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Undiagnosed kidney disease in hospitalised patients: an opportunity for improvement

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ABSTRACT

Objectives: In hospitalised patients, chronic kidney disease (CKD) and acute kidney failure (AKI) are associated with morbidity, mortality and drug toxicity. We identify improvement care opportunities in patients with renal disease in a hospital without intensive care unit. **Material and method:** Patients: 200 hospitalized patients in Alcañiz Hospital (Spain) in the second half of 2008 were randomly selected. Data sources: laboratory data, clinical history and discharge report. RLIPT criteria were applied to define acute kidney failure (AKI). Quality indicators: 1) percentage of hospitalised patients with renal function control (at least one determination of renal function during admission). 2) percentage of patients with CKD and/or AKI with this diagnosis recorded in clinical course. 3) percentage of patients with ERC and/or AKI with this diagnosis recorded in discharge report. **Results:** Mean age was 71.1±17 years, 42% women, 63% admitted to medical areas and 37% to surgical areas. 194 patients have renal function control at admission, however during admission renal function was not monitorised in 54 patients (27%), especially in surgical areas. Previous ERC was detected in 50 patients (25%), although this diagnosis figure only in the clinical course in 14 (28%), and in the discharge report in 17 (34%). AKI is detected in 68 of the 146 patients with renal function control during hospitalisation (46.5%). This information is contained in the clinical course in only 50% and in the discharge report in 33,8%. **Conclusions:** CKD at admission and AKI during hospitalisation are frequent. Often these diagnoses are not included in clinical course or in discharge report, reflecting a poor process awareness. A clinical protocol implementation and diffusion could be important in order to achieve a more efficient and consistent management of these processes in hospitalized patients.

Key words: Chronic kidney disease. Acute kidney failure. Hospitalary kidney disease. Kidney disease in hospitalized patients. Early detection of kidney disease.

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La enfermedad renal que se oculta tras los ingresos: una oportunidad de mejora

RESUMEN

Objetivos: *Los pacientes hospitalizados afectados de enfermedad renal crónica (ERC) constituyen un grupo de*

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elevado riesgo de sufrir morbilidad intrahospitalaria asociada y efectos adversos de fármacos. Pretendemos identificar oportunidades de mejora en el proceso asistencial de pacientes con enfermedad renal ingresados en un hospital comarcal. ***Material y método:*** *Auditoría clínica: muestreo aleatorio simple sobre 200 ingresos por cualquier motivo en el Hospital de Alcañiz. Las fuentes de datos fueron la base de datos del laboratorio, la historia clínica y el informe de alta. Como indicadores de deterioro de función renal durante el ingreso se aplicaron los criterios RLIPT. Como indicadores de calidad del proceso consideramos: 1) porcentaje de pacientes en los que se realiza al menos una determinación de función renal a lo largo del ingreso; 2) porcentaje de pacientes que cumplen criterios de ERC y/o de deterioro de función renal y en quienes este diagnóstico figura en la evolución clínica, y 3) porcentaje de pacientes que cumplen criterios de ERC y/o deterioro de función renal y figura este diagnóstico en el informe de alta hospitalaria.* ***Resultados:*** *La edad media fue de 71,1 ± 17 años, el 42% fueron mujeres, el 63% ingresados en áreas médicas y el 37% en áreas quirúrgicas; en 194 pacientes se disponía de control de función renal en el momento del ingreso; sin embargo, durante la estancia hospitalaria en 54 casos (27%) no se realizó ningún control posterior, especialmente en áreas quirúrgicas. Se constató ERC a través de la analíticas previas al ingreso disponibles en 50 pacientes (25%), aunque tan sólo figura este diagnóstico en la historia clínica hospitalaria en 14 de ellos (28%), y en el informe de alta en 17 casos (34%). Detectamos deterioro de función renal en 68 pacientes de los 146 en quienes se realizó control de la misma durante el ingreso (un 46,5%). Este dato figura en la historia clínica únicamente en el 50% y en el informe de alta en el 33,8%.* ***Conclusiones:*** *La incidencia de ERC previa al ingreso y de deterioro de función renal durante el mismo es elevada. Es frecuente que el diagnóstico de ERC o de su deterioro durante la hospitalización no figure en la evolución clínica ni en el informe de alta, reflejo de una escasa conciencia del proceso por parte de nuestros compañeros. La implantación de un protocolo de práctica clínica y su difusión hospitalaria puede servir como una herramienta eficaz para conseguir una atención más eficiente y consistente de este proceso.*

Palabras clave: *Enfermedad renal crónica. Fracaso renal agudo. Vía clínica enfermedad renal. Enfermedad renal en pacientes hospitalizados. Detección precoz de enfermedad renal.*

INTRODUCTION AND OBJECTIVES

In recent years, extensive studies have reinforced the understanding that chronic kidney disease (CKD) is a public health problem given its high prevalence[1] and its resulting increased morbidity and mortality, and its evolution towards end-stage CKD.[2,3] Despite available measures to prevent its deleterious effects,[4,5] the condition is currently under-diagnosed and its detection and appropriate treatment is one of the strategic objectives of the Spanish Society of Nephrology (S.E.N. by its Spanish initials).[6]

Although there have been major epidemiological studies on the general population[1] and in patients in primary care,[7,8] less is known about data on hospitalised patients, such as the prevalence of CKD, the incidence of kidney function deterioration during hospitalisation and the attention paid to this condition during hospitalisation and after discharge. The importance of these data is reinforced by the higher rate of hospitalisation of patients with CKD and the fact that this group has a high risk of associated in-hospital morbidity and drug side effects.

In order to identify ways to improve the care process for hospitalised patients with kidney disease, we initiated a new project called «Kidney disease in hospitalised patients. Detection by MDRD formula (Modification of Diet in Renal Disease) and implications for the management of patients» into the Support Programme for the Quality Improvement Initiatives in the Aragon Health Department.

Within this project, we analysed the adequacy of the diagnostic process for kidney disease in hospitalised patients and whether it was included in the patient's medical record and hospital discharge report.

MATERIAL AND METHOD

Design

Retrospective cross-sectional descriptive study

Inclusion criteria

Clinical audit of a randomly selected sample of 200 medical records from the 2,104 patients over 18 years of age admitted to Alcañiz Hospital during the second half of 2008 (admitted for any cause except obstetrics and minor surgery).

Data sources

Laboratory database, medical history and discharge report.

Variables

The following variables were recorded: demographics (age and sex); previous diagnosis of diabetes mellitus, arterial hypertension and chronic kidney disease; department where the patient was hospitalised, reason and duration of hospitalisation; serum creatinine (SCr) prior to admission, at

admission and throughout hospitalisation and, lastly, diagnosis of CKD and/or kidney function deterioration during hospitalisation in the clinical evolution and in the discharge report.

Variables generated

1. **Estimation of kidney function.** An evaluation of kidney function was conducted by collecting serum creatinine levels and calculating estimated glomerular filtration rates (eGFR) according to the MDRD (Modification of Diet in Renal Disease) study equation.[9,10]

$$eGFR = 186 \times (creatinine)^{-1.154} \times (age)^{-0.203} \times (0.742 \text{ if female}) \times (1.210 \text{ if black}).$$

2. **Definition of CKD.** We define CKD according to the K/DOQI 2002 guidelines of the National Kidney Foundation. CKD is defined by the presence of an eGFR lower than 60 ml/min/1.73m^2 for a period equal to or greater than 3 months.

3. **Definition of acute deterioration of kidney function (AKF).** We adopted the RIFLE definition according to GFR levels of the Second Consensus Conference of the Acute Dialysis Quality Initiative. This model stratifies AKF as risk, injury, failure, loss and end-stage disease:[11,12]
   a) Risk: increase in SCr prior normal to readings >1.5 mg/dl or eGFR decrease of >25%.
   b) Injury: increase in SCr prior normal to readings >2 mg/dl or eGFR decrease of >50%.
   c) Failure: increase in SCr prior normal to readings >3 mg/dl or eGFR decrease of >75%.
   d) Persistent AKF: complete loss of kidney function >4 weeks.
   e) End-stage kidney disease: complete loss of kidney function >3 months.

Quality indicators

1. *For all patients admitted*, kidney function must be recorded on admission and at least one new determination must be made during hospitalisation. As a quality indicator in detecting kidney disease, we established the percentage of patients in whom at least one determination of kidney function throughout hospitalisation was performed.

2. *In patients hospitalised with a history of CKD and in patients with kidney function deterioration during hospitalisation*, the diagnosis must be included in the clinical history and hospital discharge report. We consider the following to be indicators of correct information on this condition: *1)* the percentage of patients who meet the criteria for CKD and/or kidney function deterioration and whose clinical evolution includes this diagnosis, and *2)* the percentage of patients who meet the criteria for CKD and/or kidney function deterioration and whose hospital discharge report includes this diagnosis.

Statistical analysis

To calculate the sample size, we considered the following parameters: a finite population of 2,104 patients admitted during the second half of 2008, exhaustive random sampling, an estimated proportion of patients with eGFR<60ml/min/1.73m^2 on admission of 35%, 95% confidence level and maximum estimation error of 10%.

Quantitative variables were described using the mean and standard deviation and qualitative variables by frequency distribution. The exact confidence intervals were calculated using the binomial distribution. Comparison of quantitative variables was performed using the Student's t-test for independent data and qualitative variables were compared using the chi-squared test or Fisher's exact test. A $P<.05$ was considered significant. The statistical analysis was performed using the SPSS software for Windows version 10.1.

RESULTS

Characteristics of all patients admitted

The mean age of the 200 patients was 71.1 years (17) (range: 22-95 years), with 58% male and 42% female. Patients were admitted to the medical areas in 63% of cases and to the surgical areas in 37%. The mean stay was 9.4 days (5) (range: 3-28 days). During hospitalisation, 18 patients died (9%). Among the associated diseases, the high incidence of arterial hypertension (AHT) (56%) and diabetes (24%) stand out.

The mean values for prior SCr and eGFR at admission, at the time of maximum kidney function deterioration during hospitalisation and at discharge are shown in Table 1 along with the number of patients for whom each of the determinations were made. The classification of CKD according to K/DOQI stages is shown in Table 2.

Of the total of patients whose kidney function was monitored during hospitalisation, 31.5% met the criteria for risk of AKF, 12.3% for injury and 2.7% for failure (Table 3).

Indicator of proper detection of kidney disease during hospitalisation

Percentage of patients in whom at least one determination of kidney function during hospitalisation was performed.

Table 1. Values of creatinine and glomerular filtration prior to admission, on admission, the most deterioration value during hospitalisation and value at discharge. Shows the number of patients who underwent each test

	Value prior to admission	On admission	Maximum deterioration during hospitalisation	Discharge
No. of patients	200	194	134	86
SCr (mg/dl)	0.99 (0.3)	1.10 (0.4)	1.41 (0.8)	1.25 (0.8)
GFR by MDRD	78.7 (28)	74.1 (32)	63 (38)	70.4 (36)

Ninety-seven percent of patients had kidney function monitoring at admission. However, there was no monitoring of kidney function during hospitalisation in 54 patients (27%; CI±5.9). When reviewing the reasons for this group's hospital admissions, we concluded that the condition of up to 66.6% of these patients was severe enough to recommend this monitoring (major surgery, infections with complications, cardiovascular events). The information of the 54 patients in whom kidney function monitoring was not performed during hospitalisation is shown in Table 4.

Indicators of correct information on the condition

1. Percentage of patients who meet criteria for CKD and/or kidney function deterioration and whose clinical evolution includes this diagnosis.
   Only 28% (CI±11.9) of patients with criteria for prior CKD at admission had this diagnosis included in the hospital medical records and 50% (CI±11.5) of cases with kidney function deterioration during hospitalisation had this diagnosis in their medical history.
2. Percentage of patients who meet criteria for CKD and/or kidney function deterioration and whose hospital discharge report includes this diagnosis.
   The diagnosis of CKD was present in the hospital discharge report for 34% of cases (CI±11.6) coinciding with the percentage for whom kidney function deterioration during hospitalisation was reported, 34% (CI±12.6).

DISCUSSION

In our study, by analysing a random sample of 200 hospitalised patients, we see that in 27%, no monitoring of kidney function was conducted and the diagnosis of CKD and the incidence of kidney function deterioration during hospitalisation were frequently not recorded in the clinical progress reports or in the hospital discharge report. These data reflect the lack of awareness of the condition by our colleagues.

The lack of monitoring of kidney function during hospitalisation may be justified in some cases, such as short stays for relatively unimportant procedures, but we found data on our patients that deserve further reflection:

- Age, the associated pathology (AHT, diabetes, and CKD) and the average length of stay were similar to those of the group whose evolution of eGFR was monitored.
- The percentage of patients for whom no monitoring was performed is significantly greater in surgical areas than in medical areas.
- As a reflection of the severity of the condition leading to admission, 59.3% of cases in which there was no monitoring of eGFR had their hospitalisation extended by seven or more days. Upon reviewing the reasons for admission, we believe that up to 66.6% of cases were complicated enough to recommend this monitoring (major surgery, infections with complications and cardiovascular events).

A simple criterion for improvement, such as the recommendation to perform at least one kidney function

Table 2. Stages of CKD according to K/DOQI criteria prior to admission, on admission, minimum during hospitalisation and at discharge. Shows the number of patients who underwent each test

DOQI Stages	Prior value to admission	On admission	Maximum deterioration during hospitalisation	Discharge
No of patients	200	194	134	86
GFR >60 ml/min/m^2	75%	64.9%	44.8%	62.8%
Stage 3 CKD	24%	32%	40.3%	27.9%
Stage 4 CKD	1%	3.1%	10.4%	7%
Stage 5 CKD	0	0	4.5%	2.3%

Table 3. Percentage of patients with kidney function deterioration during hospitalisation according to RIFLE criteria

RIFLE Criteria	Percentage of total 200 patients admitted	Percentage of the 146 patients with kidney function monitoring
Normal	39%	53.4%
Risk	23%	31.5%
Injury	9%	12.3%
Failure	2%	2.7%
Not monitored	27%	–

monitoring per week in patients hospitalised for more than 7 days, would resolve this issue, which in our opinion is currently inadequately addressed.

The high prevalence of CKD in this population (influenced by a greater age and associated pathology) and the high incidence of kidney function deterioration based on the RIFLE criteria highlight the need for further work in recognising kidney disease as a cardiovascular risk factor, which progresses to end-stage kidney failure and complications during hospitalisation.

This study has the limitations of being conducted in a single centre with its particular characteristics (regional hospital with no ICU). There is also the limited value of the eGFR calculation in the assessment of kidney function in hospitalised patients and due to situations such as special diets prior to admission (strict vegetarians, creatine and creatinine supplements), important alterations in muscle mass (loss of muscle mass, paralysis [no amputations or muscle diseases were registered], body mass index below 19kg/m^2 or above 35kg/m^2 and presence of severe liver disease, general oedema and ascites. Nonetheless, we believe this study highlights the problem of under-diagnosis and lack of attention to kidney disease in hospitals.

To summarise, the prevalence of CKD prior to admission (25%) and the incidence of kidney function deterioration during hospitalisation (46.5%) are high. Often these diagnoses are not included in the clinical progress reports or in the hospital discharge report. These data stress the lack of importance given this condition in hospitalised patients and indicates first, a failure to recognise kidney disease that may complicate hospitalisation and, second, a significant lack of information and awareness by primary care physicians, which increases the risk of inadequate monitoring and treatment of these patients. The implementation of a clinical practice protocol and its dissemination throughout the hospital may serve as an effective tool for achieving more efficient and consistent care for this condition.

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Table 4. Characteristics of the group of patients without monitoring of kidney function during hospitalisation versus those with monitoring

Variable	No monitoring (n = 54)	Monitoring (n = 146)	p
Age (years)	68.4±18	72.02±16	NS
Male sex (%)	42.7	56.3	NS
Percentage of patients without GFR monitoring, by services			
- Medical section	6.3%	93.7%	<0.05
- Surgical section	62.2%	37.8%	
Mean stay (days)	7.9±4	9.6±5	NS
Associated pathology			
- AHT	59.3%	56.3%	NS
- DM	22.2%	24.2%	NS
Prior CKD with GFR <60ml/min/1.73m^2	27.1%	24.5%	NS
Death	5.5%	10.2%	NS

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