The care that people with diabetes receive when they are in hospital is frequently suboptimal, and they have longer length of stay and poorer outcomes than those without the condition. The Diabetes Inpatient Care and Education project employs a whole-system approach to diabetes inpatient care and a new study shows that its implementation leads to a shorter length of hospital stay for patients with diabetes.
Almost two-thirds of the spend on diabetes healthcare goes on hospitalisation, and the increase in prevalence of the condition means that there has been an increase in the proportion of hospital beds occupied by people with diabetes. In 2011, the figure was one in eight beds and this rose to one in six in 2017, according to the National Diabetes Inpatient Audit. At this rate, one in four inpatients will have diabetes by 2030. Indeed, in some UK hospitals, this prevalence is already 30%, and this figure is even higher in some US states. Thus, inpatient diabetes care is an increasing concern.

People with diabetes are admitted to hospital more often than those who do not have the condition. Diabetes is among the five most prevalent comorbidities in hospitalised and readmitted patients. However, most people with diabetes are actually admitted for other reasons; a diabetic emergency accounts for fewer than 10% of these admissions.

Once in hospital, people with diabetes often receive suboptimal care. They have poorer clinical outcomes, a longer length of stay, higher rates of complications and increased mortality compared with those who do not have diabetes. It is not clear why this is, but hyperglycaemia has been linked to higher infection rates and hypoglycaemia to higher morbidity and mortality.

In response to this challenge, efforts are being made in some hospitals to improve diabetes inpatient care. These include: new protocols for glucose management, staff education programmes and alert systems like ‘Think Glucose’ to identify patients needing specialist review.

Thus far, it is not known what impact these initiatives have had, although there is evidence that the availability of diabetes inpatient specialist nurses (DISNs) reduces length of stay and is highly cost-effective. However, this research took place some time ago when length of stay was considerably greater than it is today. There is thus a need for new studies on the impact of care interventions.

The impact of health service interventions is traditionally investigated through before-and-after studies, analysing observational data. But this approach does not take account of the ongoing effect of an intervention or secular trends or changes happening that are unrelated to the intervention. The real effect of the intervention can be missed if the time between the intervention, behavioural change and follow-up is insufficient for the impact to be detected. A newer technique, known as interrupted time series, has more power than the before-and-after studies and is more practical in a clinical service than the traditional randomised controlled trial to identify the real effect of an intervention. The design of an interrupted time series uses data from multiple time periods to estimate the effect of the intervention while allowing for any underlying secular trend.

Pre- and post-intervention periods can be compared in interrupted time series analysis in both the study population and in the comparison population separately, as well as in comparison between the two populations. Changes to the outcome, as a result of the intervention, can be looked at, with allowance made for natural variation in the outcome over time.

Gerry Rayman and his team at Ipswich Hospital NHS Trust have introduced a whole-systems approach to improving diabetes care, which combines technology, education, protocols and pathways. In a new study, carried out with colleagues at the University of Birmingham, an interrupted time series analysis was used with a before-and-after analysis to assess the impact of this approach.

The Diabetes Inpatient Care and Education (DICE) project

The DICE project was implemented from 1 July 2013 across all the medical, surgical, haematology and oncology wards at Ipswich Hospital. It sought to improve outcomes for diabetes inpatients by making a number of changes in existing diabetes practice, as described below.

"One in four inpatients will have diabetes by 2030. Indeed, in some UK hospitals this prevalence has already reached 30%. Thus, inpatient diabetes care is an increasing concern."

1. The DICE care pathway

Every patient with diabetes is issued with an eight-page diabetes pathway – the DICE chart or booklet – which stays with them throughout their stay. It acts as an education tool for the healthcare professionals looking after them. The booklet contains:

- user-friendly glucose and insulin charts designed to improve patient safety
- a foot check form to be completed on admission, with instructions for the Ipswich Touch Test and how and when to refer to the multidisciplinary foot team
- the Diabetic Person At Risk scoring system, for prioritising and referral
- a checklist to facilitate insulin self-management
- a safe discharge checklist.

2. Induction for junior doctors

The DICE project introduced an induction scheme for junior doctors. This was based upon common case scenarios and was adapted to include training in the DICE pathway.

3. Staffing

Crucial to the implementation of the DICE project was the employment of additional DISNs in addition to the existing specialist nurses. This was equivalent to 2.5 full-time staff members and enabled seven-day working, with a...
Implications of this study

Both the before-and-after and the interrupted time series analyses show that the DICE project led to a significant reduction in length of stay for people with diabetes beyond that for people without diabetes. The reduction in mortality observed in the before-and-after analysis was not seen in the interrupted time series. In the interrupted time series, mortality increased in those without diabetes compared with those who did have diabetes. Readmissions were higher among those with diabetes, but lower than has otherwise been reported. There was a step down in readmissions during the intervention, but thereafter readmissions continued to increase in parallel with those without diabetes.

Since the publication of the DICE study, Public Health England has produced a ‘variation in inpatient activity’ tool that confirms a significantly lower number of benchmarked bed days (-20%) and readmission rate (-17%) for the Ipswich and East Suffolk Clinical Commissioning Group, for which over 90% of their admissions are to Ipswich Hospital NHS Trust.

This study is the first to evaluate the impact of a whole-systems approach to inpatient diabetes care on length of stay, mortality and readmissions across all medical and surgical wards in an acute general hospital. A key element of DICE is the involvement of all members of the diabetes team in the design and implementation of interventions to deliver high-quality and evidence-based education to non-specialist healthcare staff. It is also unique in using interrupted time series analysis to adjust for changes in the background population.

The authors note that the results of the interrupted time series analysis highlight the limitations of before-and-after analysis. The latter revealed a significant reduction in both length of stay and mortality, and this was greater in patients with diabetes than in those without. When interrupted time series was applied, reduction in length of stay remained significant and attributable to the implementation of the DICE project, while reduction in mortality was no longer significant. Moreover, interrupted time series analysis showed a wider issue of increasing 30-day readmissions in all patients, revealing the presence of systemic factors, outside of the DICE project, which affected all patients.

Previous research showed a median reduction in length of stay of three days for diabetes inpatients when there is a DISN on hand. But the most recent study was carried out in 2008, and it is not clear whether these findings would be applicable today. This new study shows a more modest, but significant and ongoing, reduction in length of stay. Given that one bed-day costs the NHS £400, this reduction would have saved the trust over £2m in the three years since the implementation of the DICE project.

While this study is the first to use interrupted time series analysis for an initiative like the DICE project, the approach is gaining in popularity and has also been used to look at the impact and implementation of national guidance.

Of course, the study does have a few limitations. It is based on a single hospital trust, so it is not known if the findings are generalisable to other hospitals. And, as the DICE project is a multi-system approach, it is not possible to determine which element of the intervention has the most impact on patient outcomes.

In conclusion, the DICE project demonstrates that a well-staffed diabetes inpatient team, delivering care through a whole-systems approach, and working seven days a week, leads to a sustained reduction in length of hospital stay for patients with diabetes. This has important financial implications for the NHS and for patient quality of life.

The methodology used here shows that additional information can be gained by using interrupted time series and indicates the benefit of using a negative control group of patients without diabetes. The authors therefore advocate the use of this quasi-experimental approach for assessing the impact of interventions, like the DICE project, in the clinical setting.

LOW UPTAKE OF COLORECTAL CANCER SCREENING AMONG PEOPLE WITH TYPE 2 DIABETES

Type 2 diabetes is a risk factor for colorectal cancer, so it is concerning to learn that people living with the condition are less likely to attend for screening. In this issue’s Journal Club, Dr Florence Johnson, Improving Care Manager (London), for Diabetes UK, reviews two new papers that report on this issue and the possible underlying reasons for low uptake.

New research from University College London suggests that people living with Type 2 diabetes are significantly less likely to take part in the NHS colorectal cancer (CRC) screening programme. Colorectal cancer is the fourth most common cancer in the UK, accounting for 12% of total cancer diagnoses. Screening is aimed at early diagnosis of CRC, and consists of a one-off flexible sigmoidoscopy (FS) at age 55, followed by biennial invitations to complete a home-based stool sample to those between 60 and 74 years old. Type 2 diabetes is a risk factor for developing CRC, so it is particularly important that this population participates in the screening process.

The study, funded by Cancer Research UK, used data from the English Longitudinal Study of Ageing in a CRC screening-eligible population of English adults aged 60 to 75 years without a previous cancer diagnosis. Of 3,720 participants, 422 had Type 2 diabetes, defined either by self-report alone or in combination with an HbA1c greater than 48mmol/mol.

Those with Type 2 diabetes were significantly less likely to ever have taken part in CRC screening, or be up-to-date with the two yearly CRC screening invitation, than those without diabetes. Participants with Class 3 obesity (BMI ≥40), increasing age or existing respiratory disease were also less likely to have ever participated in CRC screening, independent of Type 2 diabetes.

In a second study by the same group, data from a large primary care based survey of adults about to be invited for FS were analysed. Those who reported having diabetes were less likely to attend screening, even if they originally intended to participate, independent of demographics, health motivation, health beliefs and other health behaviours.

Reasons for missing out
So why are people living with Type 2 diabetes less likely to participate in CRC screening and FS, despite being at increased risk of CRC? The answer, unfortunately, is not yet clear. The study authors speculate that lower uptake of screening may be due to lower engagement with positive health behaviours in those with Type 2, or other psychosocial influences, such as low literacy levels. Additional health conditions and the management of diabetes itself may also present as barriers to CRC screening, if these are particularly demanding to the individual.

In other studies, it has been reported that women with Type 2 diabetes are less likely to participate in cervical or breast cancer screening, so this issue may not be exclusive to CRC screening. The importance of these life-saving health checks should be clearly communicated to those eligible, and the barriers to uptake of screening in those with Type 2 diabetes determined. Despite survival rates for CRC more than doubling in the last 40 years, earlier detection and subsequent treatment will improve chances of survival.

REFERENCES: