What Is the Quality of Pre-Dialysis Healthcare in the Czech Republic?

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Key Words

Chronic kidney disease • Early referral • Pre-dialysis • Dialysis preparation • Patients education

Abstract

Aim: The PREPARE study (PRE-dialysis healthcare in Patients initiating Renal rEplacement therapy and its consequences) evaluates the quality of pre-dialysis healthcare in patients commencing dialysis treatment in the Czech Republic. **Methods:** 48% of Czech dialysis centers participating in this prospective multicenter observational study provided data on all consecutive patients starting renal replacement therapy during 24 weeks. **Results:** 68% out of 303 patients had nephrological pre-dialysis care lasting >6 months (57% diabetics). Peritoneal dialysis (PD) was chosen by 11.2%. 23.6% of patients were receiving erythropoiesis-stimulating agents while the mean hemoglobin level was 98.3 ± 15.6 g/l. 36.1% of patients were taking phosphate binders while serum phosphates reached 1.90 ± 0.61 mmol/l. 64.4% of patients had a functional arteriovenous fistula or PD catheter. 91.8% of the patients felt they were well informed about hemodialysis and 51.6% about PD. Physicians reported poor compliance of patients in 15.1% of cases, while the patients evaluated their own compliance as 9.4%. **Conclusions:** To con-

clude: (1) better pre-dialysis care and information are needed; (2) higher awareness on PD might increase its low popularity; (3) particular attention should be paid to diabetics due to their higher morbidity, a lower proportion considered for transplantation and a lower proportion referred to nephrologists by diabetologists, and (4) preemptive transplantation should be considered more often.

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Background

Several studies have shown that the presence, duration and intensity of nephrological care before the initiation of dialysis treatment have an impact on the morbidity and mortality of patients during dialysis. However, there is no consistent definition of late referral and the time period for late referral mostly ranges from 1 to 6 months before the initiation of renal replacement therapy (RRT). There is evidence of higher mortality in late referred patients; e.g. Winkelmayer et al. [1] reported 36% higher mortality compared to patients referred early (>90 days before RRT initiation) and even 75% higher mortality during the first 3 months of dialysis. A recently published meta-analysis showed reduced mortality even 5 years after dialysis start [2]. Other authors confirm this trend in hemodialyzed

patients as well as in peritoneal dialysis patients [3–11]. Late referred patients require an urgent dialysis start more often [8, 12, 13], their treatment is more expensive [12], they have worse management of anemia [13] and they have a permanent dialysis vascular access at the time of dialysis initiation less often [5, 9, 14–16]. The presence of a permanent vascular access at the time of dialysis initiation is associated with a lower mortality of patients during the first 90 days of dialysis [1]. A well-timed nephrological care is associated with a higher proportion of native arteriovenous fistulas (AVF) compared to grafts and a lower need for central venous catheters in newly dialyzed European patients [16]. It has recently been shown that early referred patients (>3 months before RRT initiation) have a 41% higher chance of inclusion on the kidney transplant waiting list and a 54% higher likelihood of kidney transplantation [17]. Furthermore, some authors believe that late referral has an impact on the choice of the dialysis modality (hemodialysis (HD) vs. peritoneal dialysis (PD)); however, results of studies are not uniform. Late referral increases the probability of dialysis method change during the first months of treatment, especially in patients who have chosen PD [18]. Pre-dialysis care improves health-related quality of life [19]. Nephrological care also decreases the mortality of pre-dialysis patients [20].

The percentage of late referred patients varies with population sample and definition of late referral and ranges from 16% (30 days in Europe) [16] to 34% (90 days in the USA) [1] to 61% in HD and 73% in PD patients in the USRDS Dialysis Morbidity and Mortality Study (3 months in the USA) [21]. The percentage of late referred patients seems to decrease over years, at least in the USA (49.6% in 1996 and 34.7% in 2006) [22]. Late referred patients are older [5, 23, 24], have lower education, are married less often, and suffer from hypertension or diabetes less often [17].

The true quality of nephrological pre-dialysis healthcare has only recently become a subject of interest [25]. There is unsatisfactory information about the quality of pre-dialysis healthcare, as well as the reasons for its limitations and their impact of these limitations in the Czech Republic (CR). In fact, up to now only one single-center study has been reported [26, 27], but the results do not necessarily reflect the situation in the whole CR. This has led to the realization of the *PREPARE study – PRE-dialysis healthcare in PATients initiating Renal rEplacement therapy and its consequences*. From the wide range of available data, those pertaining to patients with a long-term nephrological follow-up (>6 months) are presented.

The comparison between the early, late, and very late referred patients will be discussed in another paper. The follow-up data are being processed.

Methods

The PREPARE study is a prospective multicenter observational study. Patients enrolled in this study were followed up during a 1-year period after they had entered the dialysis program. All the dialysis centers (DCs) in the CR were asked to participate in the study; participation was voluntary.

The aims of the PREPARE study were to: (1) characterize the groups of patients with late referral (<6 months before RRT initiation) and extremely late referral (<1 month before RRT initiation) and compare them with early referred patients; (2) identify the groups/specializations of physicians referring patients early and late and referral circumstances, and (3) evaluate the consequences of the timing of referral for the patient in a prospective 12-month follow-up.

Incident patients older than 18 years initiating RRT in the participating DCs during the time period under consideration (24 weeks from February to August 2009) were enrolled in the study. The patients commencing dialysis due to kidney graft failure were studied as well and analyzed separately. At the time of dialysis initiation, the following data on each single patient were collected: age, sex, marital status, education, occupation, cause of renal failure, comorbidities, dialysis modality, the need of hospitalization at dialysis initiation and the reason, preparation for dialysis initiation [vaccination against viral hepatitis type B (VHB), presence of vascular access/catheter for PD], blood pressure, basic laboratory parameters [serum hemoglobin (Hb) level, serum calcium (S-Ca), serum phosphate (S-P), intact parathormone (iPTH), C-reactive protein, serum albumin, serum iron, saturation of transferrin, serum ferritin, actual bicarbonate in the serum (HCO_3^-)] and medical therapy at dialysis initiation [vitamin D, phosphate binders, bicarbonate, erythropoiesis-stimulating agents (ESA), antihypertensive agents], the person referring the patient to a nephrologist and time of referral, specialists taking care of the patient before the referral, and patients' assessment of timing and quality of information provided concerning RRT and necessary lifestyle changes. A year of prospective follow-up collects information on dialysis modality change, vascular access patency, time of the start of the examinations evaluating kidney transplantation eligibility, time to inclusion on the kidney transplant waiting list, time to kidney transplantation, time to death, and cause of death.

All patients gave informed consent to participate in the study. Data collection was performed online at a website created in HTML and Perl, through a data form at the www.nefrologie.eu website. This work presents baseline data of early referred patients.

Statistics

Data were processed using SPSS 15.0 for Windows, release 15.0.5 (SPSS, Inc., Chicago, Ill. USA). Methods applied were: parametrical and non-parametrical tests (paired and unpaired t test, Wilcoxon test, Mann-Whitney test, Kruskal-Wallis test), analysis of dispersion, and contingency tables with χ^2 test. Results with $p < 0.05$ were considered significant with a 95% confidence interval.

Results

Population Sample

42 DCs participated in the study, corresponding to 48.3% of all DCs in the CR in 2009. Overall, 359 patients initiated RRT during this time period at these DCs. Of these, 3.9% refused to participate in the study, 8.6% were not enrolled due to limited compliance (poor health status, dementia, language barrier, etc.) and 2.3% for administrative reasons (e.g. change of responsible physician during the study and thus failing to report the patient). Thus, data about RRT initiation were available in 306 patients (85.2%); 3 of these patients (0.8%) underwent kidney transplantation preemptively and 303 patients (84.4%) initiated dialysis treatment.

Of these 303 patients, 72 (23.8%) were referred to nephrologists very late (≤ 1 month before RRT initiation), 26 (8.6%) late (1–6 months), and 205 (67.7%) early (> 6 months), respectively. The analysis presented here is focused on the group of patients referred to nephrologists early. The basic characteristics of patients with a nephrological follow-up lasting > 6 months are shown in table 1, their laboratory results in table 2, and their comorbidities in table 3.

Primary Renal Disease

The most frequent diagnoses were diabetic nephropathy (46.3%, the percentage of diabetic patients being 56.6%), hypertensive nephropathy (31.6%), tubulointerstitial nephritis (26.0%), chronic glomerulonephritis (13.6%), and ischemic renal disease (9.0%). In 37.6% of patients the diagnosis was established by imaging methods (ultrasound, computed tomography, intravenous urography) and in 51.2% of patients the diagnosis was estimated on the basis of laboratory values and typical clinical course of the disease (non-diabetics in 36%, diabetics in 62.9%). A renal biopsy had been performed in only 11.2% of patients (in 20.2% of non-diabetic patients and 4.3% of diabetics; $p = 0.000$).

Transplantability

20.6% of the patients were examined for kidney transplantation eligibility and 1.5% had already been included on the kidney transplant waiting list at the time of RRT initiation. Diabetics were considered for kidney transplantation twice less often than non-diabetics (14.8 vs. 28.1%, respectively).

Hospitalization at Dialysis Initiation

Hospitalization due to health complications at the time of dialysis initiation was necessary in 42.4% of pa-

Table 1. Basic characteristics of patients ($n = 205$) with nephrological follow-up lasting > 6 months

<i>Characteristics</i>	
Male, %	64.4
Age (mean $\pm$ SD), years	64.9 $\pm$ 13.7
Presence of DM, %	56.6
Choice of HD, %	88.8
Choice of PD, %	11.2
Hospitalization at RRT initiation, %	42.4
Hospitalization for education, %	5.9
Acceleration of RRT initiation, %	39.9
Blood transfusion at RRT initiation, %	20.0
Bleeding/operation at RRT initiation, %	9.3
VHB vaccination, %	77.6
AVF/PD catheter, %	
Functional	64.4
Created, but still unusable	7.3
Impossible, venous catheter intended	7.8
None	20.5
<i>Therapy</i>	
ACEI/ARB use, %	72.2
Phosphate binders use, %	36.1
Vitamin D use, %	56.6
ESA administration, %	23.9
ESA administration ≤ 3 months, %	9.3
ESA administration > 3 months, %	14.7

RRT = Renal replacement therapy; VHB = viral hepatitis type B; AVF = arteriovenous fistula; PD catheter = catheter for peritoneal dialysis; ACEI = inhibitors of angiotensin-converting enzyme; ARB = angiotensin II type 1 receptor blockers; ESA = erythropoiesis-stimulating agents.

tients, more frequently in diabetics (49.1%) compared to non-diabetics (33.7%). Similarly, accelerated RRT initiation due to acute worsening of chronic kidney disease was more frequent in diabetics (46.6%) than in non-diabetics (29.2%), representing 39.9% of the whole study population. Diabetics had to undergo surgery (other than vascular access-related) or had a clinically significant bleeding (12.1%) during the 2 weeks preceding and 2 weeks following the RRT initiation more often than non-diabetics (5.6%).

Preparation for Dialysis

Functional AVF or PD catheter at the time of dialysis initiation was created in 64.4% of patients (in 65.2% of non-diabetics and 63.8% of diabetics, respectively). Surgical creation of a vascular access had failed or the AVF had not been functional (yet) in 7.3% of cases. Creation of an AVF had been evaluated as unfeasible in 7.8% of pa-

Table 2. Basic characteristics of patients with nephrological follow-up lasting >6 months – laboratory results at the dialysis initiation and comparison of diabetics and non-diabetics (mean $\pm$ SD values)

Laboratory results	Total	Non-diabetics	Diabetics	p
Hemoglobin, g/l	98.3 $\pm$ 15.6	100.1 $\pm$ 16.8	97.3 $\pm$ 15.5	0.357
Albumin, g/l	36.7 $\pm$ 5.6	38.2 $\pm$ 5.2	35.2 $\pm$ 7.5	0.005*
Serum iron	9.6 $\pm$ 4.7	9.7 $\pm$ 4.7	9.5 $\pm$ 4.8	0.761
Ferritin, mmol/l	239.3 $\pm$ 232.7	232.0 $\pm$ 239.7	242.2 $\pm$ 239.8	0.469
Transferrin saturation, %	20.0 $\pm$ 12.3	20.1 $\pm$ 12.1	24.1 $\pm$ 13.0	0.416
Serum calcium, mmol/l	2.12 $\pm$ 0.24	2.16 $\pm$ 0.25	2.08 $\pm$ 0.29	0.020*
Serum phosphate, mmol/l	1.90 $\pm$ 0.61	1.96 $\pm$ 0.72	1.83 $\pm$ 0.54	0.327
iPTH, pg/ml	286 $\pm$ 239	335 $\pm$ 256	254 $\pm$ 230	0.120
Bicarbonate, mmol/l	19.4 $\pm$ 4.2	19.0 $\pm$ 5.3	19.6 $\pm$ 3.3	0.330

* Statistically significant.

Table 3. Comorbidities and transplantability – in total and according to diabetes status (%)

	All patients	Non-diabetics (43.4%)	Diabetics (56.6%)
Hypertension	95.1	93.3	96.6
Myocardial infarction (MI)	24.4	16.9	30.2
Ischemic heart disease without MI	26.3	19.1	31.9
Peripheral artery disease	14.6	5.6	21.6
Cerebrovascular disease	12.2	9.0	13.8
Chronic heart failure	28.3	20.2	34.5
Considered for transplantation	20.6	28.1	14.8
Included into the waiting list	1.5	3.4	0

Table 4. Selected risk factors at the start of nephrological follow-up

Risk factor	% of patients
Proteinuria	66.8
Microalbuminuria	17.1
(Micro)hematuria	24.4
Elevated serum creatinine	77.1
Diabetes mellitus	51.2
Hypertension	38.2
Recidivating urinary tract infections	14.1
Urolithiasis	5.4
Solitary kidney	5.4
None of listed	2.4

tients (in 4.5% of non-diabetics and 9.5% of diabetics) and a permanent central venous catheter (Permcath™) had been chosen as a primary vascular access in these patients.

Overall, 77.6% of patients had been vaccinated with at least two doses of anti-VHB vaccine. Treatment by angiotensin-converting enzyme inhibitors (ACEI) and/or angiotensin II type 1 receptor blockers (ARB) was more frequent in diabetics (78.4%) than in non-diabetics (64.0%).

Treatment of Anemia

ESA had been administered to 23.9% of patients, but administration exceeded 3 months in only 14.7%. The mean Hb level at dialysis initiation was 98.3 $\pm$ 15.6 g/l and blood transfusion had to be administered to 20.0% of the patients. 23.9% of the patients reached an Hb level of 110–130 g/l, whereas 74.4% presented a lower level and

1.7% higher levels of Hb. 39.8% of the patients had a transferrin saturation >20 and 31.0% had a ferritin level between 200 and 500 μ g/l, whereas in 58.5% of the patients the ferritin level was <200 μ g/l and in 10.6% >500 μ g/l.

The mean Hb value in kidney transplant patients (6.2% of patients) with a graft failure was 93.1 $\pm$ 17.1 g/l. Non-diabetic patients with a nephrological follow-up lasting >12 months had been treated with ESA in 10.8% of the cases whereas those with diabetes in 14.7% cases.

Treatment of Mineral and Bone Disease

At the time of dialysis initiation, 36.1% of the patients were treated with phosphate binders and 56.6% with an active form of vitamin D (calcitriol or alfacalcidol). At the same time, the mean S-Ca level achieved was 2.12 $\pm$ 0.24 mmol/l, mean S-P level was 1.90 $\pm$ 0.61 mmol/l and the mean iPTH level was 286 $\pm$ 239 pg/ml. In 54.9% of the

Table 5. Selected results of awareness and compliance of patients (%)

Recommendation	Not informed	Informed, adhered to recommendation	Informed, did not adhere to recommendation	Not necessary
Dietary salt restriction	14.9	71.8	6.6	6.6
Dietary protein restriction	18.2	64.1	8.8	8.8
Dietary phosphate restriction	37.2	43.3	4.4	15.0
Smoking cessation	6.6	17.7	9.4	66.3 (non-smokers)

patients, S-Ca was in the range of 2.1–2.38 mmol/l, 36.6% had a lower and 8.6% a higher calcemia level. Hyperphosphatemia >1.78 mmol/l was present in 51.7% of the patients. iPTH was in a K/DOQI target level of 150–300 pg/ml in 36.7% of cases, lower in 29.5% and higher in 33.8%. Vascular and extravascular extraosseal calcifications were reported in 6.3 and 1.0% of the patients, respectively. Diabetics had been treated with active vitamin D less often than non-diabetics (53.4 vs. 60.7%, respectively), and the same was true for phosphate binders (34.5 vs. 38.2%, respectively).

Referring Physician

Patients had been referred to a nephrologist by general practitioners (30.7%), general internists (27.8%), diabetologists (17.6%), urologists (10.2%), other nephrologists (9.4%), cardiologists (5.4%), surgeons (3.0%) or other physicians (5.2%), respectively. In 1.5% of cases the patient sought nephrological care by himself. 63.2% of the patients lived less than a 20-min car drive from the nephrology center. The prevalence of selected risk factors for kidney diseases at the time of referral is listed in table 4.

Patients' Awareness and Compliance

64.3% of the patients felt they had enough information about HD and 27.5% felt they were only partly informed (HD was contraindicated in 0.5% of the patients). By contrast, 29.1% of the patients were well informed about PD and 22.5% just partly (this method being contraindicated in 8.8% of the patients) and 39.6% of the patients reported not having any information about PD at all. 22.5% of the patients stated that they had got sufficient information on transplantation, 23.1% perceived the information as incomplete, and 35.2% lacked any information on transplantation. Kidney transplantation was contraindicated in 19.2%. 63.5% of the patients thought that the information had been provided to them on time.

Physicians reported poor patient compliance in 15.1% of the cases. Patients evaluated their own compliance as excellent in 37% of the cases, as good in 53.6%, and as unsatisfactory in 9.4% of the cases, respectively (out of this latter number, the lack of compliance was caused by lack of information in 4.4% and by underestimation of disease severity in 5.0% of cases). Patients found their own compliance unsatisfactory in the following fields: dietary restrictions (38.5%), physical activity (24.4%), drug ingestion (14.1%), visiting physicians (10.7%) and monitoring of blood pressure (10.2%). Some of the results related to patients' awareness and compliance are shown in table 5.

Discussion

Almost half of all dialysis Czech DCs participated in the study. Overall, 1,993 patients initiated chronic dialysis treatment in the CR during 2009 [28], of which 832 (41.7%) were referred very late. The 359 patients who participated in the study therefore represented 18% of all incident patients in the CR. Considering the duration of the study and the number of participating DCs, the expected number of patients would be 444, e.g., the authors collected data from 80.8% of expected patients. The data acquired during the study may therefore, with some limitations, be extrapolated to the whole population in the CR. The quality of the study may possibly be limited by the voluntary participation in the study, even though participation was offered to all DCs.

There is no consistent definition of late referral and several authors define it differently: the time period in particular publications ranges from >12 months before dialysis initiation till the necessity of immediate dialysis initiation [2, 11, 25, 29, 30]. In our study we used a cut-off period of 1 month for very late referral; this time period is apparently insufficient for an adequate medical preparation of the patient for dialysis and there is usually no

choice but to initiate RRT. Further, we chose a cut-off period of 6 months for late referral as this period should be fully adequate for a complex medical preparation of the patient for RRT initiation (in particular for education of the patient, selection of treatment modality, creation of an AVF/insertion of a PD catheter, vaccination, management of anemia and mineral and bone disease, consideration of medical eligibility for kidney transplantation). We performed the same analysis for groups of patients referred ≤ 1 month before RRT initiation, >1 and ≤ 4 months, >4 and ≤ 12 months, and >12 months, respectively. These results (not presented here) were comparable with those mentioned above.

Verification of the primary renal disease by performing a renal biopsy was lower than expected, especially when considering the long-term duration of follow-up in these patients. 30 patients with long-term nephrological follow-up received diagnosis of chronic glomerulonephritis, even though only 17 (56.7%) of them were biopsied. As suspicion of diabetic nephropathy is not a clear indication for a renal biopsy, it is not surprising then that diabetic patients are four times less likely to undergo a renal biopsy. The occurrence of ischemic nephropathy was surprisingly low – 9% in contrast with 18% in the NECOSAD study [11]; however, we believe that in a certain number of patients referred as suffering from hypertensive nephropathy the renal failure was actually caused by atherosclerosis of renal arteries or peripheral nephrosclerosis.

Overall, one fifth of the patients were examined to assess their medical eligibility for kidney transplantation; transplantation was considered twice less often in diabetic patients compared to patients without diabetes. The number of preemptive inclusions on the kidney transplant waiting list and the number of preemptive kidney transplantations are unfavorably low, particularly considering the better long-term outcomes of preemptive kidney transplantations compared with transplantations after >6 months of dialysis treatment and considering the long-term nephrological follow-up of studied patients, which should enable inclusion of all the medically eligible patients on the transplant waiting list already before dialysis initiation.

Hospitalization at the time of dialysis initiation was necessary in two fifths of the patients; this corresponds with the number of patients (two fifths of all patients) who had to initiate dialysis prematurely, e.g. due to an acute aggravation of chronic kidney disease ('acute on chronic disease').

Functional AVF/PD catheter at the time of RRT initiation was present in less than two thirds of the patients.

Even though there were no contraindications for it, no attempt had been made to create an AVF or to implant a PD catheter before the initiation of dialysis treatment in as many as 20.5% of the patients with a long-term nephrological follow-up. It is obviously desirable to get this number down to near zero.

ESA had been administered on a long-term basis in only one seventh of the patients, even though the mean Hb value was as low as 98.3 ± 15.6 g/l and 20.0% of the patients needed blood transfusion at dialysis initiation. A strikingly high proportion of patients (three fourths) had an Hb level <110 g/l. 69.8% of the patients with a low Hb were not receiving any ESA. However, regular administration of ESA to pre-dialysis patients was approved by some Czech medical insurance companies while this study was in progress. We can therefore assume that the results of anemia management may be better to date. Iron therapy is also to be improved, as more than half of the patients had a low transferrin saturation and/or ferritin level. The mean value of Hb in patients with a graft failure was comparable with the Hb in patients with a pre-dialysis nephrological follow-up lasting <1 month (93.4 ± 17.4 g/l), which illustrates the underestimation of anemia management as well as its complexity in this specific group of patients.

The use of phosphate binders was as low as 36.1% and patients' awareness of a low phosphate diet reached only 47.7%, whereas a mean S-P level of 1.90 ± 0.61 mmol/l was unacceptably high, and more than half of the patients presented hyperphosphatemia >1.78 mmol/l. The use of active vitamin D was also insufficient considering a mean S-Ca of 2.12 ± 0.24 mmol/l, a mean iPTH of 286 ± 239 pg/ml and the fact that more than one third of the patients had hypocalcemia <2.1 mmol/l. A high proportion of hypocalcemic patients might contribute to quite a high proportion of cases with high iPTH (one third). In fact, 50.8% of the patients with hypocalcemia were not treated with vitamin D, whereas 93.3% of those with hypercalcemia were. Similarly, 58.0% of the patients with hyperphosphatemia were not given any phosphate binders. 68.3% with a low iPTH were receiving vitamin D, and 50.0% of those with a high iPTH were not. These data show that more attention should be given to continuous evaluation of the therapy (K/DOQI targets for calcium-phosphate metabolism have been applied). Nutritional status assessed by serum albumin was comparable with that of patients included in the newly published NECOSAD study, but Hb levels, bicarbonates levels and calcium-phosphate metabolism parameters were considerably worse in our group of patients [11].

Regarding patient referral to nephrologists, most cases were often referred by general practitioners or internists. Further, it is evident that diabetologists often fail to refer patients to nephrologists as only 26.3% of diabetics were referred by diabetologists, and the rest by other specialists. At the time of referral, the most frequently occurring risk factors were elevated serum creatinine, proteinuria, diabetes and hypertension. Microhematuria at referral was present in only one fourth of the patients who subsequently developed renal failure.

HD awareness was significantly better than that of PD; overall, two fifths of the patients were not informed about PD at all and less than 30% felt they were informed well about the issue. The low number of patients who had chosen PD may thus be at least partly caused by the lack of information on PD. Patients thought the information had been given at an appropriate time in less than two thirds of the cases. Kidney transplantation awareness was generally low, but it corresponded with the percentage of patients being prepared for the inclusion on the kidney transplant waiting list. Although most patients had been informed about the need of dietary salt restriction, up to one fifth of the patients had not been educated about dietary protein restriction and more than one third of the patients were not given information about dietary phosphate restriction. 33.7% of the patients were smokers, of which 19.6% had not been informed about the necessity of smoking cessation. On the other hand, two thirds of the patients who were advised to stop smoking did so.

Conclusion

To sum up: (1) A significant number of patients with nephrological care lasting >6 months before RRT initiation had not been treated optimally and had not been well

and timely informed about the recommended treatment, particularly those with a failing graft. Improvement is especially needed with regard to the management of anemia and calcium-phosphate metabolism and patient information about dialysis modalities and appropriate lifestyle changes. Focused screening for extraosseal calcifications should be considered. (2) The low number of patients choosing PD may in part be because of the lack of sufficient information about PD. (3) Particular attention should be paid to diabetic patients due to their higher morbidity, lower proportion of patients considered for transplantation and only a low proportion of patients referred to nephrologist by diabetologists. (4) Finally, it is desirable to increase the proportion of patients included on the kidney transplant waiting list preemptively.

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