

# Insufficienza Renale Cronica

*Carmelo Fede*

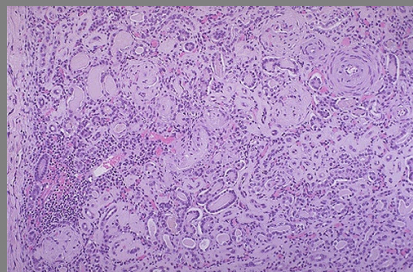


UO di Nefrologia e Reumatologia Pediatrica con Dialisi  
Dipartimento di Scienze Pediatriche Mediche e Chirurgiche  
AOU Policlinico "G. Martino" - Messina

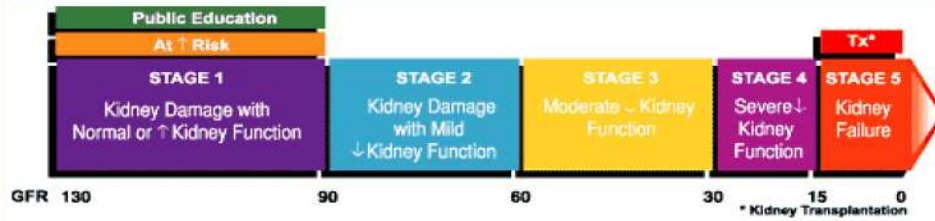


**Rene normale**

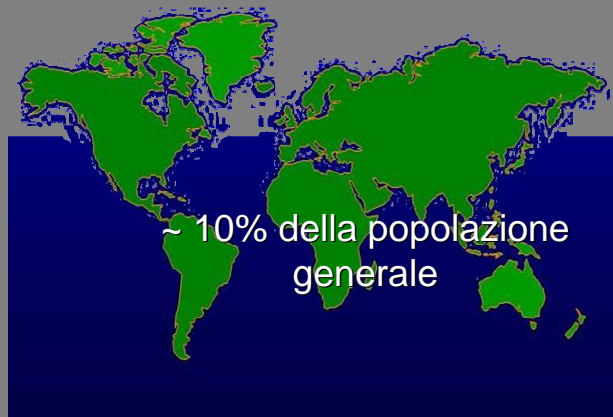
# Insufficienza Renale Cronica



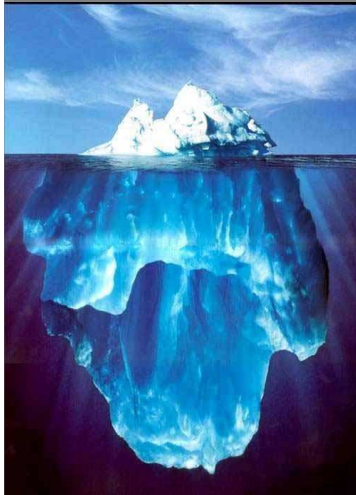
## Stadi di IRC (secondo K-DOQI)



World  
Health  
Organization



## IL SOMMERSO DELL' INSUFFICIENZA RENALE



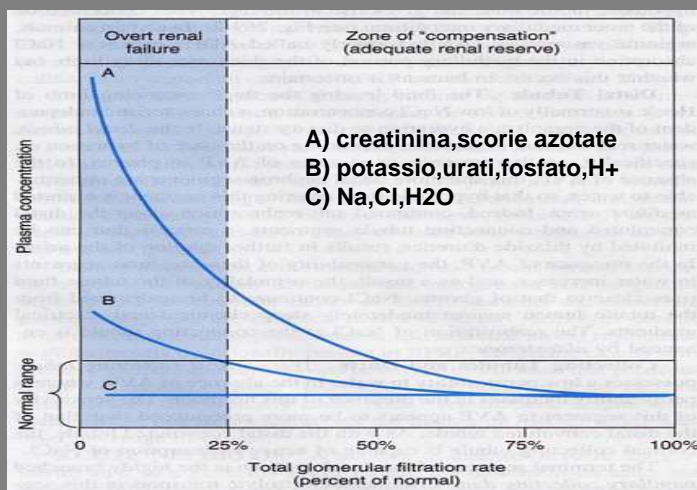
**Pz. con IR conosciuta**

Possibilità di agire sui fattori modificabili della progressione del danno renale e sulla comparsa della co-morbilità

**Pz. con IR sconosciuta**

Accelerazione della progressione del danno renale, maggiore incidenza e gravità di co-morbilità

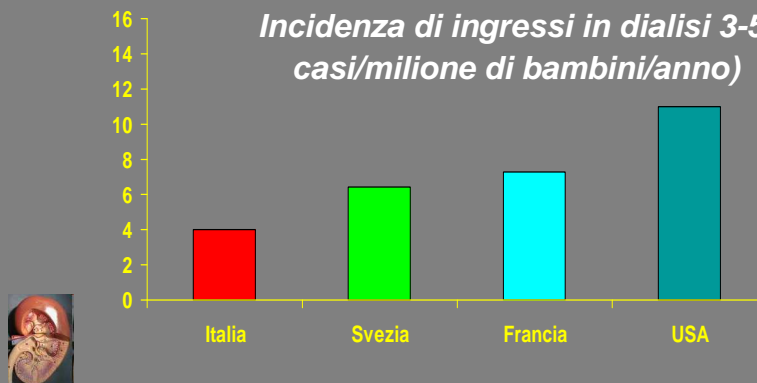
## Meccanismi di adattamento alla riduzione della funzione renale



## Incidenza di IRC in età pediatrica

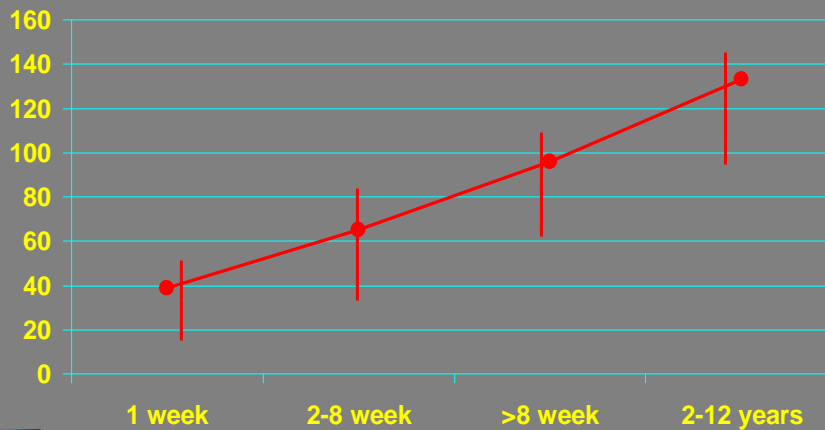
VFG < 30ml/min.: 7 casi/milioni di bambini/anno  
VFG < 75ml/min.: 12,1 casi/milioni di bambini/anno  
VFG < 90ml/min. : 96 casi/milioni di bambini/anno

Incidenza di ingressi in dialisi 3-5  
casi/milione di bambini/anno)



## Normale GFR in bambini ed adolescenti

Mean GFR +/- SD  
(ml/min/1,73mq)



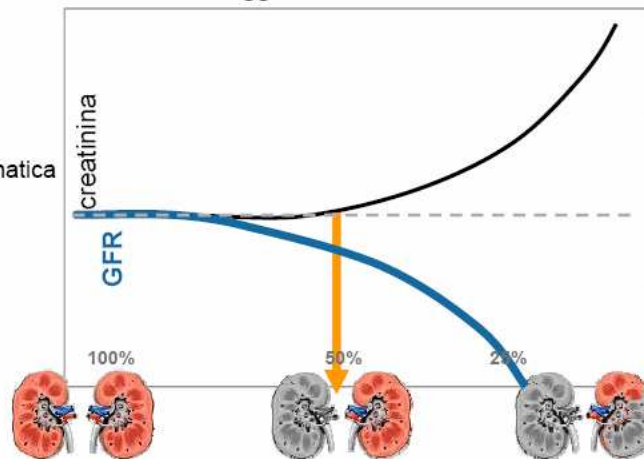
NKF: Pediatrics 2003

▪ La misura della concentrazione di un solo soluto non può descrivere la funzionalità renale:

▪ La velocità di filtrazione glomerulare (Glomerular Filtration Rate, GFR) è considerata l'indice migliore, sia nei soggetti malati che nei sani

- Variabilità di

- Flusso urinario
- Massa corporea
- Concentrazione ematica



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## Valutazione della Filtrazione Glomerulare

• Tecniche infusionali (inulina o Cr<sup>51</sup>-EDTA)  
gold standard, ma invasiva e laboriosa

$$\frac{\text{cretU} \times \text{diuresi}}{\text{creatS}} \times \frac{1,73}{\text{Sup.corporea}}$$

• Formula di Schwartz:  $\text{lungh (cm)} \times K / \text{CreatS}$

K= 0,4 prematuri

0,45 nati a termine < 1a

0,5 >1a <2aa

0,55 >2aa <13aa



### New Equations to Estimate GFR in Children with CKD

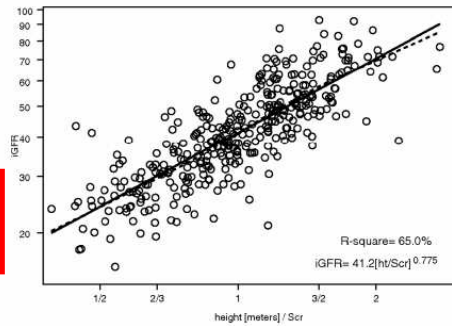
George J. Schwartz,\* Alvaro Muñoz,† Michael F. Schneider,† Robert H. Mak,‡  
Frederick Kaskel,§ Bradley A. Warady,¶ and Susan L. Furth\*\*

#### GFR nei bambini: La formula aggiornata di Schwartz

$$GFR \text{ (mL/min/1.73 m}^2\text{)} = (0.41 \times \text{Height}) / \text{Serum creatinine}$$

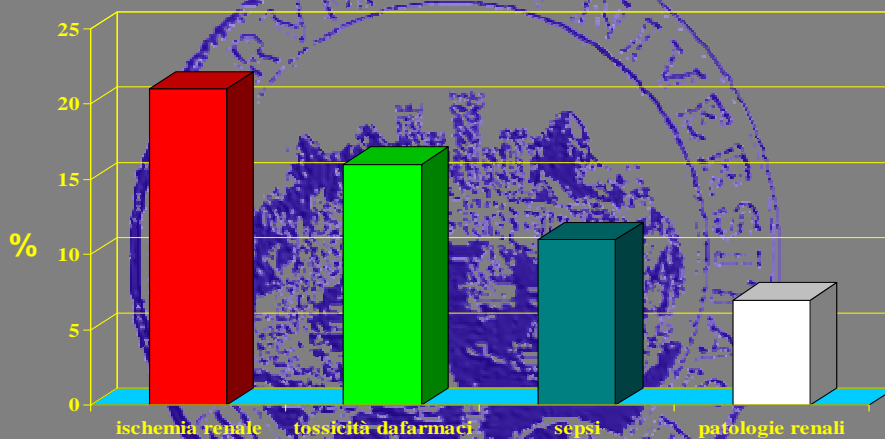
- Height in cm
- Serum creatinine in mg/dL

Questa è la prima formula  
pediatrica basata su creatinina  
enzimatica IDMS tracciabile.

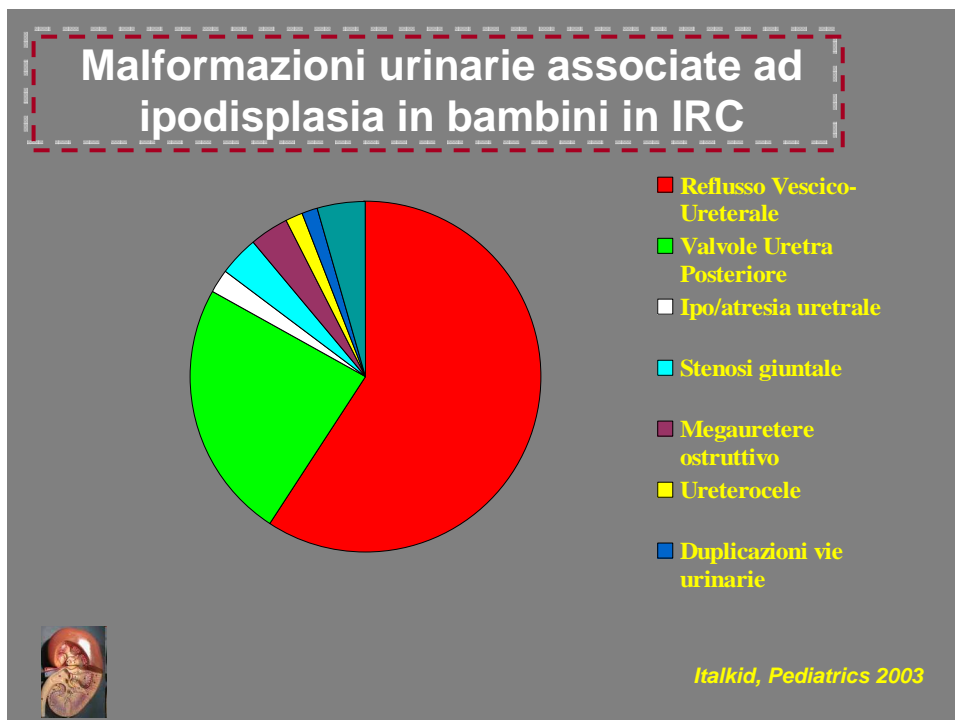
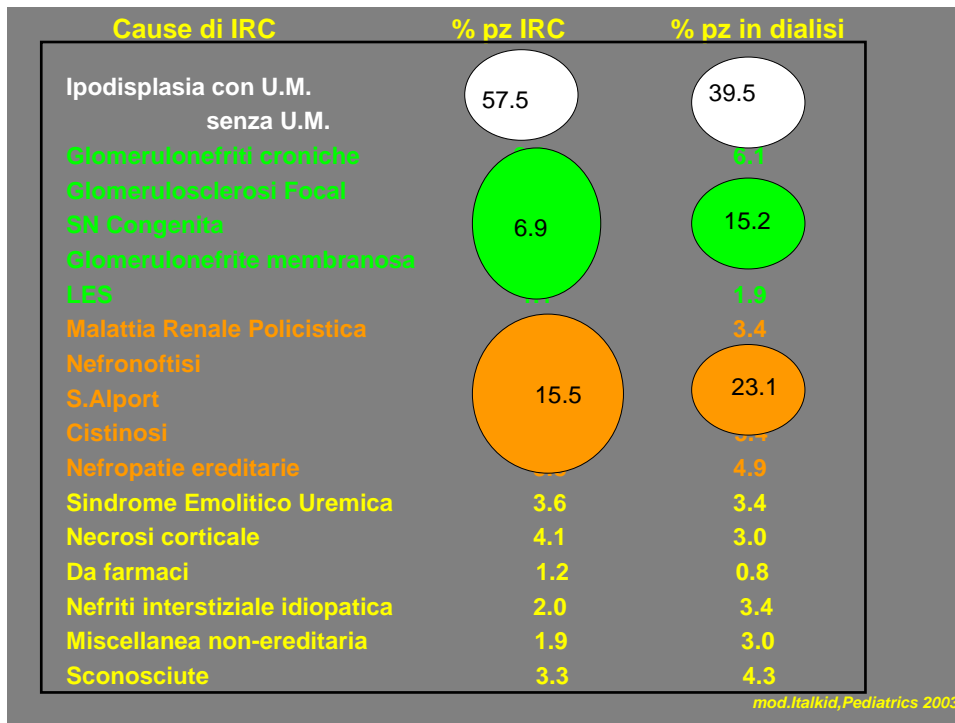


Schwartz, G. J. et al. J Am Soc Nephrol 2009;20:629-637

### Cause di insufficienza renale acuta (Texas Children's Hospital, Houston, Texas, USA)



Askenazi DJ, Kidney Int 2006

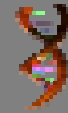
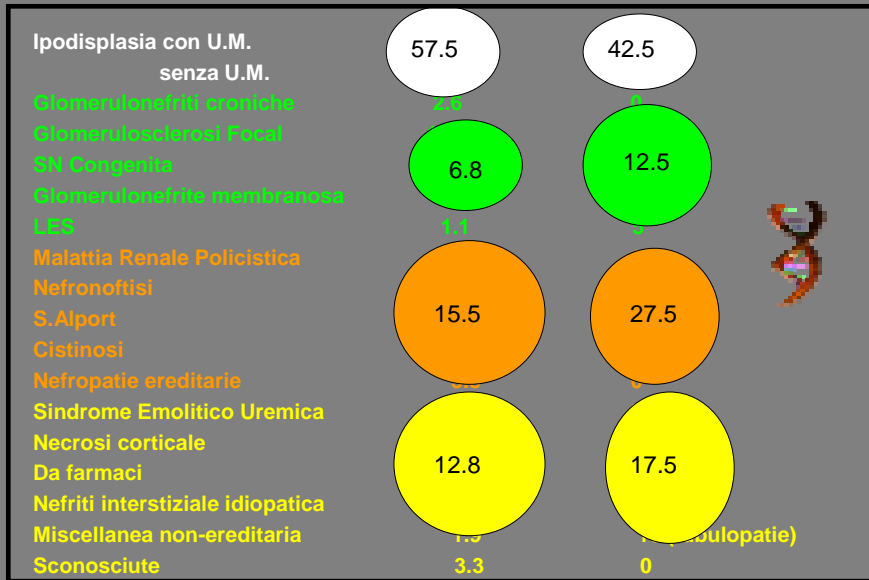


CASISTICA DELLA UO DI NEFROLOGIA PEDIATRICA MESSINA  
 % CAUSE DI IRC: 40 PAZIENTI

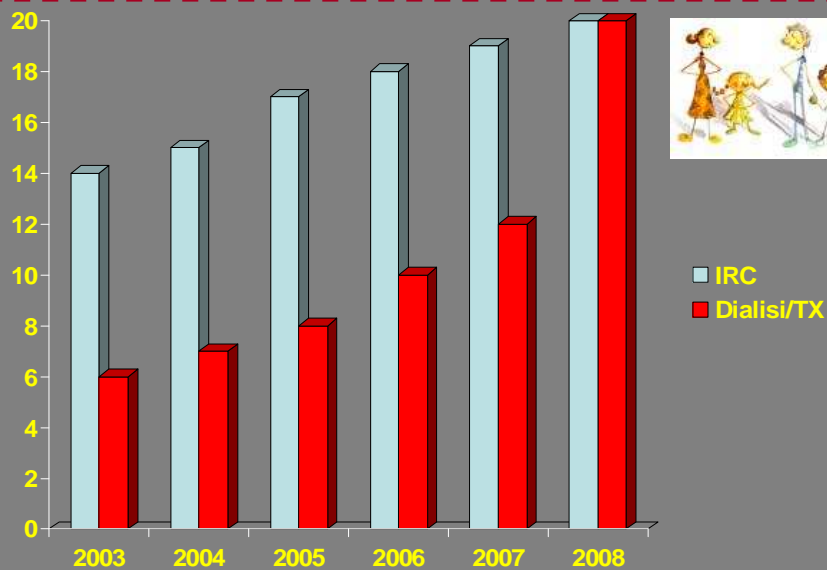


Italkid 2003

Messina 2007

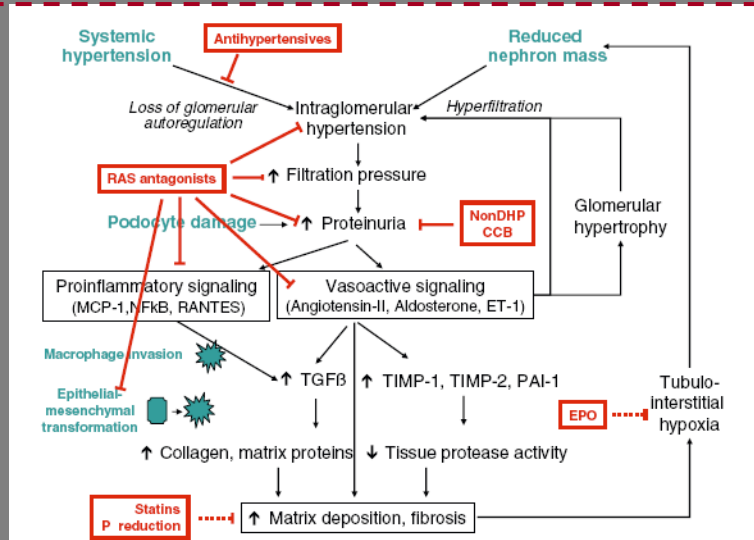


CASISTICA UO NEFROLOGIA PEDIATRICA





## Quali possibili trattamenti possono rallentare i meccanismi di progressione del danno verso l'insufficienza renale cronica



J Am Soc Nephrol 11: 88-96, 2000

## Chronic Proteinuric Nephropathies. II. Outcomes and Response to Treatment in a Prospective Cohort of 352 Patients: Differences Between Women and Men in Relation to the ACE Gene Polymorphism

PIERO RUGGENENTI,\*<sup>†</sup> ANNALISA PERNA,\* CARMINE ZOCCALI,<sup>‡</sup> GIULIA GHERARDI,\* ROBERTO BENINI,\* ALESSANDRA TESTA,<sup>‡</sup> and GIUSEPPE REMUZZI,\*<sup>†</sup> FOR THE "GRUPPO ITALIANO DI STUDI EPIDEMIOLOGICI IN NEFROLOGIA" (GISEN)<sup>a</sup>

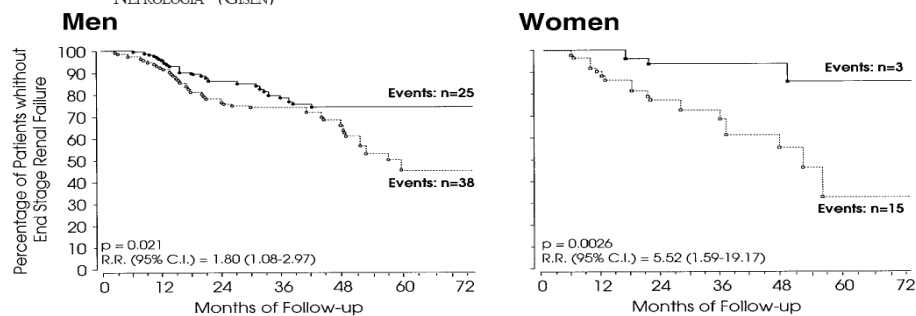


Figure 2. Kidney survival and number of patients on ramipril treatment (black dots) or conventional treatment (white dots) who progressed to ESRD (events) according to gender.

## No clear evidence of ACEi efficacy on the progression of chronic kidney disease in children with hypodysplastic nephropathy—report from the ItalKid Project database

Gianluigi Ardissino<sup>1</sup>, Sara Viganò<sup>1</sup>, Sara Testa<sup>1</sup>, Valeria Daccò<sup>1</sup>, Fabio Paglialonga<sup>1</sup>, Antonio Leoni<sup>1</sup>, Mirco Belingheri<sup>1</sup>, Luigi Avolio<sup>2</sup>, Antonio Ciofani<sup>3</sup>, Aido Claris-Aspiani<sup>1</sup>, Daniele Cusi<sup>1</sup>, Alberto Edefonti<sup>1</sup>, Anita Ammenti<sup>4</sup>, Milva Cecconi<sup>5</sup>, Carmelo Fedè<sup>6</sup>, Luciana Ghio<sup>1</sup>, Angela La Manna<sup>7</sup>, Silvio Maringhini<sup>8</sup>, Teresa Papalia<sup>9</sup>, Ivana Pela<sup>10</sup>, Lorena Pisanello<sup>11</sup> and Ilse Maria Ratsch<sup>12</sup> on behalf of the ItalKid Project

**Table 2.** Distribution of patients treated with ACEi and controls by progression rate during follow-up

	Cases	Controls	
Fast progressors (%)	22	28	$\chi^2 = 0.581$
Slow progressors (%)	54	48	$P = 0.75$
Non-progressors (%)	24	24	

Progression classes based on Cr slopes over time:

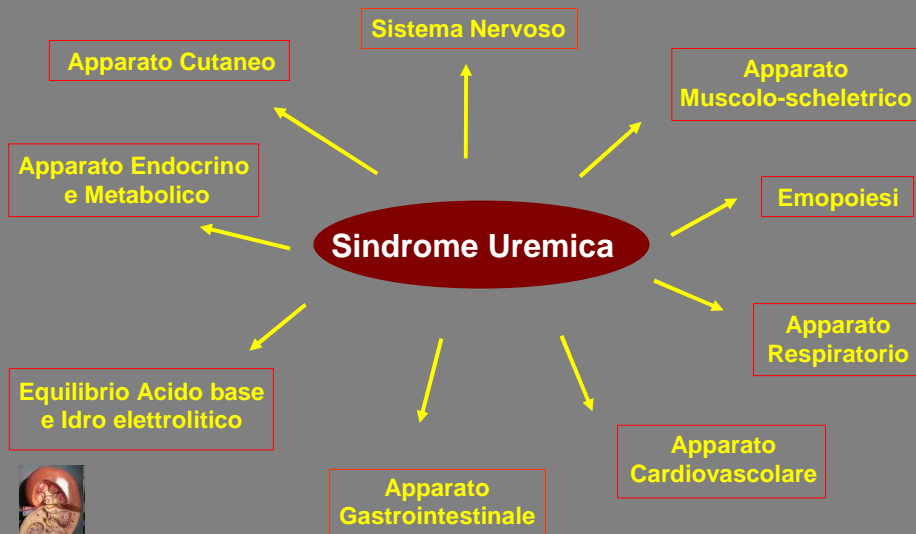
Fast progressors:  $< -3$  ml/min/1.73 m<sup>2</sup>/year,

Slow progressors: between  $-3$  and  $-0.01$  ml/min/1.73 m<sup>2</sup>/year

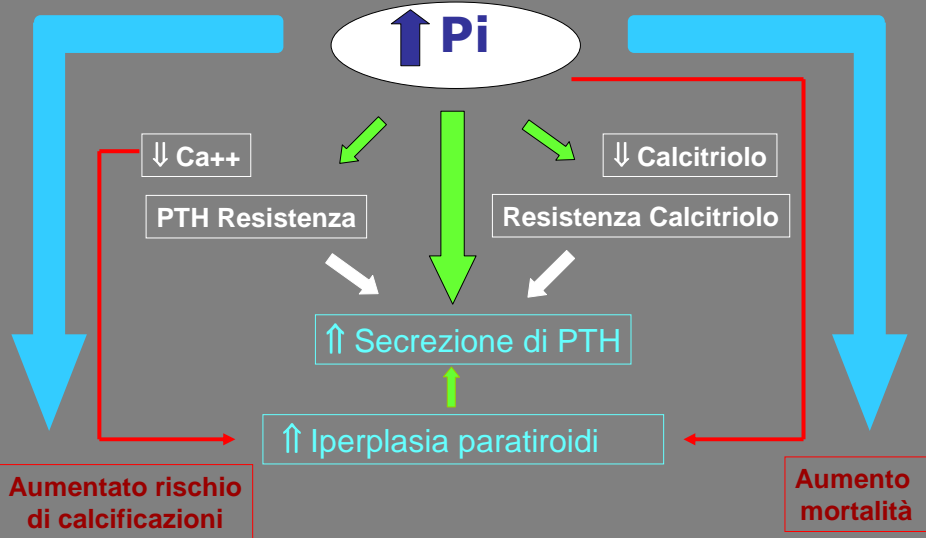
Non-progressors:  $\geq -0.0$  ml/min/1.73 m<sup>2</sup>/year.

## Insufficienza Renale Cronica (IRC)

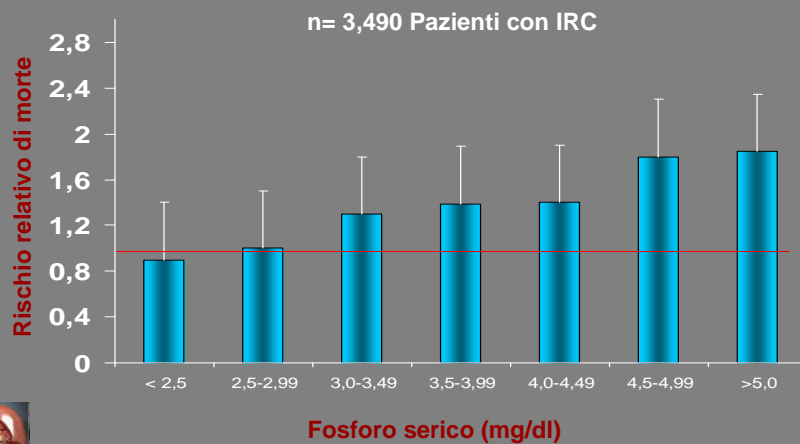
### Segni e Sintomi uremici



## Conseguenze dell'iperfosfatemia

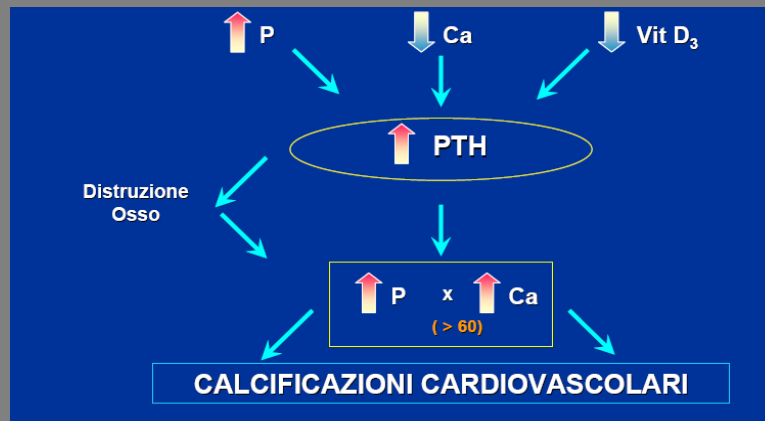


## Rischio relativo di morte per livelli di fosforo nei pazienti con IRC



Kestenbaum B, J Am Soc Nephrol 16:520-528 2005

## Colecalciferolo



PubMed

National  
Library  
of Medicine 

### Arterial compliance in adolescents and young adults receiving chronic hemodialysis

- Increased vascular stiffness is an established risk marker of cardiovascular diseases (CVD) ...We prospectively examined arterial compliances of adolescents and young adults on hemodialysis (HD) using diastolic pulse wave analysis (DPWA). ...the reduction in large artery elasticity index (LAEI) and/or small artery elasticity index (SAEI) was observed in four normotensive patients, suggesting hypertension was not the only contributing factor for the reduced arterial compliances in our patients. The association between SAEI and serum phosphorus suggests that SAEI derived from DPWA can potentially be an early non-invasive, operator-independent, and volume-independent marker of CVD in adolescents and young adults receiving HD.

Gbadegesin et al Ren Fail. 2008

Nephrol Dial Transplant (2006) 21: 729–735  
doi:10.1093/ndt/gfi196  
Advance Access publication 12 October 2005

**NDT**  
Nephrology Dialysis Transplantation

*Original Article*

### **Increased arterial stiffness in children on haemodialysis**

Nephrol Dial Transplant (2009) 1 of 8  
doi: 10.1093/ndt/gfp066

**NDT**  
Nephrology Dialysis Transplantation

*Original Article*

### **The relationship between circulating endothelial microparticles and arterial stiffness and atherosclerosis in children with chronic kidney disease**

<p>22 International Symposium on Paediatric Surgical Research</p> <p>20 <b>congresso nazionale congiunto</b></p> <p>40 Società Italiana di Chirurgia Pediatrica</p> <p>25 Società Italiana di Urologia Pediatrica</p> <p>10 Società Italiana di Videochirurgia Infantile</p> <p>25 Società Italiana di Nefrologia Pediatrica</p>		<p><b>UO Nefrologia e Reumatologia Pediatrica con Dialisi</b></p> <p><b>UO Cardiologia Pediatrica</b></p> <p><b>AOU G Martino - Messina</b></p>
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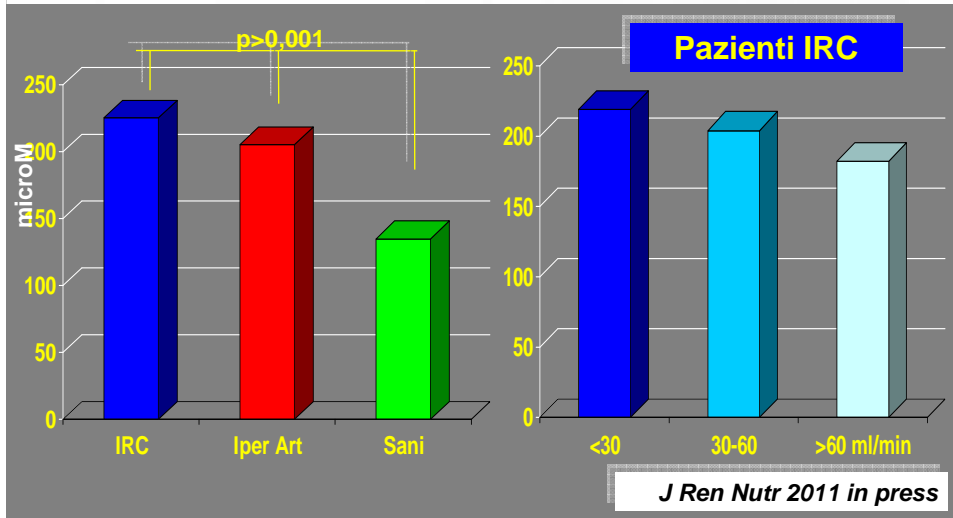
### **UTILITA' DELLA METODICA ECOTRACHING NELL'INDIVIDUAZIONE PRECOCE DI ALTERAZIONI VASCOLARI NELLA POPOLAZIONE UREMICA**

5/14 (36%) valori all'ecotraching superiori di 2DS rispetto alla popolazione sana di pari età e sesso.

**Non sono state riscontrate correlazioni significative con i dati auxologici, valori di pressione arteriosa, parametri ematologici, durata dell'IRC e patologia di base (glomerulopatie, malformazioni...) ed alterazioni cardiache all'ecocardiogramma**

## STRESS OSSIDATIVO IN UNA POPOLAZIONE DI IPERTESI E NEFROPATICI: UTILITA' DEL DOSAGGIO DELL'AOPP

CONTI GIOVANNI, SANTORO DOMENICO, CACCAMO DANIELA, SATTA ERSILIA, CONDELLO SALVATORE, PAZZANO DARIO, SAVICA VINCENZO, JENTILE RICCARDO, FEDE CARMELO, BELLINGHIERI GUIDO  
UO Nefrologia e Reumatologia Pediatrica con Dialisi, UO Nefrologia e Dialisi, UO Biochimica, AOU G Martino, Dip SEFISAT, Messina, Italia



## Conseguenze dell'osteodistrofia renale



## Anemia

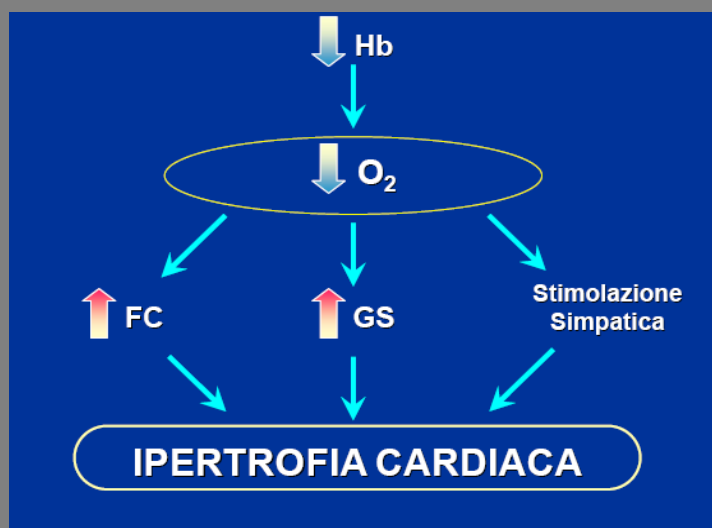
- Normocitica
- Normocromica

Cause: deficit di sintesi renale di EPO, ridotta emivita GR, emolisi

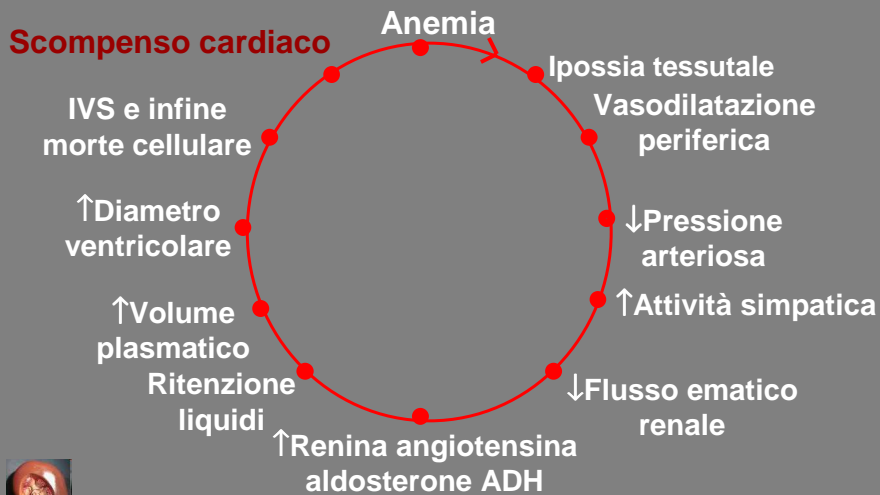
- Diminuita massa eritrocitaria
- Diminuita stimolazione midollare
- Diminuita risposta midollare



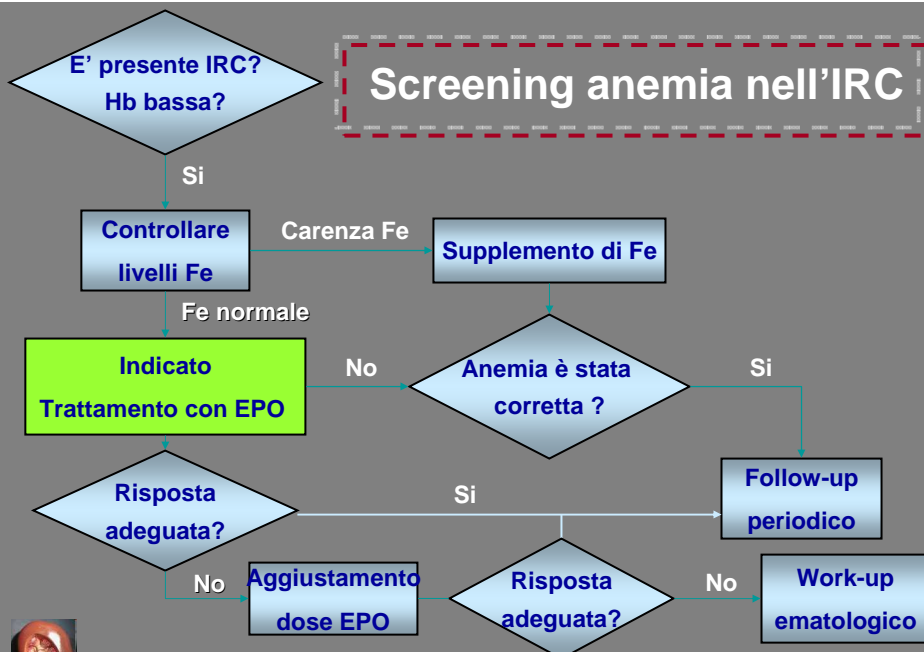
## Anemia



## Anemia causa di scompenso cardiaco



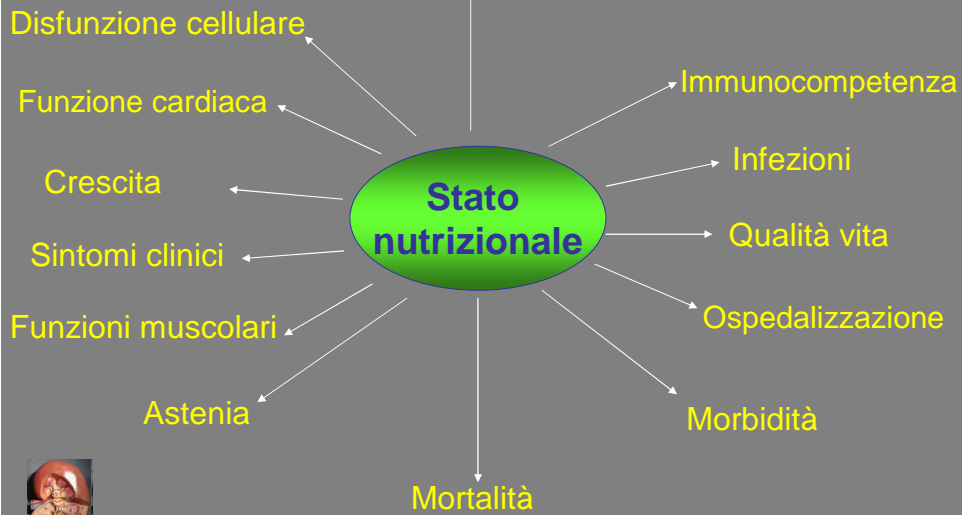
## Screening anemia nell'IRC



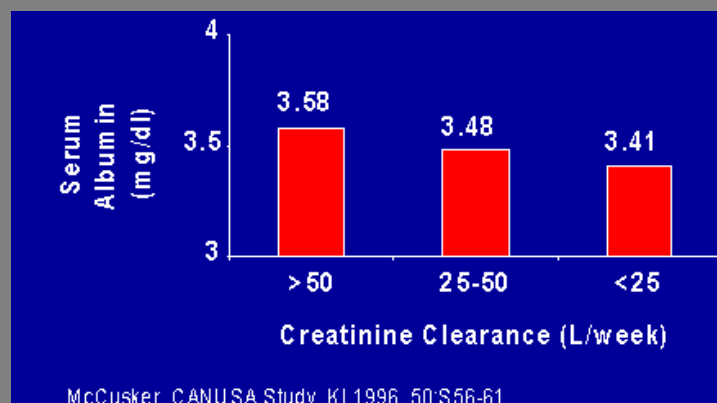


## IRC


Alterazioni delle funzioni  
biochimiche e fisiologiche



## Declino della funzione renale e malnutrizione



680 pz da 14 centri USA e Canada che hanno iniziato la PD nel 1990-92



## Compromissione della crescita **ponderale** nell'IRC

	All Patients		Age at CKD Registration							
			0-1 year		2-5 years		6-12 years		>12 years	
	N	%	N	%	N	%	N	%	N	%
<b>Total</b>	6918	100.0	1390	100.0	1096	100.0	2241	100.0	2191	100.0
<b>Weight SDS</b>										
-1.88 or worse	1894	27.4	808	58.1	312	28.5	470	21.0	304	13.9
-1.88 to 0	2843	41.1	476	34.2	550	50.2	997	44.5	820	37.4
Better than 0	2181	31.5	106	7.6	234	21.4	774	34.5	1067	48.7



NAPRTCS 2007

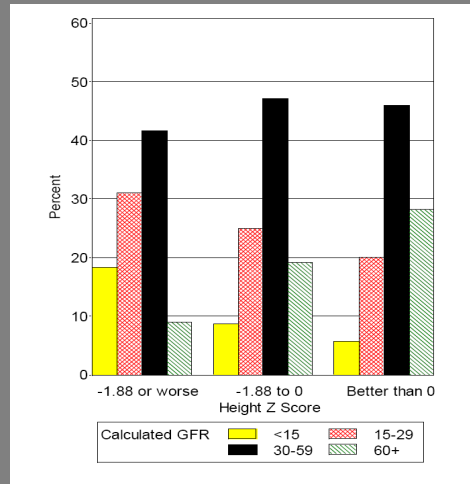
## Compromissione della crescita **staturale** nell'IRC

	All Patients		Age at CKD Registration							
			0-1 year		2-5 years		6-12 years		>12 years	
	N	%	N	%	N	%	N	%	N	%
<b>Total</b>	6907	100.0	1349	100.0	1087	100.0	2238	100.0	2233	100.0
<b>Height SDS</b>										
-1.88 or worse	2455	35.5	786	58.3	448	41.2	727	32.5	494	22.1
-1.88 to 0	3233	46.8	457	33.9	524	48.2	1110	49.6	1142	51.1
Better than 0	1219	17.6	106	7.9	115	10.6	401	17.9	597	26.7



NAPRTCS 2007

## Influenza del grado di IRC sulla crescita staturale



NAPRTCS 2007

## Confronto crescita staturale e funzione renale in b.ni >1 anno in IRC sottoposti a trattamento con GH vs b.ni >1 anno in IRC non trattati

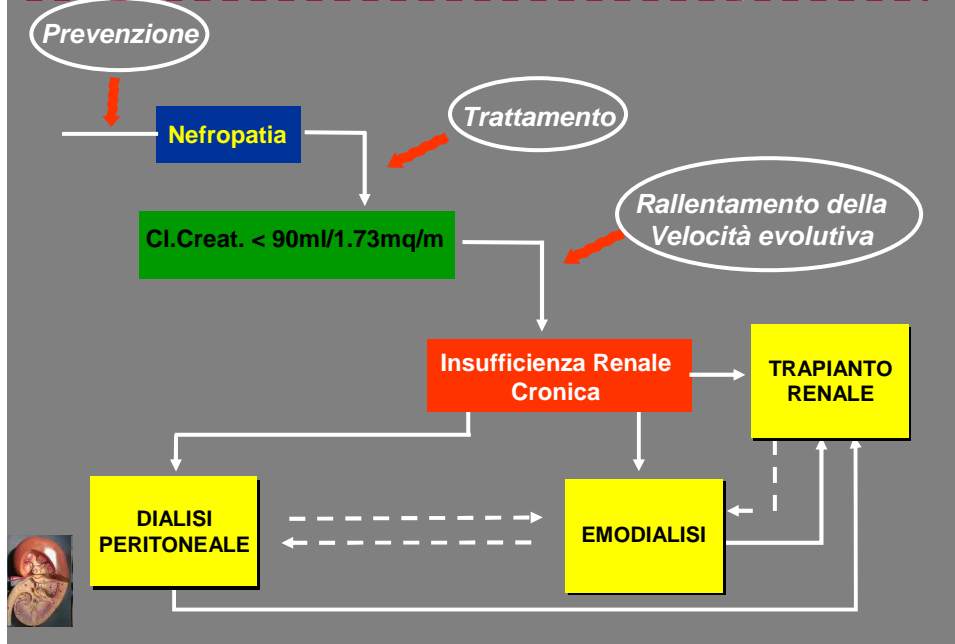
12 MONTH GROWTH DATA AND RENAL FUNCTION DATA EXCLUDING PATIENTS AGE 0-1 YEAR

	rhGH (n=189)			All Untreated Patient (n=2279)		
	Mean	SE	Median	Mean	SE	Median
<b>Height SDS</b>						
Baseline	-2.05	0.08	-2.00	-1.09	0.03	-0.95
12 Month	-1.74	0.08	-1.64	-1.17	0.03	-1.00
Change from baseline	0.32	0.04	0.28	-0.08	0.02	-0.05
<b>Serum Creatinine</b>						
Baseline	2.27	0.09	1.90	2.07	0.03	1.70
12 Month	2.83	0.13	2.30	2.53	0.04	2.00
Change from baseline	0.56	0.08	0.30	0.47	0.03	0.20
<b>Calculated GFR</b>						
Baseline	36.42	1.18	35.10	44.80	0.38	44.61
12 Month	33.54	1.33	29.73	43.18	0.50	40.18
Change from baseline	-2.88	0.76	-2.37	-1.62	0.36	-2.64

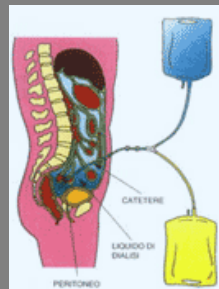


NAPRTCS 2007

# Storia "Naturale" delle Nefropatie



# Dialisi Peritoneale



## Emodialisi



## Trapianto Renale



Si ringraziano per la collaborazione:

UOC di Pediatria e Neonatologia – Ospedale Papardo , Messina

UOC di Pediatria di Bronte (CT)

UOC di Pediatria e PS Cannizzaro CT

UOC di Pediatria di Nicosia (EN)

UOC di Pediatria e Talassemia Osp Umberto I Siracusa

UOC di Pediatria di Noto (SR)

UOC di Pediatria di Comiso (RG)

UOC di Pediatria di Vittoria (RG)

Consorzio UUOO di Pediatria –  
Network 2008

