

A Spanish multicentric study to evaluate the clinical activity of nephrology fellows during in-hospital on-call shifts

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Abstract

Background. Nephrologists develop their work in diverse scenarios. A training programme must qualify trainees to assist different kinds of problems. The aim of this study was to characterize patients and pathologies that Spanish nephrology fellows face while on-call.

Methods. This is a descriptive study with clinical and demographic data gathered with a form by 10 nephrology fellows of five university hospitals of Madrid (Spain), throughout their in-hospital 24 h on-call shifts in February and March 2013.

Results. We collected 409 episodes over 338 patients, through 72 shifts. Among these, 16.7% had previous normal renal function, 24.6% chronic kidney disease, 39.5% were on dialysis and 18.2% had a kidney transplant. Most of the consults came from the emergency room (35.9%) or the previous on-call team (13.7%). Afterwards, the most usual destiny was admittance to a nephrology department (32.8%) or discharge (20.5%). The most frequent reason for consulting was a decline in renal function (31.6%) and the second motive an infection. Thirty-four episodes (8.3%) were related to dialysis access problems. Medical treatment was prescribed in 79.2% of the cases, primarily fluids (47.2%) and antibiotics (42.2%). The fellow had to place a central venous catheter in 24 cases (5.9%). Renal replacement therapy was prescribed in 19.8% of the episodes.

Conclusions. Specific renal reasons for consulting nephrologists are common, such as acute kidney injury or dialysis access complications. These patients benefit from a specialized approach to their problems. Clinical activities during in-hospital out-of-hours shifts are a priceless tool as part of the training programme of nephrology fellows.

Keywords: nephrology fellowships; nephrology training; on-call activity

Introduction

Nephrology is a relatively young branch in the field of Internal medicine, not yet recognized as a specialty in every country. Although the subject has been an issue for decades, training programmes in nephrology are still widely diverse [1, 2]. This results in important variations in knowledge and aptitudes of nephrologists depending on their training centre [3, 4]. In order to stimulate homogeneity across Europe and in response to official EU directives, the Specialty Section in Nephrology of the European Union of Medical Specialists (UEMS) published a document with the minimum requirements that training programmes should cover [5].

Acute care in nephrology is also diverse between different scenarios. Many hospitals rely on their emergency room physicians for a first-time evaluation of renal pathologies, as well as for the management of acute disorders of patients on dialysis or with a transplanted kidney. The

progressive superspecialization of nephrology, with new and more complex dialysis techniques and accesses, more varied immunosuppressive regimens, is making the availability of a consulting nephrologist increasingly necessary to solve some of the possible doubts that may arise and cannot wait until the next morning shifts. In larger centres, 24-h nephrologists provide a better and more specific care for new and known renal patients.

The official 4-year programme defined by the Spanish legislation to achieve the specialty title requires that nephrology fellows in training to have four to six in-hospital on-call shifts every month [6]. The point is to provide the nephrologist-to-be with tools and experience to manage acute renal problems and acute problems of any kind in typical renal patients (such as transplanted or dialysis patients). There is a lack of uniformity regarding the characteristics of these shifts: most hospitals establish regular 24-h shifts with a senior attending physician's collaboration, while in some centres fellows only have 12-h shifts [7].

The aim of our study was to properly characterize the type of patients and pathologies that nephrology fellows may expect to deal with while on-call, in order to discuss their importance for an appropriate training in nephrology.

Subjects and methods

This is a transversal descriptive study of the patients evaluated and/or treated by nephrology fellows in their in-hospital on-call shifts through February and March, 2013. Ten nephrology fellows from five teaching hospitals of Madrid (Spain) were enrolled for participation in the study. A pre-designed form with predetermined answers was distributed to fill in with the data of the patients, who were codified to assure complete confidentiality. Clinical and demographic data were gathered, including hour of the call, renal function and aetiology if necessary, where the consult had originated, what happened to the patient after evaluation, reasons for consulting the nephrology fellow, and actions taken regarding each case.

Variables are expressed as percentages or mean \pm standard deviation. All statistical analyses were performed with SPSS 17.0 version (SPSS Inc, Chicago, IL).

Results

We report the results of 409 episodes over 338 patients that required an urgent evaluation from a nephrology fellow. Two hundred and sixteen patients (63.9%) were males, and the mean age was 64.7 ± 16.6 years. The busiest time frame was from 4 to 9 P.M. Distribution of calls along day time hours is shown in Figure 1.

Two-hundred and eighty-four of the 338 patients (84.0%) required a single evaluation throughout the study. Forty patients (11.8%) were seen two times, 11 patients three times (3.3%) and 3 patients (0.9%) as many as four times.

Consultations came from different scenarios. Most of them, 146 (35.7%), came from the emergency room; 72 (17.6%) were calls from colleagues from other specialties;

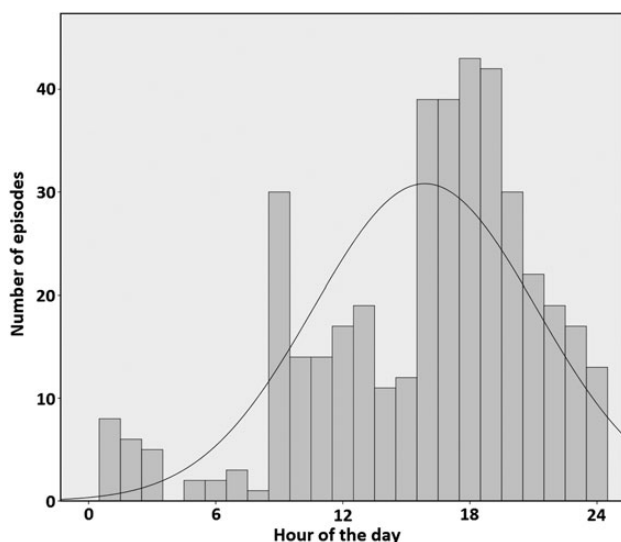


Figure 1. Hour distribution of calls to the nephrology fellow.

56 episodes (13.7%) came from the previous on-call fellow; 37 (9.0%) were patients admitted to the Nephrology Department that required urgent attention; 33 patients (8.1%) had been referred from a dialysis unit; 19 (4.7%) were referred from any nephrology out-patient clinic (including chronic kidney disease, end-stage renal disease, peritoneal dialysis or transplant clinics); 19 (4.7%) were patients from the intensive care units and 27 (6.5%) came from other places, including primary care physicians, non-renal clinics or scheduled admissions to a hospital.

According to previous renal function, 16.7% (68) were not known to have kidney disease; 24.6% (101) had chronic kidney disease not on dialysis; 35.1% (144) were on haemodialysis; 5.4% (22) on peritoneal dialysis and 18.2% (74) had a functioning transplanted kidney. For those with some kind of kidney disease, the distribution of their aetiologies was as follows: diabetic nephropathy, 27.9%; unknown aetiology, 17.4%, vascular nephropathy, 17.1%; glomerular diseases, 15.0%; chronic interstitial nephritis, 9.3%; polycystic kidney disease, 6.6% and other aetiologies, 6.6%.

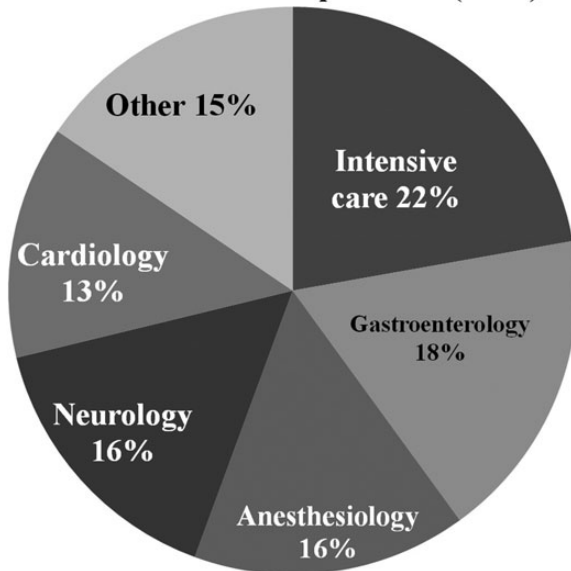
Table 1 summarizes the reasons that motivated nephrology consultation. The main motive was a decline of renal function, in 129 episodes (31.6%). This decline was usually an oligoanuric kidney injury (53.1%, 68). The

Table 1. Reasons for requiring evaluation by a nephrologist

Reason	Percentage (number)
Renal function decline	31.6% (129)
Oliguric/non-oliguric	53.1% (68)/46.9% (61)
Acute/acute on chronic/probably unknown CKD ^a	53.1% (68)/43.8% (57)/3.1% (4)
Infectious disease	20.3% (83)
Respiratory	33.2% (28)
Fever with unknown origin	26.5% (22)
Gastrointestinal	16.9% (14)
Dialysis access-related	12.6% (10)
Urogenital	8.4% (7)
Infective endocarditis	1.2% (1)
Surgical wound	1.2% (1)
Miscellaneous	12% (49)
Dialysis prescription adjustment	26.5% (13)
Kidney transplant	16.3% (8)
Pharmacological treatment	14.3% (7)
adjustment	
Traumas, bone and joint problems.	42.9% (21)
Cardiovascular events	7.4% (30)
Congestive heart failure	30.0% (9)
Acute pulmonary oedema or volume overload	23.3% (7)
Arrhythmias	23.3% (7)
Other	23.3% (7)
Blood and urine electrolyte disturbances	5.9% (24)
Hyponatraemia	29.2% (7)
Hyperkalaemia	25.0% (6)
Metabolic acidosis	8.3% (2)
Hypocalcaemia	8.3% (2)
Proteinuria	8.3% (2)
Other	20.8% (5)
Dialysis access-related problems	5.9% (24)
AVF ^b or AVG ^c thrombosis	37.5% (9)
AVF or AVG bleeding	29.2% (7)
CVC ^d malfunctioning	20.8% (5)
PD ^e catheter malfunctioning	12.5% (3)
Gastrointestinal and surgical diseases	5.9% (24)
Blood pressure disturbances	3.9% (16)
Respiratory diseases	2.7% (11)
Neurological diseases	2.7% (11)
Haematological diseases	2.0% (8)

^aCKD, chronic kidney disease; ^bAVF, arteriovenous fistula; ^cAVG, arteriovenous graft; ^dCVC, central venous catheter; ^ePD, peritoneal dialysis.

Consulted medical specialties (n=45)



Consulted surgical specialties (n=58)

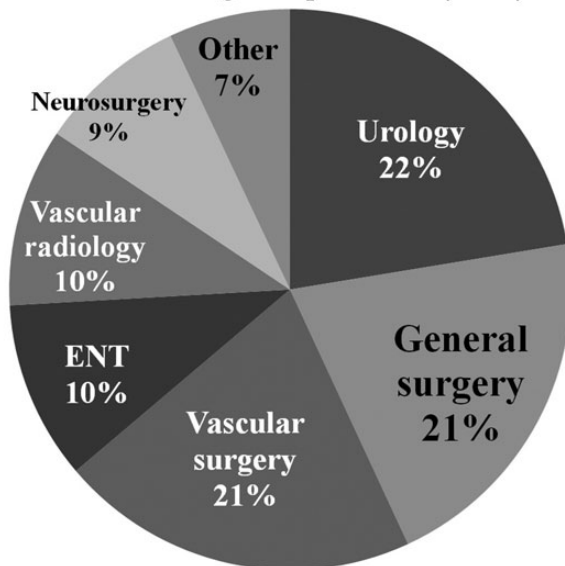


Figure 2. Other specialties consulted by Nephrology fellows.

second reason was an infectious disease (20.3%, 83), mostly from respiratory or gastrointestinal origin, or due to a fever without a known origin. Other frequent causes were cardiovascular disease (7.4%, 30), electrolyte disturbances (5.9%, 24) and surgical or abdominal pathologies (5.9%, 24). Interestingly, 34 calls (8.9%) were related to problems with the dialysis access, either infections or malfunctioning: 3.9% arteriovenous fistulae or grafts, 2.9% tunnelled dialysis catheters and 1.5% peritoneal catheters. Of note, 6.9% of the calls were for a treatment adjustment in renal patients, a dialysis prescription adjustment or were addressed to organize a kidney transplant from a deceased donor.

Some kind of medical treatment was prescribed in 324 episodes (79.2%). In these cases, the most prescribed modalities were fluids (42.7%, 138) and antibiotics

(42.2%, 137), followed by electrolyte reposition (24.2%, 78), diuretics (15.2%, 49), blood transfusions (11.5%, 37) and immunosuppressants (8.4%, 27). A central venous catheter was placed by the nephrology fellow in 24 episodes (5.9%). Renal replacement therapies were prescribed in 81 episodes (19.8%): conventional haemodialysis (75.6%), continuous therapies (15.4%), peritoneal dialysis (7.7%) and apheresis (1.3%). Other medical specialties were consulted by the fellows 45 times (11.0%), and surgeons were consulted 58 times (14.2%). Consulted specialties are summarized in Figure 2.

Regarding the destiny of the patients after the nephrology evaluation, 134 (32.8%) were admitted to the Nephrology Department, to continue with diagnosis tests or with treatments of their acute pathologies. Eighty-four times (20.5%), patients were discharged from the hospital for ambulatory care; 82 (20.0%) stayed in the emergency room for further evaluations and they were referred to the next day's on-call team. Seventy-six patients (18.6%) were admitted or continued their stay in other departments in the hospital, but still required follow-up by the nephrology consultation teams. Fifteen patients (3.7%) were admitted to other departments, not requiring any more nephrology follow-up, while 11 (2.7%) were transferred to the intensive care unit. The mortality rate was 1.7%.

Discussion

This large descriptive study is the first one to address the content of nephrology on-call activity and its importance for the training of nephrology fellows. Several conclusions can be drawn out of this study.

Firstly, there is a high rate of nephrology-oriented chief complaints, which can only be evaluated for the first time when on an acute set-up. A renal function decline was the most common reason to ask for the opinion of a nephrologist. The internalization of differential diagnosis schemes requires the evaluation of multiple types of acute kidney injuries, in order to learn how to interpret its temporal evolution, its pattern and the specific tests required to achieve a final diagnosis. Fellows need to learn how to deal with other pathologies that have different orientations when they are approached for the first time or when they have already been diagnosed. Some of these may include preeclampsia, hypertensive urgencies and emergencies, electrolyte disturbances, and many more.

Second, there is also a high rate of typically renal patients. More than half of the patients (55.1%) were either on dialysis or recipients of a kidney transplant. These patients have very particular conditions that require a deep knowledge of their status and treatments. It cannot be expected for other specialists to have a deep knowledge of dialysis techniques and prescriptions or their accesses, the continuously evolving field of immunosuppressants, or the specific field of drug dosing in chronic kidney disease patients. As an example of this, 8.3% of the episodes were related to the dialysis access, due to malfunctioning (17 episodes), infection (10 episodes) or bleeding (7 episodes).

Besides, renal patients frequently have many comorbidities. They require a generic view of the patient and a general management of complications of other organs or systems. Not in vain, over 40% of the episodes involved infectious, cardiovascular, gastrointestinal, respiratory,

neurological or haematological diseases. The holistic view of these patients has consistently been found to be an important characteristic in order to choose the nephrology fellowships [8].

Due to their situation, these patients often access health care more frequently than other population groups. Hence, they can benefit from being known by the on-call team. In this study, 16% of the patients required more than one evaluation. Fellows can also benefit from getting to know them, helping them to have a broader view of the acute episode within the whole condition of these complex patients.

Finally, it is usually in this acute setting when interventional procedures are required. Some procedures such as tunnelled catheter placement can wait until the morning to be performed, when the hospital is at its maximum working capacity. In other cases, sometimes procedures must be carried out immediately, and nephrologists find it necessary to be well trained in this area [9, 10]. This is the case of dialysis catheter placement in the face of severe hyperkalaemia or acute pulmonary oedema. Continuous therapies, such as haemofiltration or apheresis, are frequently required in critically ill patients who also need immediate attention. The indication and prescription of these therapies may be more easily learnt in the context of out-of-hours attention.

Few studies have analysed in detail specific aspects of nephrology training. Most papers so far have focused on how to improve outcomes in interventional nephrology [11–15]. A few other studies investigate specific disparities or knowledge gaps in training programmes [16, 17]. We found a single study that evaluated the type of patients admitted to the nephrology department [18]. However, to the best of our knowledge no one has explicitly addressed the issue of the opportunities that on-call working provides for the fellows.

There is a growing concern about too few medical graduates opting for nephrology, not only in Spain [19], but worldwide [20–22]. Many reasons have been considered, including a difficult physiopathology and difficulties to experience the field of nephrology as undergraduates [23, 24]. In a survey by Shah *et al.*, the three main reasons associated with fellows' satisfaction with the specialty were 'excellent teaching', 'stimulation by the variety of cases' and 'enjoying intensive nephrology'. In-hospital on-call shifts clearly fulfill these three criteria. Clinical skills have been identified as an important quality for a well-prepared professional [25]. While new teaching tools are being implemented to enhance interest in nephrology [26, 27], the 'clinical eye' cannot be taught, and it must be achieved only through everyday practice.

Lappin and Cannata, on behalf of the UEMS section in nephrology, have just published an update on the document of minimums for nephrology training programmes across Europe [28]. With the hope of a progressive implementation in the EU countries, they highlight several important requisites for a successful formation in nephrology. Among them, they establish the need for 'a progressive acquisition of responsibility in clinical management' and clinical expertise to formulate differential diagnoses and adequate management of renal diseases. Our study proves that out-of-hours on-calls undoubtedly provide a way to achieve these goals. Renal patient care can be improved by this working method, both in the short term for reasons previously explained and in the long term by training better nephrologists.

In conclusion, the clinical activity of in-hospital on-call shifts is a very valuable tool for nephrology training. The characteristics of the patients and diseases seen in this context can hardly be replaced by any other activity.

Conflict of interest statement. None declared.

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