



Diabetes in day case general and vascular surgery: A multicentre regional audit

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Summary

Background: People with Diabetes Mellitus (DM) are at increased risk of postoperative complications if their HbA1C readings are not well controlled. In the UK, there are clear national guidelines requiring all people with DM to have HbA1C blood testing within 6 months before undergoing surgery and that these readings should be below 69 mmol/mol if this is safe to achieve. The aim of this study was to determine whether hospitals in the region were compliant with the guidelines.

Methods: Data were prospectively collected from seven hospitals across the East of England region from 1st October 2017 to 31st March 2018 (6 months) in all people with DM undergoing elective day case procedures in General and Vascular surgery for benign disease.

Results: A total of 181 people with DM were included in the study, of whom 77.9% were male patients and the median age was 63 years. The three most commonly performed operations were laparoscopic cholecystectomy (20.9%, n = 38/181), inguinal hernia repair (20.4%, n = 37/181) and umbilical/para-umbilical hernia repair (11.0%, n = 20/181). In keeping with the national guidelines, only 86.7% (n = 157/181) of patients had an HbA1C tested within 6 months prior to their surgery date. Of the patients who had a preoperative HbA1C, 14 (n = 14/157, 8.9%) had an HbA1C \geq 69 mmol/mol, and 12 (n = 12/14, 85.7%) of these proceeded to surgery without optimisation of their HbA1C.

Conclusion: A significant proportion of people with diabetes undergoing elective day case procedures in our region do not have HbA1C testing within 6 months of their procedure as recommended by the national guidelines. In patients who do have a high HbA1C, the majority still undergo surgery without adequate control of their DM. Greater awareness amongst healthcare workers and robust pathways are required for this vulnerable group of patients if we are to reduce the risk of developing post-operative complication rates.

1 | INTRODUCTION

The prevalence of Diabetes Mellitus (DM) in the UK currently stands at 8.6%, affecting nearly 3.8 million people¹ and accounting for 10%-15% of patients undergoing surgery.^{2,3} Furthermore, the prevalence of DM is predicted to rise by 50% over the next decade.^{1,4} Poor perioperative glucose control has been associated with adverse outcomes and higher complication rates in almost every surgical speciality.⁵⁻¹⁸ Consequently, the Joint British Diabetes Societies for Inpatient Care (JBDS-IP)¹⁹ developed guidelines for the perioperative management of DM. Specifically they recommend that people with DM should have: (a) a glycated haemoglobin (HbA1C) done within 6 months of surgery; (b) an HbA1C \leq 69 mmol/mol (8.5%); (c) their surgery delayed until adequate control can be obtained if the HbA1C $>$ 69 mmol/mol, if clinically safe; (d) the time between decision to operate and preoperative assessment minimised to allow time for achievement of glycaemic control.¹⁹ To date, there are no studies assessing compliance to these specifications amongst elective general surgical patients. This multicentre national study investigates how many people with DM undergoing elective day case general and vascular surgery meet these specifications.

2 | METHODS

Centres were recruited via the Surgical Trainees East of England Research (STEER) Collaborative. A total of seven individual hospital trusts were recruited; Watford General Hospital (West Hertfordshire Hospitals NHS Trust), Queen Elizabeth Hospital Kings Lynn (NHS Trust), Peterborough City Hospital (North West Anglian Foundation Trust), Lister Hospital (East and North Herts NHS Trust), Ipswich Hospital (East Suffolk and North Essex NHS Trust), Broomfield Hospital (Mid Essex Hospital Trust) and the Princess Alexander Hospital (NHS Trust). Data were collected retrospectively over a 6-month period between 1st October 2017 and 31st March 2018. All adults (\geq 18) with DM (type 1 or 2) undergoing day case elective general and vascular surgery for benign conditions were included.

Patients who did not have a preoperative assessment, had arteriovenous fistula creation, or amputation were excluded from the study. Internal hospital coding systems were used to identify patients undergoing surgery with DM. Details of the preoperative assessment and surgical outpatient clinic were found using internal electronic databases and online letter systems, respectively. HbA1C results were collected via online pathology and reporting systems. The study was registered as a local clinical audit at each of the involved centres (code), and as such ethics approval was not required.

3 | RESULTS

3.1 | Demographics and type of surgery

A total of 190 patients were initially included in the study, however nine were excluded as three did not attend a preoperative clinic and six

What's known

There are a number of studies demonstrating that people with poorly controlled diabetes have worse outcomes following surgery. There are also studies which demonstrate the poor management and recognition of diabetes by GP's when referring people to secondary care for surgery.

What's new

There are national guidelines published by JBDS-IP specifying optimal management of people with diabetes undergoing surgery. Compliance with these specifications amongst general surgical and vascular elective day case surgeries is unknown to date, and this multicentre regional observational study fills this void in the literature.

had surgical procedures for malignant conditions. Of the remaining 181 patients, 77.9% ($n = 141/181$) were male and the median age was 63 (range: 23-90 years old). The three most commonly performed operations (Table 1) were laparoscopic cholecystectomy (20.9%, $n = 38/181$), inguinal hernia repair (20.4%, $n = 37/181$) and umbilical/para-umbilical hernia repair (11.0%, $n = 20/181$). Only one centre, provided data for both patients with and without diabetes undergoing elective surgery for the given period, giving a prevalence of diabetes amongst day case elective general and vascular surgery of 7.9% ($n = 53/674$).

3.2 | Comparison with National Standards

Comparing regional practice with national standards showed that overall, 86.7% ($n = 157/181$) of patients had an HbA1C tested preoperatively, the remaining 13.3% did not have an HbA1C recorded within 6 months of the preoperative period. Of the 157 patients who did have an HbA1C, the mean HbA1C was 56 (SD \pm 16) mmol/mol. Of these patients, 91.1% ($n = 143/157$) had an HbA1C $<$ 69 mmol/mol; 8.9% ($n = 14/157$) had an HbA1C \geq 69 mmol/mol. Of these 14 patients with an HbA1C \geq 69 mmol/mol, 85.7% ($n = 12/14$) proceeded to surgery without optimisation of their HbA1C. These patients and their operation are detailed in Table 2. The remaining 14.3% ($n = 2$) were given a further preop clinic but did not require a delay to their surgery since their HbA1C was brought within normal range by the time of their second preoperative clinic. The median time from clinic to preop was for all included patients was 121 days, (Interquartile Range [IQR] 71-196 days).

4 | DISCUSSION

This multicentre regional audit demonstrates that the majority of people with DM undergoing day case elective surgery had an HbA1C

TABLE 1 Types of day case surgeries performed across the entire study population

Procedure type	n	%
Laparoscopic cholecystectomy	39	21.5
Inguinal hernia (Lap or Open)	37	20.4
Umbilical/paraumbilical hernia	20	11
EUA + lay open fistula/seton/ other mx	13	7.2
Other proctology case	9	5
Other hernia (lap or open)	7	3.9
Benign breast	6	3.3
Haemorrhoidectomy/THD	4	2.2
Other	46	25.4
Total	181	

measured in the preoperative period, although a sizeable minority (nearly 14%) did not. Of the patients with a preoperative HbA1C, the vast majority (91%) had a result within an acceptable range (<69 mmol/mol). In the group with HbA1C \geq 69 mmol/mol, only two patients were given a further preoperative appointment, with the remainder proceeding to surgery regardless of their high reading. It is possible that the continuation of these patients towards surgery was because of unawareness of the high reading rather than a conscious decision to proceed regardless, as is permissible for reasons of clinical urgency. This contravenes the recommendation of the current national guidelines which are based on the acknowledgement of evidence which describes poorer outcomes for patients with inadequate glycaemic control.³

According to the World Health Organization (WHO) diabetes is a common condition affecting 422 million people (approximately 1 in 17 people) worldwide. The number of adults with diabetes has risen significantly from 4.7% in 1980 to 8.5% in 2014 and the figure is continued to continue rising in the next few decades.²⁰ Whilst most of the sequelae from persistently high blood glucose (such as renal damage, vascular disease, heart disease, stroke and retinal disease) occur slowly over time, a high blood sugar in the perioperative period has been attributed to a variety of postoperative complications, particularly Surgical Site Infections (SSI) and sepsis.^{7,14-17} A meta-analysis of 428 studies, involving 866,427 procedures demonstrated diabetic patients to have a more than 50% higher risk of SSI compared to non-diabetic patients.¹⁰

However, wound dehiscence and SSIs are not the only complications which diabetic patients are at increased risk from. A large study of 1,525 patients has recently demonstrated that amongst general surgical and orthopaedic patients, DM is an independent risk factor for a worrying array of postoperative morbidity including delayed extubation, cardiovascular events, respiratory complications and even death.²¹ Furthermore, diabetic patients have a longer length of stay, even postelective surgery as well as a higher readmission rate.^{22,23} Both of these events have profound medical, quality of life and healthcare economics implications.

It is important to note that none of the published evidence pertains directly to elective day case general and vascular surgery

TABLE 2 Type of Surgeries performed on those with an HbA1C \geq 69 mmol/mol

Procedure Type	n	%
Laparoscopic cholecystectomy	4	28.6
Excision of sebaceous cyst	3	21.4
Excision of Lipoma	2	14.3
EUA and lay open of fistula/seton	2	14.3
Inguinal hernia	1	7.1
Excision of skin sinus	1	7.1
Umbilical/paraumbilical hernia	1	7.1
Total	14	

patients specifically. Unfortunately, this study is itself underpowered to assess whether those with an HbA1C \geq 69 mmol/mol had worse complication profiles than those with HbA1C < 69 mmol/mol in elective general and vascular surgery; this question is currently under investigation by the same authors.

Special mention should be made of the 14% (n = 24) of patients who proceeded to surgery without even having an HbA1C measured within the 6-month preoperative period. Work published by Pournaras et al demonstrated that of 169 primary care referrals to secondary care for consideration of elective surgery, 23% (n = 38) did not mention the presence of existing diabetes.² Furthermore, it showed that only 8% (n = 13) included an HbA1C reading in the referral letter. Our study would suggest that the failure to highlight the presence of diabetes in the primary care referral letter is propagated through secondary care, with the surgeon in clinic failing to pick up on the presence of diabetes. Although, the presence of diabetes is subsequently picked up in the preoperative clinic, it is not the prerogative of preoperative staff to note or request an HbA1C.²⁴ Indeed, efforts subsequent to this study at Peterborough City Hospital to introduce a check box for HbA1C on the preoperative assessment paperwork were met with firm resistance from the anaesthetic team—who highlighted that this is within the remit of the responsible surgeon. Despite this, it remains true that preoperative assessment does act as “checkpoint” for patients with diabetes, at which point unacceptable HbA1C's can be noted and action taken. In this study, two such patients were given further preoperative clinic appointments in order to allow time for glycaemic optimisation. Interestingly, both of these patients had their preoperative clinic within 30 days of their surgical outpatient clinic, which allowed ample subsequent time for optimisation of glycaemic control, a further preoperative clinic and importantly, the avoidance of delayed surgery. Indeed, the JBDS guidelines recommend minimising the time-frame between the surgical outpatient clinic and the preop clinic, in order to enable adequate time to optimise glycaemic control if required prior to the planned procedure. This study demonstrated an average delay of 120 days, inclusive of those with poorly controlled diabetes. Importantly, if the HbA1C is not noted during the surgical outpatient clinic, there follows a 3-month period of inaction during this potential window for intervention and optimisation. This represents an excellent example of how a preoperative pathway can unfortunately be based

around provider convenience rather than patient need. The concept of re-engineering perioperative care pathways to better serve patient needs has been recently explored and developed by Grocott et al²⁴. They argue that elective surgical pathways offer the ideal opportunity to plan radical change in the way care is delivered, enabling “improved patient experience of care (including quality and satisfaction), population/public health, and healthcare value (outcome per unit of currency).” This triple aim framework, first published by the US Institute for Healthcare Improvements,²⁵ is now integrated into the NHS UK 5 Year Forward View.²⁶ Examples of such re-engineered preoperative pathways include shared decision-making, comorbidity management and collaborative behavioural change. Linking this concept specifically to the presented results, it is clear that an early preoperative assessment with targeted intervention would contribute greatly in optimising glycaemic control, and thereby minimising surgery-associated risk.

The seven centres involved in this study were all within the East of England Deanery which encompasses the six counties of Cambridgeshire, Norfolk, Suffolk, Essex, Hertfordshire and Bedfordshire. The prevalence of diabetes amongst the general population of these counties is between 6.6% and 11.0%,¹ which rises amongst hospital inpatients to 15%, and to 20% amongst those undergoing elective orthopaedic and vascular surgery.²⁷ This is in contrast to the prevalence of diabetes amongst this patient subgroup demonstrated at Peterborough City Hospital, which stood at 8%. This lower prevalence is likely explained by the exclusion of large proportion of vascular patients—a subset of patients with higher prevalence of DM. It is a limitation of this paper that this data was not available for the remaining six centres involved to enable an accurate calculation of the prevalence of diabetes amongst this subgroup.

Further limitations of this study are that the local practices, both clinical and administrative are substantially varied across the different trusts. There are substantial differences in the way referrals are vetted, dealt with, the preoperative clinics are organised, the staffing levels and experiences at these clinics and perhaps even the local populations they provide healthcare to, making meaningful comparisons between the Trusts difficult. The sample size of the study is also quite small despite 6 months of prospective data collection of consecutive patients prohibiting higher level statistical analysis. It is also difficult from the clinical notes to discern as to why the patients with a high HbA1C who despite being identified as having a high reading still went on to undergo elective day case surgery. Such information would be valuable in implementing targeted reforms within the healthcare services to ensure that such events do not occur. Other valuable information would be outcome data, ie determining the rate of postoperative complications in those patients who had an HbA1C reading within the accepted limits and those that were high. Despite these accepted limitations, this study is one of the few studies to prospectively collect data across a multiple trusts with a large geographical region.

The main findings of this study are that a significant minority of patients undergoing day case elective general and vascular surgery did not have an HbA1C measured within the preoperative period as

is set out in the national guidelines. Of those that did, the majority were able to achieve an HbA1C < 69 mmol/mol, although nearly all of those who failed to meet this target proceeded to surgery regardless. Increasing awareness, evaluation of existing pathways for diabetic patients and implementing robust safeguards are vital in ensuring that diabetic patients undergo elective day case surgery only once their HbA1C is within the accepted range. Failure to do so, may result in significant morbidity for the patient in the postoperative period.

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