

Referral pattern of patients with end-stage renal disease at a public sector hospital and its impact on outcome

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ABSTRACT

Background. Late referral of patients with chronic kidney disease (CKD) to a nephrologist has been shown to be associated with greater morbidity and adverse clinical outcomes.

Methods. We did a prospective cross-sectional study of 2490 consecutive, newly diagnosed patients with end-stage renal disease (ESRD) referred to the Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh over 2 years. The referral pattern was classified on the basis of the interval between first visit to a nephrologist and initiation of renal replacement therapy (RRT). If the patient reported later to a nephrologist, the disease would have progressed more, and the time interval to initiation of RRT would thus be shorter. A time interval of <3 months was classified as late referral (LR), 3–12 months as intermediate referral (IR) and >12 months as early referral (ER). The demographic and clinical characteristics and co-morbid conditions were compared, and factors associated with LR and outcomes were evaluated.

Results. About 75% of patients were referred late. Poor socioeconomic status, low level of education and reduced access to reimbursement of treatment costs contributed to LR. The aetiology of ESRD could not be established in a larger number of LR patients as compared to the other groups. LR patients had a higher prevalence of uraemic complications and required emergency dialysis more frequently. A higher proportion of LR patients were lost to follow up because they could not afford to continue dialysis. Early mortality was higher in the ER group than in the other groups. ER patients were older, more likely to have diabetic nephropathy and a higher burden of co-morbid conditions. They were also more likely to choose continuous ambulatory peritoneal dialysis or undergo transplantation. Only 28% of all patients continued RRT beyond 3 months.

Conclusion. A large majority of patients with ESRD in India seek medical attention late, usually in advanced stages of CKD with uraemic complications. LR is more frequent in younger patients and those with non-diabetic kidney disease, and is associated with poor socioeconomic status, lack of education and poor outcomes.

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INTRODUCTION

Chronic kidney disease (CKD) is being increasingly recognized as a public health problem. Despite therapeutic advances, mortality among patients on dialysis remains high.¹ The detrimental effects of renal failure start long before renal replacement therapy (RRT) can be initiated. The time gap and quality of care before initiation of dialysis influence the mortality and morbidity of patients on dialysis. Optimal care of patients with CKD includes early detection of disease, interventions to retard progression, cardiovascular risk modification, adequate preparation for RRT and timely initiation of dialysis.² Timely referral of patients with CKD to a nephrologist should result in an improved clinical condition and better preparation for initiation of dialysis. Referral is said to be late when management could have been improved by earlier contact with renal services.³

Studies from the USA,⁴ Europe^{3,5,6} and South America⁷ have shown that delayed referral of patients with CKD to a nephrologist is associated with suboptimal pre-end-stage renal disease (ESRD) care and higher morbidity and mortality. Given the limited access to healthcare and lack of health insurance in India the systematic practice of referrals and level of awareness on CKD, the percentage of late referrals can be expected to be higher. At present there are no data on the referral pattern of CKD in India and its impact on outcomes. Observation of patients referred to our hospital showed that the large majority were already in stage V CKD by the time they were referred.

We prospectively studied the referral pattern of patients with ESRD presenting to our public sector hospital and analysed the factors associated with referral patterns and clinical outcomes.

METHODS

All patients with newly diagnosed ESRD who attended the outpatient and emergency services of Nehru Hospital of the Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh over a period of 2 years from January 2006 to December 2007 were included. Patients with acute, reversible kidney failure, diseases that cause rapidly progressive renal failure, those who died before the chronic nature of disease could be established and those requiring dialysis following renal allograft failure were excluded. Data were collected by direct interviews and from referral records. ESRD was defined according to the Kidney Disease Outcomes Quality Initiative criteria. Details of aetiology of ESRD, duration of disease, socioeconomic status, level of education, biochemical tests and drug therapy before referral, co-morbid conditions, need, timing and type of RRT, access to medical reimbursement, and likelihood of getting long term RRT were recorded. RRT was initiated according to standard clinical indications.

The aetiological diagnosis was made as follows. *Diabetic nephropathy* was diagnosed in the presence of diabetes mellitus, proteinuria, diabetic retinopathy and absence of any other cause for CKD. *Hypertensive nephrosclerosis* was diagnosed if the patient had documented primary hypertension for >5 years before the onset of renal failure in the absence of any other renal disease. *Chronic glomerulonephritis* was diagnosed if a kidney biopsy showed glomerulonephritis or history of long-standing oedema and/or proteinuria >1.5 g/day. The diagnosis of *tubulo-interstitial disease* was made either on the basis of histology or on the basis of a compatible history, the presence of vesicoureteric reflux and/or recurrent urinary tract infection. *Obstructive uropathy* and *cystic disease* were diagnosed on the basis of imaging findings. The diagnosis of *renovascular disease* was based on Doppler study or angiography. Kidney disease in association with specific 'syndromes' was diagnosed by characteristic clinical findings, family history and laboratory abnormalities. The aetiology was classified as 'undetermined' in the remaining.

Patients were classified into 3 groups according to referral patterns—early, intermediate and late, based on the interval between the first visit to a nephrologist (either at this institute or elsewhere) and the initiation of RRT. Late referral (LR) was defined when this duration was <3 months, intermediate referral (IR) when it was 3–12 months and early referral (ER) when it was >12 months. The LR patients were further sub-classified as 'ultra-late' when the interval was <1 month.

After initial metabolic control and work-up to establish the diagnosis, patients and their caregivers were counselled about the need for long term RRT and explained the treatment alternative. Because of the lack of universal insurance, patients decided how and where to pursue further treatment. Help was provided in fund-raising by the Public Relations department of PGIMER. Dialysis was initiated according to standard clinical indications. Both haemodialysis (HD) and peritoneal dialysis (PD) were used. Vascular access for HD was obtained by placing catheters in the internal jugular or femoral veins. PD was done when HD could not be provided immediately due to logistic reasons, and in haemodynamically unstable patients. PD catheters were inserted percutaneously. The dwell-time was about 30–60 minutes to allow rapid metabolic control. Dialysis using this approach was typically given for 24–48 hours. Co-morbid conditions were identified on clinical grounds. A diagnosis of coronary artery disease (CAD) was made if the patient had symptoms suggestive of the same with consistent electrocardiographic findings, or if the patient had documented evidence of CAD from investigations done elsewhere. Diagnosis of peripheral vascular disease was made on the basis of history and missing/asymmetric pulses. The diagnosis of peripheral neuropathy was based on history and physical examination.

Patient outcomes were determined at the end of 6 months as (i) death, (ii) transplantation, (iii) haemodialysis, (iv) chronic peritoneal dialysis, and (v) lost to follow up. Attempts were made to telephonically contact those not on follow up to assess their status. Laboratory parameters included were the initial value on presentation.

Statistical analysis was done using the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, version 15.0 for Windows). All quantitative variables were described using measures of central location (mean, median) and measures of dispersion (standard deviation). Normality of data was checked by measures of Kolmogorov–Smirnov test. Categorical variables were described as frequencies and proportions. Comparisons of

characteristics between the ER, IR and LR groups were done with chi-square test or ANOVA. All tests were two-sided and performed at a significance level of $p < 0.05$.

RESULTS

A total of 2490 patients were included in the study (Table I). The majority (75%) of our patients were LRs. Of these, 88% were 'ultra-late' referrals. There was no difference in the characteristics between the LR and ultra-late categories and hence they have been described together. CKD of undetermined aetiology was the most common diagnosis (38.5%), followed by diabetic nephropathy (24.9%) and chronic glomerulonephritis (12.6%). The proportion of patients with CKD of undetermined aetiology was higher in the LR group, whereas patients with diabetic nephropathy were more likely to be referred early. ER was more common in patients with diabetic nephropathy (27%) compared to the combined population with other types of CKD (12%, $p < 0.0001$). Patients in the ER group were older compared to those in IR and LR groups. The sex ratio was similar in the 3 groups. About 20% of the patients were unschooled and 36% had gone to college. About 86% of the uneducated and 67% of college-educated patients were referred late ($p < 0.0001$). The majority of our patients came from the poor socioeconomic group; about 57% had a monthly income $< ₹5000$, and only 7.5% of the patients had a monthly income $> ₹20\ 000$. About 46% of patients in the high-income category were referred late, compared to 78% and 72% of the low and intermediate income categories, respectively ($p < 0.0001$). Compared to the uninsured, patients who had access to medical reimbursement were less likely to be referred late (76% v. 69%).

Patients in the LR group had significantly higher prevalence of anaemia, hypoalbuminaemia, hypocalcaemia and hyperphosphataemia compared with those in the ER group ($p < 0.0001$; Table II).

The prevalence of co-morbid conditions such as CAD, peripheral arterial disease, stroke and neuropathy was higher among the ER group. The proportions of patients receiving phosphate binders and erythropoietin were significantly lower in the LR compared with the ER group (Table III). A significantly higher proportion of patients in the LR group required dialysis within 48 hours of presentation ($p < 0.0001$). More patients in the ER group (43.4%) had been informed of the need of dialysis compared with the IR (24.5%) and LR groups (14.4%, $p < 0.001$). PD was the mode of first dialysis in 50.8% of LR and 14% of ER groups ($p < 0.0001$, Table III).

At the time of diagnosis, 548 patients in the LR, 117 in the IR and 228 in the ER groups felt that they had the resources to continue long term RRT ($p < 0.0001$). Early mortality was higher in the ER group (Table IV). Fifty-eight patients were started on chronic PD; the ER group chose this modality more frequently than the LR group ($p < 0.0001$). A total of 284 patients underwent renal transplantation, with the LR group patients receiving transplants less frequently. A total of 353 patients continued to be on HD at the end of 3 months, which included 10.3% LR, 24.4% IR and 26.5% ER patients, respectively ($p < 0.0001$). A total of 1703 patients were lost to follow up. The proportion of patients lost to follow up was significantly more in the LR group ($p < 0.0001$).

DISCUSSION

This is possibly the first study from India to evaluate the referral

TABLE I. Patient characteristics and the factors that had an impact on referral patterns

Demographic characteristic	Referral			Total
	Late (LR)	Intermediate (IR)	Early (ER)	
Number of cases	1868 (75)	234 (9.4)	388 (15.6)	2490
Mean (SD) age (years)*	43.16 (16.1)	41.25 (15.4)	50.13 (15.7)	—
Sex ratio (M:F)	2.4:1	2.4:1	2.1:1	—
<i>Aetiology of chronic kidney disease</i>				
Diabetic nephropathy†	382 (61.6)	70 (11.3)	168 (27.1)	620 (24.9)
Undetermined†	860 (89.8)	50 (5.2)	48 (5)	958 (38.5)
Chronic glomerulonephritis	193 (61.5)	36 (11.4)	85 (27.1)	314 (12.6)
Chronic interstitial nephritis	105 (79.5)	21 (15.9)	6 (4.6)	132 (5.3)
Cystic disease	68 (62.4)	10 (9.2)	31 (28.4)	109 (4.3)
Obstructive uropathy	38 (46.3)	9 (11)	35 (42.7)	82 (3.3)
Hypertensive nephrosclerosis	34 (68)	9 (18)	7 (14)	50 (2.1)
Others	188 (83.5)	29 (12.9)	8 (3.6)	225 (9)
<i>Socioeconomic characteristics influencing timing of referral</i>				
<i>Level of education†</i>				
None	438 (85.7)	41 (8)	32 (6.3)	511 (20.5)
Attended school	825 (76.6)	95 (8.8)	157 (14.6)	1077 (43.3)
Attended college	605 (67.1)	98 (10.8)	199 (22.1)	902 (36.2)
<i>Monthly family income (₹)†</i>				
<5000	1099 (78.1)	136 (9.7)	172 (12.2)	1407 (56.5)
5000–20 000	684 (76.2)	79 (8.8)	135 (15)	898 (36)
> 20 000	85 (45.9)	19 (10.3)	81 (43.8)	185 (7.5)
<i>Source of funding‡</i>				
Self	1554 (76.3)	192 (9.4)	291 (14.3)	2037 (81.8)
Reimbursement	314 (69.3)	42 (9.3)	97 (21.4)	453 (18.2)

Figures in parentheses are percentages * p<0.0001 LR v. ER, LR v. IR, p=0.08 ER v. IR † p<0.0001 (chi-square for trend)
‡ p=0.0003 (chi square for trend), p=0.0002 LR v. ER, p=0.05 IR v. ER

TABLE II. Selected laboratory parameters in the three referral groups at presentation (mean [SD])

Characteristic	Referral			p value
	Late (LR)	Intermediate (IR)	Early (ER)	
Haemoglobin (g/dl)	7.3 (1.9)	7.5 (1.4)	8.5 (1.8)	<0.0001 LR v. ER, LR v. IR; 0.11 LR v. IR
Calcium (mg/dl)	7.9 (1.8)	8.2 (0.9)	8.4 (1.0)	<0.0001 LR v. ER; 0.01 LR v. IR, IR v. ER
Phosphate (mg/dl)	8.3 (1.2)	7.4 (2.0)	6.9 (1.5)	<0.0001 LR v. ER, LR v. IR; 0.004 IR v. ER
Albumin (g/dl)	2.9 (0.7)	2.9 (0.4)	3.0 (0.5)	0.008 LR v. ER, LR v. IR; 0.01 IR v. ER

TABLE III. Co-morbid conditions, use of medication, and complications of uraemia and requirement of dialysis at the time of referral in the three groups

Item	Late (n=1868)	Intermediate (n=234)	Early (n=388)	Total (n=2490)	p value
<i>Co-morbid conditions</i>					
Peripheral vascular disease	27 (1.4)	14 (6)	29 (7.5)	70 (2.8)	<0.0001
Coronary artery disease	230 (12.3)	34 (14.5)	115 (29.6)	379 (15.2)	<0.0001
Left ventricular hypertrophy	637 (34.1)	80 (34.5)	222 (57.2)	939 (37.7)	<0.0001
Stroke	49 (2.6)	8 (3.45)	20 (5.2)	77 (3.1)	0.02
Neuropathy	156 (8.4)	11 (4.74)	72 (18.6)	239 (9.6)	<0.0001
<i>Medication use</i>					
Erythropoietin	94 (5)	24 (10.3)	188 (48.5)	306 (12.3)	<0.0001
Vitamin D	192 (10.3)	130 (55.6)	355 (91.5)	677 (27.2)	<0.0001
Phosphate binders	183 (9.8)	147 (62.8)	372 (70.1)	702 (28.2)	<0.0001
<i>Complications of uraemia and requirement for dialysis</i>					
Fluid overload	832 (44.5)	101 (43.2)	73 (18.8)	1006 (40.4)	<0.0001
Hyperkalaemia	1183 (63.3)	104 (44.4)	60 (15.5)	1347 (54.1)	<0.0001
Encephalopathy	466 (25)	29 (12.4)	40 (10.3)	535 (21.5)	<0.0001
Emergency dialysis	1472 (78.8)	155 (66.2)	103 (26.5)	1730 (69.5)	<0.0001
PD as the first dialysis	950 (50.8)	75 (32.1)	50 (12.9)	1075 (43.2)	<0.0001

PD peritoneal dialysis Figures in parentheses are percentages

TABLE IV. Outcomes in the three referral groups

Outcome	Referral group			Total	p value
	Late	Intermediate	Early		
Peritoneal dialysis	26 (1.4)	6 (2.6)	26 (6.7)	58 (2.3)	<0.0001
Haemodialysis	193 (10.3)	57 (24.4)	103 (26.5)	353 (14.2)	<0.0001
Kidney transplantation	163 (8.7)	31 (13.2)	90 (23.2)	284 (11.4)	<0.0001
Lost to follow up	1436 (76.9)	134 (57.3)	133 (34.3)	1703 (68.4)	<0.0001
Died	50 (2.7)	6 (2.6)	36 (9.3)	92 (3.7)	<0.0001

Figures in parentheses are percentages

pattern of patients with ESRD and its impact on the outcome. The main findings are the high percentages of late and ultra-late referrals, the high proportion of patients with ESRD due to CKD of unknown aetiology, and the poor outcomes. CKD was most frequently detected in stage V. The presentation was precipitated in a majority of patients by advanced uraemia, with a need for urgent dialysis. A majority of LR patients came from a poor socioeconomic background and had no capability of meeting RRT costs, leading to poor outcomes.

PGIMER is a large public sector tertiary care referral hospital and the profile of patients in this study typifies those presenting to a public sector hospital in India. Patients from the poorer sections of society who cannot afford private hospitals come here for subsidized healthcare. Only 18% of our patients were eligible for reimbursement of treatment costs. A large proportion came to get a confirmation of the diagnosis and its irreversible nature. Even after confirmation, about 64% expressed an inability to afford long term RRT. Although a large majority of patients did receive RRT initially, about 68% were eventually lost to follow up. It is unlikely that some of them could have gone on to another healthcare facility and continued RRT, since these patients were from low socioeconomic groups who would be unable to afford even more expensive RRT elsewhere. We suspect that these patients discontinued therapy and are likely to have died.

There was a discrepancy between the initial estimates of affordability of RRT by the patient and the actual numbers that continued on long term RRT. A higher proportion discontinued RRT than what was originally estimated. This is likely because the patients and their caregivers could not accurately assess the treatment cost in the initial stages. Once RRT was started, the costs became apparent, leading to discontinuation of therapy.

The outcome data in this study are similar to those reported earlier from southern India by Rao *et al.*⁸ who had documented 9% in-hospital mortality and 60% lost to follow up due to economic reasons. In a more recent report from the same centre,⁹ about 42% of patients were either unable to afford RRT or were uncertain. In contrast, the loss to follow up was 8% from a private sector dialysis unit.¹⁰ Since patients getting dialysis in the private sector pre-select themselves based on socioeconomic criteria, the relatively low attrition rate is to be expected.

The proportion of LR patients was higher than that reported in most published studies from the European and American continents. The reported incidence ranges from 10.5% to 83%,¹¹ with most reporting an incidence of about 30%. Factors responsible for LR can be categorized into disease-related, patient-related and physician-related. There was no gender difference in referral pattern, but contrary to reports published from the West, LR patients in our study tended to be younger. Previous studies have correlated increasing patient age with LR,¹² with the likelihood of ER significantly low above the age of 75 years. The age profile of ESRD cases in our study is not compatible with that reported from

these studies. Notably, our ESRD population is at least 2 decades younger than that reported from developed countries. The reason behind these differences can only be speculated. Most of our patients were self-employed working adults, typically with family responsibilities, and it is possible that they could not afford to get away from work for the fear of loss of income and therefore delayed seeking medical advice. Other possibilities include differences in genetic predisposition and/or the nature of disease which remains asymptomatic till a late stage.

Consistent with earlier studies, LR was more common in patients with non-diabetic kidney disease. Navaneethan *et al.*¹³ reported that patients with non-diabetic kidney disease were 1.4 times more likely to be referred later to nephrologists than patients with diabetic kidney disease. The cause of CKD was undetermined in a majority of our patient population. The reasons behind this finding could be multiple, including unique aetiological factors resulting in slow asymptomatic progression and/or delayed presentation due to lack of awareness, denial and economic difficulties. This type of presentation has been described only in a minority of patients in other studies.^{14,15} It is possible that these patients had some unique form of CKD that progressed insidiously and symptoms became evident only when RRT was imminent. This presentation is analogous to some form of chronic interstitial disease. Postulations have been made about the role of indigenous medicines, herbs and pesticides in the genesis of this condition,^{16,17} and establishing the cause of ESRD in these patients would require further studies.

We found co-morbid conditions to be associated with ER. The likely explanation for this phenomenon is that symptoms due to involvement of any system prompt patients to seek medical advice. Investigations unveil renal involvement, at which point a nephrology opinion is sought. These patients needed frequent hospitalization for co-morbid conditions and were more likely to die in the first few months after development of ESRD as opposed to LR patients who could leave the hospital after the initial management for uraemia but were lost to follow up and died later for want of dialysis. This finding, however, contrasts with published reports that state that patients with co-morbid conditions tend to be referred late to nephrologists.

'Therapeutic nihilism' has been suggested as a reason for physicians to not refer patients with advanced CKD.¹⁸ We found that a significant proportion of patients were not informed of the irreversible nature of the disease by the referring physicians. General physicians find themselves poorly equipped to break the diagnosis of ESRD with the implied irreversibility, virtually amounting to announcing a death sentence. Of those who were given this information, many wanted confirmation from a nephrology centre before making up their minds.

Socioeconomic factors stood out as important determinants of LR as well as poor outcomes. The proportion of poorly educated patients belonging to the lower socioeconomic group and those

who did not have access to reimbursement for healthcare costs was higher in the LR group. Being poor, homeless, unemployed and uninsured was significantly associated with LR.^{12,19} The Indian healthcare system is characterized by a lack of insurance and absence of an organized system of referral.²⁰ Even those eligible for support get reimbursement much later, and often the compensation is only partial. A substantial proportion of the expenses are related to long distance travel, prolonged hospitalization and loss of wages of the caregivers who often accompany the patients. These expenses have to be borne by the patients themselves even when the cost of medical treatment is reimbursed.

Some of our findings confirm what has been already described in the western literature,^{4,21-24} but were more exaggerated. These include the worse clinical and biochemical profile, poor nutrition and reduced likelihood of undergoing kidney transplantation or choosing PD in the Indian scenario. LR patients showed clear evidence of suboptimal CKD care, exemplified by a higher frequency of uncontrolled hypertension, lower haemoglobin and albumin and higher phosphate levels.

As reported by others, we also saw an impact of the referral pattern on the choice of modality for RRT. ER patients required emergency dialysis less frequently, and were more likely to undergo kidney transplantation or choose chronic PD. ER avoids precipitous initiation of dialysis in unstable patients and results in a higher percentage of patients choosing PD for RRT.^{25,27} Previous studies have shown that with LR, patients were less likely to be put on the waiting list or given a transplant and needed to wait longer.^{28,29} In our study, about 11% patients received kidney transplantation. This figure is higher than the estimated national average of 3% due to the fact that several patients came to our institution specifically to get a kidney transplant.³⁰

In the western literature, the discussion on referral focuses not only on the timing but also on the quality of care after referral to a nephrologist. Most organizations recommend that patients should be referred once the glomerular filtration rate (GFR) declines below 30 ml/minute, and that care should be provided by a multidisciplinary team consisting of a nephrologist, a nurse, a dietician and a social worker. Early studies with such an integrated care approach have shown better survival after initiation of RRT,³¹ greater use of permanent vascular access³² and continuous ambulatory peritoneal dialysis.³³ Curtis *et al.*³⁴ showed that a multidisciplinary approach optimizes management of CKD even more than timely referral to a nephrologist. Our study highlights the fact that with a majority of cases presenting for the first time to any physician only in advanced stages of CKD, such recommendations would be difficult to apply to a majority of Indian patients with CKD.

With a total population of over 1.2 billion, referral of all patients with CKD will clearly overwhelm nephrology services in India. Therefore, targeted intervention is needed with the internist or general practitioner being aware of the broad guidelines for preliminary management and appropriate referral.³⁵

Some limitations of our study need to be acknowledged. Hospital-based data do not permit us to draw conclusions about the incidence and/or prevalence of ESRD. Lack of specialized nephrology care in large parts of India forces patients to travel to hospitals located far from their places of origin. Our patients were not limited to areas in geographic proximity to the city. Only about 52% lived within a radius of 200 km of Chandigarh and the rest came from far-flung areas that have no nephrology facilities, in some cases as far as 1500 km.

The referral profile of affluent urban patients presenting to private hospitals is likely to be different, especially in terms of the degree of sickness at the time of presentation. Private hospitals often do not treat patients who present *in extremis*. Many patients who ultimately get dialysis in private units go there only after being referred from major public sector hospitals. In any case, a vast majority of the Indian population cannot afford care in private hospitals. In a small study of 95 patients from a non-public sector hospital from southern India,¹⁰ the mean creatinine, haemoglobin and phosphate values at the time of presentation were 8.4 mg/dl, 7.4 g/dl and 5.7 mg/dl respectively, suggesting that the difference, if any, is marginal. We did not examine the detailed and subtle socioeconomic reasons behind the differences in timing of referral, for example, whether the patient was referred by the primary care physician in a timely manner and did not visit a nephrologist, or whether the referral itself was delayed, or their awareness of the different ways of obtaining financial assistance. Finally, the co-morbid condition(s) were identified on clinical basis rather than after extensive investigations.

In conclusion, we found LR of ESRD patients to a tertiary care centre to be a common problem in India. LR is associated with being less educated and a lower socioeconomic status. Older patients, those with diabetes and those with co-morbid conditions were more likely to be referred early. The LR group had greater CKD-related complications, needed emergency dialysis more frequently, showed less preference for continuous ambulatory peritoneal dialysis and were less likely to get a kidney transplant. The ER group had a higher burden of co-morbid conditions and mortality early after diagnosis of ESRD. Despite the lower initial mortality, the LR group showed a high attrition rate because of inability to afford long term RRT.

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