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van Dipten, Carola; de Grauw, Wim; ten Dam, Marc; Assendelft, Willem; Scherpbier-de Haan, Nynke D.; Wetzels, Jack

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Referring patients with stable moderate to advanced chronic kidney disease back to primary care: a feasibility study

Carola van Dipten, MD, GP, PhD candidate ¹	Carola.vanDipten@radboudumc.nl
Wim JC de Grauw, MD, GP, PhD ¹	Wim.deGrauw@radboudumc.nl
Marc AGJ ten Dam, MD, Nephrologist, PhD ²	m.t.dam@CWZ.nl
Willem JJ Assendelft, Professor MD, PhD ¹	Pim.Assendelft@radboudumc.nl
Nynke D Scherpbier-de Haan, MD, GP, PhD ^{1,3}	Nynke.Scherpbier-deHaan@radboudumc.nl n.d.scherpbier@umcg.nl
Jack FM Wetzels, Professor MD, Nephrologist, PhD ⁴	Jack.Wetzels@radboudumc.nl

¹Department of Primary and Community Care, Radboud Institute for Health Sciences, Radboud university medical center, Geert Grooteplein Noord 2, postal route 117, 6525 EZ Nijmegen, The Netherlands.

²Department of Internal medicine, Canisius Wilhelmina Hospital, Weg door Jonkerbos 100, 6532 SZ Nijmegen, The Netherlands.

³ Department of General Practice and Elderly Care Medicine, University of Groningen, University Medical Centre Groningen (UMCG), Antonius Deusinglaan 1, 9713 AV Groningen, The Netherlands.

⁴Department of Nephrology, Radboud Institute for Health Sciences, Radboud university medical center, Geert Grooteplein Zuid 8, postal route 464, 6525 GA Nijmegen, The Netherlands.

Correspondence to

Radboud University Medical Center, Department of Primary and Community Care, postal route 117, PO Box 9101, 6500 HB Nijmegen, The Netherlands

E Carola.vanDipten@radboudumc.nl

T +31 243 61 45 95 / F +31 243 54 18 62

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Abstract

Background: care for patients with chronic kidney disease (CKD) necessitates tailored pathways between primary and secondary care. It is unknown if back referring CKD patients is safe and effective.

Aim: to study the feasibility of discharging patients with stable moderate-to-advanced CKD from secondary to primary care, and to evaluate Quality of Care (QoC) and patients' and General Practitioners' (GPs) experiences.

Design and Setting: a monocentre prospective mixed-method study.

Method: we included patients who met pre-determined back referral criteria. Patients were discharged with personalised information guides and transfer letters. GPs had the option of consulting a nephrologist by Telenephrology. Renal outcomes, QoC and experiences were collected after one year.

Results: 18 patients were included. The mean age was 73 years old; the mean estimated Glomerular Filtration Rate (eGFR) was 34.3 ml/min/1.73m² at baseline. After one year, three patients had received either no or incomplete monitoring, and two patients' blood pressure was too high. The remaining 13 had stable eGFR, proteinuria and metabolic parameters. Patients were satisfied with information provision and treatment by GPs but expected more frequent monitoring. In a third of cases, monitoring frequency was decreased by GPs for several reasons. GPs believed they had sufficient knowledge to treat CKD patients but indicated they needed support besides a transfer letter.

Conclusion: back referral seems safe and feasible for patients with moderate-to-advanced stable CKD who meet specific criteria. Patients have good renal outcomes after one year and are satisfied with treatment. GP QoC can be improved, particularly completeness and monitoring frequency.

Keywords

Chronic kidney disease, Back referral, Primary care, Patient participation, Feasibility study

How this fits in

Rising incidence in chronic kidney disease necessitates optimal use of primary and secondary care facilities, for example, back referral to primary care in case of non-progressive kidney disease. It is unknown what factors help facilitate an effective and safe transition from secondary to primary care for patients with moderate to advanced stable kidney disease. Therefore, we referred patients with chronic kidney disease back to primary care and studied quality of care, renal outcomes and patients' and general practitioners' experiences after one year.

List of abbreviations

ACR	-	Albumin/Creatinine-rate
AKI	-	Acute Kidney Injury
BR	-	Back Referral
CKD	-	Chronic Kidney Disease
COPD	-	Chronic Obstructive Pulmonary Disease
CVA	-	Cerebrovascular Accident
CWZ	-	Canisius Wilhelmina hospital
eGFR	-	estimated Glomerular Filtration Rate
GP	-	General Practitioner
OSAS	-	Obstructive Sleep Apnoea Syndrome
QoC	-	Quality of Care
SD	-	Standard Deviation
TIA	-	Transient Ischemic Attack
TIN	-	Tubulointerstitial Nephritis

Introduction

Chronic kidney disease (CKD) contributes to cardiovascular morbidity and mortality.¹ CKD prevalence is increasing due to population aging and the rising incidence of hypertension and diabetes.² Consequently, care for patients with CKD necessitates tailored pathways between primary and secondary care³, and the optimal use of primary and secondary care facilities. Management in primary care requires a balance between timely consultations with and referral of patients with uncontrolled or progressive diseases⁴, and back referral (BR) to primary care when possible.

Several international CKD guidelines provide general practitioners (GPs) tools for determining whether referral to secondary care is needed.⁵⁻⁷ However, there is no description of the best circumstances for referring patients back to primary care. Therefore, we developed BR criteria in a regional consensus meeting and reviewed the records of patients under nephrologist care. We concluded that a quarter of the patients under nephrologist care could be referred back to primary care.⁸ However, BR depends on more factors than clinical suitability alone. Involved patients and professional perspectives, conditions for collaboration and maintaining quality of care (QoC) are equally important.

Information on patients' preference for care setting is scarce. One study indicates patients prefer care by GPs with access to nephrologists.⁹ GPs state that, besides conservative care for older and frail patients with advanced CKD, they have little experience in treating younger patients with advanced CKD, and need guidance from nephrologists.¹⁰ Nephrologists in Germany collaborate with GPs.¹¹ Both GPs and nephrologists are willing to collaborate. They prefer shared care^{9,12}, provided adequate information exchange is guaranteed.¹³ Several older studies indicate discharge to primary care is generally safe.¹⁴⁻¹⁶

In hospitals and general practices, it is important to involve patients as much as possible, because CKD requires an optimal lifestyle, and for managing symptoms and treatment and activating resources.¹⁷ Well-instructed patients can also monitor QoC for their CKD after being referred back to primary care.

It is still unknown what factors facilitate effective and safe transitions from secondary to primary care for patients with moderate-to-advanced non-progressive kidney disease. Accordingly, we studied the feasibility of BR by evaluating QoC for CKD patients who were discharged back to primary care, including patient participation in follow-up care, and explored the experiences of patients and GPs in the process of BR and transition of care.

Method

Study design

Our prospective study started in the Canisius Wilhelmina Hospital (CWZ). CWZ is a large regional hospital, with four nephrologists treating 630 patients in the outpatient renal clinics. We identified CKD patients under nephrologists' care who met the BR criteria. These BR criteria were developed by nephrologists and GPs in a local consensus meeting⁸ and were based on (inter)national guidelines.⁵⁻⁷ Suitable patients were further informed about the study and asked to participate. Patients received an informed consent form from the nephrologists and were later seen at the renal nurses' office. The nurse answered patient's questions, went through the treatment plan, took the signed consent forms and distributed personal CKD information guides, the 'kidney passport' (in Dutch: 'nierpas'). The kidney passport was developed in collaboration with the Dutch Kidney Foundation and includes general information, patients' most recent measurements, blood results, medication, personal target values and personal monitor frequency (see supplementary kidney passport). The aim of the kidney passport is to stimulate patient empowerment in treatment and follow-ups at the GP practice. The study's setting was extended to the GP practice once the patients were referred back to primary care. The nephrologists sent extensive transfer letters to the patients' GPs and remained available for consultation by Telenephrology.^{18 19} Telenephrology is a web-based consultation system linked to the patient's medical record. GPs open an online consultation form, and all data relevant to CKD is uploaded automatically. Inclusion took place from January until September 2019. The follow-up after the inclusion of patients was one year.

Study population

We included CKD patients under nephrologists' care who met our BR criteria.

The BR criteria were defined as follows:

- Patients with stable kidney function **AND** stable blood pressure **AND** stable metabolic parameters, where renal replacement therapy was not expected within five years (see Box 1).
- Patients in whom patient and nephrologist concluded that renal replacement therapy did not contribute to quality of life or life expectancy.
- Patients with glomerular haematuria and/or proteinuria with stable kidney function, proteinuria less than 1 gram **AND** stable blood pressure, where follow-ups were guaranteed to conform with nephrologists recommendations (exception: IgA-nephropathy with proteinuria > 0.5 gram, which could be a reason to start immunosuppressive drugs).

Exclusion criteria were:

- Rapidly decreasing kidney function expressed by: a drop in eGFR more than 5 ml/min/1.73m²/year OR a decrease of more than 25% in five years OR proteinuria more than 1 gram.
- eGFR less than 30 ml/min/1.73m², with progression and who were suitable candidates for renal replacement therapy.
- Expectation of requiring renal replacement therapy within five years (current age taken into consideration and assuming the worst-case scenario).
- Use of immunosuppressive drugs relating to a renal disease.
- Polycystic kidney disease at younger than 50 years old.
- Glomerular haematuria with proteinuria > 0.5 gram, which could be a reason to start immunosuppressive drugs.
- Multiple morbidities or metabolic complications that could not be regulated in primary care or medications shifts within the last three consultations.

Data collection and analyses

Each participant's data was collected twice; first, from the hospital information system directly after inclusion (T0). We recorded demographics, most recent blood and urine results, blood pressure measurements, personal target values, medication and took the transfer information letter intended for the GP. eGFR was extracted using the CKD-epi formula. Secondly, one year after each patient's inclusion, we asked GPs for data on follow-up and actual medication from their medical records (T1). We derived QoC indicators from the Dutch CKD guidelines: monitoring of disease progression (eGFR and ACR assessment) and blood pressure measurements and achievement of blood pressure targets.

⁶ If nephrologists demanded the monitoring of metabolic parameters (assessment of potassium, haemoglobin, calcium and phosphate), we added this as a QoC indicator. We examined whether monitoring frequency conformed with nephrologists' requests. We assessed the stability of kidney function, blood pressure, metabolic parameters, medication changes and the number of Telenephrology consultations after one year. We counted the patients who remained in primary care and investigated nephrologists' involvement during follow-up and reasons for re-referral from primary to secondary care. We also evaluated satisfaction and suggestions concerning BR to primary care by patients and GPs by questionnaire (see supplementary questionnaire S1 and S2). All qualitative data were examined by two researchers independently (CvD and WdG). The researchers discussed the data

and reached a consensus on the themes that emerged. Data was stored using Castor, an authorised web-based system that enables researchers to build electronic Case Report Forms and store data.²⁰

Results

Demographics

In total, 19 patients agreed to be referred back to primary care. One patient preferred BR without participating in our study. Consequently, 18 patients participated: ten men and eight women (see table 1). The mean age was 73 years old (SD 6.3), with a range of 62-86 years. Average estimated GFR (CKD-epi formula) was 33.2 ml/min/1.73m² (SD 5.8); the mean ACR was 6.7 mg/mmol (SD 8.8); the mean systolic blood pressure was 132 mmHg (SD 16.8) and diastolic blood pressure 71 mmHg (SD 8.4) at baseline. All patients had comorbidities besides CKD. In all patients, values of serum potassium, phosphate, calcium and haemoglobin were within normal ranges.

Renal outcomes after one year of follow-up in primary care

After follow-up, data from two patients were missing: one GP did not respond to our letters and one GP missed the letter about patient BR and did not monitor the patient. The other 16 patients had stable kidney function and albuminuria after one year of follow-up (see supplementary table 1, definitions of stability in supplementary box 1). The mean eGFR at the end of the study year was 34.3 ml/min/1.73m² (SD : 6.4) and the mean ACR was 4.1 mg/mmol (SD : 2.6). Two patients' blood pressure was too high; one received extra blood pressure medication.

All patients were treated and followed in primary care after one year. One patient called the outpatient clinic after the study for a follow-up; he was seen twice at his request and was referred back to primary care. In all patients, metabolic parameters were stable during follow-up.

Quality of care in primary care

One patient did not receive blood pressure measurements during the follow-up period. Another lacked a proteinuria measurement during the follow-up. As mentioned, one patient was not monitored at all, and there was no medication change for one patient with high blood pressure. GPs decreased the monitoring frequency recommended by the nephrologist for six patients, for three patients, for no apparent reason. Reasons for adjusting monitoring frequency were: many hospital admissions including control of kidney function, patient refusing to take blood samples because of COVID-19 and the GP missed the transfer letter (see supplementary table 1) . Telenephrology was used once in nine cases: one GP had a question about albuminuria and another about blood pressure. All others used

Telenephrology for feedback for the nephrologists, as requested by the nephrologists in the transfer letter.

Patients' experiences

One patient did not respond to our letters. Three patients indicated that they did not want to complete the final evaluation without giving a reason. One patient died due to COVID-19 just after the follow-up period, so was unable to fill in the evaluation. The survey sent to the patients concerned four areas: information provision, use of the kidney passport, monitoring by the GP and the GP and nephrologist's collaboration. For nominal results of patients' answers, see supplementary table 2.

Information provision

Most patients (ten of 13) were satisfied with the nephrologists' explanation about the cause of their CKD. One patient said: *"extensive explanation by the nephrologist, taking into account my medical background as a dentist"*. Participants remembered some important information: *"it has something to do with my blood pressure"*, *"the kidney function must be above 30"* and *"I must pay attention to medication use"*.

Three patients were not satisfied with the nephrologists' explanation. They did not remember the nephrologist mentioning the cause. One said: *"I haven't really heard anything about the cause"*.

Patients were satisfied with information about treatment. They received lifestyle advice, like weight loss, stopping smoking and decreasing protein intake. It was also clear what the GP's task in this study would be: *"monitoring of kidney function"*.

Use of the kidney passport

Patients who used the kidney passport were enthusiastic, particularly about having insight into their own target values. One patient said: *"I am satisfied about the target values, I can check [them] myself"*.

Four patients did not examine the kidney passport after BR to primary care. They said: *"I already know the information"*, *"I lost it"* and *"I never received the kidney passport"*.

Monitoring by the GP

Eight patients thought they had been monitored as instructed by the nephrologist. Five patients noticed differences in monitoring: one patient was not monitored at all, one patient was not weighed by the GP and three patients mentioned being monitored less frequently than prescribed. Two patients experienced difficulties with going to the GP's practice because of COVID-19. *"I think the check was too long ago, I would like to be checked more often"* and *"Because of COVID-19 I could not easily go to the doctor."*

Most patients (eight of 13) took initiative and approached their GPs themselves to continue monitoring. One patient said: *"Another check was necessary. I did not receive a call for this from the GP and I had to take the initiative myself. That was not a problem in my case, but it may be for someone else"*.

Only one patient had no confidence in the GP's treatment because of the lack of monitoring. Another patient indicated that he did not know whether to trust the GP. *"I would have liked to remain under the control of my nephrologist"*. Other patients said: *"I have a good empathic doctor"* or *"I have good contact with my GP. Everything was thoroughly discussed during the check-up. Everything can be discussed"*.

Collaboration between GP and nephrologist

Seemingly, most patients were unaware of communication between the GP and the nephrologist. Only four patients knew about the GP's Telenephrology consultations. Patients were thus unable to value the collaboration.

GPs' experiences

The GPs filled in 17 evaluation forms. Patients were referred back to 15 different GPs. Two GPs received two patients who were referred back to their practice and completed an evaluation form for each patient. One GP did not respond to our letters. See supplementary table 3 for nominal results of the questionnaires completed by GPs.

Information provision

Two GPs did not read the referral back letter: one GP had taken over the practice of a retired GP and noticed the control of cardiovascular risk factors had not been started, and the other missed the letter completely. This last letter was received by a colleague from the same practice, who did not inform the GP. In three cases, the letter was unclear after digital transmission due to a shift of personal target values in the table. All other GPs (14) evaluated the letter as clear. One GP said: *"a very clear letter, a cookbook with strict directions; but I am not a servant or a physician assistant to be managed in this way"*.

Organisation of care

Ten GPs ensured active CKD monitoring after BR to primary care, mostly by instructing the practice nurse. Other GPs instructed the patient to call the practice every three months for a lab form and an appointment. GPs who did not actively ensure follow-up indicated: *"too much work in my current practice"* or *"patient's responsibility"*

In seven practices, the patients were only seen by the GP; in six practices both GPs and practice nurses were involved; in three practices, the practice nurse was in charge of monitoring and no follow-up by GP or practice nurse occurred in one practice. GPs responded: *"our practice nurse is not competent"* and *"the care is provided by the practice nurse as much as possible but given the non-compliance and bad lifestyle of the patient, monitoring often is conducted by the GP"* and *"the patient will automatically enter our cardiovascular care program where kidney function assessment is included"*.

Knowledge and follow-up

Ten GPs said they executed the follow-up as prescribed by the nephrologist. Several reasons for adjusting the monitoring were mentioned: *"The patient has not given blood for testing since COVID-19"* and *"the patient has stable kidney function"* and *"frequent emergency room and specialist visits in between"* and *"we did the lab checks, although three monthly monitoring seems quite lavish to me"*.

Only two GPs reported a lack of knowledge when monitoring moderate-to-advanced CKD patients. One GP indicated: *"I need further training, although I don't know if I want to do that on top of all my other tasks"*.

CKD care substitution was mostly seen as not or slightly onerous: *"not more onerous than an average complex patient. But I only have a few similar cases, so it is not in my system"* and *"it's a bit onerous because I have to guard the patient to take blood samples"* and *"you need a practice nurse for all logistic matters, but we don't have enough manpower for that"*.

One GP experienced the substitution of care as an increase of workload: *"it takes time to read what exactly is intended, and you have to read it again every three months, because this is not an everyday problem for a GP"*.

Other GPs felt various barriers during follow-ups: *"a patient with a very low motivation, not consistent with the number of check-ups"* and *"the study is onerous"* and *"apparently we had to use the kidney passport but we decided not to use it"*.

Use of the web-based consultation system (Telenephrology) and the kidney passport

Two GPs used Telenephrology because they needed to consult a nephrologist. One question was about blood pressure management, the other was about target values. All other uses of Telenephrology were because we requested consultations as part of the study.

Most of the GPs (11 of 17) did not use the kidney passport. GPs argued: *"I am not aware of the benefits of the kidney passport"* and *"the patients did not bring the kidney passport every visit"* and *"too much administration"* and *"the patients filled-in the Kidney passport himself, I have the results in the computer"*.

Discussion

Summary

This pilot study showed BR is safe and feasible for CKD patients who meet the BR criteria. All patients had good renal outcomes after one year. There would likely have been no differences in outcomes for patients between GP treatment and nephrologist treatment. However, there is room for improving QoC in primary care. Particularly monitoring frequency and completeness of monitoring could be improved, although this must be balanced against all other aspects of care. Follow-up frequency was decreased by several GPs for various reasons. Patients were generally satisfied with nephrologists' information provision, the kidney passport and treatment by the GP but expected more frequent monitoring. GPs believed they had sufficient knowledge to treat patients with moderate to advanced CKD in primary care, but indicated they needed support besides a transfer letter. Some GPs did not trust aftercare to their practice nurses.

Strengths and limitations

It is a strength that we involved patients and that we asked for their opinions and experiences. Involving patients and stimulating self-management remains a challenge. A limitation of this feasibility study is its small sample size. The study was intended as an initial exploration of BR of patients with moderate to advanced CKD. Unfortunately, it was impossible to evaluate all participating patients since patients were free to leave the study at any time. The follow-up period was long (one year), which induced a risk of loss to follow-up. We asked GPs for reactions who were not included in the study beforehand in the way patients were. Some GPs found participation very time-consuming. The extensive explanations for patients in outpatient clinics were also very time consuming. For future BR procedures, a good explanation for patients and GPs about BR will take time.

Comparison with existing literature

The rising pressure on hospital facilities and the ambition to provide care in patients' own environments necessitate a critical consideration of the need for CKD hospital care. Accordingly, it is important to prevent referrals using Telenephrology¹⁹ and to refer stable CKD patients back to primary care when possible. A study from Wales shows patients with stable CKD who were discharged back to primary care were at low risk for disease progression. Those referred back to primary care because of failing to attend renal clinics were at risk of deteriorating renal function.²¹ Another study shows nearly 30% of patients with moderate to advanced CKD could be treated in a shared care construction. These

patients had good outcomes concerning risk of death and renal replacement therapy compared to patients solely treated in hospital.²² Both in our study and the two previously mentioned studies, the median age was relatively high. This reflects the fact that most patients had renovascular or diabetic aetiology and are more likely to have stable kidney damage. Very limited research has been done concerning BR in nephrology, but the principle and quality of monitoring in primary care have been researched in other specialties, for example, heart failure in cardiology.²³ This study also indicates that some of the outpatient population could be monitored by GPs.²⁴

Most GPs in our study felt they were capable of taking care of these CKD patients. They experienced no differences with other complex patients treated in primary care. However, most quantitative studies show educational gaps and even unawareness of CKD in GPs.²⁵ Facilitators for CKD care in primary care are access to the nephrologist²⁶ and a proactive approach where multimorbid conditions are treated together.^{25 27}

A downside of this substitution of care from different specialisms to the GP is the increase in GP workload. This has not been well researched yet, but some GPs in our study reported an extensive workload because of the BR. A study into the BR of patients with chronic cancer indicates a workload limited increase for GPs, since most patients already have comorbidities.²⁸ These comorbidities need to be periodically checked by the GP anyway, with some overlapping content. It is common knowledge that consultation time and workload increase with the number of chronic conditions.²⁹ In our study population, all patients had comorbidities, like hypertension and diabetes. In the Netherlands, patients with chronic conditions like these are enrolled in specific disease management programmes, where they are regularly checked by a nurse practitioner and by the GP once a year.³⁰

Our study shows patients are not aware of collaboration between GPs and nephrologists. This is in line with another study. Patients consider collaboration between GP and specialist as important and self-evident, but do not know what it entails.³¹ If patients know that their case is being discussed with a nephrologist, this may increase confidence in treatment and GP. A likely mode for improvement is likely giving patients insight into written communications between GPs and nephrologists, with a shared medical file for example. The kidney passport alone is insufficient.

Implications for practice and research

Nephrologists' main concern is whether patients will be monitored adequately when referred back to primary care.⁹ Nephrologists may be more likely to refer patients back to primary care if they know that follow-up is guaranteed. In one third of the cases, GPs adjusted the monitoring frequency - recommended by the nephrologist- downwards. GPs also deviated from guidelines in this regard, since guidelines recommend monitoring frequencies for each different CKD stage. It is unclear whether monitoring frequency was discussed with the patients or whether patients influenced monitoring

frequency. The importance of frequent monitoring must be brought to the attention of GPs. Ensuring follow-up is not easy since GPs' knowledge and visions and GP practice organisations vary greatly. In the Netherlands, it is not required to keep separate CKD registers in the practices. It is GPs' responsibility to code CKD in the patient's medical file with an International Classification of Primary Care code and to periodically report the current eGFR to the pharmacist. Follow-up could be established by patient participation, IT solutions or monitoring in a disease management programme, besides guidelines and transfer letters.

Engaging patients with only personalised information guides proved to be insufficient. Patients were not aware of cooperation between GPs and nephrologists, so more interventions are needed to give patients greater insight. These interventions could include a shared digital protected web-based platform containing laboratory results, blood pressure and written consultations, accessible by the nephrologist, GP and patient.³² Good agreements must then be made about who bears what responsibilities, since unclear roles are perceived as a barrier to collaboration.²⁶

Several participating GPs suggested that even if the back referred CKD patients had no other comorbidities, the patients could be followed in the prevailing disease management programmes in primary care. One condition for organising this chronic care in disease management programmes is that follow-up is well described by nephrologists. A practice nurse could be deployed to guarantee monitoring and signalling deviations from the patients' target values. The nephrologist can be consulted in case of progression or metabolic dysregulation. Rapid communication from GPs with nephrologists could be achieved by shared digital files. Allowing nephrologists to examine shared files also addresses one of the other contradictions that affects GPs: the need for structure and embedding CKD care versus the experience of being patronised by the nephrologist.

The implementation of BR criteria and the BR of patients with moderate to advanced CKD can now be studied on a larger scale, and in multiple hospitals and GP practices. Appropriate IT and health care apps need to be studied to offer patients more insight in treatment and communication and to give more self-management options. Research into BRs' sustainability and cost-effectiveness is a crucial next step.

Conclusion

BR seems safe and feasible for CKD patients with moderate to advanced stable CKD who meet the correct criteria. Patients have good renal outcomes after one year of follow-up in primary care. QoC at GP practices can be improved, particularly monitoring frequency, which was decreased by GPs for several reasons. Generally, patients are satisfied with treatment by GPs and the kidney passport. Overall, GPs believe that they have sufficient knowledge to treat patients with moderate to advanced CKD in primary care, but indicate that they need support besides a transfer letter. Sufficient follow-up in primary care must be ensured by more interventions than a transfer letter and engaging patients with kidney passports.

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Ethical approval

Ethical approval for this study was not required according to the accredited Medical Research Ethics Committee of Arnhem/Nijmegen, registration number 2018-4094

Conflicts of interest

We have no conflicts of interest.

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Box 1: definition of stable kidney function, blood pressure and metabolic parameters

Stable kidney function:

1a) decrease of estimated Glomerular Filtration rate (eGFR) less than 25% compared to the first measurement within five years without a decrease in CKD stage

OR

1b) decrease of eGFR less than 5 ml/min/1.73 m²/year, determined with at least three measurements

AND

2) less than 0.5-1.0 grams proteinuria in a 24-hour-urine-test (depending on the patient's kidney pathology: in case of glomerular haematuria with proteinuria less than 0.5 grams, in case of vascular pathology less than 1.0 gram).

Stable blood pressure:

Patients with blood pressure at or below their individual target value and which remained stable during two consultations at the outpatient department; no drug adjustments were necessary or possible, and no new drug were started.

Stable metabolic parameters:

Patients who did not need any adjustment of medication targeting phosphate, calcium, parathormone or haemoglobin during the last two consultations.

Table 1: demographics of patients before start of the pilot (T0)							
No.	M/F	Age	Nephrological diagnosis	Kidney function CKD-epi	Albuminuria ACR	Blood pressure	Comorbidity
		years		(ml/min /1.73m ²)	(mg/mmol)	(mmHg)	
1	M	70	Renovascular and postrenal problem	30	26.2	134/77	Hypertension Prostate cancer Seminoma testis Pulmonary embolism Depression
2	M	69	Glomerular disease	29	25.4	121/69	Hypertension Hyperglycaemia
3	F	77	Diabetes mellitus	35	0.8	144/69	Hypothyroidism
4	F	66	Diabetes mellitus and TIN [‡]	30	1.9	160/79	Atrial fibrillation Mitral insufficiency
5	F	70	Renovascular and drug-induced	28	0.6	121/63	Hypertension Hypothyroidism
6	M	81	Renovascular	37	1.8	138/63	Hypertension Heart failure Diabetes mellitus Pancreas insufficiency
7	M	74	Nephrectomy after incidentaloma	30	4.7	134/68	Diabetes mellitus Anaemia
8	M	86	Renovascular	28	16.7	127/73	Myocardial infarction CVA Aneurysm iliac artery
9	F	66	Renovascular	39	4.2	159/80	Hypertension
10	M	82	Unknown	26	3.0	117/73	Hypertension Anaemia
11	F	78	Kidney atrophy	30	4.1	90/50	CVA Lung cancer Non-Hodgkin lymphoma Colon cancer Larynx cancer Aorta valve stenosis
12	M	77	Renovascular	27	4.5	124/76	Diabetes mellitus Hypertension Angina pectoris COPD gold II Anaemia Aneurysm abdominal aorta Bladder cancer
13	F	67	Renovascular and nephrectomy	31	0.0	116/61	Coronary artery disease Peripheral vascular disease
14	M	76	Renovascular	32	0.2	127/69	Hypertension
15	M	71	Glomerular disease	42	3.8	144/83	Diabetes mellitus Coronary artery disease
16	F	72	Renovascular	36	19.7	138/66	Hypertension Diabetes mellitus Peripheral artery disease
17	F	62	TIN [‡]	41	1.2	148/73	Hypertension Obesity TIA Gout OSAS Cholecystectomy

18	M	70	Unknown	46	1.0	140/83	TIA
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¥ tubulointerstitial nephritis

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