PROBLEMI NEFROLOGICI IN UTIC

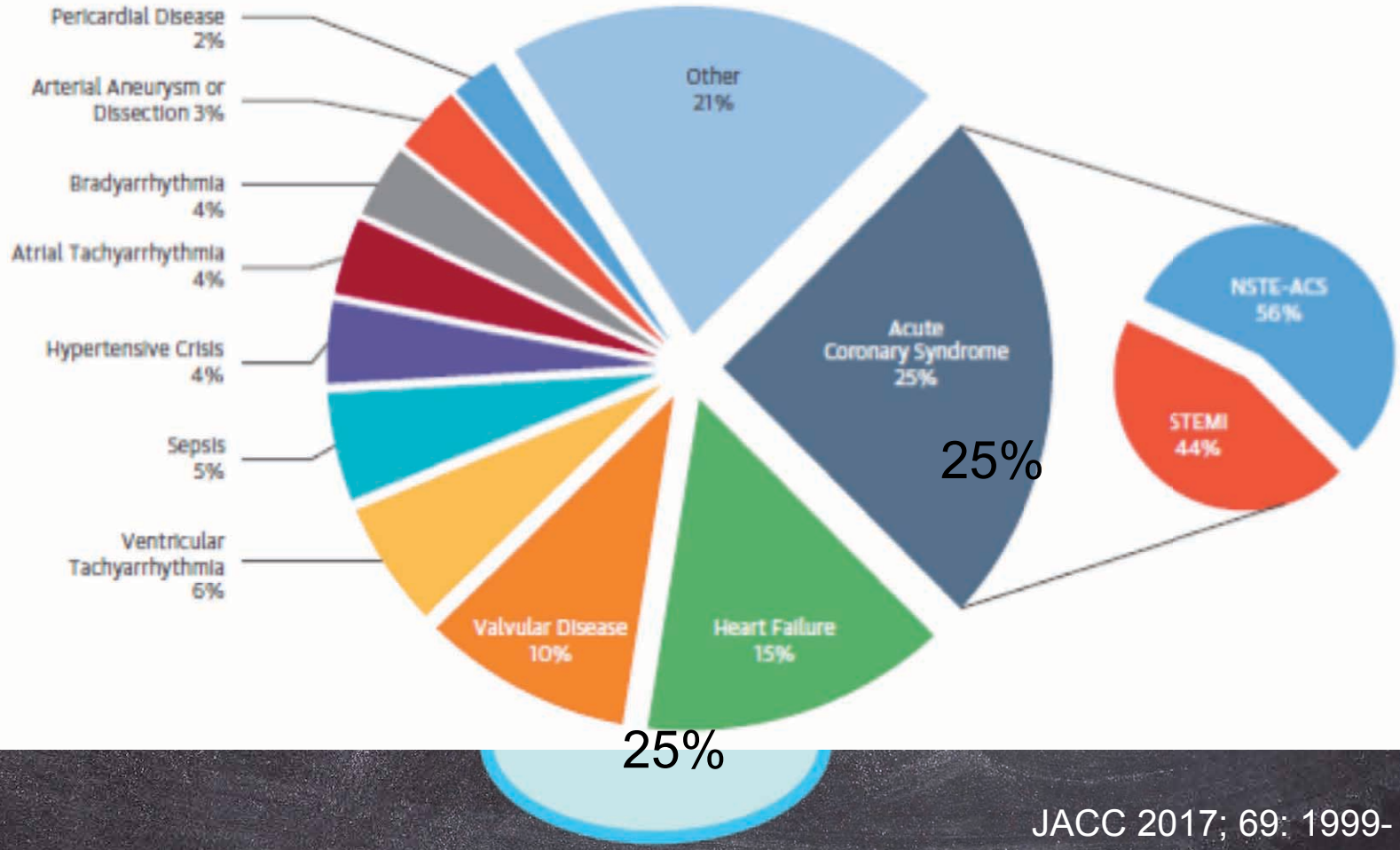
Dott. ssa Lidia ROSSI

Responsabile UTIC – Novara

Acute Noncardiovascular Illness in the Cardiac Intensive Care Unit

Eric M. Holland, MD,[a,b] Travis J. Moss, MD, MSc[a,b]

FIGURE 1 Primary Diagnoses in the CICU



JACC 2017; 69: 1999-2007

Acute Noncardiovascular Illness in the Cardiac Intensive Care Unit

TABLE 3 Determinants of CICU LOS and 30-Day Hospital Readmission

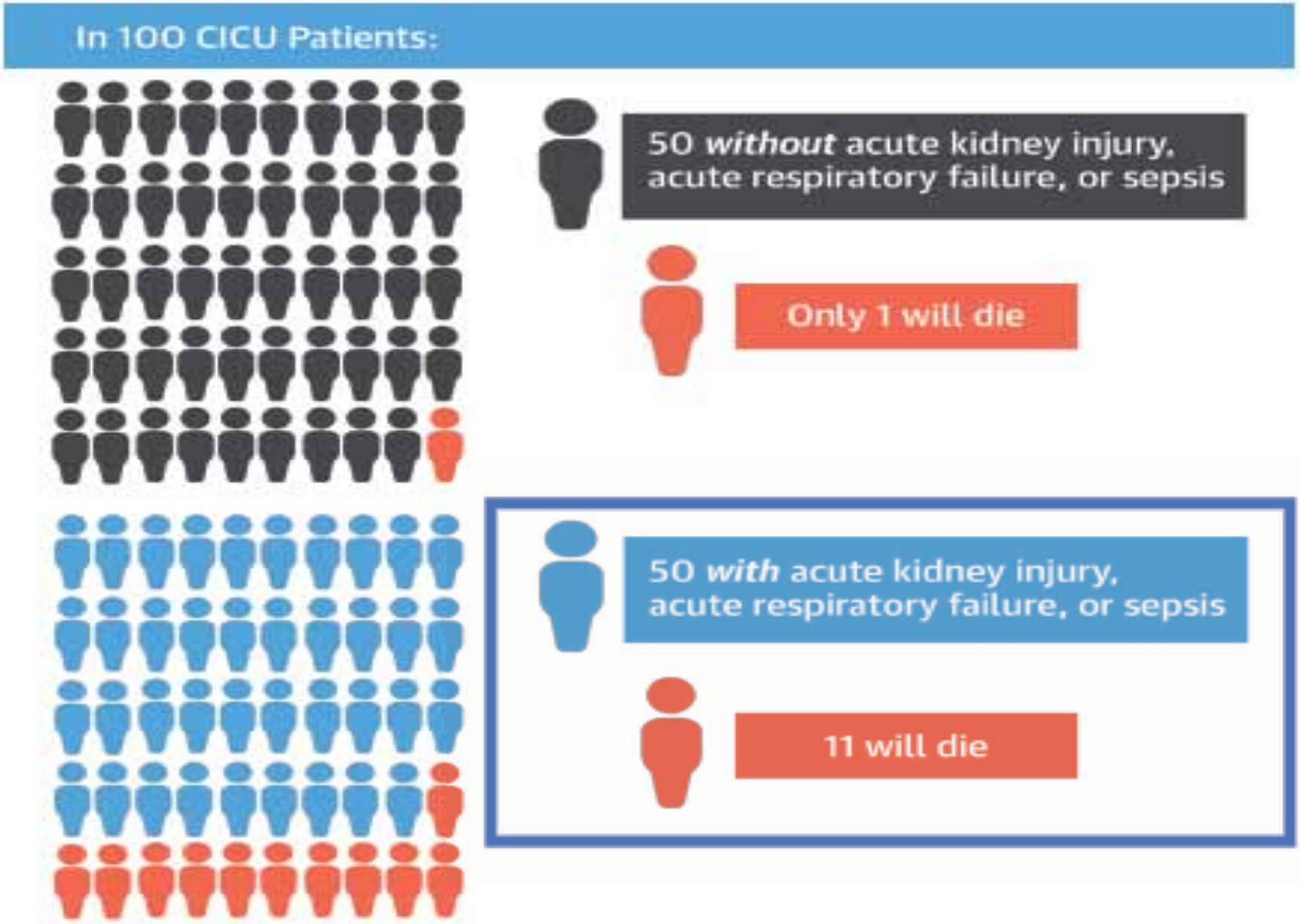
Predictors	Coefficient	SE	p Value
CICU LOS			
Age	−0.2209	0.0453	<0.0001
OASIS	−0.0700	0.0897	
Acute kidney injury	5.5497	1.4793	
Hemorrhage	−2.9431	5.5823	
Acute respiratory failure	6.6954	1.6693	
Sepsis	2.6333	1.952	
Cardiogenic shock	−0.0572	2.3011	
Cardiac arrest	−4.3523	3.3593	
New subclinical AF	6.28817	2.5656	
New clinical AF	3.5183	5.151	
Previous AF	2.4192	1.4544	
Post-operative	3.6355	1.7033	
30-day hospital readmission			
Age	−0.0100	0.0061	0.1031
OASIS	0.0022	0.0131	0.8688
Acute kidney injury	0.1154	0.2044	0.5722
Hemorrhage	0.0562	0.8394	0.9466
Acute respiratory failure	0.0957	0.2316	0.6797
Sepsis	0.1730	0.2654	0.5145
Diabetes mellitus	0.3444	0.1853	0.0631
Heart failure	−0.0734	0.2062	0.7219
Chronic kidney disease	0.5502	0.2055	0.0074
Previous stroke	0.4064	0.2156	0.0594
CICU LOS	0.0129	0.0114	0.2571
Scheduled procedure	−0.3606	0.2375	0.1290
Unscheduled procedure	0.4404	0.3777	0.2436

are unit (CICU), noncardiovascular illnesses have

hospital. Of the 920 patients who survived to hospital di
kidney injury, and acute respiratory failure were associat
and new-onset subclinical atrial fibrillation, which occur

CONCLUSIONS Many patients in the modern CICU have acute noncardiovascular illnesses that are associated with mortality and increased LOS. (J Am Coll Cardiol 2017;69:1999–2007)

CENTRAL ILLUSTRATION Impact of Noncardiovascular Illness in the CICU



CONCLUSIONS Many patients in the modern CICU have acute noncardiovascular illnesses that are associated with mortality and increased LOS. (J Am Coll Cardiol 2017;69:1999-2007)

Hospital-acquired renal insufficiency: a prospective study.
Hou et Al: . 1983 Feb;74(2):243-8

Mortalità elevata anche in assenza di severa disfunzione d'organo

F G Brivet et al :
Acute renal failure in intensive care units--causes, outcome, and prognostic factors of hospital mortality; a prospective, multicenter study.
French Study Group on Acute Renal Failure.

CONCLUSIONS
The hospital mortality rate of patients with severe acute renal failure in patients requiring intensive care remains high. .....

- **ARF is associated with a mortality that is not well explained only by organ function loss per se but is related to clinical circumstances that lead to renal dysfunction**

Table 2. Clinical patient characteristics (all values mean ± SEM)

	ARF ($N = 254$)	ESRD ($N = 57$)	No ARF ($N = 1219$)
Age *years*	59 ± 1	58 ± 2	59 ± 1
APACHE III[a]	64 ± 2	64 ± 3	42 ± 1
APS3[a]	53 ± 2	58 ± 4	31 ± 1
Temperature *°C*	36.3 ± 0.1	36.2 ± 0.1	36.2 ± 0.03
Systolic blood pressure *mm Hg*[a]	113 ± 3	130	
Diastolic blood pressure *mm Hg*[a]	54 ± 2	58	
Heart rate min^{-1}[a]	112 ± 2	106	
Respirations min^{-1}[a]	21 ± 1	21	
White blood cells $\times 10^9/L$[a]	14.5 ± 0.6	10.7	

LA COMPARSA DI AKI IN PAZIENTI TRATTATI PER PATOLOGIE ACUTE ASSUME SIGNIFICATO DI INDICATORE PROGNOSTICO NEGATIVO

Table 3. Clinical Outcomes

	ARF ($N = 254$)	ESRD ($N = 57$)	No ARF ($N = 1219$)
ICU length of stay *days*[a]	11 ± 1	5 ± 1	4 ± 0.1
ICU length of stay (predicted) *days*[a]	6 ± 0.1	6 ± 0.3	5 ± 0.1
ICU (predicted)[a]	0.177 ± 0.013[b]	0.179 ± 0.013[b]	0.063 ± 0.004[b]
ICU mortality (observed)[c]	59/254 (23%)[c]	6/57 (11%)	55/1219 (5%)
Standardized ICU mortality	1.31	0.59	0.71
Hospital death (predicted)[a]	0.276 ± 0.016[b]	0.272 ± 0.035[b]	0.115 ± 0.005[b]
Hospital mortality (observed)[c]	86/254 (34%)[c]	8/57 (14%)	109/1219 (9%)
Standardized hospital mortality	1.21	0.52	0.75

[a] By ANOVA single variant
[b] P = NS predicted vs. observed mortality (χ^2 or Fisher's Exact Test where appropriate)
[c] $P < 0.001$ ARF vs. no renal failure by χ^2

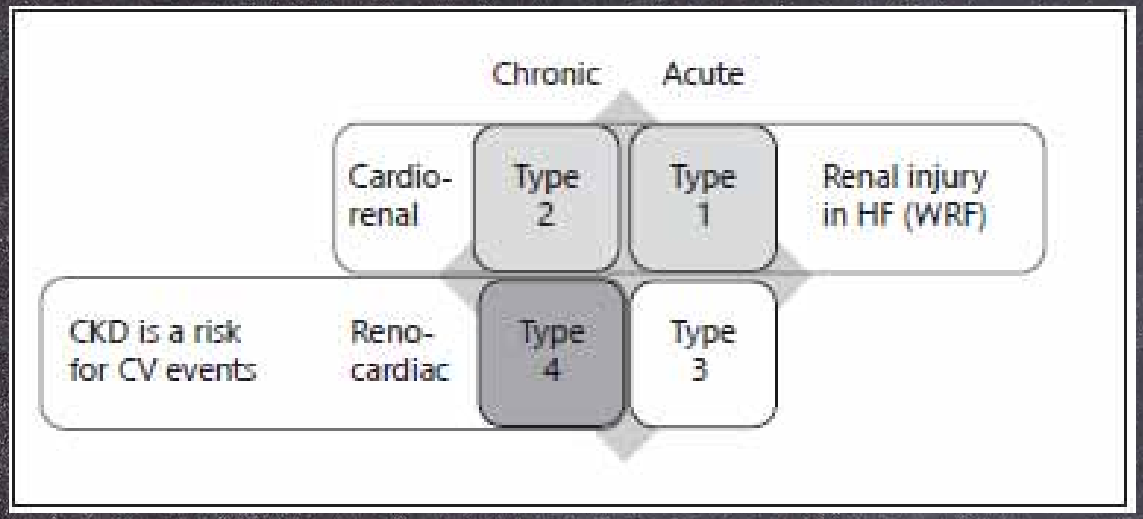
CLERMONT G Kideny Intern 2002

Kidney–Heart Interactions in Acute Kidney Injury

- AKI is a common complication in critically ill patients treated in intensive care units

- RRT - requiring AKI occours in approximately 5-10% of patients in ICU and their mortality rate is unacceptably high (50-60%)

THIS SUGGESTS THAT THERE ARE UNRECOGNIZED ORGAN INTERACTIONS FOLLOWING AKI THAT COULD WORSEN THEIR OUTCOMES



DOI Nephron 2016, 134: 141-44

STATE-OF-THE-ART PAPER

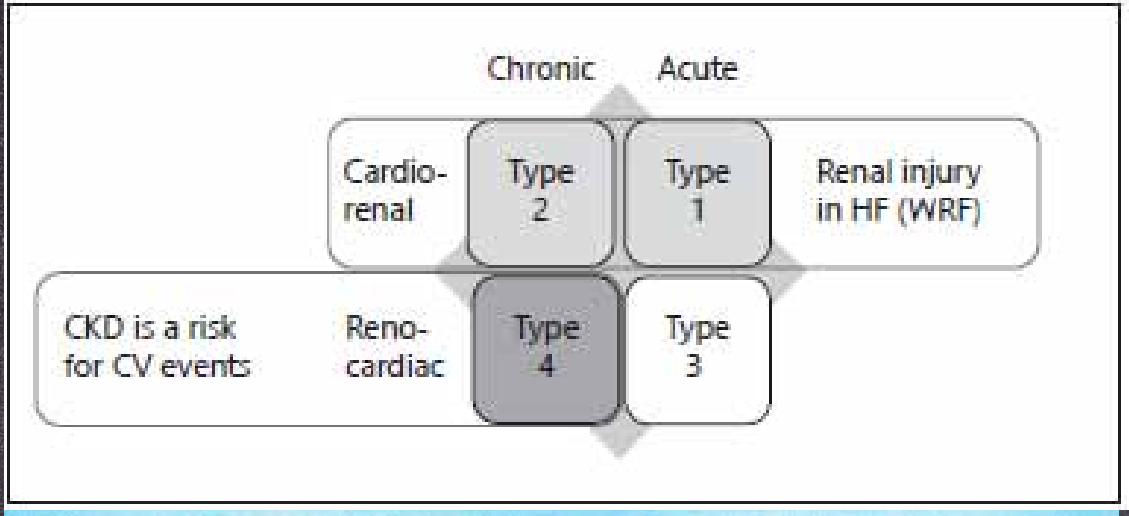
Cardiorenal Syndrome

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

whereby an acute or chronic dysfunction in one organ may induce acute or chronic dysfunction in the other organ

The CRS include a variety of acute and chronic conditions where the primary failing organ may be either the heart or the kidney



JACC 2008; 52: 1527-32

CLASSIFICATION OF CARDIORENAL SYNDROMES

Class	Type	Description	Clinical Scenarios (Examples)
1	Acute CRS 	Abrupt worsening of cardiac function leading to AKI	- AHF - Cardiac surgery - ACS - CIN after coronary angiogram
2	Chronic CRS 	Chronic abnormalities of cardiac function leading to CKD	- IHD/hypertension - CHD - CHF
3	Acute renocardiac syndrome 	Abrupt worsening of renal function leading to acute cardiac dysfunction	- Acute pulmonary edema in AKI - Arrhythmia - CIN with adverse cardiac outcomes
4	Chronic renocardiac syndrome 	CKD leading to chronic cardiac dysfunction	- Cardiac hypertrophy in CKD - Adverse cardiovascular events in CKD - ADPKD with cardiac manifestations
5	Secondary CRS 	Systemic disorders causing cardiac and renal dysfunction	- Sepsis - SLE - DM

- Riflette interazione bidirezionale tra cuore e rene
- Il meccanismo fisiopatologico sottostante
- Il contesto temporale del danno renale

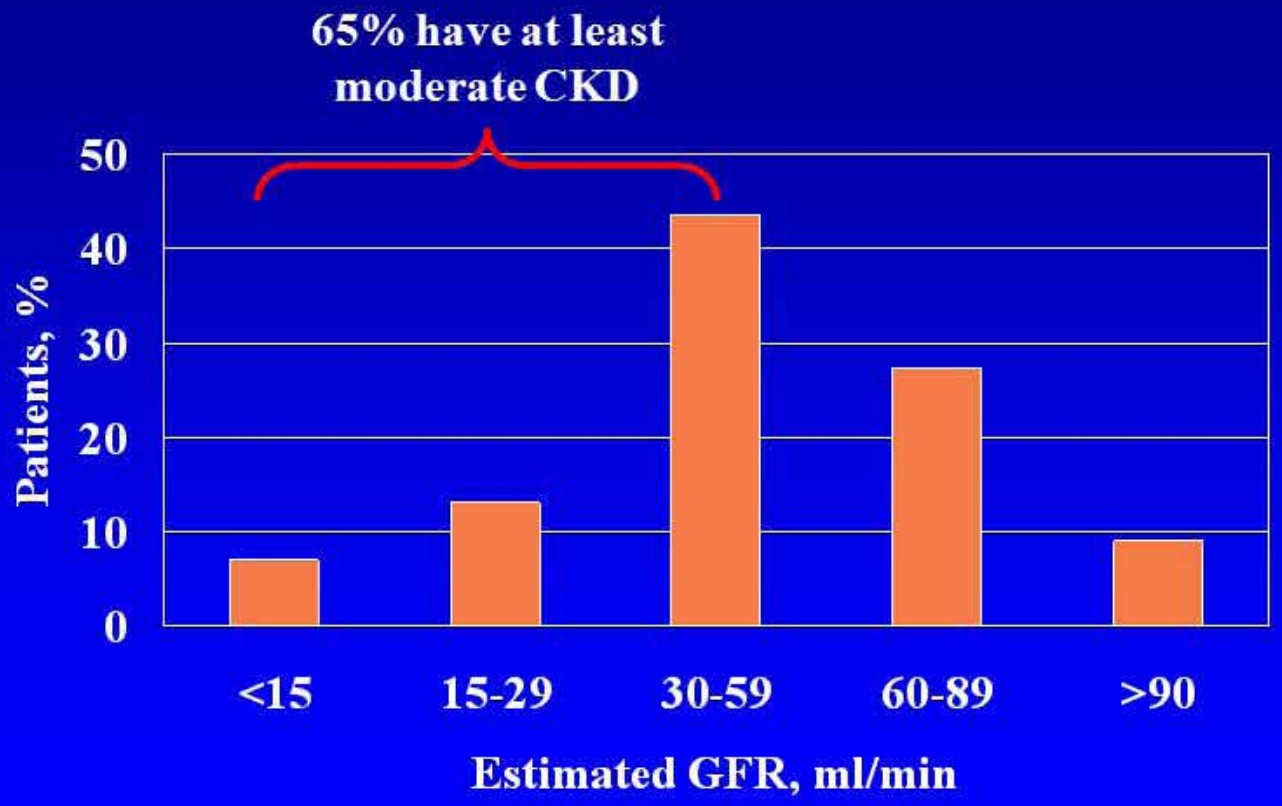
Cruz DN. Crit Care, 2009, 13: 211-220

Nationwide survey on acute heart failure in cardiology ward services in Italy

eGFR (ml/m'/1.73m)	TOTAL N=2727	WORSENING N=1524	DE NOVO N=1203
<30	12.4	15.6	8.3
30-60	46.7	52.3	46.7
>60	40.9	32.1	52.0

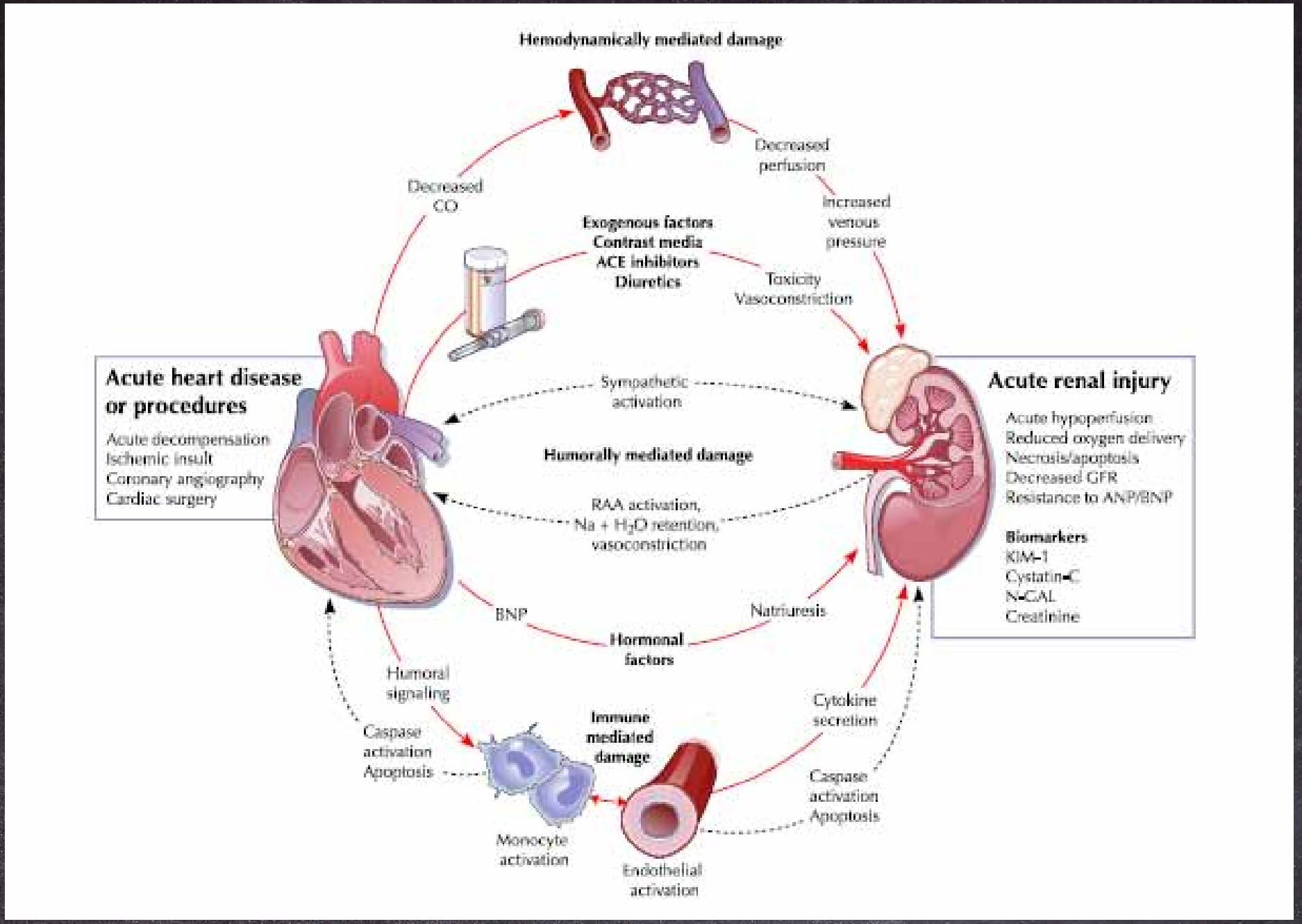
Tavazzi L. European Heart Journal 2006 27(10):1207-1215

Majority of Patients with AHF have Renal Dysfunction (N = 118,465)

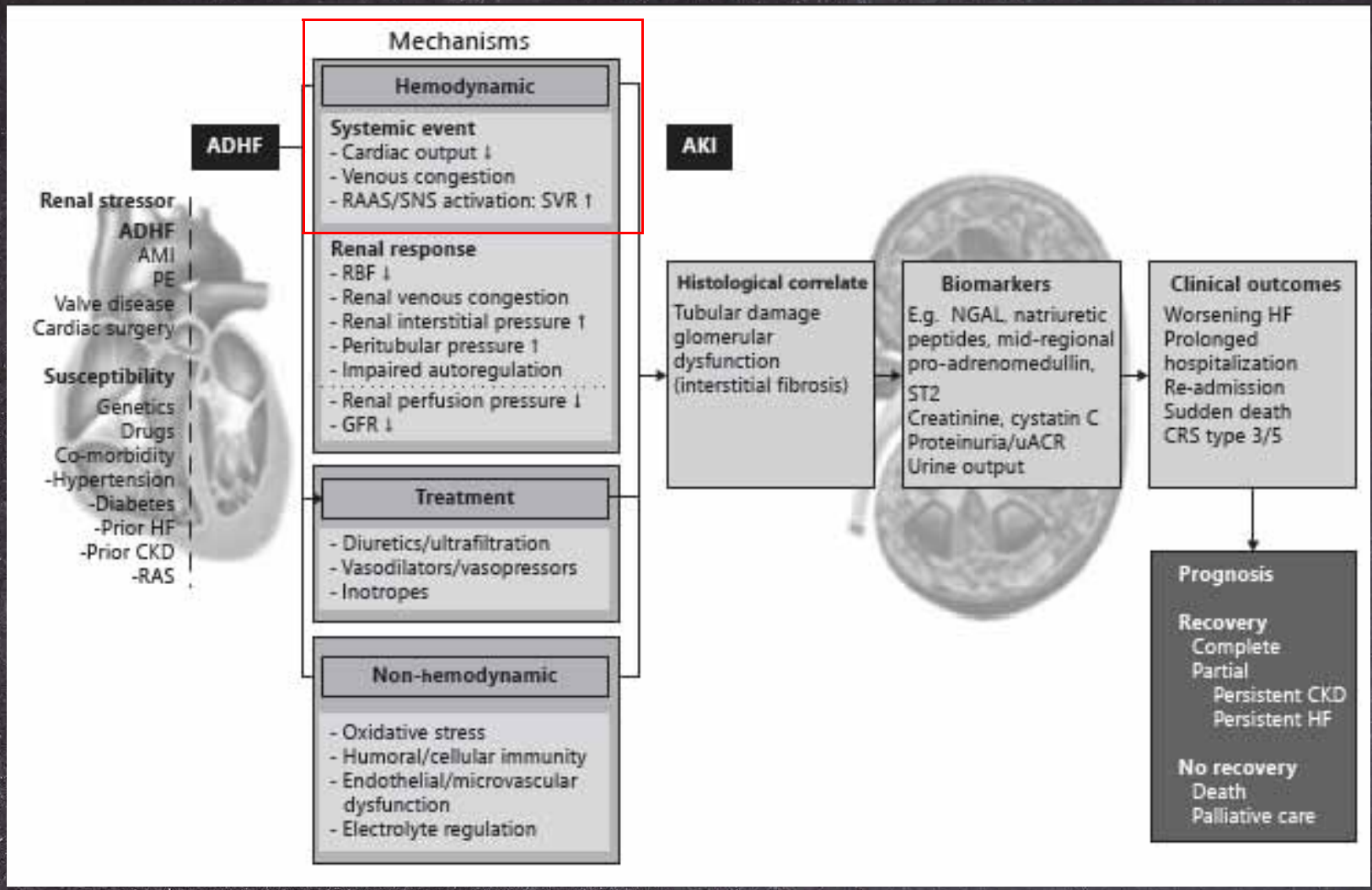


Heywood et al., J Card Fail 2007;13:422

SINDROME CARDIORENALE TIPO 1



Patogenesi crs tipo 1



McCullough PA, Kellum JA, Mehta RL, Murray PT, Ronco C (eds): ADQI Consensus on AKI Biomarkers and Cardiorenal Syndromes. Contrib Nephrol. Basel, Karger, 2013, vol 182, pp 99–116

Hemodynamic
Systemic event - Cardiac output ↓ - Venous congestion - RAAS/SNS activation: SVR ↑

Cardiorenal Interactions

Insights From the ESCAPE Trial

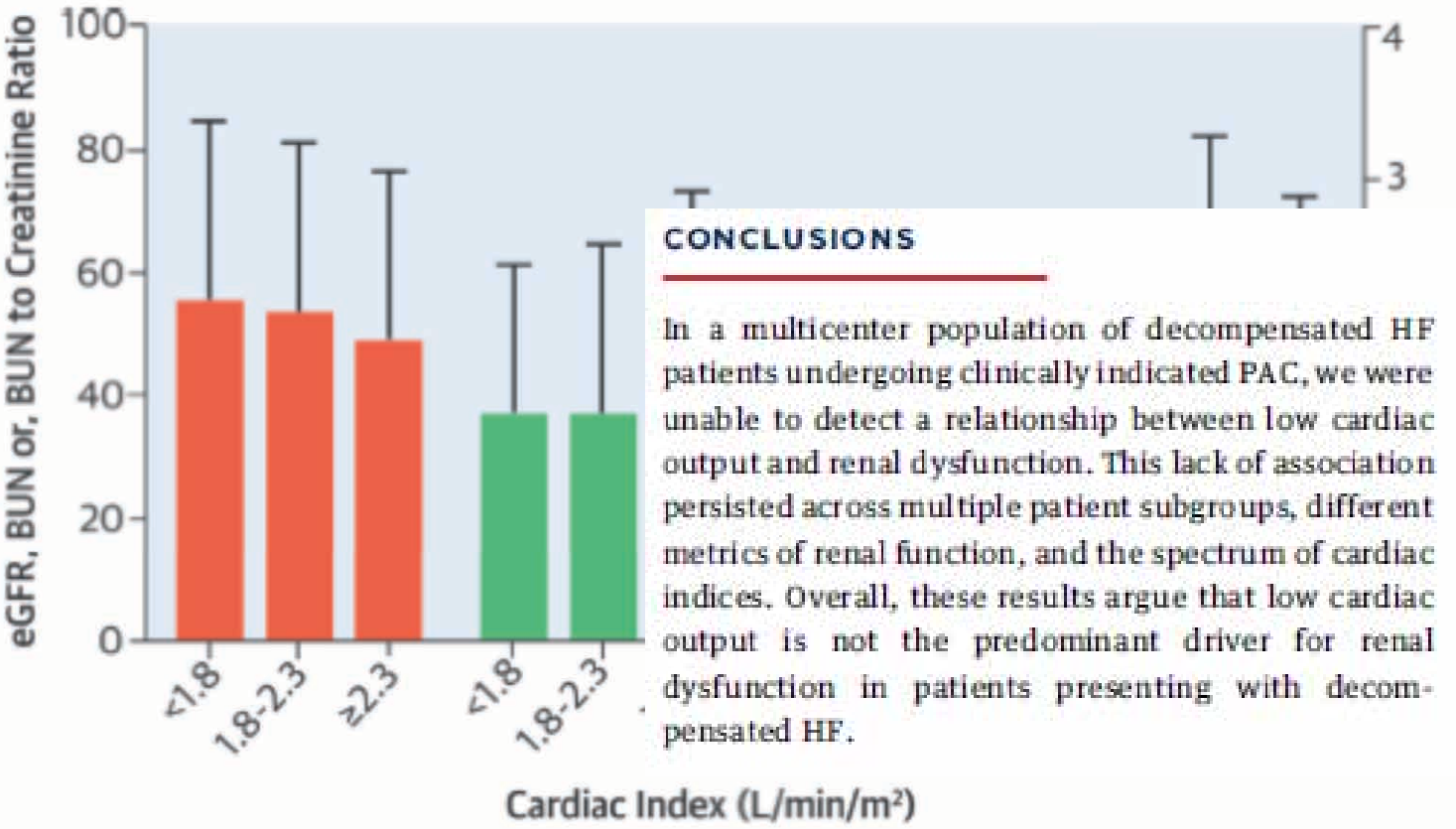
Conclusions

This analysis of the ESCAPE trial suggests that in patients hospitalized with advanced decompensated heart failure, baseline renal insufficiency impacts prognosis more than worsening renal function during hospitalization. The lack of correlation between measured hemodynamic parameters and renal function suggests that poor forward flow may contribute to but is not the primary cause of renal dysfunction in patients with advanced heart failure. Accordingly, hemodynamic optimization with PAC did not reduce the incidence of worsening renal function or improve renal function or outcomes, even among patients with baseline renal insufficiency, in this study. Advanced heart failure

Nohria A Jacc 2008
Bader F Curr Opin Cardiol

Reduced Cardiac Index Is Not the Dominant Driver of Renal Dysfunction in Heart Failure

Jennifer S. Hanberg, BA,[a] Krishna Sury, MD,[b] F. Perry Wilson, MD, MSCE,[a,b,c] Meredith A. Brisco, MD, MSCE,[d] Tariq Ahmad, MD, MPH,[b] Jozine M. ter Maaten, MD,[e] J. Samuel Broughton, BS,[a] Mahlet Assefa, BS,[a] W.H. Wilson Tang, MD,[f] Chirag R. Parikh, MD, PhD,[a,b,c] Jeffrey M. Testani, MD, MTR[a,b]



CONCLUSIONS

In a multicenter population of decompensated HF patients undergoing clinically indicated PAC, we were unable to detect a relationship between low cardiac output and renal dysfunction. This lack of association persisted across multiple patient subgroups, different metrics of renal function, and the spectrum of cardiac indices. Overall, these results argue that low cardiac output is not the predominant driver for renal dysfunction in patients presenting with decompensated HF.

CONCLUSIONS These results reinforce evidence that reduced CI is not the primary driver for renal dysfunction in patients hospitalized for HF, irrespective of the degree of CI impairment or patient subgroup analyzed.
(J Am Coll Cardiol 2016;67:2199–208)

Elevated Intra-Abdominal Pressure in Acute Decompensated Heart Failure

A Potential Contributor to Worsening Renal Function?

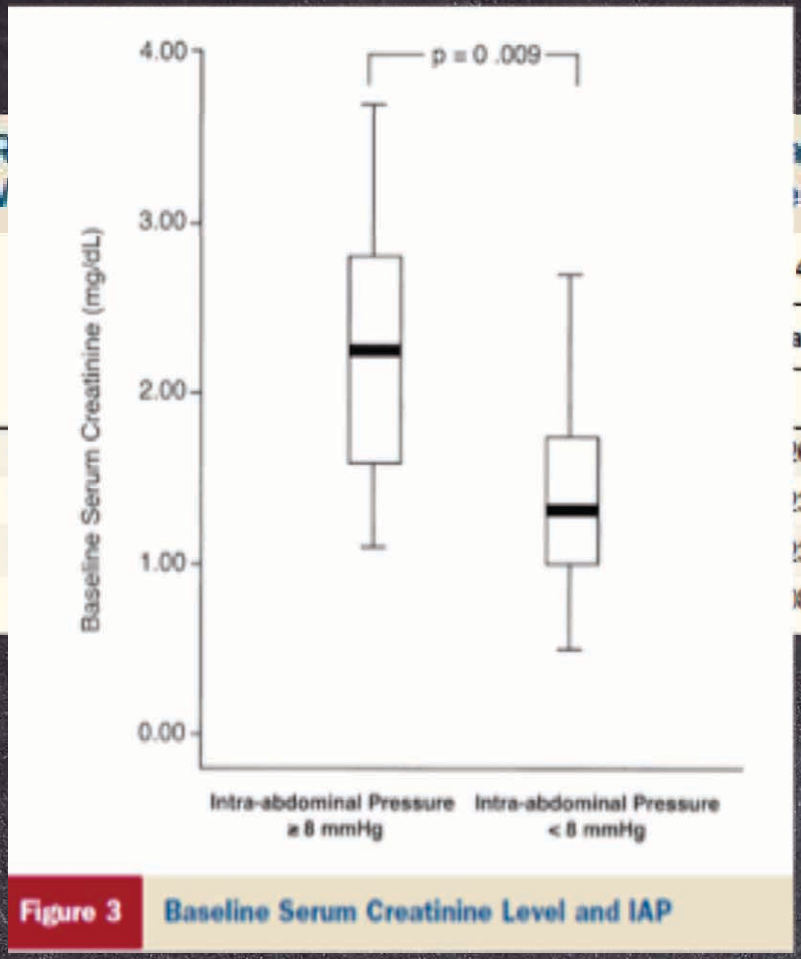


Figure 3 Baseline Serum Creatinine Level and IAP

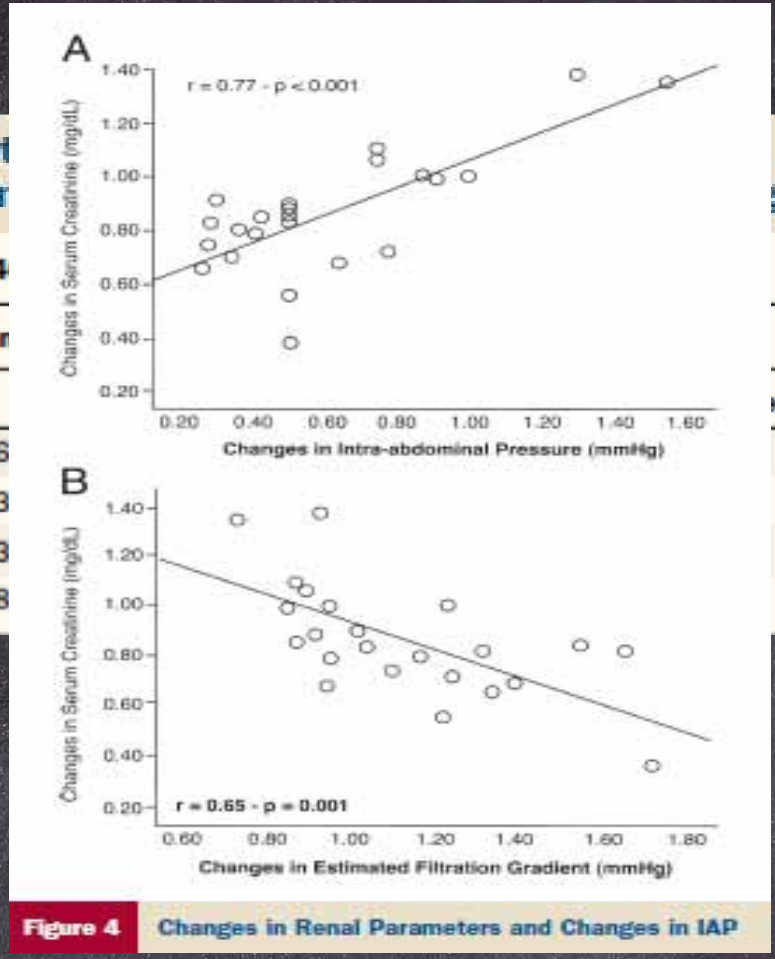


Figure 4 Changes in Renal Parameters and Changes in IAP

Conclusions:

elevated IAP is prevalent (60%)in pts with ADHF and is associated with impaired renal function… changes in IAP were better correlated with changes in renal function than any hemodynamic variable.

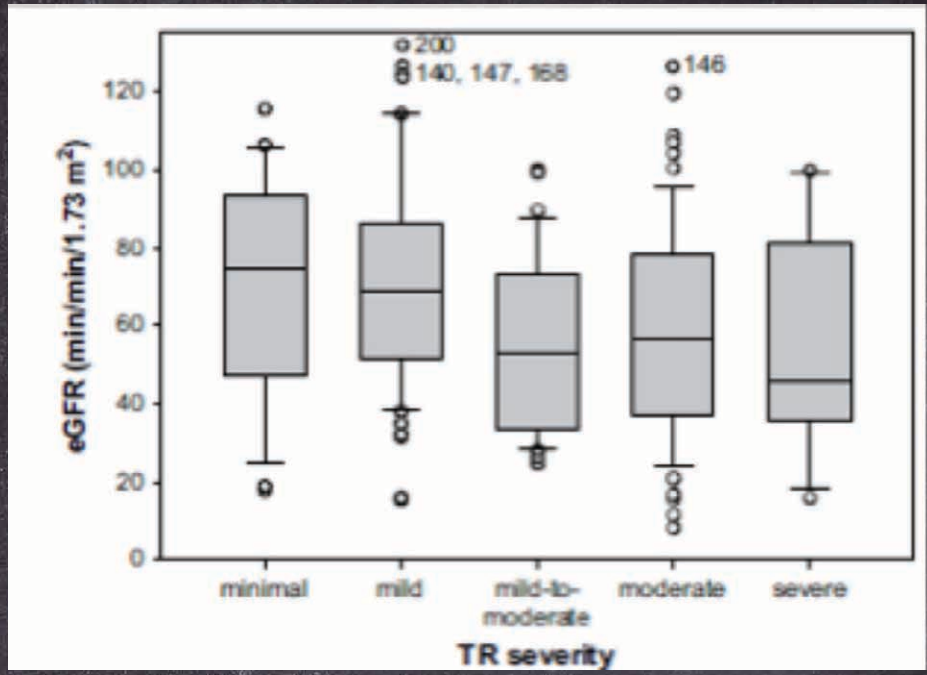
Mullens JACC 2008; 51: 300-306

Tricuspid Regurgitation Contributes to Renal Dysfunction in Patients With Heart Failure

MICHA T. MAEDER, MD, DIANE P. HOLST, RN, AND DAVID M. KAYE, MD, PhD

Table 3. Univariate and Multivariate Predictors of Estimated Glomerular Filtration Rate

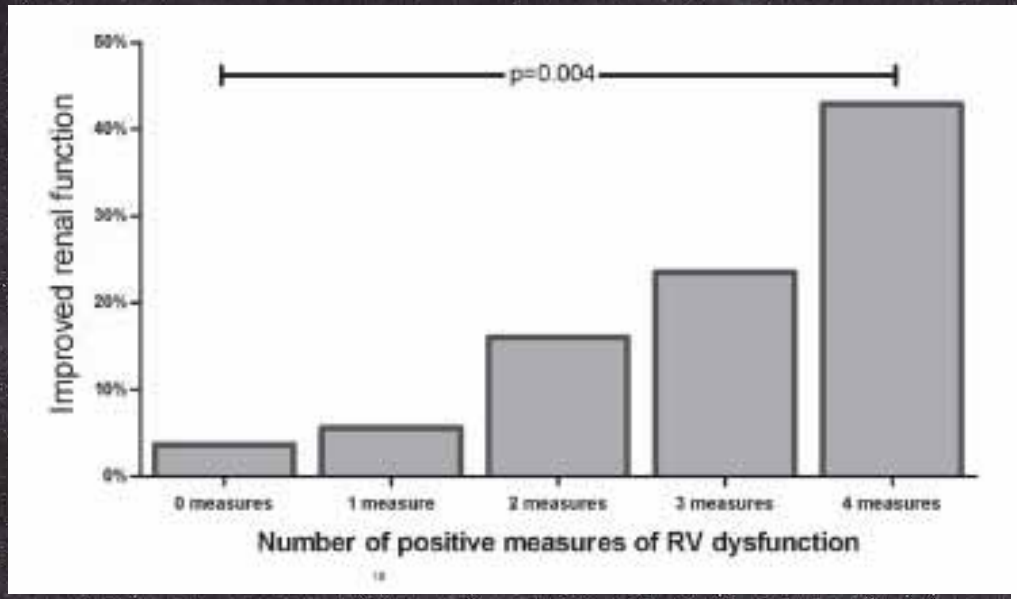
	Univariate		Multivariate	
	Standardized β	*P*	Standardized β	*P*
Age	−0.36	<.001	−0.31	<.001
ACEI/ARB	0.20	.006	0.24	.001
Loop diuretic	−0.14	.058	−0.19	.008
RV diameter	−0.16	.07		
MR severity	−0.19	.009		
TR severity	−0.21	.004	−0.19	.003
RVSP	−0.14	.057		

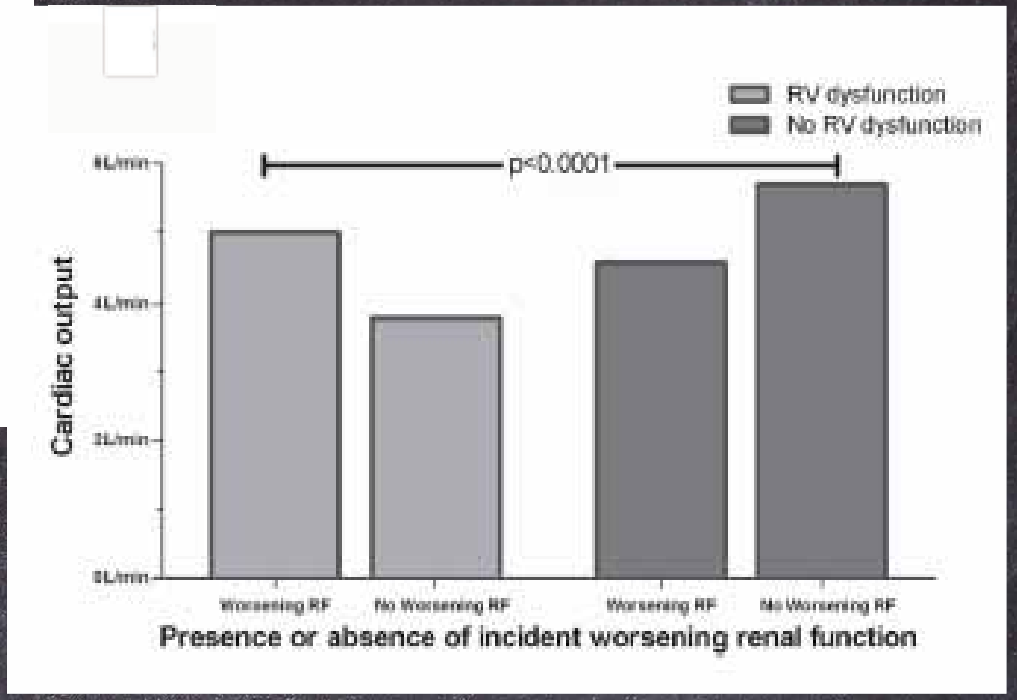


Although a causal relationship can not be proven, these data suggest that significant TR and high CVP might contribute to renal dysfunction in HF patients, possibly by elevating renal venous pressure and thereby reducing renal perfusion pressure. Taken together, these observations suggest that strategies which may reduce the severity of TR might be beneficial in HF patients with significant renal impairment.

J Card Fail 2008; 14: 824-830

Effect of Right Ventricular Function and Venous Congestion on Cardio-Renal Interactions during the Treatment of Decompensated Heart Failure



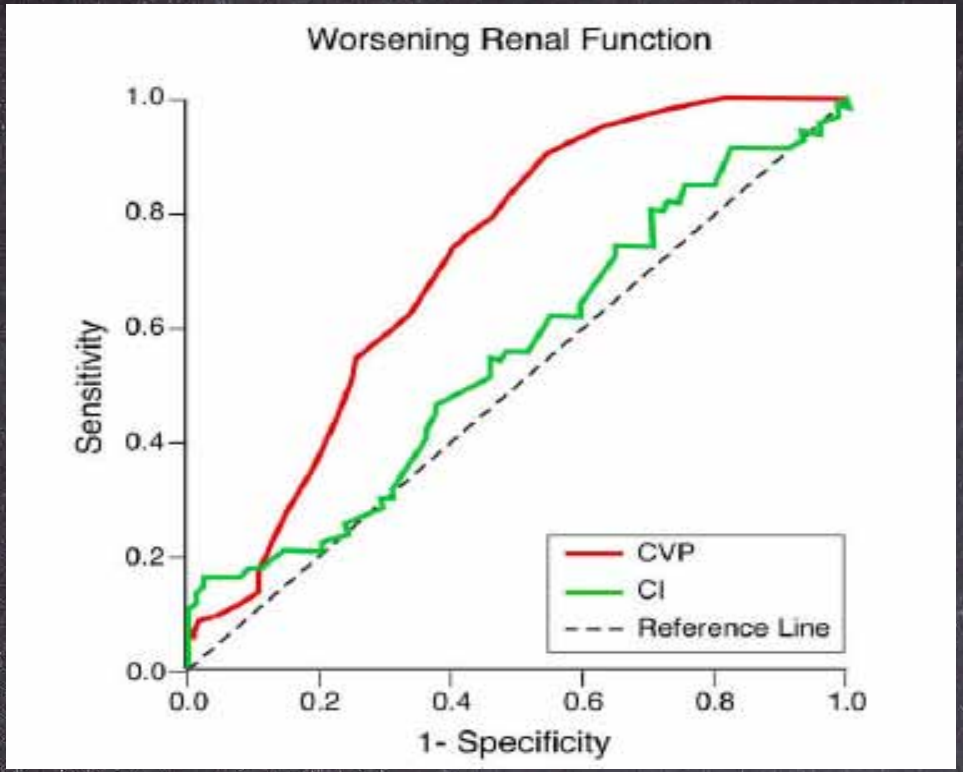


..the dominant effect of venous congestion in cardiorenal interactions
that overwhelms the influence of diminished CO

Testani JM am J Cardiol 2010; 105: 511-516

Importance of Venous Congestion for Worsening of Renal Function in Advanced Decompensated Heart Failure

Baseline CVP but not baseline CI predicted worsening renal function

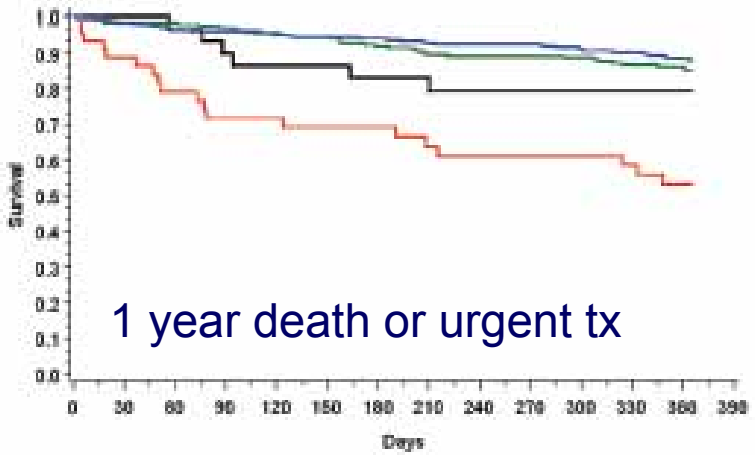


therapy had limited contribution to WRF. These observations provide important clinical confirmation of experimental data that preservation of cardiac output without relieving venous congestion may not necessarily avert the development of WRF. While many of these findings may seem intuitive to the experienced clinician, the concept of "congestive kidney failure" is of high clinical value with the contemporary epidemic proportions of ADHF where cardiac insufficiency (rather than venous congestion) is often considered the core lesion.

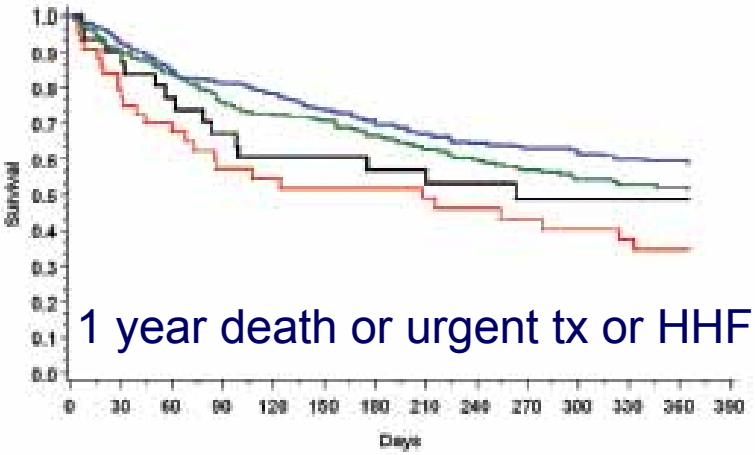
Mullens W. JACC 2009; 17:589-596

Is Worsening Renal Function an Ominous Prognostic Sign in Patients With Acute Heart Failure?

The Role of Congestion and Its Interaction With Renal Function



1 year death or urgent tx



1 year death or urgent tx or HHF

WRF/Cong
No WRF/Cong
WRF/No Cong
No WRF/No Cong

Table 2. Predictors of Death

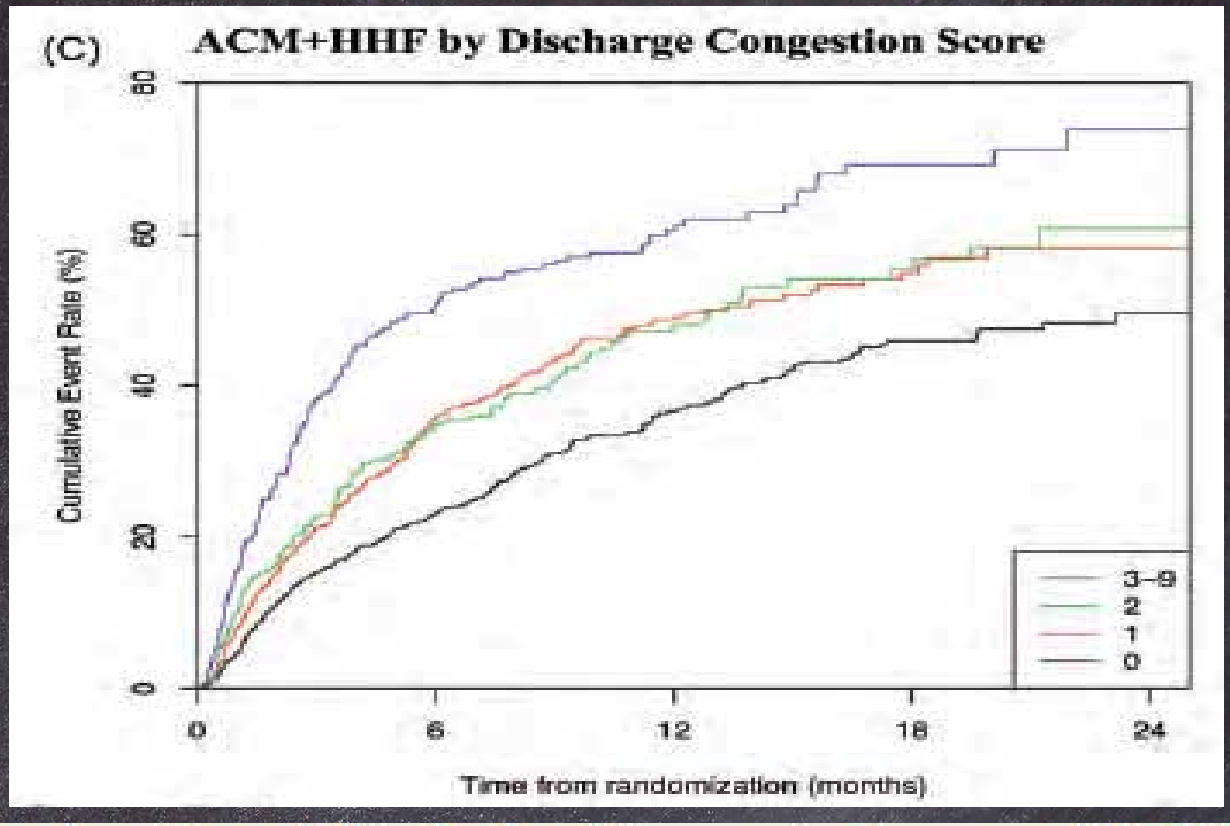
Variable	25th, 75th Percentiles	Death or Transplant: Univariable HR (95% CI)*	Univariable *P* Value	Multivariable HR (95% CI)*	Multivariable *P* Value
Congestion and WRF					
1: Yes WRF and yes congestion		5.35 (3, 9.55)	<0.0001	2.44 (1.24, 4.81)	0.0097
2: No WRF and yes congestion		1.95 (0.81, 4.7)	0.1364	1.35 (0.52, 3.5)	0.5324
3: Yes WRF and no congestion		1.24 (0.75, 2.03)	0.4037	1.04 (0.62, 1.73)	0.8811
Reference: No WRF and no congestion			Ref		Ref

Circ H Fail 2012

Clinical course and predictive value of congestion during hospitalization in patients admitted for worsening signs and symptoms of heart failure with reduced ejection fraction: findings from the EVEREST trial†

Table 1 Grading scale for investigator-assessed signs and symptoms of congestion

Signs/ symptoms	0	1	2	3
Dyspnoea	None	Seldom	Frequent	Continuous
Orthopnoea	None	Seldom	Frequent	Continuous
Fatigue	None	Seldom	Frequent	Continuous
JVD (cm H_2O)	≤6	6–9	10–15	≥15
Rales	None	Bases	To <50%	To >50%
Oedema	Absent/ trace	Slight	Moderate	Marked

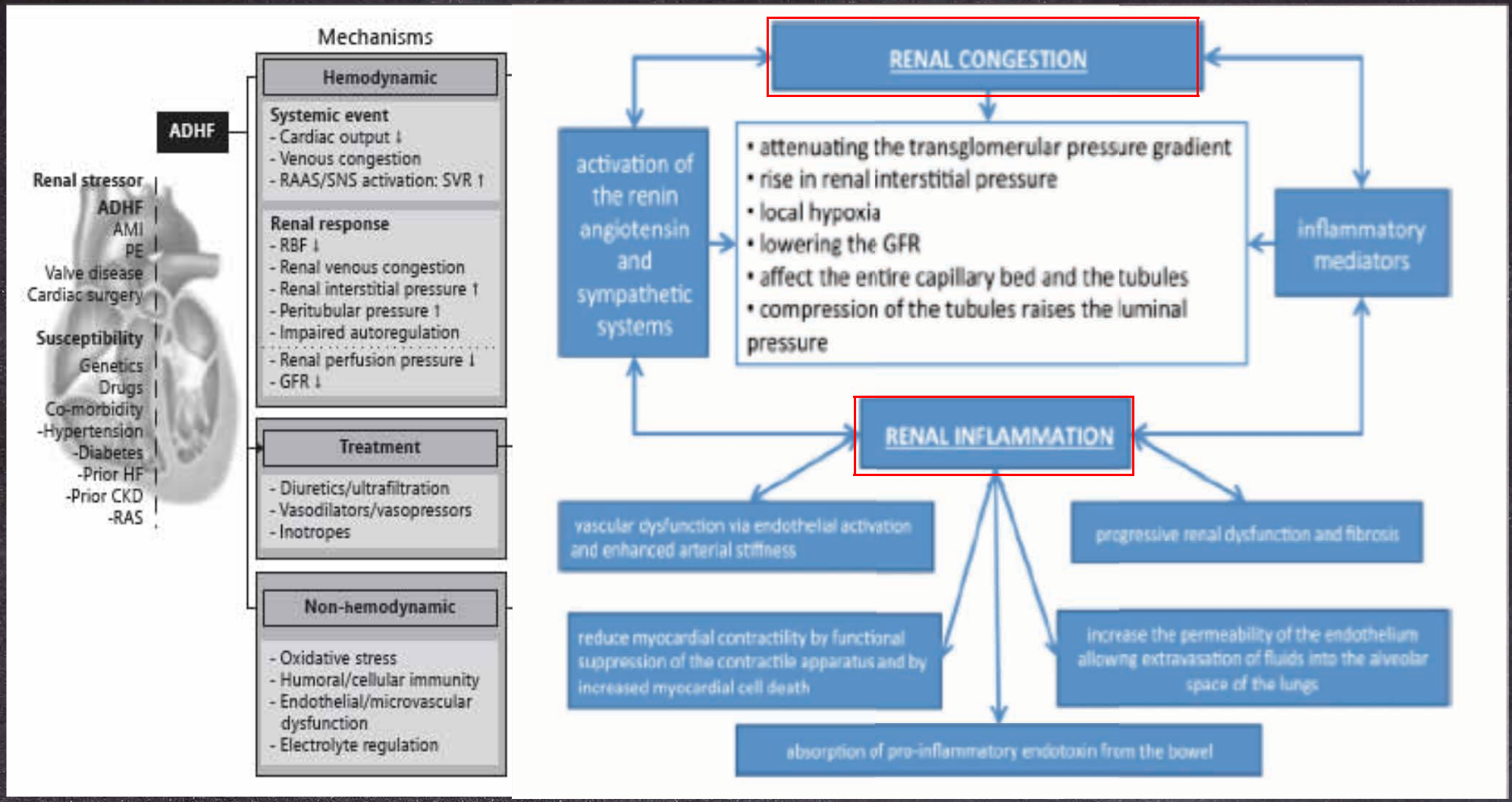


Among patients admitted for worsening signs and symptoms of HF and reduced EF, congestion improves substantially during hospitalization in response to standard therapy alone. However, patients with absent or minimal resting signs and symptoms at discharge still experienced a high mortality and readmission rate.

Eur H J

CKJ REVIEW

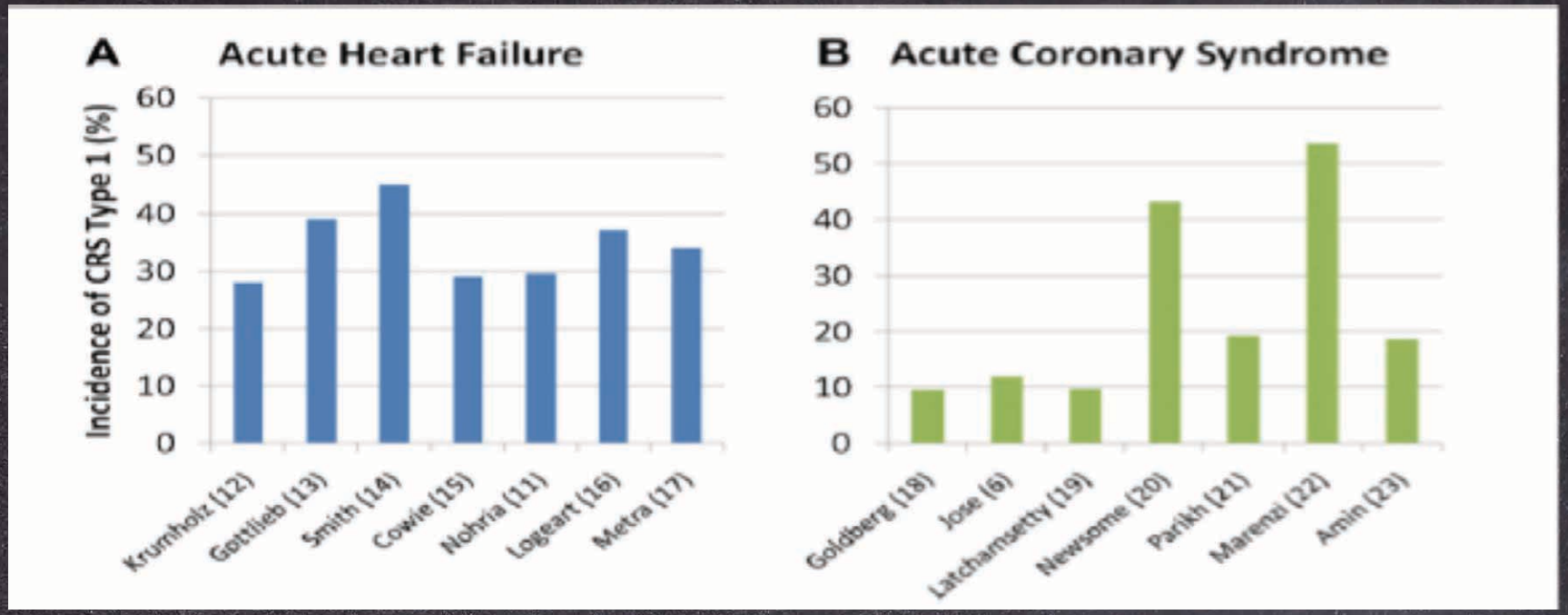
Focus on renal congestion in heart failure



Clin kidney journal 2016

Take home messages:

- l'aumentata incidenza di ADHF e ACS spiega il frequente riscontro di SCR tipo 1 nei pazienti ricoverati nelle UTIC



- RRT - requiring AKI occours in approximately 5-10% of patients in ICU and their mortality rate is unacceptably high (50-60%)

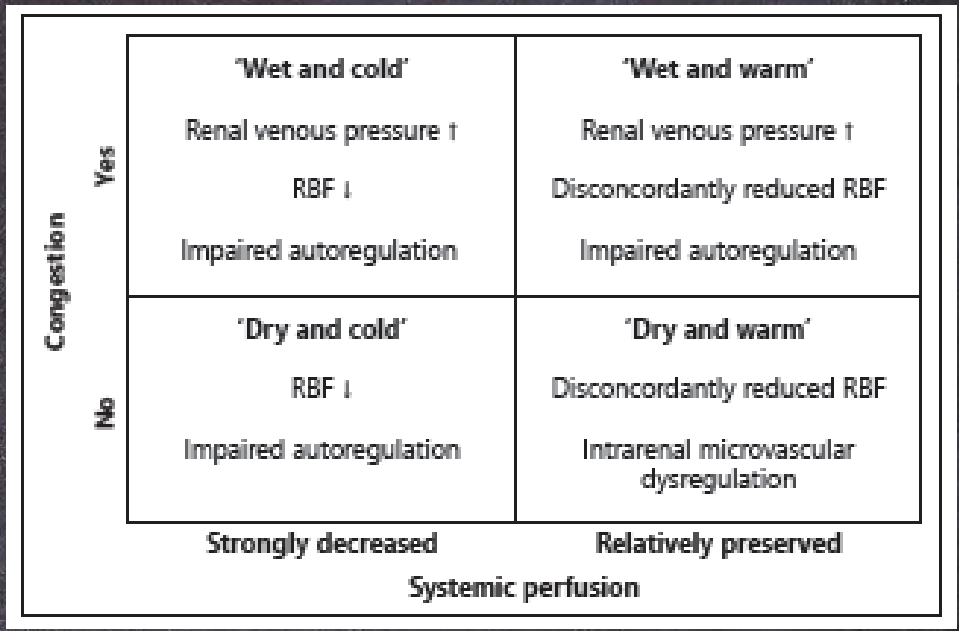
Cruz DN. Crit Care, 2009, 13: 211-220
DOI Nephron 2016, 134: 141-44

- come ben sappiamo si tratta di quadro i cui meccanismi fisiopatologici non sono univoci e del tutto conosciuti

- uno dei fattori determinanti la SCR tipo 1 è classicamente rappresentato dalla riduzione della portata cardiaca (CO)

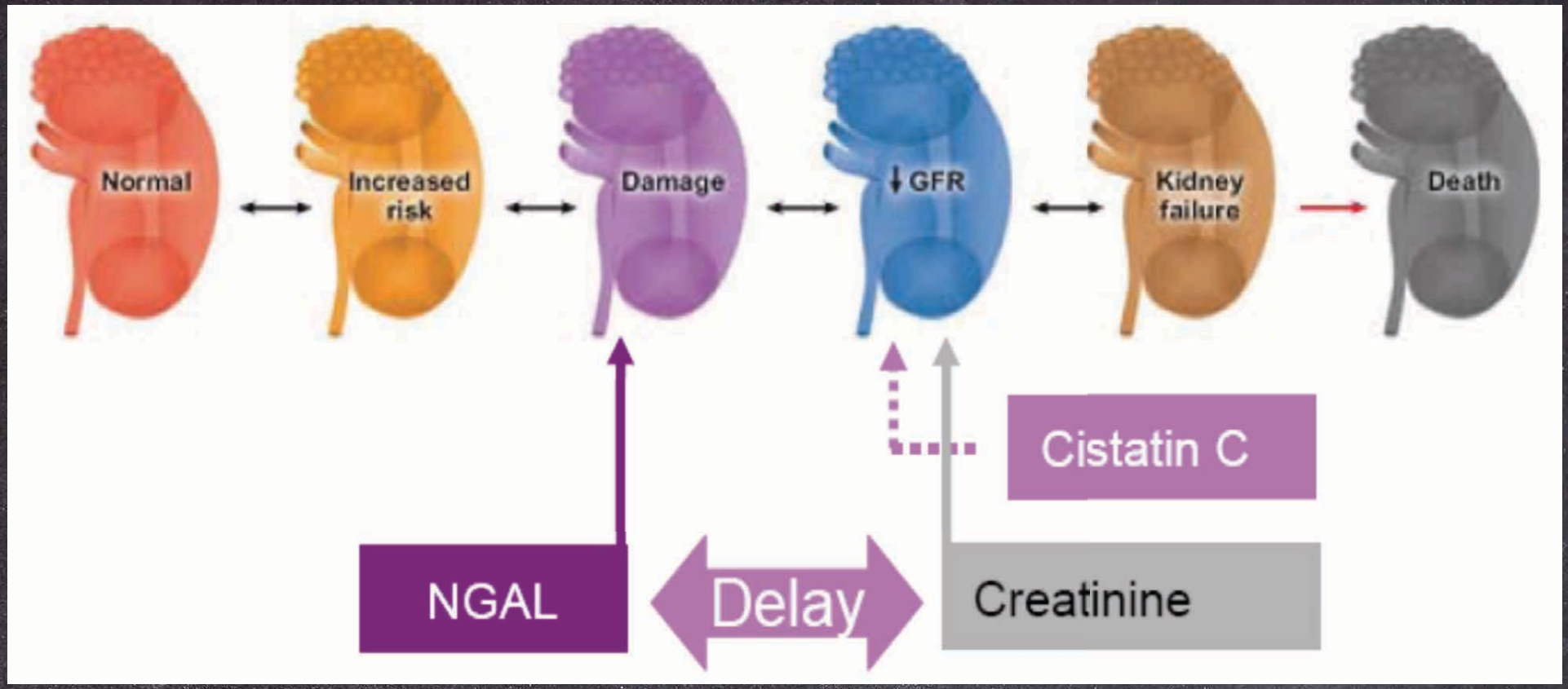
- un ruolo fisiopatologico sempre più importante viene attribuito alla CONGESTIONE VENOSA tanto da essere arrivati a parlare di CONGESTIVE RENAL FAILURE

- sicuramente i meccanismi emodinamici sono più complessi a seconda delle interazioni che si stabiliscono tra CONGESTIONE e PERFUSIONE



McCullough Contrib Neprol 2013
Afsar CKJ 2016

- necessità di identificare markers precoci di danno renale



Vaidya et al. Ann Rev Pharmacol Toxicol, 2008, 48: 463-93

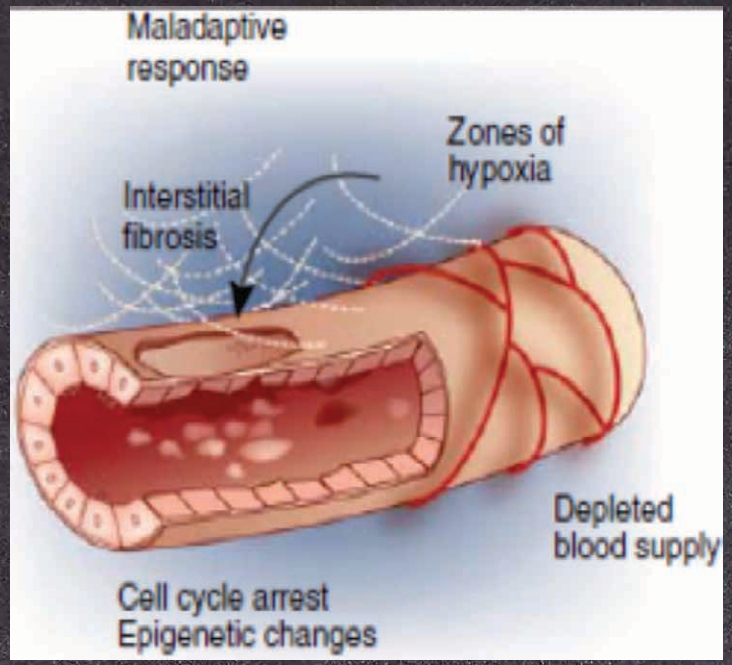
- e’ stato stabilito anche il ruolo di meccanismi NON EMODINAMICI tra i quali

Infiammazione,

Risposta Immunitaria

Disfunzione endoteliale

Acute kidney injury and chronic kidney disease: an integrated clinical syndrome



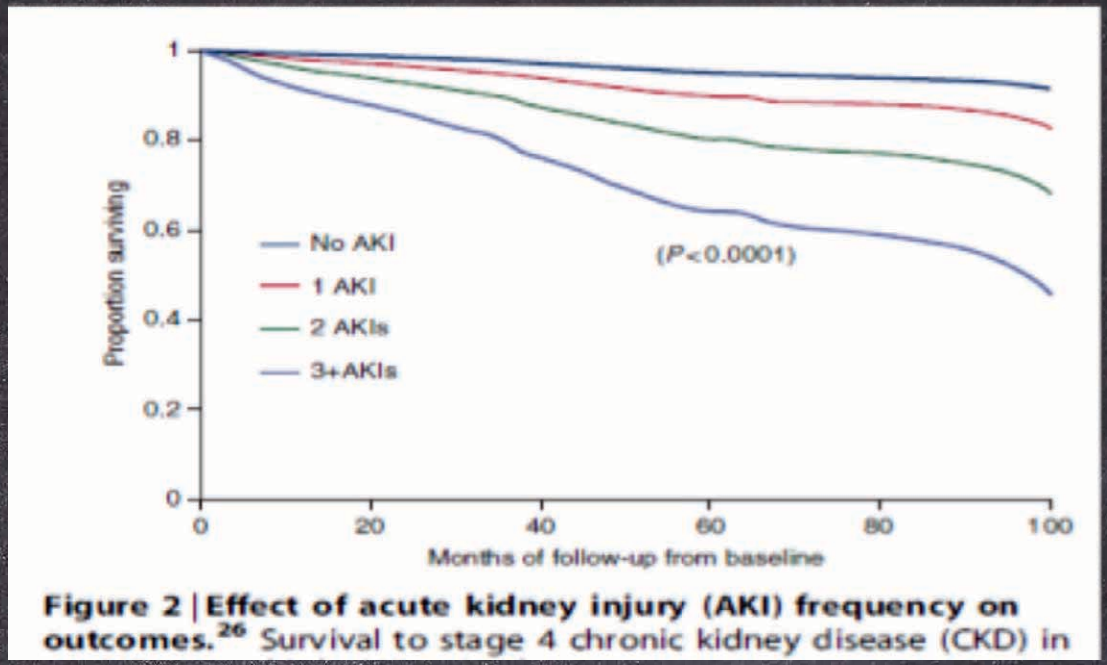


Figure 2 | Effect of acute kidney injury (AKI) frequency on outcomes.[26] Survival to stage 4 chronic kidney disease (CKD) in

Physicians must provide long-term follow-up to patients with first episodes of AKI, even if they presented with normal renal function.

Kidney International 2012; 82: 516-524
Belayev Curr opin Nephrol Hypertens