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A study of prescription pattern in the drug therapy of chronic kidney disease

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Abstract

Objectives: a) To analyze the pattern of drug prescription for chronic kidney disease and its co-morbid conditions, if exist. b) To study the rationality of drug therapy.
Methodology: Over a period of 1 year, the discharge-summary records of 188 patients with CKD, admitted to nephrology wards of Justice K. S. Hegde Charitable Hospital, Mangaluru, were scrutinized and the data was collected in a specially designed proforma. Descriptive analysis of the data was done.
Results: Of the total 188 patients, 101(53.7%) were males and 87 (46.3%) females. Highest numbers of patients were in the age group of 58-67 years (29.3%). Hypertension was the most common co-morbidity (82%) observed, followed by anaemia (54.8%) and type 2 diabetes (43%). A total of 1436 drugs were prescribed to 188 CKD patients. Each patient received an average of 7.6 drugs. Polypharmacy was seen in all patients. Drugs acting on the cardiovascular system constituted the bulk of the prescriptions (31%) followed by nutritional Supplements (15.3%), haematinics (10.7%) and the drugs acting on gastrointestinal system (10.3%). Other important categories of drugs prescribed included antimicrobials (5.8%), antiplatelets and hypolipidaemic agents (5%), antidiabetic drugs (4.7%) and phosphate binders (4%).
Conclusion: This study shows that the management of chronic kidney disease in the nephrology department of Justice K. S. Hegde Charitable Hospital, is in congruity with the rational utilization of medicines which is based on the clinical knowledge, expertise and the guidelines accessible in the field of nephrology practice.
Keywords: Rational prescription, chronic kidney disease, nephrology.

1. Introduction

A recent systematic review and meta-analysis on chronic kidney disease (CKD) revealed that the global prevalence of CKD is as high as 13.4%, indicating that the CKD has assumed epidemic proportions globally. The study also revealed that the CKD prevalence in Europe is around 18.38%, whereas in USA & Canada, it is about 15.45%. In India too, the CKD burden is as high as 13.1%. This has been ascribed to the growing prevalence of diabetes mellitus (DM), hypertension and ischemic heart disease (IHD).[1] CKD patients have multiple co-morbidities and complications, and are prescribed, a large number of medications, including those that might alter the rate of progression of decline in kidney function, and those used to treat hypertension, diabetes, lipid disorders, anaemia and osteodystrophy.[2] The extent of potential medication-related problems such as over and under prescription, drug interaction types and frequencies, adverse reactions are largely unknown. Recent data do suggest that specific populations of patients with kidney disease are prone to suboptimal prescription of medications, but the extent of this phenomenon is unclear.[3]

The irrational prescription is a well-recognized problem worldwide. It is not just responsible for the adverse effects, but also exacerbates the disease and causes psychological distress to the patients as well as to the family members.[4] As indicated by an estimation done by the World health organisation (WHO), more than half of all medications are endorsed, administered or sold improperly. Likewise, half of all patients come up short to take the

endorsed prescription effectively. The abuse, underuse or misuse of prescriptions results in wastage of rare assets and far-reaching wellbeing perils.[5]

Therefore, steps need to be taken to ensure rational use of medications worldwide, so that an adequate standard of treatment is provided at all levels of the health care delivery system. Keeping in mind the end goal to guarantee that the medications are endorsed to the patients rationally and in this way to diminish the health risks and the financial burden on patients, medical auditing system is given tremendous significance in the present-day situation. The study of prescribing patterns is an integral component of medical audit, which looks to screen, assess, and if important, propose alterations in recommending practices to make medical care judicious and financially savvy.[6,7] Appropriate selection of the drug therapy thus ensures maximal benefits to the patient while minimizing the side effects. The purpose of this study was to analyse current prescribing trends in the management of CKD patients and to suggest ways to rationalize drug use, minimize medication error and improve therapeutic outcome.

2. Material and methods

The study was a prospective, observational study. After obtaining approval from the Institutional Ethics Committee, the study was undertaken for a period of 12 months, from January 2015 to December 2015. CKD patients above 18 years of age from the in-patient department of nephrology with a discharge summary were included in the study. Patients attending out-patient department, pregnant and lactating women were excluded from the study. The discharge-summary records of 188 CKD patients, admitted to nephrology wards of Justice K. S. Hegde Charitable Hospital, Mangaluru, were scrutinized and the data was collected in a specially designed proforma which included the following details:

Demographic data: Name, age, gender, address, In-patient (IP) number and duration of stay in hospital.

Disease data: Stage of CKD and co-morbidities.

Data pertaining to the drug therapy which included: Drugs prescribed (with group/class), fixed dose combination (if any), dose of the drugs, frequency of prescription, route of administration and usage of generic/brand name.

Data was tabulated on Microsoft Excel spreadsheet (version 2013) and analyzed using Microsoft Excel and represented as numbers and percentages.

3. Results

3.1 Demographic profile of the patients

Of the total 188 patients, 101(53.7%) were males and 87 (46.3%) were females. Highest number of patients (both males and females included) were in the age group of 58-67 years (59 patients, 29.3%), followed by the age group of 48-57 years (39 patients, 20.7%), and 38-47 years (38 patients, 20.2%). Mean age of the patients was 52.5 +/- 13.7 years.

3.2 Disease profile of the patients:

It was observed that most of the CKD patients admitted, belonged to stage 5 of CKD (165 patients, 87.8%) followed by stage 4 (14 patients, 7.4%) and stage 3 (9 patients, 4.8%). Stage 1 and stage 2 CKD patients were not admitted.

Hypertension was the most common co-morbidity (154 patients, 82%) observed in the study population followed by anaemia (103 patients, 54.8%) and type 2 diabetes (81 patients, 43%). Table 1 depicts the co-morbidities observed in the study population.

Table 1: Co-morbidities observed in the study population

Sl. No.	Co-morbidity	Frequency (n=188)	Percentage (%)
1	Hypertension	154	82
2	Anaemia	103	54.8
3	Type 2 diabetes	81	43
4	IHD	37	19.7
5	UTI	21	11.2
6	Fluid overload	20	10.6
7	Dyslipidaemia	14	7.4
8	CKD-MBD	11	5.9
9	LRTI	8	4.3
10	Stroke	8	4.3
11	Pneumonia	7	3.7
12	Acid-peptic disease	7	3.7
13	Encephalopathy	7	3.7
14	Stones in urinary tract	6	3.2
15	Uraemia	5	2.7
16	Bronchial asthma	5	2.7
17	Arrhythmia	4	2.1
18	Long bone fracture	4	2.1
19	Pyelonephritis	3	1.6
20	Pulmonary tuberculosis	3	1.6
21	Deep vein thrombosis	3	1.6
22	Hypothyroidism	3	1.6
23	Congestive heart failure	2	1.1
24	Cholecystitis	2	1.1
25	Hepatitis B virus infection	2	1.1
26	Pancreatitis	1	0.5
27	History of snake bite	1	0.5

(IHD: Ischaemic heart disease, UTI: Urinary tract infections, CKD-MBD: Chronic kidney disease related Mineral bone disease, LRTI: Lower respiratory tract infections)

3.3 Drugs prescribed to the study population:

A total of 1436 drugs were prescribed to 188 patients who were part of the study. Each patient received an average of 7.6 drugs. None of the patients received monotherapy and thus polypharmacy was seen in all patients – 5 drugs (26 patients, 13.8%), 6 drugs (28 patients, 14.9%), 7 drugs (27 patients, 14.3%), 8 drugs (26 patients, 13.8%) and 9 drugs (26 patients, 13.8%). 4 patients (2.2%) received the highest number of 13 drugs each.

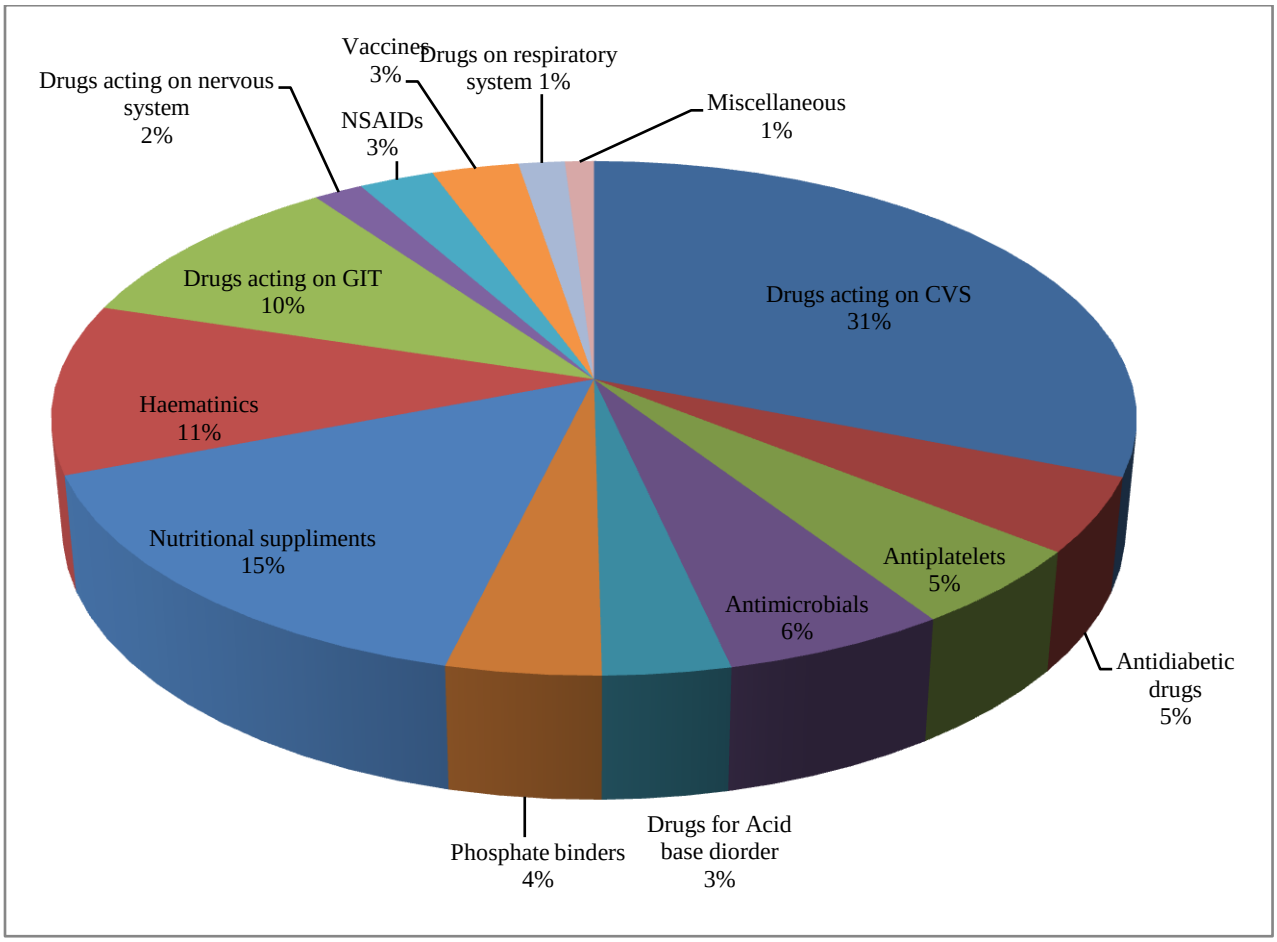
Table 2: Frequency of number of drugs prescribed per patient

No. of drugs per patient	Frequency of patients [n=188] and (%)
2	1 (0.6)
3	4(2.1)
4	8(4.4)
5	26(13.8)
6	28(14.9)
7	27(14.3)
8	26(13.8)
9	26(13.8)
10	19(10.1)
11	9(4.7)
12	10(5.3)
13	4(2.2)

Of the 1436 drugs prescribed, 1416 (98.6%) were written by brand name and only 20 drugs (1.4%) were written by generic name. Of the 1436 drugs prescribed, 1204 drugs (83.8%) were to be administered by oral route, 44 drugs (3.1%) by intravenous route, 42 drugs (2.9%) by intramuscular route and 146 drugs (10.2%) by subcutaneous route.

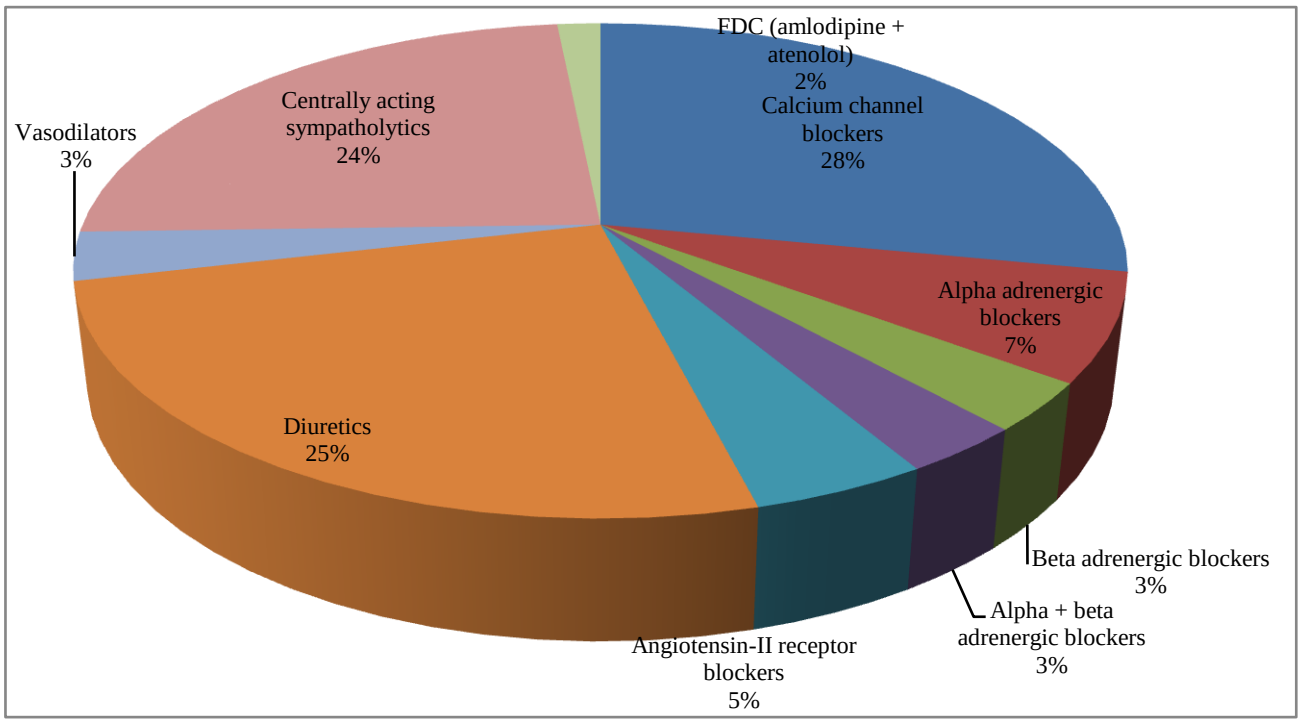
A total of 1436 prescriptions were analysed, out of which drugs acting on cardiovascular system constituted the bulk of the prescriptions (445 prescriptions, 31%) followed by nutritional supplements (219 prescriptions, 15.3%), haematinics (152 prescriptions, 10.7%) and drugs acting on gastrointestinal system (148 prescriptions, 10.3%).

Figure 1: Frequency of various classes of drugs



Of the 435 antihypertensive drugs prescribed, calcium channel blockers (CCBs) (123 prescriptions, 28.3%) were the most commonly prescribed antihypertensive medications followed by diuretics (107 prescriptions, 25.6%) and central sympatholytic drugs (105 prescriptions, 24.1%).

Figure 2: Frequency of antihypertensive drugs



Insulin was the most common antidiabetic drug prescribed (51 prescriptions) and second generation sulfonylureas (14 prescriptions) were the commonly prescribed oral hypoglycaemic agents.

Of the 84 antimicrobial agents prescribed, cefixime (34 prescriptions, 40.5%) was the most common antimicrobial agent prescribed followed by levofloxacin (11 prescriptions, 13.1%) and linezolid (9 prescriptions, 10.7%). Other antimicrobial agents prescribed were cefpodoxime proxetil (7 prescriptions, 8.3%), faropenem (4 prescriptions, 4.7%), ciprofloxacin (2 prescriptions, 2.4%) and colistin (2 prescriptions, 2.4%). A fixed dose combination of amoxicillin and clavulanic acid was also prescribed (4 prescriptions, 4.7%). Antitubercular agents - isoniazid, rifampicin and ethambutol were also prescribed (3 prescriptions each, 3.6%). An antifungal agent, fluconazole was prescribed in 2 prescriptions (2.4%).

Of the 72 anticoagulant – antiplatelet - hypolipidemic agents prescribed, a fixed dose combination of aspirin and atorvastatin (38 prescriptions, 52.7%) was the most commonly prescribed antiplatelet – hypolipidemic agent followed by aspirin (10 prescriptions, 13.8%), warfarin (8 prescriptions, 11.2%) and atorvastatin (7 prescriptions, 9.7%). Clopidogrel (2 pescriptions, 2.7%) and fixed dose combinations of aspirin, clopidogrel and atorvastatin (4 prescriptions, 5.6%) and clopidogrel and atorvastatin (3 prescriptions, 4.3%) were also prescribed.

Of the 48 drugs prescribed for acid-base disorder, febuxostat constituted 25 prescriptions (52.1%) and sodium bicarbonate 23 prescriptions (47.9%). Sevelamer (38 prescriptions, 65.5%) and calcium acetate (20 prescriptions, 34.5%) were the phosphate binders prescribed to study population.

Of the 219 prescriptions of nutritional supplements, vitamin D (alpha D3) (111 prescriptions, 50.7%) was the most commonly prescribed nutritional supplement followed by fixed dose combination of calcium carbonate and vitamin D3 (64 prescriptions, 29.2 %) and vitamin B complex (36 prescriptions, 16.4%). 7 prescriptions (3.2%) of folic acid and 1 prescription (0.5%) of fixed dose of combination of vitamin E and vitamin D3 were also prescribed.

Of the 152 haematinics prescribed, erythropoietin (96 prescriptions, 63.1%) was the most frequent hematinic prescribed followed by intravenous iron sucrose (41 prescriptions, 27%) and oral elemental iron (15 prescriptions, 9.9%).

Of the 148 drugs prescribed for gastro intestinal system disorders, pantoprazole (83 prescriptions, 56%) was the most frequently prescribed drug followed by a fixed dose combination of pantoprazole and domperidone (51 prescriptions, 34.6%). Other drugs prescribed under this category included ranitidine (6 prescriptions, 4.1%), lactulose (6 prescriptions, 4.1%), lactobacillus (1 prescription, 0.6%) and Rabeprazole (1 prescription, 0.6%)

Of the 25 drugs prescribed for central nervous system disorders, chlorazepam (8 prescriptions, 32%) was the most frequently prescribed drug followed by phenytoin

(7 prescriptions, 28%) and pregabalin (7 prescriptions, 28%). Other drugs prescribed under this category included gabapentin (2 prescriptions, 8%) and chlordiazepoxide(1 prescription, 4%).

4. Discussion

Prescription pattern studies are done to evaluate the quality of care given to the patients in the health care system. Appropriate selection of the drug therapy ensures maximum benefit to the patients and decreases the side effects.

In our study, over a period of 12 months, we evaluated discharge-summaries of 188 patients. There were 101 (53.7%) males and 87 (46.3%) females. This is in accordance with the prevalence of CKD being more in men than in women, worldwide and also in India.[1] The first report of Indian CKD registry also reports similar findings – 55% males and 45% females.[9] Mean age of the patients in our study, was 52.5 ± 13.7 years. This contrasts with the report of Indian CKD registry which showed a mean age of 45.22 ± 15.2 years. This could be co-incidental as demographic variations are common.

It was observed that most of the patients admitted to the hospital belonged to stage 5 of CKD (165 patients, 87.8%) followed by stage 4 (14 patients, 7.4%) and stage 3 (9 patients, 4.8%). Need to undergo regular dialysis in stage 5 CKD and prevalence of large number of comorbidities in the later stages of CKD could be the reasons for this finding.

Hypertension was the most common co-morbidity (154 patients, 82%) observed in our study subjects. Studies done by Haroun MK *et al*,[10] and Schaeffner ES *et al*,[11] report similar findings. In our study, we found that 43% patients had type 2 diabetes. Study done by Prasannakumar M *et al*, reports similar finding.[12]

Anaemia was the most common haematological manifestation observed in our study population which affected 103 patients (54.8%). This finding is in contrast to the study done by Abramson JL *et al*, in which anaemia prevalence was 12.2%.[13] This disparity could be due to high prevalence of anaemia in Indian women, menstruation in women of reproductive age group, prevalence of anaemia in rural Indian population etc.

A total of 1436 drugs were prescribed to 188 patients who were part of our study. Each patient received an average of 7.6 drugs. None of the patients received monotherapy. Thus, polypharmacy was evident. Polypharmacy has been variously defined. It has been defined as the concurrent use of multiple drugs, and some researchers have discriminated between minor (two drugs) and major (more than four drugs) polypharmacy.[14, 15, 16] Others have defined it as the use of more drugs than are clinically indicated or too many inappropriate drugs[14, 17], as two or more medications to treat the same condition and as the use of two or more drugs of the same chemical class.[18] Polypharmacy is inevitable in CKD patients because of the prevalence of large number of co-morbidities.

In our study, antihypertensive medications were the most commonly prescribed drugs. CCBs (28.3%) were the most commonly prescribed antihypertensive drugs followed by diuretics (25.6%) and centrally acting symptholytics (24.1%). Alpha adrenergic blockers (7.1%), ARBs (4.6%) and beta adrenergic blockers (3.2%) and alpha plus beta adrenergic blockers (3.2%) were the other antihypertensive drugs prescribed. In a study done by Rama M *et al*,[19] drugs acting on cardiovascular system were the most frequently prescribed drugs in CKD. However, the data about drugs in each group was not analysed in that study.

In our study, Insulin was the most common antidiabetic drug prescribed. A study done by Bajait CS *et al*,[20] also reported insulin as the most commonly prescribed antidiabetic drug in CKD patients. In our study, of the 48 drugs prescribed for acid-base disorder, febuxostat constituted 25 prescriptions (52.1%) and sodium bicarbonate 23 prescriptions (47.9%). Similar finding was noted in a study done by George S *et al*,[21] where in the prescription of sodium bicarbonate was 53.1%. In our study, Sevelamer (65.5%) and calcium acetate (34.5%) were the phosphate binders prescribed to study population. This is in contrast to the study done by Bajait CS *et al*,[20] who reported calcium carbonate as the most commonly prescribed phosphate binder followed by sevelamer and calcium acetate. In our study, nutritional supplements were the second most commonly prescribed category of drugs (15%). A study done by Bajait CS *et al*,[20] found 24.7% of prescriptions with nutritional supplements which is much higher than our finding.

In our study, 11% of the drugs prescribed were haematinics. Erythropoietin (96 prescriptions) (6.7% overall and 63% of haematinics) was the most frequent hematinic prescribed followed by intravenous iron sucrose (41 prescriptions, 27%) and oral elemental iron (15 prescriptions, 9.9%). In a study done by Bajait CS *et al*,[20] 11% of the total prescriptions included erythropoietin.

In our study, of the 37 drugs prescribed for pain management, paracetamol constituted 27 prescriptions (73%) and a fixed dose combination of tramadol and paracetamol constituted 10 prescriptions. Adherence to KDIGO clinical practice guidelines is noted while prescribing these drugs. Only paracetamol and no other nonsteroidal anti-inflammatory drug (NSAIDs) was prescribed. NSAIDs in CKD patients cause a myriad of

adverse effects and enhance the renal damage. Thus, these drugs need to be avoided in CKD patients.[22] The other drug used for pain was tramadol which is a safe synthetic opioid.

5. Conclusion

There is a high burden of chronic kidney disease in Indian population that accounts for a high prevalence of morbidity and mortality. This study intends to describe patterns in prescribing drugs for various issues in CKD patients. Noteworthy results were obtained from our study. According to our study, CKD was more prevalent in men than in women and affected the patients in their 6thdecade. Hypertension was the most common co-morbidity observed followed by anaemia and type 2 diabetes. Antihypertensive agents were the most common drugs prescribed followed by nutritional supplements and the drugs acting on gastrointestinal system. Insulin was the most common antidiabetic agent prescribed and human recombinant erythropoietin was the most common haematinic prescribed. Hepatitis B vaccine was advised to CKD patients on haemodialysis as per the standard guidelines. Prescription of nephrotoxic drugs like NSAIDs was minimal.

In conclusion, it has been found that the management of chronic kidney disease in nephrology department of Justice K. S. Hegde Charitable Hospital, is in congruity with the rational utilization of medicines which is based on clinical knowledge, expertise and the guidelines accessible in the field of nephrology practice.

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