Questions about clinical and organisational components make up the two latest National Diabetes Audit reports: the Fourth National Diabetes Foot Care Audit and the 2018 Hospital Characteristics Inpatient Audit. Steve Chaplin here examines the audits’ findings in detail.

The National Diabetes Audit (NDA) is one of 11 national audits commissioned by the Healthcare Quality Improvement Partnership. It is managed by NHS Digital (https://digital.nhs.uk/data-and-information/clinical-audits-and-registries) in partnership with Diabetes UK and the National Cardiovascular Intelligence Network (a part of Public Health England that produces resources to improve cardiovascular services and outcomes). There is now a legal obligation on GP practices and specialist services to provide the NDA with data on diabetes care for their practice or diabetes clinic.

The NDA measures performance in delivering annual checks and meeting targets in England and Wales against NICE guidance and quality standards. It looks at five topics: diagnosis and registration rates; achievement of NICE-defined targets for glucose control, blood pressure and blood cholesterol; delivery of the nine care processes recommended by NICE; delivery of structured education; and the rates of acute and long-term complications. But the NDA is also concerned with other aspects of care delivery, such as care structure, funding and the uptake of technology. These clinical and organisational components make up the two latest NDA reports: the Fourth National Diabetes Foot Care Audit and the 2018 Hospital Characteristics Inpatient Audit.

National Diabetes Foot Care Audit
The Foot Care Audit covers the period April 2015 (the end of its first year) to March 2018 and summarises data on all foot ulcers first assessed by a specialist foot care service up to the end of the period.¹ The number of registered ulcers now exceeds 33,000 meaning that the statisticians have, for the first time, sufficient numbers to reliably assess how risk factors are associated with clinical outcomes. However, the report acknowledges that the estimated prevalence of foot ulcer in England and Wales is 64,000. The missing thousands are important because of the high morbidity and mortality associated with foot ulcer (7000 major amputations annually in England and a five-year survival of 60% after major amputation) and the associated expenditure (£1 billion annually, or 1% of the NHS budget, plus personal and social costs).

The numbers involved in this report are impressive. Data were contributed by 203 specialist foot care services in 136 NHS trusts and seven local health boards (though not all provided data for every question). The number of patients newly registered (14,120) and care episodes (15,570) in 2017/18 increased by 55% over the previous year. However, the case ascertainment rate was only 10–20%, meaning that some findings are likely to be substantial underestimates.

Structures
This section assessed the proportion of services with six important structures in place. About 90% had a Foot Protection Service (FPS) pathway and a step-down or shared care arrangement between the multidisciplinary foot team and the FPS. About 70% offered training for routine diabetic foot examinations, an established pathway for assessment within 24 hours for new referrals, and time dedicated for case discussion with vascular services. Urgent vascular assessment within 24 hours was in place in 54%. All structures were in place in 31% of services and 30% provided five; 8.4% – one in 12 services – had only one or two structures.

The 10 services that, in the 2018 report, had the highest proportion of patients with a severe ulcer who were alive and ulcer-free after 12 weeks – that is, the best-performing – were asked to identify structural factors they believed contributed to their track record. All identified direct access to a multidisciplinary foot care team that was well integrated with community podiatry and 80% identified ‘fuss-free referrals’ from any health care professional or patients themselves, next working day appointments and prompt access to a vascular service.

Outcomes
Analysis of outcomes showed that the outlook for associated severe ulcer was not good for either patients or trusts. Sixty percent of patients with a less severe ulcer (SINBAD score 0–2

<table>
<thead>
<tr>
<th>Element</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>Ulcer penetrates the hindfoot</td>
</tr>
<tr>
<td>Ischaemia</td>
<td>Impaired circulation in the foot</td>
</tr>
<tr>
<td>Neuropathy</td>
<td>Loss of protective sensation in the foot</td>
</tr>
<tr>
<td>Bacterial infection</td>
<td>Signs of bacterial infection of the foot (e.g. redness, swelling, heat, discharge)</td>
</tr>
<tr>
<td>Area</td>
<td>Ulcer covers a large surface area (≥1 cm²)</td>
</tr>
<tr>
<td>Depth</td>
<td>Ulcer penetrates to tendon or bone</td>
</tr>
</tbody>
</table>

Table 1. SINBAD system for scoring foot ulcer severity. Score 1 point for the presence of each element. A score of ≥3 denotes a severe ulcer; a score of <3 is classed as a less severe ulcer.
– see Table 1) were alive and ulcer-free 12 weeks after first assessment but the figure for severe ulcer was only 35%. Less severe ulcers persisted at 12 weeks in 38% of patients but 61% of severe ulcers persisted. Of patients with less severe ulcer, 0.7% underwent major amputation but the figure for severe ulcer was 2.7%. All these differences were statistically significant.

Severe ulcer was also associated with more hospital admissions (6230 vs 2205) and longer hospital stay (mean 16.3 vs 13.7 days), but the low case ascertainment rate means the true figure could be 5–10 times higher. When outcome was known, one-year mortality rates were 7.2% for patients with less severe ulcer and 14% among those with severe ulcer.

**Associations**

This is the first NDA report on foot care to explore possible associations between services and outcomes (Figure 1). It found that the most important determinants of being alive and ulcer-free, of foot disease admission and of major amputation were the SINBAD elements (especially ischaemia), and delay before first expert assessment and comorbidity (myocardial disease or kidney disease). For six-month mortality, age >65 and heart failure were by far the most important factors, contributing about 21% and 8% of the risk, respectively.

**Risk-adjusted variation**

The statistics behind these associations were reliable for all but the alive and ulcer-free outcome, from which the report infers that a large part of the variation in ulcer healing is still unexplained. The report analysed variation between providers after adjusting for case mix, though it qualifies its findings by adding that outliers cannot be identified due to the low case ascertainment rate and lack of statistical robustness. Providers can use interactive NDA local reports to find out if their result is substantially outside the expected value (defined as more than three standard deviations from the mean).

No regions or providers had higher or lower than expected numbers of patients having major amputations or dying within six months.

For the outcome of alive and ulcer-free at 12 weeks, three regions had higher and five lower than expected numbers, and four providers had higher and six had lower than expected numbers. For foot disease admissions, the corresponding figures were three above and five below expected for regions, and five above and five below for providers.

The report found substantial variation between NHS regions in the proportions of patients who had their first expert assessment within 14 days, with a national average of 62% and a range of 45% in Wessex to 80% in Northern England (Figure 2). The gap between best- and worst-performing providers was even greater, with a median of 61% and a range of 12–97%.

**Hospital inpatient audit**

There are two reports relevant to hospital diabetes care this year. The smaller report summarises the early data collected from the new inpatient harms extension audit.

The larger NDA Hospital Characteristics report covers the care structures needed to achieve the required standards of care. This usually includes a bedside survey of patients’ experiences but this part was omitted in 2018 due to other data-collection commitments. The current report therefore covers staffing, improvement initiatives, technologies and transformation funding, and provides evidence of service provision recommended in the Diabetes UK 2018 report ‘Making hospitals safe for people with diabetes’ and the 2019 ‘NHS Long Term Plan’. They recommend access to a multidisciplinary team and specialist inpatient nurses, implementation of electronic prescribing (which can reduce errors by up to 30%), remote blood glucose monitoring (i.e. data access via WiFi), and improved training. The ‘NHS Long Term Plan’ is clear that the full benefits of new technology will not be realised as long as clinicians rely on paper-based information systems.

**Funding, staffing and technology**

In 2016, £44 million were made available to support transformations in diabetes care in England. Forty percent of sites received funding to
improve access to the multidisciplinary team and 60% were funded to improve access to diabetes specialist nurses. In each case, about one-quarter of sites formerly provided no such service and 90% of sites used the money to fund new posts.

Staffing in diabetes services increased across all disciplines except pharmacy between 2015 and 2018, with growth greatest among nurses, consultants and podiatrists. Nevertheless, in 2018, 22% of sites had no inpatient specialist diabetes nurse, 17% did not have a multidisciplinary foot care team, 66% had no specialist dietetic provision, and 16% had no inpatient diabetes podiatry service. Provision of diabetes specialist pharmacists was tiny, with input averaging only 3 minutes per inpatient per week.

The uptake of technology increased but the rate of change was slow. The use of electronic patient records grew slowly: 41% of sites were full users in 2018 – little change from the previous year but up from 25% in 2015. Another 37% of sites had partially implemented electronic records and 22% were non-users. Uptake of electronic prescribing was less widespread but growing faster, with 35% of sites with full users compared with 29% in 2017, though the proportion of non-users was still more than half. Remote blood glucose monitoring was fully implemented by 62% of sites in 2018, almost double the figure for 2015 and growing by about 8 percentage points annually. The proportion of non-users declined correspondingly, reaching 24% in 2018.

The proportion of sites providing regular ward training for nurses has increased since 2016 and reached 89% in 2018. There was little change in the provision of morbidity and mortality meetings, reaching 89% of sites in 2018.

**Harms**

This is a new (beginning May 2018) continuous collection of four life-threatening events that are specific to people with diabetes: rescue treatment for hypoglycaemia, diabetic ketoacidosis (DKA), hyperosmolar hyperglycaemic state (HHS), and diabetic foot ulcer. These events were identified in the 2017 NDA snapshot audit and 77 have provided data. In the six-month period, 750 harms were reported, of which 525 (70%) were hypoglycaemic rescue. There were 125 cases of DKA (17%), 15 of HHS (2%) and 80 of diabetic foot ulcer (11%). These figures are considered to be underestimates of the true level of harms.

The next steps in the harms audit will be to circulate these findings and encourage participation by the remaining trusts, including identification of barriers to data submission and promoting good practice through case studies.

**Summary**

Effective management of diabetic foot ulcer remains a challenge to NHS diabetes services. The morbidity and mortality associated with severe ulcers are high, partly because they affect older patients with comorbidity but also because some patients do not have an expert assessment soon enough. That should not shift the spotlight from the outcomes associated with less severe ulcers, for which the healing rate is still far from good and mortality is substantial.

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**Box 1. Serious harms identified in the 2017 NDA snapshot audit, September 2017**

- Around 1 in 80 inpatients with diabetes (1.3%) require hypoglycaemic rescue in the last 7 days of their hospital stay
- Around 1 in 25 inpatients with type 1 diabetes (4.3%) develop diabetic ketoacidosis during their hospital stay
- Around 1 in 800 inpatients with type 2 diabetes (0.12%) develop hyperosmolar hyperglycaemic state during their hospital stay
- Around 1 in 100 inpatients with diabetes (1.0%) develop a diabetic foot ulcer during their hospital stay
The extent to which shortcomings in service provision underly these findings is not readily quantified but it is clear that some trusts and specialist services are not providing a standard of care that others have achieved. Such variation in services between regions and providers is the bane of the NHS and has proven one of the most intractable problems the system faces, but when one provider can assess 97% of patients within 14 days it is difficult to understand why another can only manage to do so in 12%.

Recent years have seen welcome increases in staffing, particularly among specialist nurses, but a slow adoption of technologies with the potential to reduce patient harm (and presumably increase service efficiency). The report sheds no light on the extent to which lack of resources may be hampering uptake. The current Secretary of State for Health has proved a strong advocate of technological solutions and it would be interesting to see where the gaps, if any, lie between rhetoric and reality.

Finally, closer monitoring of serious harms among inpatients is welcome. It may well prove impossible to completely avoid hypoglycaemia and foot ulcer but the report states that DKA and HHS should not occur during a hospital stay. The new harms audit will be a valuable clinical measure of service quality.

Steve Chaplin, BPharm, MSc, Medical Correspondent

References