

## Prevalence of Acute and Chronic Renal Failure in Patients aged over 59 Years

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### Abstract

**Introduction:** This study compared the prevalence of acute renal failure (ARF) and chronic renal failure (CRF) or chronic kidney disease (CKD) in patients aged over 59 years admitted to hospital in the ED, for 2 periods: 1997 and 2005, or 9 years apart.

**Methods:** In 1997, the study was conducted over 6 months and covered 5783 hospitalized patients, 54.6% aged over 59 years. That of 2005 was also conducted over 6 months, and covered 4677 hospitalized patients, 64.9% aged over 59 years. Renal failure (RF) was defined as a serum creatinine level over 149  $\mu\text{mol/L}$  on admission. CRF was defined as the persistence of a serum creatinine level over 115 in male and 90  $\mu\text{mol/L}$  in female at the end of the study period; ARF was defined as a serum creatinine level under 116 and 91  $\mu\text{mol/L}$  respectively, at the end of the study period.

**Results:** The prevalence of RF on admission in hospitalized patients aged over 59 years was 6.4% in 1997, with 8.2% in men and 4.9% in women and 9.4% in 2005, with 13.5% in men and 6.3% in women (an increase of +46% in 9 years -+64% in men and +28% in women). The prevalence of ARF was 1.5% in 1997, (1.3% in men and 1.6% in women) and 2.9% in 2005, (3.9% and 2.2% respectively), the risk of ARF on admission to hospital having significantly increased in 9 years of +55% in men. The prevalence of CKD was 4.4% in 1997 (6.2% in men and 2.7% in women) and 5.5% in 2005 (9.2% and 4%). The risk of CKD in ED increased to more than 19% in 9 years (+23% in men and +19% in women). The incidence of an ESRD treatment occurring during hospitalization or in the period of the study in 1997 was 1.5 per 1000 hospitalized patients aged over 59 years and in 2005 it was 1.3/1000 patients. A nephrologist advice was sought for 25% of the patients in 1997 and 54% in 2005.

**Conclusion:** The hospital epidemiology data on RF at ED are original and suggest actions to be taken for optimal and early nephrological care for patients after admission to hospital.

**Keywords:** Acute renal failure; Elderly patients

### Introduction

The increasing prevalence of chronic kidney disease (CKD) in the general population is linked to longer life expectancy and the aging of kidney vessels. The last two decades have been characterized by the increasing prevalence of ESRD treatment in patients growing older [1,2].

Several studies point out that 30-40% of new dialysis patients have not received prior support by a nephrologist [3] and that this lack of specialist monitoring before ESRD treatment represents an early mortality factor on dialysis [4]. CKD in the elderly is unknown and its severity is underestimated [5]. The number of CKD patients in France is estimated in 2002 to be 1.75 to 2,500,000 [6], the imprecision of this evaluation is due in particular to the lack of validation of methods for measuring glomerular filtration rate (GFR) in elderly patients [7-9]. Preventing a worsening CKD can prevent or delay the ESRD treatment. It can also reduce cardiovascular morbidity and mortality associated with kidney failure condition. CKD is recognized as a major risk factor for cardiovascular mortality, including myocardial infarction [10,11].

The emergency department (ED) of a general hospital is frequented by a population of elderly patients with cardiovascular co-morbidities. The ED is a special place for observation to assess and monitor the prevalence of acute renal failure (ARF) and CRF in patients hospitalized for diseases other than nephrology.

This work aims to assess the prevalence of ARF and CRF at ED of a general hospital in patients older than 59 years, and to monitor its evolution in 9 years interval (1997-2005). It also clarifies how a nephrologist is urged by his hospital colleagues to support these patients with renal failure (RF) ten years after the recommendations of the High Committee of Public Health [12].

### Methods

An initial survey was conducted from January, 1 to June, 30, 1997. During this period, 16,221 patients were admitted at the ED of Yves Le Foll Hospital of Saint Brieuc and 5,783 (35.6%), 2,820 men and 2,963 women were hospitalized, with 54.6% aged over 59 years (1420 men and 1737 women). The second survey was conducted from January, 1 to June, 30, 2005 in the same ED. During the second period, 18,835 patients were admitted and 4,677 (24.8%), among those 2,198 men and 2,479 women were hospitalized, with 64.9% aged over 59 years (1,310 men and 1,730 women).

Serum creatinine was measured at least twice during the stay: at the time of admission to the ED and at the end of the hospital stay. Renal failure was defined in the two survey periods by a serum creatinine value equal to or higher than 150  $\mu\text{mol/L}$  at the time of admission. Patients on chronic dialysis, transplant patients hospitalized at the ED, as well as patients who were already monitored by a nephrology team were excluded from the study. Only one hospitalization was taken into account, the first one, in case of new admission of the patient during the study period.

The method for the determination of serum creatinine dosage was the same in 1997 and 2005 (Jaffe method). Renal failure was considered as acute when the serum creatinine level regresses to a level equal to or less than 115  $\mu\text{mol/l}$  in men and 90  $\mu\text{mol/l}$  in women at the end of the stay or the period of the study [9].

Renal failure was considered as chronic when the serum creatinine level was unchanged or higher than 115  $\mu\text{mol/l}$  in men and 90  $\mu\text{mol/l}$  in women at the end of the stay or during the period of the study. The average hospital stay of renal failure in patients was 14 +/- 12 days in 1997 and 13 +/- 15 days in 2005. Seventeen patients had no second determination of serum creatinine in 1997 and seven in 2005. They were excluded from the calculation of prevalence of ARF and CRF.

The orientation of the patients, with renal failure in the ED, towards the speciality departments other than the nephrology was studied, as well as the frequency of the requests for nephrologist advice from the hospital experts of the respective departments during the stay of the patients. The hospital has a nephrology department since 1978 where 5 nephrologists practised in 1997 and 7 in 2005.

In 1997, a prospective study was led by same investigators [13]. In 2005, the research was carried out over the same period of the year as in 1997 by another investigator, from the computerized medical file.

In the two studies, the prevalence in the hospitalized population at the ED is calculated over a 6 month period and prolonged to 12 months. The prevalence of the ARF and the CRF was evaluated only in the hospitalized population of more than 59 years of age. The Hospital of St Brieuc is a local hospital for a catchment population of 158,917, including 41,318 aged over 59 (19,007 men and 22,311 women), called *Pays de St Brieuc* [14]. The department of nephrology has a wider appeal than *Pays de St Brieuc* since it is the only specialized department for a health care area of 400.000 inhabitants. It is the reason why, only the patients presenting themselves on admission of St Brieuc hospital are considered as the relevant recruitment of the *Pays de St Brieuc*, three other hospitals within the health care area (*Lannion*, *Paimpol* and *Guingamp*), being equipped with one admission department ensuring their own recruitment.

The incidence of the ESRD treatment occurring in the course of hospitalization in patients admitted with RF at the ED was calculated in the following way: number of new patients aged over 59 years from *Pays de St Brieuc* and definitively taken on chronic dialysis during or immediately after the hospital stay, reported either to the number of patients of more than 59 years of age hospitalized during the time of the study (n/1000 hospitalized patient /year), or to the total population of *Pays de St Brieuc* (n/10%/year) evaluated in censuses in 1997 and 2005 [13]. This data represented the part of the patients not treated beforehand by a nephrologist and arriving at the stage of the ESRD during the period of the study.

The statistical analysis of the two studies was carried out with the method of Chi-2 and Student coefficient. If the number of hospitalized patients at the ED in 2005 was 19% lower than that of the patients hospitalized in 1997, the difference between the patients of more than 59 years of age with patients under 59 years was not significant (3040 vs 3157, or - 3.7%), and higher for men (1310 vs 1420, - 7.7%) than women (1730 vs 1737, - 0.4%).

## Results

The average age of patients with renal failure at ED was 73.1 +/- 10.5 years in 1997 and 75.1 +/- 8.3 years in 2005 ( $p < 0.01$ ). In 1997, 202/228 (88.5%) patients were aged over 59 years and in 2005, 286/311 (92%). The distribution by age brackets of ten years, for patients aged over 59, is presented in table 1. The risk of having renal failure upon admission to hospital in each of the age brackets compared to the reference (60-69

years) increased steadily to 90 years in 1997 and 2005. In 1997, the average value of the serum creatinine of the 202 patients (117 men and 85 women) was  $224.5 \pm 16.6 \mu\text{mol/l}$  and in 2005, it was  $221.2 \pm 14.0 \mu\text{mol/l}$  for the 286 patients (175 men and 111 women) (ns). The distribution according to various levels of values of the serum creatinine on admission is presented in table 2. The number of patients located in the range from 250 to 299  $\mu\text{mol/l}$  had significantly increased in 2005 compared to 1997.

In 1997, the prevalence of the renal failure in the patients hospitalized at the ED, all age groups taken into account, was 3.9% (228/5, 783 in-patients) and in 2005, it was 6.6% (311/4, 677). The relative risk (RR) of having a renal failure at the moment of admission to hospital increased by +35% in 9 years. It was more frequent in men than in women: 164/2820 (6.67%) vs 124/2963 (4.1%) in 1997 and 187/2198 (8.5%) vs 124/2479 (5%) in 2005 (Table 3).

In 1997, 54.6% of the patients hospitalized at the ED were older than 59 years, and in 2005, 64.9%. The prevalence of renal failure in elderly patients of more than 59 years was 6.4% in 1997 (8.2% in men and 4.9% in woman) and 9.4% in 2005 (13.3% and 6.4%). The risk of having a renal failure at the time of admission to hospital increased by +19% in 9 years (Table 3).

Throughout the period of the study, 74/202 (36.6%) patients died during hospitalization (87%) or the six-month period of the study in 1997 and 145/286 (52.4%) in 2005, including 92% during hospitalization. The progression of short-term mortality was +43% in 9 years. The evolution of the renal failure during hospitalization was evaluated in 185/202 (91.5%) patients in 1997 and 279/286 (97.5%) in 2005.

The renal function had been standardized at the end of the stay or before the death among 47 patients (33.1%), 19 men and 28 women, in 1997 and in 90 patients (31.4%), 52 men and 38 women, in 2005.

These patients were regarded as having an ARF. In 1997, the ARF was of functional origin in 38/47 patients (80.8%), parenchymatous in 5 (10.4%), obstructive in 2 (4.2%) and unspecified origin in 2 (4.2%). In 2005, the ARF was functional in 64/90 patients (71.2%), parenchymatous in the 26 others (28.8%).

The prevalence of the ARF in these hospitalized patients was 1.5% in 1997 (1.3% in men and 1.6% in women) and 2.9% (3.9% and 2.2%) in 2005. The risk of having an ARF at the time of the admission to the hospital in the aged population of more than 59 years increased by +28% in 9 years, primarily in men (+55%) (Table 3). The annual incidence of ARF on admission to ED, reported to the aged population of more than 59 years living in *Pays de St Brieuc*, was in 1997, 227,5 patients per 100.000 inhabitants and in 2005, 218/100 000 (ns).

The initial renal failure was improved, but not resumed at the end of the stay or the end of the investigation, in 52 patients (28.2%) in 1997 and in 65 (23%) patients in 2005; it was remained stable compared with the initial level in 40 (22%) and 91 (33%), and worsened in 46 (24.8%) and 33 (12%) patients. In 1997, the diagnosis of CRF was retained in 138/185 (74.5%) patients (88 men and 47 women) and in 189/279 (68%) patients (121 men and 68 women) in 2005 (ns). In 37.7% of the patients in 1997 and 34.4% in 2005, it was about a functional ARF superimposed to previous CRF including four cases of acute retention of urine in 2005.

The prevalence of CRF in aged patients hospitalized at ED was 4.4% in 1997 (6.2% in men and 2.7% in women) and 5.5% in 2005 (9.2% and 4%, respectively). The risk of having a CRF at the time of admission to hospital increased by +19% in 9 years, this progression being comparable in men (+23%) and in women (+19%) (Table 3). The prevalence of the aged patients with CRF, living in *Pays de St Brieuc* and not monitored by nephrologists at the moment of their admission to hospital, was of 327/100000 inhabitants (463 men and 211 women) in 1997 and 474 /100

000 (658 men and 318 women) in 2005 ( $p < 0.02$ ). Thus, the population older than 59 years, with CRF at the time of admission to hospital and not monitored beforehand by a nephrologist, increases by +45% in 9 years.

In this study, all the patients previously monitored by a nephrologist were not under ESRD treatment at the time of admission to hospital, both in 1997 and 2005. Five patients in 1997 and four in 2005 had during their hospital stay or for the period of the study an irreversible aggravation of initial renal failure, requiring a final decision of renal replacement therapy.

Age (years)	1997 n (%)	2005 n (%)	RR	95% CI	p
60-69	25 (12.4%)	31 (10.8%)	1	-	-
70-79	65 (32.1%)	75 (26.2%)	0.96	0.68-1.35	0.82
80-89	86 (42.5%)	138 (48.3%)	1.16	0.83-1.63	0.39
90 and +	26 (12.8%)	42 (14.7%)	1.17	0.77-1.78	0.47
Total	202 (100%)	286 (100%)			

**Table 1:** Distribution by age groups of patients with renal failure aged >59 years on admission to hospital

Serum creatinine on admission ( $\mu\text{mol/l}$ )	1997 n (%)	2005 n (%)	RR	95% CI	p
150 to 199	139 (68.8%)	178 (62.2%)	1	-	-
200 to 249	38 (18.8%)	48 (16.8%)	0.99	0.76-1.2	0.95
250 to 299	7 (3.5%)	32 (11.2%)	2.44	1.23-4.83	0.001
$\geq 300$	18 (8.9%)	28 (9.8%)	1.12	0.77-1.64	0.54
Total	202 (100%)	286 (100%)			

**Table 2:** Serum creatinine value on admission to hospital

Type of RF	1997	2005	RR	95% CI	p
RF on admission (all hospitalized patients)	3.9%	6.6%	1,35	1.25-1.45	$< 10^{-7}$
RF on admission (hospitalized patients >59 years)	6.4%	9.4%	1,19	1.08-1.31	0.001
ARF on admission (hospitalized patients >59 years)	1.5%	2.9%	1,28	1.13-1.45	0.000008
Men	1.3%	3.9%	1,55	1.34-1.79	0.000015
Women	1.6%	2.2%	1,16	0.94-1.43	0.2
CKD on admission (hospitalized patients >59 years)	4.4%	5.5%	1,19	1.08-1.31	0.001
Men	6.2%	9.2%	1,23	1.09-1.39	0.0028
Women	2.7%	4%	1,19	1.02-1.39	0.0440
ESRD treatment (hospitalized patients >59 years)	1.5/1000	1.3/1000	0,91	0.44-1.88	0.78

**Table 3:** Prevalence of renal insufficiency (RI) in patients admitted to CH of *St Brieuc* by the emergency department (%), prevalence of CKD and implications of the ARF and ESRD treatment in the hospitalized population aged >59 years and in the population of *Pays de St Brieuc* (per million inhabitants aged >59 years or pmi).

Departments year	Cardiology	Endocrinology	Nephrology	Rheumatology	Neurology	Urology	Other medical departments*	Other surgical departments**	Total
1997	41 (20.5%)	23 (11.4%)	20 (10%)	9 (4.5%)	8 (3.9%)	7 (3.5%)	60 (29.7%)	34 (16.8%)	202 (100%)
2005	31 (11%)	4 (1.4%)	55 (19.2)	5 (1.7%)	13 (4.5%)	0 (0%)	117 (40.9%)	61 (21.3%)	286 (100%)
RR	0.47	0.31	1	0.41	0,7	0.27	0.79	0.75	
IC to 95%	0.3-0.7	0.2-0.5	-	0.2-0.7	0.4-1.4	0.2-0.4	0.5-1.2	0.5-1.2	
p	0.0002	$10^{-7}$	-	0.01***	0.3	0.0002	0.25	0.2	

**Table 4:** Department of medical specialties where patients with RF stayed from ED admission

\* Internal medicine, dermatology, pneumology, gastroenterology and geriatric medicine.

\*\* Digestive surgery, vascular surgery, orthopedic surgery and traumatology.

\*\*\* p Fischer

The incidence of ESRD treatment occurring in this aged population hospitalized at ED was 1.5 per 1000 hospitalized patients in 1997 and 1.3 per 1000 in 2005 (ns). Relative to the overall annual incidence of ESRD treatment in the health area, these patients represented 23% in 1997 of incident cases of ESRD treatment (24.2 per million inhabitants or pmi) and in 2005, 18% (19.6 pmi) (ns).

Table 4 shows the specialty departments where patients with RF were admitted from ED. Less than 10% of the patients in 1997 and 19% in 2005 were addressed as first line in the nephrology department. A nephrologist advice was sought in 1997 for 27 patients (15%) hospitalized in the other centres, and for 103 (36%) in 2005.

Thus, in 1997, 25% of the RF patients admitted to hospital at ED had a nephrology care during their hospital stay, and 2005, 55% ( $p < 0.001$ ). This progression of nephrology care was done at the expense of direct hospitalization in cardiology, endocrinology and rheumatology. On the other hand, in the other specialty departments, the rate of addressing was comparable in 2005 with that of 1997. None of the RF patients, not seen by a nephrologist during the hospital stay, was then re-examined in outpatient department for nephrology for the study period.

## Discussion

The results of these two investigations show that the prevalence of ARF and CRF on admission to hospital in aged patients of more than 59 years is high. At 9 years of interval, the prevalence of ARF progressed especially in men and that of CRF progressed in both genders. Nephrology care during hospital stay clearly progressed in 2005 compared to 1997.

The prevalence of ARF was evaluated at the beginning of the 90s with approximately 1% of the patients admitted to the veterans of Boston hospital [15]. In this American study, ARF is functional in 70%, parenchymatous in 17% and obstructive in 11%, unspecified mechanism in 2% of the patients.

The average age of the 100 patients studied was 61 years +/-13 years. In 1996, a Spanish study evaluated the annual incidence of ARF in patients hospitalized in 13 hospitals in Madrid with 209 patients per million inhabitants [16]. This study takes into account both ARF on admission and the one occurring in the course of hospitalization. Forty eight percent of the patients studied had a normal renal function on admission. ARF was functional in 22%, obstructive in 11% and parenchymatous origin in 56% of the patients. Nearly 14% of the cases occurred on a pre-existent CRF. The average age of this population was of 63 +/-17 years. A more recent American study carried out in African-Americans, compares the prevalence of ARF on admission to the one occurring in the course of hospitalisation [17]. The population studied has an average age of 54 years and 67% were men. The prevalence of ARF on admission was 0.55%, 3 times higher than the one that occurred in the course of hospitalization (0.15%).

Our results are hardly comparable to literature data, firstly because we immediately limited our study to the population aged over 59 years, secondly because the definitions of the ARF have evolved in time and according to studies [18]. It must be noted that in this elderly population both in 1997 and 2005, the CRF was mostly functional, joining the US study data conducted in the early 90s [15]. The low prevalence of functional ARF in the Spanish study is due to the fact that the ARF that occurred during hospitalization was taken into account [16]. This ARF was more often parenchymal than functional [18].

In our study, the prevalence of the ARF at the time of admission to hospital is two to three times higher than those reported so far in literature. Compared to the annual incidence of the ACR in Madrid's population [16], the incidence in our region, reported in the population of *Pays de St Brieuc* would be ten times higher.

The average age of our patients is higher than that of patients included in the studies in Boston and Madrid. On the other hand, our results of the incidence of ARF in *Pays de St Brieuc* is similar to those of the study conducted in 2003 in the area of Aberdeen in the United Kingdom [19]. This prospective study was conducted over a 6 month period in a geographical area of 523,390 inhabitants. It includes patients with serum creatinine greater than or equal to 150  $\mu\text{mol/l}$  in men and greater than or equal to 130  $\mu\text{mol/l}$  in women. The incidence of ARF was 181.1 per 100,000 inhabitants and the average age of patients was 76 years.

Our results and those of Aberdeen suggest that the vascular kidney of the aged patient is exposed to the occurrence of an ARF, whether there is or not a previous CRF. This risk increased by +28% in 9 years, primarily in the male population of *Pays de St Brieuc* (+55%) [13].

The prevalence of the CRF in the elderly population, at the time of admission to hospital, is an original data of our study. There are no other comparable studies in literature. Three patients out of 4 with RF on admission had a CRF, in 1997 as in 2005 and more than 50% were 80 years old and over. The prevalence of the CRF on admission progressed between 1997 and 2005, moving from 4.4 to 5.5% for all the patients, from

6.2 to 9.2% in men and from 2.7 to 4% in women. The defining criterion of RF on admission supported the diagnosis of ARF but underestimated that of CRF, in particular in aged patients who have a glomerular filtration rate (GFR) ranging between 30 and 59  $\text{ml}/\text{mn}/1.73 \text{ m}^2$  of body surface [5]. Thus some patients were excluded from the study by the definition of renal failure, especially among women.

A study compared in the general population the inulin clearance values to the serum creatinine values: 85% of adults with  $\text{GFR} < 60 \text{ ml}/\text{min}/1.73 \text{ m}^2$  had serum creatinine higher than 137  $\mu\text{mol/l}$  in men and 104  $\mu\text{mol/l}$  in women [9]. By defining arbitrarily renal failure on admission by a serum creatinine value equal to or greater than 150  $\mu\text{mol/l}$  (17  $\text{mg/l}$ ), all the men included in the study had at least a stage 3 CKD, while the elderly women with this same stage were excluded from the study. The differences in prevalence of CKD observed between men and women, both in 1997 and 2005 could therefore be reduced.

The method of calculation of the GFR (formula of Cockcroft and Gault) [7] can be inappropriate for the elderly. For the obese patient (BMI higher than 30  $\text{kg}/\text{m}^2$ ), it overestimates the actual value of the GFR and for the elderly patient of more than 75 years it is yet to be evaluated [5].

These methodological limits explain the frequent over-estimate of stage 3 of CRF in certain studies of population where the percentage of false positives was estimated at 32% when the GFR was calculated by equation MDRD (Modification of Diet in Renal Disease) from a single measurement of serum creatinine [8]. The results of the NHANES III study published in 1998 [20] were reviewed and corrected in 2000 [21] for these methodological reasons.

The relationship between the level of serum creatinine and GFR measured by inulin clearance was specified in 1999 [9]. This study shows that the relationship between GFR calculated by the Cockcroft-Gault formula and the measured clearance inulin is quite good when the GFR is less than 60  $\text{ml}/\text{mn}$  [9]. Our first study conducted in 1997 could not take into account these results. In the 2005 study, we retained the 1997 inclusion criteria to support benchmarking. Nevertheless, we considered the results of the study of Couchoud et al. [9] in order to define the ARF and CKD in patients included in both studies.

In the study by Jungers et al. conducted in 1992 [22], the prevalence of CKD was calculated from a threshold value of serum creatinine 200  $\mu\text{mol/l}$  (22  $\text{mg/l}$ ). It increased according to age, with a value of 739  $\text{pmi}$  in men, and 354  $\text{pmi}$  in women in the age group of 60 to 74 years, and 1124 and 354  $\text{pmi}$  in the age group equal to or greater than 75 years. The difference in prevalence between men and women in the study by Jungers et al. [22] fell under the same methodological means other than the one we have just analyzed.

In the prospective study of the *Île-de-France*, only patients hospitalized in the nephrology departments were recorded. The study of the prevalence of CKD, limited to only the nephrology departments, underestimates the true prevalence of CKD in the hospitalized population. In our study, it is less than 55% of hospitalized patients with CKD who are hospitalized in nephrology. In 1997, with a threshold definition of CKD lower than the one in the study by Jungers et al. [22], the prevalence of CKD in the elderly, from the *Pays de St Brieuc*, was 5 times higher than that estimated in 1992 in *Île-de-France*, six times higher in men and 7 times in women. The French study in *Île-de-France* therefore underestimated the true prevalence of CKD in hospitalized patients, but confirmed that the majority of CKD patients were not seen by a nephrologist during their hospitalization.

In the NHANES III study conducted between 1988 and 1994 in the United States, which selected patients with serum creatinine equal to or greater than 17  $\text{mg/l}$  (150  $\mu\text{mol/l}$ ), the prevalence of CKD in the American

population was estimated at 1.9% in men and 0.7% in women [20]. In our study, with the same selection threshold, the prevalence of CKD related to the population of the *Pays de St Brieuc* was 0.92% for men and 0.42% for women in 1997, 1.3% and 0.63% in 2005.

After the epidemiological data of the NHANES III study were corrected in 2000, the prevalence of chronic kidney disease decreased between 1990 and 2000 by 12% for stage 3 (creatinine clearance between 59 and 30 ml/min) and 32% for stage 4 (creatinine clearance between 29 to 15 mL/min), while the prevalence of ESRD treatment during the same period increased by 70% [21].

Hypotheses to explain these epidemiological changes in 10 years are numerous: a methodological bias when the stage of kidney disease is defined by a single sampling of the serum creatinine [9], high mortality in CKD patients aged over 70 years, 52% of patients with stage 3-4 renal disease and aged over 70 years dying before ESRD treatment [9], a support increasingly early in replacement therapy as shown by serum creatinine at the time of dialysis that happened in the USA, from 87 mg / l in 1995 to 67 mg / l in 2004 [21].

This study provides original epidemiological data on renal failure acquired in a city area and evolving in hospital in population aged over 59 years hospitalized by ED. The existence of a RF on admission in the elderly is a severity indicator that should be taken into account upon admission to ED for patients with RF to receive a nephrologist advice during their hospital stay for an early treatment of those at risk of moving towards ESRD.

### Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

### What was Known

- The prevalence of ARF in a hospital intensive care, regardless of patient age
- The prevalence of ARF on admission to hospital regardless of age
- The prevalence of advanced CKD in nephrology departments

### What this Article Contains

- The prevalence of renal failure (ARF and CKD) in patients admitted to the emergency department (ED) of a general hospital.
- The prevalence of ARF and CKD in patients aged over 59 years admitted to hospital by the ED.
- The causes of ARF in elderly patients admitted by the ED.
- The incidence of ESRD treatment occurring in hospitals, not attended to previously by a nephrologist.
- (The impact of a nephrology department in the early treatment of a patient with renal failure admitted to hospital by the ED)??
- The mortality rate at within months of patients with renal failure admitted to hospital.

The evolution of all these data at 9 year interval.

### References

1. Lysaght MJ (2002) Maintenance dialysis population dynamics: current trends and long-term implications. *J Am Soc Nephrol* 13: S37-S40.
2. Simon P, Benarbia S, Charasse C, Stanescu C, Boulahrouz R, et al. (1998) The nephroangiosclerosis and the ischemic atheromatous renal disease became the most frequent causes of terminal chronic kidney disease to the patients of more than 60 years old. *Arch Mal Coeur Vaiss* 91: 1065-1068.
3. Lameire N, Biesen WV (1999) The pattern of referral of patients with end stage renal disease to the nephrologist: a European survey. *Nephrol Dial Transplant* 14: 17-23.
4. Jungers P (2002) loss of chance for the patient, loss of money for society. *Nephrol Dial Transplant* 17: 371-375
5. Agence Nationale d'Accréditation et d'Évaluation en Santé (ANAES) (2002) Diagnosis of the chronic kidney disease at the adult's. France.
6. Chronic kidney disease and public health (2001) Bernard Kouchner's intervention, delegate Minister of Health. The Sorbonne, Paris.
7. Cockcroft DW, Gault MH (1976) Prediction of creatinine clearance from serum creatinine. *Nephron* 16: 31-41.
8. Poggio ED, Wang X, Greene T, Van Leute F, Hael PM (2005) Performance of the modification of diet in renal disease and Cockcroft-Gault equations in the estimation of GFR in health and in chronic kidney disease. *J Am Soc Nephrol* 16: 459-466.
9. Couchoud C, Pozet N, Labeeuw M, Pouteil-Noble C (1999) Screening early renal failure: cut-off values for serum creatinine as an indicator of renal impairment. *Kidney Int* 55: 1878-1884.
10. Go AS, Chertow GM, Fan D, McCulloch CE, Hsu CY (2004) Chronic kidney disease and the risks of death, cardiovascular events, and hospitalisation. *N Engl J Med* 351: 1296-1305.
11. Anavekar NS, McMurray JJV, Velasquez EJ, Salomon SD, Kober L, et al. (2004) Relation between renal dysfunction and cardiovascular outcomes after myocardial infarction. *N Engl J Med* 351: 1285-1295.
12. Chronic kidney disease, etiology, ways of early diagnosis, prevention: report established at the request of the High Committee of the Public health (1998) INSERM Expertise collective 213-218.
13. Le Lann MH: Study of the association between presence and/or worsening of a chronic renal disease and the consumption of medicine with potentiality nephrotoxic to the more than 60-year-old subjects sent to the emergencies of the hospital center of StBrieuc; study case-control. Doctoral thesis in medicine, Faculty of Medicine, University of Rennes 1997
14. Riezou G (2001) Population census 1999: the new Breton social landscape. *Insee Bretagne*. Octant 88: 22-31.
15. Kaufman J, Dhakal M, Patel B, Hamburger R (1991) Community-acquired acute renal failure. *Am J kidney Dis* 17: 191-198.
16. Liano F, Pascual J (1996) Epidemiology of acute renal failure : a prospective, multicenter, community-based study. Madrid acute renal failure study group. *Kidney Int* 50: 811-818.
17. Obialo CI, Okonofua EC, Tayade AS, Riley LJ (2000) Epidemiology of de novo acute renal failure in hospitalized Africans Americans: comparing community-acquired vs hospital-acquired disease. *Arch Intern Med* 160: 1309-1313.
18. Lameire N, Van Biesen W, Vanholder R (2006)The changing epidemiology of acute renal failure. *Nat Clin Pract Nephrol* 7: 364-375.
19. Ali T, Khan I, Simpson W, Prescott G, Townend J, et al. (2007) Incidence and outcomes in acute kidney injury : a comprehensive population-based study. *J Am Soc Nephrol* 18: 1292-1298.
20. Jones C, McQuillan G, Kusek J, Eberhardt MS, Herman WH, et al. [1998] Serum creatinine levels in the US population: third National Health and Nutrition Examination Survey. *Am J Kidney Dis* 32: 992-999.
21. Centers for Disease and Prevention (CDC) (2007) Prevalence of chronic kidney disease and associated risk factors. United States 1999-2004. *MMWR Morb Mort Wkly Rep* 56: 161-165.
22. Jungers P, Chauveau P, Descamps-Latscha B, Labrunie M, Giraud E, et al. (1996) Age and gender-related incidence of chronic renal failure in a French urban area: a prospective epidemiologic study. *Nephrol Dial Transplant* 11: 1542-1146.