Improving the quality of diabetes care: An audit tool for chronic kidney disease

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Citation: Milne N (2014) Improving the quality of diabetes care: An audit tool for chronic kidney disease. *Diabetes & Primary Care* **16**: 78–83

Article points

1. A semi-automated audit tool was developed at the author's practice that could be run on a weekly basis to identify people with diabetes in need of review (against a newly created protocol) relating to chronic kidney disease.
2. While reviewing data and acting upon findings was initially a time-consuming task, this is now a process that takes no more than 30 minutes a week.
3. The results indicate that there has been an important improvement in the quality of care.

Key words

- Audit
- Chronic kidney disease
- Quality of care

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In this article, the author describes how a significant event analysis at the Northenden Group Practice in South Manchester led to the development of a semi-automated audit tool that could be run on a weekly basis to identify people with diabetes in need of review (against a newly created protocol) relating to chronic kidney disease.

Chronic kidney disease (CKD) is present in up to a third of people with diabetes. (Middleton et al, 2006; New et al, 2007; Dreyer et al, 2009). A UK-based study suggested that the risk of developing CKD (stages 3, 4 and 5) in people with diabetes was eight times higher among women and over 12 times higher among men compared with those without diabetes (Hippisley-Cox and Coupland, 2010).

People diagnosed with these co-existing conditions have a significantly increased risk of morbidity, predominantly from cardiovascular disease and end-stage renal disease (NHS, 2011). In 2004, it was estimated that the total annual cost to the NHS for managing co-existing diabetes and CKD was £152 million for type 1 diabetes and £614 million for type 2 diabetes, and this is set to rise with increasing prevalences (Gordois et al, 2004).

It is well documented that clinical interventions can be effective in preventing the onset or progression of CKD in people with diabetes and the wider population (NICE, 2008; SIGN, 2010). Quality and Outcomes Framework (QOF) indicators for diabetes in 2014–15 include the use of an angiotensin-converting enzyme (ACE) inhibitor or angiotensin II receptor blocker (ARB) in people with diabetes who have clinical proteinuria or microalbuminuria, which is intended to facilitate this prevention or delay in progression (NHS Employers, 2014).

Just retired is an indicator relating to measuring the albumin-to-creatinine ratio (to detect the earliest stage of CKD) on at least an annual basis, which had a 50–90% achievement threshold (NHS Employers, 2014). This change to QOF is of some concern, particularly since the National Diabetes Audit, which is undertaken annually, demonstrated, in 2011–12, that of the nine care processes (excluding retinal screening), kidney surveillance had the lowest rate of administration in both type 1 and type 2 diabetes (Health and Social Care Information Centre, 2013).

Clearly, healthcare professionals need to be aware of the mortality and morbidity risks associated with a co-diagnosis of CKD and diabetes, and should strive to embrace the philosophy outlined in the NICE (2008) guidelines on CKD. These go beyond current and former QOF requirements and stress the importance of a holistic approach to management, including optimisation of risk factors for progressive CKD:

- Cardiovascular disease.
- Smoking.
- Hypertension.
- Poor glycaemic control.
- Suboptimal medicines management.

The challenge of addressing the latter two risk factors is heightened by the fact that among the oral antidiabetes agents and glucagon-like peptide-1 (GLP-1) receptor agonists, many require renal dose adjustment and some are contraindicated in CKD stage 3 or above (see *Table 1* and *Box 1*).

The Northenden Group Practice

The practice at which I work is based in South Manchester, with a population (predominantly Caucasian) of just over 11 000 patients. There is a high prevalence of diabetes (above both the local and

Table 1. Kidney-related dose adjustments, cautions and assessment recommendations in newer non-combination oral antidiabetes agents and glucagon-like peptide-1 receptor agonists.*

Agent	Dose adjustments, cautions and assessment recommendations	Reference
Dipeptidyl peptidase-4 inhibitors		
Alogliptin	No dose adjustment is required in mild renal impairment (CrCl >50 mL/min) In moderate renal impairment (CrCl ≥30 to ≤50 mL/min), a dose of 12.5 mg once daily should be prescribed In severe renal impairment (CrCl <30 mL/min) or ESRD requiring dialysis, a dose of 6.25 mg once daily should be prescribed; the agent should be used with caution in such individuals Assessment of renal function is recommended prior to initiation and should be done periodically thereafter	eMC (2014f)
Linagliptin	No dose adjustment is required	eMC (2013f)
Saxagliptin	No dose adjustment is required in mild renal impairment (CrCl >50 mL/min) The dose should be reduced to 2.5 mg once daily in moderate (CrCl ≥30 to ≤50 mL/min) or severe (CrCl <30 mL/min) renal impairment The agent should be used with caution in severe renal impairment Not recommended for people with ESRD requiring haemodialysis Assessment of renal function is recommended prior to initiation and should be done periodically thereafter	eMC (2013d)
Sitagliptin	No dose adjustment is required in mild renal impairment (CrCl ≥50 mL/min) In moderate renal impairment (CrCl ≥30 to <50 mL/min), a dose of 50 mg once daily should be prescribed In severe renal impairment (CrCl <30 mL/min) or ESRD requiring haemodialysis or peritoneal dialysis, a dose of 25 mg once daily should be prescribed Assessment of renal function is recommended prior to initiation and should be done periodically thereafter	eMC (2013e)
Vildagliptin	No dose adjustment is required in mild renal impairment (CrCl ≥50 mL/min) In moderate (CrCl ≥30 to <50 mL/min) or severe (CrCl <30 mL/min) renal impairment or ESRD, the recommended dose is 50 mg once daily The agent should be used with caution in people with ESRD on haemodialysis	eMC (2013a)
Sodium–glucose cotransporter 2 inhibitors		
Canagliflozin	No dose adjustment is required in people with an eGFR of ≥60 to <90 mL/min/1.73 m² or a CrCl of ≥60 to <90 mL/min The agent should not be initiated in people with an eGFR <60 mL/min/1.73 m² or a CrCl <60 mL/min In people tolerating the agent whose eGFR falls persistently below 60 mL/min/1.73 m² or whose CrCl falls persistently below 60 mL/min, the dose should be adjusted to or maintained at 100 mg once daily The agent should be discontinued when eGFR is persistently below 45 mL/min/1.73 m² or CrCl is persistently below 45 mL/min This agent should not be used in ESRD or in people on dialysis Assessment of renal function is recommended prior to initiation and at least annually thereafter (at least two to four times per year for renal function approaching moderate renal impairment)	eMC (2014d) eMC (2014e)
Dapagliflozin	No dose adjustment is required in mild renal impairment (CrCl ≥60 mL/min or eGFR ≥60 mL/min/1.73 m²) The agent is not recommended in moderate or more severe renal impairment (CrCl <60 mL/min or eGFR <60 mL/min/1.73 m²) Assessment of renal function is recommended prior to initiation and at least annually thereafter (at least two to four times per year for renal function approaching moderate renal impairment)	eMC (2014c)
Glucagon-like peptide-1 receptor agonists		
Exenatide twice daily	No dose adjustment is required in mild renal impairment (CrCl ≥50 mL/min) In moderate renal impairment (CrCl ≥30 to <50 mL/min), dose escalation from 5 µg to 10 µg should proceed conservatively The agent is not recommended for use in severe renal impairment (CrCl <30 mL/min) or ESRD	eMC (2014b)
Exenatide once weekly	No dose adjustment is required in mild renal impairment (CrCl ≥50 mL/min) The agent is not recommended for use in moderate (CrCl ≥30 to <50 mL/min) or severe (CrCl <30 mL/min) renal impairment or ESRD	eMC (2014a)
Liraglutide	No dose adjustment is required in mild renal impairment (CrCl ≥60 mL/min) The agent is not recommended in moderate (CrCl ≥30 to <60 mL/min) or severe (CrCl <30 mL/min) renal impairment or in ESRD	eMC (2013g)
Lixisenatide	No dose adjustment is required in mild renal impairment (CrCl ≥50 mL/min) The agent should be used with caution in moderate renal impairment (CrCl ≥30 to <50 mL/min) The agent is not recommended in severe renal impairment (CrCl <30 mL/min) or in ESRD	eMC (2013b) eMC (2013c)

*The information presented in this table was up to date as of 20 March 2014 and has been extracted from summaries of product characteristics. For full details of dosing considerations and stipulations for each agent, please refer to the prescribing information.

CrCl=creatinine clearance; eGFR=estimated glomerular filtration rate; eMC=electronic Medicines Compendium; ESRD=end-stage renal disease.

Box 1. Definitions of CKD stages 3 and above.

CKD stage 3a
eGFR, 45–59 mL/min/1.73 m^2

CKD stage 3b
eGFR, 30–44 mL/min/1.73 m^2

CKD stage 4
eGFR, 15–29 mL/min/1.73 m^2

CKD stage 5
eGFR, <15 mL/min/1.73 m^2 or on dialysis

Source: The Renal Association website – http://bit.ly/1muqcQf (accessed 20.03.14)

CKD=chronic kidney disease; eGFR=estimated glomerular filtration rate.

national average), which the practice considers is due to active initiation of cardiovascular risk assessments and proactive screening for diabetes.

Diabetes care within the practice is led by one nurse under the guidance of a GP with a special interest in diabetes and, as *Figure 1* illustrates, QOF performance at the start of the project was above both the local and the national average. However, despite this good performance in regard to the QOF data, a significant event analysis within the practice (as outlined below) highlighted that when a patient had a decline in renal function outside of a diabetes review, and was seen by other members of the practice healthcare team, medication optimisation was not always taking place.

Significant event analysis

Case details

Mr M was seen for his annual diabetes review and his renal function (estimated glomerular filtration rate [eGFR], 72 mL/min/1.73 m^2) and glycaemic control (HbA_{1c}, 51 mmol/mol [6.8%]) were satisfactory. His antidiabetes regimen was confirmed as follows:

- Metformin 1 g twice daily.
- Gliclazide 160 mg twice daily.
- Sitagliptin 100 mg twice daily.

It was agreed that Mr M would attend for his next review in a year's time, unless he was experiencing any concerns.

Follow-up

Four months later, Mr M became unwell with a problem not related to diabetes and his eGFR had dropped to 28 mL/min/1.73 m^2. His medications were not adjusted. It was only a chance conversation in the waiting area of the practice with his wife that alerted the diabetes team to the fact that he had been unwell and was awaiting a renal clinic appointment.

Actions taken

Significant event analysis of this case led us to ask the question of how many medication adjustments for other patients we might be able to instigate more rapidly, to ensure that optimal care was continuously being delivered rather than being implemented only at the formal diabetes review. It also led us to ask if it would even be feasible for one nurse to keep abreast of changing blood results and other clinical measurements in over 600 individuals with diabetes.

There was a clear need to establish and trial a semi-automated audit tool to help facilitate this type of ongoing care, and one that would ideally encompass patients within both primary and secondary care.

To begin the process, a new practice protocol (based on national guidance [NICE, 2008*; SIGN, 2010]) was established for all people with CKD stage 3 or above. In the protocol (see *Box 2*), individuals were split into three sub-groups: those with an eGFR of 46–60 mL/min/1.73 m^2; those with an eGFR of 31–45 mL/min/1.73 m^2; and those with an eGFR <30 mL/min/1.73 m^2.

*The publication of updated NICE guidance on chronic kidney disease is expected in July 2014 (http://bit.ly/1j2BlEH [accessed 20.03.14]).

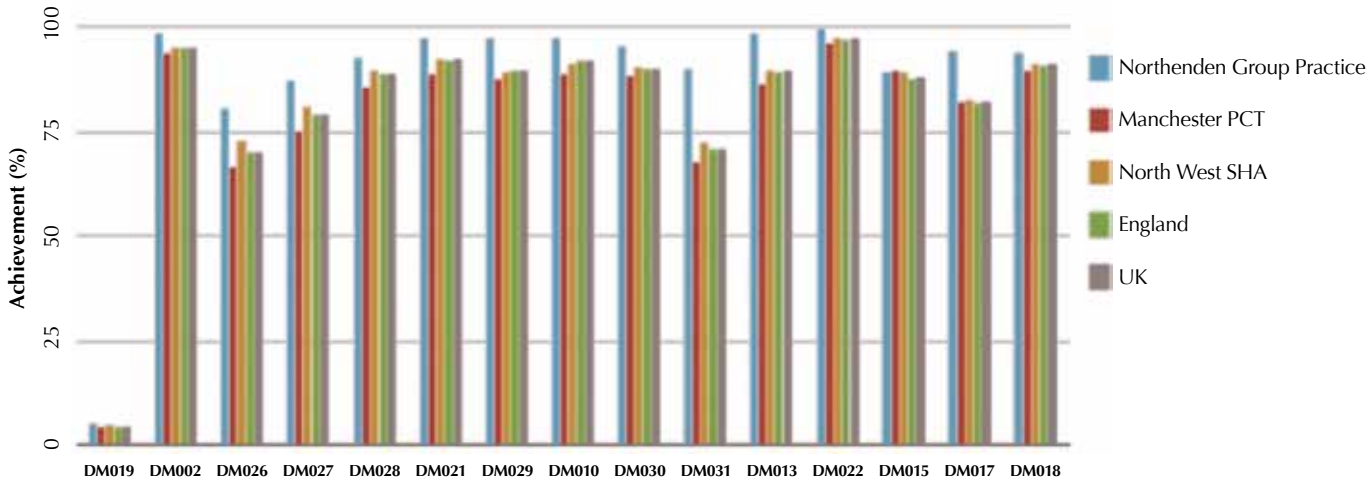

Figure 1. Quality and Outcomes Framework achievements in the diabetes clinical area during the financial year 2010–11 in the author's practice, primary care trust (PCT), strategic health authority (SHA), region and country.

With the protocol established, time was spent in discussion with the practice IT lead, who suggested ways to build a search algorithm using EMIS Web (Egton Medical Information Systems, Yeadon). Over the course of a few days' trial and error, the algorithm was built and programmed to automatically run an audit every Sunday so that the results could be viewed at the start of each week in order to identify people in need of review as per the protocol.

Audit

Baseline findings

The first weekly audit was run in August 2012, and there were a total of 118 people with CKD stage 3 or above, equating to a prevalence within the population with diabetes of 20% (11%, 6% and 3% with an eGFR of 46–60, 31–45 and <30 mL/min/1.73 m^2, respectively). In the prior 12 months, within the 118 individuals with CKD stage 3 or above:

- Four (3%) had no blood pressure recorded (all of these were house-bound).
- Four (3%) people who had a recorded blood pressure significantly over target level had no management plan.
- Ten (8%) had no HbA_{1c} recorded (half of whom were under secondary care).
- All of those with an HbA_{1c} ≥54 mmol/mol (7.1%) had a management plan.

Box 2. A protocol implemented in the author's practice following a critical event analysis.

All patients with an eGFR <60 mL/min/1.73 m^2

Ensure an up to date annual review to include:

- HbA_{1c}, with a target of <54 mmol/mol (7.1%)
- eGFR measurement
- Lipid profile with optimisation of lipid-lowering therapy
- Urine microalbuminuria measurement
- Retinopathy screen
- Foot examination
- Weight, BMI or waist circumference measurement
- Blood pressure measurement, with a target of <130/80 mmHg
- Optimisation of ACE inhibitor or, if intolerant, an ARB
- Lifestyle advice, to include diet, activity and smoking cessation

Medication review

- Review of any NSAIDs used, including over-the-counter preparations
- Review of oral antidiabetes agents and GLP-1 receptor agonists to ensure appropriate renal doses
- Review of prescribed fibrates

Patients with an eGFR of 31–45 mL/min/1.73 m^2 (additional)

- Ensure annual full blood count
- Plan 6-monthly review of chronic kidney disease

Medication review

- Review metformin if eGFR is <45 mL/min/1.73 m^2
- Review doses of digoxin

Patients with an eGFR of <30 mL/min/1.73 m^2 (additional)

- Ensure annual bone profile*
- Plan 3-monthly review
- Consider secondary care referral†

Medication review

- Use of atorvastatin rather than simvastatin
- Review lercanidipine and thiazide diuretics

On account of the potential for renal osteodystrophy (Svára, 2009). †For advice on deteriorating eGFR.

ACE=angiotensin-converting enzyme; ARB=angiotensin II receptor blocker; eGFR=estimated glomerular filtration rate; GLP-1=glucagon-like peptide-1; NSAID=non-steroidal anti-inflammatory drug.

Page points

1. Discussion with the IT lead at the author's practice led to the development of a search algorithm using EMIS Web (Egton Medical Information Systems, Yeadon), which was run each week to identify people in need of review.
2. The first weekly audit was run in August 2012, and there were a total of 118 people with chronic kidney disease stage 3 or above.

Page points

1. The initial viewing of the baseline audit results, as well as the necessary subsequent actions, proved to be a time-consuming task involving examining notes, inviting patients into practice and undertaking telephone reviews.
2. Once this preliminary work was complete, however, the weekly searches identified very few new patients in need of review each week.
3. At the time of writing, it takes no more than 30 minutes a week to review and act upon the audit findings.
4. The results indicate that there is an important improvement in the quality of care.

- Five (4%) people were on inappropriate doses of oral antidiabetes drugs or GLP-1 receptor agonists.
- Seven (6%) people were not taking an ACE inhibitor or ARB (excluding individuals in whom they were contraindicated).
- Fourteen (12%) people had no urine microalbuminuria measurement recorded (nine of these were under secondary care).
- Many had full blood counts (FBCs) and bone profiles in hospital letters but the data had not been transferred onto the computerised patient notes (for example, this applied to 50% of FBCs in the group with an eGFR <30 mL/min/1.73 m^2).

These key findings were encouraging, but they indicated that there was definitely some room for improvement.

Results at 6 months

During the 6 months from August 2012 to February 2013 the practice population with diabetes increased by 18 people, and the number of individuals with CKD stage 3 or above increased by 17, bringing the practice prevalence to 22% (13%, 5% and 4% with an eGFR of 46–60, 31–45 and <30 mL/min/1.73 m^2, respectively).

The ongoing changes in the population with diabetes underline the need for audits that are fluid and continuous in nature. They also raise the need for slight caution in data interpretation: the results at 6 months in this non-static population do not provide an exact like-for-like comparison with the baseline findings.

Key findings

After 6 months of weekly audits and focused reviews:

- Three (2%) people had no recorded blood pressure measurement (all were house-bound).
  This represents a reduction of 1 percentage point.
- Four (3%) people had no HbA_{1c} recorded (again, half of these were under secondary care).
  This represents a reduction of 5 percentage points.
- All individuals with an HbA_{1c} ≥54 mmol/mol (7.1%) had a management plan.
  This is as previously.
- There were no individuals on inappropriate doses of oral antidiabetes drugs or GLP-1 receptor agonists (eight people over the first 6 months of audit underwent a dose adjustment, all of which concerned dipeptidyl peptidase-4 inhibitors).
  This represents a reduction of 5 percentage points.
- Two (1%) people were not taking an ACE inhibitor or ARB (excluding individuals in whom they were contraindicated).
  This represents a reduction of 5 percentage points.
- Seventeen (13%) people had no urine microalbuminuria measurement recorded (12 of these were under secondary care).
  This represents a reduction of 1 percentage point.
- There was still a problem relating to a poor transfer of hospital blood results to the computer records.
- There were three referrals over the period to secondary renal care.

Interpretation

The initial viewing of the baseline audit results, as well as the necessary subsequent actions, proved to be a time-consuming task involving examining notes, inviting patients into practice and undertaking telephone reviews. However, once this preliminary work was complete, the weekly searches identified very few new patients in need of review each week. At the time of writing, it takes no more than 30 minutes a week to review and act upon the audit findings.

No statistical testing has been performed on the data on account of the small sample numbers and the above-mentioned issue concerning the non-static nature of the population being audited. Nevertheless, we feel at the practice that the results indicate that there has been an important improvement in the quality of care, as illustrated by a case example.

Case example

Mrs T was seen for her annual review and her renal function (eGFR, 78 mL/min/1.73 m^2) and glycaemic control (HbA_{1c}, 52 mmol/mol [6.9%]) were both satisfactory. Her antidiabetes regimen was confirmed as follows:

- Metformin 1 g twice daily.
- Gliclazide 160 mg twice daily.
- Liraglutide 1.2 mg once daily.

It was agreed that Mrs T would attend for her next review in a year's time, unless she was experiencing any concerns.

Follow-up

Six months later, Mrs T became unwell with a problem not related to diabetes and her eGFR had dropped to 34 mL/min/1.73 m^2. Within 3 days of the eGFR result, medication was adjusted and review appointments were arranged.

Discussion

Implementation of a semi-automated audit tool has enabled the continuous review of CKD in diabetes within a busy GP practice to become a manageable undertaking. In addition, alongside focused patient reviews and heightened health education in relation to reducing the risk factors associated with CKD, it has delivered results indicating an improvement in the quality of care. It is hoped that the impacts will be increasingly evident over time, in terms of reduced patient mortality and morbidity.

There is clearly still a need to address how a reduced variation in care can be extended to those people who are house-bound, and the practice is working closely with the district nursing team to address this.

Also of note is that two of the eight individuals requiring adjustment to their oral antidiabetes drug or GLP-1 receptor agonist regimen were under secondary care and that our enquiries into adjusting these medications were well received by our colleagues.

Conclusion

This audit tool, in combination with focused reviews, is – according to early indications – effective in reducing variation in, and improving quality of, patient care. It has enabled timely intervention to ensure appropriate and optimal medicines management within a complex patient population. The practice has now begun to share this audit work with other GP practices, both locally and nationally.

If there are identifiable needs in a relatively high-performing practice, then these needs are perhaps amplified in lower-performing practices. It is anticipated that with such an audit tool, supported by educational input, other practices can be supported to reduce variations in care. ■

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"This audit tool has enabled timely intervention to ensure appropriate and optimal medicines management within a complex patient population."