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Quality of chronic kidney disease management in primary care: a retrospective study

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ABSTRACT

Background: Early detection and appropriate management of chronic kidney disease (CKD) in primary care are essential to reduce morbidity and mortality. **Aim:** To assess the quality of care (QoC) of CKD in primary healthcare in relation to patient and practice characteristics in order to tailor improvement strategies. **Design and setting:** Retrospective study using data between 2008 and 2011 from 47 general practices (207 469 patients of whom 162 562 were adults). **Method:** CKD management of patients under the care of their general practitioner (GP) was qualified using indicators derived from the Dutch interdisciplinary CKD guideline for primary care and nephrology and included (1) monitoring of renal function, albuminuria, blood pressure, and glucose, (2) monitoring of metabolic parameters, and alongside the guideline: (3) recognition of CKD. The outcome indicator was (4) achieving blood pressure targets. Multilevel logistic regression analysis was applied to identify associated patient and practice characteristics. **Results:** Kidney function or albuminuria data were available for 59 728 adult patients; 9288 patients had CKD, of whom 8794 were under GP care. Monitoring of disease progression was complete in 42% of CKD patients, monitoring of metabolic parameters in 2%, and blood pressure target was reached in 43.1%. GPs documented CKD in 31.4% of CKD patients. High QoC was strongly associated with diabetes, and to a lesser extent with hypertension and male sex. **Conclusion:** Room for improvement was found in all aspects of CKD management. As QoC was higher in patients who received structured diabetes care, future CKD care may profit from more structured primary care management, e.g. according to the chronic care model.

KEY POINTS

- Quality of care for chronic kidney disease patients in primary care can be improved.
- In comparison with guideline advice, adequate monitoring of disease progression was observed in 42%, of metabolic parameters in 2%, correct recognition of impaired renal function in 31%, and reaching blood pressure targets in 43% of chronic kidney disease patients.
- Quality of care was higher in patients with diabetes.
- Chronic kidney disease management may be improved by developing strategies similar to diabetes care.

Introduction

General practitioners (GPs) play a key role in the complex care of patients with chronic kidney disease (CKD). The K/DOQI guidelines (USA) and the National Institute for Health and Clinical Excellence (NICE) CKD guideline (UK) provide GPs with recommendations on good CKD management, including monitoring of disease progression and strictly controlling cardiovascular risk factors.[1,2] The Dutch interdisciplinary CKD guideline for primary care and nephrology is similar to these guidelines, but incorporates age in its recommendations (Web appendix Table 1).[3]

Studies have shown that high standard CKD management attenuates and delays adverse outcomes such as progression to end-stage renal failure and cardiovascular events.[4,5] However, literature also notes deficiencies in the quality of care (QoC).[6,7] The high

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prevalence of comorbidity challenges the GP to balance guideline advice to the patient's individual needs.[8]

Our study aimed to analyse QoC in routine general practice for all stages of CKD, in relation to patient and practice characteristics. We hypothesized that our study would reveal predictors of high QoC.

Material and methods

Recruitment of participants

This retrospective study used baseline patient data of general practices that participated in a cluster randomized controlled trial on the effect of web consultation between GP and nephrologist on in-person referrals: the CONTACT study (Consultation Of Nephrology by Telenephrology Allows optimal Chronic kidney disease Treatment in primary care, Netherlands Trial Registration code 2368). The CONTACT study recruited general practices during a CKD management course for GPs. Forty-seven non-academic general practices signed up for participation. Data between 2008 and 2011 were analysed from their registered populations' electronic medical records (EMRs) (n = 207 469). We included all patients aged 18 years or older who met the CKD criteria: eGFR < 60ml/min/1.73m^2 or albuminuria. Patients under secondary renal care were excluded from analysis.

Classification of patients

The interdisciplinary CKD guideline for primary care and nephrology provides guidance for the GP in selecting the best suited health care setting for patients with CKD, based on eGFR, albuminuria and age. These settings are: treatment in primary care, consultation with a nephrologist without referral, and referral to secondary care. The guideline provides specific monitoring criteria for each group. We applied this classification to our cohort, resulting in a primary care, a consultation, and a referral group (Table 1). For the primary care group this implied monitoring of disease progression, while the consultation and the referral groups additionally required monitoring of metabolic parameters (Web appendix Table 1). We used laboratory-reported MDRD calculated eGFR values and in congruence with the guideline we defined microalbuminuria as a urinary albumin to creatinine ratio (ACR) of 2.5–25mg/mmol in men and 3.5–35mg/mmol in women. Higher ratios reflected macroalbuminuria. If an ACR was unavailable, we used urine albumin concentration with cut-off values > 20–200mg/l for microalbuminuria and > 200

Table 1. Classification of adult patients with available renal function using the interdisciplinary CKD guideline for primary care and nephrology.

	Albuminuria			
	Not known	Normal	Microalbuminuria	Macroalbuminuria
Patients ≥ 65 years (n = 19 887)				
eGFR ≥ 60	7.696	5.467	893	74
eGFR 45–60	2.085	1.632	411	52
eGFR 30–45	620	442	195	46
eGFR < 30	179	44	33	18
Patients < 65 years (n = 39 841)				
eGFR ≥ 60	28.927	8.350	693	59
eGFR 45–60	869	620	70	16
eGFR 30–45	102	55	22	7
eGFR < 30	33	4	6	8

Classification of patients based on renal function, albuminuria and age. "Primary care group" n = 5714: treatment in primary care. "Consultation group" n = 2816: consultation with a nephrologist without referral. "Referral group" n = 758: referral to secondary care. eGFR in ml/min/1.73m^2

mg/l for macroalbuminuria. Patient age was set on the latest eGFR date.

Process and outcome indicators

We derived indicators (Table 2) from the interdisciplinary CKD guideline for primary care and nephrology.[3] Included process indicators were: (1) monitoring of disease progression (assessment of eGFR or serum creatinine, albuminuria, glucose, and blood pressure); (2) monitoring of metabolic parameters (assessment of haemoglobin, calcium, phosphate, parathyroid hormone (PTH), serum albumin, and potassium), and alongside the guideline: (3) recognition of CKD in patients with an eGFR < 60ml/min/1.73m^2 (separate entity on the EMR episode list with International Classification of Primary Care (ICPC) code U99.1 for renal impairment). The outcome indicator was (4) achievement of blood pressure targets, for which the mean of the two latest measurements had to be <140/90mmHg. Additionally, we analysed blood pressures <130/80mmHg to allow comparison with existing literature.

Patient and practice characteristics

We extracted patient demographic and clinical data concerning comorbidities and medication from the EMRs (Table 3). Patient age was categorized in ranges 18–45, 45–60, 60–75, and over 75 years. Comorbidities were defined by ICPC codes as a history of diabetes (T90), hypertension (K86,K87), and cardiovascular disease (K74-K77,K89,K90,K92).[9] We selected drug prescriptions issued during 2010 for medication shown in Table 3 using Anatomical Therapeutic Chemical (ATC) codes.[10]

Practice characteristics included type (solo, duo, or group practice), vocational training, location (urban or

Table 2. Performance on process and outcome indicators within 15 months prior to data extraction for patients under GP care.

Patient group	n	Monitoring of disease progression					Monitoring of metabolic parameters								Blood pressure targets	
		Renal function	Albuminuria	Fasting glucose	Blood pressure	Complete	Haemoglobin	Calcium	Phosphate	Pth	Serum albumin	Potassium	Complete	Recognition	<140/90 mmHg*	<130/80 mmHg*
Primary care group:																
Age ≥ 65 eGFR ≥ 60 and microalbuminuria	892	817	763	795	776	676 (76%)									265 (34%)	90 (12%)
Age <65 eGFR ≥ 60 and microalbuminuria	693	588	555	565	532	455 (66%)									249 (47%)	84 (16%)
Age ≥ 65 eGFR 45–60	4125	3403	1686	2573	3003	1529 (37%)								1088 (26%)	1234 (41%)	478 (16%)
Total primary care	5710	4808 (84.2%)	3004 (52.6%)	3933 (68.9%)	4311 (75.5%)	2660 (46.6%)									1748 (40.5%)	652 (15.1%)
Consultation group:																
Age ≥ 65 eGFR 30 – 45	1235	1023	501	703	892	451 (37%)	696	194	159	75	124	872	51 (4%)	721 (58%)	427 (48%)	196 (22%)
Age <65 eGFR 45–60	1545	1131	540	844	907	447 (29%)	645	96	74	32	49	816	19 (1%)	324 (21%)	465 (51%)	149 (16%)
Total consultation group	2780	2154 (77.5%)	1041 (37.4%)	1547 (55.6%)	1799 (64.7%)	898 (32.3%)	1341 (48.2%)	290 (10.4%)	233 (8.4%)	107 (3.8%)	173 (6.2%)	1688 (60.7%)	70 (2.5%)	1045 (37.6%)	892 (49.6%)	345 (19.2%)
Referral group:																
Age ≥65 eGFR <30	79	67	18	35	48	16 (20%)	58	20	13	2	13	59	1 (1%)	47 (59%)	24 (50%)	18 (38%)
Age <65 eGFR 30–45	63	49	20	38	38	16 (25%)	36	14	11	2	8	39	2 (3%)	28 (44%)	23 (61%)	10 (26%)
Age <65 eGFR <30	6	3	0	1	1	0 (0%)	4	2	1	0	2	3	0 (0%)	3 (50%)	1 (100%)	1 (100%)
Macroalbuminuria	156	137	118	135	128	104 (67%)	60	19	10	3	12	117	1 (1%)	26 (38%)**	35 (27%)	13 (10%)
Total Referral group	304	256	156	209	215	136 (44.7%)	158 (52.0%)	55 (18.1%)	35 (11.5%)	7 (2.3%)	35 (11.5%)	218 (71.7%)	4 (1.3%)	104 (47.9%)**	83 (38.6%)	42 (19.5%)
Total consultation and referral group	3084	2410 (78.1%)	1197 (38.8%)	1756 (56.9%)	2014 (65.3%)	1034 (33.5%)	1499 (48.6%)	345 (11.2%)	268 (8.7%)	114 (3.7%)	208 (6.7%)	1906 (61.8%)	74 (2.4%)	1149 (38.3%)**	975 (48.4%)	387 (19.2%)
Total	8794	7218 (82.1%)	4201 (47.8%)	5689 (64.7%)	6325 (71.9%)	3694 (42.0%)								2237 (31.4%)**	2723 (43.1%)	1039 (16.4%)

Process- and outcome indicators are derived from the interdisciplinary CKD guideline for primary care and nephrology. or each indicator, performance in the preceding 15 months is shown. Renal function: eGFR or serum creatinine; albuminuria: albumin creatinine ratio or urine albumin. eGFR in ml/min/1.73m².
*Percentages show the achieved blood pressure targets divided by the number of blood pressure measurements.
**Percentage calculated with patients with eGFR <60 ml/min/1.73m² as denominator (n = 69 in macroalbuminuria group).

Table 3. Patient characteristics based on data from 2008 to 2011 for patients under GP care.

Patient characteristic	Groups			
	Overall (n = 8794)	Primary care (n = 5710)	Consultation (n = 2780)	Referral (n = 304)
Demographics (SD):				
Age in years	71.4 (11.9)	73.6 (10.2)	66.7 (13.3)	72.3 (14.0)
Male sex	40.0%	42.7%	33.6%	47.0%
Comorbidity:				
Diabetes	32.9%	36.0%	24.5%	52.6%
Hypertension	56.2%	57.8%	53.5%	52.0%
Cardiovascular disease	35.6%	36.1%	32.4%	53.6%
Laboratory (SD), n:				
Creatinine, µmol/l	103.9(25.9) [n = 8792]	95.6 (18.5) [n = 5709]	117.4 (23.7) [n = 2779]	136.7 (61.6) [n = 304]
eGFR, ml/min/1.73m^2	52.6 (8.1) [n = 8794]	55.4 (4.9) [n = 5710]	47.7 (9.0) [n = 2780]	43.0 (15.1) [n = 304]
Fasting glucose, mmol/l	6.5 (1.8) [n = 6938]	6.6 (1.9) [n = 4689]	6.2 (1.6) [n = 1998]	7.0 (2.3) [n = 251]
Haemoglobin, g/dl			13.50 (1.56) [n = 2085]	12.78 (1.96) [n = 227]
Calcium, mmol/l			2.33 (0.12) [n = 445]	2.32 (0.14) [n = 72]
Phosphate, mmol/l			1.03 (0.18) [n = 341]	1.15 (0.20) [n = 46]
PTH, pmol/l			7.51 (4.70) [n = 138]	7.34 (5.42) [n = 13]
Albumin, g/l			38.8 (4.4) [n = 271]	38.6(4.6) [n = 57]
Potassium, mmol/l			4.3 (0.45) [n = 2238]	4.4 (0.56) [n = 270]
Urine (first and third quartile), n				
Albumin urine, mg/l	15.0 (3.4–51.0) [n = 2928]	20.0 (5.0-53.0) [n = 2049]	6.0 (2.9-18.0) [n = 721]	210.6 (84.3–480.2) [n = 158]
Albumin/creatinine ratio	2.5 (0.9-6.1) [n = 5022]	3.2 (0.9-6.4) [n = 3557]	0.9 (0.8-2.3) [n = 1254]	37.7 (14.8-58.2) [n = 211]
Physical examination (SD), n				
Diastolic blood pressure, mm Hg	78.8 (9.7) [n = 7291]	78.6 (9.5) [n = 4889]	79.1 (9.9) [n = 2147]	78.6 (11.3) [n = 255]
Systolic blood pressure, mm Hg	142.7 (17.7) [n = 7290]	143.8 (17.4) [n = 4889]	139.8 (17.5) [n = 2146]	145.1 (21.6) [n = 255]
Medication prescribed in 2010:				
Renin angiotensin blockers	55.9%	56.4%	53.7%	67.4%
B-blockers	46.3%	46.5%	45.4%	52.0%
Diuretics	41.4%	40.8%	41.8%	49.3%
Calcium antagonist	21.6%	21.4%	20.6%	32.9%
Statins	47.0%	48.8%	42.6%	52.3%
Vitamin D	3.7%	2.2%	6.1%	9.5%
Erythropoietin	0.3%	0.1%	0.5%	1.3%
Blood glucose lowering drugs	25.0%	27.3%	18.5%	40.1%
Antithrombotics	46.6%	48.3%	42.1%	57.6%
NSAIDs	21.3%	21.1%	22.3%	17.8%

"Primary care group": treatment in primary care. "Consultation group": consultation of a nephrologist without referral. "Referral group": referral to secondary care.

rural based on the Statistics Netherlands' Key figures postcode areas database of 2004), and General Practice Information System (Web appendix Table 2).

Data analysis

CKD stage prevalence was calculated using the registered population aged 18 years and over as denominator. We used descriptive statistics to assess adherence to process and outcome indicators and to evaluate GPs' recognition of CKD. The guideline advises annual monitoring, but in routine general practice the monitoring could take place outside this 12-month timeframe. We took this into account and extended the period to 15 months prior to data extraction on 1 March 2011. Because of the hierarchical structure of our data (patients nested within practices) the analyses were based on the multilevel logistic regression model (PROC GLIMMIX in SAS). To identify patient and practice characteristics associated with high-quality care, we performed a model with a random intercept and all other variables were fixed. The type of General Practice Information System was considered a confounder, since it could affect the quality of data recording. We started with a full model including all independent variables and excluded statistically non-significant variables one by one in a backward procedure. We considered a p-value < 0.05 as statistically significant. Descriptive analysis was conducted using SPSS version 20.0™ (IBM PASW statistics 20, IBM, Armonk, NY, USA) and multilevel logistic regression analysis was conducted using SAS V9.2™ (SAS Institute, Cary, NC, USA).

Results

Practice population

The 47 practices served a population of 207 469 people of whom 162 562 were aged 18 or older. Data on renal function (n = 59 728) or albuminuria (n = 19 217) were present for 59 728 adult patients (31%). More data were

Table 4a. Significant results of multilevel logistic regression model on the association between patient and practicecharacteristics and QoC.

Variable	Monitoring disease progression				
	eGFR	Albumin urine	Fasting glucose	Blood pressure	Complete
Patient characteristics:					
Age (18–45 years as reference)					
45–60 years	1.46 (1.04–2.05)	0.99 (0.71–1.40)	1.61 (1.16–2.25)	1.82 (1.29–2.58)	1.15 (0.79–1.68)
60–75 years	1.99 (1.43–2.76)	1.03 (0.74–1.24)	2.09 (1.52–2.87)	2.59 (1.85–3.61)	1.43 (0.99–2.05)
>75 years	2.47 (1.77–3.43)	0.81 (0.58–1.12)	1.58 (1.15–2.18)	2.90 (2.08–4.04)	1.20 (0.83–1.72)
Male sex		1.28 (1.16–1.42)			1.26 (1.13–1.40)
Diabetes	2.98 (2.58–3.45)	9.33 (8.34–10.44)	7.07 (6.22–8.04)	4.14 (3.62–4.74)	10.97 (9.75–12.34)
Hypertension	1.84 (1.64–2.07)	2.15 (1.94–2.38)	2.42 (2.19–2.68)	4.00 (3.58–4.48)	2.45 (2.19–2.73)
Cardiovascular disease	0.87 (0.76–0.98)	0.77 (0.69–0.86)	0.82 (0.73–0.91)		0.76 (0.68–0.86)
Practice characteristics:					
Urban location		0.57 (0.37–0.88)		0.52 (0.29–0.93)	

Results are shown as odds ratios with 95% confidence intervals in parentheses. Outcomes on practice type and vocational training practice were not significant.

available for the elderly: 71% of the population over 65 years had a renal function assessment. Diabetes was recorded in 10 623 patients (6.5% of the population), hypertension in 23 647 (14.5%), and cardiovascular disease in 12 938 (8.0%).

Study population

A total of 9288 patients met the criteria for CKD, resulting in a known adult prevalence of CKD in our study of 5.7%. K\DOQI stages 1–2 accounted for 1.06% (n = 1719) and stages 3–5 for 4.66% (n = 7569). Of these, 494 patients received secondary renal care and were excluded from analysis. In the cohort of 8794 patients treated by their GP, the guideline recommended treatment in primary care in 64.9%, consultation with a nephrologist in 31.6%, and referral in 3.5% of patients. Table 3 provides detailed characteristics.

Process and outcome indicators

GPs completely followed the guideline in 42% (95% CI 41–43%) of their CKD patients for monitoring disease progression and in 2.4% (95% CI 1.9–2.9%) for monitoring metabolic parameters. Blood pressure was below 140/90 mmHg in 43.1% (95% CI 41.8–44.3%) and below 130/80 mmHg in 16.4% (95% CI 15.5–17.3%) of patients in whom a blood pressure measurement was available (n = 6325). All patients considered, the achievement of blood pressure targets amounted to 31.0% and 11.8% respectively. GPs recognized decreased eGFR in 31.4% (95% CI 30–32%) by using ICPC code U99.1 for impaired renal function. Table 2 provides further details on quality indicators.

Associated patient and practice characteristics

A history of diabetes (OR 10.97; 95% CI 9.75–12.34) or hypertension (OR 2.45; 95% CI 2.19–2.73), and male gender were associated with better monitoring of disease progression (Table 4a). A history of cardiovascular disease was negatively correlated with monitoring of disease progression. Cardiovascular disease and highest age were positively associated with monitoring of metabolic parameters (Table 4b). Factors associated with recognition of CKD were a history of cardiovascular disease, hypertension, female sex, and highest age. Blood pressure outcome target < 140/90 mmHg was positively associated with a history of cardiovascular disease, and had a negative correlation with highest age.

Discussion
Summary

Our results show room for improvement in all aspects of CKD management, yet most clinical relevance lies in the achievement of blood pressure targets (43% < 140/90mmHg). A history of diabetes was strongly associated with high QoC.

Prevalence and recognition

In the Netherlands, the estimated community prevalence of CKD is 10.4%, with 5.1% in CKD stages 1–2, and 5.3% in stages 3–5.[11] For our data, this implies that respectively 21% and 88% of expected CKD patients could have been ascertained in primary care with the available laboratory results. However, recognized decreased eGFR was lower at only 31.4% of potentially identifiable patients. Recognition is important, as it is associated with better quality of care.[12]

Strengths and limitations

A key strength of our study is the utilization of routine general practice data, which provides a realistic view on quality of care. Our study represents a large proportion

Table 4b. Significant results of multilevel logistic regression model on the association between patient and practice characteristics and QoC.

	Monitoring metabolic parameters							Outcome variables		
Variable	Haemoglobin	Calcium	Phosphate	PTH	Serum albumin	Potassium	Complete	Recognition	<140/90 mmHg	<130/80 mmHg
Patient characteristics:										
Age (18–45 years as reference)										
45–60 years	1.00 (0.66–1.53)	3.10 (0.74–13.01)	4.47 (0.60–33.16)		1.57 (0.37–6.78)	2.16 (1.34–3.47)		1.53 (0.91–2.55)	1.11 (0.72–1.72)	
60–75 years	1.05 (0.69–1.60)	5.63 (1.36–23.29)	9.52 (1.30–69.60)		3.03 (0.73–12.69)	2.73 (1.69–4.40)		2.72 (1.66–4.46)	0.79 (0.52–1.20)	
>75 years	2.26 (1.47–3.49)	10.22 (2.48–42.14)	15.39 (2.11–112.23)		5.68 (1.37–23.55)	4.19 (2.57–6.82)		3.95 (2.41–6.48)	0.59 (0.39–0.89)	
Male sex	0.78 (0.67–0.91)		0.73 (0.55–0.97)					0.87 (0.78– 0.97)		
Diabetes	0.62 (0.52–0.73)					1.59 (1.32–1.92)				1.18 (1.03–1.36)
Hypertension	0.72 (0.62–0.84)					2.78 (2.36–3.27)		1.42 (1.27–1.58)	0.57 (0.51–0.64)	0.49 (0.43–0.57)
Cardiovascular disease	1.23 (1.03–1.46)					1.39 (1.15–1.67)		1.52 (1.36–1.71)	1.37 (1.22–1.53)	1.69 (1.47–1.94)
Practice characteristics:										
Practice type (solo practice as reference)										
Duo						1.88 (1.02–3.48)				
Group						1.27 (0.72–2.26)				
Vocational training practice					2.03 (1.28–3.20)	0.69 (0.50–0.95)	3.30 (1.17–9.36)			
Urban location						0.70 (0.49–0.99)				

Results are shown as odds ratios with 95% confidence intervals in parentheses. Outcome on practice location was not significant. PTH and complete monitoring of metabolic parameters yielded too few results for the model to work.

of the (potential) CKD population in primary care, as data on renal function were available for most patients over 65 years. To accurately report on QoC in routine general practice, we focused on patients under care of their GP.

Several limitations should be considered. We applied the guideline classification based on single creatinine and albuminuria assessments whereas at least two or three measurements are advised. This might have led to less accurate classification, but is in line with other CKD studies. The practices' intrinsic motivation to participate in the CONTACT trial might have led to a selection bias with possible overestimation of QoC. Conversely QoC might be underestimated due to analysis of data routinely recorded in the EMR. It is not unlikely that blood pressure was measured but not registered. Furthermore, GPs had little time to implement the guideline within our studied timeframe (1 December 2009 to 1 March 2011) considering its introduction in November 2009.

Comparison with existing literature

Our results on monitoring of disease progression are in line with previous studies. Research on CKD stages 3–4 conducted within multi-specialty group practices, housing both GPs and nephrologists, found a comparable eGFR assessment rate (86%), and a slightly lower albuminuria testing rate (30%).[6] Also, impressive results are shown in the United Kingdom, where they recorded an 82% albuminuria testing rate in CKD stages 3–5.[13] Of possible influence is the pay for performance system: the Quality and Outcomes Framework (QOF). In the Netherlands, GPs are not given incentives to manage CKD, but for diabetes management local financial incentives exist.[14]

Outcomes on metabolic parameter monitoring were relatively low in our study. The earlier mentioned multi-specialty group study reported two- to threefold more monitoring of haemoglobin, calcium, and PTH.[6] Nephrologists' presence close to GPs may account for these differences.

The overall level of CKD recognition is not exceptional in our study, as other studies report electronic documentation of CKD of between 4% and 38%.[6,7,12,15] Low recognition may well be related to hurdles that doctors experience in assigning a CKD diagnosis.[16]

Blood pressure targets were equally met in most other studies: an Italian study reported blood pressures < 140/90 mmHg in 45% of CKD patients; other reports mention blood pressures < 130/80 mmHg in 13% to 54% of patients depending on the included CKD stages.[12,17,18] The QOF shows strong results with blood pressures < 140/85 mmHg in 74% of the CKD population.[13]

Research shows that patient factors associated with high QoC are concurrent diabetes, hypertension, or coronary artery disease, age > 75 years, and male sex.[6,18–20] Our findings are comparable, except that cardiovascular disease was negatively associated with monitoring of disease progression. Possibly, monitoring was left to the discretion of a cardiologist.

Results derived from the QOF show that vocational training practices, group practices, and practices in less socially deprived areas were associated with a higher QoC in general.[21,22]

Implications for research and/or practice

In CKD stages 1 and 2 we found a high QoC for monitoring of disease progression. We hypothesize that the high prevalence of diabetes in these patients (62%), and their treatment supported by an evidence-based primary care-generated diabetes guideline, is key to their renal function and albuminuria assessments.[23,24] This guideline has been developed in, by, and for general practice, with the objective to translate disease-specific recommendations into a framework of person-centred care over time. Since its introduction in 1989, the guideline has been revised and updated in relation to scientific progress but also following practice-based experiences in its implementation.[25] Our findings suggest that embedding of CKD care in a support model and organization comparable to diabetes would stand the best chance to improve QoC in general practice.[26] This should not be a new single disease model, but should support GP-based CKD care and preferably be integrated in existing support models for chronic care to prevent fragmentation.[27]

Feedback on laboratory results and GP education to increase CKD recognition can assist GPs to better identify CKD patients.[12] Periodic reviewing of EMRs, with or without the support of nephrologists, could be a component of support models.[28] Introduction of a pay-for-performance system for CKD management has shown favourable results in the UK.[17] Quality improvement strategies should focus on better recognition, systematic monitoring of disease progression including albuminuria, and blood pressure targets.

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Ethical approval

Ethical approval was not required according to the accredited Medical Research Ethics Committee Arnhem/Nijmegen registration number 2010/187. This study was performed according to the Code of Conduct for Health Research, which has been approved by the Data Protection Authorities for conformity with the applicable Dutch privacy legislation.

Disclosure statement

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References

[1] National Kidney Foudation. K/DOQI Guidelines [internet]. New York; 2002. Available from: http://www.kidney.org/professionals/KDOQI/guidelines_commentaries.cfm [accessed 2012].

[2] National Collaborating Centre for Chronic Conditions Chronic Kidney Disease. National Clinical Guideline for Early Identification and Management in Adults in Primary and Secondary Care. London: Royal College of Physicians; 2008. available from http://www.nice.org.uk/nicemedia/pdf/CG073NICEGuideline.pdf (last accessed 15 November 2012).

[3] De Grauw WJC KH, Bilo HJG, Faber EF, et al. Landelijke transmurale afspraak chronische nierschade [Dutch guideline for primary care and nephrology]. Huisarts Wet. 2009;52:586–597.

[4] Go AS, Chertow GM, Fan D, et al. Chronic kidney disease and the risks of death, cardiovascular events, and hospitalization. New Engl J Med. 2004;351:1296–1305.

[5] Matsushita K, van der Velde M, Astor BC, et al. Association of estimated glomerular filtration rate and albuminuria with all-cause and cardiovascular mortality in general population cohorts: a collaborative meta-analysis. Lancet. 2010;375:2073–2081.

[6] Allen AS, Forman JP, Orav EJ, et al. Primary care management of chronic kidney disease. J Gen Intern Med. 2011;2:386–392.

[7] Stevens PE, O'Donoghue DJ, de Lusignan S, et al. Chronic kidney disease management in the United Kingdom: NEOERICA project results. Kidney Int. 2007;72:92–99.

[8] Luijks HD, Loeffen MJ, Lagro-Janssen AL, et al. GPs' considerations in multimorbidity management: a qualitative study. Br J Gen Pract. 2012;62:e503–510.

[9] Wonca International Classification Committee. ICPC–2: International Classification of Primary Care. 2nd edn. Prepared by the International Classification Committee of WONCA (WICC). Oxford, UK: Oxford University Press; 1998.

[10] WHO Collaborating Centre for Drug Statistics Methodology. (2006) Guidelines for ATC classification and DDD assignment. Oslo: WHO; 2007.

[11] De Zeeuw D, Hillege HL, de Jong PE. The kidney, a cardiovascular risk marker, and a new target for therapy. Kidney Int Suppl. 2005(98):S25–29.

[12] Ravera M, Noberasco G, Weiss U, et al. CKD awareness and blood pressure control in the primary care hypertensive population. Am J Kidney Dis. 2011;57:71–77.

[13] Stevens PE, de Lusignan S, Farmer CK, Tomson CR. Engaging primary care in CKD initiatives: the UK experience. Nephrol Dial Transplant. 2012;27(Suppl 3): iii5–iii11.

[14] Struijs JN, Baan CA. Integrating care through bundled payments: lessons from the Netherlands. N Engl J Med. 2011;364:990–991.

[15] De Lusignan S, Chan T, Stevens P, et al. Identifying patients with chronic kidney disease from general practice computer records. Fam Pract. 2005;22:234–241.

[16] The NHS Information Centre. Centre TNI. Quality and Outcomes Framework Achievement Data 2010/11. 2012. Available from: http://www.hscic.gov.uk/catalogue/ PUB04396/qof-10-11-rep.pdf (last accessed 12 November 2012).

[17] Blakeman T, Protheroe J, Chew-Graham C, et al. Understanding the management of early-stage chronic kidney disease in primary care: a qualitative study. Br J Gen Pract. 2012;62:233–242.

[18] Parikh NI, Hwang SJ, Larson MG, et al. Cardiovascular disease risk factors in chronic kidney disease: overall burden and rates of treatment and control. Arch Intern Med. 2006;166:1884–1891.

[19] Wyatt C, Konduri V, Eng J, Rohatgi R. Reporting of estimated GFR in the primary care clinic. Am J Kidney Dis. 2007;49:634–641.

[20] De Lusignan S, Nitsch D, Belsey J, et al. Disparities in testing for renal function in UK primary care: cross-sectional study. Fam Pract. 2011;28:638–646.

[21] Akbari A, Swedko PJ, Clark HD, et al. Detection of chronic kidney disease with laboratory reporting of estimated glomerular filtration rate and an educational program. Arch Intern Med. 2004;164:1788–1792.

[22] Ashworth M, Armstrong D. The relationship between general practice characteristics and quality of care: a national survey of quality indicators used in the UK Quality and Outcomes Framework, 2004–5. BMC Fam Pract. 2006;7:68.

[23] Ashworth M, Schofield P, Seed P, et al. Identifying poorly performing general practices in England: a longitudinal study using data from the quality and outcomes framework. J Health Services Res Policy. 2011;16:21–27.

[24] Dhoul N, de Lusignan S, Dmitrieva O, et al. Quality achievement and disease prevalence in primary care predicts regional variation in renal replacement therapy (RRT) incidence: an ecological study. Nephrol Dial Transplant. 2012;27:739–746.

[25] Rutten GEHM De Grauw WJC, Nijpels G, Houweling ST, et al. NHG-Standaard Diabetes mellitus type 2 [The Dutch College of General Practitioners practice guideline 'Diabetes Mellitus type 2']. Huisarts Wet. 2013;56:51225.

[26] Van Doorn-Klomberg AL, Braspenning JC, Wolters RJ, et al. Organizational determinants of high-quality routine diabetes care. Scand J Primary Health Care. 2014;32:124–131.

[27] Van Hateren KJ, Drion I, Kleefstra N, et al. A prospective observational study of quality of diabetes care in a shared care setting: trends and age differences (ZODIAC-19). BMJ Open. 2012;2(4).

[28] Van Weel C, Carelli F, Gerada C. Reforming primary care: innovation or destruction? Br J Gen Pract. 2012;62:43–44.

[29] Rayner HC, Hollingworth L, Higgins R, Dodds S. Systematic kidney disease management in a population with diabetes mellitus: turning the tide of kidney failure. BMJ Qual Safety. 2011;20:903–910.