The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus

Revised September 2013
This document is coded JBDS 01 in the series of JBDS documents:

Other JBDS documents:

The Management of the hyperosmolar hyperglycaemic state (HHS) in adults with diabetes  August 2012  JBDS 06

Glycaemic management during the inpatient enteral feeding of stroke patients with diabetes  June 2012  JBDS 05

Self-Management of Diabetes in Hospital  March 2012  JBDS 04

The Management of Adults with Diabetes undergoing Surgery and Elective Procedures: improving standards April 2011  JBDS 03

The Hospital Management of DKA in Adults Revised September 2013  JBDS 02

These documents are available to download from the ABCD website at http://www.diabetologists-abcd.org.uk/JBDS/JBDS.htm and the Diabetes UK website at www.diabetes.org.uk
Contents

Foreword 5
Authorship 6
Introduction 7
Clinical Features 8
Risk factors for hypoglycaemia 9
Potential causes of inpatient hypoglycaemia 10
Management of hypoglycaemia 11
Treatment of hypoglycaemia 12
  Adults who are conscious, orientated and able to swallow 13
  Adults who are conscious but confused and able to swallow 14
  Adults who are unconscious or having seizures 15
  Adults who are ‘Nil by Mouth’ 16
  Adults requiring enteral feeding 17
When hypoglycaemia has been successfully treated 18
Audit Standards 19
Acknowledgements 20
Guideline Update 20
References 21-22
Further reading 23
Traffic light algorithm for the treatment of hypoglycaemia 24
Flow chart for the treatment of hypoglycaemia 25
Appendices
  Appendix 1 – List of insulins currently available 26
  Appendix 2 – Example of contents of hypo box 27
  Appendix 3 – Hypoglycaemia audit form 28-29
  Appendix 4 – Example of treatment sticker 30
  Appendix 5 – Injectable medicines monograph 31
The original JBDS-IP hypoglycaemia guideline (March 2010) was written by practicing clinicians drawing from their experiences of managing hypoglycaemia in UK hospitals. This document has now been revised by the original authors. During the revision process comments were requested from all interested parties mentioned on page 6. Many comments were received, all were considered and the authors would like to thank everyone who contributed for their constructive comments.

A regular theme occurred with many Trusts having taken the traffic light algorithm and adapted it to suit their own needs. We received many examples of excellent adapted algorithms. However, this highlighted the fact that different Trusts have different preferences with regards to the type of quick and long acting carbohydrate used. For this reason the algorithm in this document has been kept generic so that it can continue to be easily adapted.

Another issue highlighted was the lack of a suitable IV glucose preparation in the volumes recommended in the guideline. This has now been resolved with the availability of 20% glucose in 100ml vials.

JBDS has audited the implementation of this guideline using SurveyMonkey®. One hundred and eighteen hospitals responded of which 24 have adopted this guideline in its entirety, 74 have adopted but adapted it to suit their Trust and 10 are currently adopting it within their Trust. This demonstrates that 92% of responding hospitals have recognised the value of this guideline.

We hope that all teams find this a useful document and adopt the principles, adapting them where necessary to suit individual needs, thus ensuring good quality, timely and effective treatment for all.

Esther Walden

Debbie Stanisstreet
List of Authors

**Lead authorship**
Esther Walden (RGN), Norfolk and Norwich University Hospitals NHS Foundation Trust
Debbie Stanisstreet (RGN), East and North Hertfordshire NHS Trust
Christine Jones, Norfolk and Norwich University Hospitals NHS Foundation Trust
Dr Alex Graveling, Aberdeen Royal Infirmary

**Supporting organisations**
Tracy Kelly, Diabetes UK
Professor Mike Sampson (Norwich), Joint British Diabetes Societies (JBDS) Inpatient Care Group Chair
Esther Walden (Norwich), Diabetes Inpatient Specialist Nurse (DISN) UK Group Chair
Dr Chris Walton (Hull), Association of British Clinical Diabetologists (ABCD) Chair

**Writing group**
Professor Stephanie Amiel, King’s College Hospital NHS Foundation Trust
Dr Clare Crowley, Oxford Radcliffe Hospitals NHS Trust
Dr Ketan Dhatariya, Norfolk and Norwich University Hospitals NHS Foundation Trust
Professor Brian Frier, The Queen’s Medical Institute, University of Edinburgh
Dr Rifat Malik, King’s College Hospital NHS Foundation Trust

**Distributed and incorporated comments from:**
Diabetes Inpatient Specialist Nurse (DISN) UK Group membership
Joint British Diabetes Societies (JBDS) Inpatient Care Working Group members
NHS Diabetes
Diabetes UK
Diabetes UK User Group
Association British Clinical Diabetologists (ABCD)
The Diabetes Management & Education Group (DMEG) of the British Dietetic Association
United Kingdom Clinical Pharmacy Association (UKCPA) Diabetes & Endocrinology Committee
Guild of Healthcare Pharmacists (GHP)
Royal College of Physicians (RCP)
Training, Research and Education for Nurses in Diabetes (TREND UK)
Ambulance Service Network
National Diabetes Nurse Consultant Group

**Wider distribution:**
Royal College of Nursing

**JBDS IP Review Group**
Dr Belinda Allan, Hull and East Yorkshire Hospital NHS Trust
Dr Hamish Courtney, Belfast Health and Social Care Trust, Northern Ireland
Dr Ketan Dhatariya, Norfolk and Norwich University Hospitals NHS Foundation Trust
Dr Daniel Flanagan, Plymouth Hospitals NHS Trust
June James, University Hospitals of Leicester NHS Trust
Tracy Kelly, Diabetes UK
Dr Rif Malik, King’s College Hospital NHS Foundation Trust
Dr Colin Perry, NHS Greater Glasgow and Clyde
Dr Gerry Rayman, The Ipswich Hospital NHS Trust
Dr Stuart Ritchie, NHS Lothian
Dr Aled Roberts, Cardiff and Vale University Health Board
Professor Mike Sampson (Norwich), Joint British Diabetes Societies (JBDS) Inpatient Care Group Chair
Dr Maggie Sinclair-Hammersley, Oxford University Hospitals NHS Trust
Debbie Stanisstreet, East and North Hertfordshire NHS Trust
Dr Jonathan Valabhji, National Clinical Director for Obesity and Diabetes
Esther Walden, Norfolk and Norwich University Hospital NHS Foundation Trust
Dr Chris Walton, Hull and East Yorkshire Hospital NHS Trust
Dr Peter Winocour, East and North Hertfordshire NHS Trust
Introduction
This guideline is for the management of hypoglycaemia in adults (aged 16 years or older) with diabetes mellitus within the hospital setting. Local policies may exist for the treatment of younger adults aged between 16 to 18 years and you may need to refer to these.

This guideline is aimed at all healthcare professionals involved in the management of people with diabetes in hospital. Since the introduction of the original guideline in 2010, the practice of using 50% intravenous (IV) glucose has become much less commonplace, although it is still occasionally used. Expert opinion would suggest that the use of hyperosmolar solutions such as 50% glucose increase the risk of extravasation injury. Furthermore, Moore et al (2005) found that the smaller aliquots used to deliver 10% glucose resulted in lower post treatment glucose levels. For these reasons 10% or 20% glucose solutions are preferred (a suitable 20% preparation is now available).

The authors recommend the IV glucose preparation chosen is prescribed on an ‘as required’ (PRN) basis for all patients with diabetes. If agreed locally, glucagon (and IV glucose) may be given without prescription in an emergency for the purpose of saving a life (Medicines, Ethics & Practice 2012) or via a Patient Group Directive.

Nurses using this guideline must work within the Nursing and Midwifery Council (NMC) professional code of conduct and work within their own competencies.

This guideline is designed to enable adaptation to suit local practice where required.

Hypoglycaemia in Adults with Diabetes

Hypoglycaemia is the commonest side effect of insulin and sulfonylureas in the treatment of all types of diabetes mellitus and presents a major barrier to satisfactory long term glycaemic control. Metformin, pioglitazone, the DPP-4 inhibitors, SLGT-2 inhibitors and GLP-1 analogues prescribed without insulin or sulfonylurea therapy are unlikely to result in hypoglycaemia. Hypoglycaemia results from an imbalance between glucose supply, glucose utilisation and current insulin levels. Hypoglycaemia should be excluded in any person with diabetes who is acutely unwell, drowsy, unconscious, unable to co-operate, presenting with aggressive behaviour or seizures.

Fifteen to twenty percent of inpatients in England and Wales have known diabetes; this increases to 25% in some high risk groups (Sampson et al 2007). The hospital environment presents additional obstacles to the maintenance of good glycaemic control and the avoidance of hypoglycaemia (Farrokhi et al 2012).

Definition
Hypoglycaemia is a lower than normal level of blood glucose. It can be defined as “mild” if the episode is self-treated and “severe” if assistance by a third party is required (DCCT, 1993). For the purposes of people with diabetes who are hospital inpatients, any blood glucose less than 4.0mmol/L should be treated.

Frequency
People with type 1 diabetes mellitus (T1DM) experience around two episodes of mild hypoglycaemia per week. Studies such as the DCCT excluded patients with a history of severe hypoglycaemia and reported lower incidences of hypoglycaemia than would be observed in an
unselected group of patients. In unselected populations, the annual prevalence of severe hypoglycaemia has been reported consistently at 30-40% in several large studies (Strachan, 2007).

Severe hypoglycaemia is less common in people with insulin treated type 2 diabetes mellitus (T2DM) but still represents a significant clinical problem. Patients with insulin treated T2DM are more likely to require hospital admission for severe hypoglycaemia than those with T1DM (30% versus 10% of episodes) (Donnelly et al 2005). The risk of hypoglycaemia with sulfonylurea therapy is often underestimated and as a consequence of the duration of action of the tablets, is frequently prolonged. Elderly patients or those with renal impairment are at particular risk of hypoglycaemia. The UK Hypoglycaemia Group Study showed equivalent levels of severe hypoglycaemia in those treated with sulfonylureas compared with insulin therapy of less than two years duration (UK Hypoglycaemia Group, 2007).

Frequency in hospitalised patients

Farrokhi et al (2012) reports a prevalence of severe hypoglycaemia ranging from 5% to 32% in hospital inpatients treated with insulin.

NaDIA (National Diabetes Inpatient Audit 2012) data shows 22.4% of inpatients with diabetes experienced one or more hypoglycaemic episodes (blood glucose less than 4.0mmol/L) with 10.5% experiencing one or more hypoglycaemic episodes less than 3.0mmol/L. The highest proportion of episodes took place overnight (34.3%).

Patients with type 1 diabetes had the highest prevalence with 40.4% experiencing a hypoglycaemic episode between 3- 4mmol/L and 28.8% experiencing a hypoglycaemic episode <3mmol/L. Injectable treatment was required by 2.2% of patients.

Clinical Features

The symptoms of hypoglycaemia warn an individual of its onset and vary considerably between individuals. Autonomic symptoms are generated by the activation of the sympatho-adrenal system and neuroglycopenic symptoms are the result of cerebral glucose deprivation. The brain is dependent on a continuous supply of circulating glucose as the substrate to fuel cerebral metabolism and to support cognitive performance. If blood glucose levels fall sufficiently, cognitive dysfunction is inevitable (Evans & Amiel, 2002). The 11 most common symptoms were used to form the Edinburgh Hypoglycaemia Scale and are reproduced in the below table (Deary et al 1993).

**Table 1: Edinburgh Hypoglycaemia Scale**

<table>
<thead>
<tr>
<th>Autonomic</th>
<th>Neuroglycopenic</th>
<th>General malaise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweating</td>
<td>Confusion</td>
<td>Headache</td>
</tr>
<tr>
<td>Palpitations</td>
<td>Drowsiness</td>
<td>Nausea</td>
</tr>
<tr>
<td>Shaking</td>
<td>Odd behaviour</td>
<td></td>
</tr>
<tr>
<td>Hunger</td>
<td>Speech difficulty</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incoordination</td>
<td></td>
</tr>
</tbody>
</table>
Risk Factors for Hypoglycaemia

Table 2: Risk Factors for Hypoglycaemia

<table>
<thead>
<tr>
<th>Medical issues</th>
<th>Lifestyle issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Strict glycaemic control</td>
<td>• Increased exercise (relative to usual)</td>
</tr>
<tr>
<td>• Previous history of severe hypoglycaemia</td>
<td>• Irregular lifestyle</td>
</tr>
<tr>
<td>• Long duration of type 1 diabetes</td>
<td>• Increasing age</td>
</tr>
<tr>
<td>• Duration of insulin therapy in type 2 diabetes</td>
<td>• Alcohol</td>
</tr>
<tr>
<td>• Lipohypertrophy at injection sites</td>
<td>• Early pregnancy</td>
</tr>
<tr>
<td>• Impaired awareness of hypoglycaemia</td>
<td>• Breast feeding</td>
</tr>
<tr>
<td>• Severe hepatic dysfunction</td>
<td>• No or inadequate blood glucose monitoring</td>
</tr>
<tr>
<td>• Renal failure (on dialysis)</td>
<td></td>
</tr>
<tr>
<td>• Acute kidney injury</td>
<td></td>
</tr>
<tr>
<td>• Impaired renal function</td>
<td></td>
</tr>
<tr>
<td>• Inadequate treatment of previous hypoglycaemia</td>
<td></td>
</tr>
<tr>
<td>• Terminal illness</td>
<td></td>
</tr>
<tr>
<td>• Bariatric surgery involving bowel resection</td>
<td></td>
</tr>
</tbody>
</table>

Reduced carbohydrate intake

• Food malabsorption e.g. gastroenteritis, coeliac disease

Be aware that the following can also precipitate hypoglycaemia:

• Concurrent use of drugs with hypoglycaemic agents e.g. warfarin, quinine, salicylates, fibrates, sulphonamides (including cotrimoxazole), monoamine oxidase inhibitors, NSAIDs, probenecid, somatostatin analogues, SSRIs. Do not stop or withhold medication, discuss with the medical team or pharmacist

• Loss of counterregulatory hormone function (e.g. Addison’s disease, growth hormone deficiency, hypothyroidism, hypopituitarism)

Potential causes of inpatient hypoglycaemia

Common causes of inpatient hypoglycaemia are listed in table 3. One of the most serious and common causes of inpatient hypoglycaemia is insulin prescription errors including:

• Misreading poorly written prescriptions – when ‘U’ is used for units (i.e. 4U becoming 40 units)

• Confusing the insulin name with the dose (e.g. Humalog Mix25 becoming Humalog 25 units)

• Transcription errors (e.g. where patient on animal insulin is inadvertently prescribed human insulin or where handwriting is unclear)
Morbidity and Mortality

Hypoglycaemia can cause coma, hemiparesis and seizures. If the hypoglycaemia is prolonged the neurological deficits may become permanent. Acute hypoglycaemia impairs many aspects of cognitive function, particularly those involving planning and multitasking. The long term effect of repeated exposure to severe hypoglycaemia is less clear.

The ACCORD study highlighted a potential risk of intensive glycaemic control. Recognised and unrecognised hypoglycaemia was more common in the intensive group than in the standard group. In the intensive group, a small but statistically significant inverse relationship of uncertain clinical importance was identified between the number of hypoglycaemic episodes and the risk of death among participants (ACCORD, 2012).

Turchin et al (2009) examined data from 4368 admission episodes for people with diabetes of which one third were on regular insulin therapy. Patients experiencing inpatient hypoglycaemia experienced a 66% increased risk of death within one year and spent 2.8 days longer in hospital compared to those not experiencing hypoglycaemia. Garg et al (2013) reported increased mortality rates for inpatients on insulin therapy who experienced hypoglycaemia (blood glucose < 2.8mmol/L) compared to those with no hypoglycaemia (20.3% versus 4.5%). However, only 41-51% of these participants had diabetes and sub-group analysis of those with diabetes would have been useful.

Impaired awareness of hypoglycaemia

Impaired awareness of hypoglycaemia (IAH) is an acquired syndrome associated with insulin treatment. IAH results in the warning symptoms of hypoglycaemia becoming diminished in intensity, altered in nature or lost altogether. This increases the vulnerability of affected individuals of progression to severe hypoglycaemia. The prevalence of IAH increases with duration of diabetes and is much more common in type 1 than in type 2 diabetes (Graveling & Frier, 2010).

Table 3: Potential causes of Inpatient Hypoglycaemia

<table>
<thead>
<tr>
<th>Medical issues</th>
<th>Reduced carbohydrate intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Inappropriate use of ‘stat’ or ‘PRN’ rapid/short acting insulin</td>
<td>• Missed or delayed meals</td>
</tr>
<tr>
<td>• Acute discontinuation of long term steroid therapy</td>
<td>• Less carbohydrate than normal</td>
</tr>
<tr>
<td>• Recovery from acute illness/stress</td>
<td>• Change of the timing of the biggest meal of the day (i.e. main meal at midday rather than evening)</td>
</tr>
<tr>
<td>• Mobilisation after illness</td>
<td>• Lack of access to usual between meal or before bed snacks</td>
</tr>
<tr>
<td>• Major amputation of a limb</td>
<td>• Prolonged starvation time e.g. ‘Nil by Mouth’</td>
</tr>
<tr>
<td>• Incorrect type of insulin or oral hypoglycaemic therapy prescribed and administered</td>
<td>• Vomiting</td>
</tr>
<tr>
<td>• Inappropriately timed insulin or oral hypoglycaemic therapy in relation to meal or enteral feed</td>
<td>• Reduced appetite</td>
</tr>
<tr>
<td>• Change of insulin injection site</td>
<td>• Reduced carbohydrate intake</td>
</tr>
<tr>
<td>• IV insulin infusion with or without glucose infusion</td>
<td></td>
</tr>
<tr>
<td>• Inadequate mixing of intermediate acting or mixed insulins</td>
<td></td>
</tr>
<tr>
<td>• Regular insulin doses or oral hypoglycaemia therapy being given in hospital when these are not routinely taken at home</td>
<td></td>
</tr>
</tbody>
</table>
Management of Hypoglycaemia

Introduction
People experiencing hypoglycaemia require quick acting carbohydrate to return their blood glucose levels to the normal range. The quick acting carbohydrate should be followed up by giving long acting carbohydrate either as a snack or as part of a planned meal. All patients experiencing hypoglycaemia should be treated without delay. Where it is safe to do so, a blood glucose measurement should be taken to confirm hypoglycaemia (especially if there is any suspicion that the person may be currently under the influence of alcohol). If measurement is difficult (e.g. in a patient undergoing a seizure) then treatment should not be delayed.

After acute treatment, consideration should be given to whether the hypoglycaemia is likely to be prolonged, i.e. as a result of long acting insulin or sulfonylurea therapy; patients may require a continuous infusion of dextrose to maintain blood glucose levels. Normal blood glucose levels in a person without diabetes are 3.5-7.0 mmol/L. To avoid potential hypoglycaemia, Diabetes UK recommends a practical policy of “make four the floor”, i.e. 4.0 mmol/L the lowest acceptable blood glucose level in people with diabetes. Regular blood glucose monitoring enables detection of asymptomatic biochemical hypoglycaemia.

Evidence for treatment options
There is limited evidence regarding the quantity of quick acting carbohydrate required to successfully treat an episode of hypoglycaemia. The initial quantities chosen were the result of expert consensus subsequently backed up with glucose clamp studies (Brodows et al, 1984, Slama et al, 1990). Vinedzis et al (2012) compared 15g versus 20g and found that 32-63% of episodes resolved after one treatment with 15g carbohydrate compared with 55-89% of episodes with 20g carbohydrate. Larsen et al (2006) used continuous glucose monitoring (CGM) to monitor 125 adult patients with T1DM over 6 days; they defined adequate treatment as ingesting 10-20g of quick acting carbohydrate. They reported that 30% of hypoglycaemic episodes were under-treated and 38% were over-treated. Participants that were under-treated had a 57% chance of remaining hypoglycaemic at the repeat test, this compares with 30% for those adequately treated and 26% for those over treated. This reinforces the suggestion that treatment of hypoglycaemia with less than 10g of quick acting carbohydrate is likely to be inadequate.

Chocolate is no longer recommended for the treatment of hypoglycaemia. Chocolate contains quick acting carbohydrate and fat; and the addition of fat has been shown to slow the absorption of quick acting carbohydrate (Cedermark et al, 1993, Shively et al, 1986). Sugar or sucrose is also less commonly recommended as it takes longer to affect blood glucose levels than glucose (Georgakopoulos et al, 1990). Orange juice (which contains fructose) remains a popular treatment for hypoglycaemia. The results of two studies using a modified glucose clamp technique have suggested that orange juice may not be the most effective treatment in adults with T1DM (Slama et al, 1990, Brodows et al, 1984). Brodows et al reported that almost double the amount of orange juice was required to produce a similar increment compared with glucose tablets. The total sugar content of any fruit juice varies according to the ripeness of the fruit, the season it is picked and the addition of any sugar when packaged (Slama et al, 1990). A more recent study showed that fructose (in the form of a fruit bar) was less effective than sucrose in successfully treating hypoglycaemia in children with type 1 diabetes. The fibre in the bar may have slowed down the absorption of the fructose, reducing its efficacy as a treatment for hypoglycaemia (Husband et al, 2010). By contrast, a recent “real-world” study of children with type 1 diabetes attending a diabetes camp found orange juice to be as effective as other treatments (McTavish and Wiltshire, 2011).

Several studies have examined the time interval between treatment and re-testing to confirm resolution of hypoglycaemia. All are supportive of a minimum interval of at least 10 minutes before retesting to ensure resolution of hypoglycaemia (McTavish and Wiltshire, 2011). Slama et al (1990) concluded that repeating carbohydrate intake
every 5-10 minutes would not allow adequate
time for the treatment to take effect thus leading
to over treatment. Vindedzis et al (2012) reported
that when hypoglycaemia was treated with 20g
of carbohydrate, 55% were adequately treated
after a 5 minute wait, compared with 89% after
a 10 minute wait.

“Hypo” boxes
Areas of good practice have successfully used
“hypo boxes” for the management of
hypoglycaemia (Baker et al, 2007). These boxes
are often in a prominent place e.g. on
resuscitation trolleys and are brightly coloured for
instant recognition. They contain all the
equipment required to treat hypoglycaemia from
cartons of fruit juice to IV cannulas. Suggested
contents of a “hypo box” can be found in
Appendix 2.
There are now commercially available hypo boxes.

Conclusion
This is a general guideline for the treatment of
hypoglycaemia but each patient should be
individually assessed and management altered
where necessary. You may want to agree local
guidance for the self management of
hypoglycaemia in conjunction with certain other
medical conditions (e.g. renal impairment, heart
failure). Many people with diabetes carry their
own supplies of oral carbohydrate and should be
supported to self manage when capable and
appropriate. Following assessment this should be
recorded in their hospital care plan. Patients
capable of self care should alert nursing staff that
an episode of hypoglycaemia has occurred so that
their management plan can be altered if
necessary. Many episodes of hypoglycaemia are
avoidable so every preventable measure should be
taken.

Easily accessible quick and long acting
carbohydrate must be available in your clinical
area and all staff should be aware of its location.

Treatment of Hypoglycaemia
Adults who have poor glycaemic control may start
to experience symptoms of hypoglycaemia above
4.0mmol/L. There is no evidence that the
thresholds for cognitive dysfunction are reset
upwards; therefore the only reason for treatment
is symptomatic relief. So adults who are
experiencing hypoglycaemia symptoms but
have a blood glucose level greater than
4.0mmol/L – treat with a small carbohydrate
snack only e.g. 1 medium banana, a slice of
bread or normal meal if due. All adults with a
blood glucose level less than 4.0mmol/L with or
without symptoms of hypoglycaemia should be
treated as outlined below.
A. Adults who are conscious, orientated and able to swallow

1) Give 15-20g quick acting carbohydrate of the patient’s choice where possible. Some examples are:
   - 5-7 Dextrosol® tablets (or 4-5 Glucotabs®)
   - 90-120ml of original Lucozade®
   - 1 bottle (60ml) Glucojuice®
   - 150-200ml pure fruit juice e.g. orange
   - 3-4 heaped teaspoons of sugar dissolved in water.

N.B. Patients following a low potassium diet (due to chronic kidney disease) should not use orange juice to treat hypoglycaemia.

N.B. Sugar dissolved in water is not an effective treatment for patients taking acarbose as it prevents the breakdown of sucrose to glucose.

2) Repeat capillary blood glucose measurement 10-15 minutes later. If it is still less than 4.0mmol/L, repeat step 1 (no more than 3 treatments in total).

3) If blood glucose remains less than 4.0mmol/L after 30-45 minutes or 3 cycles, contact a doctor. Consider 1mg of glucagon IM (may be less effective in patients prescribed sulfonylurea therapy/patients currently under the influence of alcohol) or IV 150-200ml of 10% glucose over 15 minutes, (e.g. 600-800ml/hr). Care should be taken if larger volume bags are used to ensure that the whole infusion is not inadvertently administered. Volume should be determined by clinical circumstances (refer to Appendix 5 for administration details).

4) Once blood glucose is above 4.0mmol/L and the patient has recovered, give a long acting carbohydrate of the patient’s choice where possible, taking into consideration any specific dietary requirements. Some examples are:
   - Two biscuits
   - One slice of bread/toast
   - 200-300ml glass of milk (not soya)
   - Normal meal if due (must contain carbohydrate).

N.B. Patients given glucagon require a larger portion of long acting carbohydrate to replenish glycogen stores (double the suggested amount above). However, nausea associated with glucagon injections may be an issue.

N.B. Patients who self-manage their insulin pumps (CSII) may not need a long acting carbohydrate but should take initial treatment, continue their pump and assess for the cause of the episode.

5) **DO NOT omit insulin injection if due** (However, insulin regime review may be required).

6) Document event in patient’s notes. Ensure regular capillary blood glucose monitoring is continued for 24 to 48 hours. Ask the patient to continue this at home if they are to be discharged. Give hypoglycaemia education or refer to Diabetes Inpatient Specialist Nurse (DISN).

N.B. If the hypoglycaemia was due to sulfonylurea or long acting insulin therapy then be aware that the risk of hypoglycaemia may persist for up to 24-36 hours following the last dose, especially if there is concurrent renal impairment.
B. Adults who are conscious but confused, disorientated, unable to cooperate or aggressive but are able to swallow

1) If the patient is capable and cooperative, follow section A in its entirety.

2) If the patient is not capable and/or uncooperative, but is able to swallow give either 1.5 -2 tubes GlucoGel®/Dextrogel® squeezed into the mouth between the teeth and gums or (if this is ineffective) give glucagon 1mg IM (may be less effective in patients prescribed sulfonylurea therapy/patients currently under the influence of alcohol).

3) Repeat capillary blood glucose levels after 10-15 minutes. If it is still less than 4.0mmol/L repeat steps 1 and/or 2 (no more than 3 treatments in total and only give IM glucagon once).

4) If blood glucose level remains less than 4.0mmol/L after 30-45 minutes (or 3 cycles of A1), contact a doctor. Consider IV 150-200ml of 10% glucose over 15 minutes, (e.g. 600-800ml/hr). Care should be taken if larger volume bags are used to ensure that the whole infusion is not inadvertently administered. Volume should be determined by clinical circumstances (refer to Appendix 5 for administration details).

5) Once blood glucose is above 4.0mmol/L and the patient has recovered, give a long acting carbohydrate of the patient’s choice where possible, taking into consideration any specific dietary requirements. Some examples are:
   o Two biscuits
   o One slice of bread/toast
   o 200-300ml glass of milk (not soya)
   o Normal meal if due (must contain carbohydrate).

N.B. Patients given glucagon require a larger portion of long acting carbohydrate to replenish glycogen stores (double the suggested amount above).

N.B. Patients who self-manage their insulin pumps (CSII) may not need a long acting carbohydrate but should take initial treatment, continue their pump and assess for the cause of the episode.

6) DO NOT omit insulin injection if due (However, insulin regime review may be required).

7) Document event in patient’s notes. Ensure regular capillary blood glucose monitoring is continued for 24 to 48 hours. Ask the patient to continue this at home if they are to be discharged. Give hypoglycaemia education or refer to DISN.

N.B. If the hypoglycaemia was due to sulfonylurea or long acting insulin therapy then be aware that the risk of hypoglycaemia may persist for up to 24-36 hours following the last dose, especially if there is concurrent renal impairment.
C. Adults who are unconscious and/or having seizures and/or are very aggressive

1) Check:
- Airway (and give oxygen)
- Breathing
- Circulation
- Disability (including GCS and blood glucose)
- Exposure (including temperature)

If the patient has an insulin infusion in situ, stop immediately

Request immediate assistance from medical staff (e.g. “fast bleep” a doctor)

2) The following three options (i-iii) are all appropriate; local agreement should be sought:

i) If IV access available, give 75-100ml of 20% glucose over 15 minutes, (e.g. 300-400ml/hr). A 100ml preparation of 20% glucose is available that will deliver the required amount after being run through a standard giving set. If an infusion pump is available use this, but if not readily available the infusion should not be delayed (see Appendix 5 for administration details). Repeat capillary blood glucose measurement 10 minutes later. If it is still less than 4.0mmol/L, repeat.

ii) If IV access available, give 150-200ml of 10% glucose over 15 minutes, (e.g. 600-800ml/hr). If an infusion pump is available use this, but if not readily available the infusion should not be delayed. Care should be taken if larger volume bags are used to ensure that the whole infusion is not inadvertently administered. Repeat capillary blood glucose measurement 10 minutes later. If it is still less than 4.0mmol/L, repeat (refer to Appendix 5 for administration details).

iii) Glucagon 1mg IM (may be less effective in patients prescribed sulfonylurea therapy/patients currently under the influences of alcohol).

Glucagon, which may take up to 15 minutes to take effect, mobilises glycogen from the liver and will be less effective in those who are chronically malnourished (e.g. alcoholics), or in patients who have had a prolonged period of starvation and have depleted glycogen stores or in those with severe liver disease. In this situation or if prolonged treatment is required, IV glucose is better.

3) Once the blood glucose is greater than 4.0mmol/L and the patient has recovered give a long acting carbohydrate of the patient’s choice where possible, taking into consideration any specific dietary requirements. Some examples are:
- Two biscuits
- One slice of bread/toast
- 200-300ml glass of milk (not soya)
- Normal meal if due (must contain carbohydrate).

N.B. Patients given glucagon require a larger portion of long acting carbohydrate to replenish glycogen stores (double the suggested amount above).

N.B. Patients who self manage their insulin pumps (CSII) may not need a long acting carbohydrate.

4) DO NOT omit insulin injection if due
(However, insulin regime review may be required).

5) If the patient was on IV insulin, continue to check blood glucose every 15 minutes until above 3.5mmol/L, then re-start IV insulin after review of dose regimen. Consider concurrent IV 10% glucose infusion at 100ml/hr.

6) Document event in patient’s notes. Ensure regular capillary blood glucose monitoring is continued for 24 to 48 hours. Ask the patient to continue this at home if they are to be discharged. Give hypoglycaemia education or refer to DISN.

N.B. If the hypoglycaemia was due to sulfonylurea or long acting insulin therapy then be aware that the risk of hypoglycaemia may persist for up to 24-36 hours following the last dose, especially if there is concurrent renal impairment.
D. Adults who are ‘Nil by Mouth’

1) If the patient has a variable rate intravenous insulin infusion, adjust as per prescribed regimen, and seek medical advice. Most variable rate intravenous insulin infusions should be restarted once blood glucose is above 4mmol/L although a rate adjustment may be indicated.

2) Options i and ii (intravenous glucose) as above in section C (2) are both appropriate treatment options. Again local agreement should be sought.

3) Once blood glucose is greater than 4.0mmol/L and the patient has recovered consider 10% glucose at a rate of 100ml/hr (refer to Appendix 5 for administration details) until patient is no longer ‘Nil by Mouth’ or has been reviewed by a doctor.

4) Document event in patient’s notes. Ensure regular capillary blood glucose monitoring is continued for 24 to 48 hours. Ask the patient to continue this at home if they are to be discharged. Give hypoglycaemia education or refer to DISN.

N.B. If the hypoglycaemia was due to sulfonylurea or long acting insulin therapy then be aware that the risk of hypoglycaemia may persist for up to 24-36 hours following the last dose, especially if there is concurrent renal impairment.
**E. Adults requiring enteral feeding**

Patients requiring total parenteral nutrition (TPN) should be referred to a dietitian/nutrition team and diabetes team for individual assessment.

**Risk factors for hypoglycaemia**

- Blocked/displaced tube
- Change in feed regimen
- Enteral feed discontinued
- TPN or IV glucose discontinued
- Diabetes medication administered at an inappropriate time to feed
- Changes in medication that cause hyperglycaemia e.g. steroid therapy reduced/stopped
- Feed intolerance
- Vomiting
- Deterioration in renal function
- Severe hepatic dysfunction

**Treatment – To be administered via feed tube:**

*Do not administer these treatments via a TPN line.*

1) Give 15-20g quick acting carbohydrate of the patient’s choice where possible. Some examples are:
   - 25ml original undiluted Ribena®
   - 45-60ml Fortijuce®
   - 1 bottle (60ml) Glucojuice®
   - 3-4 heaped teaspoons of sugar dissolved in water

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

2) Repeat capillary blood glucose measurement 10 to 15 minutes later. If it is still less than 4.0mmol/L, repeat step 1 (no more than 3 treatments in total).

3) If blood glucose remains less than 4.0mmol/L after 30-45 minutes (or 3 cycles), consider 150-200ml of 10% glucose over 15 minutes, (e.g. 600-800ml/hr). Care should be taken if larger volume bags are used to ensure that the whole infusion is not inadvertently administered.

4) Once blood glucose is above 4.0mmol/L and the patient has recovered, give a long acting carbohydrate. Some examples are:
   - Restart feed
   - If bolus feeding, give additional bolus feed (read nutritional information and calculate amount required to give 20g of carbohydrate)
   - 10% IV glucose at 100ml/hr. Volume should be determined by clinical circumstances (refer to Appendix 5 for administration details).

5) **DO NOT omit insulin injection if due**

(However, insulin regime review may be required).

6) Document event in patient’s notes. Ensure regular capillary blood glucose monitoring is continued for 24 to 48 hours. Ask the patient to continue this at home if they are to be discharged. Give hypoglycaemia education or refer to DISN. Ensure patient has been referred to a dietician for individualised hypoglycaemia treatment advice.

N.B. If the hypoglycaemia was due to sulfonylurea or long acting insulin therapy then be aware that the risk of hypoglycaemia may persist for up to 24-36 hours following the last dose, especially if there is concurrent renal impairment.
When hypoglycaemia has been successfully treated

- Complete an audit form, and send it to the DISN (see Appendix 3 for Audit form). Some Trusts have utilised pre-printed stickers in patients’ notes both for documentation and audit purposes. For an example see Appendix 4. Consider completing an incident form if appropriate. If “hypo boxes” are used replenish as appropriate.

- Identify the risk factor or cause resulting in hypoglycaemia (see tables 2 and 3).

- Take measures to avoid hypoglycaemia in the future. The DISN or diabetes medical team can be contacted to discuss this.

- Unless the cause is easily identifiable and both the nursing staff and patient are confident that steps can be taken to avoid future events, a medical or DISN review should be considered. If the hypoglycaemia event was severe or recurrent, or if the patient voices concerns then a review is indicated.

- Please DO NOT omit the next insulin injection or start variable rate intravenous insulin infusion to ‘stabilise’ blood glucose. If unsure of subsequent diabetes treatment, discuss with the diabetes team/DISN e.g. it may be safe to omit a meal time bolus dose of rapid acting insulin if the patient is declining food and has had their usual basal insulin.

- Medical team (or DISN if referred) to consider reducing the dose of insulin prior to the time of previous hypoglycaemia events. This is to prevent further hypoglycaemia episodes occurring.

- Please DO NOT treat isolated spikes of hyperglycaemia with ‘stat’ doses of rapid acting insulin. Instead maintain regular capillary blood glucose monitoring and adjust normal insulin regimen only if a particular pattern emerges.
## Audit Standards

<table>
<thead>
<tr>
<th>Processes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protocol</strong></td>
<td>Availability of diabetes management guidelines based on national examples of good practice including management of patients who are nil-by-mouth or enterally fed</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>Availability of hospital-wide pathway agreed with diabetes speciality team</td>
</tr>
<tr>
<td></td>
<td>Defined rolling education programme for ward staff and regular audit of key components including staff knowledge of correct treatment targets, blood glucose meter calibration, and quality assurance</td>
</tr>
<tr>
<td></td>
<td>Percentage of wards with “hypo boxes“ (or equivalent)</td>
</tr>
<tr>
<td></td>
<td>Percentage of people with diabetes able to access treatments to manage their own hypos</td>
</tr>
<tr>
<td><strong>Specialist review</strong></td>
<td>People with diabetes who are admitted to hospital with hypoglycaemia are reviewed by a specialist diabetes physician or nurse prior to discharge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome measures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incidence</strong></td>
<td>Benchmark incidence of severe hypoglycaemia against equivalent national and regional data for admissions using widely available local and national datasets</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td>Percentage of hospital discharges delayed by inpatient hypoglycaemia episode</td>
</tr>
<tr>
<td><strong>Identification &amp; prevention</strong></td>
<td>Cause of hypoglycaemia identified &amp; recorded</td>
</tr>
<tr>
<td></td>
<td>Percentage of appropriate insulin/anti-hyperglycaemic medication dose adjustment regarding prevention of hypoglycaemia (snap shot audit of different areas of Trust on monthly basis)</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>Time to recovery</td>
</tr>
</tbody>
</table>
**Acknowledgements**

We would like to thank Debbie Stanisstreet and the Department of Diabetes and Endocrinology, East and North Hertfordshire NHS Trust whose original hypoglycaemia guideline gave us a starting point for this document.

We would like to thank Dr Rifat Malik for producing the Audit Standards for hypoglycaemia.

We would like to thank Dr Clare Crowley for her work in acquiring a suitable individual use IV 20% glucose preparation.

**Guideline update**

This guideline should be updated regularly.
References


Garg R, Turchin A, Hurwitz S, Trivedi A. (2013) Hypoglycaemia, with or without insulin therapy, is associated with increased mortality among hospitalized patients. Diabetes Care 36: 1107-1110


Further reading


Anthony M (2008). Hypoglycaemia in Hospitalized Adults: MEDSURG Nursing 17 (1)

Briscoe VJ, Davis SN (2006). Hypoglycaemia Type 1 and Type 2 Diabetes: Physiology, Pathophysiology, and Management, Clinical Diabetes 24(3): 115-121


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

Hypoglycaemia is defined as blood glucose of less than 4mmol/L (if symptomatic but blood glucose is above 4mmol/L then give a small carbohydrate snack for symptom relief)

**Mild**
- Patient conscious, orientated and able to swallow

  - Give 15-20g of quick acting carbohydrate (insert Trust preference).
  - Test blood glucose level after 10-15 minutes.
  - If still less than 4mmol/L repeat up to 3 times
  - If this has been repeated 3 times, consider IV 10% glucose 150 - 200ml over 15 minutes or 1mg glucagon IM

  - Blood glucose level should now be above 4mmol/L. Give 20g of long acting carbohydrate eg 2 biscuits or a slice of bread or next meal if due. If IM glucagon has been used give 40g of long acting carbohydrate in order to replenish glycojen stores.

  - For enterally fed patients ONLY: Restart feed or give bolus feed as per guideline or IV 10% glucose at 100ml/hr

**Moderate**
- Patient conscious but confused/disorientated or aggressive and able to swallow

  - If capable and cooperative, treat as for mild hypoglycaemia
  - If not capable and cooperative but can swallow give either 1.5-2 tubes of GlucoGel®/Dextrogel®

  - Test BGL after 10-15 minutes. If still less than 4mmol/L repeat up to 3 times or if ineffective use 1mg glucagon IM (once daily).
  - If still hypoglycaemic or deteriorating at any stage, call doctor and consider IV glucose (as for severe)

**Severe**
- Patient unconscious/having a fit or very aggressive or nil by mouth (NBM)

  - Check ABC, Stop any IV insulin, fast bleep a doctor
  - If patient suitable for IM glucagon (i.e. no repeated hypos, patient not starved/NBM and no severe hepatic disease) give 1mg glucagon IM. If not give IV glucose (insert Trust agreed strength and amount) repeat up to 3 times

  - Recheck glucose level after 10 - 15 minutes, it should now be above 4mmol/L. Follow up treatment as described on the left.
  - If nil by mouth (NBM) give 10% glucose infusion at 100ml/hr until no longer NBM or reviewed by doctor

**DO NOT** OMIT SUBSEQUENT DOSES OF INSULIN, CONTINUE REGULAR CAPILLARY BLOOD GLUCOSE MONITORING FOR 24 TO 48 HOURS AND GIVE HYPOEDUcation OR REFER TO DIABETES INPATIENT SPECIALIST NURSES FOR ADVICE

For enterally fed patients please see section E of the Hypoglycaemia Guideline

BGL = blood glucose level

© 2008 East and North Hertfordshire NHS Trust Medical Photography and Illustration
**For enteral fed patients please see Section F of Hypoglycaemia Guideline.**
# Appendix 1: List of insulins currently available

<table>
<thead>
<tr>
<th>Name</th>
<th>Manufacturer</th>
<th>Source</th>
<th>Delivery system</th>
<th>Taken</th>
<th>Onset, peak and duration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rapid-acting analogue</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NovoRapid</td>
<td>Novo Nordisk</td>
<td>Analogue</td>
<td>Vial, cartridge, prefilled pen</td>
<td>Just before / with / just after food</td>
<td></td>
</tr>
<tr>
<td>Humalog</td>
<td>Lilly</td>
<td>Analogue</td>
<td>Vial, cartridge, prefilled pen</td>
<td>Just before / with / just after food</td>
<td></td>
</tr>
<tr>
<td>Apidra</td>
<td>Sanofi-Aventis</td>
<td>Analogue</td>
<td>Vial, cartridge (two types), prefilled pen (two types)</td>
<td>0-15 mins before, or soon after, a meal</td>
<td></td>
</tr>
<tr>
<td><strong>Short-acting / neutral</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actrapid</td>
<td>Novo Nordisk</td>
<td>Human</td>
<td>Vial</td>
<td>30 mins before food</td>
<td></td>
</tr>
<tr>
<td>Humulin S</td>
<td>Lilly</td>
<td>Human</td>
<td>Vial, cartridge</td>
<td>20-45 mins before food</td>
<td></td>
</tr>
<tr>
<td>Hepurin Bouvax Neutral</td>
<td>Wockhardt UK</td>
<td>Boxine</td>
<td>Vial, cartridge</td>
<td>30 mins before food</td>
<td></td>
</tr>
<tr>
<td>Hepurin Pontine Neutral</td>
<td>Wockhardt UK</td>
<td>Porcine</td>
<td>Vial, cartridge</td>
<td>20 mins before food</td>
<td></td>
</tr>
<tr>
<td>Insman Rapid</td>
<td>Sanofi-Aventis</td>
<td>Human</td>
<td>Cartridge, prefilled pen</td>
<td>15-20 mins before food</td>
<td></td>
</tr>
<tr>
<td><strong>Medium and long-acting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulatard</td>
<td>Novo Nordisk</td>
<td>Human</td>
<td>Vial, cartridge, prefilled insulin doser</td>
<td>As advised by the healthcare team</td>
<td></td>
</tr>
<tr>
<td>Humulin I</td>
<td>Lilly</td>
<td>Human</td>
<td>Vial, cartridge, prefilled pen</td>
<td>About 30 mins before food or bed</td>
<td></td>
</tr>
<tr>
<td>Hepurin Bovine isophane</td>
<td>Wockhardt UK</td>
<td>Boxine</td>
<td>Vial, cartridge</td>
<td>As advised by the healthcare team</td>
<td></td>
</tr>
<tr>
<td>Hepurin Bovine Lente</td>
<td>Wockhardt UK</td>
<td>Boxine</td>
<td>Vial</td>
<td>As advised by the healthcare team</td>
<td></td>
</tr>
<tr>
<td>Hepurin Bovine P31</td>
<td>Wockhardt UK</td>
<td>Boxine</td>
<td>Vial</td>
<td>As advised by the healthcare team</td>
<td></td>
</tr>
<tr>
<td>Hepurin Bovine isophane</td>
<td>Wockhardt UK</td>
<td>Boxine</td>
<td>Vial, cartridge</td>
<td>As advised by the healthcare team</td>
<td></td>
</tr>
<tr>
<td>Insman basal</td>
<td>Sanofi-Aventis</td>
<td>Human</td>
<td>Vial, cartridge, prefilled pen</td>
<td>45-60 mins before food</td>
<td></td>
</tr>
<tr>
<td><strong>Mixed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humulin M3</td>
<td>Lilly</td>
<td>Human</td>
<td>Vial, cartridges, prefilled pen</td>
<td>20-45 mins before food</td>
<td></td>
</tr>
<tr>
<td>Hepurin Pank 30/70 Mix</td>
<td>Wockhardt UK</td>
<td>Porcine</td>
<td>Vial, cartridge</td>
<td>As advised by the healthcare team</td>
<td></td>
</tr>
<tr>
<td>Insman Comb 15</td>
<td>Sanofi-Aventis</td>
<td>Human</td>
<td>Cartridge, prefilled pen</td>
<td>30-45 mins before food</td>
<td></td>
</tr>
<tr>
<td>Insman Comb 25</td>
<td>Sanofi-Aventis</td>
<td>Human</td>
<td>Vial, cartridge, prefilled pen</td>
<td>30-45 mins before food</td>
<td></td>
</tr>
<tr>
<td>Insman Comb 50</td>
<td>Sanofi-Aventis</td>
<td>Human</td>
<td>Cartridge, prefilled pen</td>
<td>20-30 mins before food</td>
<td></td>
</tr>
<tr>
<td><strong>Analogue mixture</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humalog Mix 25</td>
<td>Lilly</td>
<td>Analogue</td>
<td>Vial, cartridge, reconstituted pen</td>
<td>Just before / with / just after food</td>
<td></td>
</tr>
<tr>
<td>Humalog Mix 50</td>
<td>Lilly</td>
<td>Analogue</td>
<td>Cartridge, prefilled pen</td>
<td>Just before / with / just after food</td>
<td></td>
</tr>
<tr>
<td>NovoMix 30</td>
<td>Novo Nordisk</td>
<td>Analogue</td>
<td>Cartridge, prefilled pen</td>
<td>Just before / with / just after food</td>
<td></td>
</tr>
<tr>
<td><strong>Long-acting analogue</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lantus</td>
<td>Sanofi-Aventis</td>
<td>Analogue</td>
<td>Vial, cartridge (two types), prefilled pen (two types)</td>
<td>Once a day, any time (but at same time each day)</td>
<td></td>
</tr>
<tr>
<td>Levemir</td>
<td>Novo Nordisk</td>
<td>Analogue</td>
<td>Cartridge, prefilled pen, prefilled insulin doser</td>
<td>Once or twice daily (at same time each day)</td>
<td></td>
</tr>
</tbody>
</table>

All the information in this wallchart has been supplied and checked by the manufacturers.
Company contacts
- Lilly: 01256 315000
- Novo Nordisk: 0845 600 5055
- Sanofi-Aventis: 0845 606 6887
- Wockhardt UK: 01978 661261

The charity for people with diabetes
020 7424 1000 | info@diabetes.org.uk | www.diabetes.org.uk
A charity registered in England and Wales No. 231319 and in Scotland No. SC036126, @ Diabetes UK, 2011
Appendix 2: Example of contents of hypo box

- Copy of hypoglycaemia algorithm (laminated and attached to inside of lid)
- 2x 200ml carton fruit juice (or 120 ml Lucozade® original for renal patients)
- 2 x packets of dextrose tablets
- 1x mini pack of biscuits (source of long acting carbohydrate)
- 3x tubes (1 box) Glucogel® (formerly known as Hypostop)
- 20% glucose IV solution (100ml vial)
- 1x green venflon 18G
- 1x grey venflon 16G
- 1x 10ml sterile syringe
- 3 x 10ml sodium chloride 0.9% ampoules for flush
- 1x green sterile needle 21G
- Chlorhexidine spray/alcohol wipes
- 1x IV dressing (venflon cover)
- 10% glucose for IV infusion (500ml bag)
- Audit form
- Instructions on where to send audit form and replenish supplies
- 1x Glucagon pack – to be kept in the nearest drug fridge or labelled with reduced expiry date of 18 months if stored at room temperature

“Hypo box” contents should be checked on a daily basis to ensure it is complete and in date. It is the responsibility of the member of staff who uses any contents to replenish them after use.

N.B. Chosen preparation of IV glucose should also be included or kept nearby with appropriate giving set.

N.B. Appropriate portable sharps disposal equipment should also be kept nearby.
Hypoglycaemia Audit Form
(To be completed by a Healthcare Professional after each hypoglycaemic episode)

Patient Details/Sticker:

Hosp No: .................................. DoB: ..........................
Surname: ................................................................
Forename(s): ............................................................
Male  Female  NHS No ..........................

Healthcare Professional Details:

Name: ................................................................
Grade/Band: ..........................................................

Ward: ............................................................  Consultant: ..........................................................

Date of Event:   ____ / ____ / ____       Time of Event:   ______:  ______ hrs (24 hr clock)

Hypoglycaemic episode type please insert letter from key below:

Key:
A. Patient was conscious, orientated and able to swallow
B. Patient was conscious but confused, disorientated, aggressive or had an unsteady gait but was able to swallow
C. Patient was unconscious and/or having seizures and/or was very aggressive
D. Patient was conscious, orientated but ‘Nil by Mouth’
E. Patients requiring enteral feeding

Blood Glucose (BG) at time of event:   
BG - 10 minutes after treatment:   
BG - 15 minutes after treatment:   
Treatment (if required):

Was Hypoglycaemia Treatment Guideline followed?    Yes  No*  (Please tick appropriate box)

*If No, please give details:
Hypoglycaemia Audit Form (Cont’d)

Did the patient self-manage?   Yes ☐  No* ☐  (Please tick appropriate box)

Patient recovered?   Yes ☐  No* ☐  (Please tick appropriate box)

*If No, please give details:

What steps were taken to identify the reason for the hypoglycaemia?
Please give details:

What steps were taken to prevent a recurrence?
Please give details:

Please comment on the ease and effectiveness of the Treatment Guideline and make any suggestions on how it could be improved.

Thank you

Please return completed form to the DISN or diabetes department
Appendix 4: Example of a Hypoglycaemic Episode Label

With kind permission from Laura Dinning, Harrogate and District NHS Foundation Trust
Appendix 5
written by Dr Clare Crowley, Consultant Medicines Safety Pharmacist, Oxford University Hospitals NHS Trust.

Sample injectable monograph
To provide healthcare staff with essential technical information in clinical area at point of use, in accordance with NPSA Patient Safety Alert 20 ‘Promoting safer use of injectable medicines’

MEDICINE: GLUCOSE 10% & 20% INFUSION

Indication: Management of adult hypoglycaemia, where dose should be prescribed by volume and concentration to minimise confusion.

Available as: 10% glucose 500ml solution for IV infusion (0.1g/ml)
20% glucose 100ml solution for IV infusion (0.2g/ml)

Example calculations
Should not be required if prescribed via concentration and volume as advised

Usual adult dose: see guidelines

Administration:
IV injection: Not recommended
IV infusion:
20% glucose - short term peripheral use via a secure cannula into a large vein is acceptable for the emergency management of hypoglycaemia with close monitoring of the infusion site for thrombophlebitis. Central access is preferred where available and is desirable if 20% infusion has to be continued after the initial dose.
10% glucose - peripherally via a secure cannula into a large vein or central access (preferred where available). If peripheral infusion continues for more than 24 hours change infusion site to minimise thrombophlebitis. Care should be taken to ensure that the whole 500ml infusion is not inadvertently administered.

IM injection: Contraindicated
Subcutaneous injection: Contraindicated

Preparation & final concentration
Ready to use infusion. If only part of the infusion is needed discard any unused portion.

Rate of administration
Give 75-100ml of 20% glucose (or 150-200ml 10% glucose) over 10-15 minutes. For the initial emergency management of hypoglycaemia this may be administered via a giving set alone. In all other situations, an infusion pump is required. With 10% glucose, care should be taken to ensure that the whole 500ml infusion is not inadvertently administered.

Flush
Sodium chloride 0.9%, glucose 5% - flush well to reduce vein irritation

Do not administer blood through the same infusion equipment

Compatible infusions
Not applicable

Storage and handling
Do not use unless solution is clear and container undamaged

High strength solution – packaging looks similar to other infusion fluids take care to confirm correct strength selected

Cautions and side effects
- Hyperglycaemia, monitor blood glucose
- Avoid extravasation – may cause tissue damage
- Pain and phlebitis may occur during administration as the solution is hypertonic. This is a particular risk if infused too quickly. Monitor the infusion site, if any signs of phlebitis, stop infusion, remove cannula and resite
- Fluid and electrolyte disturbances including oedema, hypokalaemia and hypomagnesaemia

References