Reporting On Annual Healthcare Checks For People With Diabetes

Variation Between The National Quality And Outcomes Framework Data (QOF) And The National Diabetes Audit (NDA)

V12

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1. Executive Summary

Everyone in the NHS is working hard to improve care for people with diabetes. Between 2005 and 2011 there was a tenfold increase in the number of the people, who have received all nine diabetes care processes from 5% to 54%, as demonstrated by the National Diabetes Audit (NDA).

The data from the Quality and Outcomes Framework (QOF) also indicates the quality of care for people with diabetes for the nine care processes. It is extracted in aggregate form which makes it impossible to calculate how many patients received all nine care processes however the achievement of individual care processes in QOF averaged 94% in 2009/10, a significantly higher result than the NDA reported. The greatest difference was for urine albumin testing: 73% in the NDA, 89% in QOF (see table 2).

The purpose of this paper is to explore the differences between the findings reported by the NDA and the QOF that arose from differences in the specification of the two sets of measurements.

Differences in the Purposes of the NDA and the QOF

It is important to emphasise that the intention of both the NDA and the QOF is to promote continuing improvements in diabetes care but they are designed for different purposes and so the measurements of the care processes are different.

- **The purpose of the NDA** is to measure the quality of care received by individual patients with diabetes and identify annual trends and uses patient level data to achieve this.
- **The QOF is intended** to incentivise and resource GPs to deliver a high level of patient care and only extracts aggregate data from general practices. .

The Main Causes of Different Results Reported by the NDA and the QOF Results

1. The frequency of recording of Read codes in patient records is influenced by the reason for recording the data in computer-readable form.

The use of coded entries to create patient records is strongly influenced by the requirements of direct patient care and, separately, by the need to record data that scores points in the QOF. Data that is not required for QOF is less likely to be Read coded which means that it will not be picked up by electronic audits such as the NDA. This does not mean that the care process has not taken place. It may have been recorded in another form such as free text or a scanned hospital letter where it is readily available to support direct patient care by healthcare professionals if not for electronic audits such as the NDA.

2. The base populations were designed to suit the purposes of the NDA and the QOF.

Both the NDA and QOF rely on reporting on the occurrence of specific Read codes in General Practice electronic patient records. Read codes are computer-readable terms that are used to record clinical and administrative data in patient records.

The NDA reported on all patients with a coded diagnosis of diabetes mellitus in their record. The QOF defined the diabetes register by the presence of a smaller subset of Read codes (see glossary) in the patient record, specifically removing four sets of patients from measurement: (a) patients aged less than 17 years, (b) those registered with their current practice for less than three months or diagnosed with diabetes for less than 3 months, (c) those who had been reported as an exception from the QOF audit by their practice (see section 4.5) or (d) had a coded record of "*diabetes resolved*" (see section 4.6).

The patients that are not in the QOF base populations were less likely to have coded records of achievement of the care processes in their General Practice records because (a) they were

unsuitable to receive care (an example would be terminally ill patients), (b) had declined to receive care or (c) should have received their diabetes care in secondary care.

The effect of exception coding in QOF can be calculated and correcting for it reduces the differences between QOF and NDA (see table 2). For six of the indicators the difference falls to only 1.4%. This is unlikely to reflect a true difference. The systematic difference in the base population of the NDA and QOF are probably responsible for most of this underlying variation.

3. QOF is aggregated data and NDA is patient level data,

The average achievement for QOF care processes was over 90% but the data were extracted in aggregate form and so it is impossible to calculate how many patients received all nine care processes.

The NDA data is extracted in identifiable form so it is possible link patient level data across the numerators of each NDA indicator. This showed that 54% (NDA 2010/11) of all patients received all nine care processes. It is likely that patients each missed different checks, which means that practices could have had a high level of achievement for each QOF indicator while the percentage of patients who received all nine checks remained significantly lower. Mathematically, with the average QOF scores, the overall achievement for all nine care processes could be as low as 40%.

4. Differences in purpose between the NDA and the QOF were reflected in the Read codes used as evidence of achievement of individual care processes

- **Urinary Albumin (10.2% difference after correction for exception reporting)**

  Unlike the NDA, the QOF only looked at testing for abnormal urine albumin excretion in diabetic patients without diagnosed proteinuria, so these patients were excluded from the QOF data. Recording urinary albumin testing in the GP records of the excluded group is likely to have been less complete because most of them will have received their renal care in secondary care.

  The other main difference arose from the choice of Read codes made for the NDA and the QOF measurements. Prior to publication of the NICE type 2 diabetes guideline CG66 in 2008, the use of micro-albuminuria dipstick testing of a urine sample was acceptable. Following CG66, the NDA excluded some codes that were not in line with the guideline but the QOF did not. NICE are now responsible for the QOF indicators and have proposed re-wording the QOF indicator DM13 on micro-albuminuria testing used since 2009/10 to "Percentage of patients with diabetes who have a record of an albumin:creatinine ratio (ACR) test in their record in the preceding 15 months.

- **Eye Check (7.5% difference after correction for exception reporting)**

  The clinical intent of the NDA and the QOF retinopathy indicators were essentially the same: to look for evidence of retinopathy screening in patients' records but there were significant differences in the two sets of codes used by the reports. Both included codes that might be legitimately recorded in a patient's notes for reasons other than proper retinopathy screening. The code cluster differences can probably explain most of the difference between the two reports.

- **Smoking Status (5.2% difference after correction for exception reporting)**

  The QOF smoking data comes from a single complex indicator that extracts aggregated data on smoking status for a population who have one or more of a group of long term conditions of which diabetes is only one. It looks separately at specific age groups and categories of non-smokers. This is probably the cause of most, if not all, of the difference between the two results but the aggregate nature of the QOF prevents any further analysis to confirm this.

2. Introduction

Everyone in the NHS is working hard to improve care for people with diabetes. Between 2005 and 2011 there was a tenfold increase in the number of the people, who have received all nine diabetes care processes from 5% to 54%, as demonstrated by the National Diabetes Audit (NDA).

The National Audit Office (NAO) produced a report on the care provided to patients with diabetes using the data provided by the NDA for the year 2009-10, entitled 'The management of adult diabetes services in the NHS'. The NAO report highlighted areas where the results of the analysis of diabetes care process completion differed between the QOF data from 31 March 2010 and the NDA report.

The data from the Quality and Outcomes Framework (QOF) also indicates the quality of care in diabetes. It is extracted in aggregate form which makes it impossible to calculate how many patients received all nine care processes however the achievement of individual care processes in QOF averaged 94% in 2009/10, a significantly higher result than the NDA reported. The greatest difference was for urine albumin testing: 73% in the NDA, 89% in QOF (see table 2).

The purpose of this paper is to explore the differences between the NDA and the QOF that arose from differences in the specification of the two sets of measurements so that continuing improvements in diabetes care are encouraged, measured and supported

The purpose of this report is to look into the specification, query logic, Read code clusters and post-extraction analysis of data from General Practice electronic patient records about the care process indicators that were common to the QOF and the NDA and to identify and, where possible, quantify the differences between them.

The NDA indicators for the NICE recommended care processes are as follows:

1. weight corrected for height as Body Mass Index (BMI)
2. blood pressure
3. smoking status review
4. glycaemic control (HbA1c)
5. urinary albumin test (corrected for urinary creatinine)
6. serum creatinine level
7. serum cholesterol level
8. eye check (retinopathy screening)
9. foot check (vascular and nerve screen)

There were seventeen QOF indicators covering care for diabetes in Business Rules v14 released in May 2009, which relate to the period of the NDA in question (2009/10). Ten of these indicators look at the same nine care processes measured by the NDA:

1. DM 2.The percentage of patients with diabetes whose notes record BMI in the previous 15 months
2. DM 11: The percentage of patients with diabetes who have a record of the blood pressure in the previous 15 months
3. Smoking 3: The percentage of patients with any or any combination of the following conditions: coronary heart disease, stroke or TIA, hypertension, diabetes, COPD, CKD, asthma, schizophrenia, bipolar affective disorder or other psychoses whose notes record smoking status in the previous 15 months
4. DM 5: The percentage of patients with diabetes who have a record of HbA1c or equivalent in the previous 15 months

5. DM 13: The percentage of patients with diabetes who have a record of micro-albuminuria testing in the previous 15 months (exception reporting for patients with proteinuria)
6. DM 22: The percentage of patients with diabetes who have a record of estimated glomerular filtration rate (eGFR) or serum creatinine testing in the previous 15 months
7. DM 16: The percentage of patients with diabetes who have a record of total cholesterol in the previous 15 months
8. DM 21: The percentage of patients with diabetes who have a record of retinal screening in the previous 15 months
9. DM 9: The percentage of patients with diabetes with a record of the presence or absence of peripheral pulses in the previous 15 months.
10. DM 10: The percentage of patients with diabetes with a record of neuropathy testing in the previous 15 months

Both the NDA and QOF results are based on data extracted from the same source of information, the General Practice electronic patient record. It would seem likely that the differences between the outputs of the two audits are likely to arise from differences in the specification and execution of the data extraction and analysis. This paper presents an analysis of how the data was specified and analysed to identify probable causes of the differences.

3. Differences between the NDA and the QOF

There may be differences or idiosyncrasies in query engines which may cause differences in comparisons between the datasets – QOF data extractions are implemented by using, MIQUEST, Apollo SQL Suite, TPP SystmOne and Informatica's system to extract the final NDA datasets from which data was published. Just 1.1% of the data came from approximately 30% of acute trusts.

In 2009-2010 the NDA extracted data from 6,507 from roughly 8,300 practices in England (78%), of these 1,350 (20.7%) used SystmOne (CTV3). Almost all the rest used Read V2. 82 practices (1%) declined to release data. Reasons for other practices not to participate were largely technical, where it was not possible to implement data extraction by any of the methods listed above.

3.1 Differences in the purposes of the NDA and the QOF

The NDA and the QOF were designed for different purposes.

- **The purpose of the NDA** is to measure the quality of care received by all patients with diabetes. As such the NDA is very specific in which Read Codes are counted towards achievement. The NDA mainly focuses on test results and doesn't count test referrals as achievement.
- **The QOF is intended** to incentivise and resource GPs to deliver a high level of patient care. In some indicators the QOF will count patients who have been referred for a test towards achievement, regardless of whether or not the patient received that test or not.

Because of this the audits are designed differently. For most of the care processes, the NDA and the QOF look for a different code set and query logic to seek evidence of completion of the care process. The differences affect both denominator and numerators of the audit indicators and mean that the results of the two audits are generally not directly comparable.

3.2 The influence of the QOF on practice coding priorities

Both the NDA and QOF rely on reporting on the occurrence of specific Read codes in General Practice electronic patient records. Read codes are computer-readable terms that are used to record clinical and administrative data in patient records(see section 4.3). Detailed analysis of the query logic, Read code clusters and post-extraction processing of the data from the NDA and the QOF reveals many reasons for the differences between the two audits.

It is important to distinguish between the recording of Read codes by health professionals in patients' records and the reality of actual disease. The audits can only look at what practices record, not the actual health of patients.

Data that is not Read coded will not be picked up by electronic audits such as the NDA. This does not mean that the care process has not taken place, nor that it has not been recorded at all. It may have been recorded in another form such as free text or a scanned hospital letter.

Read code recording is strongly influenced by the requirements of direct patient care and, separately, by the need to record data that scores points in the QOF. This incentivises practices to use codes that are in QOF clusters in preference to others and to use Read codes to record data from other sources such as secondary care that are required by the QOF where otherwise the information may remain in the scanned hospital letters or only be recorded in free text where it is readily available to support direct patient care if not for electronic audits such as the NDA.

3.3 Differences in the base populations used by the NDA and the QOF

The NDA reported on all patients with a coded diagnosis of diabetes mellitus in their record. The QOF defined diabetes by the presence of a smaller subset of Read codes (see glossary) in the patient record, specifically excluding four sets of patients from measurement: (a) patients aged less than 17 years,(b) those registered with their current practice for less than three months or diagnosed with diabetes for less than 3 months, (c) those who had been reported as an exception from the QOF audit by their practice (see section 4.5) or (d) had a coded record of "*diabetes resolved*" (see section 4.6).

The NDA and the QOF report on populations of patients identified by different ranges of Read codes.

The QOF business rules v14 and 16 used in 2009-10 included patients with the Read codes C10E.%, C10F.%, (excluding C10F8).

The NDA v6.5 diagnosis code list is much more extensive than QOF, including the full C10..% set of codes, which includes some codes which possibly do not indicate a confirmed diagnosis of diabetes (Table 1). Patients who only have these codes will not appear in practice QOF registers and may not receive annual diabetic care and surveillance. Anyone found in the NDA just because of those codes is likely not to be receiving or requiring on-going diabetes care.

Table 1: Read codes included in the NDA that may not indicate a need for on-going diabetes care	
Read2	
C10L.	Fibrocalculous pancreatopathy
C10L0	Fibrocalculous pancreatopathy without complication
C10K.	Type A insulin resistance
C10K0	Type A insulin resistance without complication
CTV3	
X40JF	Transitory neonatal diabetes mellitus
Q441.	Neonatal diabetes mellitus
Xa08a	Small for gestation neonatal diabetes mellitus
XaJlP	Fibrocalculous pancreatopathy without complication
C10L0	Fibrocalculous pancreatopathy without complication
X40JS	Hyperproinsulinemia

The QOF business rules exclude specific groups of patients that are included in the NDA data.

The QOF is for people with diabetes who are aged 17 years old or over. Patients aged 16 and under are excluded from the QOF diabetes area on the basis that these patients are best managed by consultants in secondary care. This mainly affects the achievement levels for patients with Type 1 diabetes mellitus who are generally much younger than patients with Type 2 diabetes mellitus.

The QOF excluded patients who have been registered with their current practice for less than three months or had only been diagnosed with diabetes in the three months prior to the year end. There may not have been time to provide the diabetes care processes or summarise the outcomes of care processes carried out in previous the patient's practice.

Inclusion of these patients in the NDA will have reduced the overall achievement results.

Practices can except patients from the QOF with appropriate justification

The use of the exception codes (9h4..% *Exception reporting: diabetes quality indicator* in Read V2) has a significant impact on QOF results by removing patients from the denominators who did not receive care processes for valid reasons outside the control of the practice (see section 4.5). Its purpose is to remove patients from the denominator when they are unsuitable for or decline care from the practice. Practices may "except" patients from the whole of the diabetes set of indicators or from individual indicators. These patients' records are included in the NDA and that will lower the overall practice results.

The rate of exception coding for different indicators over and above the general diabetes exception codes vary more than tenfold: from 0.67%for smoking status to 7.33% for eye checks (see table 2). There are various reasons for this. One may be the lack of retinopathy screening or foot checks in some parts of the country.

The effect of exception coding in QOF can be calculated and correcting for. It reduces the differences between QOF and NDA. The systematic differences in the base population of the NDA and QOF are probably responsible for most of this underlying variation.

The number of patients who are counted towards achievement (the numerator), the number of patients who should have received the care process (the denominator) and the number of patients who were exception reported are reported in the extracted QOF data. To compare the QOF achievement more meaningfully to the NDA, exception reported patients can be added back into the denominator. If exception coding is corrected for in this way, the difference for six of the indicators falls to only 1.4%.

One possible reason for the high exception reporting may be the lack of specialist services such as podiatry or retinopathy screening in some areas, including temporary interruptions to the services. The highest exception reporting rates were for eye checks, foot checks and urine albumin testing. When the results are corrected, the QOF results for both foot checks fall back very close to the NDA result but the achievement results for eye checks and urinary albumin tests still remain significantly higher than the NDA(see table 2).

Table 2: Care Process Achievement	**NDA only: - Primary care - Type 1 or 2 diabetes - 16 and older**	**QOF with no exception reporting**	**NDA-QOF difference with no exception reporting**	**QOF with exception reporting**	**Exception coding rate**
Weight/BMI Measurement	90.5	91.7	1.2%	94.7	3.25%
Blood pressure	95.6	96.8	1.2%	98.3	1.6%
Smoking status	87.0	94.5	7.5%	95.2	0.7%
Glycaemic control (HbA1c)	92.6	94.4	1.8%	97.2	2.9%
Urinary albumin test	72.5	83.8	10.3%	88.5	5.4%
Serum creatinine test	92.9	94.9	2%	97.0	2.2%
Serum	92.2	93.5	1.3%	96.0	2.7%

cholesterol test					
Eye check	79.1	84.3	5.2%	90.9	7.3%
Foot risk assessment*	84.9				
Foot check: vasculopathy		85.8	0.9%	91.1	5.6%
Foot check: neuropathy		85.4	0.5%	90.8	5.9%

Patients considered not to have diabetes mellitus despite the presence of a diagnostic code in the record – "*diabetes resolved*"

The QOF excludes patients with at least one of the diabetes resolved codes two codes (212H. *Diabetes resolved* or 21263 *Diabetes resolved* in Read V2) even if they have a code for diabetes in their record. Practices may use these codes where the diagnosis was wrong or the patient does not need regular annual diabetes surveillance or care. The key point is that the patient was considered to be diabetic at one point but that is no longer the case or they do not need standard diabetes care with annual review (see section 4.6). These patients were included in the NDA report but they are considered not to require diabetes care.

3.4 Urinary Albumin Test (10.2% difference after correction for exception reporting)

There are three factors in the design of the specific indicators of urinary albumin testing in the NDA and the QOF that are likely to explain the remaining differences between the findings of the two reports after the general baseline population factors have been allowed for.

Unlike the NDA, the QOF looked at screening for abnormal urine albumin excretion in diabetic patients without diagnosed proteinuria, so these patients were excluded from the QOF data.

"Indicator DM 13: The percentage of patients with diabetes who have a record of micro-albuminuria testing in the previous 15 months (exception reporting for patients with proteinuria)."

The indicator uses the words "exception reporting for patients with proteinuria" to indicate that all such patients are not included in the denominator, in the terminology of the QOF, these patients were actually *excluded*. That means that they were not added back into the denominator when patients with exception codes were added. This has a significant impact on the percentage of patients reported by the QOF on this indicator to have received the care process. Recording of data on urinary albumin testing in the GP records of the excluded group is likely to have been less complete because most of them will have received kidney care in secondary care and the relevant data would be not be coded in the GP record. So the NDA would probably report lower achievement that the QOF because of this exclusion.

The other main difference between the NDA and the QOF arises from the choice of Read codes to indicate the achievement of the care process. There are reasons for the differences. Prior to publication of the NICE guideline for type 2 diabetes (CG66) in 2008, micro-albuminuria dipstick testing of a urine sample in the GP surgery was acceptable. Anecdotal evidence suggests that it is still recommended in some local clinical guidelines. Following the publication of CG66, the NDA excluded some codes that were not in line with the guideline but the QOF did not (e.g. 467A., 467E. and 467H, and 46N3. - 46N8. and 46W..% - see table 3). Since then NICE have become responsible for the QOF indicators and have proposed re-wording the QOF indicator DM13 on micro-albuminuria testing which has remained unchanged since 2009/10 to "Percentage of patients with diabetes who have a record of an albumin:creatinine ratio (ACR) test in their record in the preceding 15 months."

Box 1: In CG66 of May 2008 (p232), NICE recommend that health care professionals should:
"Ask all people with or without detected nephropathy to bring in a first-pass morning urine specimen once a year. In the absence of proteinuria/urinary tract infection (UTI), send this for laboratory estimation of albumin:creatinine ratio. Request a specimen on a subsequent visit if UTI prevents analysis." and *"Make the measurement on a spot sample if a first-pass sample is not provided (and repeat on a first-pass specimen if abnormal) or make a formal arrangement for a first-pass specimen to be provided."*

The NDA looked for the latest code in the indicator code cluster and considered it evidence urine albumin testing if it contained a value. Some laboratories report a very low level of micro-albuminuria with a text value rather than a numerical one. This may have reduced the sensitivity of the NDA audit for this indicator.

All these factors will have led the NDA to underestimate the frequency of urinary albumin testing being carried out across primary and secondary care.

Table 3. QOF v14/16 Read Code V2 cluster for urine albumin testing (CTV3 is equivalent)
There are five codes that do relate to the recommended test, only one (46TC.) unambiguously relates to the required test result:
46TC. Urine albumin:creatinine ratio*
46N4. Urine albumin*
46N8. Urine microalbumin profile
46W.. Urine microalbumin
46W0. Urine microalbumin positive
46W1. Urine microalbumin negative
46W2. Microalbumin excretion rate
There are seven codes that do not specifically relate to urine albumin testing.
44ID. Urine protein/creatinine ratio
467A 24 hour urine protein output
467E Urine protein level
467H Random urine protein level
46N3. Urine total protein
46N6. 24 hour urine albumin output*
46N7. Urine protein/creatinine index
One code that was relevant was omitted:
46TD. Urine microalbumin:creatinine ratio
The NDA v6.5 included three codes not found in the QOF clusters, from the Read hierarchy under 44J.. *Blood urea/renal function*

44J6.	Albumin excretion rate
44J7.	Albumin / creatinine ratio
44JG.	Overnight albumin excretion rate

3.5 Eye Check (7.5% difference after correction for exception reporting)

Even after the results are corrected for exception coding, the NDA and the QOF reported significantly different results. The clinical intent of the NDA and the QOF retinopathy indicators were essentially the same: to look for evidence of retinopathy screening in patients' records but there were significant differences in the two sets of codes used by the reports. They can probably explain most of the difference between the two reports.

Both clusters are open to criticism because they included codes that might be legitimately recorded in a patient's notes for reasons other than proper retinopathy screening (see table 4).

Table 4. Examples of codes appearing in QOF and NDA code clusters that are not specific indicators of a completed retinopathy screening process

1.	**Read V2**
	In QOF and NDA
2BBG.	Retinal abnormality - non-diabetes
2BBN.	Myelinated retinal nerve fibres
2BBZ.	O/E - retinal inspection NOS
2BBb.	O/E - fundus not adequately seen
	QOF only
9N2U.	Seen by optician
9N2V.	Seen by optometrist
9N2e.	Seen by ophthalmologist
2.	**Read CTV3**
	In QOF and NDA
2BBr.	Impaired vision due to diabetic retinopathy
XaPen	Impaired vision due to diabetic retinopathy
XaJTO	O/E - fundus not adequately seen
XaBLk	Direct fundoscopy following mydriatic
XaFrP	Indirect fundoscopy following mydriatic
	In QOF only
9N2U.	Seen by optometrist (synonym: seen by optician)
XaATf	Seen by ophthalmologist

There are also codes that may reasonably be assumed to indicate diabetic retinopathy screening that do not appear in both audit's code clusters (see table 5).

Table 5. Read codes in the clusters for eye checks that imply a retinopathy screening process not found in the both audits' code clusters
1. QOF eye check codes not found in NDA
Read V2 8HBD. Retinopathy follow up 8HBG. Diabetic retinopathy 12 month review 8HBH. Diabetic retinopathy 6 month review 2BB..% O/E - retinal inspection - *some child codes of 2BB..* 2BBk. O/E - right eye stable treated proliferative diabetic retinopathy 2BBl. O/E - left eye stable treated proliferative diabetic retinopathy 2BBo. O/E - sight threatening diabetic retinopathy
Note: it is not clear if all these 2BB..% or 3128.% codes existed in 2009-10 because the QOF rules specify all child codes using the *nnnn%* convention rather than listing individual codes as the NDA does. So the impact is unclear but the QOF now counts several relevant codes that were not in the NDA cluster including:
Read CTV3 3129. Eye fundus photography XaJLa Diabetic retinopathy 12 month review XaJLb Diabetic retinopathy 6 month review XaEUK Retinopathy follow up
2. NDA includes codes not found in QOF
Read V2 None **Read CTV3** XaPen Impaired vision due to diabetic retinopathy

An analysis of the data received would be required to define the impact of the code differences on the overall results but is not possible because the QOF data is extracted as aggregate numbers for each individual indicator.

The different age range that the NDA and QOF report may be responsible for some of the difference in the results but the impact is probably small. Children under 17 years of age may receive diabetic retinopathy screening in secondary care and because coding by the practice is not incentivised the electronic patient record in primary care may not include coded records of the screening. There are only 24000 children with diabetes and only those over the age of 12 are eligible for retinopathy screening.

3.6 Smoking Status (5.2% difference after correction for exception reporting)

The QOF smoking data comes from a single complex indicator that extracts aggregated data on smoking status for a population with one or more of a group of long term conditions of which diabetes is only one. It looks separately at specific age groups and categories of non-smokers. It seems very likely that this is the cause of most, if not all, of the difference between the two results.

The smoking indicator for QOF for patients with diabetes is included in Smoking 3 ("The percentage of patients with any or any combination of the following conditions: coronary heart disease, stroke or TIA, hypertension, diabetes, COPD, asthma, CKD, schizophrenia, bipolar affective disorder or other psychoses whose notes record smoking status in the previous 15 months."). The aggregate nature of the QOF data makes it impossible to separate out the results for diabetes patients alone.

The diabetes component of the QOF Smoking 3 denominator is similar to the other diabetes indictators except that the 9h4..% Exception reporting: diabetes quality indicator codes are not included in the code set. The diabetes resolved codes are included and the age range of the cohort still excludes those under 17. Patients with specific smoking exception codes are also excluded (9hG1. and 9hG0.) or have been recently registered or diagnosed.

The QOF numerator calculation is complicated. It includes:

1. Any patient that has, as the most recent smoking status, a status of 'current smoker' and that it has been recorded in the last 15 months.
2. Any patient aged over 25 that has a latest smoking status of 'never smoked' which has been recorded after the diagnosis date AND after the patient's 25th birthday.
3. Any patient aged 25 or under that has a latest smoking status of 'never smoked' which has been recorded in the last 15 months.
4. Any patient that has, as the most recent smoking status, a status of 'ex-smoker'.
5. Any patient that has a latest smoking status of 'ex-smoker' which has been recorded in the last 15 months
6. Any patient that has a latest smoking status of 'ex-smoker' and has a smoking status of 'ex-smoker' recorded in three consecutive years ending at the date the latest recording of 'ex-smoker' WITHOUT a later smoking status of 'smoker' recorded.

Each rule uses a different smoking code cluster.

The NDA numerator is very simple. It looks for the latest smoking status code recorded in the audit period and uses just one cluster. The codes are 137..% *Tobacco consumption* (except 137m.), 68T.. *Tobacco usage screening* and 137K0 *Recently stopped smoking.*

It seems very likely that this explains much, if not all, of the difference between the two audit results but the differences in denominator and numerator specification make meaningful comparison of the two sets of audit data impossible.

3.7 Serum Creatinine (2.0% difference after correction for exception reporting)

The difference between the results of the NDA and the QOF (without exception coding) was the highest of the lower 6 indicators at 2%. There was a coding difference that may explain why it was slightly higher than the average of theother five.

The NDA only included codes for serum creatinine while the QOF included codes for estimated glomerular filtration (eGFR) rate as well and a practice may have succeed in QOF by recording a code for either concept. Where patients were looked after by secondary care, such as patients with diabetic nephropathy or type 1 diabetes, they are likely to have these measurements carried out in hospital. The results of investigations carried out there are usually reported to the practice by letter rather than electronically directly from the laboratory. While a practice may transcribe the more useful eGFR results from a letter from hospital, they have no incentive to transcribe the serum creatinine as well.

3.8 Foot Examination

Lower levels of achievement were recorded in the NDA foot screening assessments (Type 1 – 67.8%, Type 2 – 85.2%) than in the QOF Vascular (DM 9) and Neuropathy(DM 10) assessments (91.1% and 90.8%). The clinical intent of the NDA foot examination indicator is the same as the combined result for DM9 and 10, which should, all other things being equal, produce better results in the NDA than either DM9 or 10 alone. However if exception codes are ignored the difference reduces to less than 1% for each QOF indicator.

The demographic profile of the NDA denominator cohorts includes patients under 17 who largely have type 1 diabetes and are managed in secondary care. They may receive all their diabetic foot examinations in secondary care and because coding by the practice is not incentivised, the data on these patients in primary care records is likely to be incomplete. However, this represents a relatively small number of patients most of whom are ineligible for foot screening.

Analysis of the code clusters and query logic for each audit suggests that they should produce very similar results for their numerators. Although there are differences in the code clusters, they probably have only a small impact on the results.

Table 5. Read code differences between the QOF and the NDA foot examination indicators
The following Read Codes are included in the NDA audit but not in QOF (generic foot assessment rather than specific vascular or neuropathy testing concepts):
Read V2: 66AE. Feet examination 66AW. Diabetic Foot Risk Assessment 66Ab. Diabetic Foot Examination 2G5A – 2G5L diabetic foot at risk codes – not specifically a record of neuropathy or vascular testing being carried out on the date the code was entered
Read CTV3: 66Aq. equivalent CTV code is XaPQH 24FZ. O/E Left Leg Pulses NOS 24EZ. O/E Right Leg Pulses NOS) XaBLF, XABLH, XalqY, XalqZ, XaBLf, XaBLg, XaleH, Xalel (foot at risk codes) 311A. CTV equivalent – XaluE – non QOF code XaleT Diabetic Foot Examination
There are no Read V2 codes in the QOF that do not appear in the NDA. The following Read CTV3 are in the QOF but not in the NDA:

XaJD2	Left posterior Tibial Pulse abnormal
XaJvl	Left Posterior Tibial Pulse normal
Xa7sn	Posterior tibial pulse present
Xa7so	Dorsalis pulse present
Xa7sp	Peripheral pulse absent
Xa7sx	Posterior tibial pulse absent
XaYBz	Right posterior tibial pulse absent
XaYBx	Left posterior tibial pulse absent
Xa7sy	Dorsalis pulse absent
XaYBn	Right dorsalis pedis pulse absent
XaYBm	Left dorsalis pedis pulse absent
XaBmv	*Foot pulses absent*
XaPQH	*Diabetic foot screen*
XaIRF	10g monofilament sensation absent
XaJO9	replaces 9NND
XaIQS	replaces 8H7r
29B1.	Tactile sensation normal
29B21	Anaesthesia of the extremes
29B20	Anaesthesia of the legs
29B3.	hypothesia present

4. Background Information

4.1 Background of the Data Collections

National Diabetes Audit

The National Diabetes Audit (NDA) is an annual audit, commissioned and sponsored by the Healthcare Quality Improvement Partnership (HQIP), which aims to measure the quality of care received by people with diabetes in England and Wales. The NDA (2009/10) was the seventh annual report presenting the key national findings in all age groups.

The NDA collects demographic and observational data for people with diabetes from both primary care and secondary care in England. The NDA (2009/10) audited diabetes registrations in primary and secondary care and comprised data from 1,929,985 persons with diabetes - 1,881,701 from primary care +/- secondary care, and 48,284 from secondary care alone. 17,796 records (0.9%) were from people under 16 years old. Primary care data came from 6507 practices (81%) in England.

Quality and Outcomes Framework

The QOF was introduced in 2003 as part of the General Medical Services Contract. It is a voluntary incentive scheme for GP practices in the UK, offering a financial reward to practices who achieve the highest level of patient care. QOF contains groups of indicators, against which practices score points according to their level of achievement. The QOF gives an indication of the overall achievement of a practice through a points system. It is not about performance management, but resourcing, incentivising and rewarding good practice. The final payment is adjusted to take account of the practice list size and prevalence. The data is collected and published annually.

National Institute for Health and Clinical Excellence and the Health and Social Care Information Centre

The National Institute for Health and Clinical Excellence (NICE) is responsible for producing clinical guidelines for healthcare. In April 2009, NICE also became responsible for managing an independent and transparent approach to developing the QOF clinical and health improvement indicators. The Health and Social Care Information Centre (HSC IC) QOF Business Rules team, with the help of clinical informaticians, work closely with NICE and NHS Employers to develop and produce the set of Read codes and logical rules that are used to extract the data that specifies achievement in QOF indicators. The indicators and code clusters compared in this report from QOF 2009/10 and therefore were developed before NICE and the HSC IC were involved in the process.

The NDA team at the HSC IC, with the clinical leads from partners Diabetes UK, seek to ensure that the NDA data set and extraction rules produce data that accurately produces results that report on the completion of care processes following NICE guidelines.

4.3 Creating the Indicators

Read Codes

Read Codes are computer-readable coded thesauruses of clinical terms. There are two versions in use in the United Kingdom (Read V2 and CTV3). Each item in the Read code set has a textual term and a alphanumeric, computer readable code (e.g. type 1 diabetes mellitus – C10E.). They are used by clinicians to record patient diagnoses, symptoms, findings and procedures in general practice computer systems where there is a need for the computer system to be able to process the data items. Patient data is also recorded on free text and on scanned images of letters and reports. The

benefit of using Read codes to record an item in the patient's record is that a computer search is able to find, count and export the data.

The queries used in both the QOF and the NDA search for specific Read Codes. Some of the Read Code sets for the QOF and the NDA are the same, e.g. the NDA care process indicator for BMI and the QOF indicator DM 2, but some are different.

National Diabetes Audit

Each year, Primary Care Information Services (PRIMIS) review and test the set of Read codes produced by the NDA. These are checked against the current QOF business rules and any new business rules in the QOF may be added into the NDA. The specification is also sent to Open Exeter where the validation and import rules are updated. This is to ensure that only the Read codes in the code set are accepted in the extraction process and that the data collected falls within realistic bounds.

Once the queries have been designed, data is extracted from a number of practices to test the functionality of the queries. This ensures that the queries have been designed correctly and that they are extracting the correct data.

Quality and Outcomes Framework

Before new indicators become part of QOF the business rules go through a four country review process which includes clinicians, system suppliers, the Department of Health (DH), NHS Employers and others. The indicators must also be negotiated into QOF each year by NHS Employers, on behalf of the DH, and the General Practitioners Committee (GPC) of the British Medical Association (BMA). Once negotiations are complete, the business rules are signed off by all parties and sent to NHS Connecting for Health.

NICE now have the responsibility for reviewing existing indicators, supported by the HSC Information Centre. This may lead to a change in code clusters and / or query logic. Some diabetes indicators that were live in 2009/2010 have been retired and replaced, others have been reviewed. Two important recent changes have been:

- For 2011/12, indicator DM9 was replaced with indicator DM29: "*The percentage of patients with diabetes with a record of a foot examination and risk classification: 1) low risk (normal sensation, palpable pulses), 2) increased risk (neuropathy or absent pulses), 3) high risk (neuropathy or absent pulses plus deformity or skin changes or previous ulcer) or 4) ulcerated foot within the preceding 15 months*".

- For 2012/13, the diabetes register was altered. DM19 was replaced with DM 32: "*The practice can produce a register of all patients aged 17 years and over with diabetes mellitus, which specifies the type of diabetes where a diagnosis has been confirmed.*"

Connecting for Health test and certify the data extraction programmes of all the system suppliers to ensure the business rules have been followed and that all the GP system suppliers are extracting the data in a consistent manner.

4.4 Data Extraction

National Diabetes Audit

Participation in the NDA is not mandatory; practices are invited individually each year. The NDA raises awareness of the audit amongst all (approximately) 8300 GP practices and 151 PCTs in England, writing to each individually to describe the objectives and the processes involved in the NDA. Practices can provide data manually or by automated extraction. They can also opt out of disclosing data; 82 practices opted out of the audit in 2009-2010. The letter also explains the details of the approval for the extraction of identifiable patient level data by the Secretary of State on advice from the Ethics and Confidentiality Committee of the National Information Governance Board for Health under NHS Act (2006) section 251. Section 251 allows the common law duty of confidentiality to be set aside in specific circumstances where anonymised information is not sufficient and where it is not practicable to obtain express consent from patients.

Read code data from participating practices involved in the NDA is extracted using Apollo Medical Service, TPP SystmOne or BMJ Informatica software. The data extraction occurs over a three month window and the data collected covers a 15 month period, from January to March of the following year in line with the QOF. Data collected is quality checked using either time series analysis or by comparison with the numbers from the QOF. The NDA team use data from the Medical Research Information Service (MRIS) to remove any patients who have died within the audit year from the dataset.

The data is used to calculate the numerator (number of patients who received the care process) and the denominator (number of patients with diabetes) for each care process and how many patients have received all nine of the care processes.

Quality and Outcomes Framework

For 2009/10, 8,305 GP practices in England were included in the published results, covering almost 100 per cent of registered patients in England. GP computer system suppliers are responsible for writing the software that extracts the QOF data according to the negotiated business rules and sending it to the Quality Management Analysis Service (QMAS). In 2013 QMAS will be replaced by the Calculating Quality Reporting Service (CQRS). The data are aggregated at practice level before they are extracted and are therefore effectively anonymised so there is no requirement for patient consent to the extraction. However it is then impossible to calculate how many patients have received all nine care processes.

Patients can be exception reported by their GP practice for valid reasons if, for example, they decline the practice offer of care or they are unsuitable for care (they may be terminally ill). This removes them from the indicator. QMAS receives a report of the number of exceptions made for each indicator and it is possible to add the number of patients with reported exceptions back into the dataset in order to make the QOF results for the combined prevalence of diabetes type 1 and 2 and care process completion more comparable to the NDA (see section 3.3).

4.5 Exception Reporting

(Taken from *Quality and Outcomes Framework guidance for GMS contract 2009-10*, March 2009, BMA and NHS Employers, p5-6)

The QOF includes the concept of exception reporting. This has been introduced to allow practices to pursue the quality improvement agenda and not be penalised, where, for example, patients do not attend for review, or where a medication cannot be prescribed due to a contraindication or side-effect.

The following criteria have been agreed for exception reporting:

A. patients who have been recorded as refusing to attend review who have been invited on at least three occasions during the preceding twelve months

B. patients for whom it is not appropriate to review the chronic disease parameters due to particular circumstances, for example terminal illness, extreme frailty

C. patients newly diagnosed within the practice or who have recently registered with the practice, who should have measurements made within three months and delivery of clinical standards within nine months, for example blood pressure or cholesterol measurements within target levels

D. patients who are on maximum tolerated doses of medication whose levels remain sub-optimal

E. patients for whom prescribing a medication is not clinically appropriate, for example those who have an allergy, another contraindication or have experienced an adverse reaction

F. where a patient has not tolerated medication

G. where a patient does not agree to investigation or treatment (informed dissent), and this has been recorded in their medical records

H. where the patient has a supervening condition which makes treatment of their condition inappropriate, for example cholesterol reduction where the patient has liver disease

I. where an investigative service or secondary care service is unavailable.

In the case of exception reporting on criteria A and B this would apply to the disease register and these patients would be subtracted from the denominator for all other indicators. For example, in a practice with 100 patients on the coronary heart disease (CHD) disease register, in which four patients have been recalled for follow-up on three occasions but have not attended and one patient has become terminally ill with metastatic breast carcinoma during the year, the denominator for reporting would be 95. This would apply to all relevant indicators in the CHD set.

In addition, practices may exception-report patients relating to single indicators, for example a patient who has heart failure due to left ventricular dysfunction (LVD) but who is intolerant of ACE inhibitors could be exception-reported. This would again be done by removing the patient from the denominator.

Practices should report the number of exceptions for each indicator set and individual indicator. Exception codes have been added to systems by suppliers. Practices will not be expected to report why individual patients were exception-reported. Practices may be called on to justify why they have excepted patients from the QOF and this should be identifiable in the clinical record.

Exception reporting guidance can be found at the following location:
www.pcc.nhs.uk/uploads/QOF/october_06/qof212_exception_reporting_guidance_final.pdf

4.6 Diabetes Resolved Codes

CTV3 has 24 patient condition resolved codes including epilepsy, hypertension, asthma, osteoporosis, atrial fibrillation, depression, psychosis, schizophrenia and bipolar affective disorder, heart failure and proteinuria. Read V2 has 15 resolved codes covering all the same QOF disease areas.

The resolved codes have two specific roles in QOF:

- Some of the conditions in QOF can resolve: epilepsy, asthma, depression, atrial fibrillation, hypertension and psychosis are examples. Practices use the resolved codes to take patients

out of the QOF disease register when they no longer have active disease. I think this is straightforward.

- Sometimes diagnoses are added incorrectly (in error or as a result of mis-diagnosis). It would be inappropriate to delete the code from the record if the patient had received treatment on the basis of the diagnosis, although one system (to the best of my knowledge) does have a way of doing this without damaging the record. For the other systems (and EMIS practices who don't know how to delete problem titles), the resolved code is used to remove the patient from the QOF disease register. For clinical purposes the incorrect diagnostic code is removed from the list of active diseases. This is likely to be the most common reason for the code "diabetes resolved" code to be used, as an electronic record "fix" rather than because of a clinical recognition that a long term condition has been cured or resolved.

It is clear that the semantic meaning of the term "diabetes resolved" does not include the concepts of a mis-diagnosis or erroneous entry, but the tradition of making do with the best Read code available (concept of "code use" which is different to the concept of "code meaning") is well established and this is a good example.

There is an informatics question here – should GP systems re-design their problem management systems to allow for a better method for patients to be removed from QOF disease registers and errors to be corrected?

The clinical question appears to be whether ther is a need for a national guidance about when to stop healthcare for patients who no longer have a long term condition which might be said to have "resolved" due to curative treatment, other health events or the natural history of the condition, which we can then build into the QOF business rules.

4.7 Glossary

Table 6: Glossary of terms used in the report	
Aggregate data	Data which is made up by combining the data held in a number of records. In the QOF and NDA reports, aggregate data is made up of counts of the number of patients whose record contains specific data items. (See patient level data.)
Diabetes mellitus	Diabetes mellitus is a chronic condition characterised by elevated blood glucose levels. It is of diverse aetiology and pathogenesis, and should not be regarded as a single disease. Predominant types are type 1 diabetes and type 2 diabetes, diabetes secondary to other pancreatic disease or other endocrine disease, and diabetes of onset in pregnancy. The NDA looks at all forms of diabetes mellitus. The QOF looks at just type 1 and type 2.
Exception coding	See section 4.6
Estimated glomerular filtration rate (eGFR)	The glomerular filtration rate (GFR) is measure of kidney function. It is the rate at which blood is filtered by the glomeruli of the kidneys. Direct measurement the GFR is too complicated to be used in everyday medical practice. NICE recommend the use of the "four-variable MDRD formula" to calculate the estimated GFR (eGFR) on from a blood test of the serum creatinine (see below), and the patient's age, gender and ethnicity instead

	(Chronic kidney disease CG73).
General Practice Computer Systems	There are five companies that supply the General Practices computer systems that all practices in the United Kingdom use to keep patient records. Data may be recorded in Read codes (see below), free text or as scanned letters or reports. Coded data may be extracted automatically by or from all General Practice computer systems which make it suitable for NDA and the QOF. The systems all offer structured data entry that support the entry of coded data for specific care processes such as those of diabetes, and in particular the recoding of data required for the QOF but not necessarily for other purposes such as other audits.
Glomerulus	The kidneys have thousands of glomeruli which contain small networks of blood vessels where fluids and soluble materials in the blood are forced out of the capillaries into the urine. Normally large molecules such as haemoglobin and albumin are too big to pass through the pores in the glomerular membrane. The rate at which blood is filtered by the kidneys is referred to as the glomerular filtration rate.
Glycaemic control	The risk of heart and circulatory, kidney and eye complications of diabetes increases with the average level of blood glucose. A central aim of diabetes care is to enable patients to keep their blood glucose as low as possible by use of medication and lifestyle measures to. This is glycaemic control. It is measured by using a blood test called HbA1c (see below).
HbA1c	The predominant form of glycated haemoglobin, present in red blood cells, and formed when the normal haemoglobin A reacts non-enzymatically with glucose. As the reaction is slow and only concentration dependent, the amount of HbA1c formed is proportional only to the concentration of HbA and glucose. As HbA remains in the circulation for around three months, the amount of HbA1c present, expressed as a percentage of HbA, is proportional to the glucose concentration over that time and is the main measure of glycaemic control in diabetes.
Micro-albuminuria	Diabetes may cause damage to the glomeruli, the filtering system of the kidney, causing the leakage of larger molecules than normal from the blood into the urine. The presence in the urine of abnormal amounts of a small protein called albumin (albuminuria or micro-albuminuria), which is normally too big to leak through a healthy glomerular system, may indicate diabetic nephropathy (see below). The most sensitive way to detect small but significant of albumin in the urine (micro-albuminuria) is to test the urinary albumin:creatinine ratio (NICE Guideline, Chronic kidney disease, CG73). There are other causes of abnormal results, such as a urinary tract infection.
MIQUEST	MIQUEST (Morbidity Information Query and Export Syntax) provides a means of extracting data from all GP computer systems by specifying a syntax or language for developing the queries in a format which can be processed by them all. Data is extracted in a uniform format that allows for easier comparison of data from different systems.

Nephropathy	Diabetes affects the kidneys by damaging the glomeruli (see above). Diabetic kidney damage is known as diabetic nephropathy. It is a leading cause of kidney failure requiring dialysis in the United Kingdom. Progression to diabetic nephropathy is more likely if glycaemic control is poor or if the blood pressure or serum cholesterol remains high.
Neuropathy	This is disease of the peripheral nerves outside the central nervous system (brain and spine). It is a complication of diabetes and is more likely to occur when glycaemic control is poor. An early sign of neuropathy is loss of sensation in the feet.
Patient level data	This is data where the data extracted from individual patients' records remain linked to show that they are derived from a single patient. Typically each row in a table of patient level data refers to one individual. The data may or may not contain items that directly identify the patient such as name, address, date of birth or NHS number.
Proteinuria	This is the presence of protein in the urine. Albumin is the principal component of proteinuria in diabetic glomerular disease. The most sensitive measure of proteinuria is the urinary albumin:creatinine ratio. There are many possible causes of proteinuria not relate to diabetes.
Read codes	Read codes are the standard clinical hierachical terminology systems used in General Practice in the United Kingdom. Version 2 and version 3 (CTV3) are currently in use in different computer systems. The codes support detailed clinical encoding of multiple patient phenomena including: occupation; social circumstances; ethnicity and religion; clinical signs, symptoms and observations; laboratory tests and results; diagnoses; diagnostic, therapeutic or surgical procedures performed; and a variety of administrative items (e.g. whether a screening recall has been sent and by what communication modality). Clinical data extracted for the NDA and the QOF is restricted to Read codes recorded in electronic patient records.
Retinopathy	This is disease of the retina, the layer at the back of the eye which detects light. Patients with diabetes are at an increased risk of certain types of disease of the retina and diabetes is the single largest cause of blindness before old age. Early detection by annual retinal screening and treatment can prevent loss of sight.
Serum cholesterol level	Serum is the fluid which remains after removal of the cells from the blood. Cholesterol is a type of fat found in the blood serum. Increased levels, along with elevated blood glucose and blood pressure, increase the risk of developing disease of large blood vessels such as coronary artery disease, especially in patients with diabetes where blood vessel disease (or vasculopathy – see below) is one of the major causes of morbidity and death. Regular monitoring allows the level of cholesterol and the risk of complications of diabetes to be reduced.
Serum creatinine level	Serum is the fluid which remains after removal of the cells from the blood. The level of creatinine in the serum is an indicator of kidney function, rising as a result of kidney damage.

Urine albumin test	The NICE guideline Chronic kidney disease (CG73) specifies that the albumin:creatinine ratio (ACR) as the gold standard of measurement of urine albumin excretion (comparing albumin to creatinine concentration allows for differences in urine concentration). There are other, less accurate or sensitive, means of testing urine albumin, e.g. urine dipstick tests give a measurement of urine albumin based on the change in colour of a reagent soaked pad on a stick dipped in a urine sample, and the urine protein:creatinine ratio.
Urine albumin:creatinine ratio	The NICE guideline Chronic kidney disease (CG73) specifies that the albumin:creatinine ratio (ACR) as the gold standard of measurement of urine albumin excretion (comparing albumin to creatinine concentration allows for differences in urine concentration). The assay is carried out in the laboratory, ideally on a first pass urine sample.
Vasculopathy	Patients with diabetes are at increased risk of disease of large (macro-vascular) and small (micro-vascular) disease. Macro-vascular disease leads to the blockage of large arteries throughout the body. There are several reversible risk factors: poor glycaemic control, raised blood pressure, cholesterol and smoking. The presence of peripheral vascular disease, blockage of arteries in the pelvis and legs, can be assessed by examination of the pulses in the feet.

4.8 Read Codes That Count Towards Achievement (Read V2)

For ease of comparison only Read V2 codes are listed here. For a comparison of Read CTV3 codes, refer to the National Clinical Audit Support Programme (NCASP) National Diabetes Audit, Diabetes Query Set (MiQuest) 2009-10 v6.5 and the New GMS Contract QOF Implementation Dataset and Business Rules - Diabetes Mellitus Indicator Set v16 (see references).

Read Code	Description	NDA - Weight corrected for height as Body Mass Index or BMI	QOF - DM 2:The percentage of patients with diabetes whose notes record BMI in the previous 15 months
22K..	BMI - Body mass index	✓	✓
22K1.	Body mass index normal K/M2	✓	✓
22K2.	Body mass index high K/M2	✓	✓
22K3.	Body mass index low K/M2	✓	✓
22K4.	Body mass index index 25-29 – overweight	✓	✓
22K5.	Body mass index 30+ - obesity	✓	✓
22K6.	Body mass index less than 20	✓	✓
22K7.	Body mass index 40+ - severely obese	✓	✓
22K8.	Body mass index 20-24 – normal	✓	✓
Read Code	**Description**	**NDA - Blood pressure**	**QOF - DM 11: The percentage of patients with diabetes who have a record of the blood pressure in the previous 15 months**
246..	O/E - blood pressure reading	✓	✓
2460.	O/E - BP unrecordable	✓	
2461.	O/E - BP reading very low	✓	✓
2462.	O/E - BP reading low	✓	✓
2463.	O/E - BP borderline low	✓	✓
2464.	O/E - BP reading normal	✓	✓
2465.	O/E - BP borderline raised	✓	✓
2466.	O/E - BP reading raised	✓	✓
2467.	O/E - BP reading very high	✓	✓
2468.	O/E - BP reading:postural drop	✓	
2469.	O/E - Systolic BP reading	✓	✓
246A.	O/E - Diastolic BP reading	✓	✓
246B.	O/E - BP stable	✓	✓
246C.	Lying blood pressure reading	✓	✓
246D.	Standing blood pressure reading	✓	✓
246E.	Sitting blood pressure reading	✓	✓

246F.	O/E - blood pressure decreased	✓	✓
246G.	O/E - BP labile	✓	✓
246H.	O/E - Arterial pressure index normal	✓	
246I.	O/E - Arterial pressure index abnormal	✓	
246J.	O/E - BP reading: no postural drop	✓	✓
246K.	Target systolic blood pressure	✓	
246L.	Target diastolic blood pressure	✓	
246M.	White coat hypertension	✓	
246N.	Standing systolic blood pressure	✓	✓
246P.	Standing diastolic blood pressure	✓	✓
246Q.	Sitting systolic blood pressure	✓	✓
246R.	Sitting diastolic blood pressure	✓	✓
246S.	Lying systolic blood pressure	✓	✓
246T.	Lying diastolic blood pressure	✓	✓
246V.	Average 24 hour diastolic blood pressure		✓
246W.	Average 24 hour systolic blood pressure		✓
246X.	Average day interval diastolic blood pressure		✓
246Y.	Average day interval systolic blood pressure		✓
246Z.	O/E-blood pressure reading NOS	✓	✓
246a.	Average night interval diastolic blood pressure		✓
246b.	Average night interval systolic blood pressure		✓
246c.	Average home diastolic blood pressure		✓
246d.	Average home systolic blood pressure		✓
246e.	Ambulatory systolic blood pressure	✓	✓
246f.	Ambulatory diastolic blood pressure	✓	✓
246g.	Self measured blood pressure reading		✓

Read Code	Description	NDA - Smoking status review	QOF - Smoking 3: The percentage of patients with any or any combination of the following conditions: coronary heart disease, stroke or TIA, hypertension, diabetes, COPD, CKD, asthma, schizophrenia, bipolar affective disorder or other psychoses whose notes record smoking status in the previous 15 months
137..	Tobacco consumption	✓	
1371.	Non-smoker (& [never smoked tobacco])	✓	✓
1372.	(Trivial smoker - < 1 cig/day) or (occasional smoker)	✓	✓
1373.	Light cigarette smoker (1-9 cigs/day)	✓	✓
1374.	Moderate cigarette smoker (10-19 cigs/day)	✓	✓
1375.	Heavy cigarette smoker (20-39 cigs/day)	✓	✓
1376.	Very heavy cigarette smoker (40+ cigs/day)	✓	✓
1377.	Ex-trivial smoker (<1/day)	✓	✓
1378.	Ex-light smoker (1-9/day)	✓	✓
1379.	Ex-moderate smoker (10-19/day)	✓	✓
137A.	Ex-heavy smoker (20-39/day)	✓	✓
137B.	Ex-very heavy smoker (40+/day)	✓	✓
137C.	Keeps trying to stop smoking	✓	✓
137D.	Admitted tobacco cons untrue ?	✓	✓
137E.	Tobacco consumption unknown	✓	
137F.	Ex-smoker - amount unknown	✓	✓
137G.	Trying to give up smoking	✓	✓
137H.	Pipe smoker	✓	✓
137I.	Passive smoker	✓	
137J.	Cigar smoker	✓	✓
137K.	Stopped smoking	✓	✓

137L.	Current non-smoker	✓	
137M.	Rolls own cigarettes	✓	✓
137N.	Ex-pipe smoker	✓	✓
137O.	Ex-cigar smoker	✓	✓
137P.	Smoker (& cigarette)	✓	✓
137Q.	Smoking: [started] or [restarted]	✓	✓
137R.	Smoker	✓	✓
137S.	Ex smoker	✓	✓
137T.	Date ceased smoking	✓	✓
137U.	Not a passive smoker	✓	
137V.	Smoking reduced	✓	✓
137W.	Chews tobacco	✓	
137X.	Cigarette consumption	✓	✓
137Y.	Cigar consumption	✓	✓
137Z.	Tobacco consumption NOS	✓	✓
137a.	Pipe tobacco consumption	✓	✓
137b.	Ready to stop smoking	✓	✓
137c.	Thinking about stopping smoking	✓	✓
137d.	Not interested in stopping smoking	✓	✓
137e.	Smoking restarted	✓	✓
137f.	Reason for restarting smoking	✓	✓
137g.	Cigarette pack-years	✓	
137h.	Minutes from waking to first tobacco consumption	✓	✓
137j.	Ex-cigarette smoker	✓	✓
137k.	Refusal to give smoking status	✓	✓
137l.	Ex roll-up cigarette smoker	✓	✓
68T..	Tobacco usage screening	✓	
137K0	Recently stopped smoking	✓	
Read Code	**Description**	**NDA - Blood glucose levels (HbA1c)**	**QOF - DM 5: The percentage of patients with diabetes who have a record of HbA1c or equivalent in the previous 15 months**
42W..	Hb. A1C - diabetic control	✓	✓
42W1.	Hb. A1C < 7% - good control	✓	✓
42W2.	Hb. A1C 7-10% - borderline	✓	✓
42W3.	Hb. A1C > 10% - bad control	✓	✓
42W4.	HbA1c level (DCCT aligned)	✓	✓
42W5.	Haemoglobin A1c level - IFCC standardised	✓	✓
42WZ.	Hb. A1C - diabetic control NOS	✓	✓
42c..	HbA1 - diabetic control	✓	✓
42c0.	HbA1 < 7% - good control	✓	✓

42c1.	HbA1 7 - 10% - borderline control	✓	✓
42c2.	HbA1 > 10% - bad control	✓	✓
42c3.	HbA1 level (DCCT aligned)	✓	✓
44TB.	Haemoglobin A1c level		✓
44TC.	Haemoglobin A1 level		✓
44TL.	Total glycosylated haemoglobin level		✓
Read Code	**Description**	**NDA - Urinary albumin test (corrected for urinary creatinine)**	**QOF - DM 13: The percentage of patients with diabetes who have a record of micro-albuminuria testing in the previous 15 months (exception reporting for patients with proteinuria)**
467A.	24 hour urine protein output		✓
467E.	Urine protein level		✓
467H.	Random urine protein level		✓
44J6.	Albumin excretion rate (ug/min)	✓	
44J7.	Albumin/creatinine ratio (mg/mmol)	✓	
44JG.	Overnight albumin excretion rate (ug/min)	✓	
46N3.	Urine total protein		✓
46N4.	Urine albumin	✓	✓
46N5.	24 hour urine protein excretion test		✓
46N6.	24 hour urine albumin output	✓	✓
46N7.	Urine protein/creatinine index		✓
46N8.	Urine microalbumin profile		✓
46W..	Urine microalbumin		✓
46W0.	Urine microalbumin positive		✓
46W1.	Urine microalbumin negative		✓
46W2.	Microalbumin excretion rate		✓
Read Code	**Description**	**Microalbuminuria/proteinuria diagnosis**	**Proteinuria excluded from QOF denominator**
C10EK	Type 1 diabetes mellitus with persistent proteinuria	✓	**Excluded from QOF**
C10EL	Type 1 DM with persistent Microalbuminuria	✓	
C10FL	Type 2 diabetes mellitus with persistent proteinuria	✓	**Excluded from QOF**
C10FM	Type 2 DM with persistent	✓	

	microalbuminuria		
R110.	[D]Proteinuria	✓	**Excluded from QOF**
R1100	[D]Albuminuria	✓	**Excluded from QOF**
R1101	Bence-Jones proteinuria		**Excluded from QOF**
R1102	Exercise proteinuria		**Excluded from QOF**
R1103	[D] Microalbuminuria	✓	**Excluded from QOF**
R110z	[D]Proteinuria NOS	✓	**Excluded from QOF**
K190X	[X]Persistent proteinuria, unspecified	✓	**Excluded from QOF**
Kyu5G	[X]Persistent proteinuria, unspecified	✓	**Excluded from QOF**
Read Code	**Description**	**NDA - Serum creatinine level**	**QOF - DM 22: The percentage of patients with diabetes who have a record of estimated glomerular filtration rate (eGFR) or serum creatinine testing in the previous 15 months**
44J3.	Serum creatinine	✓	✓
44J30	Serum creatinine abnormal	✓	✓
44J31	Serum creatinine low	✓	✓
44J32	Serum creatinine normal	✓	✓
44J33	Serum creatinine raised	✓	✓
44J3z	Serum creatinine NOS	✓	✓
44JC.	Corrected plasma creatinine level	✓	✓
44JD.	Corrected serum creatinine level	✓	✓
44JF.	Plasma creatinine level	✓	✓
451E.	GFR calculated abbreviated MDRD		✓
451F.	Glomerular filtration rate		✓
451G.	GFR calculated abbreviated MDRD adj for African Americ origin		✓
Read Code	**Description**	**Serum cholesterol level**	**DM 16: The percentage of patients with diabetes who have a record of total cholesterol in the previous 15 months**
44OE.	Plasma total cholesterol level	✓	✓
44P..	Serum cholesterol	✓	✓
44P1.	Serum cholesterol normal	✓	✓

44P2.	Serum cholesterol borderline	✓	✓
44P3.	Serum cholesterol raised	✓	✓
44P4.	Serum cholesterol very high	✓	✓
44PH.	Total cholesterol measurement	✓	✓
44PJ.	Serum total cholesterol level	✓	✓
Read Code	**Description**	**NDA - Eye check (retinopathy screening)**	**QOF - DM 21: The percentage of patients with diabetes who have a record of retinal screening in the previous 15 months**
2BB..	O/E - retinal inspection	✓	✓
2BB1.	O/E - retina normal	✓	✓
2BB2.	O/E - retinal vessel narrowing	✓	✓
2BB3.	O/E - retinal A-V nipping	✓	✓
2BB4.	O/E - retinal microaneurysms	✓	✓
2BB5.	O/E - retinal haemorrhages	✓	✓
2BB6.	O/E - retinal exudates	✓	✓
2BB7.	O/E - retinal vascular prolif.	✓	✓
2BB8.	O/E - vitreous haemorrhages	✓	✓
2BB9.	O/E - retinal pigmentation	✓	✓
2BBA.	Examination of retina	✓	✓
2BBB.	O/E - Right retina not seen	✓	✓
2BBC.	O/E - Left retina not seen	✓	✓
2BBD.	O/E - Right retina normal	✓	✓
2BBE.	O/E - Left retina normal	✓	✓
2BBF.	Retinal abnormality - diabetes related	✓	✓
2BBG.	Retinal abnormality - non-diabetes	✓	✓
2BBH.	Retinal drusen	✓	✓
2BBI.	O/E - no retinopathy	✓	✓
2BBJ.	O/E - no right diabetic retinopathy	✓	✓
2BBK.	O/E - no left diabetic retinopathy	✓	✓
2BBL.	O/E - diabetic maculopathy present both eyes	✓	✓
2BBM.	O/E - diabetic maculopathy absent both eyes	✓	✓
2BBN.	Myelinated retinal nerve fibres	✓	✓
2BBO.	O/E - Laser photocoagulation scars	✓	✓
2BBP.	O/E - right eye background diabetic retinopathy	✓	✓
2BBQ.	O/E - left eye background diabetic retinopathy	✓	✓

2BBR.	O/E - right eye preproliferative diabetic retinopathy	✓	✓
2BBS.	O/E - left eye preproliferative diabetic retinopathy	✓	✓
2BBT.	O/E - right eye proliferative diabetic retinopathy	✓	✓
2BBV.	O/E - left eye proliferative diabetic retinopathy	✓	✓
2BBW.	O/E - right eye diabetic maculopathy	✓	✓
2BBX.	O/E - left eye diabetic maculopathy	✓	✓
2BBY.	O/E - referable retinopathy	✓	✓
2BBZ.	O/E - retinal inspection NOS	✓	✓
2BBa.	O/E- non-referable retinopathy	✓	✓
2BBb.	O/E - fundus not adequately seen	✓	✓
2BBc.	O/E - No retinal laser photocoagulation scars		✓
2BBd.	O/E - Red reflex absent		✓
2BBe.	O/E - right retina partially assessable		✓
2BBf.	O/E - left retina partially assessable		✓
2BBg.	O/E - right retina fully assessable		✓
2BBh.	O/E - left retina fully assessable		✓
2BBi.	O/E - right eye no maculopathy		✓
2BBj.	O/E - left eye no maculopathy		✓
2BBk.	O/E - right eye stable treated prolif diabetic retinopathy		✓
2BBl.	O/E - left eye stable treated prolif diabetic retinopathy		✓
2BBm.	O/E - right eye clinically significant macular oedema		✓
2BBn.	O/E - left eye clinically significant macular oedema		✓
2BBo.	O/E - sight threatening diabetic retinopathy		✓
2BBp.	On examination right red reflex present		✓
2BBq.	On examination left red reflex present		✓
2BBr.	Impaired vision due to diabetic retinopathy	✓	✓
2BBs.	Retinal arteries silverwire		✓
3128.	Fundoscopy	✓	✓

31280	Fundoscopy normal		✓
31281	Fundoscopy abnormal		✓
31282	Dilated fundoscopy normal	✓	✓
31283	Camera fundoscopy	✓	✓
31284	Indirect fundoscopy following mydriatic	✓	✓
3128Z	Fundoscopy NOS	✓	✓
3129.	Eye fundus photography	✓	✓
312E.	Direct fundoscopy following mydriatic	✓	✓
312F.	Camera fundoscopy	✓	✓
312G.	Indirect fundoscopy following mydriatic	✓	✓
58C1.	Retinal photography	✓	✓
66AD.	Fundoscopy - diabetic check	✓	✓
68A7.	Diabetic retinopathy screening	✓	✓
68A8.	Digital retinal screening	✓	✓
8HBD.	Retinopathy follow up		✓
8HBG.	Diabetic retinopathy 12 month review		✓
8HBH.	Diabetic retinopathy 6 month review		✓
9N1v.	Seen in diabetic eye clinic	✓	✓
9N2U.	Seen by optician		✓
9N2V.	Seen by optometrist		✓
9N2e.	Seen by ophthalmologist		✓
9N2f.	Seen by retinal screener	✓	✓
9NNC.	Under care of retinal screener	✓	✓
Read Code	**Description**	**NDA - Foot check (vascular and nerve screen)**	**QOF - DM 9: The percentage of patients with diabetes with a record of the presence or absence of peripheral pulses in the previous 15 months & QOF - DM 10: The percentage of patients with diabetes with a record of neuropathy testing in the previous 15 months**
24E1.	O/E -R.-leg pulses all present	✓	✓
24E2.	O/E - R.femoral pulse present	✓	✓
24E3.	O/E - R.femoral pulse absent	✓	✓

24E4.	O/E -R.popliteal pulse present	✓	✓
24E5.	O/E - R.popliteal pulse absent	✓	✓
24E6.	O/E - R.post.tib.pulse present	✓	✓
24E7.	O/E - R.post.tib pulse absent	✓	✓
24E8.	O/E - R.dorsalis pedis present	✓	✓
24E9.	O/E - R.dorsalis pedis absent	✓	✓
24EA.	O/E - Absent right foot pulses	✓	✓
24EB.	O/E - right foot pulses present	✓	✓
24EC.	O/E - Right dorsalis pedis abnormal	✓	✓
24ED.	O/E - Right posterior tibial pulse abnormal	✓	✓
24EE.	O/E - Right dorsalis pedis normal	✓	✓
24EF.	O/E - Right posterior tibial pulse normal	✓	✓
24F1.	O/E - L.leg pulses all present	✓	✓
24F2.	O/E - L.femoral pulse present	✓	✓
24F3.	O/E - L.femoral pulse absent	✓	✓
24F4.	O/E -L.popliteal pulse present	✓	✓
24F5.	O/E - L.popliteal pulse absent	✓	✓
24F6.	O/E - L.post.tib.pulse present	✓	✓
24F7.	O/E - L.post.tib. pulse absent	✓	✓
24F8.	O/E - L.dorsalis pedis present	✓	✓
24F9.	O/E - L.dorsalis pedis absent	✓	✓
24FA.	O/E - Absent left foot pulses	✓	✓
24FB.	O/E - left foot pulses present	✓	✓
24FC.	O/E - left dorsalis pedis abnormal	✓	✓
24FD.	O/E - Left posterior tibial pulse abnormal	✓	✓
24FE.	O/E - left dorsalis pedis normal	✓	✓
24FF.	O/E - Left posterior tibial pulse normal	✓	✓
585V.	Left dorsalis pedis doppler pressure	✓	✓
585W.	Right dorsalis pedis doppler pressure	✓	✓
585X.	Left posterior tibial doppler pressure	✓	✓
585Y.	Right posterior tibial doppler pressure	✓	✓
585a.	ABPI - Ankle brachial pressure index	✓	✓
585b.	Left dorsalis pedis ABPI	✓	✓
585c.	Right dorsalis pedis ABPI	✓	✓
585d.	Left posterior tibial ABPI	✓	✓
585e.	Right posterior tibial ABPI	✓	✓
66Aq.	Diabetic foot screen	✓	✓
8H7r.	Refer to diabetic foot screener	✓	✓

9NND.	Under care of diabetic foot screener	✓	✓
29B1.	O/E - tactile sensation normal		✓
29B2.	O/E - anaesthesia present		✓
29B20	O/E - anaesthesia in legs		✓
29B21	O/E - anaesthesia of extremities		✓
29B3.	O/E - hypoaesthesia present		✓
29B7.	10g monofilament sensation present	✓	✓
29B8.	10g monofilament sensation absent	✓	✓
29B9.	10g monofilament sensation R foot abnormal	✓	✓
29BA.	10g monofilament sensation L foot abnormal	✓	✓
29BB.	10g monofilament sensation R foot normal	✓	✓
29BC.	10g monofilament sensation L foot normal	✓	✓
29BD.	10g monofil sensation plantar aspect gt toe L foot present	✓	✓
29BE.	10g monofil sensation plantar aspect mid toe R foot present	✓	✓
29BF.	10g monofil sensation plantar aspect mid toe L foot present	✓	✓
29BG.	10g monofil sensation plantar aspect lit toe R foot present	✓	✓
29BH.	10g monofil sensation plantar aspect lit toe L foot present	✓	✓
29BJ.	10g monofil sensat plantar aspect 1st met hd R foot present	✓	✓
29BK.	10g monofil sensat plantar aspect 1st met hd L foot present	✓	✓
29BL.	10g monofil sensation plantar aspect gt toe R foot present	✓	✓
29BM.	10g monofil sensation plantar aspect gt toe R foot absent	✓	✓
29BN.	10g monofil sensation plantar aspect gt toe L foot absent	✓	✓
29BP.	10g monofil sensation plantar aspect mid toe R foot absent	✓	✓
29BQ.	10g monofil sensation plantar aspect mid toe L foot absent	✓	✓
29BR.	10g monofil sensation plantar aspect lit toe R foot absent	✓	✓
29BS.	10g monofil sensation plantar aspect lit toe L foot absent	✓	✓

29BT.	10g monofil sensat plantar aspect 1st met hd R foot absent	✓	✓
29BV.	10g monofil sensat plantar aspect 1st met hd L foot absent	✓	✓
29H1.	O/E - vibration sense normal	✓	✓
29H2.	O/E - vibration sense reduced	✓	✓
29H3.	O/E - vibration sense absent	✓	✓
29H4.	O/E - Vibration sense of right foot abnormal	✓	✓
29H5.	O/E - Vibration sense of right foot normal	✓	✓
29H6.	O/E - Vibration sense of left foot abnormal	✓	✓
29H7.	O/E - Vibration sense of left foot normal	✓	✓
29H8.	O/E - vibration sense left foot reduced	✓	✓
29H9.	O/E - vibration sense right foot reduced	✓	✓
29HA.	O/E - Vibration sense of right foot absent	✓	✓
29HB.	O/E - Vibration sense of left foot absent	✓	✓
311A.	Monofilament foot sensation test	✓	✓
66Ab.	Diabetic foot examination	✓	
66Ac.	Diabetic peripheral neuropathy screening	✓	✓
66AE.	Feet examination	✓	
66AW.	Diabetic foot risk assessment	✓	
2G5A.	Right diabetic foot at risk	✓	
2G5B	Left diabetic foot at risk	✓	
2G5E.	Right diabetic foot at low risk	✓	
2G5F.	Right diabetic foot at moderate risk	✓	
2G5G.	Right diabetic foot at high risk	✓	
2G5H.	Right diabetic foot - ulcerated	✓	
2G5I.	Left diabetic foot at low risk	✓	
2G5J.	Left diabetic foot at moderate risk	✓	
2G5K.	Left diabetic foot at high risk	✓	
2G5L.	Left diabetic foot - ulcerated	✓	

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