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**Introduction**

The National Diabetes Audit (NDA) is commissioned by the Healthcare Quality Improvement Partnership (HQIP) and delivered by NHS Digital formerly the Health and Social Care Information Centre (HSCIC), working in collaboration with Diabetes UK and Public Health England (PHE).

The NDA is a major national clinical audit, which measures the effectiveness of diabetes healthcare against NICE Clinical Guidelines and NICE Quality Standards, in England and Wales. The NDA collects and analyses data for use by a range of stakeholders to drive changes and improvements in the quality of services and health outcomes for people with diabetes.

The NDA answers four key questions:

1. Is everyone with diabetes diagnosed and recorded on a practice diabetes register?
2. What percentage of people registered with diabetes received the nine NICE key processes of diabetes care?
3. What percentage of people registered with diabetes achieved NICE defined treatment targets for glucose control, blood pressure and blood cholesterol?
4. For people with registered diabetes what are the rates of acute and long term complications (disease outcomes)?

Through participation in the audit, local services are able to benchmark their performance and identify where they are performing well and improve the quality of treatment and care they provide. On a national level, wide participation in the audit also provides an overview of the quality of care being provided in England and Wales.

The NDA Report 2 aims to:

- Monitor progress towards reducing the prevalence of long term diabetes diabetic complications and additional mortality,
- Highlight variation in outcomes between health economies and stimulate service improvements,
- Start to investigate long term associations between disease outcomes and the NICE specified diabetes care processes and treatment targets to see if there are implications for service provision.

For 2015-16, the NDA Report 2 has been split into two parts: Report 2a which covers complications of diabetes and Report 2b which covers associations between disease outcomes and preceding care.

This document provides you with the methodological detail relating specifically to Report 2. For information and links you need to understand how the audit data is collected, data cleaning, validation and production of the analysis database, as well as the database variable list, please refer to the overall NDA methodology document for 2015-16, published alongside NDA Report 1 in January 2017:

**Analysis**

**Coverage**

The NDA provides a detailed picture of the clinical processes and care pathway for those diagnosed with diabetes. Some of the information collected as part of the audit is collected and published via the Quality and Outcomes Framework (QOF). QOF is an aggregated return which provides information for nearly all GP practices in England. The QOF information is used within the report when discussing coverage.

Clinical Commissioning Groups (CCGs), Local Health Boards (LHBs), GP practices and adult outpatient specialist service units submit data about the care that is being delivered for people with diabetes in their organisation. This will include children that have been treated in an adult care setting. For the full picture on the paediatric care for children with diabetes, please refer to the National Paediatric Diabetes Audit (NPDA) which is conducted by the Royal College of Paediatrics and Child Health (RCPCH).

The suite of NDA reports uses three separate cohorts of patients from England and Wales:
- Primary care patients – These are patients who are registered with a participating GP practice.
- Specialist service patients – These are patients that have a specialist service record; however they may or may not be registered with a participating GP practice. Information is collected from hospitals and trusts via a bespoke data collection system.
- All patients – Any patient from participating GP practices and specialist service units.

The audit changed from an opt-out to an opt-in model from 2013-2014. A reduction in participation was observed in 2013-2014 and 2014-2015. Due to variation in participation caution should be taken when looking at local level analysis (CCGs and LHBs).

Prior to 2013-2014 the approach to the audit was opt out, this meant that GP practices had to tell NHS Digital that they did not wish to participate; this was normally a small number of practices. The drop in participation in 2012-2013 was expected due to the restructuring of the NHS in April 2013. This organisational transition disrupted many well established organisations and systems.

A large amount of work has been completed to improve participation in the audit in 2015-2016

<table>
<thead>
<tr>
<th>Audit year</th>
<th>Total number of practices</th>
<th>Number of participating practices</th>
<th>National participation rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2012</td>
<td>8,549</td>
<td>7,515</td>
<td>87.9%</td>
</tr>
<tr>
<td>2012-2013</td>
<td>8,476</td>
<td>5,991</td>
<td>70.7%</td>
</tr>
<tr>
<td>2013-2014</td>
<td>8,232</td>
<td>4,699</td>
<td>57.1%</td>
</tr>
<tr>
<td>2014-2015</td>
<td>8,198</td>
<td>4,696</td>
<td>57.3%</td>
</tr>
<tr>
<td>2015-2016</td>
<td>8,021</td>
<td>6,609</td>
<td>82.4%</td>
</tr>
</tbody>
</table>

1National Paediatric Diabetes Audit, Royal College of Paediatrics and Child Health [http://www.rcpch.ac.uk/npda](http://www.rcpch.ac.uk/npda)
Data Period
Data is collected covering a 15 month period between 1st January in the first year and 31st of March in the second year.

Registrations
This relates to the number of people registered with a GP or with a specialist service unit and covers the all patients cohort. It is expected that the majority of patients should be registered with a GP, however there are instances where this is not the case. This may be because their registered GP practice has failed to participate.

2013-14 and 2014-15 Audit Periods
A reduction in participation was observed in 2013-2014 and 2014-2015. It was identified that a cohort of people with diabetes that appeared in the 2012-2013 audit, who had not died and whose GP practice participated in the following two audits were not present in 2013-2014 and 2014-2015 data. Therefore, this supplementary cohort of people with diabetes was included in the 2013-2014 and 2014-2015 audit periods for analyses throughout Report 2a.

Definition of the Care Processes
It is vital that people with diabetes receive all nine of the NICE recommended key health tests and measures. These tests help to monitor and manage diabetes, as well as to reduce the risk of complications such as stroke, heart disease and amputations.

A care process can take place in any setting, for example the blood test can be done in hospital or in the registered GP practice and it will still count towards the GP practice, CCG, LHB and the specialist service unit. The nine annual key health tests for people with diabetes are blood pressure, weight and Body Mass Index (BMI) measurement, serum creatinine test, urinary albumin test, cholesterol, eye check, foot check, smoking status and blood test (HbA1c – blood glucose levels).

In new analyses, Report 2 focuses on associations between disease outcomes and three of these NICE specified diabetes care processes, defined below:

1. Blood Pressure
Blood Pressure is a measurement of the force of blood flow inside your arteries. Your blood pressure is stated as two figures, e.g.130/80. The first figure is known as the systolic pressure and relates to the pressure as the heart contracts and pushes blood through the arteries. The other figure is the diastolic pressure measured when the heart relaxes to refill with blood.

2. Cholesterol (Triglycerides are another type of fat in the blood)
If you have raised cholesterol and raised triglycerides you have an increased risk of Cardio Vascular Disease (CVD). This should be measured and recorded annually by the GP or specialist service unit.
3. Blood test (HbA1c – blood glucose levels)
This indicates your blood glucose levels for the previous two to three months. The HbA1c measures the amount of glucose that is being carried by the red blood cells in the body.

Disease Outcomes and Care Processes - cohort
Two cohorts of people with diabetes, aged 20 years and over and alive as at 31st March 2013 were chosen to evaluate how, over the preceding seven years, full care process completion (all 21 checks, ‘Complete’) and significantly reduced care process completion (only 12 checks or fewer, ‘Incomplete’) are associated with the outcomes of people with diabetes. Only three care processes, measurement of HbA1c, blood pressure and cholesterol, were included in this analysis.

The cohorts of people and their care process completion were tracked over the seven years between the 2006-07 and 2012-13 audit periods. Outcomes (admission to hospital with heart failure, admission to hospital for Renal Replacement Therapy (RRT) and death) experienced by the Complete and Incomplete groups during 2013-15 were analysed. Exclusions were applied for each disease outcome:

- Anyone who was admitted with heart failure between 2006-07 and 2012-13 was excluded from the heart failure and care processes analysis.
- Anyone who was admitted for RRT between 2006-07 and 2012-13 was excluded from the RRT and care processes analysis.
- Due to the cohort including only people alive as at 31st March 2013, those who died between 2006-07 and 2012-13 were excluded from all disease outcomes and care processes analyses.

Disease Outcomes and Treatment Targets - cohort
The cohorts used in these sections differ from the cohorts used in the Disease Outcomes and Care Processes sections. A cohort of people with diabetes, aged 20 years and over and alive as at 31st March 2013 was taken from the 2006-07 audit period. For this cohort, measurements of HbA1c, systolic blood pressure and cholesterol were then taken from the 2006-07 and 2012-13 audit period and divided into five groups for each measure.

Corresponding long (7 year) and short (1 year) follow up periods were used to identify if the patient was admitted to hospital with heart failure during 2013-14 or 2014-15.

The groups were defined differently for the different diabetes types; the boundaries being dictated by the volumes of data in each group to get an even spread of records across the groups, rather than by clinical significance. Again, exclusions were applied for each disease outcome:

- Anyone who was admitted with heart failure between 2006-07 and 2012-13 was excluded from the heart failure and treatment target analysis.
- Anyone who was admitted for RRT between 2006-07 and 2012-13 was excluded from the RRT and treatment target analysis.
- Due to the cohort including only people alive as at 31st March 2013, those who died between 2006-07 and 2012-13 were excluded from all disease outcomes and treatment target analyses.
Standardisation

Indirect standardisation, in the form of a standardised ratio, has been used to compare the actual number of deaths or people experiencing a complication with the number expected to.

The age, sex and locality specific rates for each complication of people without diabetes are applied to the age, sex and locality structure of the people with diabetes to give an expected number of deaths or people experiencing a certain complication. The observed number of events in the people with diabetes is then compared to the expected and is expressed as a ratio (observed/expected). For presentation purposes the standardised ratio is expressed per 100. By definition, the standard population will have a standardised ratio of 100. Standardised ratios above 100 indicate that the complication count observed was greater than that expected from the standardised complication rates, and for standard ratios below 100 that it was lower.

Additional risk is presented alongside standardised complication and mortality ratios in Report 2 to show the percentage additional risk due to diabetes. It is calculated by subtracting the ratio for the standard population (100) from the standardised ratio for the specific complication.

In CCG level DKA complication data, a banding is presented of ‘Lower than expected’, ‘As expected’ or ‘Higher than expected’ and compared the DKA complication ratio the standard population

Disclosure Control

Disclosure control has been applied to CCG level data to mitigate the risk of patient identification. We have suppressed the observed figures, ratios and confidence limits where the observed number of deaths or people experiencing a particular complication in a CCG is between 1 and 5.