Perioperative diabetes care

Authors: Ketan Dhatariya[A] and Nicholas Levy[B]

ABSTRACT

People with diabetes occupy approximately 18% of all acute inpatient hospital beds in the UK, compared with 6.5% of the general population. For those undergoing surgery, having diabetes is known to be associated with increased harms, however harm is defined. For those undergoing elective surgery, there is a defined patient journey, starting with referral from primary care to surgical outpatients, then onto preoperative assessment clinic before being admitted for surgery, and then from recovery through to discharge home. Because of the multiple causes for possible harm, communication between members of the healthcare team at each stage of this journey and with the person with diabetes is essential.

Recently, the National Confidential Enquiry into Patient Outcomes and Death has shown that the care of people with diabetes undergoing surgery needs to be improved, and they have made several recommendations that trusts should adopt to minimise the harms in this vulnerable population.

KEYWORDS: Optimisation, diabetes, dysglycaemia

Introduction

The prevalence of diabetes in the general UK population is thought to be about 6.5% but data from the 2017 National Diabetes Inpatient Audit (NaDIA) suggests that, on average across the UK, 18% of all inpatients have diabetes.[1] This is not to say that they were admitted with diabetes, but have diabetes in addition to whatever underlying condition that they have.

There are data to show that individuals who have diabetes admitted under medical or surgical specialties come to harm and have more complications than those people who are admitted with the same conditions but without having diabetes.[2–5] This often leads to extended lengths of stay and increased costs.[2,6] Furthermore, there is now evidence that complications do not just carry a short-term impact on the mortality and morbidity of patients, but that complications have an impact on the length and quality of life extending for several years after hospital discharge.[7,8]

Authors: [A]consultant in diabetes and endocrinology, Elsie Bertram Diabetes Centre, Norwich, UK and Norwich Medical School, Norwich, UK; [B]consultant in anaesthesia and perioperative medicine, West Suffolk NHS Foundation Trust, Bury St Edmunds, UK

Causes of harm for the surgical patient with diabetes

Data show that harms occur from low glucose concentrations or high glucose concentrations. Data from NaDIA 2017 demonstrated that 18% of patients with diabetes suffered at least one episode of hypoglycaemia (a blood glucose of <4.0 mmol/L) during their hospital stay. Furthermore, 26% of people with type 1 diabetes experienced at least one episode of severe hypoglycaemia (defined as <3.0 mmol/L, or requiring third-party assistance) during their hospital stay. Hypoglycaemia is not an innocuous occurrence. There is evidence from critical care and the wards that hypoglycaemia is associated with increased mortality and morbidity.[2,9–11]

Harm may also arise through acute and chronic hyperglycaemia. Several large studies have demonstrated increases in both infective and non-infective complications if blood glucose concentrations exceed 10.0 mmol/L.[4,7,12,13] Increased risk of adverse outcomes are also associated an elevated glycated haemoglobin (HbA1c) concentrations, which reflects chronic poor glycaemic control.[5,11,14] However, recent data suggest that elevated HbA1c is not an independent risk factor, and that it may purely be a signal that perioperative hyperglycaemia is more likely, and that hyperglycaemia is the more important risk factor for adverse events in surgical patients.[11]

Of greater concern, however, are the data from NaDIA that showed during the 2017 data collection, one in 25 people with type 1 diabetes developed the entirely preventable condition of hospital acquired diabetic ketoacidosis while they were an inpatient with a lower proportion also developing hyperosmolar hyperglycaemic syndrome.

As part of a balanced anaesthetic technique to promote early return of eating and drinking and effective analgesia, many anaesthetists will administer dexamethasone.[15,16] However, there are concerns about the risk of subsequent hyperglycaemia, especially if the patient has pre-existing diabetes.[17,18]

There are further data to show that the harms that come to people with diabetes can occur as a result of drug error or an inappropriate use of a variable rate intravenous insulin infusion.[19]

While for emergency admissions there may be little opportunity to optimise glycaemic control in people who are undergoing surgery, for those individuals who are elective admissions there are national clinical guidelines that encourage pre-referral optimisation to achieve an HbA1c of less than 69 mmol/mol if it is safe to do so.[20]

There are data to show that referral from primary care does not always mention that an individual has diabetes nor any of the comorbidity and other information that the national clinical guidelines recommend show be included in the referral letter.[21]

More recently there has been data to suggest that even in elective surgery if an individual is known to have an Hb1Ac >69 mmol/mol then the surgeons often do not take this into consideration and operate anyway despite being aware that this associated with a higher risk of postoperative complications.[22]

The data that show that diabetes is not included in the referral letter also suggests that many of these letters did not include the medication or the comorbidity history that is so often essential for surgeons and anaesthetic colleagues to be aware of.[21]

The recent document from the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) entitled *Highs and lows* looked at data from across the UK on individuals with diabetes over the age of 16 undergoing surgery.[23] NCEPOD identified over 12,000 patients between 01 February 2017 and 31 March 2017 that met the initial inclusion criteria for the study. 1,724 people with diabetes were then identified, of whom 1,268 were finally recruited enabling an analysis of their perioperative diabetes care. Among other things, the data demonstrated that almost 60% of individuals were referred electively for an operation, however 41% of all referrals had no information about the management of their diabetes and just over 40% had an HbA1c measurement in the previous 3 months prior to referrals.

Almost one in four had no comorbidities recorded in the referral letter and, surprisingly, almost one in six had no current medication recorded. Comorbidities were very rarely recorded with estimated glomerular filtration rate in only one in five, and a body mass index in just over a third of individuals.

When a person was in hospital, more than half of the individuals had no clear plan for the management of their diabetes. One in 10 people did not have their diabetes medications documented on the day of surgery. Almost half of the people with diabetes had no capillary glucose recordings taken during their operation and one in seven did not have a capillary blood glucose concentration measured during their recovery time. One in five did not have a glucose concentration measured during the postoperative period and one in six individuals were not seen by a member of the diabetes team.

As a result of these and other data, NCEPOD came up with 13 recommendations, listed in Box 1.

Box 1. List of recommendations around perioperative diabetes care made by the National Confidential Enquiry into Patient Outcome and Death in their report *Highs and lows*[23]

- Write and implement a national joint standard and policy for the multidisciplinary management of patients with diabetes who require surgery.
- Appoint a clinical lead for perioperative diabetes care in hospitals where surgical services are provided.
- Use a standardised referral process for elective surgery to ensure appropriate assessment and optimisation of diabetes.
- Ensure that patients with diabetes undergoing surgery are closely monitored and their glucose levels managed accordingly.
- Ensure a safe handover of patients with diabetes from theatre recovery to ward, this should be documented in the case notes.
- Develop a preoperative assessment clinic policy and standards for the management of patients with diabetes. These should be developed by the lead anaesthetist and the clinical lead for perioperative diabetes management
- Ensure that patients with diabetes attending a preoperative assessment clinic prior to elective surgery have access to the diabetes multidisciplinary team and written instructions regarding their diabetes management plan prior to surgery.
- A clinical lead for day surgery should be in place in all hospitals providing day surgery services.
- Cancellation of elective surgery in patients with diabetes should be avoided, particularly for known clinical reasons.
- Develop and implement referral criteria for surgical inpatients with diabetes to members of the diabetes multidisciplinary team members as required.
- Record and monitor the time at which a patient begins fasting (for surgery or clinical reasons).
- Prioritise patients with diabetes on the operating list to avoid prolonged starvation.
- Provide patients with diabetes with education and information about their diabetes management at discharge from hospital as part of the discharge planning process.

Reducing unwarranted variation and improving outcomes

Among the top priorities identified by NCEPOD was the need for a perioperative diabetes lead in all hospitals. The role of this lead is not only to work closely with preoperative assessment teams to ensure appropriate assessment and optimisation of diabetes, but also to ensure that there is an integrated pathway of care that covers the whole of the patient journey from primary care referral through to preoperative assessment; admission, theatre, recovery, surgical ward, discharge and finally back to the care of primary care. Further identified responsibilities of the postholder would be to ensure that mechanisms are in place to reduce the harm from dysglycaemia, variable rate intravenous insulin infusion use and drug errors across the whole of the patient pathway. This will often mean that day surgery is the safest place for patients with diabetes to have procedures because there is less time for iatrogenic harm. To date, there are data to show that people with diabetes have been inappropriately denied day-case surgery. There is also the need for integration with primary care and the creation of a standardised referral process for elective surgery.

In addition, there is the call for surgical diabetes inpatient specialist nurses who have been shown to make such a positive difference in outcome in medical units.[24] The surgical diabetes inpatient specialist nurses would be part of the diabetes team and able to liaise across primary and secondary care to optimise diabetes control and provide continuity of care. Furthermore, they would be able to collect and share audit data, which would then lead to quality improvement projects within the field of management of the surgical patient with diabetes. The Getting It Right First Time (GIRFT) programme requires this type of data, and is a powerful tool in facilitating improvements in standards of care within the NHS by promoting the elimination of unwarranted variation in care.[25]

Perioperative management of diabetes is an important component of the Royal College of Anaesthetists' *Guidelines for the Provision of Anaesthetic Services (GPAS)*.[26] These recommendations are constantly being reviewed as more data becomes available. GPAS forms the backbone of the standards by which departments are assessed if they want to be awarded the coveted Anaesthesia Clinical Services Accreditation.[27] As of July 2019, 32 out of 173 eligible departments within the UK have such accreditation.

Good glycaemic control matters

Previously, there were uncertainties about whether dysglycaemia in hospital inpatients should be treated.[28] However, more recent data suggests that maintaining good glycaemic control is associated with better outcomes in cardiac surgery, liver transplant surgery and also preventing surgical site infections.[29–32] A recent meta-analysis has suggested that good glycaemic control is associated with reduced mortality.[32] However, the authors noted that there are several different definitions of the lowest acceptable glucose, ranging between 6.1–8.9 mmol/L (110–160 mg/dL), and that eight of the 15 papers in their analysis only referred to postoperative tight glycaemic control. In addition, patients were more likely to experience hypoglycaemia if tight glycaemic control was advocated. Thus, there was a degree of heterogeneity in the papers that makes firm recommendations difficult to advocate. Further evidence suggesting that perioperative hypoglycaemia should be avoided, particularly in cardiac surgery, is exemplified by the retrospective study by van den Boom and colleagues who demonstrated higher mortality if blood sugars fell below a 5.6 mmol/L (100 mg/dL) when compared to 7.8 mmol/L (140 mg/dL).[11]

Continuous subcutaneous insulin infusion (pump) therapy and surgery

There has been recent controversy about whether insulin pumps can be used in the presence of a diathermy while in the operating theatre and this is an issue yet to be resolved. The argument is that this technology has not been trialled in a formal setting and thus cannot be deemed to be safe. Indeed, most manufacturers have suggested that if a pump is used in the presence of a diathermy then the warranty will be invalidated and, of course given that these technologies are very expensive, this is something that most healthcare providers are unwilling to risk. Most individuals are therefore potentially inappropriately put onto a variable rate of intravenous insulin infusion or back onto multiple dose injections for the duration of their inpatient stay. Others, however, have looked either at retrospective data or prospective cohort data and suggested their use is safe and have attempted to come up with strategies to use them safely.[33–35]

Enhanced recovery after surgery

Many of the components of the enhanced recovery after surgery are designed to reduce unwarranted variation and promote a more rapid recovery with a faster return of normal physiological and psychological function.[36] Part of this pathway includes the use of carbohydrate loaded drinks. In the postoperative period, the stress response will induce insulin resistance leading to an overall catabolic state with reduced skeletal muscle and adipose tissue uptake of glucose with resultant hyperglycaemia.[37] Thus an oral preoperative carbohydrate drink will increase endogenous insulin secretion to overcome the insulin resistance induced by surgery. However, in people with diabetes this is probably not appropriate because in people who are already hyperglycaemic, particularly in those with type 2 diabetes, may already be hyperinsulinaemic.

Summary

Over the last few years, great progress has been made on identifying the modifiable risk factors that are associated with poor outcomes in the care of the person with diabetes undergoing surgery. The challenge is identifying and promoting the strategies that are now known to be associated with better outcomes, and conversely identifying strategies that are associated with worse outcomes and then eliminating these from practice. This will require collaborative work between patient representatives, primary care, diabetologists, surgeons, anaesthetists and nursing staff, and may best be served by the creation of truly multidisciplinary guidelines with each recommendation being assigned an appropriate level of evidence and strength of recommendation.[38] This will enable local teams and clinicians to independently judge the strength of each recommendation and enable local adoption. With the recent formation of the Centre for Perioperative Care,[39] there is now the impetus and the mechanisms in place to promote the integration of services that are urgently required to improve the management of the surgical patient with diabetes. While the challenges are large, the rewards are huge in terms of cost savings to the NHS and allowing more patients to experience the benefits of surgery, rather than experiencing adverse outcomes. ■

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Address for correspondence: Prof Ketan Dhatariya, Elsie Bertram Diabetes Centre, Norfolk and Norwich University Hospitals NHS Foundation Trust, Colney Lane, Norwich, Norfolk NR4 7UY, UK.
Email: ketan.dhatariya@nnuh.nhs.uk