

# I presupposti teorici: come inquadro clinicamente l'IRA nel paziente cardiopatico critico

*Mario Cozzolino, MD, PhD*

*Dipartimento di Scienze della Salute  
Laboratorio di Nefrologia Sperimentale  
Università di Milano*

*L'insufficienza renale acuta nel paziente critico*



Quali sono le 3 cose più importanti che il medico di base dovrebbe conoscere sulla nefrologia?

**Mayo Clin Proc. 2009;84(2):180-186**



## CONCISE REVIEW FOR CLINICIANS

# **The Top 10 Things Nephrologists Wish Every Primary Care Physician Knew**

NEIL M. PAIGE, MD, MSHS, AND GLENN T. NAGAMI, MD

*After reviewing this article, the reader should be able to (1) interpret the clinical relevance of the serum creatinine level in the setting of age, sex, muscle mass, and medications the patient is taking; (2) identify chronic kidney disease in its earliest stage and apply measures to prevent its progression and complications; and (3) initially diagnose, evaluate, and manage other common renal diseases, such as nephrolithiasis and hypertension, encountered by primary care physicians.*

*Mayo Clin Proc.* 2009;84(2):180-186

- 1. A “Normal” Serum Creatinine Level May Not Be Normal.**
- 2. Know the Medications That Spuriously Elevate the Serum Creatinine Level.**
- 3. Patients With Decreased GFR or Proteinuria Should Be Evaluated to Determine the Cause; Positive Urine Dipstick Test Results for Protein Should Be Followed Up With a Spot Urine Protein to Urine Creatinine Ratio.**
- 4. In Patients With Early-Stage CKD, Periodic Evaluation and Intervention Are Appropriate to Slow the Progression of Renal Disease and Avoid Its Complications.**
- 5. Do Not Automatically Discontinue an ACEI or ARB Solely Because of a Small Increase in the Serum Creatinine or Potassium Level.**
- 6. Anemia in Patients With CKD Should Be Treated With Erythrocyte-Stimulating Agents Such as Recombinant Human Erythropoietin But Should Not Be Overtreated.**
- 7. Phosphate-Containing Bowel Preparations Should Be Used With Caution.**



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**8. Patients With Severe CKD Should Avoid Magnesium- or Aluminum-Containing Oral Preparations. Concomitant Use of Citrate-Containing Preparations and Aluminum-Containing Oral Preparations Is Potentially Hazardous Because It Can Lead to Acute Aluminum Toxicity.**

**9. Although Most Patients With Hypertension Should Not Be Screened for Secondary Hypertension, Certain Clinical Clues May Suggest the Presence of an Underlying Cause That, When Addressed, May Resolve or Improve the Patient's Hypertension.**

**10. In Patients With Recurrent Stone Disease, an In-depth Metabolic Evaluation Is Needed to Identify and Treat Modifiable Risk Factors, Thereby Preventing Further Episodes and/or Promoting Stone Dissolution.**



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Ho appena iniziato il giro, ma mi rendo conto  
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# Sindromi nefrologiche principali

- Insufficienza renale acuta

- Insufficienza renale cronica

- Sindrome nefrosica

- Ostruzione della via escrettrice

- Difetti del trasporto tubulare

- Nefrolitiasi

- Insufficienza renale rapidamente progressiva

- Sindrome nefritica acuta

- Alterazioni urinarie asintomatiche

- Infezione del rene e delle vie urinarie

- Ipertensione arteriosa

# Insufficienza renale

riduzione della capacità dei reni ad espletare le specifiche funzioni

**Il criterio di classificazione più semplice è temporale:**

## **ACUTA (IRA)**

- ore
- giorni
- può essere reversibile

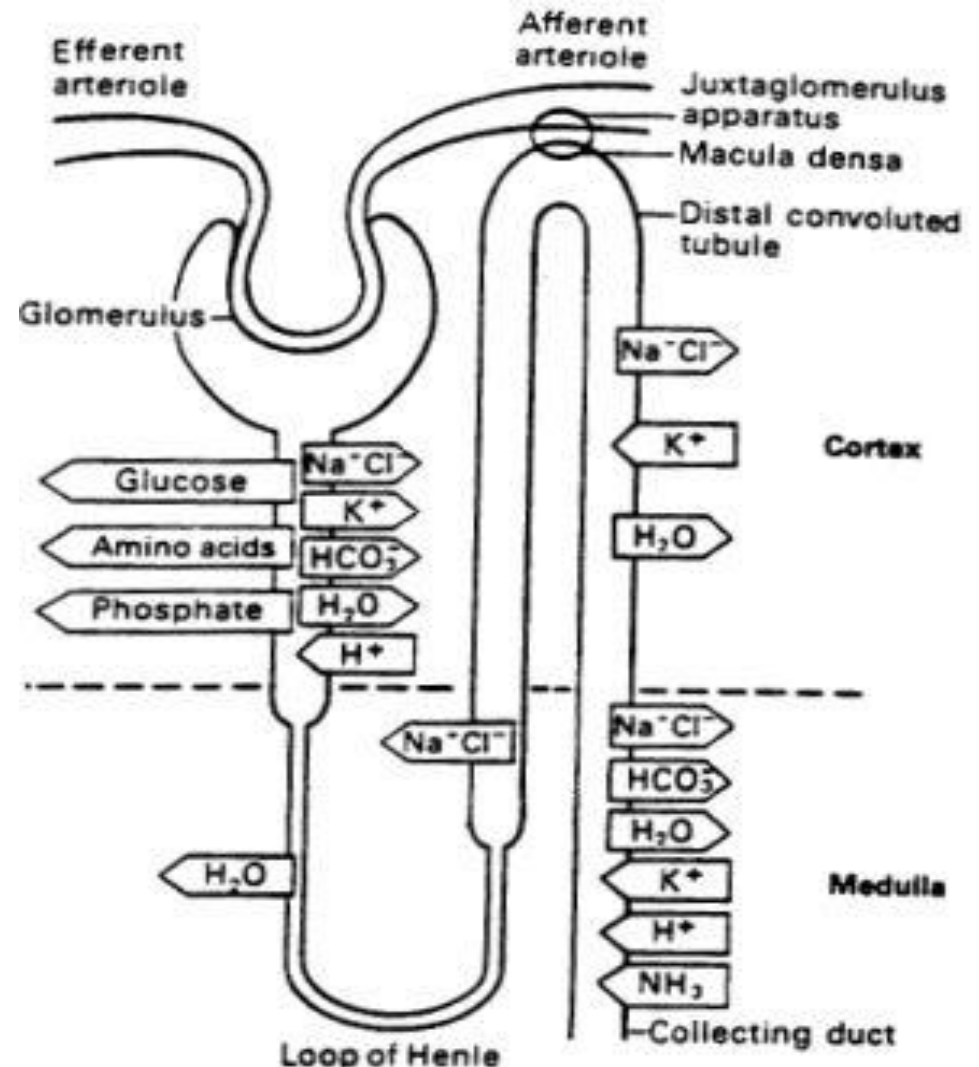
## **CRONICA (IRC)**

- mesi
- anni
- irreversibile



# Funzioni renali

- Funzione depurativa e omeostatica
  - Eliminazione di cataboliti
    - Urea
    - Creatinina
  - Eliminazione di molecole esogene (Farmaci, mdc)
  - Controllo volume e composizione del liquido extracellulare
    - Bilancio idrico
    - Bilancio elettrolitico
    - Bilancio acido-base
- Funzioni endocrine
  - Vit D
  - Eritropoietina
  - Renina



# IRA - Definizioni

- **Varie definizioni non univoche, proposte da diversi autori:**
  - **Aumento dei livelli di creatinina > 0,5 mg/dl/die**
  - **Raddoppio creatininemia = ↓ 50% GFR (in particolare quando già esiste IRC)**
  - **Riduzione della funzione renale che richieda la dialisi**

**Oliguria:** < 400 ml/die

**Anuria:** < 100

## Incidenza di Insufficienza Renale Acuta in pazienti critici sottoposti a chirurgia cardiovascolare

| <b>Autore</b>            | <b>Casistica</b>      | <b>n° paz.</b> | <b>Incidenza IRA</b> |
|--------------------------|-----------------------|----------------|----------------------|
| <b>Cardiochirurgia</b>   |                       |                |                      |
| Brown (2006)             | CABG                  | 1391           | 28 % (sCr + 25%)     |
| Loef (2005)              | CABG/valv.            | 843            | 17 % (sCr + 25%)     |
| Ryckwaert (2002)         | CABG/valv.            | 591            | 16 % (sCr + 25%)     |
| Mangano (1998)           | CABG/valv.            | 2222           | 8 % (sCr > 2mg/dl)   |
| Bove (2004)              | CP bypass/ CABG/valv. | 5068           | 3 % (sCr +100%)      |
| <b>Chirurgia aortica</b> |                       |                |                      |
| Godet (1997)             | Toraco-addominale     | 475            | 25 % (sCr + 30%)     |
| Ryckwaert (2002)         | A. sottorenale        | 215            | 20 % (sCr + 20%)     |
| Prinssen (2004)          | Open/endovasc.        | 174            | 13 % (sCr + 20%)     |

## Incidenza di Insufficienza Renale Acuta in pazienti critici non cardiocirurgici

| Autore          | Casistica           | n° paz. | Incidenza IRA          |
|-----------------|---------------------|---------|------------------------|
| Cruz (2007)     | 19 ICUs nord Italia | 2.164   | 11 % (RIFLE)           |
| Yegenaga (2004) | Sepsi/SIRS          | 217     | 13 % (sCr > 2 mg/dl)   |
| Clermont (2002) | 8 ICUs              | 1.530   | 15 % (sCr + 0.5 mg/dl) |
| Thakar (2009)   | 191 ICUs            | 325.395 | 22 % (sCr +0.3-3mg/dl) |
| Hoste (2003)    | Sepsi post chir.    | 185     | 30 % (sCr > 2 mg/dl)   |
| Rangel (1995)   | Shock settico       | 2.527   | 51 % (sCr x 2)         |



Research

Open Access

**Acute renal failure – definition, outcome measures, animal models, fluid therapy and information technology needs: the Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group**

Rinaldo Bellomo<sup>1</sup>, Claudio Ronco<sup>2</sup>, John A Kellum<sup>3</sup>, Ravindra L Mehta<sup>4</sup>, Paul Palevsky<sup>5</sup> and the ADQI workgroup<sup>6</sup>

- There is no consensus definition of acute renal failure (ARF) in critically ill patients
- More than 30 different definitions have been used in the literature, creating much confusion and making comparisons difficult

# RIFLE

**The first consensus definition of acute renal failure**



R = Risk of renal dysfunction

I = Injury to the kidney

F = Failure of kidney function

L = Loss of kidney function

E = End-Stage Kidney Disease

# RIFLE Criteria for Acute Renal Dysfunction

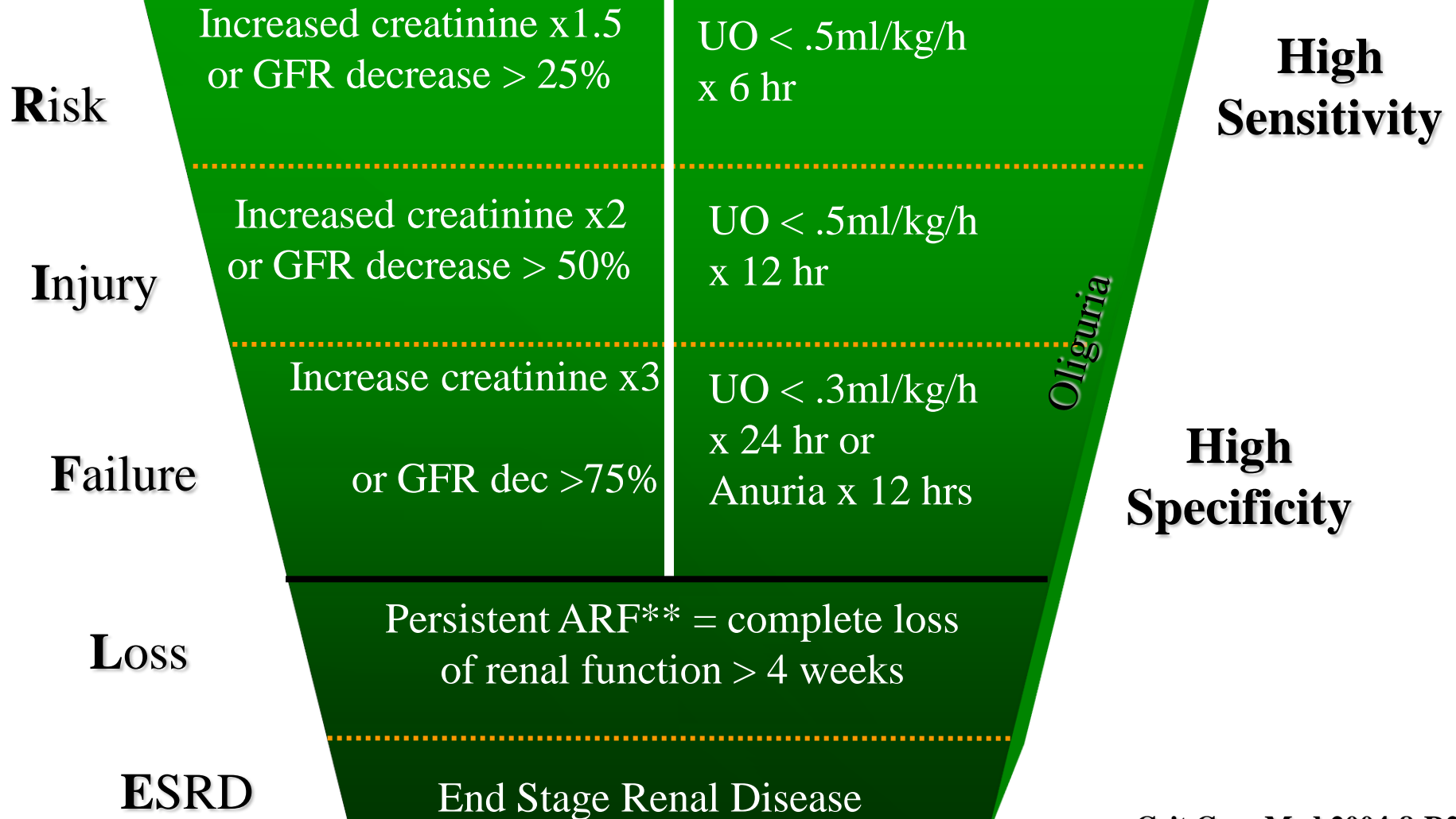
(Acute Dialysis Quality Initiative)

ADQI

ADQI

## GFR Criteria\*

## Urine Output Criteria



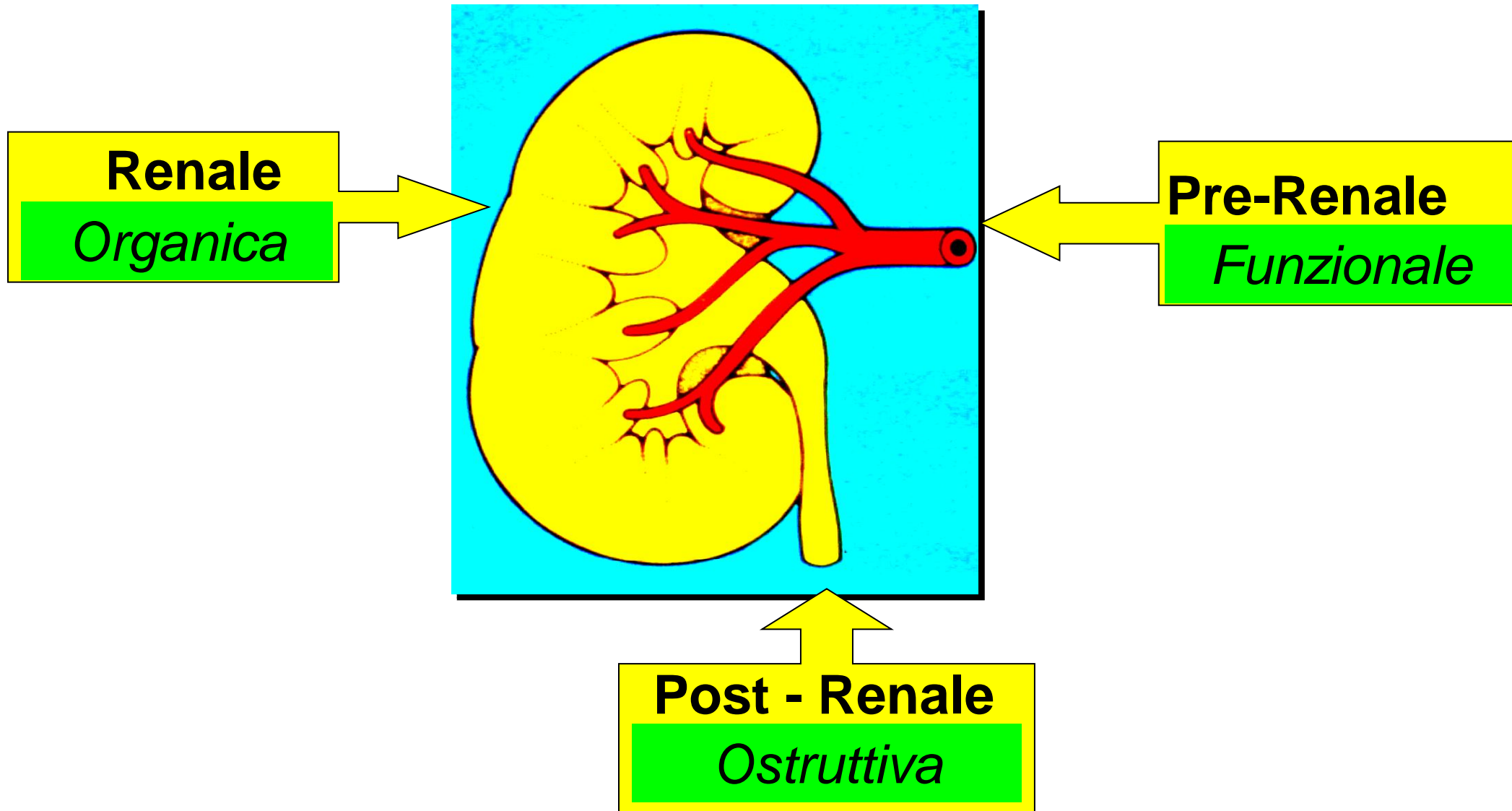
# *L'insufficienza renale acuta nel paziente critico*



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# Forme di Insufficienza Renale Acuta



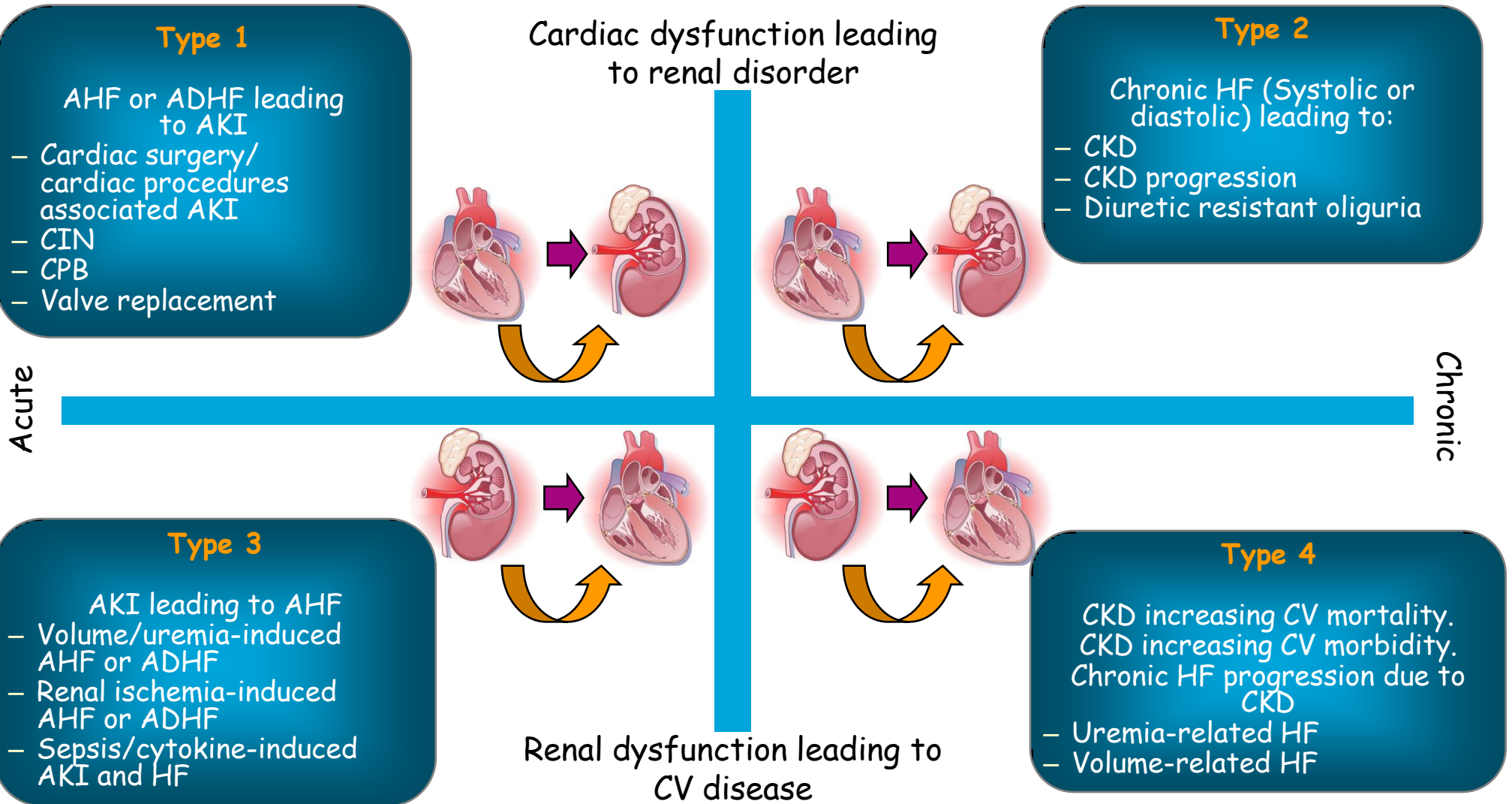
**STATE-OF-THE-ART PAPER**

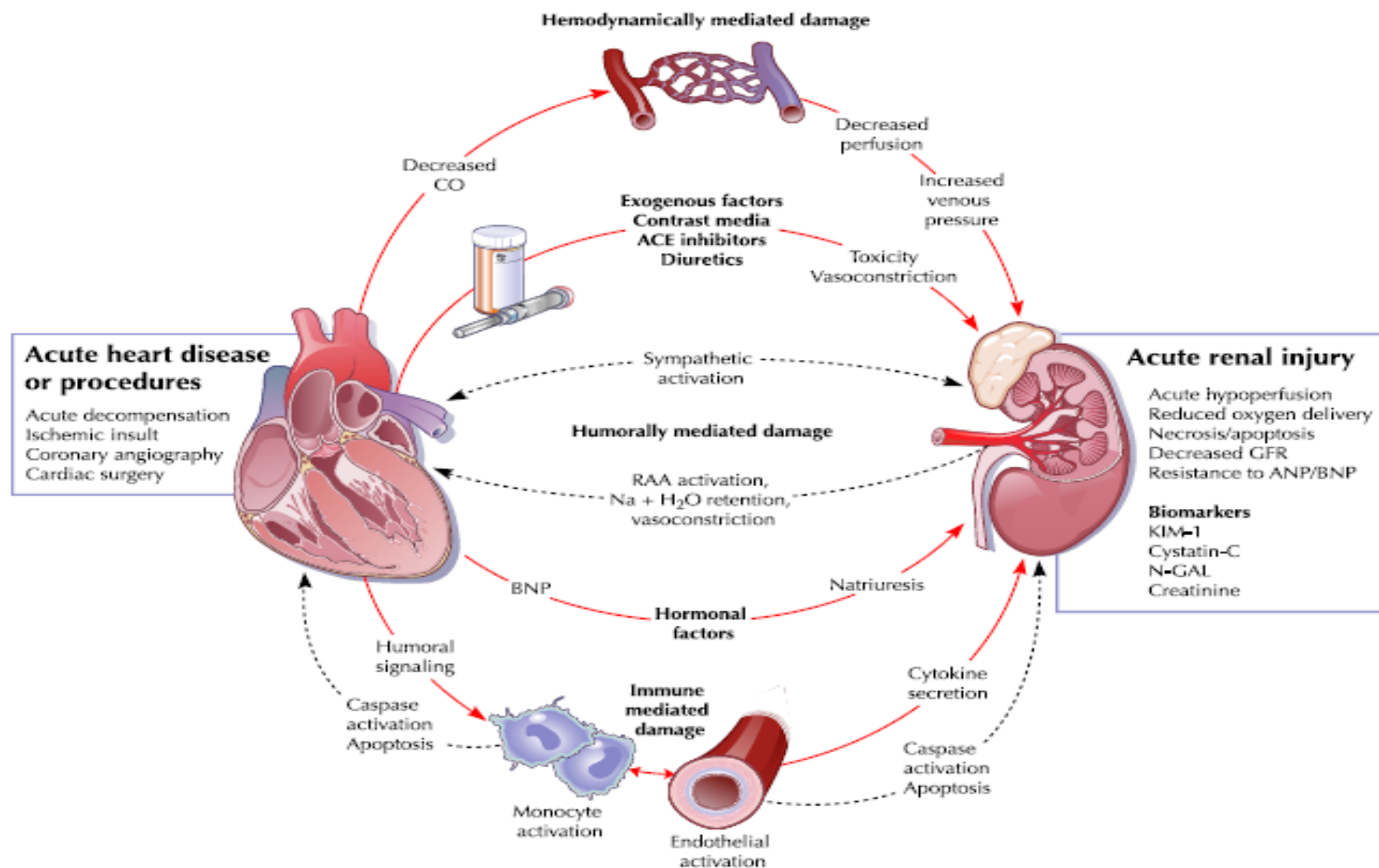
## **Cardiorenal Syndrome**

Claudio Ronco, MD,\* Mikko Haapio, MD,† Andrew A. House, MSc, MD,‡ Nagesh Anavekar, MD,§  
Rinaldo Bellomo, MD¶

*Vicenza, Italy; Helsinki, Finland; London, Ontario, Canada; and Melbourne, Australia*

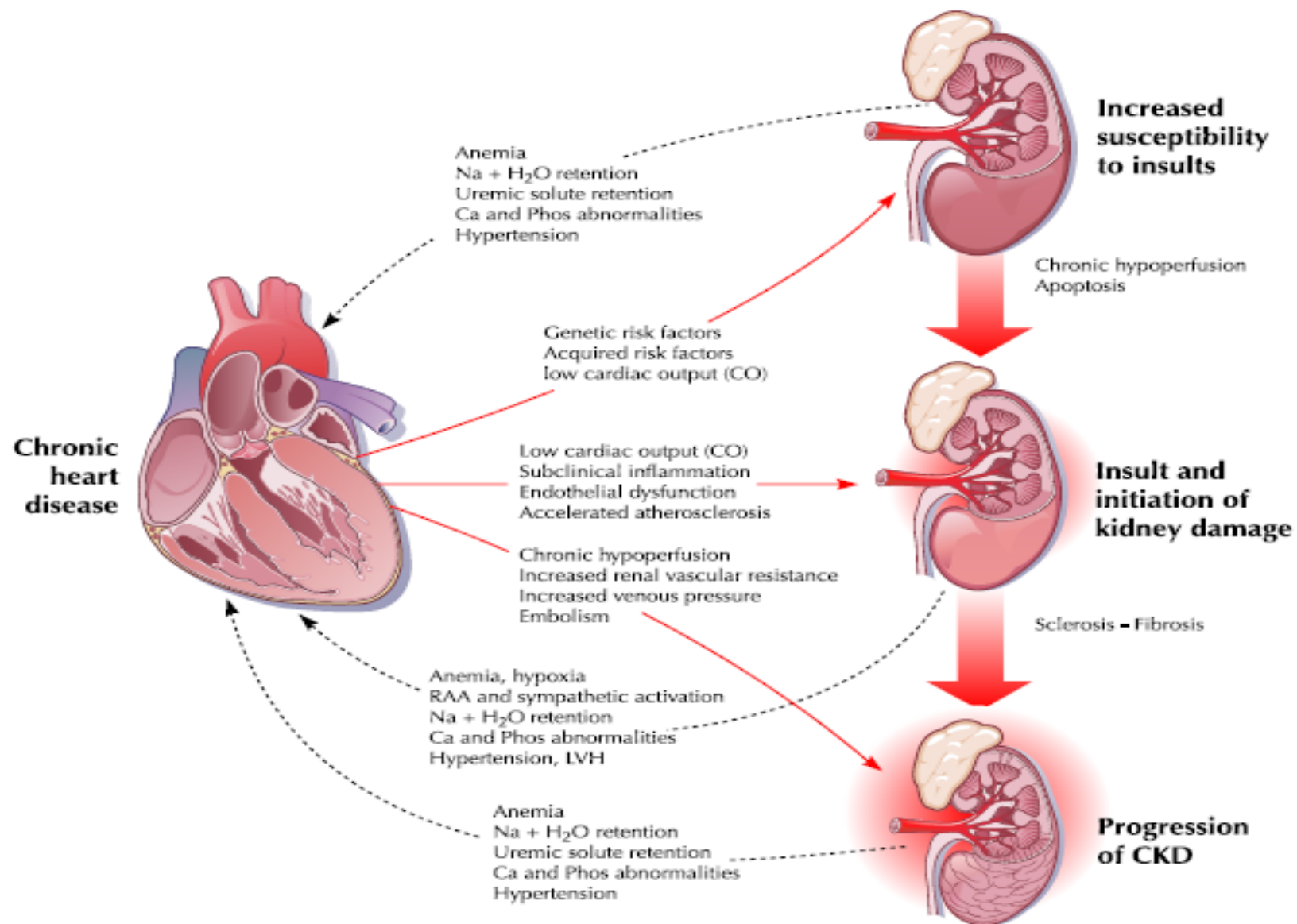
# Cardio-Renal Syndrome (CRS): New Definitions of Type 1-5





**Figure 1 CRS Type 1**

Pathophysiological interactions between heart and kidney in type 1 cardiorenal syndrome (CRS) or "acute CRS" (abrupt worsening of cardiac function, e.g., acute cardiogenic shock or acute decompensation of chronic heart failure) leading to kidney injury. ACE = angiotensin-converting enzyme; ANP = atrial natriuretic peptide; BNP = B-type natriuretic peptide; CO = cardiac output; GFR = glomerular filtration rate; KIM = kidney injury molecule; N-GAL = neutrophil gelatinase-associated lipocalin; RAA = renin angiotensin aldosterone. Figure illustration by Rob Fewell.



**Figure 2** CRS Type 2

Pathophysiological interactions between heart and kidney in type 2 cardiorenal syndrome (CRS) or "chronic CRS" (chronic abnormalities in cardiac function, e.g., chronic heart failure) causing progressive chronic kidney disease (CKD). Figure illustration by Rob Flewell. LVH = left ventricular hypertrophy; RAA = renin angiotensin aldosterone.

## Fattori di rischio per I.R.A. nel paziente cardiocirurgico

### Pre - intervento

- IRC preesistente
- Vasculopatia polidistrettuale
- Scompenso cardiaco (NYHA III-IV)
- Riduzione VEC /Diuretici
- Farmaci (M. di contrasto, nefrotossici)
- Cardiopatia valvolare

### Collegati all'intervento

- Circolazione extracorporea (C.E.C.)
- Ipotensione / Ischemia
- Contropulsatore (I.A.B.P.)
- Embolia colesterinica
- Sepsi - endocardite

## Predictors of postoperative renal failure in heart surgery (multivariate analysis)

*Filsoufi, J Card Vasc Anesthesia 2008*

|                             | Odds Ratio | <i>p</i> |
|-----------------------------|------------|----------|
| Preoperative Renal Failure  | 5.5        | 0.000    |
| Hemodynamic instability     | 5.2        | 0.000    |
| Diabetes                    | 2.6        | 0.000    |
| Aortic surgery              | 2.2        | 0.002    |
| Chronic Heart Failure       | 2.1        | 0.001    |
| Peripheral vascular disease | 1.9        | 0.008    |
| Reoperation                 | 1.8        | 0.000    |

*(Circulation. 2009;119:495-502.)*

## **Cardiovascular Surgery**

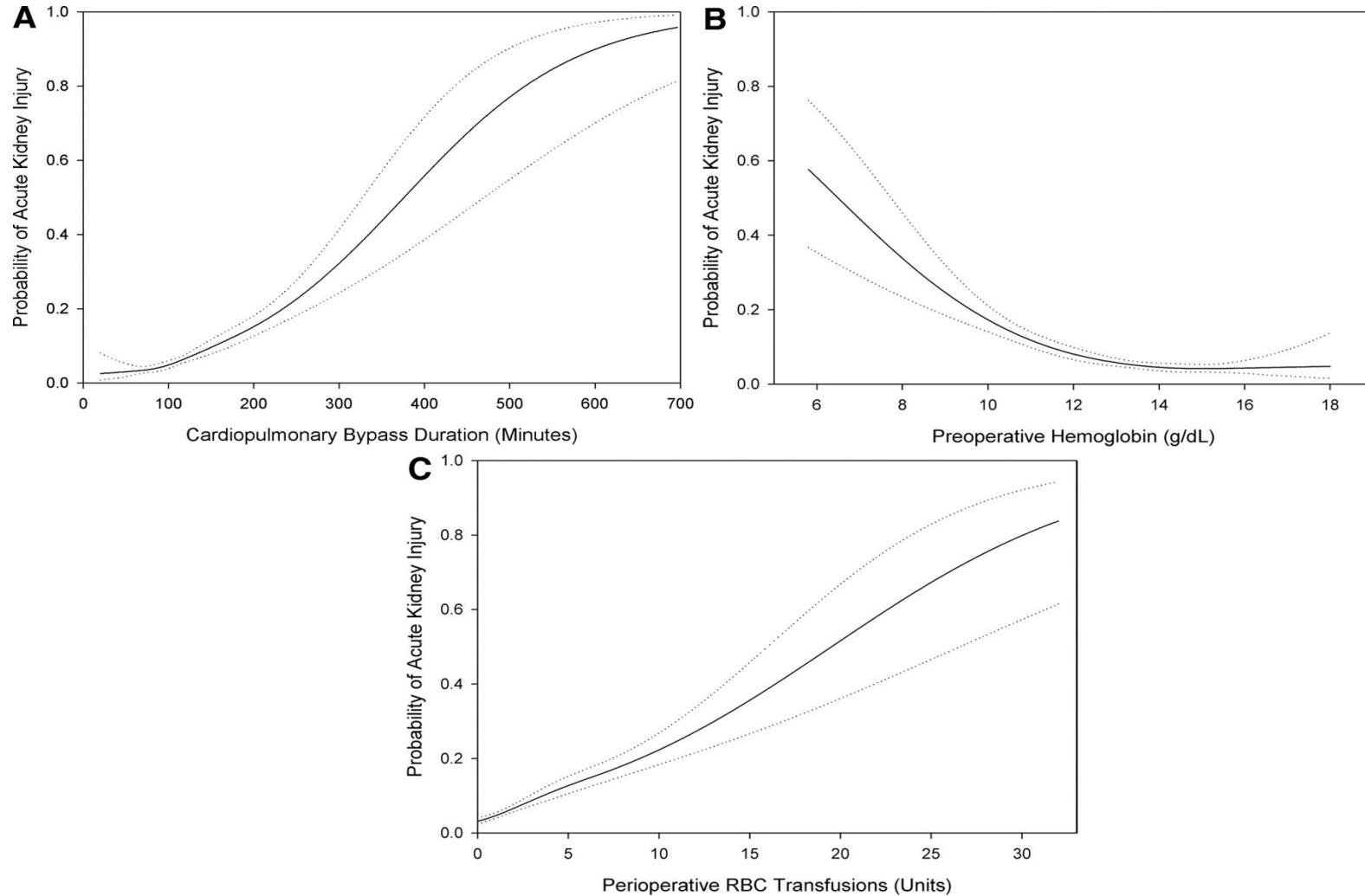
### **Acute Kidney Injury After Cardiac Surgery**

#### **Focus on Modifiable Risk Factors**

Keyvan Karkouti, MD; Duminda N. Wijeyesundera, MD; Terrence M. Yau, MD;  
Jeannie L. Callum, MD; Davy C. Cheng, MD; Mark Crowther, MD; Jean-Yves Dupuis, MD;  
Stephen E. Fremes, MD; Blaine Kent, MD; Claude Laflamme, MD; Andre Lamy, MD;  
Jean-Francois Legare, MD; C. David Mazer, MD; Stuart A. McCluskey, MD; Fraser D. Rubens, MD;  
Corey Sawchuk, MD; W. Scott Beattie, MD

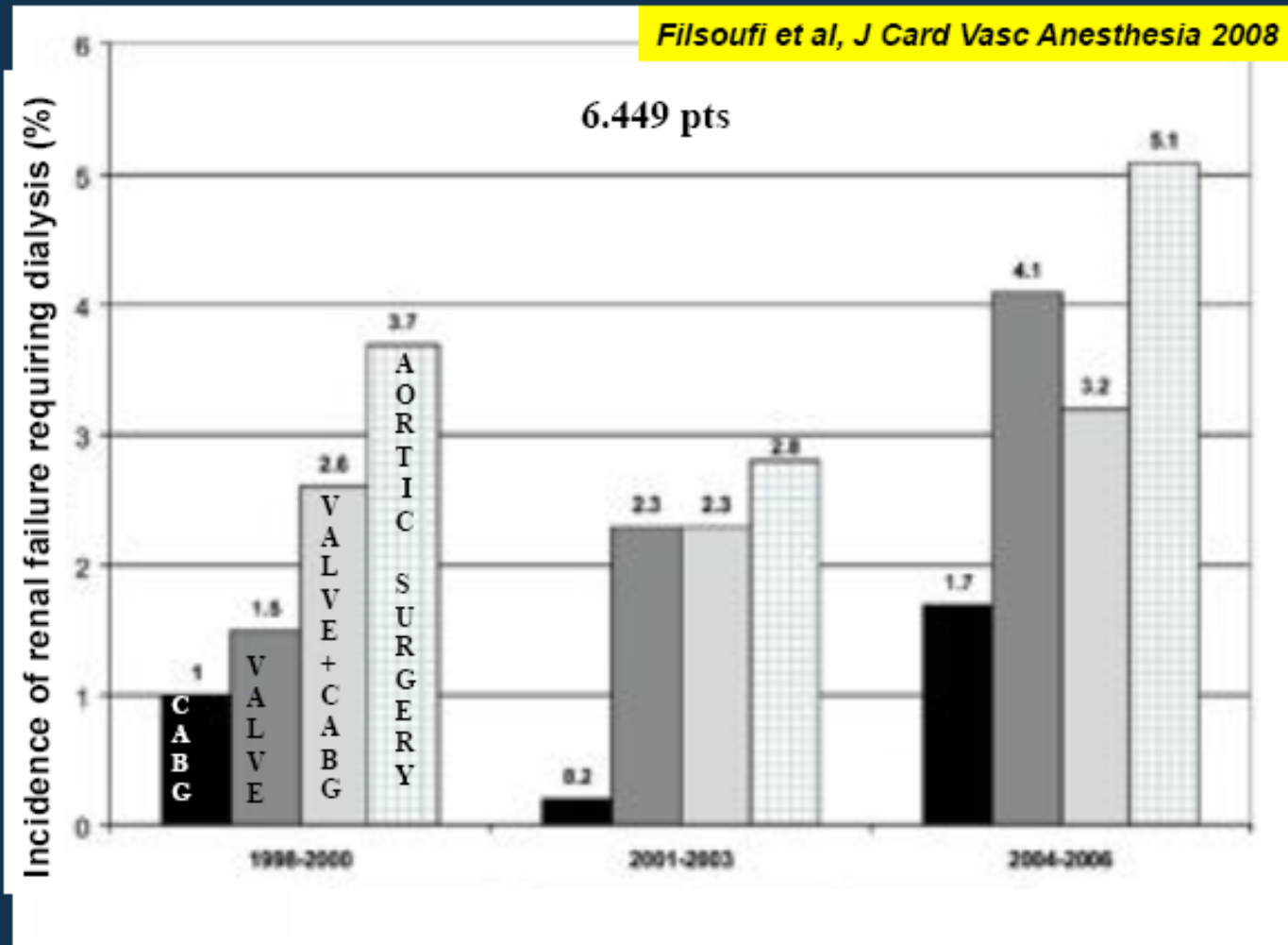


**Figure. Spline function graphs of the unadjusted relationships between selected continuous variables and probability of AKI (>50% decrease in eGFR or dialysis).**



Karkouti K et al. *Circulation* 2009;119:495-502

**La chirurgia valvolare appare come un fattore di rischio indipendente per l'insorgenza di complicanze renali...**



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## Mineral metabolism abnormalities and vitamin D receptor activation in cardiorenal syndromes

Claudio Ronco · Mario Cozzolino

