Original Article

Chronic kidney disease referral practices among non-nephrology specialists: A single-centre experience

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ABSTRACT

Background: Early referral of CKD patients to nephrology teams (NT) is vital to identify patients most likely to progress, delay decline of excretory function, and provide planned RRT. Unfortunately, many are still being referred late.
Methods: We conducted a retrospective analysis to investigate referral rates, predictors of non-referral, and performed urine investigations in hospitalised CKD patients.
Results: Out of 388 patients studied, 5.6%, 11.4%, and 16.4% in CKD3A, 3B, and 4 + 5, respectively, were referred to an NT upon discharge (CKD3A vs. CKD4 + 5, $p = 0.016$). For every additional year of age, the odds of being referred decreased by 5% (OR: 0.95, CI: 0.92–0.98, $p = 0.003$). Patients were more likely to be referred to an NT if they were males (OR: 2.31, CI: 1.09–4.90, $p = 0.029$) and having reached CKD 4 + 5 (OR: 3.99, CI: 1.58–10.10, $p = 0.003$). Only 28.8%, 43.9%, and 50.7% of patients with CKD3A, 3B, and 4 + 5 were followed up with urine investigations after discharge ($p = 0.001$). CKD stage 3B (OR: 3.54, CI: 1.23–10.19, $p = 0.019$), CKD stage 4 + 5 (OR: 6.06, CI: 1.69–21.67, $p = 0.006$), DM (OR: 6.28, CI: 2.38–16.58, $p < 0.0001$), and having been referred to a NT (OR: 20.95, CI: 3.54–123.92, $p = 0.001$) were independent predictors for having urine investigations.
Conclusion: The highest rate of referral was achieved in males, younger age group, and those who have reached CKD stage 4 + 5. Urine tests remain largely underutilised and only a minority (16.4%) of patients with an eGFR <30 mL/min/1.73 m^2 were referred to a NT.

1. Introduction

Patients suffering from chronic kidney disease (CKD) should be identified and managed appropriately in every health care system. The criteria for specialist referral may vary from one centre to another, but the general consensus is typically guided by the CKD stage and risk of progression. According to the KDIGO 2012 clinical practice guidelines, patients with progressive CKD, eGFR less than 30 ml/min/1.73 m^2, or patients with less severe CKD but with significant albuminuria should be considered for specialist referral in a timely fashion [1]. Early referral is essential for a number of reasons. Firstly, to evaluate the cause and target therapy to decrease or stop progression [2]. Secondly, to provide better pre-dialysis care and planned renal replacement therapy (including work-up for possible pre-emptive transplantation) which have been associated with better patient survival and quality of life [3–7]. Unfortunately, many CKD patients are still being referred late and close to requiring RRT [8]. The majority of studies looking at CKD referral practices have been conducted in the primary healthcare system. The few studies investigating referral practices within the hospital scenario have been performed by means of questionnaires and surveys. We hereby present a study which investigates the real-life referral practices, predictors of non-referral, and the frequency of performing urine investigations among hospital based non-nephrologist specialist doctors in the CKD population.

2. Materials and methods

2.1. Background of the Maltese healthcare system:

Mater Dei Hospital (MDH) is the main university teaching hospital providing secondary and tertiary care to the Maltese population, which is around 400,000 individuals. Public healthcare is provided for free at the point of delivery and covers almost any treatment. Nephrology services are delivered by four nephrologists and their respective teams of resident specialists and registrars. Primary healthcare in Malta is provided via the private sector and public health centres distributed across the island. The primary healthcare system is responsible for the majority of specialist referrals. Once a patient is admitted to hospital, specialist referral to various specialties (including nephrology) is expected to be organised by the admitting team upon discharge.

2.2. Inclusion and exclusion criteria

The following inclusion criteria were applied to all patients admitted to MDH during a 2 month period between the 1st January and 29th February 2012.

1. Adult patients (≥16 years of age).
2. Patients who were admitted under the care of a consultant physician (including Cardiology and Neurology) or under the care of a consultant surgeon (including Orthopaedics and Urology).
3. Patients with CKD, defined as having an estimated glomerular filtration rate (eGFR) below 60 mL/min/1.73 m^2 for at least 3 months.

Day cases (patients admitted to day surgery unit, catheterisation laboratory, and endoscopy unit), patients deceased during the admission episode being studied, and patients admitted directly under a consultant nephrologist were excluded. All patients who satisfied the above inclusion and exclusion criteria were included in the study.

2.3. Data collection

This was a retrospective observational study with most data collected using the hospital electronic laboratory data system. Data collection included patient's creatinine, eGFR, fasting plasma glucose (FPG), urinalysis and quantification of albuminuria during the admission period and after discharge, consultant in charge of the patient and any planned nephrology referral/appointments.

Serum creatinine was analysed by the enzymatic method and calibrated using isotope dilution mass spectrometry (IDMS). Three serum creatinine samples over a 6 month period were studied for every patient; one sample during the admission episode, one at 3 months prior to admission and another one at 3 months after discharge. A substantial number of patients had more than one serum creatinine sample submitted for analysis during the admission period. In all instances, the most recent serum creatinine result for that particular admission was utilised. The 3 month mark before admission and after discharge was estimated from this particular date. The eGFR is calculated and reported automatically by the biochemistry laboratory using the IDMS-traceable Modification of Diet in Renal Disease (MDRD) equation.

Urinalysis is performed using a reagent strip with automated reading using reflectance photometry and does not quantify albuminuria. Urine albumin is measured using a separate assay of a random urine sample and reported as albumin-to-creatinine ratio (ACR). Only the last admission episode was analysed in the situation that a patient was admitted more than once during the study period.

All patients included were subsequently sub-divided into four groups according to their eGFR using the KDIGO CKD staging system [1]:
CKD stage 3 A: eGFR 45–59 mL/min/1.73 m^2.
CKD stage 3B: eGFR 30–44 mL/min/1.73 m^2.
CKD stage 4: eGFR 15–29 mL/min/1.73 m^2.
CKD stage 5: eGFR <15 mL/min/1.73 m^2.

2.4. Statistical analysis

Statistical analysis was carried out using SPSS®. Results for categorical data are summarised using absolute numbers and percentages. Continuous non-normally distributed data are reported as medians together with the first (Q1) and third (Q3) quartile. Fisher's two-tailed exact test and z-test with Bonferroni adjustment were utilised for comparing categorical variables. Mann–Whitney U test and Kruskal–Wallis test were used for non-parametric continuous data as appropriate. Multivariate logistic regression was employed to investigate for any referral predictors. P values of <0.05 were considered as statistically significant.

3. Results

A total of 3336 patients were admitted to MDH between the 1st January and 29th February 2012. 88.64% (n = 2957) had at least one serum creatinine analysed and 28.81% (n = 852) had an eGFR of <60 mL/min/1.73 m^2 on discharge. Out of these, 18.08% (n = 154) died during the admission period, 20.92% (n = 146) were admitted directly under the care of an NT, and 12.7% (n = 70) were already under follow-up by an NT and therefore excluded. Out of the remaining 482 patients, 94 (19.5%) were excluded as the low eGFR was possibly attributed to acute kidney injury (AKI). A total of 388 patients were confirmed as CKD patients who never encountered an NT, and therefore included in the study. Classification of these patients according to their CKD stage: 51.0% (n = 198) were in CKD 3A, 31.7% (n = 123) CKD 3B, 16.2% (n = 63) CKD 4, and 1% (n = 4) in CKD 5. Giving the relatively small numbers in CKD 5 group, further data analysis was performed after combining CKD 4 and CKD 5 patients as one group (CKD 4 + 5) (fig. 1). Only two patients of the entire cohort were of non-Maltese race and both classified in the CKD 3A group.

Patients in CKD stage 3A had a median age of 81.5 years (Q1–Q3: 74–86), median creatinine of 105 μmol/L (Q1–Q3: 95–120.25), and 55.6% were females. Patients in CKD stage 3B had a median age of 81.0 years (Q1–Q3: 74–86), median creatinine of 148 μmol/L (Q1–Q3: 132–165), and 52.8% females. Patients in CKD stage 4 + 5 had a median age of 83.0 years (Q1–Q3: 75–87), median creatinine of 205 μmol/L (Q1–Q3: 75–87), and 58.2% females. There was no significant difference between age (p = 0.49) and gender distribution (p = 0.77) between the three CKD groups (Table 1).

Analysis of referral according to CKD stage revealed that 5.6% of the patients in CKD 3A, 11.4% of patients in CKD 3B, and 16.4% of patients in CKD 4 + 5 (CKD 3 A vs. CKD4 + 5, p = 0.016) were referred to an NT upon discharge (Table 1). The overall referral rate of all the CKD patients was 9.54%. Serum creatinine (157.5 vs. 125 μmol/L, p < 0.0001) was found to be significantly higher in the referred group (Table 2).

Out of those patients referred to an NT, only 36.1% were females (p = 0.013) and referred patients (median: 76.5 years, Q1–Q3: 65–84) were younger when compared to those not referred (median: 82.0 years, Q1–Q3: 75–86, p = 0.006). Further analysis showed that 27.6% and 7.4% of patients not referred were ≤75 and ≤65 years, respectively. Multivariate logistic regression demonstrates that, for every additional year of age, the odds of being referred decreased significantly by 5% (odds ratio [OR]: 0.95, [confidence interval] CI: 0.92–0.98, p = 0.003). Patients were also more likely to be referred to an NT if they belonged to the male gender (OR: 2.31, CI: 1.09–4.90, p = 0.029), and having reached CKD 4 + 5 (OR: 3.99, CI: 1.58–10.10, p = 0.003) when compared to CKD 3A (Table 3). The significance of the odds ratio associated with gender was lost after serum creatinine was included into the logistic regression model (Table 4).

Of all the patients studied; 81.4% (n = 316) were admitted under the care of a consultant physician and 18.6% (n = 72) were admitted under a consultant surgeon. There was no statistically significant difference in referral rates from physicians and surgeons (p = 0.52) (Table 2).

Urine investigations (urinalysis and/or albuminuria quantification) were carried out during the admission episode in 21.2% of patients with CKD 3 A and 30.9% of patients with a CKD 3B and in 25.4% of patients with a CKD 4 + 5 (p = 0.15). In contrast, urine testing after discharge (outpatient clinics) was significantly different depending on the CKD stage; 28.8% of patients with CKD 3A, 43.9% of patients with a CKD 3B, and 50.7% of patients with CKD stage 4 + 5 (p = 0.001) (Table 1). Referred CKD patients were more likely to have urine investigations (77.8%) when compared to those patients not referred to an NT (33.2%; p < 0.0001) (Table 2). CKD stage 3B (OR: 3.54, CI: 1.23–10.19, p = 0.019), CKD stage 4 + 5 (OR: 6.06, CI: 1.69–21.67, p = 0.006), DM (OR: 6.28, CI: 2.38–16.58, p < 0.0001) and having been referred to an NT (OR: 20.95, CI: 3.54–123.92, p = 0.001) were independent predictors for patients to have urine investigations (Table 5).