



Emergency management of diabetes and hypoglycaemia

A Brackenridge, H Wallbank, R A Lawrenson and D Russell-Jones

Emerg. Med. J. 2006;23;183-185
doi:10.1136/emj.2005.026252

Updated information and services can be found at:

<http://emj.bmj.com/cgi/content/full/23/3/183>

These include:

References

This article cites 9 articles, 4 of which can be accessed free at:

<http://emj.bmj.com/cgi/content/full/23/3/183#BIBL>

1 online articles that cite this article can be accessed at:

<http://emj.bmj.com/cgi/content/full/23/3/183#otherarticles>

Rapid responses

You can respond to this article at:

<http://emj.bmj.com/cgi/eletter-submit/23/3/183>

Email alerting service

Receive free email alerts when new articles cite this article - sign up in the box at the top right corner of the article

Notes

To order reprints of this article go to:

<http://journals.bmj.com/cgi/reprintform>

To subscribe to *Emergency Medicine Journal* go to:

<http://journals.bmj.com/subscriptions/>

ORIGINAL ARTICLE

Emergency management of diabetes and hypoglycaemia

A Brackenridge, H Wallbank, R A Lawrenson, D Russell-Jones

Emerg Med J 2006;23:183–185. doi: 10.1136/emj.2005.026252

See end of article for authors' affiliations

Correspondence to:
Professor D Russell-Jones,
Department of Diabetes
and Endocrinology, Royal
Surrey County Hospital,
Egerton Road, Guildford,
Surrey, GU2 7XX, UK;
drj@royalsurrey.nhs.uk

Accepted for publication
8 July 2005

Objective: Hypoglycaemia is the commonest diabetic emergency and is associated with considerable morbidity and mortality. This study looked at the use of the emergency services by people with diabetes, with particular reference to hypoglycaemia.

Method: Data were collected on all attendances related to diabetes at accident and emergency departments at two district general hospitals in Surrey, UK, over a one year period.

Results: Hypoglycaemia was the commonest reason for attendance at accident and emergency. The management of hypoglycaemia was variable, the most frequent method of treatment being intramuscular glucagon administered by the ambulance service. Ninety per cent of patients with hypoglycaemia were either discharged or self-discharged from the accident and emergency department, and half of these patients had no follow up arranged.

Conclusions: Hypoglycaemia is the commonest diabetic emergency and current management is suboptimal. Standardised protocols and better education of healthcare professionals and patients are required.

Diabetes mellitus is a common condition affecting 2–3% of the UK population. Optimal control of glucose levels aiming for near normoglycaemia prevents long-term complications,¹ but the limiting factor in achieving this is hypoglycaemia. Hypoglycaemia is the commonest reason for people with diabetes to call an ambulance or attend an accident and emergency (A&E) department^{2–3} and is associated with considerable morbidity and mortality.⁴ Admission to hospital with hypoglycaemia is uncommon⁵ therefore the specialist team is usually not involved in acute management. Most episodes of hypoglycaemia are treated by the patient, friends, or family.⁶ A study from New Zealand suggests that patients are often inadequately informed about hypoglycaemia. Only 37% of those who experienced an episode of hypoglycaemia in the study consulted their diabetic team about the event.⁷

The Surrey Ambulance Service (SAS), serving a population of 1.1 million, receives approximately 120 000 calls per year, of which 1600 (1.3%) are coded as being diabetes related. The SAS has a standard of care that recommends that all patients seen with hypoglycaemia are transported to hospital for assessment. However, it estimates that approximately 50% of patients the service attends for a hypoglycaemic episode refuse transport to hospital. There is evidence from Denmark⁸ and the USA⁹ that it may be safe to leave patients treated successfully for hypoglycaemia at home. Little is known about what treatment patients transported to A&E receive, how many patients require admission, and what follow up arrangements are made.

This study aimed to look at diabetic emergencies seen in A&E to ascertain:

- frequency of hypoglycaemia compared with other diabetic emergencies
- management of hypoglycaemia by the ambulance service and in A&E
- number of patients requiring admission
- follow up arrangements for patients discharged from A&E.

METHOD

The SAS categorises all calls into one of 32 different groups based on the primary reason for the call; diabetes mellitus is

one of the groups. The SAS provided data from its computer system on all calls categorised as “diabetes mellitus” for a one year period (1 October 2000 – 30 September 2001). A prospective audit of all of the cases seen in one month was then carried out based on examination of ambulance records.

For the second part of the study we collected data at two sites, the Royal Surrey County Hospital, Guildford, and Frimley Park Hospital, Frimley. Both hospitals are medium sized district general hospitals situated in Surrey, UK, and served by the SAS. A&E case records were examined for all patients brought to hospital by the SAS with a primary diagnosis of diabetes over the same year period. All case records were examined by the same person. For each set of case notes the following information was recorded: date and time of attendance; patient's age, sex, and whether they were treated with insulin; reason for attendance (hypoglycaemia or not); and concurrent illnesses. For patients with hypoglycaemia the following details were also recorded: capillary blood glucose (BM) on arrival; treatment received; whether the patient was admitted to hospital; and follow up arrangements.

We analysed the data using Microsoft Excel.

RESULTS

There were 1779 emergency calls to the SAS in the 12 month period coded for diabetes. 883 (50%) calls resulted in a transfer to hospital; 22 people were responsible for three or more calls.

Of the 113 calls in a one month period, 58 (51%) were taken to hospital. One hundred and eleven calls were from people known to have diabetes; 70% of calls were from the patient's own home and 13% were from a public place. The BM was less than 4 mmol/l (a “low” reading) in 58 (51%) patients. Only 27% of these were transferred to hospital. A total of 40 patients were treated with glucagon and oral carbohydrates. Mean age of the patients was 54 years. Age did not influence the likelihood of transfer to hospital. Of the 113 patients, 65 (57%) were men, and 60% of women and 44% of men were transferred to hospital.

Abbreviations: A&E, accident and emergency; CHO, carbohydrates; GCS, Glasgow Coma Scale; SAS, Surrey Ambulance Service

Table 1 Treatment received by patients with hypoglycaemia seen in A&E

Treatment method	No. of patients
Glucagon SAS	41
IV dextrose A&E	24
Oral CHO A&E	21
Oral CHO family	10
Oral CHO SAS	9
Oral CHO patient	7
Hypostop family	5
None	4
Glucagon family	3
Oral CHO general practitioner	2
Hypostop SAS	1
Hypostop patient	1

CHO, carbohydrates; IV, intravenous; SAS, Surrey Ambulance Service.

During the 12 month period the SAS brought 251 patients to the Royal Surrey County Hospital and Frimley Park Hospital with a primary diagnosis of diabetes. Of these 251 patients, A&E records could be traced for 221. Of the 221 attendances, 94 (37%) were for hypoglycaemia in 89 patients. The next most common reason for attendance was hyperglycaemia, affecting 33 patients (14.9%). Of 94 people with hypoglycaemia, 55% were men, the mean (SEM) age was 52.6 (2.44) years, and 93% were treated with insulin. Only one patient did not have a documented BM in A&E. The mean BM was 5.66 (0.41) mmol/l, 45% of patients had a BM less than 4 mmol/l and 35% had a BM less than 3.5 mmol/l. The commonest method of treatment was glucagon administered by the ambulance service followed by oral carbohydrate (CHO) and intravenous (IV) dextrose given in A&E (table 1).

Of the 94 hypoglycaemic patients, 62 (66%) had no other illness; 6 had a urinary tract infection; 4 had a decreased Glasgow Coma Scale score and 3 had a head injury; 3 had chest infections; 3 had renal impairment; 2 had diarrhoea and/or vomiting, hypothermia, fit, and confusion; and 1 had each of stroke, generally unwell, not eating, insulin overdose, alcohol intoxication, fall, nausea, social problems, chicken pox, collapse of unknown cause, and pregnancy.

Only 11% of patients with hypoglycaemia were admitted to hospital from A&E, 83% of patients were discharged and 6% self-discharged. Of the patients who were discharged, 50%

had no documented follow up arrangements, 21% had documented advice to see their general practitioner (GP), 13% were advised to see their specialist nurse, and 6% had an outpatient appointment made with their physician. Three patients (4%) saw a diabetes specialist nurse before discharge from A&E. Patients who required admission tended to be at the extremes of age and had concurrent illness (table 2).

DISCUSSION

This study confirmed that hypoglycaemia is the commonest diabetic emergency encountered by the ambulance services and in A&E. In our study, only 50% of patient calls for diabetes were transferred to hospital and only 27% of people who had a low capillary blood sugar were transported to hospital—the remainder were successfully treated by ambulance staff. This is despite the standard of care that SAS has to transport all patients with hypoglycaemia to hospital. The hypoglycaemia was treated by 12 different methods with no agreed standard. Management of hypoglycaemia was not always appropriate, with five patients arriving in A&E with a capillary blood glucose greater than 4 mmol/l and seven patients with a capillary blood glucose greater than 3.5 mmol/l administered intravenous dextrose.

Nineteen patients (20%) received no treatment from the ambulance crew or in A&E suggesting that some patients may call the emergency services inappropriately. This confirms the findings of previous studies that have shown that patients are inadequately educated about hypoglycaemia, in particular about appropriate adjustments to food, insulin, and exercise schedules.⁷ Patients are fearful of hypoglycaemia and use the ambulance service as a lifeline, often calling the ambulance before initiating appropriate treatment themselves. Nonetheless, further treatment was given to 44 patients (47%) transported by the ambulance service to A&E, whereas 34% of patients were thought to have a concurrent illness and 11% of patients required admission.

It remains a challenge to identify those people who need to be transported to hospital for further treatment or admission and, conversely, those who are safe to be left at home. In the present study, patients who required admission tended to be at the extremes of age and had a concurrent illness. Absolute criteria for transport to hospital therefore should include children and older people. In addition, people with symptoms which persist following treatment of hypoglycaemia or a

Table 2 Characteristics of patients who were admitted to hospital following hypoglycaemia

Patient no.	Sex	Age (years)	BM on arrival (mmol/l)	Insulin treated diabetes	Treatment	Concurrent illness
1	M	72	4.9	Yes	Oral CHO GP Glucagon SAS IV dextrose A&E	Hypothermia ↓ GCS
2	F	77	2.8	Yes	IV dextrose A&E	↓ GCS
3	M	53	0.7	Yes	Glucagon SAS IV dextrose A&E	Alcohol intoxication ↓ GCS
4	M	12	7.2	Yes	Glucagon family	Seizure Diarrhoea and/or vomiting
5	F	87	2.9	Yes	IV dextrose A&E	Cerebrovascular accident
6	M	80	2.8	Yes	Oral CHO SAS Oral CHO A&E	Nil
7	F	86	2.4	Yes	Glucagon SAS IV dextrose A&E	Nil
8	F	72	20.9	Yes	Oral CHO family	Head injury
9	F	96	1.8	Unknown	IV dextrose A&E	Collapse unknown cause ↓ GCS
10	M	82	2.1	Yes	Oral CHO family IV dextrose A&E	Renal impairment Social problems

↓, GCS, decreased Glasgow Coma Scale score.

CHO, carbohydrates; IV, intravenous; SAS, Surrey Ambulance Service.

Box 1: Summary guidelines for management of hypoglycaemia in people with diabetes in A&E

Make diagnosis

- Capillary blood glucose <4 mmol/l

Treatment

- If patient is alert give oral carbohydrate
- If patient has decreased level of consciousness give intravenous dextrose

Criteria for discharge

- Returned to baseline level of functioning
- No evidence of concurrent illness
- BM >4 mmol/l

Outpatient diabetes team referral

- All patients should be advised to contact their diabetes team following discharge
- Patients with decreased awareness of hypoglycaemia require urgent referral to the diabetes team

Special cases

- Patient who have decreased awareness of hypoglycaemia must be advised to stop driving
- Patients on oral hypoglycaemic drugs may have prolonged hypoglycaemia and therefore have low threshold for admission

capillary blood sugar that fails to return to normal after treatment need further assessment and hence transfer to hospital. We also recommend that those alone at home or in a public place are transported to hospital.

Of the 84 patients who were discharged, 42 (50%) had no documented follow up arrangements. The commonest method of follow up suggested was with the GP (25%). This suggests that the implications of severe hypoglycaemia are not being recognised. We recommend that all patients who have had hypoglycaemia severe enough to necessitate attending A&E are seen after discharge by a healthcare professional with specialist knowledge of diabetes (box 1). In particular, patients with reduced awareness of hypoglycaemia need intensive input from the specialist team in order to regain their warning symptoms. However, only 16 patients had follow up suggested with the specialist team.

No patient had any documented advice given about driving, including one patient who was involved in a road traffic accident as a result of their hypoglycaemic event and three patients who were found collapsed in their cars. The Driver and Vehicle Licensing Agency (DVLA) guidelines for medical practitioners state that people with diabetes must cease driving if they do not recognise the symptoms of hypoglycaemia and can only resume driving following a written report from their GP or hospital specialist stating that they have regained their warning symptoms. This study demonstrates that healthcare professionals who are dealing with severe hypoglycaemia are not aware of these rules and are not giving appropriate or safe advice.

The National Service Framework for diabetes states that the NHS will develop, implement, and monitor agreed protocols for rapid and effective treatment of diabetic emergencies (including hypoglycaemia) by appropriately trained healthcare professionals. This study provides clear evidence that currently this is not occurring. To improve care, standardised protocols for the management of hypoglycaemia for the ambulance services and also in A&E must be introduced. Education of healthcare professionals about hypoglycaemia should be given as much priority as education about hyperglycaemia. Patient education and education of family and friends may also improve the emergency management of hypoglycaemia.

In conclusion, in the present study hypoglycaemia was the commonest diabetic emergency encountered by the ambulance service and in hospital A&E departments. The management of hypoglycaemia by the emergency services was varied and not always appropriate. The vast majority of people who attend A&E with hypoglycaemia were discharged and the majority had no follow up arrangements made. This is despite the morbidity and mortality attached to severe hypoglycaemia.

ACKNOWLEDGEMENTS

We would like to thank the staff at the A&E departments of the Royal Surrey County and Frimley Park hospitals.

AUTHORS' CONTRIBUTIONS

A Brackenridge collected and analysed the data from Accident and Emergency and wrote the article. H Wallbank collected and analysed the data from the ambulance service. R Lawrenson conceived the study and co-wrote the article. D Russell-Jones provided assistance with study design and the article.

Authors' affiliations

A Brackenridge, D Russell-Jones, Royal Surrey County Hospital, Guildford, Surrey, UK

H Wallbank, Surrey Ambulance Service NHS Trust, Banstead, Surrey, UK

R A Lawrenson, Postgraduate Medical School, University of Surrey, Guildford, UK

Competing interests: none declared

REFERENCES

- 1 **Diabetes Control and Complications Trial Research Group**. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 1993;**329**:977-86.
- 2 **Holmwood KI**, Williams DR, Roland JM. Use of the accident and emergency department by patients with diabetes. *Diabet Med* 1992;**9**:366-8.
- 3 **Goyder EC**, Goodacre SW, Botha JL, *et al*. How do individuals with diabetes use the accident and emergency department? *J Accid Emerg Med* 1997;**14**:371-4.
- 4 **Cryer PE**. Banting Lecture. Hypoglycaemia: The limiting factor in the management of IDDM. *Diabetes* 1994;**43**:1378-89.
- 5 **Hart SP**, Frier BM. Causes, management and morbidity of acute hypoglycaemia in adults requiring hospital admission. *Q J Med* 1998;**91**:505-10.
- 6 **Leese GP**, Wang J, Broomhill J, *et al*. Frequency of severe hypoglycaemia requiring emergency treatment in type 1 and type 2 diabetes. *Diabetes Care* 2003;**26**:1176-80.
- 7 **Daniels A**, White M, Stander I. Ambulance visits for severe hypoglycaemia in insulin treated diabetes. *N Z Med J* 1999;**112**:225-8.
- 8 **Anderson S**, Hogskilde PD, Wetterslev J, *et al*. Appropriateness of leaving emergency medical service treated patients at home: a retrospective study. *Acta Anaesthesiol Scand* 2002;**46**:464-8.
- 9 **Mehchem C**, Kreshak A, Barger J, *et al*. The short term outcome of hypoglycaemic diabetic patients who refuse ambulance transport after out of hospital therapy. *Acad Emerg Med* 1998;**5**:768-72.