

# Enhancing inpatient diabetes care by developing a new Capillary Blood Glucose and ketone monitoring chart: a Quality Improvement Project (QIP)

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**Key words:** diabetes, glucose, glycaemic control, ketones

## Background

The 2018 National Diabetes Inpatient Audit (NaDIA) reported that people with diabetes mellitus (DM) experienced substantially longer hospital stays, poor glucose control and frequent medication errors.<sup>1</sup> Intercurrent illnesses can impact blood glucose readings;<sup>2</sup> therefore, DM management may need to be tailored when people with diabetes are hospital inpatients to prevent dysglycaemia, which is associated with harm.<sup>1</sup> There has been an increased number of admissions relating to diabetes during the pandemic.<sup>3</sup> Hospital admission may be an opportunity to improve glycaemic control, to educate people and potentially to reduce future complications. People who are on glucose-lowering medication(s) should monitor their capillary blood glucose (CBG).<sup>4</sup>

It is very important to display CBG and ketone readings in a clear, interpretable manner and to document them in a timely fashion to enable pattern recognition and titrate diabetes medications effectively. This allows one to determine the impact of change too. Sharma D et al concluded that a colour-coded CBG chart led to more actions being recorded when dysglycaemia occurred and to reduced mortality.<sup>5</sup> Our aspiration was to achieve the same result at Watford General Hospital (WGH).

Prior to this project, most people with diabetes had their CBG checked four times a day, but this was not necessarily before meals. It was randomly conducted, which led to an increase in adverse events audited by NaDIA-Harms and an increased number of referrals to the diabetes team. This required urgent intervention from the diabetes team.

There were no clear instructions for ward staff outlining when to check the patient's CBG or ketones at WGH. It is diffi-

cult to establish a pattern of hypoglycaemia or hyperglycaemia using the current line graph, which makes titration of diabetes medications tough. Moreover, there were no sections for nursing staff to add notes for any interventions carried out for dysglycaemia. After reviewing charts used at different hospitals, the team decided to develop a new chart, which looks similar to the one that people with diabetes use at home. The new Joint British Diabetes Society guidelines (JBDS) promote self-management of diabetes as an inpatient;<sup>4</sup> a familiar chart would promote this.

## Aim

The aim of the new chart was to improve documentation of pre-meal CBG readings for everyone with diabetes. We hoped to enable trend recognition, safer management of hypoglycaemic and hyperglycaemic events and to improve inpatient diabetes care.

## Methods

A quality improvement project (QIP) was conducted using five Plan, Do, Study and Act (PDSA) cycles. After each PDSA cycle, the team met to discuss the results gathered from the spot checks for each outcome measure to determine the next steps. Education and encouragement from all staff were key to success. Each PDSA cycle led to change and improvement.

## Results

By implementing the new chart and educating healthcare professionals, there was an increase in pre-meal CBG documentation from 26% to 58% and in appropriate ketone measurements from 20% to 38%. Staff surveys were used to determine the effectiveness of the chart. After the first two weeks, 17 out of 20 (85%) members of staff on the ward liked the new CBG chart and 18 out of 20 (90%) staff members found it easier to read, understand and follow. Approximately 85% of them were able to pick up trends and identify certain times when the individual was having hypoglycaemic or hyperglycaemic episodes because CBG readings were now charted at specific meal times in a columnar pattern.

## Discussion

Appropriate CBG monitoring, escalation and treatment reduce the avoidable complications of diabetes. This subset of complications includes diabetic ketoacidosis (DKA), hyperglycaemic

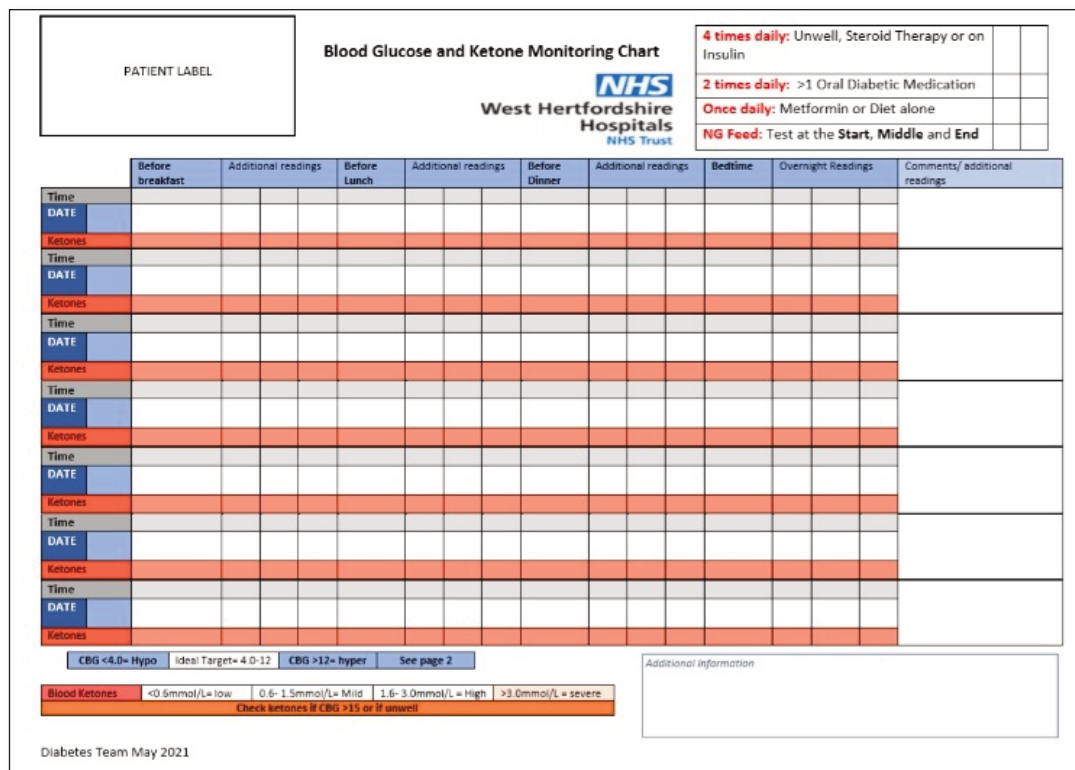
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**Figure 1.** An example of the new chart after cycle 4. Note, we did not change the charts for insulin infusion.



### Key messages

- Highlighting the importance of documenting CBG and ketone readings in a clear, interpretable and timely manner to enable pattern recognition and titrate diabetes medications effectively
- Colour coded, and informative charts lead to more actions in relation to dysglycaemia and can prevent harm
- Encourage conducting quality improvement projects as a team to improve diabetes care

hyperosmolar state (HHS) and recurrent hypoglycaemia. To highlight the reduction in adverse events: in February 2021, the number of hypoglycaemic events was seven. This reduced to one event in June 2021 after implementing the new chart for three months. Furthermore, the number of DKA and HHS events was noted to be two between February and April 2021 respectively, and it reduced to zero in May 2021.

### Conclusion

To summarise, QIPs to improve inpatient care delivery often depend upon the sustained efforts of the team. The team has been

able to introduce change, improve inpatient diabetes care and update the guidelines for hypoglycaemia and hyperglycaemia management, despite the challenges of the pandemic. We encourage readers to keep their documentation and paperwork in relation to diabetes monitoring up to date to ensure patient safety, enable better management and prevent harm.

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