

General practitioners' serum creatinine recording styles

Francesco Del Zotti¹, Eugenio Visonà²,
Dino Massignani², Cataldo Abaterusso³,
Antonio Lupo³, Giovanni Gambaro³

¹ General Practitioner, Verona - Italy

² General Practitioner, Valdagno, Vicenza - Italy

³ Division of Nephrology, Department of Biomedical and Surgical Sciences, University of Verona, Verona - Italy

ABSTRACT

Opportunistic screening of serum creatinine records in the database of general practitioners (GPs) could be a very practical and inexpensive way to pinpoint chronic kidney disease. To get an idea of the consistency of such records, we retrospectively analyzed how 8 GPs recorded serum creatinine values for a total number of 11,711 adults over a 36-month period. While more than 1 test per patient was requested on average during the observation period, unfortunately only 27% of the numerical values tested were recorded; in more than 47% of cases, the GP simply recorded that the value was "normal." This style of data recording prevents any effective use of the serum creatinine values, impeding any estimation of the glomerular filtration rate or appreciation of temporal trends.

Key words: Serum creatinine, Opportunistic screening, CKD, eGFR, Database, General practitioner

INTRODUCTION

The growing number of people developing end-stage renal disease (ESRD) in the Western world is probably the tip of an iceberg involving a far larger number of people with initial or intermediate stages of renal insufficiency and chronic progressive nephropathies, who are often asymptomatic and unaware of their condition (1). There has rightly been talk of an epidemic of silent chronic kidney diseases (CKDs) and we have coined the acronym NCIPE (which sounds like the Latin *incipere*, to initiate) to describe those Nephropathies of relevance to public health, which are Chronic, possibly in their Initial stages and carry a Potential risk of major clinical End points (e.g., ESRD, cardiovascular morbidity/mortality, general mortality) (1). Identifying these cases is of paramount importance. Since most of the subjects involved have no symptoms, their identification must rely on some sort of laboratory assessment – i.e., serum creatinine assay, urinalysis etc. *Screening* of the general population or risk groups (i.e., diabetics, hypertensive subjects or those with a family history of renal disease) and *opportunistic interception* (via laboratory databases etc.) are 2 possible strategies for pinpointing cases of NCIPE. Opportunistic screening of serum creatinine records in the databases of general practitioners (GPs) might also be a very practical and inexpensive way to seek out CKD.

GPs routinely prescribe creatinine testing, both for the healthy individuals and to monitor chronic diseases and treatments. Their recording of the results in their electronic databases may sometimes be suboptimal, however, due to shortage of time, unavailability of the personal computer (PC) (e.g., during home visits, which are common in Italy) and so on. Moreover,

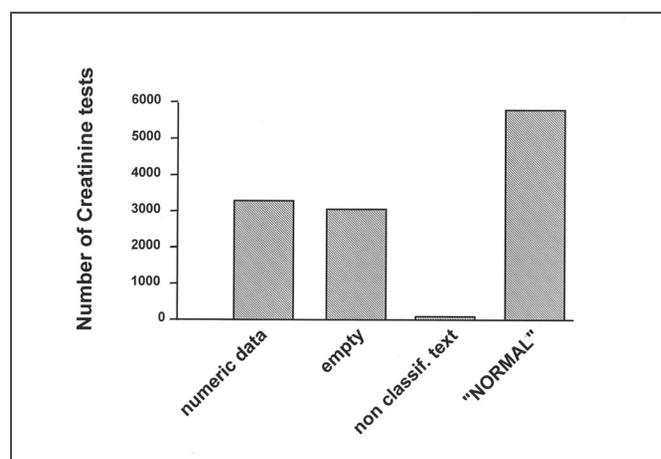


Fig. 1 - Number of serum creatinine assays prescribed by 8 GPs over a 36-month period (2003-2005), and types of reporting.

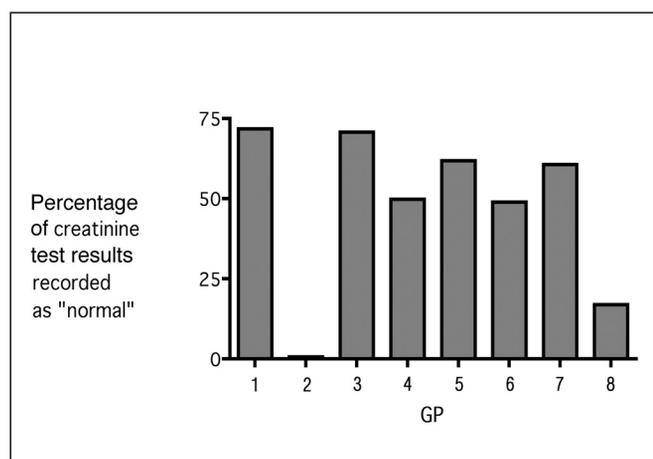


Fig. 2 - Frequency (percentage) of recording creatinine test results with the word "normal," by different GPs (numbered from 1 to 8).

patients may go to different laboratories, where creatinine is assayed using different methods or instruments, with different ranges of normality. This may introduce considerable variability in the serum creatinine data, as shown by the US National Health and Nutrition Examination Survey III (NHANES III) analysis of renal function: although a central laboratory facility was used, the systematic overestimation of serum creatinine by just 0.20 mg/dL introduced a large error in the calculated prevalence of CKD (2). To get an idea of how consistently GPs record serum creatinine values, we analyzed the style used to record serum creatinine values by 8 GPs linked to the same computer network and using the same data-recording software.

PATIENTS AND METHODS

The 8 practices are all in Valdagno, a small town in the province of Vicenza, northeastern Italy, and together they have a total of 11,711 adult subjects registered. Seventy-seven patients had an ICD-9 nephropathy code in the range 580-589 (an average of 9.6 patients for each GP; 6.6/1,000 patients) We retrospectively considered the following items as they had been recorded over a 36-month period (2003-2005): (i) total number of serum creatinine assays prescribed, (ii) total number of serum creatinine assays recorded, (iii) data-recording quality (numerical or categorical; i.e., normal vs. pathological, etc.) and (iv) recording of normality range.

RESULTS AND DISCUSSION

In all, 12,161 creatinine tests were requested during the study period, giving rise to 4 different types of record (Fig. 1):

1. the space for recording the result was left empty in 3,057 cases (25.1%);
2. only the word "normal" was added in 5,789 cases (47.6%);
3. non classified text was recorded in 25 cases;
4. a numerical value was provided in 3,290 cases (27%).

The range of normality was never specified in any record, and the habit of recording the test result with the word "normal" varied from one physician to another (Fig. 2).

Our study confirms that GPs routinely prescribe serum creatinine assays: on average, more than 1 test per patient was requested during the 3-year observation period. Unfortunately, however, numerical values were recorded for only 27% of the tests, while the result was not recorded at all in more than 25% of cases (although we cannot rule out the possibility of some patients failing to take the test, it seems highly unlikely that this should apply to 1 in 4). Another negative finding is that GPs simply recorded the value as "normal" in more than 47% of cases, certainly favored by the fact that the software used by these GPs has an automatic function for inputting a finding as "normal," probably to help save time and avoid recording errors. This style of recording makes it impossible to thoroughly appreciate the significance of the data. Serum creatinine concentration has many shortcomings as a marker of renal

function. Its serum levels are modified by lean body mass, diet and drugs interfering with the renal handling of creatinine. It also has a wide range of normality, so a decrease in renal function as high as 50% may be needed to push serum creatinine levels outside the normal range. It is nonetheless still considered a very practical tool for identifying NCIPE both in clinical practice and in research (3).

The utility of the test result could be much improved by going beyond the concept of “normal” serum creatinine values. On the one hand, its sensitivity could be vastly improved by estimating the glomerular filtration rate (GFR), which is the best measure of overall kidney function. Because it is impractical to measure GFR using inulin, iohexol or radioisotopes, clinicians now rely on equations for estimating GFR or creatinine clearance (CrCl), both in daily clinical routine and in the research setting. The US National Kidney Foundation Kidney Disease Outcomes Quality Initiative (K/DOQI) guidelines recommend calculating GFR with the Modification of Diet in Renal Disease (MDRD) Study equations, or CrCl with the Cockcroft-Gault equation (4), for which we need to know serum creatinine levels and demographic (sex, age, ethnic origin) and biometric (body weight) data.

On the other hand, the time trend of serum creatinine levels could also be extremely useful in identifying patients with nephropathy because a 10% difference between 2 values, often expressed in a single decimal figure, may be enough to trigger the suspicion of a significant change in kidney function.

The data recording styles we observed are probably partly due to GPs having a limited understanding of the notion of variability and the related “significant percentage difference,” which is particularly important in tests such as that for serum creatinine, where baseline absolute values are small and very low percentage differences are significant. Failing to use accurate numerical values also interferes with any time-related evaluation of repeated creatinine assays and prevents the use of the MDRD Study or Cockcroft-Gault equations, which are in increasingly common use in the laboratory and nephrological settings. In principle, therefore, to make best use of the data, GPs should avoid just recording a value as normal; instead, they should input a series of numerical values (including the decimal figures) in their patients’ files. Recording the ranges of normality too would enable some form of standardization of data obtained from different laboratories and would thus provide information on the population, not just on individual patients.

Our findings should also alert us to the essential conditions

for ensuring that GP data-recording software are reliable for the purpose of gaining an insight into the prevalence of renal disease in the general population: tests must be performed at the same laboratory or at laboratories that share the same quality-control program for creatinine assay (3), or must be normalized on the basis of normality ranges; and all test results must be recorded as numerical values.

A recent study conducted in Italy on data collected from GP electronic databases and concerning nearly 40,000 people at risk of nephropathy (due to hypertension or diabetes, or age >60 years) showed that as many as 32.9% of these subjects apparently had a GFR below 60 ml/min (5), a very alarming finding. But because the authors fail to say whether the serum creatinine assay was performed at the same laboratory or the serum creatinine value was normalized on the basis of normality ranges, this estimated prevalence must be interpreted as a very rough indication of the relevance of CKD in Italy.

In our opinion, the results of this study will hopefully prompt efforts to improve the integration between GPs and specialists, and action should be taken to provide training on the proper prescription and interpretation of creatinine assays, and the formulas for estimating GFR and/or CrCl so as to enable an early diagnosis and better monitoring of nephrological disorders in general practice. Our findings also confirm the need for more cooperation between GPs and nephrologists to improve data collection methods and thereby enable more reliable epidemiological forecasts.

ACKNOWLEDGEMENTS

We thank the following GPs for sharing their databases with us: Liliana Lora, Maria Pia Lora, Giuseppe Massarelli, Guido Novella, Attilio Tomba and Dino Zenere, all in Valdagno, Vicenza, Italy.

Conflict of interest statement: None declared.

Address for correspondence:
 Francesco Del Zotti, MD
 Corso Porta Nuova 3
 37122 Verona, Italy
 francesco.delzotti@tin.it

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Received: December 22, 2006

Revised: July 10, 2007

Accepted: August 01, 2007

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