

ORIGINAL ARTICLE

Evaluation of a diabetes referral pathway for the management of hypoglycaemia following emergency contact with the ambulance service to a diabetes specialist nurse team

A Walker, C James, M Bannister, E Jobes

Emerg Med J 2006;23:449–451. doi: 10.1136/emj.2005.028548

See end of article for authors' affiliations

Correspondence to:
A Walker, Mid Yorkshire Trust and West Yorkshire Metropolitan Ambulance Service, Springhill, Wakefield 41 Industrial Park, Brindley Way, Wakefield, WF2 0XQ, UK; alison.walker@wymas.nhs.uk

Accepted for publication
19 December 2005

Objectives: To evaluate the effectiveness of ambulance crew referral of patients treated for acute hypoglycaemia, to a diabetes specialist nurse (DSN) team. Patients were assessed by the ambulance service and did not attend an emergency department.

Methods: For a 3 month period patients were referred from two areas of West Yorkshire by the ambulance service to specialist diabetes teams. The DSNs contacted the patients within 7 days by telephone and arranged further review if necessary. Satisfaction questionnaires were sent to patients.

Results: Thirty eight patients were referred and all were reviewed by telephone; 30 (79%) also required a clinic review appointment. Warning signs of hypoglycaemia were identified by 21 (55%) patients, but 14 (37%) had none (three had incomplete data). Twelve patients had had a self-treated episode in the previous 6 months; nine patients had had three or more. Fifteen (39%) patients had called an emergency ambulance for similar reasons in the previous 6 months (27 "999" calls). Twenty patients (53%) had their drug treatment altered at a clinic appointment and 14 (37%) required ongoing review. Twenty six patients returned the satisfaction questionnaire; of these 88% agreed or strongly agreed that they had improved their understanding of hypoglycaemia and 73% felt more able to treat a hypoglycaemic episode in the future. Patient satisfaction with this care pathway was high.

Conclusions: The ambulance service can coordinate successful referral of patients with episodes of acute hypoglycaemia to a DSN-led service. Patients often required treatment review. They valued this service and felt more confident managing their diabetes.

Common referrals to the ambulance service include diabetic patients experiencing symptoms of acute hypoglycaemia. Most of these patients are treated effectively by crews with parenteral glucagon or glucose, or oral restoration of their normal glycaemic state.

The National Service Framework for Diabetes¹ has stated that one of the aims in the management of diabetic emergencies is "to minimise the impact on people with diabetes of the acute complications of diabetes". Standard 7 also states: "The NHS will develop, implement and monitor agreed protocols for rapid and effective treatment of diabetic emergencies by appropriately trained health care professionals. Protocols will include the management of acute complications and procedures to minimise the risk of recurrence".

Some of these patients present with repeated hypoglycaemic episodes and are well known to the ambulance service. They may not have attended standard medical services for routine review of their condition and may be unaware of the risks of poor diabetes control. In the long term these patients are likely to experience complications of poor control, reducing their quality of life and increasing costs for the National Health Service.

The objectives of this study were to assess the effectiveness of ambulance service referral to dedicated diabetes specialist nurse (DSN) teams for patients with hypoglycaemia who were treated and left at home following an emergency "999" call and to assess patient satisfaction with the pathway.

METHODS

From December 2002 to March 2003, ambulance crews in two areas of West Yorkshire (who had received DSN-led

training sessions) prospectively offered adults with episodes of hypoglycaemia access to the pathway. The patients were eligible for inclusion if a "999" ambulance call had been received for a patient with an acute hypoglycaemic episode and if the patient refused to attend an emergency department or was considered suitable to be left at home following ambulance service management. Hypoglycaemic episodes and treatment are defined in the Joint Royal Colleges Ambulance Liaison Committee guidelines.² Patients under 16 years old and those not competent to consent to the pathway were excluded.

Patients were given an information leaflet, which included the contact number of their DSN team and general advice about food and blood sugar testing.

In area 1, the crew rang ambulance control where details were logged on a referral sheet and the diabetes team contacted ambulance control each working day for referrals. In area 2, the diabetes nurse on call was contacted by telephone (allowing direct discussion with the crew) between 07:30 and 23:00; at other times details were logged by the hospital switchboard and passed on the following day. In both areas referral was optional and verbal consent was required before passing on patient details.

Patients were contacted within 7 days and a hypoglycaemia review was offered on an outpatient basis. After 3 months, questionnaires were sent to patients for their views on the ambulance and DSN services related to this

Abbreviations: DSN team, diabetes specialist nurse team; PCT, Primary Care Trust; SH, severe hypoglycaemia

project. Regular multidisciplinary meetings were held and feedback was provided to the ambulance crews.

The pathway was approved by the ambulance service clinical governance committee and legal department regarding patient confidentiality, information sharing, and consent.

RESULTS

Thirty eight patients were referred to the diabetes nurses in the 3 month period (30 from area 1 and eight from area 2); there were 26 males and 12 females. The patients were 25–92 years of age (50% were over 60 years of age).

No patients were reported as refusing access to the pathway and none refused to discuss their hypoglycaemic episode with the diabetes nurse or attend for review if required. Thirty five patients were on insulin treatment and three were treated with oral hypoglycaemic agents.

Following attendance by the ambulance crew, nine patients (24%) were treated with intravenous glucose, 15 (39%) received intramuscular glucagon, six (16%) had a glucose drink, seven (18%) were encouraged to have something to eat, and one (3%) received general advice only.

Twenty one (55%) patients had warning symptoms of their hypoglycaemic episode, while 14 (37%) claimed to have had no warning symptoms (there was insufficient information in three (8%) cases).

Twelve patients (32%) reported a self-treated episode of hypoglycaemia in the previous 6 months; nine patients (24%) had suffered three or more episodes. Ten patients (26%) had required treatment by another person for a hypoglycaemic episode at least once in the previous 6 months. Fifteen patients (39%) said they had called an emergency ambulance for a hypoglycaemic episode in the previous 6 months. In total, 27 “999” calls had been made to the ambulance service by these patients in the previous 6 months.

All 38 patients (100%) spoke to the specialist nurses about the hypoglycaemic episode and 30 (79%) attended for review with the specialist nurses; one patient had a further severe hypoglycaemic episode prior to review, with no adverse consequences (an ambulance attendance was not recorded). Twenty (53%) patients required a change in their diabetes medications, 14 patients (37%) needed a second review appointment, and six (16%) required other interventions, for example district nurse support, and all received advice on managing their diabetes. The patients’ GPs were sent information following clinic appointments.

Twenty six patients (68%) returned the satisfaction questionnaire. Of these, 23 patients (88%) agreed or strongly agreed that they had improved their understanding of their hypoglycaemic episode, while 19 (73%) agreed or strongly agreed that they felt more confident to prevent further episodes of hypoglycaemia.

Patients were satisfied (agreed/strongly agreed) with the ambulance service response in terms of speed (88%), treatment (96%), attitude (96%), and explanation of the referral (88%).

DISCUSSION

Severe hypoglycaemia (SH) is a serious complication of diabetes treatment and is most commonly related to insulin use; tight glycaemic control to reduce the development and progression of diabetes related complications makes patients more prone to SH. Hypoglycaemia can cause temporary or permanent neurological damage and in extreme circumstances can cause cerebral oedema and death. It is not uncommon for adults presenting to the ambulance services with SH to be treated and left at home³ and many of those taken to hospital are discharged from the emergency department.⁴ Recently there has been interest in developing appropriate treat and release protocols for the UK ambulance

services.⁵ Attempts have been made to develop protocols for treating these patients and leaving them at home in a safe manner,⁶ but there has been little research on attempts to follow up patients treated by the ambulance service.

All the patients in our study attended for follow up; this compared well with a previous nurse-led telephone review of patients where only 78% could be contacted by telephone.⁷ Feedback to primary care teams could have been improved by sending information (with the patients’ consent) on all the patients including those who only received telephone advice.

Patrick *et al*⁸ found a similar lack of hypoglycaemia awareness in a small study on treatment alternatives in emergency departments. Loss of awareness has been associated with tight glycaemic control,^{8,9} impaired glucose counter-regulatory response,⁸ and possibly a long history of diabetes.^{8,10} A New Zealand survey also found that patients with a longer history of diabetes required more ambulance service visits.¹⁰ In the same survey, 86% of respondents had previously requested an ambulance for hypoglycaemia and 26% had requested an ambulance at least twice in the previous year. They also found hypoglycaemic unawareness to be a significant factor, with 21% of the patients with SH unable to recall any preceding symptoms. Patients with impaired hypoglycaemic awareness have been reported to have up to a sixfold increased risk of SH.¹¹

A Scottish population study in Tayside in 2003¹² found predictors of SH included older patients, longer duration of diabetes, and higher HbA1c. The authors estimated that the cost of treating SH in the UK could be in excess of £13 million. They also found that type 2 diabetes treated with insulin was as a high risk for SH as type 1 diabetes. A third of their patients were treated solely by the ambulance service without interaction with any other health care professionals.

Roberts and Smith⁵ reviewed the current literature on treat and release protocols for ambulance services. They suggested the inclusion of a referral letter to GPs after each episode and recommendations that the patients be woken every 2 h for checks. They also recommended patient groups for transfer to hospital. They and most other authors recommended further trials of treat and release protocols for the ambulance services for patients with hypoglycaemia. However, in a US study¹³ no difference in the recurrence of hypoglycaemia was found between patients transferred to emergency departments and those treated and discharged on scene.

Although the patient numbers were small, over half of our patients (53%) required alteration to their treatment. Without the referral the patients may have continued their current treatments with risk of similar episodes; 38% required additional appointments for ongoing care. The current advice from ambulance crews to see either their GP or the practice nurse may not result in the patient attending for review. In the survey by Daniels *et al*,¹⁰ only 37% of respondents had consulted their diabetes carer despite advice to do so. The rest reduced their treatment, monitored more frequently, or took other action. Several studies have shown that both type 1 patients and their carers often inappropriately reduce insulin doses following an SH episode, resulting in poor glycaemic control, when other factors were responsible.^{14,15} The review of these patients by nurse specialists may reduce inappropriate insulin regime changes. A robust referral process for ambulance crews to an appropriate DSN service could improve patient management following an episode of hypoglycaemia.

A significant number of the patients had experienced an episode of hypoglycaemia in the previous 6 months with over a quarter requiring treatment from a third party. Muhlhauser *et al*¹⁶ found the most consistent risk factor for SH was a previous episode, and also found that patients with impaired awareness of hypoglycaemia were at particularly high risk.

Hypoglycaemia awareness and behavioural factors had often not been considered in large clinical trials. In their study of 669 patients, 48% had needed parenteral glucagon or glucose at some point in the course of their diabetes history.

We had expected at the start of the study that most patients would be young with type 1 diabetes, but the patients predominantly had insulin treated type 2 diabetes. This finding was mirrored in the Tayside study¹² and may be explained by the high prevalence of type 2 diabetes mellitus. Although the absence of hypoglycaemic awareness is clearly an issue, inexperience or difficulty with treatment adjustment in older patients may have contributed to the frequency of hypoglycaemia in this group.

The DSN referral system was provided from within existing resources for the period of the trial. However, clearly there are resource implications for both ambulance services (referral via the communications centre) and the diabetes services in developing new multiprofessional care models for patients. There was an unexpectedly high attendance at the nurse-led diabetes clinics following the telephone review; the nurses found patients and their carers presenting with real needs in terms of educational gaps or treatment adjustments, which had been unmet by conventional systems (the nurses could not recall a patient contacting them following an emergency ambulance attendance for a hypoglycaemic episode prior to the setting up of this pathway). The anticipated annual cost of this service for our ambulance service has been calculated at £6.40 per referral, which for an average primary care trust (PCT) would cost approximately £1000 per annum.

One patient had a further SH episode prior to review in the clinic. This is unsurprising as several patients in the study had had multiple SH episodes in the previous 6 months; it would be useful to highlight this subgroup of patients.

We have shown that the ambulance service can successfully coordinate referral. However, the use of a single point of contact number in the area 2 ambulance control may have contributed to the higher referral rate compared with area 1 where there were multiple contact numbers for services at different times within the same area.

Feedback from the patient questionnaire suggested high levels of satisfaction with the services provided, and greater confidence in the understanding of, and ability to prevent, future hypoglycaemic episodes. Response bias is always a possibility where there is less than 100% response in any survey. Ideally, follow up with monitoring of glycaemic control should be undertaken in order to gather evidence of the long term effects of this kind of intervention. Previous studies have confirmed patient preference for treat and release protocols,¹⁷ which ambulance crews could implement with appropriate follow up.

This study would have been more robust if the patients had been randomised to receive the nurse referral service with a suitable control group and monitored over a longer period with investigation of glycaemic control by measurement of, for instance, HbA1c levels. It would also be useful to follow up these patients to monitor the number of hypoglycaemic episodes they experienced and the frequency of emergency calls to the ambulance service compared to a control group.

CONCLUSIONS

In this pathway study, the ambulance service successfully coordinated the referral of patients with episodes of acute hypoglycaemia to a specialist nurse-led diabetes service. The patients valued this service and afterwards felt more confident managing their diabetes.

There was a high level of attendance at the specialist review clinic and significant numbers of patients required treatment alteration.

This study established multiprofessional working practices and collaboration between services that were previously working in isolation, provided patient and staff education, and improved the pre-hospital care of patients with unstable diabetes.

We recommend that ambulance service/specialist diabetes nurse liaison referral pathways should be considered in the management of diabetes patients in pre-hospital, primary, and secondary care. This pathway has now been extended to two large urban areas in West Yorkshire.

ACKNOWLEDGEMENTS

We would like to thank WYMAS ambulance crews, diabetes specialist nurse teams, Dr J Brenchley (ED Consultant Barnsley Hospital), and Dr R Jenkins (Diabetes Consultant Mid Yorkshire Trust).

Authors' affiliations

A Walker, Mid Yorkshire Trust and West Yorkshire Metropolitan Ambulance Service, Wakefield, UK

C James, West Yorkshire Metropolitan Ambulance Service, Wakefield, UK

M Bannister, Bradford City PCT, Bradford, UK

E Jobs, Huddersfield Central PCT, Huddersfield, UK

Competing interests: none declared

REFERENCES

- 1 **Department of Health**. National Service Framework for Diabetes: Standards. Standard 7. 2001. <http://www.dh.gov.uk/PolicyAndGuidance> (accessed 16 March 2006).
- 2 **JRCALC**. Clinical Practice Guidelines. www.nelh-ec.warwick.ac.uk/JRCALC_Guidelines_v3_2004.pdf (accessed 16 March 2006).
- 3 **Stark G**, Hedges JR, Neely K, *et al*. Patients who initially refuse prehospital evaluation and/or therapy. *Am J Emerg Med* 1990;**8**:509–11.
- 4 **Walford R**, Tisol W, Vasilenko P, *et al*. Prospective evaluation of criteria allowing paramedics to treat and release patients presenting with hypoglycaemia (abstract). *Prehosp Disaster Med* 1996;**109**:S36.
- 5 **Roberts K**, Smith A. Outcome of diabetic patients treated in the prehospital arena after a hypoglycaemic episode, and an exploration of treat and release protocols: a review of the literature. *Emerg Med J* 2003;**20**:274–6.
- 6 **Thompson RH**, Walford RW. Development and evaluation of criteria allowing paramedics to treat and release patients presenting with hypoglycaemia: a retrospective study. *Prehosp Disaster Med* 1991;**6**:309–13.
- 7 **Mechem CC**, Kreshak AA, Barger J, *et al*. The short term outcome of hypoglycaemic patients who refuse ambulance transfer after out-of-hospital therapy. *Acad Emerg Med* 1998;**28**:1630–4.
- 8 **Patrick AW**, Collier A, Hepburn DA, *et al*. Comparison of intramuscular glucagon and intravenous dextrose in the treatment of hypoglycaemic coma in the accident and emergency department. *Arch Emerg Med* 1990;**7**:73–7.
- 9 **The Diabetes Control and Complications Trial Research Group**. Epidemiology of severe hypoglycaemia in the Diabetes Control and Complications Trial. *Am J Med* 1991;**90**:450–9.
- 10 **Daniels A**, White M, Ilse S, *et al*. Ambulance visits for severe hypoglycaemia in insulin treated diabetes. *N Z Med J* 1999;**112**:225–8.
- 11 **Gold AE**, MacLeod KM, Frier BM. Frequency of severe hypoglycaemia in patients with type 1 diabetes with impaired awareness of hypoglycaemia. *Diabetes Care* 1994;**17**:697–703.
- 12 **Leese GP**, Wang J, Broomhall J, *et al*. Frequency of severe hypoglycaemia requiring emergency treatment in type 1 and type 2 diabetes. *Diabetes Care* 2003;**26**(4):1176–80.
- 13 **Socransky SJ**, Pirrallo RG, Rubin JM. Out-of hospital treatment of hypoglycaemia: refusal of transport and patient outcome. *Acad Emerg Med* 1998;**5**:1080–5.
- 14 **Tupola S**, Rajantie J, Akerblom HK. Experience of severe hypoglycaemia may influence both patient's and physician's subsequent treatment policy of insulin-dependent diabetes mellitus. *Eur J Pediatr* 1998;**157**:625–7.
- 15 **Casparie AF**, Elving LD. Severe hypoglycaemia in diabetic patients: frequency, causes, prevention. *Diabetes Care* 1985;**8**:141–5.
- 16 **Muhlhauser I**, Overmann H, Bender R, *et al*. Risk factors of severe hypoglycaemia in adult patients with Type 1 diabetes – a prospective population based study. *Diabetologia* 1998;**41**:1274–82.
- 17 **Lerner EB**, Billitier AJ, Lance DR, *et al*. Can paramedics safely treat and discharge hypoglycaemic patients in the field? *Am J Emerg Med* 2003;**21**(2):115–20.