

# MODALITA' DI VALUTAZIONE DELLA FUNZIONE RENALE NELLA PRATICA CLINICA

Andrea MAGNANO

Dirigente Nefrologo

UOC Medicina Interna

Ospedale "Santa Maria" di Borgo Val di Taro

Azienda USL di Parma

## DEFINIZIONE

---

**THE NATIONAL KIDNEY FOUNDATION K-DOKI AND THE K-DIGO CKD GUIDELINES DEFINE CHRONIC KIDNEY DISEASE AS BEING PRESENT IF GFR < 60 mL/min PER 1.73 m<sup>2</sup> OR EVIDENCE OF KIDNEY DAMAGE SUCH AS ALBUMINURIA OR ABNORMAL FINDINGS ON RENAL IMAGING HAVE BEEN PRESENT FOR THREE MONTHS OR MORE.**

**Patients with kidney disease may have a variety of different clinical presentations.**

**Some have symptoms or signs that are directly referable to the kidney (gros hematuria) or to associated extrarenal manifestations (edema, hypertension, signs of uremia), but many patients are asymptomatic ...**

**(Fatehi P. 2013)**

## EPIDEMIOLOGIA

---

CHRONIC KIDNEY DISEASE (CKD) IS A WORLDWIDE  
PUBLIC HEALTH PROBLEM.

THE PREVALENCE OF END-STAGE RENAL DISEASE (ESRD) IS  
INCREASING.



NKF K/DOQI 2002

IN THE USA THE EXACT REASONS FOR THE GROWTH OF  
ESRD PROGRAM ARE UNKNOWN : CHANGES IN THE  
DEMOGRAPHICS OF THE POPULATION , DIFFERENCES IN  
DISEASE BURDEN AMONG RACIAL GROUPS, AND **UNDER-  
RECOGNITION OF EARLIER STAGES OF CKD AND OF RISK  
FACTORS FOR CKD...**

McCLELLAN WM 1997; OBRADOR GT 2002

## POPOLAZIONE ADULTA ITALIANA

---

**FUNZIONE RENALE «DIMEZZATA»**  
**o «PIU' CHE DIMEZZATA»**  
**RISPETTO ALLA NORMA**  
**= 13% [1 individuo ogni 7]**

**Linee Guida ISS - Min Sal - SIN 2012**

# IL RENE E LE SUE FUNZIONI



National Kidney Foundation™



ENDOCRINA

METABOLICA

ESCRETORIA

Home Read Stories Kidney Disease Patients Organ Donation & Transplantation Professionals

Donate

Home » Kidney Disease »

### THREE SIMPLE TESTS TO CHECK FOR KIDNEY DISEASE

More than 26 million Americans—one in nine adults—have kidney disease. Millions more are at increased risk for getting it, and most don't know it. Kidney disease can be found and treated early to prevent more serious kidney disease and other complications.

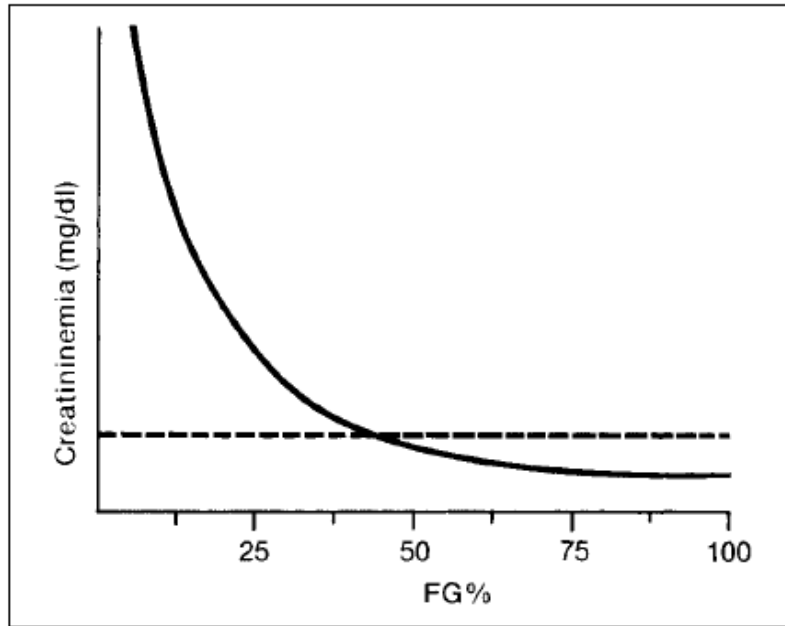
The National Kidney Foundation (NKF) recommends three simple tests to check for kidney disease:

**Blood pressure.** High blood pressure is the second most common cause of kidney disease. High blood pressure may also happen as a result of kidney disease. A blood pressure of 140/90 or higher is called high blood pressure. If you have diabetes or kidney disease a target less than 130/80 is recommended. Keeping blood pressure under control is important to lower risk of kidney disease, heart and blood vessel disease, and stroke. For more information on high blood pressure [click here](#).

**Urinalysis.** A urinalysis is a test that checks a sample of your urine for the amount of protein, blood (red blood cells and white blood cells) and other things. Protein and red and white blood cells are not normally found in the urine, so having too much of any of these may mean kidney disease. Having protein in the urine is one of the earliest signs of kidney disease especially in people with diabetes. Several other tests can be done to check for protein in urine. One of the tests is called the **protein to creatinine ratio**. It is the most accurate way to measure protein in the urine. A value of 200 mg/gm or less per day is normal. A value higher than 200 mg/gm is too high. Another test, called the **albumin to creatinine ratio**, is good for people at increased risk for kidney disease — people with diabetes, high blood pressure, or family history of diabetes, high blood pressure or kidney failure. A value of less than 30 mg/gm per day is normal for the albumin to creatinine ratio; a value of 30 mg/gm per day or higher is high and may be a sign of early kidney disease. With either of these tests, you don't need to collect a 24-hour urine sample, which may be hard to collect. For more on albumin in the urine [click here](#).

**Glomerular filtration rate (GFR).** GFR is estimated from results of a serum (or blood)creatinine test. The GFR tells how well your kidneys are working to remove wastes from your blood. It is the best way to check kidney function. A serum (or blood) creatinine test alone should not be used to check kidney function. GFR is calculated using the serum creatinine and other factors such as age and gender. In the early stages of kidney disease GFR may be normal. A value of 60 or higher is normal (GFR decreases with age). A GFR number of less than 60 is low and may mean that you have kidney disease. Check with your doctor about having the GFR test. If you are at increased risk for kidney disease (have diabetes, high blood pressure, or family history of diabetes, high blood pressure or kidney failure), you should find out if you have kidney disease. Ask your doctor about these three simple tests. They should be done at least once a year so that if you have early kidney disease, it can be treated right away. Early kidney disease can and should be treated to keep it from getting worse! To learn more about GFR [click here](#).

# COME SI VALUTA LA FUNZIONE RENALE?



## **DETERMINAZIONE DELLA VELOCITA' DI FILTRAZIONE GLOMERULARE**

(MISURATA: GFR;  
STIMATA: eGFR)

## **CONCENTRAZIONE DELLA CREATININA SIERICA**

**Test Jaffé;**

**Test di spettrometria di massa;  
(poco sensibile delle variazioni della funzione renale)**

ETA'

SESSO

ETNIA

PESO / ALTEZZA - BMI

## DALLA FISIOLOGIA ALLE FORMULE...

---

DAL CONCETTO DI CLEARANCE MISURATA  
(**creatinina**, urea, inulina, ecc.)

$$CL = (U/1440 \times V)/P = GFR$$

(inadeguata raccolta urine 24 ore,  
modalità di dosaggio della creatinina,  
cotrimossazolo, cimetidina, chetoni, dieta  
iperproteica, corporatura, ecc. )

**SOVRASTIMA**

ALLE PRIME FORMULE PER CALCOLARLA

Cockroft & Gault

$$CL = [(140 - \text{età}) \times \text{Peso}] / (72 \times Cr)$$

SE FEMMINA  $\times 0.85$

Cockroft DW & Gault MH 1976; Gault MH 1992

**Meno precisa per valori  
GFR > 60 e < 90 mL/min  
rispetto a formule  
moderne...**

**Imprecisa per valori  
GFR > 90 mL/min**

**Botev R 2009**

...ALLE LINEE GUIDA

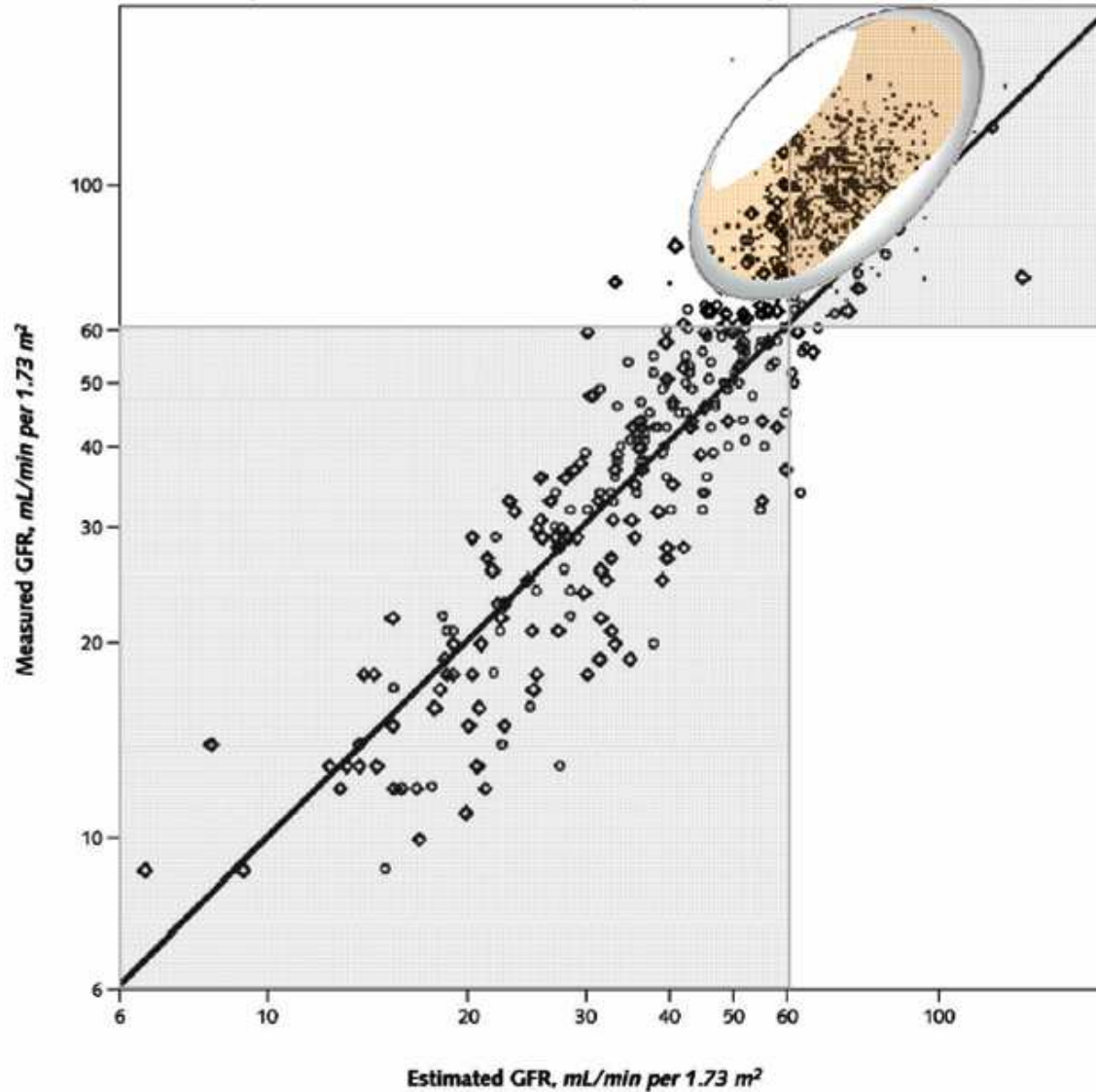
Sistema nazionale  
per le linee guida



Identificazione  
e gestione del  
cronicità nell'au



e-GF



IONE  
R > 15 E  
ORMANCE  
20 mL/min

(male)

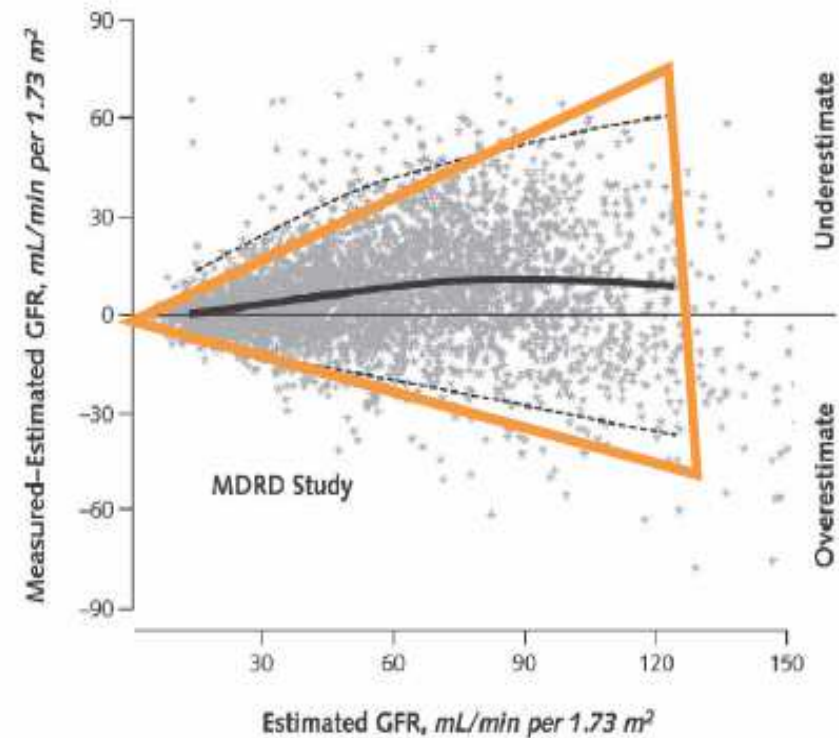
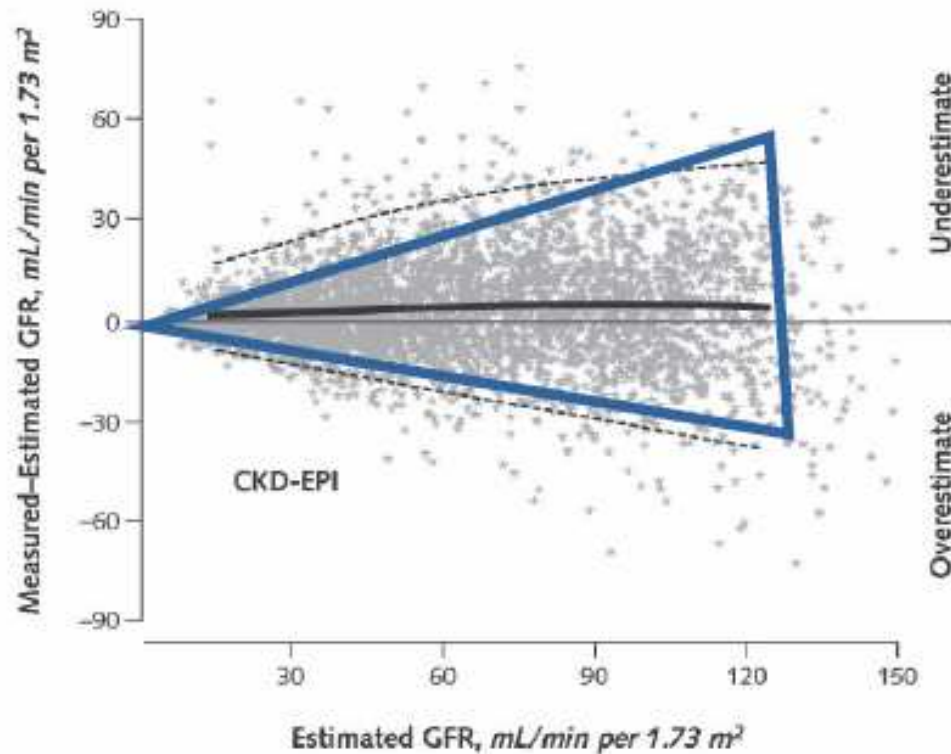
(surface area)

Levey AS;



# CKD – EPI (Chronic kidney Disease Epidemiology Collaboration)

$$\text{GFR} = a \times (\text{serum creatinine}/b)^c \times (0.993)^{\text{age}}$$

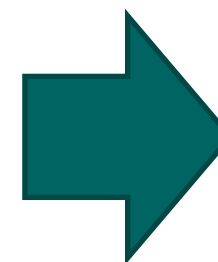


Levey AS; 2009

**GFR normale per soggetti maschi di anni tra i 20  
– 30 anni: 120 – 130 mL/min/1.73 m<sup>2</sup>**

**Table 10. Stages of Chronic Kidney Disease**

<b>Stage</b>	<b>Description</b>	<b>GFR (mL/min/1.73 m<sup>2</sup>)</b>
<b>1</b>	Kidney damage with normal or ↑ GFR	≥90
<b>2</b>	Kidney damage with mild ↓ GFR	60–89
<b>3</b>	Moderate ↓ GFR	30–59
<b>4</b>	Severe ↓ GFR	15–29
<b>5</b>	Kidney failure	<15 (or dialysis)



**CKD**

**3a e 3b**



**INTERVENTI TERAPEUTICI E  
DI PREVENZIONE DELLA  
PROGRESSIONE**

**STADIO 3**

**INCREMENTO RISCHIO CARDIOVASCOLARE**

Linee Guida ISS - Min Sal - SIN 2012

# LINEA GUIDA K - DIGO 2012

**KIDNEY DISEASE IS DEFINED AS AN ABNORMALITY OF KIDNEY STRUCTURE OR FUNCTION WITH IMPLICATIONS FOR THE HEALTH OF AN INDIVIDUAL, WHICH CAN OCCUR ABRUPTLY, AND EITHER RESOLVE OR BECOME CHRONIC.**

KIDNEY DISEASE | IMPROVING GLOBAL OUTCOMES



## KDIGO 2012 CLASSIFICATION OF CKD

GLOMERULAR FILTRATION RATE (GFR)		
CATEGORY	GFR	EXPLANATION
G1	≥90	Normal or high
G2	60-89	Mild decrease
G3a	45-59	Mild to moderate decrease
G3b	30-44	Mild to severe decrease
G4	15-29	Severe decrease
G5	<15	Kidney failure

ALBUMIN EXCRETION RATE (AER)				
CATEGORY	AER mg/24 hr	ACR mg/mmol	ACR mg/g	EXPLANATION
A1	<30	<3	<30	Normal to mild increase
A2	30-300	3-30	30-300	Moderate increase
A3	>300	>30	>300	Severe increase

Adapted from KDIGO - Kidney International Supplements (2013) 3, 19-82.  
CKD = Chronic Kidney Disease  
GFR = Glomerular Filtration Rate (ml/min/1.72m<sup>2</sup>)  
AER = Albumin excretion rate (mg/24 hours)  
ACR = Albumin to creatinine ratio (mg/g or mg/mmol) mg/g.

## TAKE HOME MESSAGES

### VALUTARE LA FUNZIONE RENALE MEDIANTE L' **EQUAZIONE MDRD SEMPLIFICATA**, ADOTTANDO LE CORREZIONI PER L' ETNIA ED IL SESSO

**MDRD: la formula è attendibile per valori di GFR compresi tra 20 e 60 mL/min/1.73 m<sup>2</sup>, ma è tanto meno accurata quanto maggiore è il valore di funzione renale (eGFR > 60 mL/min/1.73 m<sup>2</sup>).**



**Per valori di GFR < 20 mL/min/1.73 m<sup>2</sup> (CKD stages 4-5), MDRD tende a sovrastimare la funzione renale, così come nei pazienti con BMI estremo (masse muscolari ridotte: età avanzata, malnutrizione, sesso femminile)**

**Se è richiesta la determinazione accurata del GFR (**chemioterapia**) acquisire almeno due misurazioni separate della Clearance della creatinina su raccolta urine delle 24 ore.**

# CONCLUSIONE

---

---

*Creatinina – sierica; eGFR*

*Valutazione della pressione arteriosa*

*Esame urine, proteinuria e albuminuria 24 h*

*Sierologia, sedimento urinario...*

*Ecografia renale*

*Primo livello*

*Secondo livello*