% glucose over 15 minutes or 100 mls 20% glucose over 15 minutes. Volume should be determined by clinical circumstances.

5. Once blood glucose is above 4.0 mmol/L and the patient has recovered give a long acting carbohydrate of the patient's choice e.g.

    -two biscuits
    -one slice of bread/toast
    -200-300 ml glass of milk
    - normal meal with carbohydrate if due

DO NOT OMIT INSULIN IF DUE (DOSE REVIEW MAY BE REQUIRED)
CONTINUE TO MONITOR CAPILLARY BLOOD GLUCOSE FOR 24 TO 48 HOURS
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N.B If glucagon has been administered a larger portion of long acting carbohydrate will be required to replenish glycogen stores. This is approximately double the above amount.

If the patient is to be discharged out of hours once hypoglycaemia has resolved, ensure adequate education has taken place about hypoglycaemia and that the precipitant identified and appropriate

advice given. Ensure the diabetes team have been informed. **If the patient is on sulphonylurea therapy they will usually require admission due to the duration of action of the tablets and risk of recurrence of hypoglycaemia especially if renal impairment is present.**

15.3 Adults who are unconscious/fitting and/or are aggressive or nil by mouth

1. **Check ABCDE. If the patient has an insulin infusion in situ STOP IMMEDIATELY. 'Fast bleep' a doctor.**

2. If IV access available give 100 mls of 20% glucose over 15 min (400ml/hr) or 200mls of 10% glucose over 15 minutes (800mls/hr). Repeat capillary blood glucose 10 minutes later if still less than 4.0 mmol/L repeat. If an infusion pump is readily available use it but do not delay treatment if not.

3. If no IV access available Glucagon 1mg IM. This may not be effective in sulphonylurea therapy or in patients under the influence of alcohol.

4. Once blood glucose is above 4.0 mmol/L and the patient has recovered give a long acting carbohydrate of the patient's choice e.g.

    -two biscuits
    -one slice of bread/toast
    -200-300 ml glass of milk
    -normal meal with carbohydrate if due

DO NOT OMIT INSULIN IF DUE (DOSE REVIEW MAY BE REQUIRED)
CONTINUE TO MONITOR CAPILLARY BLOOD GLUCOSE FOR 24 TO 48 HOURS
REFER TO/INFORM THE DIABETES TEAM

N.B If glucagon has been administered a larger portion of long acting carbohydrate will be required to replenish glycogen stores. This is approximately double the above amount.

If the patient was on IV insulin review the need for the IV insulin infusion to continue. Consider changing back to usual treatment. Continue to check the blood glucose every 15 min until above 4.0 mmol then re-start IV insulin after review of

dose regimen i.e. reduced rate. Consider IV 10% glucose infusion at 100ml/hr with the insulin infusion especially if the patient is fasting (refer to variable rate insulin infusion guidance).

15.4 Adults requiring enteral feeding

Adults requiring eneteral feeding will need the involvement of the dietician/nutrition team and the diabetes team.

Risk factors for hypoglycaemia

- Blocked/displaced tube
- Change in feed regimen
- Eneteral feed discontinued
- IV glucose or TPN discontinued
- Mis-timing of diabetes medication relative to feed
- Changes to other medication e.g. steroids
- Feed intolerance
- Deterioration in renal function
- Vomiting
- Severe hepatic dysfunction

Treatment via the feed tube:

1. 15-20g quick acting carbohydrate e.g.
   -60 ml Glucojuice® (in hypobox)
   -45-60 ml ensure plus juice or fortijuice®
   -3-4 heaped teaspoons of sugar dissolved in water
   -25mls original Ribena® (undiluted)

   All treatments should be followed by a water flush of the feeding tube to prevent tube blockage.

2. Repeat capillary blood glucose 10 to 15 min later. If still < 4.0 mmol/l repeat step 1 up to 3 times.

3. If blood glucose remains < 4.0 mmol/l after 30-45 min or 3 cycles, give 150-200 mls of 10% glucose over 15 minutes (e.g.600-800ml/hr) **or** 75-100mls of 20% glucose over 15 minutes (e.g. 300-400mls/hr).

4. Once blood glucose is >4.0 mmol and the patient has recovered:

-restart feed if able **or**
- if bolus feeding, give additional bolus feed (equivalent of 20grams of carbohydrate) **or**
-give IV 10% glucose at 100ml/hr (volume determined by clinical circumstances)

DO NOT OMIT INSULIN IF DUE (DOSE REVIEW MAY BE REQUIRED)
CONTINUE TO MONITOR CAPILLARY BLOOD GLUCOSE FOR 24 TO 48 HOURS
REFER TO/INFORM THE DIABETES TEAM

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