

The impact of an inpatient diabetes care pathway

Sarah O'Brien, Susan Michaels, Janet Marsh and Kevin Hardy

Introduction

This article reports the development and subsequent testing of a care pathway for inpatient diabetes management. We examined the impact of care pathway-driven diabetes inpatient management on quality of care, length of stay (LoS), re-admissions within one year, nurse knowledge (using a validated questionnaire) and HbA_{1c} three months post discharge. The inpatient pathway was associated with improvements in all the parameters measured.

Ten per cent of hospital inpatients have diabetes, but most are not admitted as a result of their diabetes and will not be cared for by clinicians with specialist diabetes expertise. Standard 8 of the Diabetes National Service Framework (Department of Health, 2001) aims to improve the care of hospital inpatients with diabetes, and many contemporary recommendations, e.g. NSF and National Institute for Clinical Excellence guidance, advocate the use of care pathways to improve care.

Diabetes is a common chronic disorder affecting approximately 3% of the UK population and associated with 9% of hospital costs (Audit Commission, 2001). It is well documented that hospital admission rates and length of hospital stay are substantially greater for people with diabetes (Pickup and Williams, 1991). This may partly explain excessive expenditure on this group of patients; even when the admission diagnosis is similar, people with diabetes stay in hospital up to twice as long as their non-diabetic counterparts (MacKinnon, 1993). The reason for this costly difference in length of hospital stay may, in part, be inherent to the condition itself – people with diabetes have more extensive myocardial damage following myocardial infarction, for example, with more complications (Abbot, 1988). However, it is widely believed that suboptimal management of diabetes on general wards may also be a contributing factor (Driskill, 1996; McDermott, 1995; Callaghan and Williams, 1994).

We were aware of no randomised controlled trials (RCTs) of care pathway-

driven inpatient diabetes care. The aim of this study was to design and test the impact of a care pathway (CP) for inpatients with diabetes. CP impact was assessed through measurement of length of stay (LoS), HbA_{1c} management, if there were any re-admissions within one year, nurse knowledge and the quality of diabetes inpatient care.

Development of the care pathway

The pathway was developed in consultation with ward staff. It consisted of two key elements: a set of evidence-based standards underpinning the pathway, and the pathway itself. The standards do not form part of the patient record but are kept in clinical areas for reference. The pathway includes direction for general staff on blood glucose monitoring (see *Figure 1* for an example of a pathway record sheet for blood glucose monitoring on the wards) and investigations to be ordered for inpatients with diabetes. It also includes information for interpretation and action on the results, management of glucose potassium insulin (GKI) infusion regimens, and a patient-held pathway. The pathway was piloted and refined on one ward before being used in the study.

Research design and methods

The study was a single-centre, open-label, RCT conducted at Whiston Hospital in Prescot, Merseyside. Suitable people were recruited from the medical admissions unit between December 2000 and November 2001. All gave written informed consent prior to participation in the study.

ARTICLE POINTS

1 A care pathway for the management of inpatients with diabetes was developed and tested.

2 We measured the impact of the pathway on length of stay, quality of care, nurse knowledge, HbA_{1c} and re-admissions within one year.

3 Non-specialist staff may require ongoing support in the use of a care pathway.

4 The inpatient care pathway was associated with improved nurse knowledge, fewer re-admissions, improved diabetes care and shorter length of stay.

KEY WORDS

- Inpatient
- Care pathway
- Support
- Audit
- Re-admission

Sarah O'Brien, is Nurse Consultant in Diabetes, Susan Michaels is a DSN, Janet Marsh is a DSN and Kevin Hardy is a Consultant Physician and Endocrinologist at the Diabetes Centre at Whiston Hospital in Merseyside

PAGE POINTS

- 1 The care pathway (CP) was designed for use by both medical and nursing staff.
- 2 Whether staff required constant support and education to use the CP was examined.
- 3 Staff knowledge was measured before and after the trial using a questionnaire.

Patients

Male and female patients over 18 years of age with either type 1 or type 2 diabetes admitted to the medical admissions unit with either a diabetes-related problem or another medical complaint were invited to participate in the study. People in this group were excluded if they were unable to give informed consent or if they had already been on the admissions ward for more than 24 hours.

General ward staff

The CP was designed for use by both medical and nursing staff. It was, however, intended to be kept with other nursing charts at the end of the patient's bed and it was anticipated that nursing staff would drive its use.

A secondary objective of the study was to examine whether staff required constant support and education to use the CP accurately or whether the pathway's use required little external support following implementation. To assess this, the medical wards were divided into two groups. Wards in group one received ongoing support in the use of the pathway. They were visited regularly by the investigator and reminded

how to use it. Wards in group two received no ongoing support in the pathway's use. Staff nurses' knowledge of diabetes was measured prior to the start of the RCT using a validated knowledge questionnaire (O'Brien et al, 2003). Nurses were re-tested at the end of the study to assess the impact of the pathway on staff knowledge.

Baseline

Having secured informed consent, the following information was recorded:

- type and duration of diabetes
- current diabetes therapy and other medications
- reason for admission, number of hospital admissions in last 12 months
- body habitus (slim, normal, large, obese)
- diabetes complications
- Barthel score (a measure of dependency determining that the patients in the two groups were similarly independent)
- HbA_{1c} (Diabetes Control and Complications Trial-aligned assay, normal range 4.6–6.2%) (DCCT, 1993).

If HbA_{1c} had not been measured in the preceding four weeks, a test was arranged.

Figure 1. A pathway record sheet relating to blood glucose monitoring on the wards.

ST HELENS & KNOWSLEY HOSPITALS BLOOD GLUCOSE MONITORING CHART <small>(SVO:Ver 3:7/99)</small>																
Pt name & address or sticky label.																
Please answer questions below on admission to pathway.			Day 1		Day 2		Day 3		Day 4		Day 5					
			Date:	Date:	Date:	Date:	Date:	Date:	Date:	Date:	Date:					
			Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:					
			Do 6 hourly BMs	Do _____ tests	Do _____ tests	Do _____ tests	Do _____ tests	Do _____ tests	Do _____ tests	Do _____ tests	Do _____ tests					
	Y	N	Initials	VALUE	Initials	VALUE	Initials	VALUE	Initials	VALUE	Initials	VALUE	Initials			
Does Pt self BG monitor at home?	Y	N		Pre-breakfast												
				Pre-lunch												
Does Pt use BG meter at home?	Y	N		Pre-Tea												
				Pre-bed												
Does Pt wish to see DLN to get meter	Y	N		Ketones if required												
Important note If the answer to any of the shaded questions to the right is 'no', then you must immediately complete a variance (colour) sheet.				1.BG profile/Pt status reviewed?	Y	N		Y	N		Y	N				
				2.Does Rx need changing?	Y	N		Y	N		Y	N		Y	N	
				3.If 2=yes then, was Rx changed?	Y	N		Y	N		Y	N		Y	N	
				4.No.of tests for next day specified.	Y	N		Y	N		Y	N		Y	N	
For when to check ketones – see Monitoring Pathway ; for Rx. changes – see Treatment Pathway ; if in doubt, then contact Diabetes Liaison Nurse on 1348																

People participating were randomised to either a CP or usual care (non-pathway, NP) using computer-generated numbers in sealed, sequenced envelopes that were concealed from the investigators until assignment to a participating person.

Intervention period

Following randomisation patients were not seen again by the investigator and the intervention period lasted for as long as their length of stay (LoS). People randomised to a CP were expected to stay on the pathway until discharged, with their diabetes being managed according to the pathway. Patients randomised to NP had their diabetes managed in the usual way. The investigator continued to support those wards in group one, reminding them how to use the care pathway.

Follow-up

Following discharge, the patients' case notes were audited to assess the quality of diabetes care received and compliance with the pathway. To measure the quality of diabetes care we took four parameters – HbA_{1c}, urinalysis for protein, cholesterol levels and appropriate referral to the diabetes team. We calculated the average number of patients that received the parameter tests and compared CP to NP using the Yates-corrected chi-squared test.

We also looked at management of GKI regimen, standard of documentation, and HbA_{1c} three months post discharge. If an HbA_{1c} test had not been organised by the patient's GP, they were invited to attend the diabetes centre where it was done using a DCA 2000 Analyser (DCCT-aligned). Re-admission data were collected using the hospital electronic patient information system.

Once the trial had finished, the nurses who had completed the knowledge questionnaire before the RCT were invited to complete a second one. Comparisons were made between their first and second answers and between staff located on wards in group one (support in use of pathway) versus those on wards in group two (no ongoing support).

Results

Ninety-three patients were recruited to the study: 38 to CP and 57 to NP. Eighty-

Table 1. Baseline demographics for people in group one (care pathway with ongoing support) and group two (CP without support)

Demographic	Group 1	Group 2
Age	66 ± 13 years	65 ± 13 years
Diabetes duration	10 ± 11 years	10 ± 9 years
Sex	Male: 16 (48%) Female: 17 (52%)	Male: 33 (69%) Female: 15 (31%)
Type 2 diabetes	28 (85%)	42 (88%)
HbA _{1c}	7.8 ± 1.8	8.0 ± 1.8

one were included in the final analyses of which 33 were randomised to CP, and 48 to NP. The reasons for exclusion from the analyses were either missing three-month HbA_{1c} data (10 patients) because patients failed to attend for a repeat HbA_{1c}, or missing hospital case notes (two patients), therefore diabetes management could not be evaluated. The two groups were matched at baseline for age, diabetes duration, sex, percentage with type 2 diabetes and baseline HbA_{1c} (Table 1).

The frequency of blood glucose monitoring was more appropriate with the CP group. Twenty-three out of 33 people in the CP group (70%) compared to eight out of 48 people (17%) of the NP group had an appropriate number of tests recorded.

Almost all of the patients (33 CP and 45 NP) had their blood pressure and creatinine done, as these are measured routinely on admission.

The CP was associated with a significantly better quality of diabetes care (management of HbA_{1c}, cholesterol, urinalysis, and referrals to team), CP 26/33 people versus NP 24/48 people (p=0.02).

The GKI section was not completed on any of the pathways, although patients were on a GKI regimen. Similarly, the patient-held part of the pathway was filed in many of the notes, indicating that this had not been completed and given to patients. The standard of documentation in both the CP and NP groups was sub-optimal. Many sections of the CP were not completed, in particular the doctors' sections were often blank.

The CP was associated with a significant improvement in staff knowledge, fewer re-admissions and non-significant shorter LoS (Table 2). HbA_{1c} fell in both groups by 0.6%.

PAGE POINTS

- 1 Patients were randomised to either normal care or a CP.
- 2 Following discharge patients' notes were audited to assess quality of care received.
- 3 Frequency of blood glucose monitoring was more appropriate in the CP group.
- 4 The CP was associated with a significantly better quality of care.
- 5 Standard of documentation was sub-optimal in both the CP and non-pathway groups. Many sections of the CP were not completed.

PAGE POINTS

- 1** Length of hospital stay and HbA_{1c} control were improved, but not significantly.
- 2** On wards using a CP, those with ongoing support had a greater increase in knowledge than those without.
- 3** Overall, CPs were associated with significant improvement in staff knowledge, fewer re-admissions, and a reduction in length of stay in hospital.
- 4** Quality of diabetes care was significantly better when CPs were used.

Discussion

The CP was associated with a significant improvement in the quality of inpatient diabetes care. More of the patients on the pathway had tests for HbA_{1c}, cholesterol, proteinuria and blood glucose monitoring. Referrals to the diabetes team were more appropriate than in patients not on a pathway. In addition, staff were more likely to act on abnormal results for patients on a pathway.

We have recently re-written each of our many outpatient care pathways to fit one page, which has made them much more user-friendly and has increased their effectiveness and improved use to almost 100%. We are in the process of doing the same for these inpatient pathways with the intention of having a single side for this CP for all wards.

In both groups the documentation of care given was sub-optimal and staff did not consistently complete all sections of the pathway. The GKI chart and patient-held pathway were not completed and, prior to further implementation of the pathway, these sections and others may need revising to improve compliance.

Staff on wards in group one (which had ongoing support in the use of the pathway) had a greater increase in knowledge than those in group two. The results indicate that successful implementation of a pathway for diabetes management amongst non-specialist staff requires continuous support in its use. This support is sustainable with larger numbers of patients because it is more efficient and practicable than specialists seeing all of the patients.

A limitation of the study was the small number of patients recruited into the subgroups. Larger subgroups may have

revealed more significant differences between wards in group one and group two.

The study did not demonstrate statistically significant differences in LoS or HbA_{1c} but both parameters improved in those on the CP.

Re-admissions at one year were fewer with the patients in the CP group. It is beyond the scope of our study to determine why patients whose treatment was guided by a CP had a lower re-admission. However, this is an interesting topic for further research.

We conclude that inpatient CPs are associated with a significantly better quality of diabetes care, improved nurse knowledge, significantly fewer re-admissions after one year, shorter LoS, and better diabetes control. CPs may be a useful tool to facilitate inpatient diabetes management by non-specialists. ■

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Table 2. Differences in outcomes with (Group 1) and without (Group 2) assistance in the use of a care pathway

	Group 1 (N=33)	Group 2 (N=48)	P value
Staff knowledge (increase in total scores)	57	82	0.04
Number of patients readmitted	12	33	0.008
Length of stay (days)	8 ± 7	9.2 ± 10	0.5