

The Rowan Hillson Inpatient Safety Award 2019 for the best perioperative pathway for people with diabetes

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Abstract

Introduction: The annual National Diabetes Inpatient Audit (NaDIA) in the UK continues to show a high incidence of insulin errors in patients admitted to hospital with diabetes. New initiatives are urgently required to mitigate this risk.

Method: The Joint British Diabetes Societies for Inpatient Care (JBDS-IP) organised the sixth national Rowan Hillson Inpatient Safety Award on the theme of the best perioperative pathway for people with diabetes.

Result: The winner was the team from Aneurin Bevan University Health Board led by Dr David Burckett-St Laurent for their innovative re-design of the perioperative pathway by a cross-specialty working group. The main elements of the new system were standardised patient assessment, optimisation of perioperative diabetes control, personalised diabetes management plans generated from a drop-down menu with information on usual drug treatment, pre-op/day of surgery diabetes medication modification, advice on hypoglycaemia management and sick-day rules, anaesthetic review for people with HbA_{1c} >69 mmol/mol, secondary care diabetes review for people with suboptimal diabetes control, new inpatient charts with guidance on diabetes drug management, streamlining of time and place of admission and greater engagement and education of people with diabetes and staff looking after them. This resulted in significant improvement in outcomes and reduction in risks.

The Newcastle upon Tyne NHS Foundation Trust team led by Dr Nicola Leech and colleagues received the runners-up

award for their 3-year quality improvement project involving multiple specialties. The project included development of trust-wide policies and protocols, educational initiatives, targeted diabetes specialist nurse in-reach, innovative electronic whiteboard alerts for glycaemic control and electronic hypo alerts. The result was a reduction in insulin errors and hypoglycaemia on surgical wards by over 50%, a reduction in Datix incidents and fewer patients suffering harm events. Summary and conclusion: These and similar schemes need to be developed, promoted and shared to reduce insulin errors in hospitalised patients with diabetes.

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Introduction

Insulin and medication errors are common and preventable. The National Diabetes Inpatient Audit (NaDIA) results between 2010 and 2019 demonstrated some reduction in medication errors (44.5% to 30.4%), prescribing errors (30.7% to 16.8%), glucose management errors (24.1% to 18.4%), insulin errors (25.8% to 18.2%) and severe hypoglycaemia (11.8% to 6.8%) in hospitalised people with diabetes in the UK.¹ NaDIA results also showed that there is considerable variation between Trusts and sometimes at different times within the same Trust.¹ Only 40% of people had their capillary blood glucose (CBG) recorded at all the recommended stages of the perioperative pathway and 80% were prioritised for surgery in the 2019 audit.¹ Clearly, further improvements are needed. Diabetes affects more than 15% of UK operations and initiatives are urgently needed to secure the safety of patients undergoing surgery or procedures.

Methods

Following the success of previous contests,²⁻⁶ JBDS-IP launched the sixth round of this national competition in 2019 to find the best perioperative pathway for people with diabetes so that effective projects can be identified, rewarded and shared with the other Trusts in the UK.

The topic of this competition was selected at a meeting of JBDS members and was then agreed by Dr Rowan Hillson. Marking

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criteria were set by the Inpatient Safety Group and included the following areas; background, objectives, project plan/methods, evaluation, impact, adaptability, learning and feedback from staff and patients. Christine Jones, JBDS Administrator, coordinated advertising the award through the membership of the Association of British Clinical Diabetologists (ABCD), the Diabetes Inpatient Specialist Nurse (DISN) UK Group and Diabetes UK. Dr Rowan Hillson chaired the judging panel which consisted of Dr Clare Crowley, Consultant Pharmacist, Medicines Safety, Oxford University Hospitals NHS Foundation Trust; Professor Ketan Dhatariya, Consultant in Diabetes, Endocrinology and General Medicine, Norfolk and Norwich University Hospitals NHS Foundation Trust; Lucy Fermor, Diabetes Specialist Practitioner, London Northwest University Healthcare NHS Trust; Dr Nicholas Levy, Consultant Anaesthetist, West Suffolk NHS Foundation Trust and Mr Dimitri Pournaras, Upper Gastrointestinal, Bariatric & Metabolic Surgery Consultant, North Bristol NHS Trust.

Results of the competition

Winner

The winner was the team from Aneurin Bevan University Health Board led by Dr David Burckett-St Laurent (bstl.david@gmail.com) for their innovative re-design of the perioperative pathway by a cross-specialty working group.

Background of the project

Prior to the JBDS perioperative guidelines,⁷ an inpatient treatment chart was in existence for people with diabetes undergoing surgery in the health board but the uptake was not consistent or standardised. The traditional practice of prescribing an intravenous insulin infusion was used by default, although not necessarily appropriately, resulting in unnecessary overnight admissions and prolonged length of stay. Diabetes management, if found to be suboptimal, resulted in cancellation of surgery, often late in the day. Safety issues surrounding use of intravenous insulin infusions, particularly insulin infusions without glucose, were of concern. Long-acting insulin was not continued when variable rate intravenous insulin infusion (VRIII) was in use, leaving patients vulnerable to decompensation when VRIII was discontinued. Various specialties therefore came together and utilised the recently published JBDS inpatient guidelines for the management of adults with diabetes undergoing surgery and elective procedures as a framework to restructure the service.

Methods

The project began with clinicians interested in perioperative diabetes management forming a working group to focus on restructuring the patient journey. This involved primary care diabetes service, pre-assessment clinic (PAC) staff, anaesthetists, surgical specialties, diabetes secondary care teams, accident and emergency, ward nurses and junior doctors, theatre staff, schedulers and, importantly, people living with diabetes. The group identified the existing issues and agreed on the new pathways.

Educational material disseminated to staff included posters with a traffic light referral scheme, stickers to highlight pre-assessment

criteria, Quick Reference Card to enable safe allocation of the correct inpatient chart for both scheduled and unscheduled patients, a flexible link nurse educational programme, flag-up system to trigger consultant anaesthetist review for complex cases with risk of hypoglycaemia, uploading of alerts on the electronic patient record to notify issues or complex regimens to ward staff at the point of admission, a "Pocket Medic" educational film to provide patient education about surgery and diabetes through external collaboration with Diabetes Research Unit Cymru, a system of "Pre-Operative Optimisation of Diabetes" (POD) referrals to the diabetes team, a system of tracking these referrals on an electronic watch list, a pilot of the pre-assessment plans and inpatient charts followed by roll-out across all sites after the relevant changes, identification of clinical areas considered safe to manage VRIII, and streamlining of bed management to enable admission on the day of surgery where appropriate. A digitised dynamic perioperative care plan is being finalised at www.periopiabetesplan.com.

Results

Compared with the time before new pathways, more people with diabetes had a management plan (0% vs 100%). The mean HbA_{1c} before and after optimisation was 89.7 and 68.5 mmol/mol (difference in HbA_{1c} 21.2 mmol/mol; $p < 0.01$). Weight recorded pre- and post-optimisation was 99.0 kg and 95.2 kg, respectively (difference = 3.9 kg; NS). Two patients who lost a significant amount of weight experienced resolution of symptoms and no longer required their procedure. Of the total number seen in PAC with diabetes in one hospital over one year, out of 243 patients 56 would have required VRIII based on previous guidelines. The estimated 23% reduction quoted correlates with observation in clinical practice. There was a reduction in Datix reporting. For 2014–2017 there were 19 related to VRIII use in surgical patients with eight generated due to unopposed insulin (insulin infusion without glucose) and eight inappropriate stoppage of VRIII and/or failure of transition to subcutaneous insulin safely. In transition, in March 2018–2019 there were five incidents specific to VRIII, with three being unopposed insulin, and none from March 2019 to date.

Feedback

A survey conducted on Google Forms in February 2020 showed:

- an average positive impact score in caring for patients of 8.4/10
- an average positive impact score for staff of 8.5/10
- 94% of respondents felt that the new care pathway has made care safer for perioperative people with diabetes

Free-text feedback included:

- "The preoperative management of people with diabetes was always a headache for the PAC nurses, but the diabetic plan has changed all that and has given us a clear, safe way to see our people with type 1 and 2 diabetes through their surgery."
- "I feel the best I have ever felt since my diabetes control has improved."

Runners-up

The team from Newcastle upon Tyne NHS Foundation Trust led by Dr Nicola Leech (nicola.leech3@nhs.net), Consultant in Diabetes and Metabolic Medicine, won the runners-up award for their entry 'Making Surgery Safer for People with Diabetes'.

Background of the project

Newcastle Hospital is one of the highest volume Trusts for surgery with more than 76,000 surgical procedures per year, 15% with diabetes. Surgical wards were the highest risk areas with inadequate perioperative planning (66%), high rates of insulin errors (31%), hypoglycaemia (27%) and other diabetes harms events. The team identified improving perioperative diabetes care as a key priority when the trust enrolled in the national 'Sign-Up-to-Safety' campaign.

Methods

Over a 3-year period the Newcastle group used a multidisciplinary team (MDT) approach to transform the diabetes surgical patient journey from referral to discharge. Trust-wide policies and protocols were created based on the national guidance for best practice (JBDS, Association of Anaesthetists of Great Britain and Ireland (AAGBI)). Key areas targeted included preoperative care planning, glycaemic control in theatre and recovery, handover practices, surgical ward management and diabetes discharge planning. IT colleagues were approached to develop electronic diabetes support solutions such as electronic sugar cube alerts (colour-coded cubes on whiteboard indicating hypo or hyperglycaemia) and automatic hypoglycaemia alerts to the DSNs. Another key to success was the active involvement of clinical stakeholders in the MDT leadership group meeting every 6 weeks over 3 years. These meetings were fertile grounds for identifying good and bad practices, enabling peer support for ongoing challenges and iterative development of pathways of care through Plan Do Study Act (PDSA) cycles. The aim of the team was to reduce diabetes-related harm events in patients undergoing surgery by >50% over a 3-year period from 2016 to 2019.

Results

As a result of the interventions mentioned above, preoperative diabetes care planning substantially improved (82% vs 33%) with reduction in overnight admissions for people with diabetes (15% vs 35%). This resulted in 200 surgical bed days saved per year with annual cost savings of >£60,000. Theatre and recovery monitoring improved, reducing preoperative and intraoperative hypoglycaemia (0% vs 14%) and hyperglycaemia (1% vs 58%). Electronic alerts for insulin were also sent to pharmacy staff to enhance reconciliation processes and specialist teams alerted for any patients experiencing recurrent hypoglycaemia. These changes reduced surgical ward medication errors (17% vs 41%), prescribing errors (7% vs 10%), all hypoglycaemia (17% vs 31%) and severe hypoglycaemia (5% vs 10%), whilst maintaining high levels of patient satisfaction (96%). Perioperative diabetes Datix incident reporting initially increased and then

decreased and has continued to fall. Analysis of the reports suggested that they were arising as staff felt empowered to document when guidelines were not being adhered to.

Feedback

The impact of this project on improving patient safety and experience was favourable. People with diabetes had indicated that they were frustrated about being admitted the day before surgery "only for someone to mess up my diabetes". The planning of their diabetes care by a well-informed nurse and the option for most patients to take home a written plan of what to do with their medication and then to come in on the day of surgery were very popular. Using the NaDIA patient questionnaires to assess satisfaction, in 2018 following the introduction of the perioperative initiative, 96% of those on surgical wards reported being satisfied or extremely satisfied with their care. This was higher than the rest of the hospital and higher than the national figure.

In 2019 the Perioperative Diabetes Working Group was a finalist in the Trust's 'Celebrating Excellence' awards. This was one of two projects selected by the Chief Executive to present at the Trust leadership conference as an example of success through collaboration and leadership.

Staff feedback indicated that frontline nurses, particularly in the pre-op suite and in theatre and recovery, became much clearer on what good care looks like and, because of the clear guidelines, felt able to highlight to more senior staff when they "strayed from the guidelines" and felt empowered to correct them.

Ideas from other entries

There were some other innovations submitted for the award which can be easily adapted by other Trusts to improve safety of their inpatients.

The team from West Suffolk Foundation Trust led by Carry Beecroft (Caroline.Beecroft@wsh.nhs.uk) submitted their model of diabetes specialist surgical nurse (DSSN)-led care for perioperative patients. Her completion of Advanced Nursing Practice Masters Pathway and Independent Prescriber role helped her in the new role. She was able to help PAC nurses, ward staff, out-of-hours staff, GPs and others by sharing pathways and skills. There were many improvements in the outcome measure as a result of these initiatives – for example, over 95% of patients in 2019 were prioritised on the theatre list as opposed to 25% in 2015, length of stay improved, medicine reconciliation was more accurate and feedback from staff and patients was highly positive.

Aintree University Hospital Foundation Trust team led by Dr Sabnam Samad (SABNAM.SAMAD@liverpoolft.nhs.uk) submitted their innovative perioperative guidelines which advised all professionals involved of their role in improving this aspect of the patient journey. The guidelines and associated publications helped understand novel diabetes medications, safe and clear

cut-off glucose levels for surgery, VRlll charts for use in theatre, what medications to stop and when to re-start when coming for surgery, etc. Although the Trust has not yet objectively measured the outcome, there were early signs that unnecessary last-minute referrals from surgery had reduced and people with diabetes were getting the right advice from the right professionals in time.

The Medway NHS Foundation Trust team led by Dr Taranum Rampal (taranum.rampal@medway.gov.uk) shared their project on multimodal perioperative rehabilitation of people with diabetes with the help of a DSN, among other professionals. Their preoperative rehabilitation programme comprising supervised exercise sessions, nutritional education and psychological support for 8 weeks improved HbA_{1c} by 10 mmol/mol and body weight by 4.5 kg. This programme was supported by a perioperative DSN hot clinic, public engagement programme for black and minority ethnic communities, interns from the Sports Science department of Greenwich University and was available for people with HbA_{1c} >69 mmol/mol. All the patients felt great satisfaction with the intervention and expressed interest to continue exercise postoperatively. Two people with diabetes who used the programme were co-opted on the steering committee of the project!

A team from the Leeds Teaching Hospital NHS Trust led by Dr Saifuddin Kassim (s.kassim@nhs.net) established a dedicated surgical pathway for people with diabetes – ‘Improve Diabetes in Surgery Collaborative’ – supported by a weekly DSN clinic for people going for surgery or a procedure and other interventions including leaflets for people with diabetes and GPs. All interventions from the DSNs were recorded in the electronic patient record for others to benefit. As a result, theatre cancellation rate reduced from 9.1% to 1.6%, admission for diabetes optimisation or VRlll the night before admission reduced and £22,000 were saved over one year. The team was also heartened by positive feedback from people with diabetes who used the service.

The NHS Tayside, Ninewells Hospital team led by Dr Margaret White (m.w.white@dundee.ac.uk) developed local strategies (VRlll scales adapted from JBDS guidelines, education, web resources, tea-trolley teaching sessions for labour room staff, credit card size hand-outs) to improve diabetes control during labour so that pregnancy outcomes could be improved and neonatal hypoglycaemia could be reduced. The feedback from staff was positive.

The University Hospital Plymouth NHS Trust team led by Julie Worthington (julie.worthington1@nhs.net) developed a nurse-led perioperative diabetes service supported by a dedicated diabetes and anaesthetic consultant and with elements such as criteria-led referrals, alerts on the electronic patient record, protocols, phone call to people with poor memory the day before surgery to review arrangements for medicines, self-administration of insulin by people with diabetes, e-mail liaison with surgeons if HbA_{1c} >69 mmol/mol at an additional cost of £47,000 in the

pilot, saving the trust £250,000 in bed days alone, significantly increasing day case rates by 34.8% and reducing length of stay by 0.34 days. More people with diabetes felt supported.

The Frimley Park Hospital Trust team led by Dr Frances Coyle (f.coyle@nhs.net) produced ‘key messages and simple tools to improve perioperative care of people with diabetes’. This initiative included a prompt for the need for an early HbA_{1c} and action at the time of referral on a specially created GP Crib card, check list for preoperative team, ‘high risk foot stamp’ to promote foot protection measures in appropriate people with diabetes, reconfigured surgical guidance to include key messages and trouble-shooting, ‘hypo-stamp on the notes of people if relevant’ and education of all staff groups. Compared with an audit before intervention or figures available nationally, these messages reduced last minute cancellation of surgery (13 in 2016 vs 3 in 2019), increased foot checks (6% vs 75%), reduced excess length of stay (2–3 days reported by ThinkGlucose vs 0.6 days for some surgeries locally) and use of VRlll (10.1% vs 4.1%). Eighty-six percent of people with diabetes were satisfied and there was good feedback from all staff groups.

The Queen Elizabeth Hospital, Birmingham team led by Catherine King (catherine.king4@nhs.net) produced a simple single-page guidance on ‘Diabetes management in renal patients undergoing minor procedures with starvation’. This resulted in improvement in the knowledge of staff, reduction in the number of adverse hypoglycaemic (1%) and hyperglycaemic events (2%), improvement in the correct administration of all diabetes medications (omit oral anti-diabetes medicines (100% vs 75%), omit short-acting insulin, reduce pre-mix insulin by 50% and long-acting insulin by 30% (30% vs 0%)), improvement in the percentage of patients having hourly capillary blood glucose monitoring (21% improvement) and an increase in the percentage of patients on the morning procedure list (10% improvement). The positive feedback received from staff relating to the ease of use of the standard operating procedure (SOP) contributed to the sustainability of this improvement over a 3-year period. The simplicity of the SOP meant it was transferrable and it has now been included in an adapted format for Trust-wide guidelines.

The Dorset County Hospital NHS Foundation Trust team led by Dr Mo-Lee Wong (Mo-Lee.Wong@dchft.nhs.uk) developed a clear referral pathway by e-mail directly to the community DSNs for people with diabetes whose surgery is postponed due to HbA_{1c} being higher than 69 mmol/mol, with a clear patient information leaflet and next steps. Regular MDTs between acute and community diabetes teams as well as the pre-assessment team was set up to ensure the right support for these people with diabetes to have timely surgery. With the new system in place over 6 months, 32% achieved HbA_{1c}, of which 55% completed surgery. Feedback from people with diabetes and staff groups was positive.



Key messages

- The Rowan Hillson Inpatient Safety Award 2019 identified the best perioperative pathway for people with diabetes
- The winner was the team from Aneurin Bevan University Health Board led by Dr David Burckett-St Laurent for their innovative re-design of the perioperative pathway. This resulted in significant improvement in outcomes and reduction in risks
- The Newcastle upon Tyne NHS Foundation Trust team led by Dr Nicola Leech and colleagues received the runners-up award for their 3-year quality improvement project involving multiple specialties. The result was a reduction in insulin errors and hypoglycaemia on surgical wards by over 50%, a reduction in Datix incidents and fewer patients suffering harm events

The Royal National Orthopaedic Hospital team led by Deepa Patel (deepa.patel7@nhs.net) established a service level agreement with the Royal Free Hospital securing support from the diabetes team (2 PA of consultant time and a part-time DSN). In liaison with the anaesthetic department, the new way of working improved care for people with diabetes and helped better education of staff by virtual MDT and risk assessment of people with diabetes by DSNs.

Summary and conclusions

The competition revealed several examples of perioperative initiatives which have resulted in tangible benefits for staff and people with diabetes. The Aneurin Bevan University Health Team won the award as they were able to improve the safety and health of their perioperative patients with their effective multi-specialty team project covering many hospitals and using innovations like a traffic light referral scheme, stickers to highlight pre-assessment criteria, Quick Reference Cards to enable safe allocation of the correct inpatient chart, a flexible link nurse education programme, triggers for specialist reviews, alerts on electronic patient record and a pocket-medic educational film. The Newcastle team won the runners-up award as they were able to improve patient safety and save money by an MDT approach (meeting every 6 weeks for 3 years) of adopting, refining and developing Trust protocols and policies starting from preoperative planning through glycaemic control in theatre/recovery, handovers, stay on surgical wards and up to discharge planning. They used electronic sugar cube alerts and hypoglycaemia alerts

to reduce their rates of hypoglycaemia. These and other successful projects started with a broad situation analysis involving multiple specialties and health professionals and depended on good documentation, regular education, training and appropriate alerts or prompts to relevant team members using digital technology. We all need to promote and share these ideas and develop new ones to help increase patient safety in our hospitals for people with diabetes. Many of these initiatives required very little funding and other Trusts can easily adapt them for their use.

Next year's award will be for the 'Best intervention during the COVID-19 pandemic that has maintained inpatient safety for people with diabetes'. We look forward to spreading the inspiring work that doctors all around the country are doing. This paper satisfies quality reporting guidelines (SQUIRE 2.0) and includes the aim, the details, the outcome, the funding, the generalisability and the learning from each initiative to improve perioperative care for people with diabetes.

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Conflict of interest: UD reports personal fees from AstraZeneca, Sanofi, Novo Nordisk, Lilly, BI, outside the submitted work. RH was National Clinical Director for Diabetes, Department of Health. KD and EC have none to declare. All other authors have nothing to declare.

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