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Introduction

The National Diabetes Audit (NDA) is managed by the Healthcare Quality Improvement Partnership (HQIP) on behalf of NHS England 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 five 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. What percentage of people registered with diabetes are offered and attend a structured education course?
5. For people with registered diabetes what are the rates of acute and long term complications (disease outcomes)?

The NDA supports improvement in the quality of diabetes care by enabling participating NHS services and organisations to:

➢ Assess local practice against NICE guidelines
➢ Compare their care and care outcomes with similar services and organisations
➢ Identify gaps or shortfalls that are priorities for improvement
➢ Identify and share best practice
➢ Provide comprehensive national pictures of diabetes care and outcomes in England and Wales

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.

A Quality Improvement Toolkit has been developed in collaboration with the RCGP to help practices use their diabetes data to improve services http://www.rcgp.org.uk/clinical-and-research/toolkits/quality-improvement-toolkit-for-diabetes-care.aspx(Opens in a new window)

This document provides the information and links you need to understand how the audit data is collected and analysed.
How the data is collected

Information is collected from GP practice administrative data via pre-agreed extracts of their computer system. Data is extracted from general practice clinical systems and specialist service units in secondary care hospitals.

For the 2016-17 audit collection, a primary care specification was developed containing all the read codes for extraction and information about time periods the data needed to capture, this was used as the basis of each system supplier extract and the MiQUEST queries. Clinical System suppliers (EMIS, INPS and Microtest) developed in house queries that GP practices ran on their administrative systems and submitted the resulting CSV files to NHS Digital via the Clinical Audit Platform. For TPP, practices confirmed within their systems that they wanted to participate in the NDA by the 10th July 2017, after this date TPP automatically extracted the data from those practices confirming participation and submitted it directly to NHS Digital on their behalf. For other clinical systems or TPP practices missing the deadline for automatic extraction, MiQUEST queries were made available from the NDA website for practices to run within their administrative systems and submit the resulting CSV files to the Clinical Audit Platform. For Wales, GP practices confirmed that they wanted to participate in the NDA and NHS Wales Informatics Service collected the data on their behalf and transferred to NHS Digital.

For Specialist Services, an excel template specification was available for specialist services to complete. Guidance was given for what data items needed to be returned and the corresponding date ranges. Specialist services worked with their IT departments and Audit Teams to develop bespoke extracts from their administrative systems to be able to return the data. Where specialist services were not able to electronically extract the data, they were still able to participate in the NDA by submitting a list of the NHS numbers of the patients registered to their clinics which is routinely available from their Patient Electronic System (PAS). This was then matched to primary care records to be able to generate a report for the specialist service.

The audit is collected and disseminated in England under S254 of the Health and Social Care Act 2012, known as a Direction. This means in England it is mandatory for GP practices and Specialist Services to participate. In Wales the Confidentiality Advisory Group has granted permission to collect the NDA under Regulation 5 of the Health Service (Control of Patient Information) Regulations 2002 (known as Section 251 support), it is voluntary for GP practices and specialist services in Wales to participate in the NDA. The NDA operates under an “opt in” model so remain open and transparent with practices and specialist services about what data is being collected. The participation rate was 95.3 per cent of all GP practices in England and Wales for 2016-2017. Further information on submitting data to the NDA can be found here.

The information collected from GP practices for the audit are individual level data and so contain demographic information such as age, sex, ethnicity, diabetes duration and some geographic variables such as IMD centiles and postcode.

A full list of the information collected from GP systems can be found here a list of variables which feed the analysis database can be found here.

In previous audit years only the most recent dates and measurements for the care processes have been collected. In 2016-17 multiple readings for HbA1c, blood pressure, cholesterol and BMI have been collected. Whether a person has been diagnosed with a Severe Mental Illness (SMI) has also been collected for the first time in the NDA for 2016-17.

A data flow diagram can be found in Appendix A.
What is done with the data after submission

Data Cleaning

Cleaning rules are applied to the data on submission to ensure correct information is being received as part of the audit. The following cleaning rules are applied to these variables.

These ensure that the data received as part of the audit are within certain acceptable limits. Data outside of these limits is deemed to be invalid and therefore set to unknown or null.

<table>
<thead>
<tr>
<th>Rule statement</th>
<th>Valid codes and values</th>
<th>Invalid codes and values set to unknown values</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEX</td>
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<td>NULL</td>
</tr>
<tr>
<td>DIABETES_TYPE</td>
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</tr>
<tr>
<td>ALBUMIN_TEST</td>
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</tr>
<tr>
<td>ALBUMIN_STAGE</td>
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<tr>
<td>EYE_EXAM_VALUE</td>
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<tr>
<td>FOOT_EXAM_VALUE</td>
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<tr>
<td>SMOKING_VALUE</td>
<td>1, 2, 3, 4</td>
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</tr>
<tr>
<td>ED_REVIEW_VALUE</td>
<td>01, 02</td>
<td>NULL</td>
</tr>
<tr>
<td>ED_REVIEW_DATE</td>
<td></td>
<td>NULL</td>
</tr>
<tr>
<td>ED_OFFER_VALUE</td>
<td>01, 02</td>
<td>NULL</td>
</tr>
<tr>
<td>ED_OFFER_DATE</td>
<td></td>
<td>NULL</td>
</tr>
<tr>
<td>ED_ATTEND_VALUE</td>
<td>01, 02</td>
<td>NULL</td>
</tr>
<tr>
<td>ED_ATTEND_DATE</td>
<td></td>
<td>NULL</td>
</tr>
<tr>
<td>Clean_IHD_VALUE</td>
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<td>NULL</td>
</tr>
<tr>
<td>DIAGNOSIS_DATE</td>
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<td>NULL</td>
</tr>
<tr>
<td>BIRTH_DATE</td>
<td>&gt;=01/01/1907 and &lt;= audit end date (&lt;31/03/20xx) and &lt;= DIAGNOSIS_DATE</td>
<td>NULL</td>
</tr>
<tr>
<td>SYSTOLIC_DATE &amp; DIASTOLIC_DATE</td>
<td>SYSTOLIC_DATE = DIASTOLIC_DATE and &gt;= audit start date (01/01/20xx) and &lt;= audit end date (&lt;31/03/20xx)</td>
<td>NULL</td>
</tr>
<tr>
<td>HBA1C_mmol_Value</td>
<td>&gt;=20 and &lt;=195</td>
<td>NULL</td>
</tr>
<tr>
<td>HBA1C_%_Value</td>
<td>&gt;=3.979993595 and &lt;20</td>
<td>NULL</td>
</tr>
<tr>
<td>BMI</td>
<td>&gt;=12 and &lt;=90</td>
<td>NULL</td>
</tr>
<tr>
<td>SYSTOLIC_VALUE</td>
<td>&gt;=70 and &lt;=300</td>
<td>NULL</td>
</tr>
<tr>
<td>DIASTOLIC_VALUE</td>
<td>&gt;=20 and &lt;=150</td>
<td>NULL</td>
</tr>
<tr>
<td>CREATININE_VALUE</td>
<td>&gt;=20 and &lt;=1200</td>
<td>NULL</td>
</tr>
<tr>
<td>CHOLESTEROL_VALUE</td>
<td>&gt;=1 and &lt;40</td>
<td>NULL</td>
</tr>
</tbody>
</table>
Certain records are excluded completely from the extracts submitted by the GP practices and specialist services units.

Records are rejected for the following reasons:

- A specialist service care record submitted with only NHS number and no corresponding primary care record.
- A primary care record does not come from a GP practice which is eligible for the NDA

(A list of eligible GP practices is obtained from NHS Digital corporate reference library, which is updated weekly using data from the Organisation Data Service (ODS) for England. We also sought feedback from Clinical Commissioning Group (CCG) contacts to ensure their GP practice list is up to date).

NHS Wales Informatics Service (NWIS) supplied the list of eligible GP practices and associated LHB.

Validation

A provisional report is produced for each CCG which provides a comparison to the Quality Outcomes Framework (QOF) data on people registered as having diabetes and an overall figure on the care process completion and the treatment target achievement. This provides an opportunity for CCGs to address any data quality issues with the GP practices and NHS Digital, and re-submit the data.

Internal validation is completed on receipt of the automated extracts to ensure that there are no systematic issues with the data, and these are resolved where possible within the collection window.

Any data quality issues with the data are highlighted alongside analysis to ensure readers are made aware and further details are provided in the data quality statement accompanying the report.

For example, “Albumin Care Process” - there is a known issue with the recording of this element of the collection in 2012-13, which was rectified for later collections but needs considering when looking over time.

“There is a ‘health warning regarding the screening test for early kidney disease (Urine Albumin Creatinine Ratio, UACR). An issue with data supplied to NHS Digital for the 2012-2013 audit was brought to our attention prior to publication, which is believed to be restricted to Urine Albumin data extraction across a number of practices. Caution should be borne in mind when looking at the variation across CCGs for this care process.
Production of Analysis database

Most individuals within the NDA will have one record only which can be used to determine demographic and diagnostic information. The majority of records will come from primary care (GP extracts).

The demographic fields include:
- Age
- Sex
- Ethnicity
- Lower Super Output Area (LSOA)
- GP practice code
- Diagnosis year
- Diabetes type
- Diagnosis of Learning Disability (LD)
- Diagnosis of Serious Mental Illness (SMI)

Diagnostic information includes dates and values for each of the care processes.

Where data is received from more than one organisation a single record per person is created through the ‘golden record’ process.

Golden Record

Information for the same person can be submitted by several organisations, for instance if the person has moved GP practices during the period, and/or attended one or more hospital based specialist services. For analysis purposes a single record is created for each person.

The GP recording the most recent activity is assigned as the person’s ‘current’ GP practice, as at the end of the audit period. Similar, the specialist service recording the most recent activity is assigned as the person’s ‘current’ hospital. If no GP or hospital data was received for a person then these data fields are left blank.

Demographic information is taken from the current GP practice where this is valid. If this isn’t the case, any other records are considered, and if they are not contradictory then this information is used. For example, if a current GP practice listed the sex as female, we would use this in the first instance. If the current practice submitted sex as ‘unknown’, other records for that person would be considered. If these records were a mixture of ‘male’ and ‘female’, sex would be left as ‘unknown’. If the other records agreed that the only valid value for that person was ‘female’ then they would be assigned as ‘female’ in the data.

The exception to this in demographics is the diabetes type. For this the value from specialist services is used where this is available, and not contradictory. Where it isn’t available from hospital data, the diabetes type is taken from the current GP practice. If this is ‘unknown’ then other primary care records are considered, and the value used from these if they are not contradictory.

For care processes the most recent date per person is used, with the lowest measurements taken that day assigned to the golden record. The record can therefore be made up of information from a mixture of GP practices and specialist services.
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 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.

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, however it does not cover paediatric units. 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)1.

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) for low participation years, and across time periods.

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 was completed to improve participation in the audit the last two audit years, with a record 95.3% participation in 2016-17.

<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>
<tr>
<td>2016-2017</td>
<td>7,742</td>
<td>7,375</td>
<td>95.3%</td>
</tr>
</tbody>
</table>

1National Paediatric Diabetes Audit, Royal College of Paediatrics and Child Health http://www.rcpch.ac.uk/npdat

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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.
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.

For each of the care processes the date fields are used to determine if the care process has been performed. The most recent date is used in the audit year and these are matched back on to the relevant cohort of patients. The denominator for the care processes are the total number of people aged 12 or over within the relevant cohort with the exception of HbA1c (where all patients are used).

A care process can take place in any setting for example the blood test or the smoking review 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 health checks for people with diabetes are:

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.

   A blood pressure measurement should be taken for all registered patients with diabetes at least once a year. This information is collected as part of the audit. Records are only used within the care process completion indicator if there is a diastolic and systolic date and these are the same. Where a patient aged 12 or over has a diastolic and systolic date in the audit year at any organisation participating in the audit the care process is considered complete.

2. **Weight and BMI measurement**

   Body Mass Index this should be recorded for all patients with diabetes. This should be measured and recorded annually by the GP or specialist service unit.

   The date of this record is used to determine if the care process has been completed in the audit period. Where a patient aged 12 or over has a BMI date in the audit year at any organisation the care process is considered complete.

3. **Serum creatinine test (creatinine is an indicator for renal function)**

   This should be measured and recorded annually by the GP or specialist service unit. The date of this record is used to determine if the care process has been completed in the audit period. Where a patient aged 12 or over has a creatinine date in the audit year at any organisation the care process is considered complete.

4. **Urinary albumin test (or protein test to measure the kidney function)**

   This should be measured and recorded annually by the GP or specialist service unit. The date of this record is used to determine if the care process has been completed in the audit period. Where a patient aged 12 or over has an albumin date in the audit year at any organisation the care process is considered complete.
5. **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. The date of this record is used to determine if the care process has been completed in the audit period. Where a patient aged 12 or over has a cholesterol date in the audit year at any organisation the care process is considered complete.

6. **Eye check (retinopathy screening)**
Diabetic retinopathy is a common complication of diabetes. It occurs when high blood sugar levels damage the cells at the back of the eye, known as the retina. Patients with diabetes should be offered screening on an annual basis.

Unfortunately, the variation in the use of terminology and its impact on the consistency of data extraction from electronic clinical records rendered this element of the data unreliable as a measure of this care process. The NHS Diabetic Eye Screening Programme (NHS DESP) records every digital eye screening and we believe that its records should now be used as the preferred measure for this annual care process.

7. **Foot check**
Patients with diabetes should have an annual foot check, as diabetes can limit the blood supply to your feet and cause a loss of feeling. This can mean foot injuries do not heal well. A patient is more likely to have a limb amputated when they have diabetes. Where a patient aged 12 or over has a foot exam date in the audit year at any organisation the care process is considered complete.

8. **Smoking Status**
Where a patient aged 12 or over has a smoking status date in the audit year at any organisation the care process is considered complete.

9. **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. This care process is appropriate for all ages where a patient of any age has an HbA1c date in the audit period at any organisation the care process is considered complete.

**All 8 Care Processes** – this is where the person has to have received all eight care processes (excluding eye screening) where appropriate. The requirement is that everyone has their HbA1c measured annually, and everyone aged 12 or over should have all eight care processes annually. So, an 11 year old will only be required to have their HbA1c value tested and so if this has been done they will have achieved the all care process element, However, an adult aged 25 will have to have received all eight different care processes to have achieved the all eight care processes.
Definition of the Treatment Targets

There are targets relating to three of the care processes; “blood tests” (HbA1c), cholesterol and blood pressure. For a patient to appear in the denominator group for each of the targets section they need to have the date that the measurement was taken and a result recorded.

The most recent date is used in each audit year and the best result for the test is taken if two tests were completed on the same day. These are matched back on to the relevant cohort of patients. A care process and therefore the target result are taken from any setting and it will count towards the GP practice/CCG and specialist service unit targets.

The seven targets for the three care processes for people with diabetes are:

1. **Blood test (HbA1c – blood glucose levels).**
   This is vital to measuring the long term glucose levels within the patients’ blood; the aim should be to keep these at normal levels. The most recent result is taken for use within the calculation and if there were two tests completed on the same day the lowest value is used.

   There are three cumulative levels of the target:
   a. The HbA1c value is less than 48 mmol/mol (<48)
   b. The HbA1c value is less than or equal to 58 mmol/mol (≤58)
   c. The HbA1c value is less than or equal to 86 mmol/mol (≤86)

2. **Cholesterol**
   If you have raised cholesterol and raised triglycerides you have an increased risk of CVD. This target measures the cholesterol levels of patients with diabetes. The most recent result is taken for use within the calculation and if there were two tests completed on the same day the lowest value is used.

   There are two cumulative levels of the target:
   a. The cholesterol value is less than to 4 mmol/l (<4)
   b. The cholesterol value is less than to 5 mmol/l (<5)

3. **Blood Pressure**
   This is a flat target that the patient’s blood pressure (BP) should be less than or equal to 140/80. The most recent result is taken for use within the calculation and if there were two tests completed on the same day the lowest value is used.

   **All Targets** – this is where the person has achieved HbA1c ≤ 58 mmol/mol, cholesterol < 5mmol/l and blood pressure <=140/80.
Structured Education

Care process completion and treatment target achievement is calculated for each audit year using data from that audit year collection. Structured education information is calculated on a different basis. The most recent year’s data collection is used to provide as complete historic information for each person as possible.

Also, whereas care processes and treatment targets look at the 15 month audit period, structured education primarily looks at diagnoses within a calendar year and whether education was offered or attended in the 12 months following diagnosis.

Disclosure Control – Changes in 2016-17

Disclosure control has been applied to mitigate the risk of patient identification.

In previous years the data for practices was removed from the publication where the practice list size was less than 1,000. Data for additional practices was removed where differencing would reveal suppressed data.

This was compliant with the Anonymisation Standard for Publishing Health and Social Care Data, but data for all practices that had submitted data was not available. In addition, providing data for CCG, LHBs, specialist services or GP practices broken down by demographics such as age required additional ad-hoc suppression that was time consuming and meant much of this information was not practical to produce.

A new suppression method has been implemented for the 2016-17 audit. All numbers are rounded to the nearest 5, unless the number is 1 to 7, in which case it is rounded to ‘5’. This allows for more granular data to be made available, and also for data for all GP practices to be made available.

Rounded numbers are used to calculate rates such as care process completion and treatment target achievement. At CCG/LHB level and above this makes virtually no difference to the resultant rates. At GP level, where the numbers are small, this rounding can have a relatively large impact on the resultant rates, but where numbers are small, rates are volatile and should already be treated with caution.
Appendix A: Data Flow Diagram