Valdagno, October 27, 2017

AKI and CKD in Elderly

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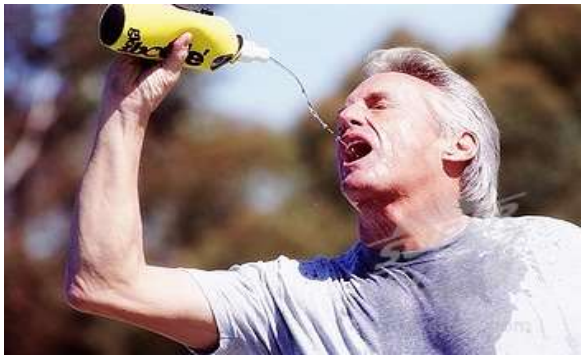
AKI & CKD in the Eldery

- What defines old age?
- Epidemiology of AKI and CKD
- Age-related physiological changes in kidney
- Is the elderly kidney more susceptible to AKI?
- Pathophysiology and Diagnosis
- Should we plan different treatments for elderly patients?
- Clinical outcomes in the elderly
- Acute and chronic disease and ethical perspective

? elderly ?



AGE is just a number.

Marc Augé

Elederly has usually been defined as a condition in which most of the physiological functions are shut down and the life expectancy is short. Elderly was assumed to be a stage of life whose next step is death.

Some tips about the used “cut-off of 65 years to designate an individual as elderly

- Aristone di Ceo: elimination of gerontocracy (perì-geròs)
- Cicerone: loss of “honores et dignitas” beyond 65 (Cato maior)
- Bismark : individuals over 65 were entitled to social benefits
- Western World: 65 year is the average limit for retirement

Today it is more a subjective term than a definition, and individual’s chronological age does not necessarily reflect physiological and health status.

How would you define Elderly?

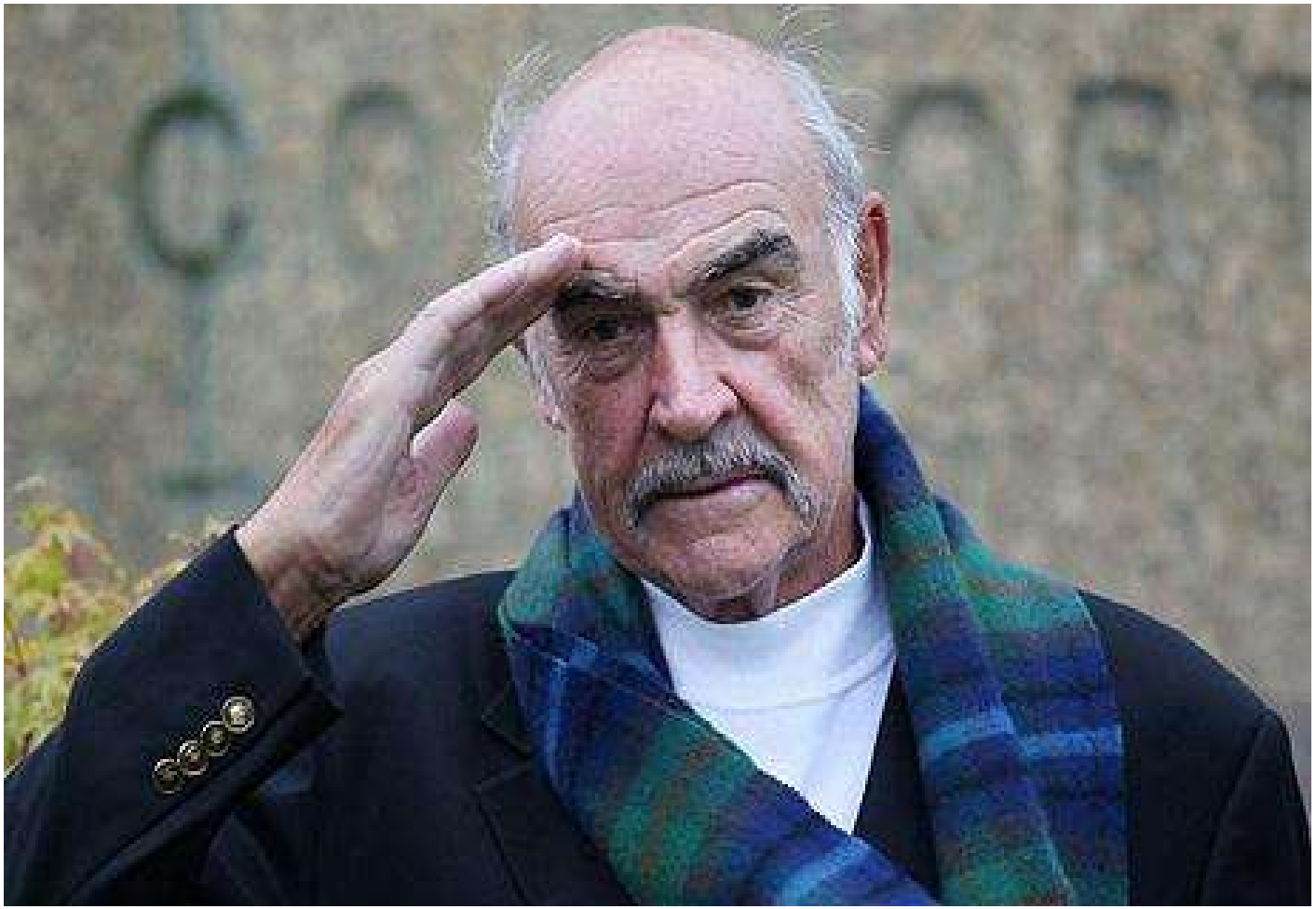
Who's an alchoolic ?

The typical patient that drinks twice what the doctor does

Who's an elderly ?

The typical patient 15 years older than his doctor

Is this man old?



Now do you think he's old?

United Nations Dossier

«An Aging World 2015»

By 2020 the % of individuals >65 will exceed that of children <5

By 2050 the ratio will be 2:1

Elderly: a resource rather than a burden

Nevertheless…..

- In spite of increased life expenctancy , quality of life is affected by aging

- due to afore mentioned ‘’demographic transition’’:

  - ↑ chronic illness
  - ↑ functional impairment

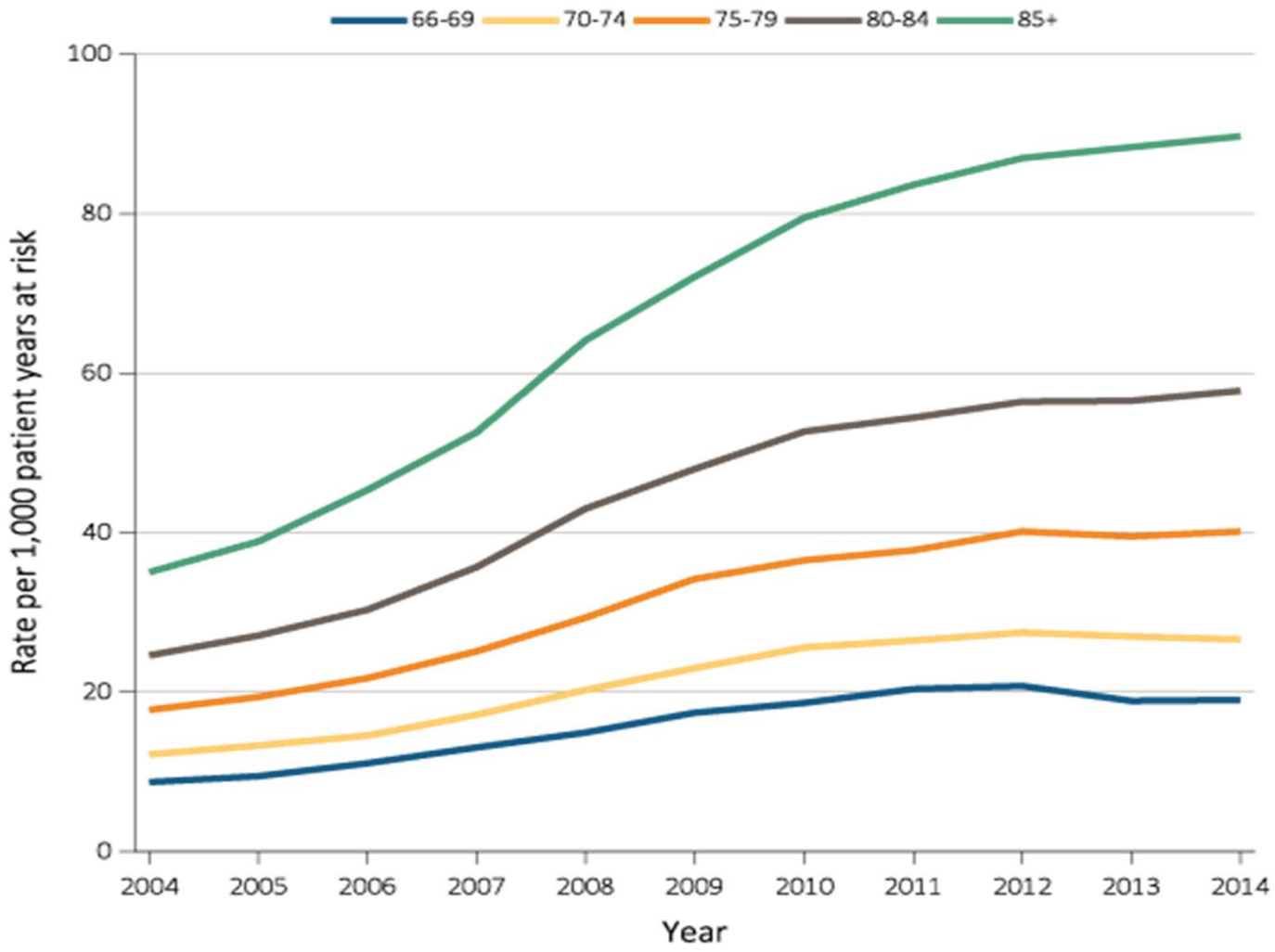
- hospitalisations for acute care will continue to increase
- Need of care for chronic illness will be inevitably increasing

Demographics: Elderly in the ICU

- ≈ 55% of all ICU beds-days are incurred by patients ≥ 65
- ≈ 14% of those ≥ 85 die in ICU (1)
- short term - long term survival of elderly admitted to ICU: conflicting data: due to differences in:
  - definition for old age,
  - treatment intensitiy
  - severity of illness
  - lenght of followup

USRDS snapshot in 2003

Unadjusted rates of first hospitalization with AKI, per 1,000 patient-years at risk, by age



Very old patients admitted to ICU

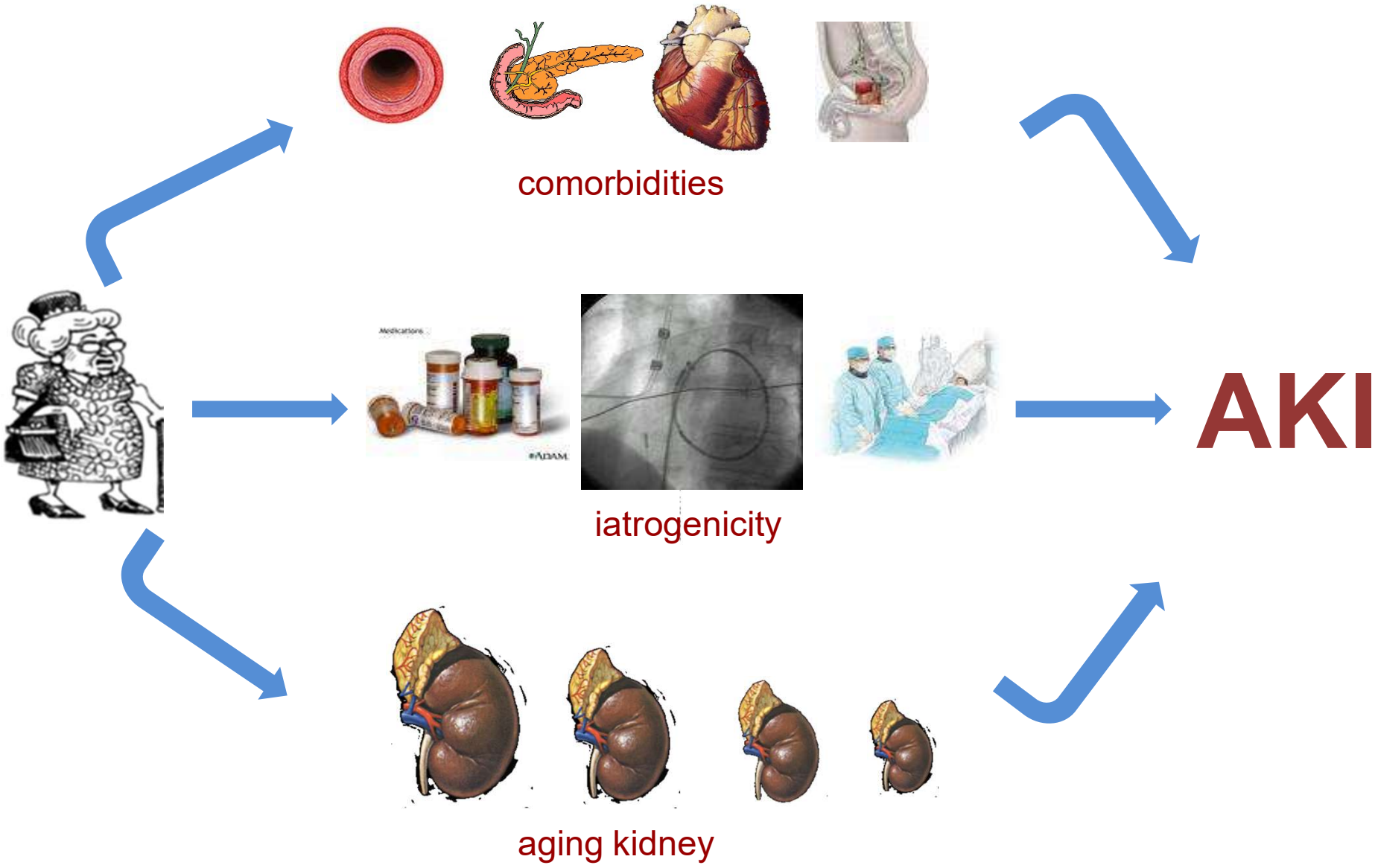
- 120,123 adult admissions for ≥24 hours, 57 ICUs, (ANZICS 2003).
- 15,640 patients ≥80 years (13.0%) were admitted
- age ≥ 80: higher ICU and hospital death compared with younger age strata (ICU: odds ratio: 2.7, 95%CI 2.4 to 3.0; hospital: 5.4, 95%CI 4.9 to 5.9)
- Factors associated with lower survival:

  admission from a chronic care facility, co-morbid illness, non-surgical admission, greater illness severity, mechanical ventilation , longer stay in ICU
- Those aged ≥80 were more likely to be discharged to rehabilitation/long-term care (12.3% vs. 4.9%, OR 2.7, 95%CI 2.6 to 2.9)
- Admission rates of very old patients increase by 5.6% per year
- Translated to a 72.4% increase in demand for ICU bed-days by 201

Elderly with AKI

- no large epidemiological studies exclusively on elderly with AKI
- data on elderly extrapolated mostly from heterogeneous AKI studies conducted on patients of various age groups
- incidence of AKI in elderly population varies (5-40%), depending on specific age group (≥60, ≥80, etc.), definition of AKI used, population studied (community, hospitalised or ICU patients)
- mean age varies between 64-77 years, depending on the population studied
- mean age is lower in studies including patients having received RRT (depending on influence of age on therapeutic intensity?)
- mean age is higher in studies including acute-on-chronic renal failure (depending on higher prevalence chronic renal disease in the elderly?)

High incidence of AKI in the Eldery



Contrast Induced AKI

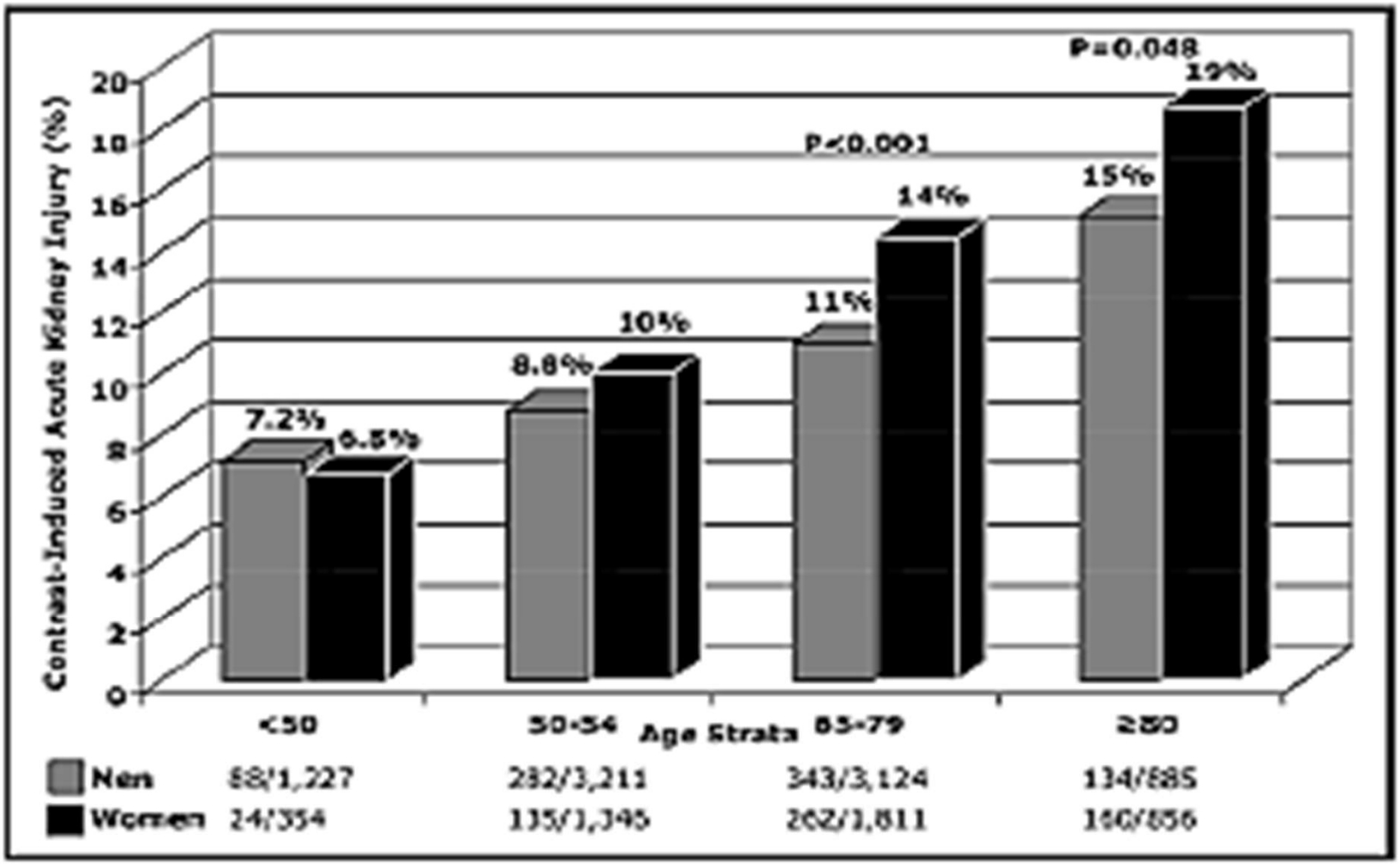
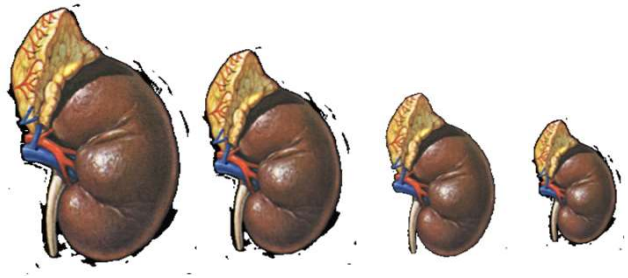


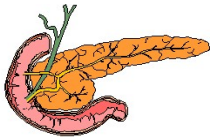
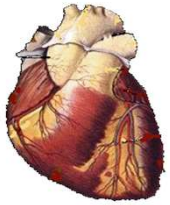
Figure 2. Development of postcatheterization CIAKI by gender and age

The aging kidney



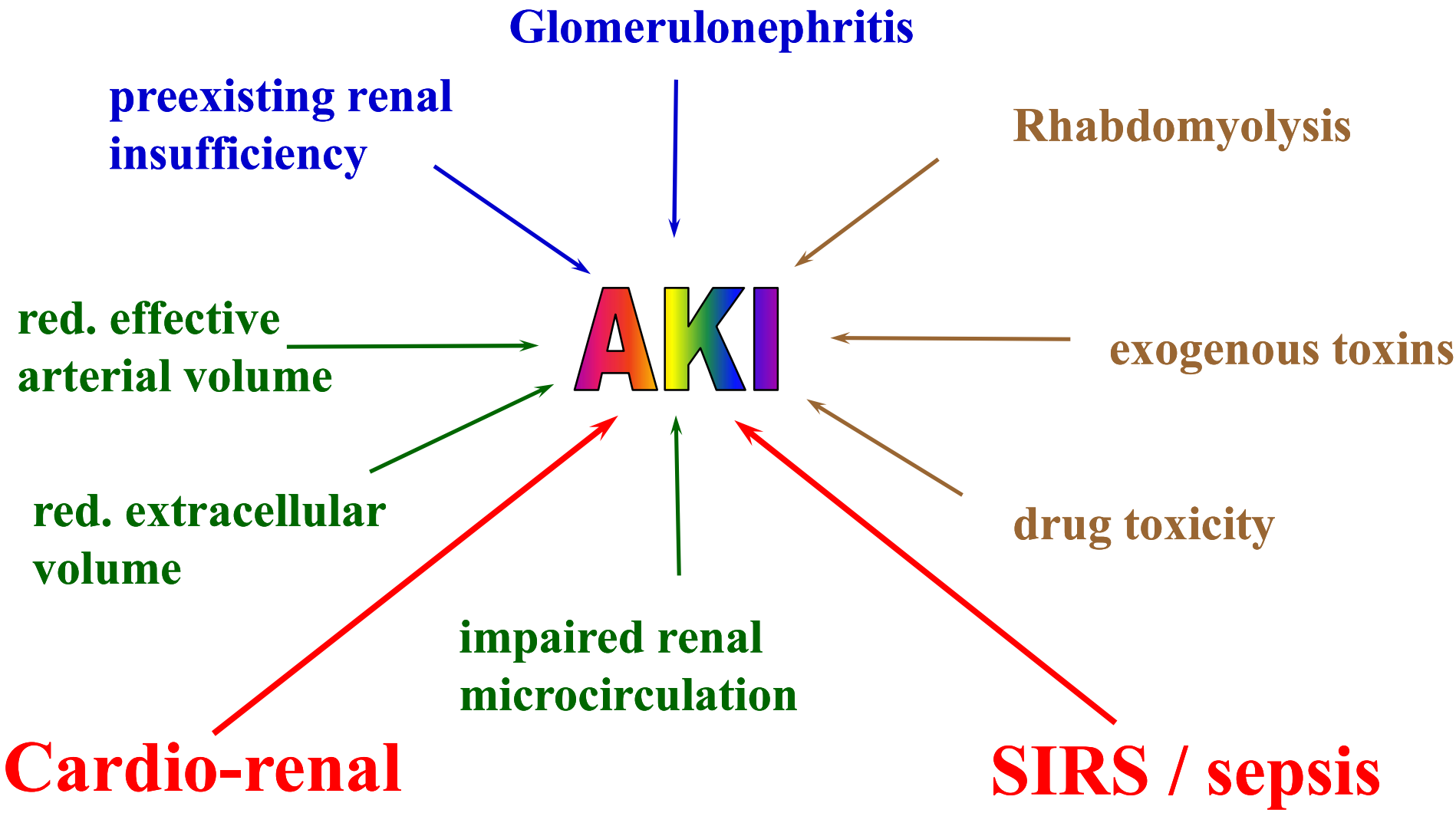
- Lower capacity of cell proliferation (proliferative burst after injury) with changes in morphology and function of MSC and EPC
- increased susceptibility to apoptosis (pro and anti-apoptotic factor imbalance) and profibrotic attitude
- age-related changes in levels of growth factors (TGF-, EGF, IGF-1, and VEGF) result in a complex shift of the microenvironmental milieu that is likely to affect tissue homeostasis and capacity of repair after injury
- Senescent endophenotype of the whole nephron structure
- Loss of renal functional reserve

Comorbidities

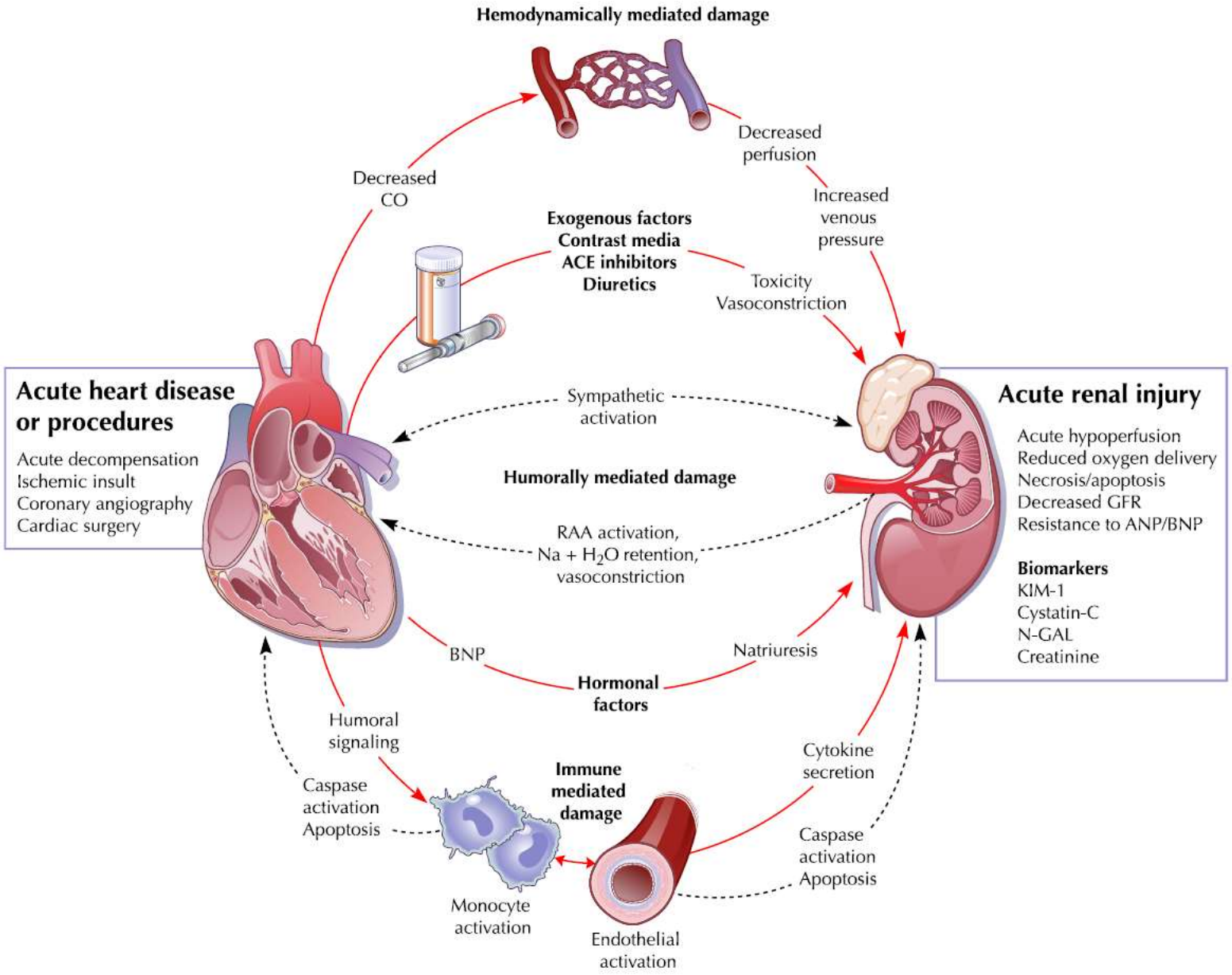




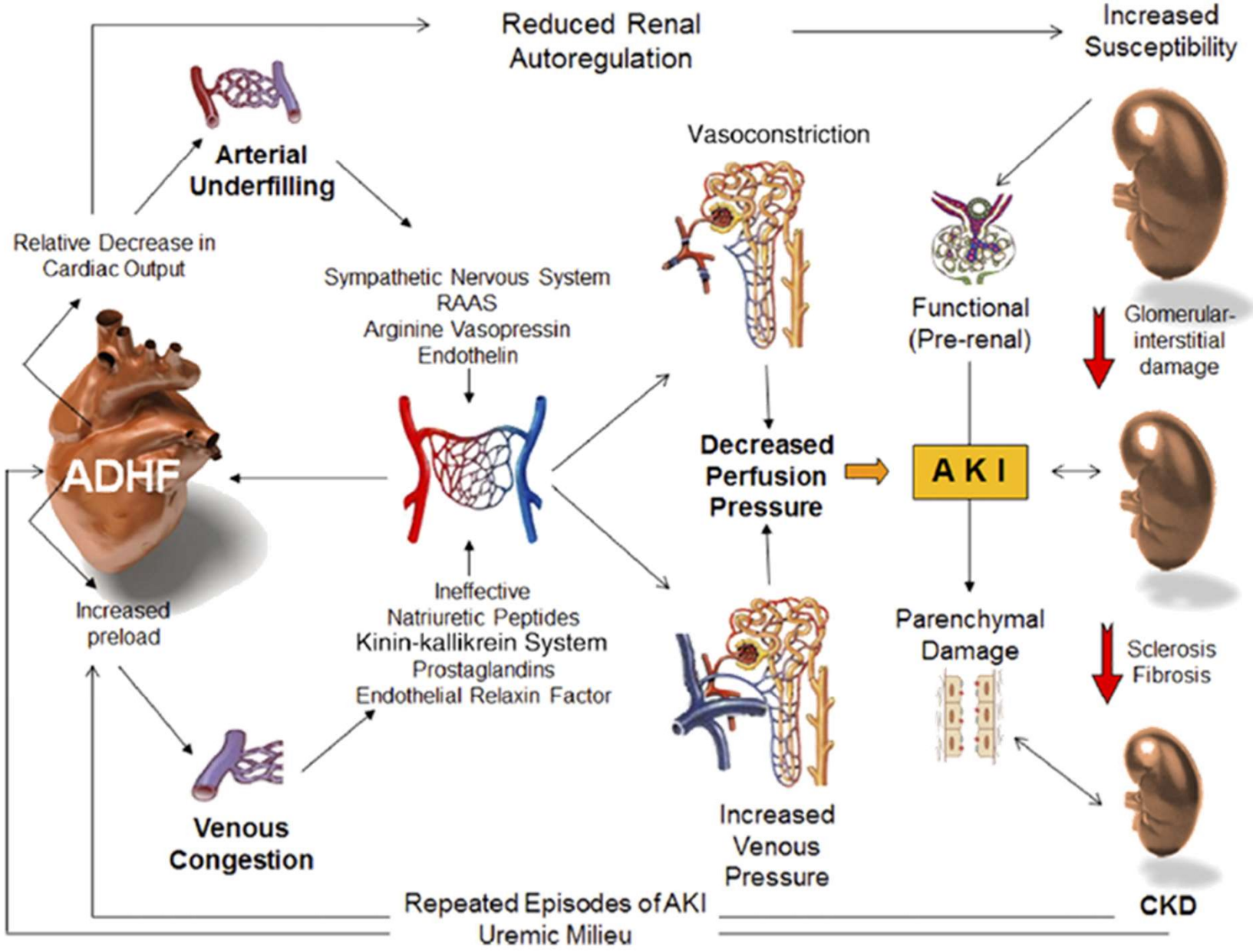
- Comorbidities dramatically increase with age
- some age related comorbidities directly induce AKI
  - ex: obstructive uropathy (prostatism)
- elevated incidence of systemic diseases that can cause kidney disease
  - hypertension, arteriosclerosis, diabetes, heart failure
- comorbidities necessitate drugs, procedures, surgery
  - renal insults
  - nephrotoxins

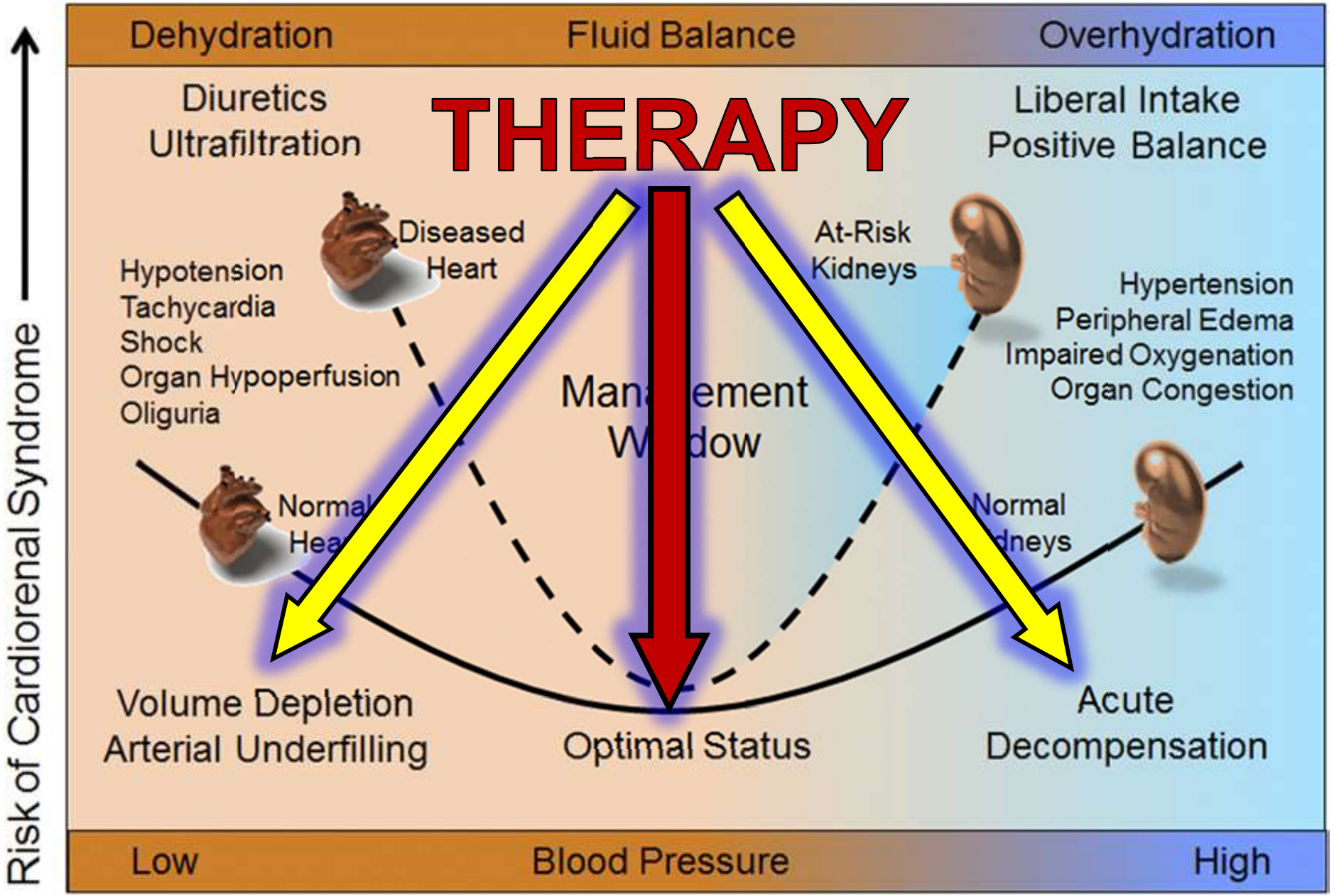
Causes of Acute Kidney Injury



Cardio-Renal Syndrome (Type 1)

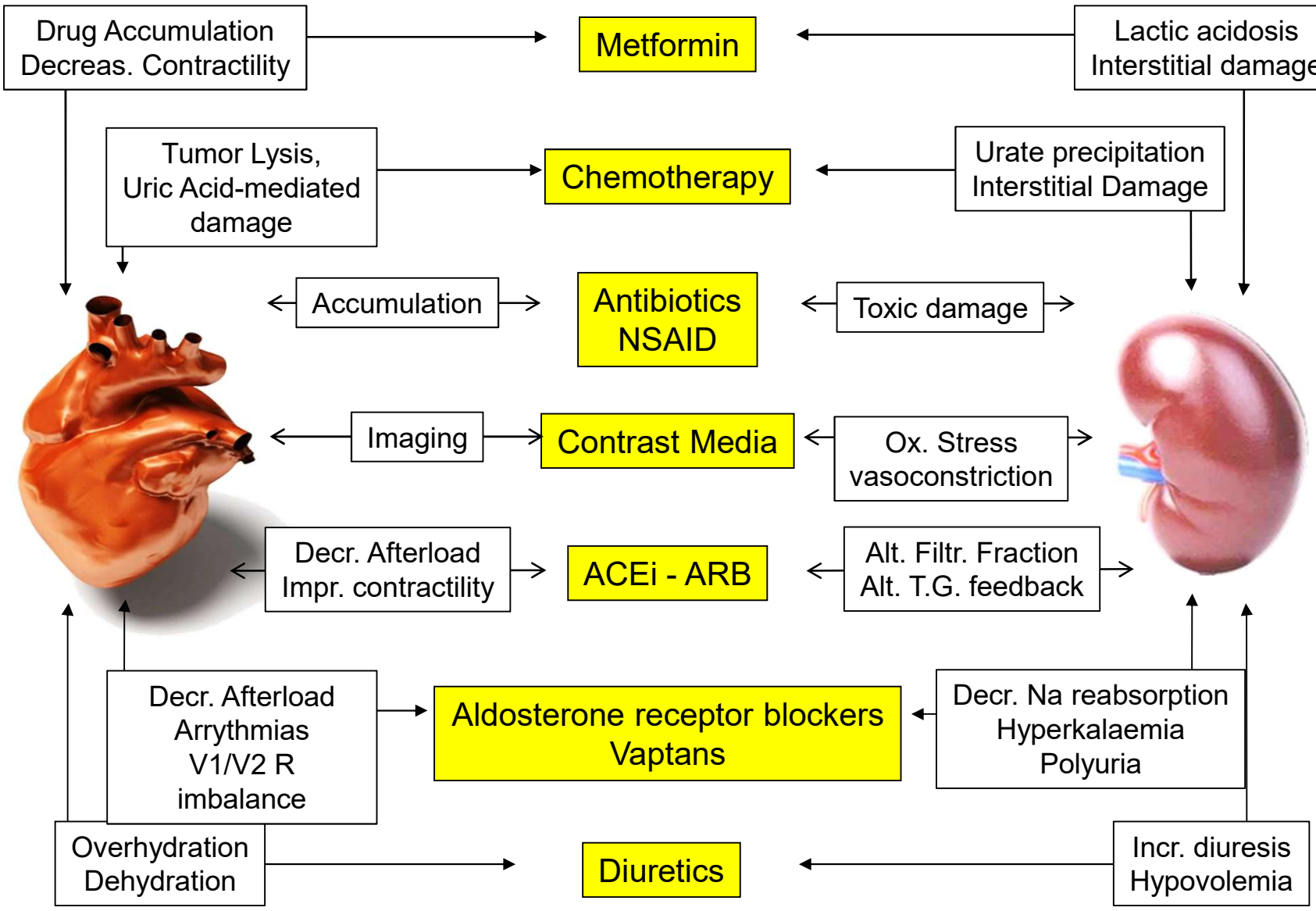


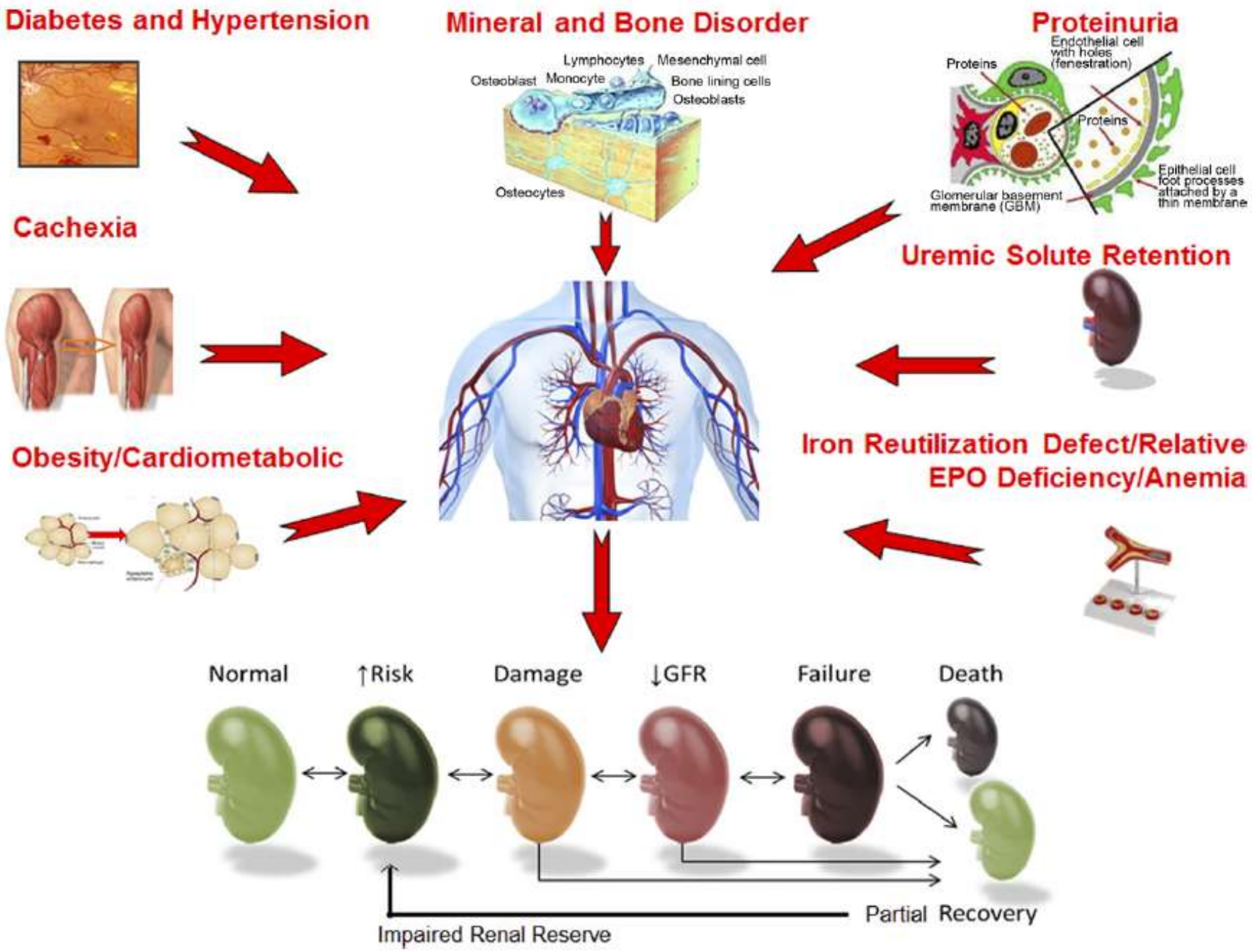

Reduced Renal Autoregulation
Increased Susceptibility
Arterial Underfilling
Vasoconstriction
Relative Decrease in Cardiac Output
Sympathetic Nervous System
RAAS
Arginine Vasopressin
Endothelin
Functional (Pre-renal)
Glomerular-interstitial damage
ADHF
Decreased Perfusion Pressure
AKI
Ineffective Natriuretic Peptides
Kinin-kallikrein System
Prostaglandins
Endothelial Relaxin Factor
Increased preload
Parenchymal Damage
Sclerosis Fibrosis
Venous Congestion
Increased Venous Pressure
Repeated Episodes of AKI
Uremic Milieu
CKD


Dehydration
Fluid Balance
Overhydration
Diuretics
Ultrafiltration
THERAPY
Liberal Intake
Positive Balance
Diseased
Heart
Hypotension
Tachycardia
Shock
Organ Hypoperfusion
Oliguria
At-Risk
Kidneys
Hypertension
Peripheral Edema
Impaired Oxygenation
Organ Congestion
Management
Window
Normal
Heart
Normal
Kidneys
Volume Depletion
Arterial Underfilling
Optimal Status
Acute
Decompensation
Low
Blood Pressure
High
Risk of Cardiorenal Syndrome

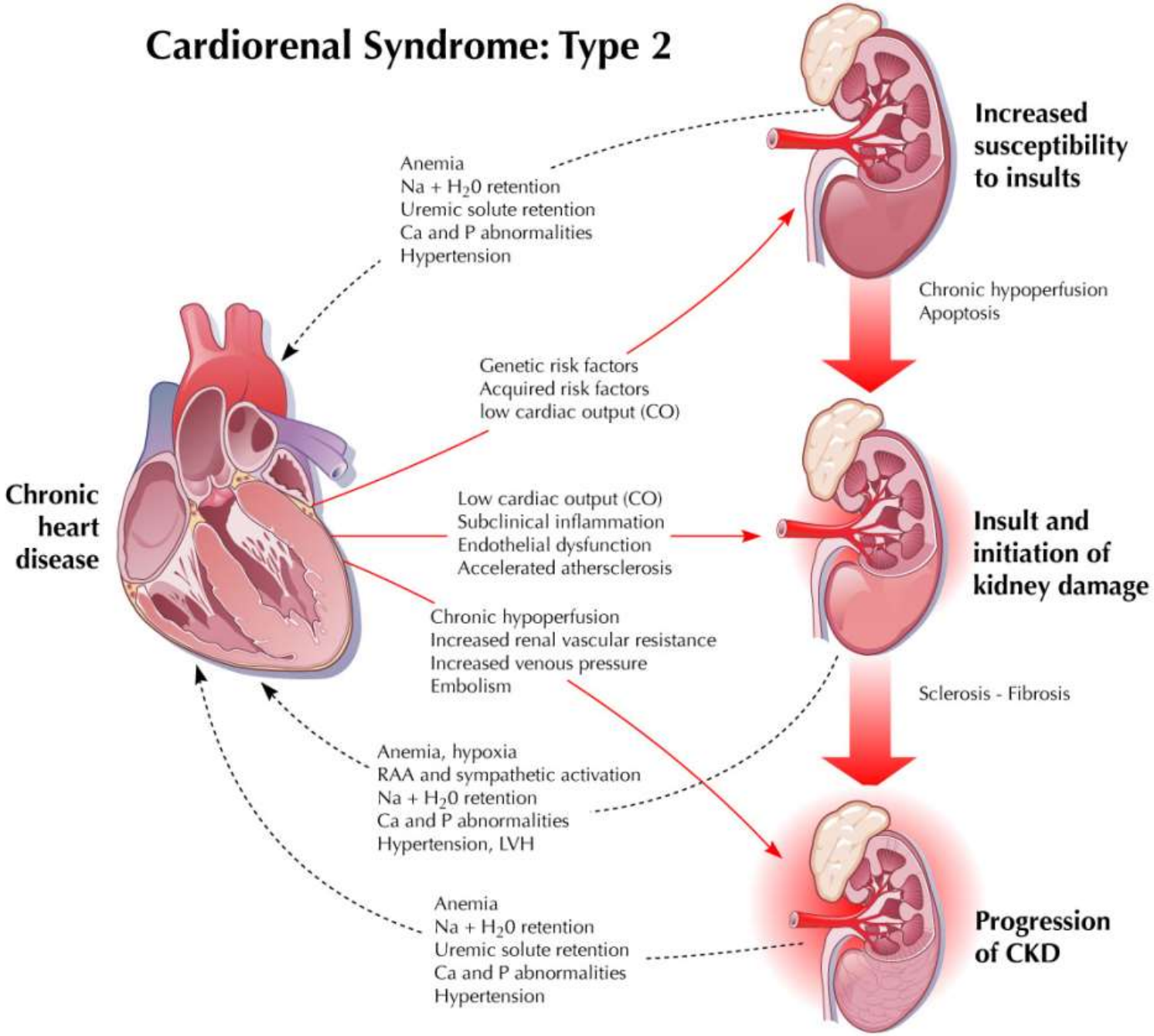
Cardio-Renal Syndrome Type 1

Selected Iatrogenic Mecanisms

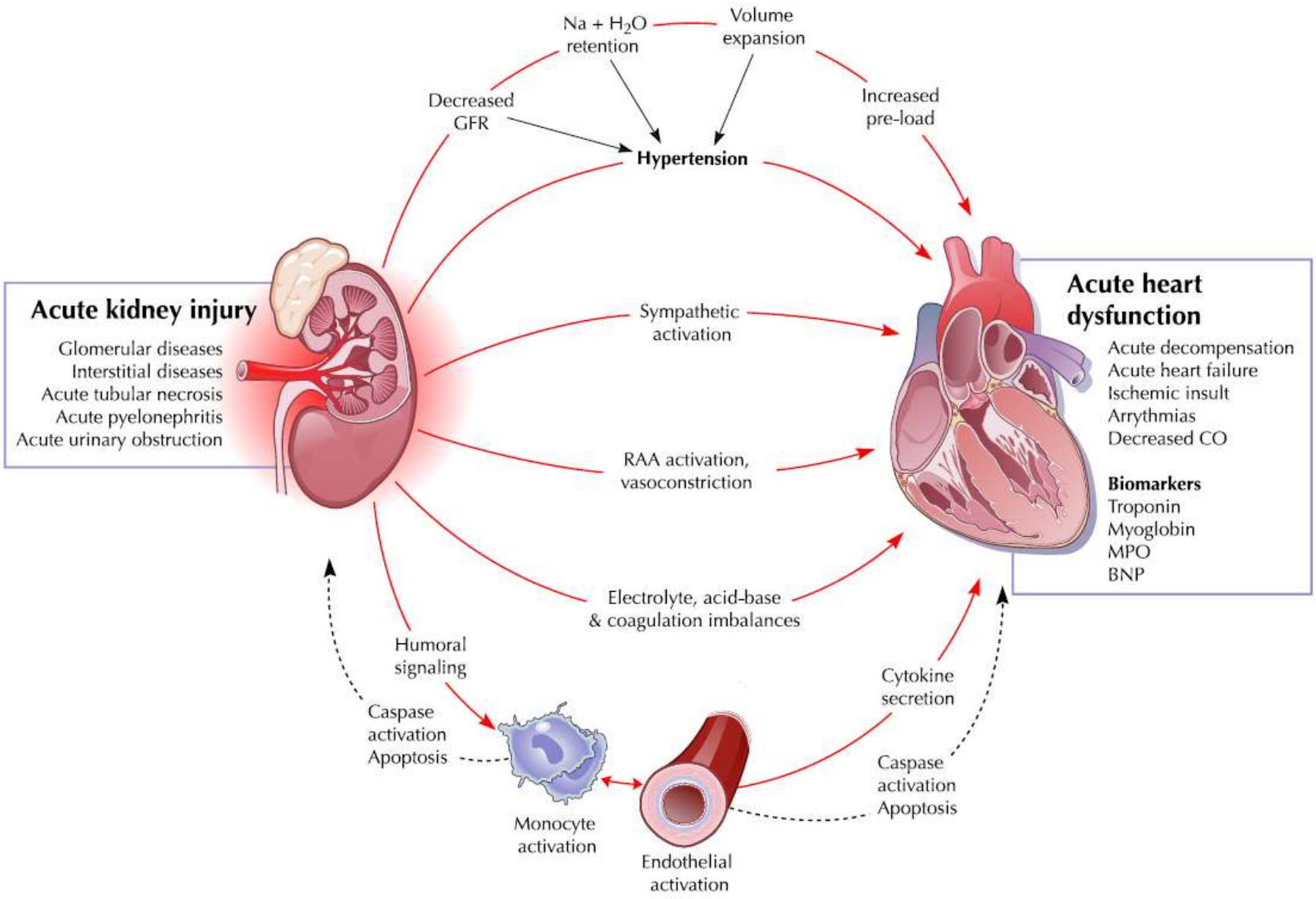



Diabetes and Hypertension
Mineral and Bone Disorder
Lymphocytes
Mesenchymal cell
Osteoblast
Monocyte
Bone lining cells
Osteoblasts
Osteocytes
Proteinuria
Endothelial cell with holes (fenestration)
Proteins
Proteins
Epithelial cell foot processes attached by a thin membrane
Glomerular basement membrane (GBM)
Cachexia
Uremic Solute Retention
Obesity/Cardiometabolic
Iron Reutilization Defect/Relative EPO Deficiency/Anemia
Normal
↑Risk
Damage
↓GFR
Failure
Death
Partial Recovery
Impaired Renal Reserve

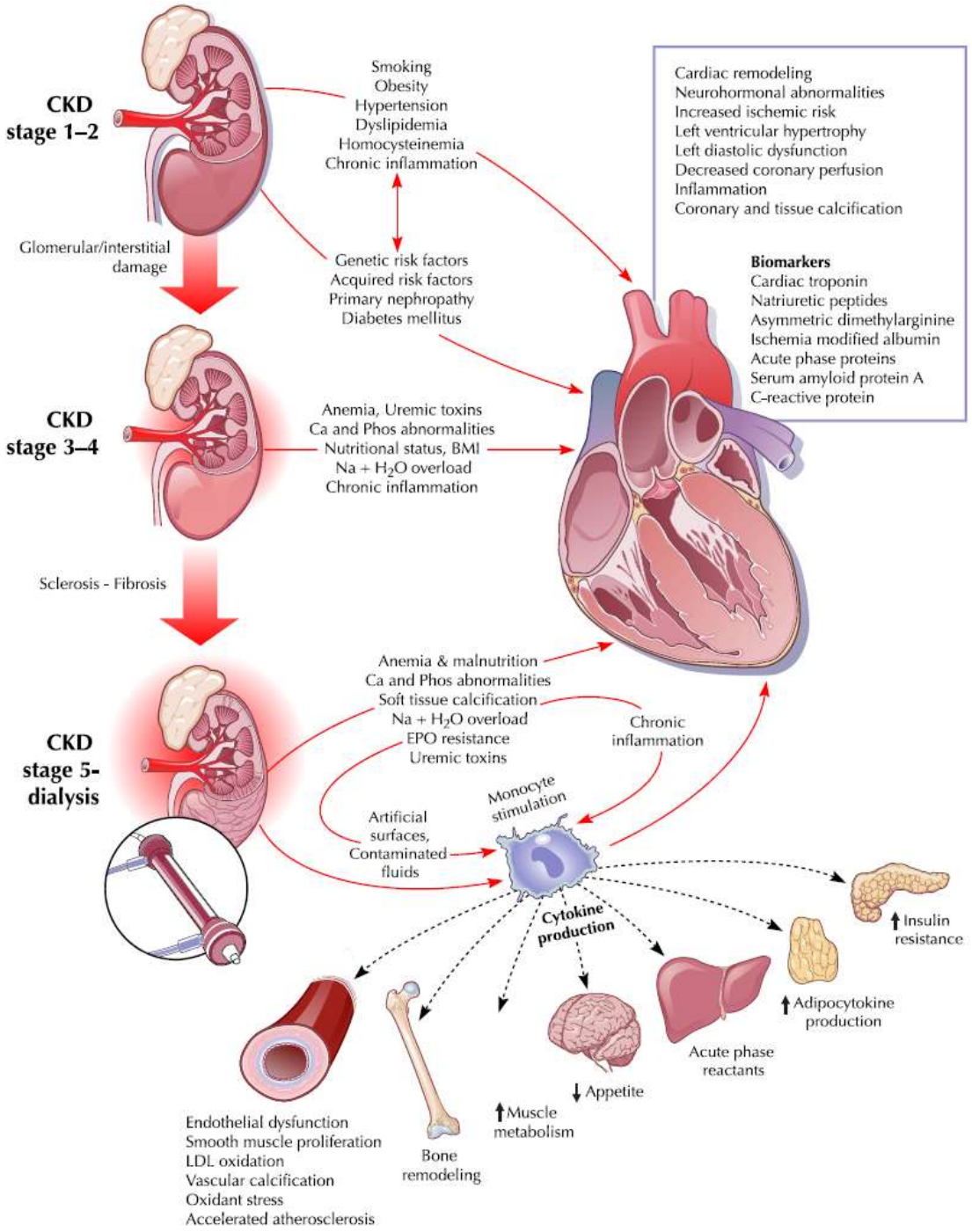
Cardiorenal Syndrome: Type 2



Cardio-Renal Syndrome (Type 3)



CRS Type 4

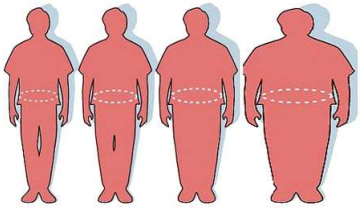

CKD stage 1–2
Smoking
Obesity
Hypertension
Dyslipidemia
Homocysteinemia
Chronic inflammation
Glomerular/interstitial damage
Genetic risk factors
Acquired risk factors
Primary nephropathy
Diabetes mellitus
Cardiac remodeling
Neurohormonal abnormalities
Increased ischemic risk
Left ventricular hypertrophy
Left diastolic dysfunction
Decreased coronary perfusion
Inflammation
Coronary and tissue calcification
Biomarkers
Cardiac troponin
Natriuretic peptides
Asymmetric dimethylarginine
Ischemia modified albumin
Acute phase proteins
Serum amyloid protein A
C-reactive protein
CKD stage 3–4
Anemia, Uremic toxins
Ca and Phos abnormalities
Nutritional status, BMI
Na + H2O overload
Chronic inflammation
Sclerosis - Fibrosis
CKD stage 5-dialysis
Anemia & malnutrition
Ca and Phos abnormalities
Soft tissue calcification
Na + H2O overload
EPO resistance
Uremic toxins
Chronic inflammation
Monocyte stimulation
Artificial surfaces, Contaminated fluids
Cytokine production
Insulin resistance
Adipocytokine production
Acute phase reactants
Appetite
Muscle metabolism
Bone remodeling
Endothelial dysfunction
Smooth muscle proliferation
LDL oxidation
Vascular calcification
Oxidant stress
Accelerated atherosclerosis

Obesity and cardiometabolic changes

Diabetes

Sleep Apnea

Heart Disease

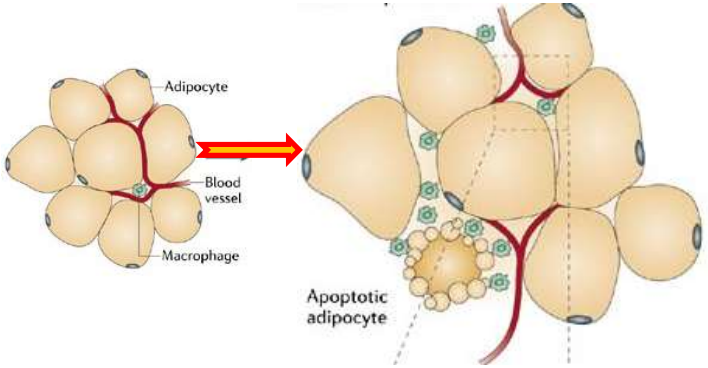


G.I. Tract Disorders

Kidney Disease

Obesity

High Blood Pressure



Lean adipose tissue

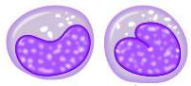
Obese adipose tissue

TNF-α
IL-6

F F A

Crosstalk

Leptin
Resistin
Adiponectin



Inflammation
CRP

Atherosclerosis

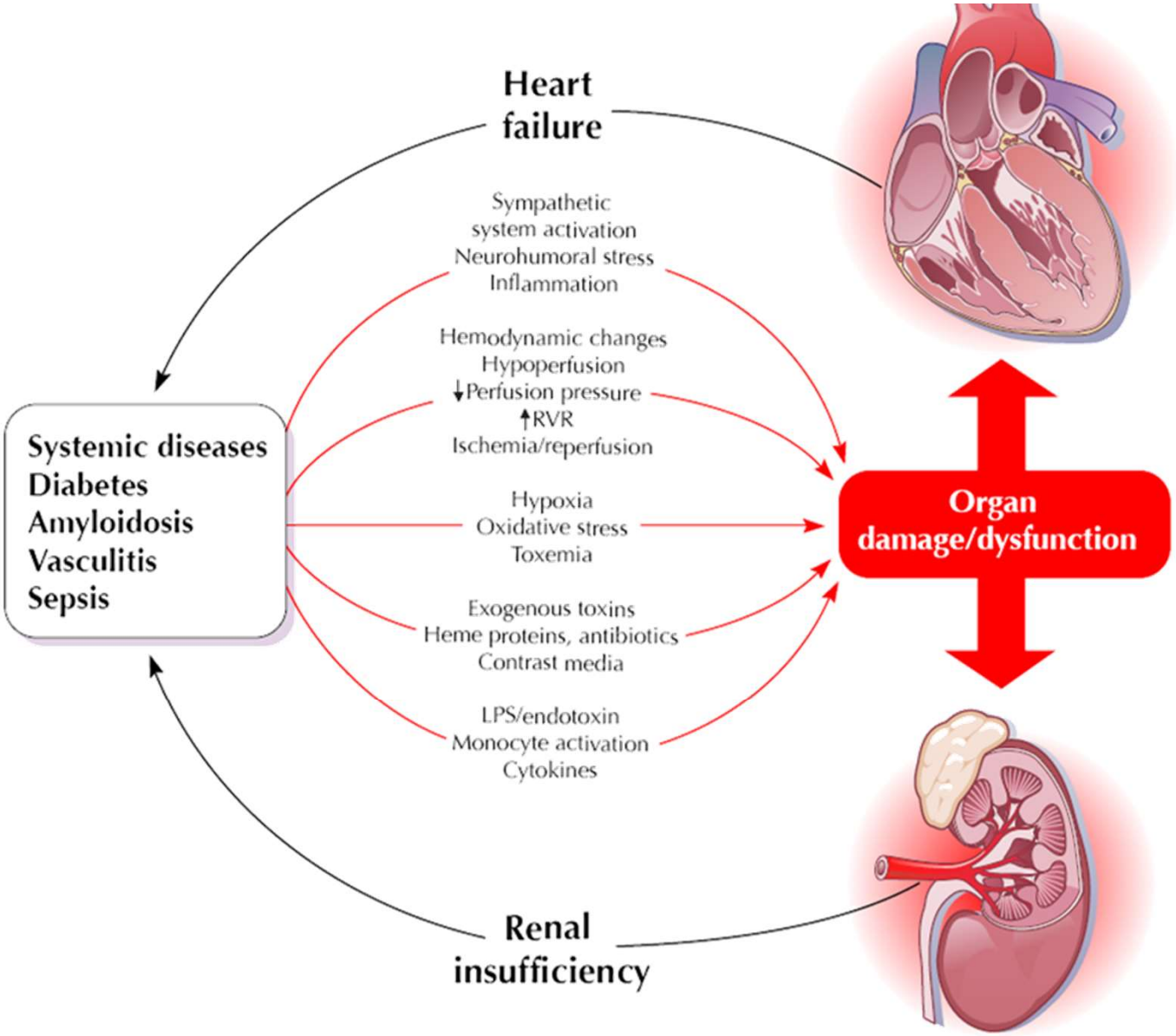
Apoptosis

Dysmetabolic syndrome

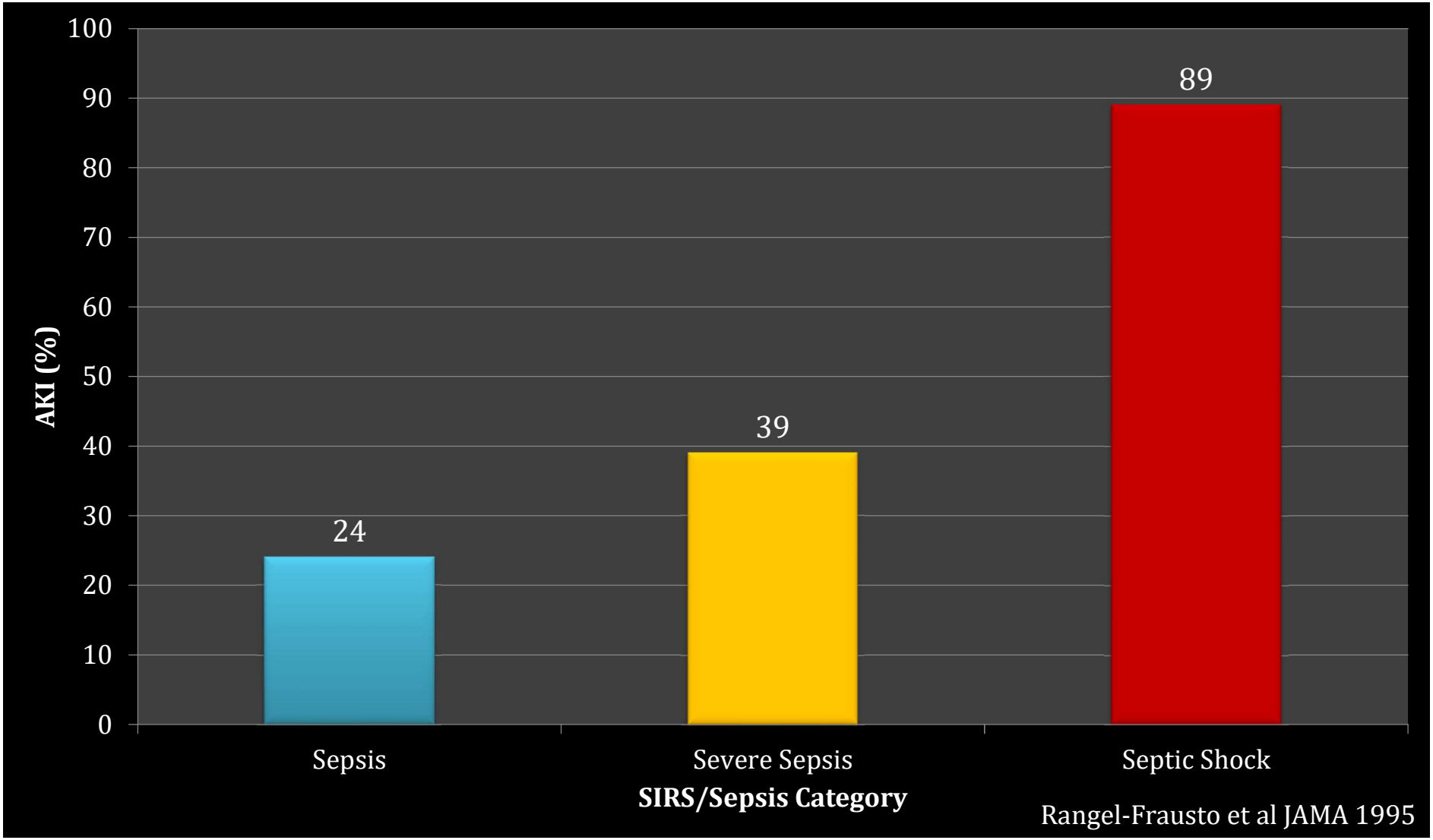
Coronary artery disease
Cardiac remodelling
LVH-Dilatation

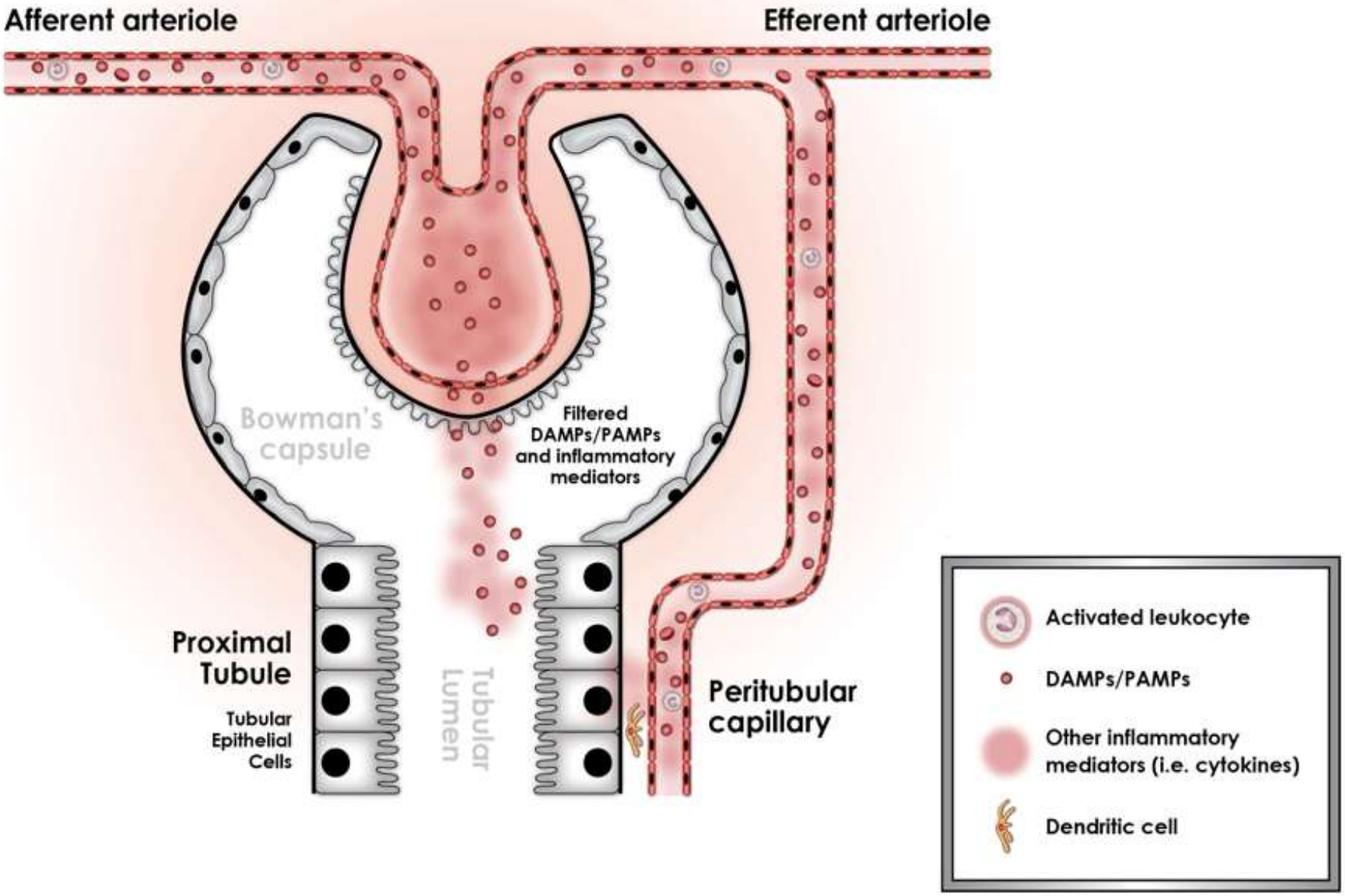
Chronic ischemia
CKD
Fibrosis-sclerosis

Cardio-Renal Syndrome (Type 5)

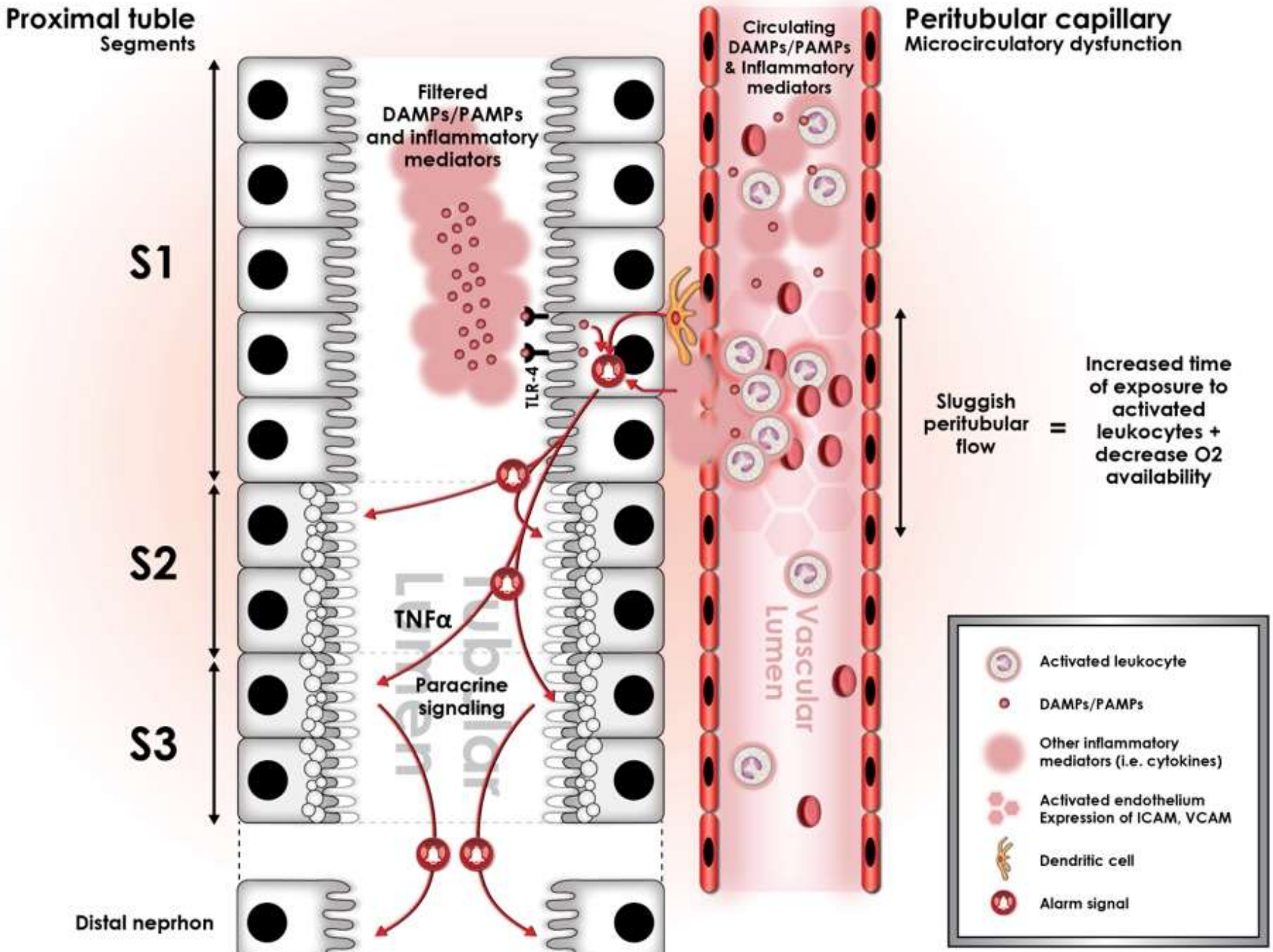


Incidence: AKI in Sepsis





Gomez et al. SHOCK, Vol. 41, No. 1, pp. 3Y11, 2014



Gomez et al. SHOCK, Vol. 41, No. 1, pp. 3Y11, 2014

Epidemiology: AKI

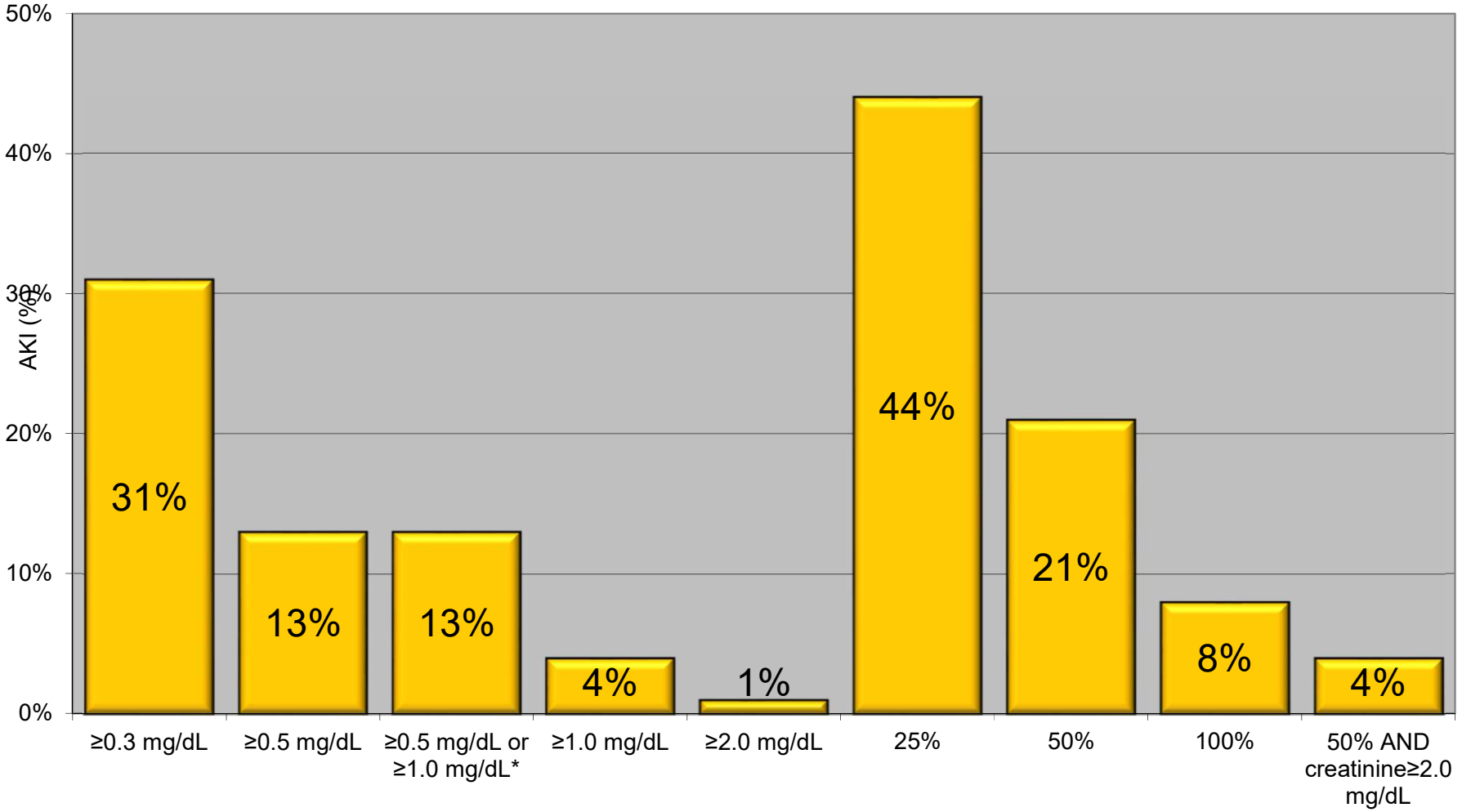
- Incidence varies greatly according to
  - specific population studied
  - definition used

- Incidence: 5-7% hospitalised patients
  - Albright RC: Acute renal failure: a practical update. Mayo Clin Proc 76: 67-74, 2001
  - Hou SH, Bushinsky DA, Wish JB, et al: Hospital acquired renal insufficiency: a prospective study. Am J Med 74: 243-248, 1983
  - Nash K, Hafeez A, Hou, S: Hospital-acquired renal insufficiency. Am J Kidney Dis 39: 930-936, 2002

- Incidence: 1-25% ICU patients
  - De Mendonca A, Vincent J-L, Suter PM, et al: Acute renal failure in the ICU: Risk factors and outcome evaluated by the SOFA score. Intensive Care Med 26: 915-921, 2000
  - Chertow GM, Levy EM, Hammermeister KE, Grover F, Daley J: Independent association between acute renal failure and mortality following cardiac surgery. Am J Med 104: 343-348, 1998

Incidence of AKI

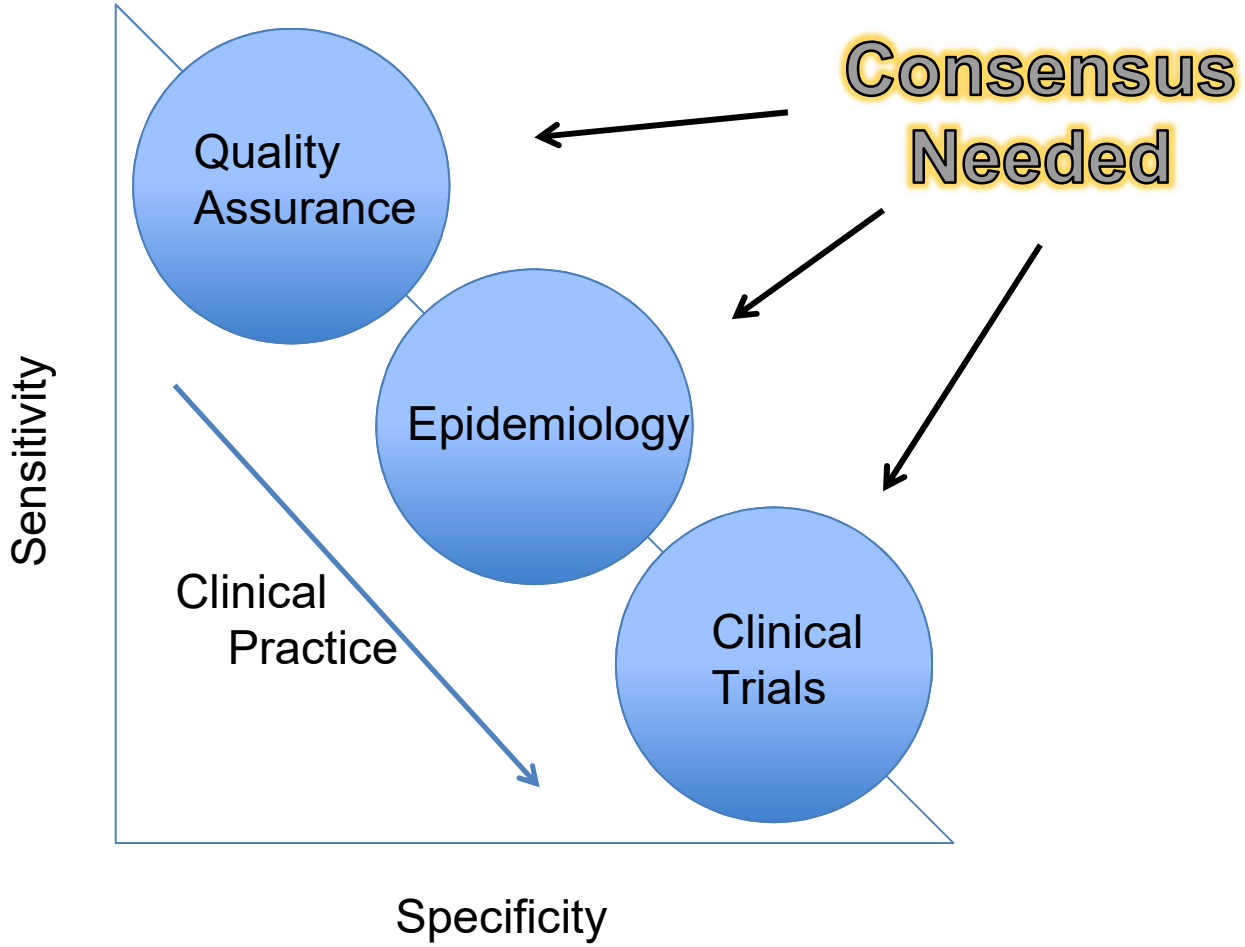
(Definition/Reporting Issues)



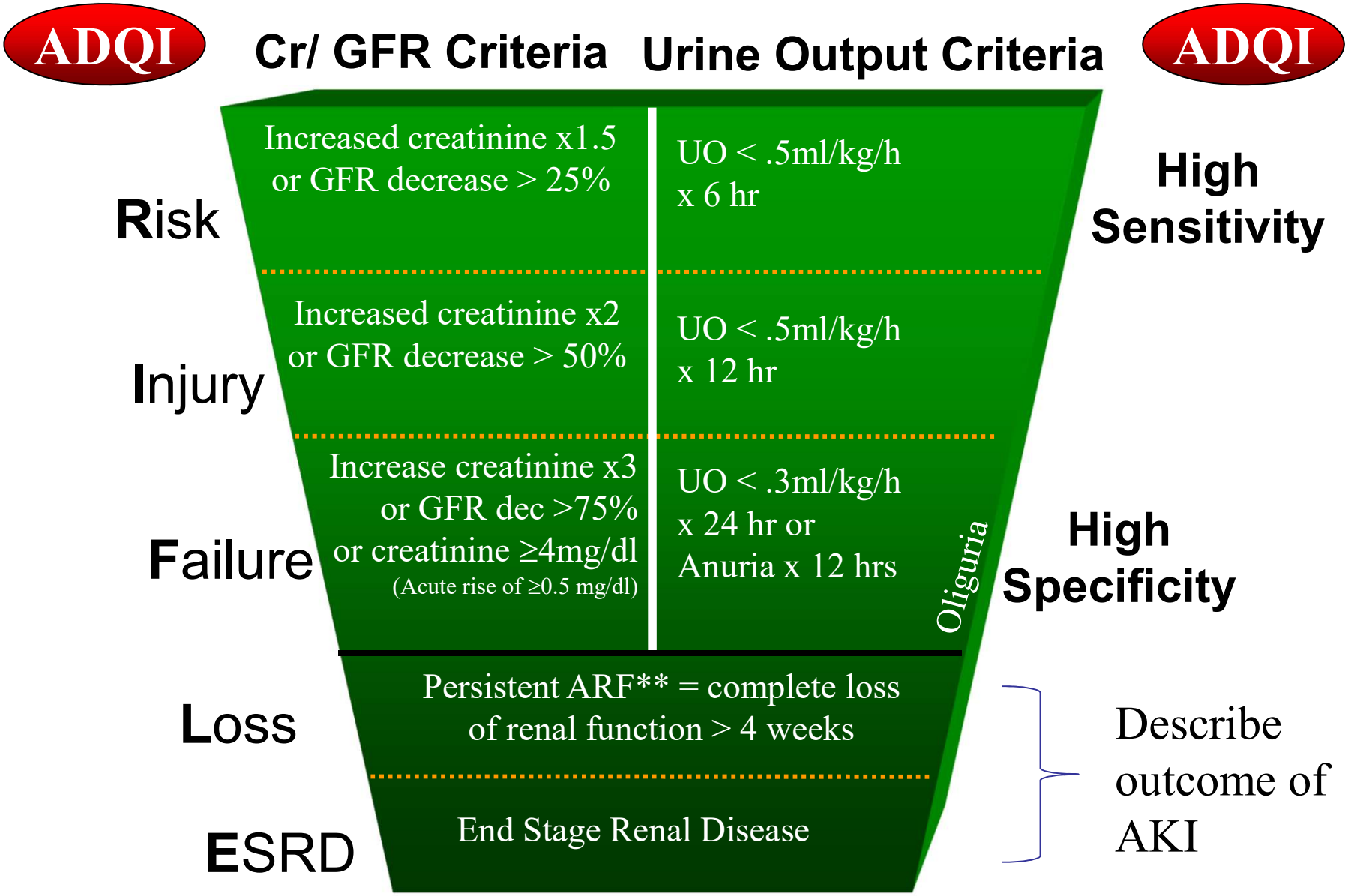
Over 30 definitions of AKI/ ARF exist in the literature

1. Creat Δ 0.1 mg/dL
2. Creat increase >0.5 mg/dL
3. Creat>= 0.5 mg/dL
4. Creat >= 1.7 mg/dL
5. Creat >= 1.5 mg/dL
6. Creat >= 2 mg/dL
7. Creat>= 2.1 mg/dL and x 2
8. Creat >= 177µmol/L Δ>62µmol/L
9. Creat > 200µmol/L (2.36 mg/dL)
10. Creat> 3.2 mg/dL or x 2
11. Creat>5 mg/dL or K > 5.5
12. RIFLE
13. Creat increase >= 25%
14. Creat increase >= 50%
15. Creat increase >= 100%
16. ΔCr72h >0µmol/L
17. ΔCr72h >25µmol/L
18. ΔCr72h >44µmol/L
19. ΔCr72h >50µmol/L
20. ΔCr72h >100µmol/L
21. Cockcroft-Gault Cr Cl < 30 mL/min
22. Cockcroft-Gault Cr Cl 30–60 mL/min
23. ΔCockcroft-Gault72hr <0%
24. ΔCockcroft-Gault72hr <-15%
25. ΔCockcroft-Gault72hr <-25%
26. ΔCockcroft-Gault72hr <-50%
27. MDRD: 50% change in GFR
28. UO <100 q 8hr
29. U α1-microglob
30. U β2- microglobulin
31. U N-acetyl- β-D-glucosaminidase
32. U gluthation transferase-π
33. U gluthation transferase- α
34. NGAL
35. RRT
36. ….

Application of AKI Definitions



RIFLE Criteria for Acute Kidney Injury

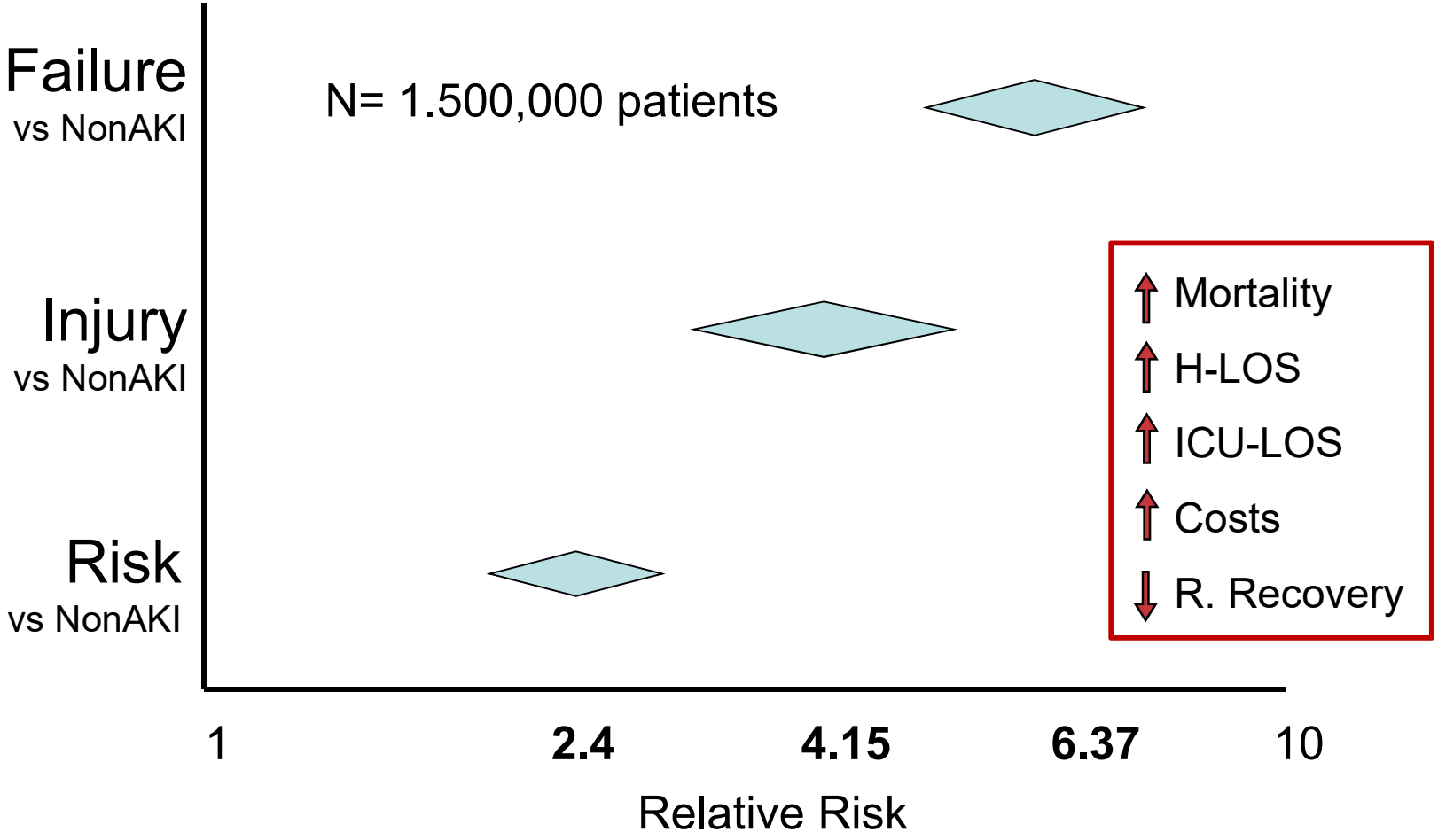


The RIFLE criteria and mortality in acute kidney injury: A systematic review

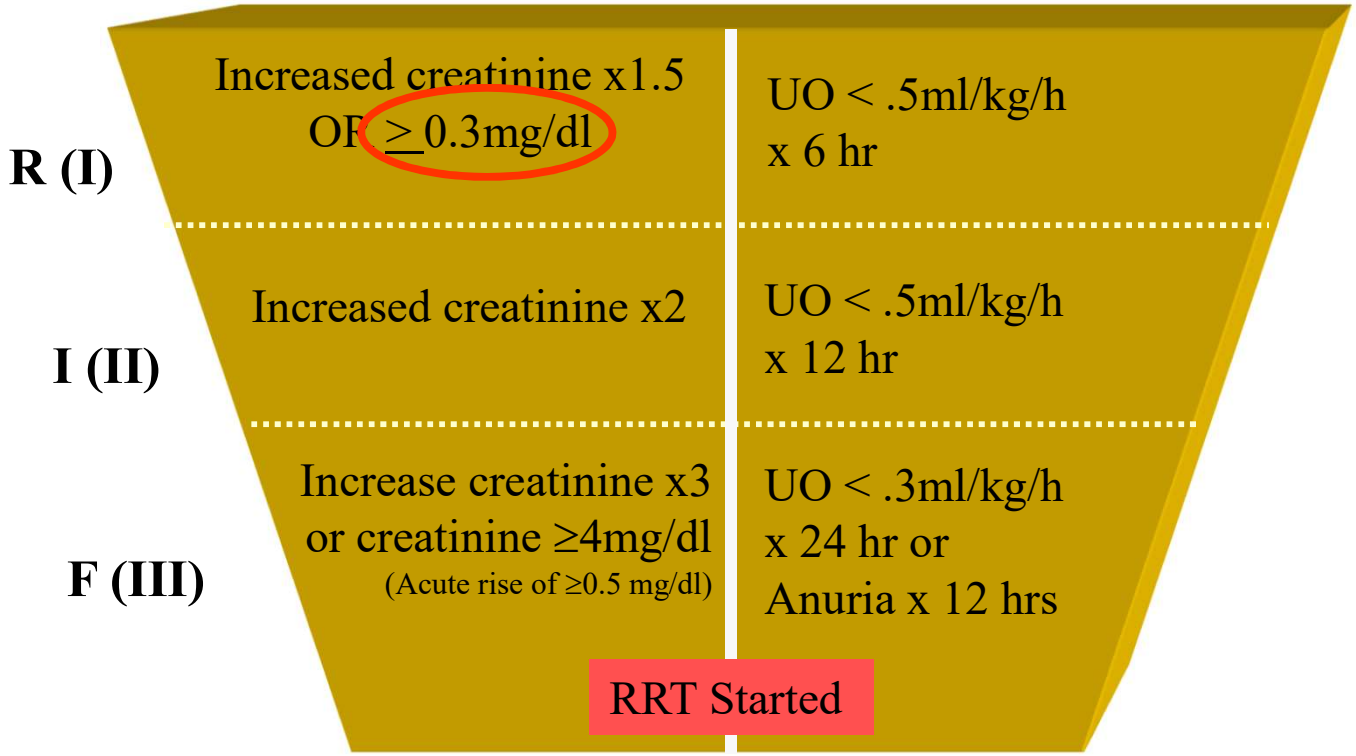
Z Ricci[1], D Cruz[2,3] and C Ronco[2,3]

[1]Department of Pediatric Cardiosurgery, Bambino Gesù Hospital, Rome, Italy; [2]Department of Nephrology, Dialysis and Transplantation, S Bortolo Hospital, Vicenza, Italy and [3]International Renal Research Institute Vicenza (IRRIV), Vicenza, Italy

Increase in All-Cause Mortality with worse RIFLE Class



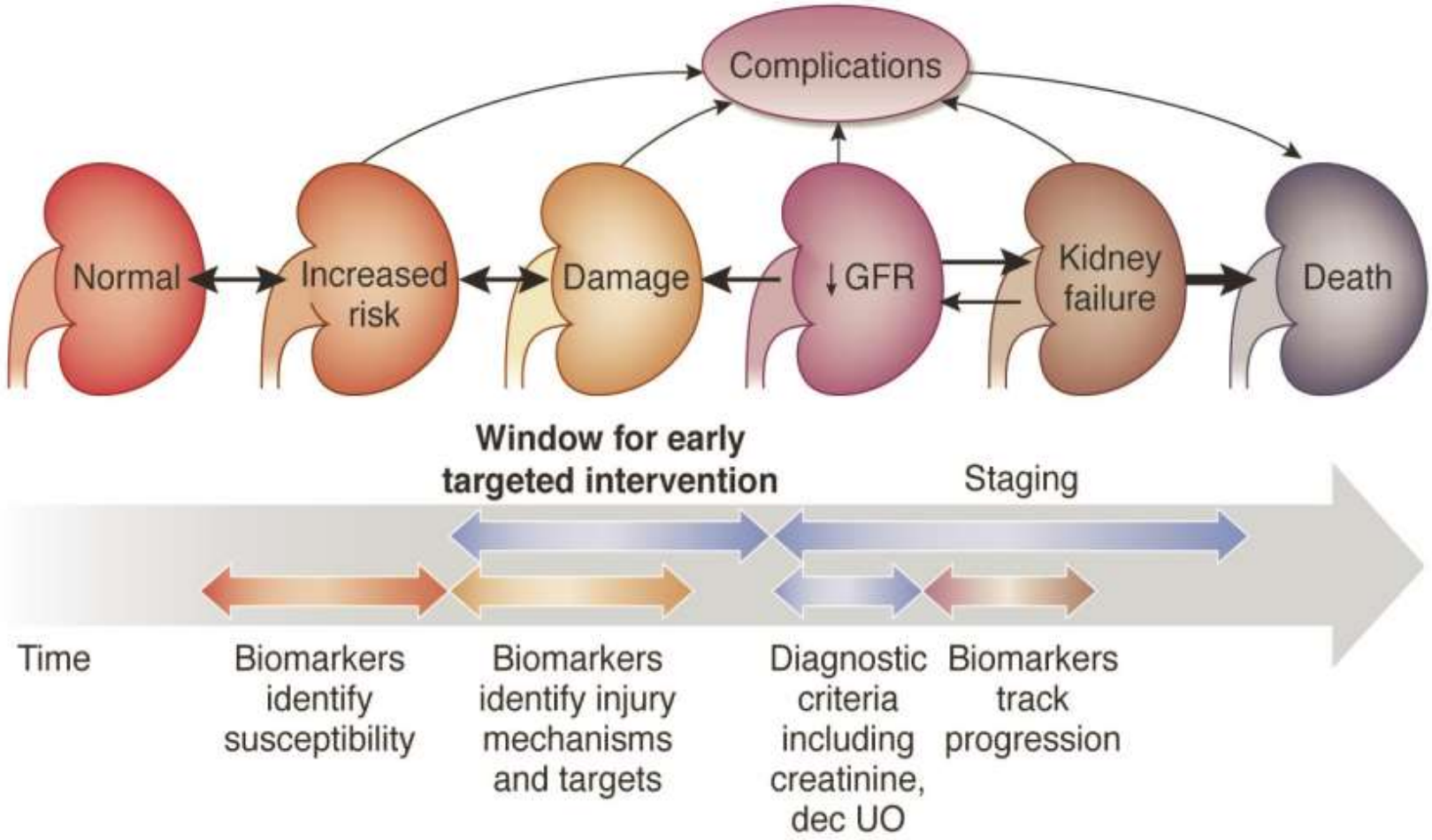
AKIN



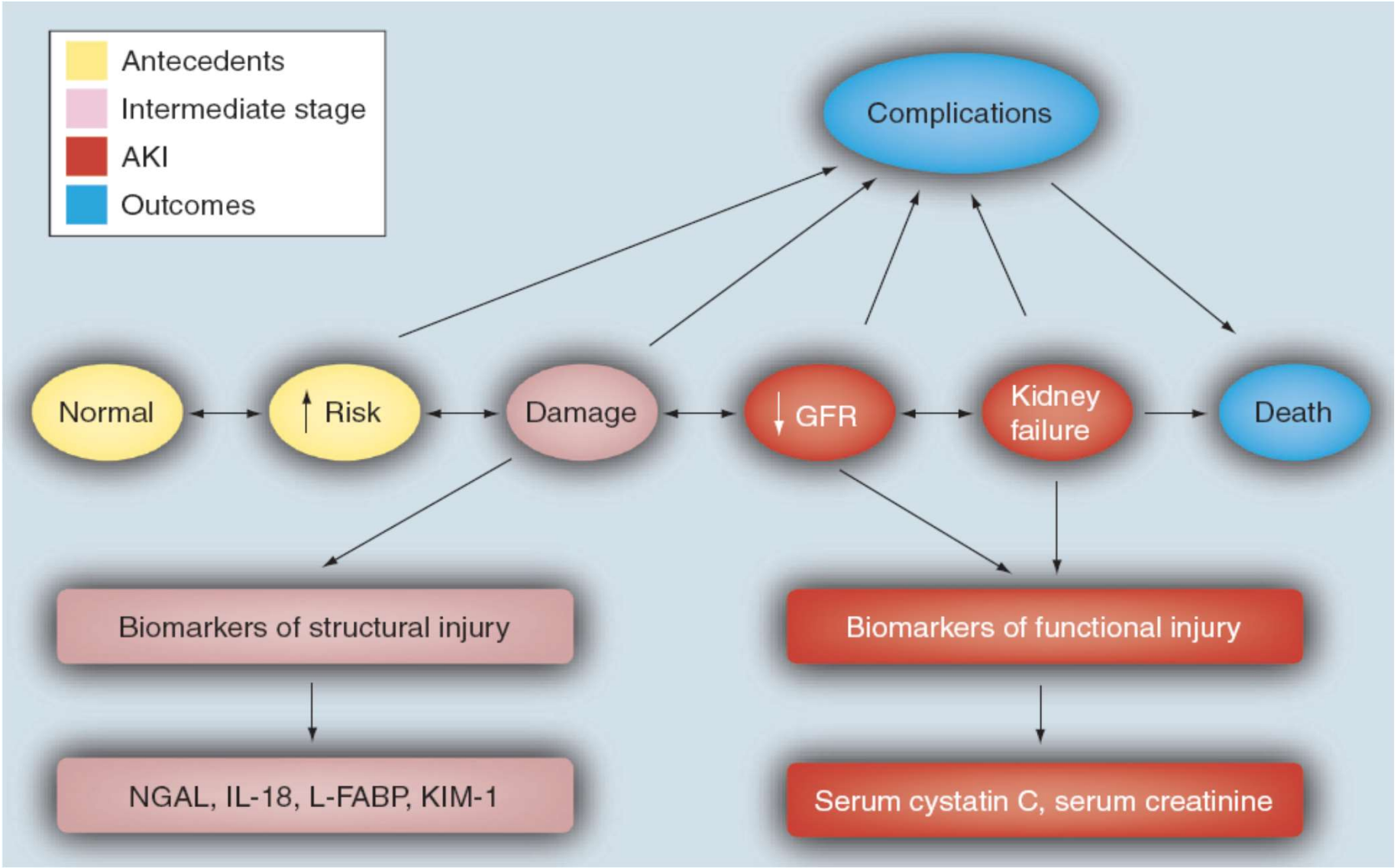
- GFR criteria removed
- RRT = Stage 3
- AKI diagnosis based on 2 creatinine levels within 48 hr period

Acute Dialysis Quality Initiative

Consensus Conference on Acute Kidney Injury Biomarkers

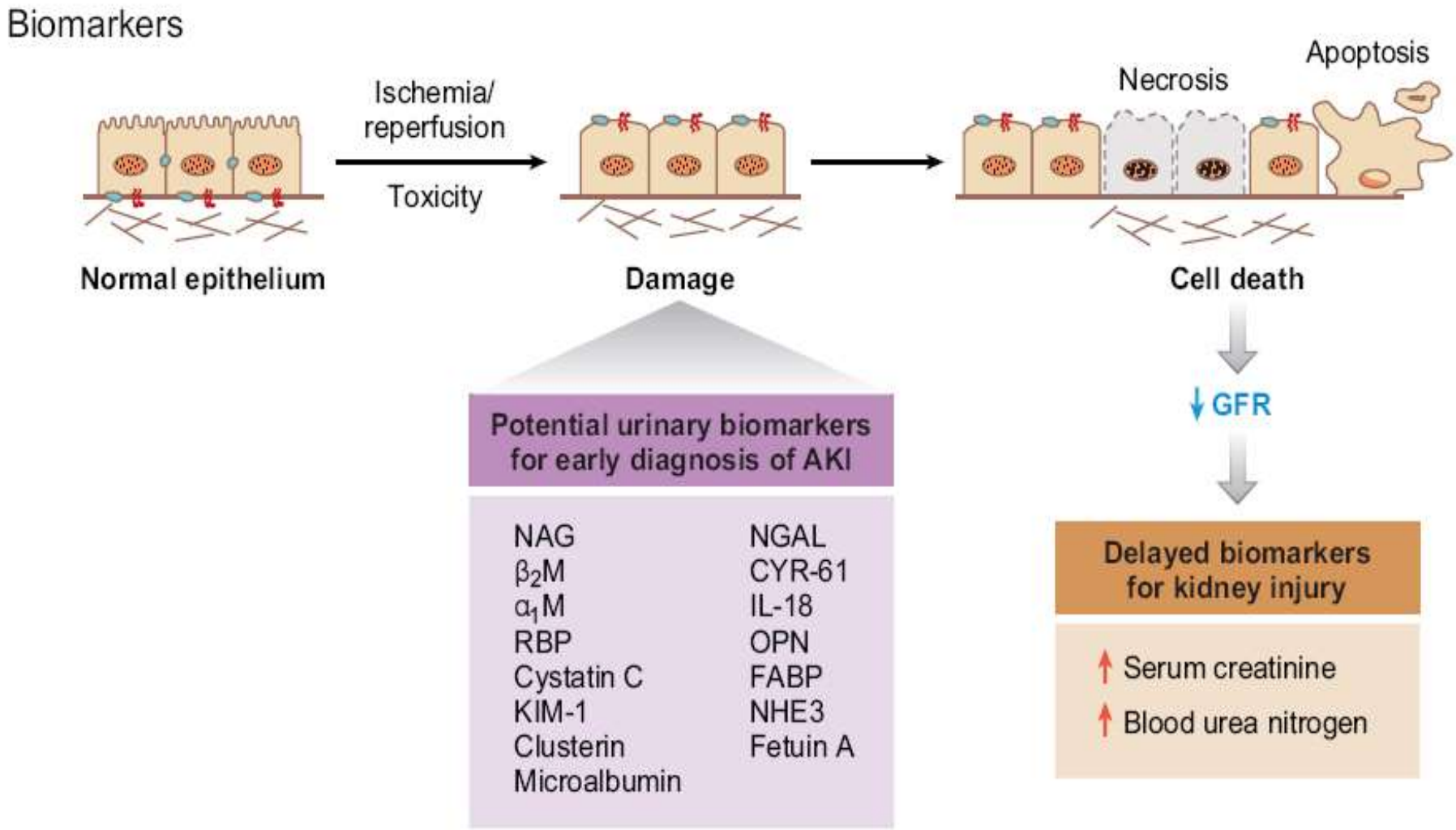


Clinical Continuum of AKI



Devarajan, Biomarkers Med 4:265-80, 2010

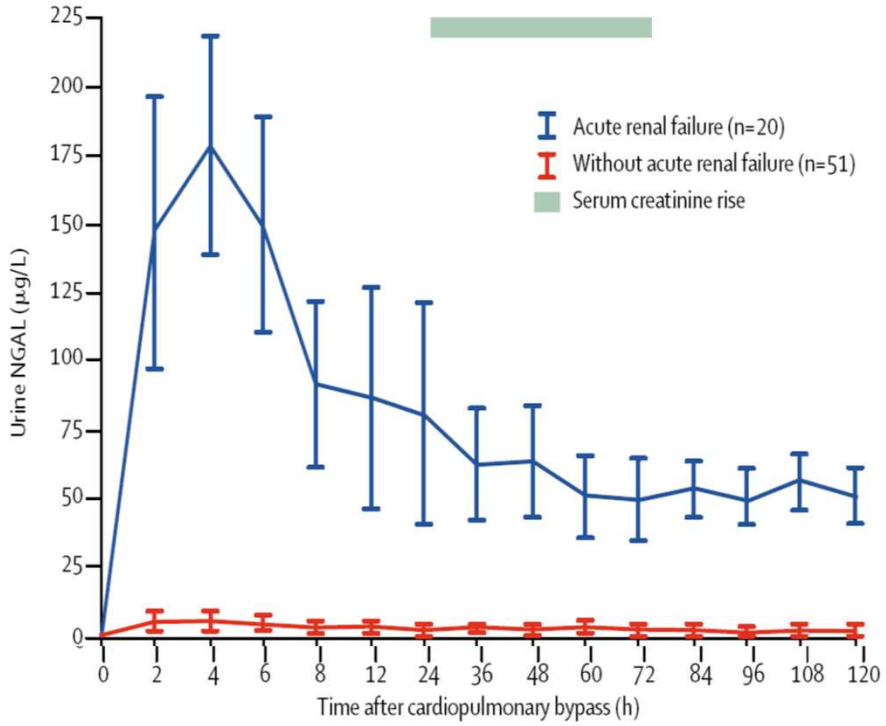
Structural VS Functional Biomarkers

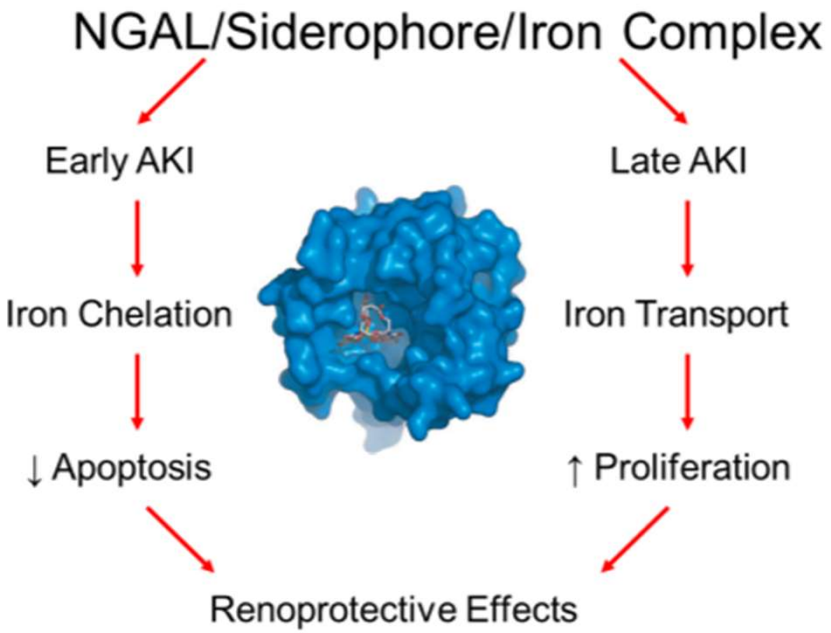


Neutrophil gelatinase-associated lipocalin (NGAL) as a biomarker for acute renal injury after cardiac surgery

Jaya Mishra, Catherine Dent*, Ridwan Tarabishi*, Mark M Mitsnefes, Qing Ma, Caitlin Kelly, Stacey M Ruff, Kamyar Zahedi, Mingyuan Shao, Judy Bean, Kiyoshi Mori, Jonathan Barasch, Prasad Devarajan*

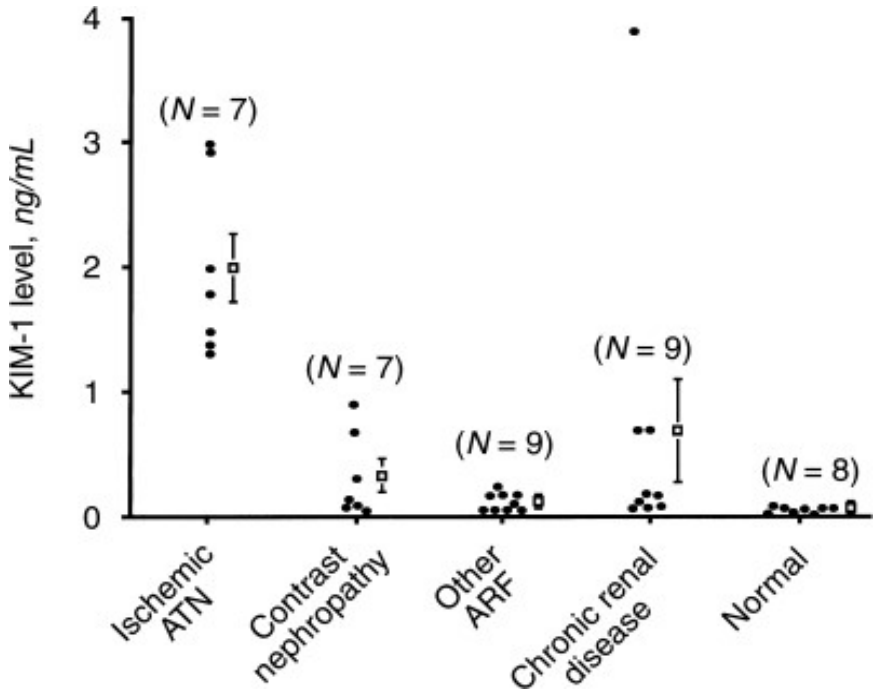
71 children undergoing cardiopulmonary bypass surgery

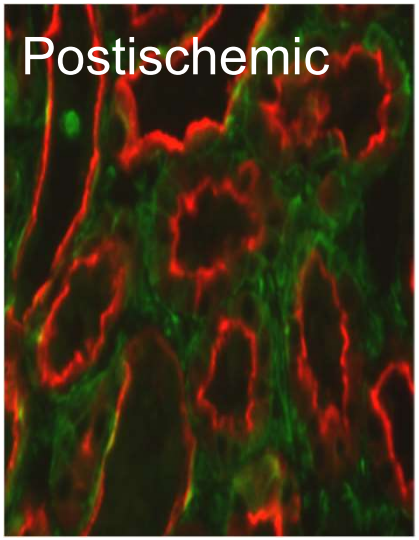


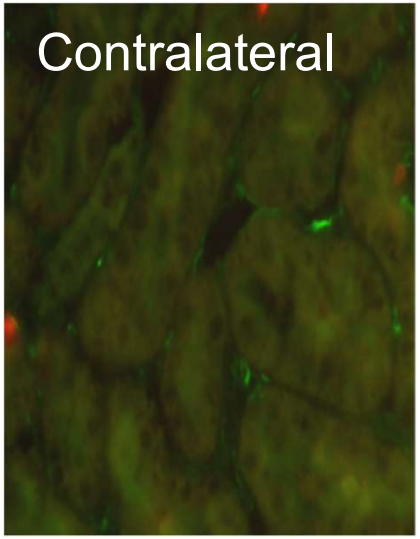


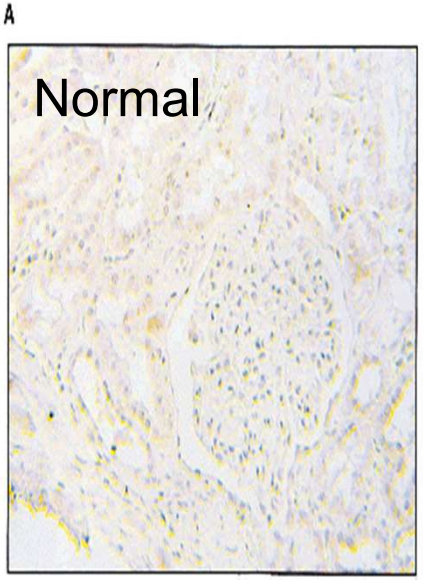
Urine KIM-1

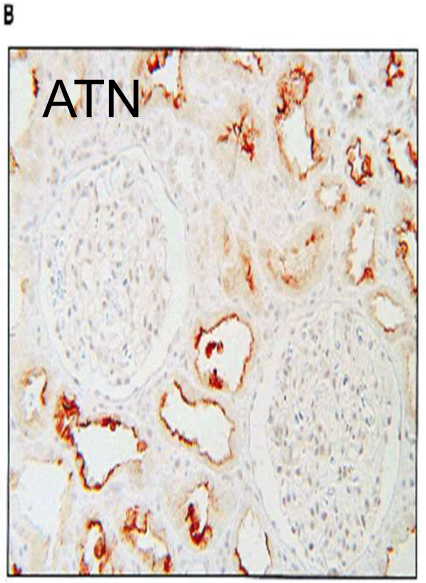
Urinary KIM-1 concentration is significantly higher in patients with ischemic ATN compared to other forms of AKI or CKD. KIM-1 is expressed in ischemic tubuli

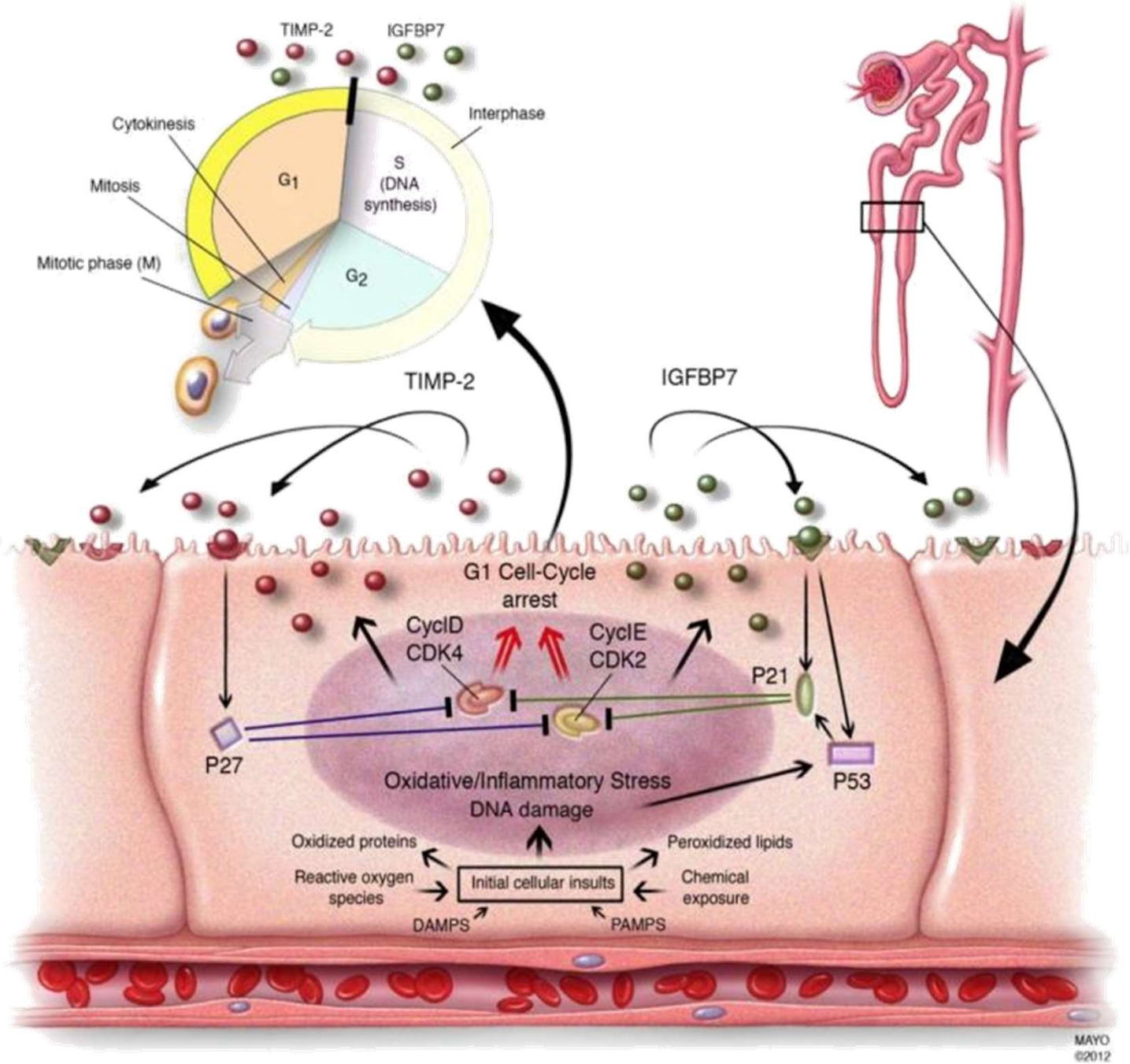




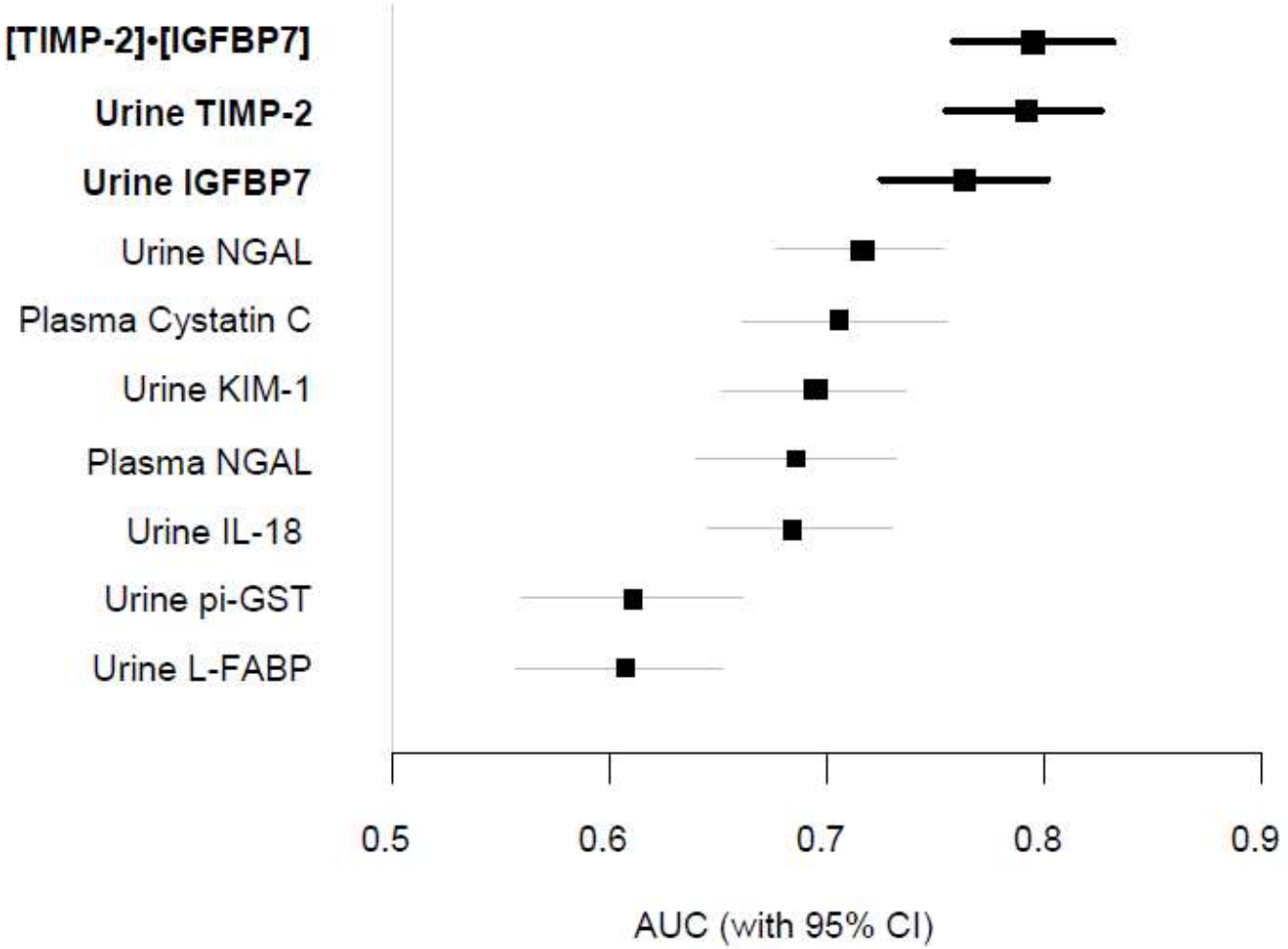




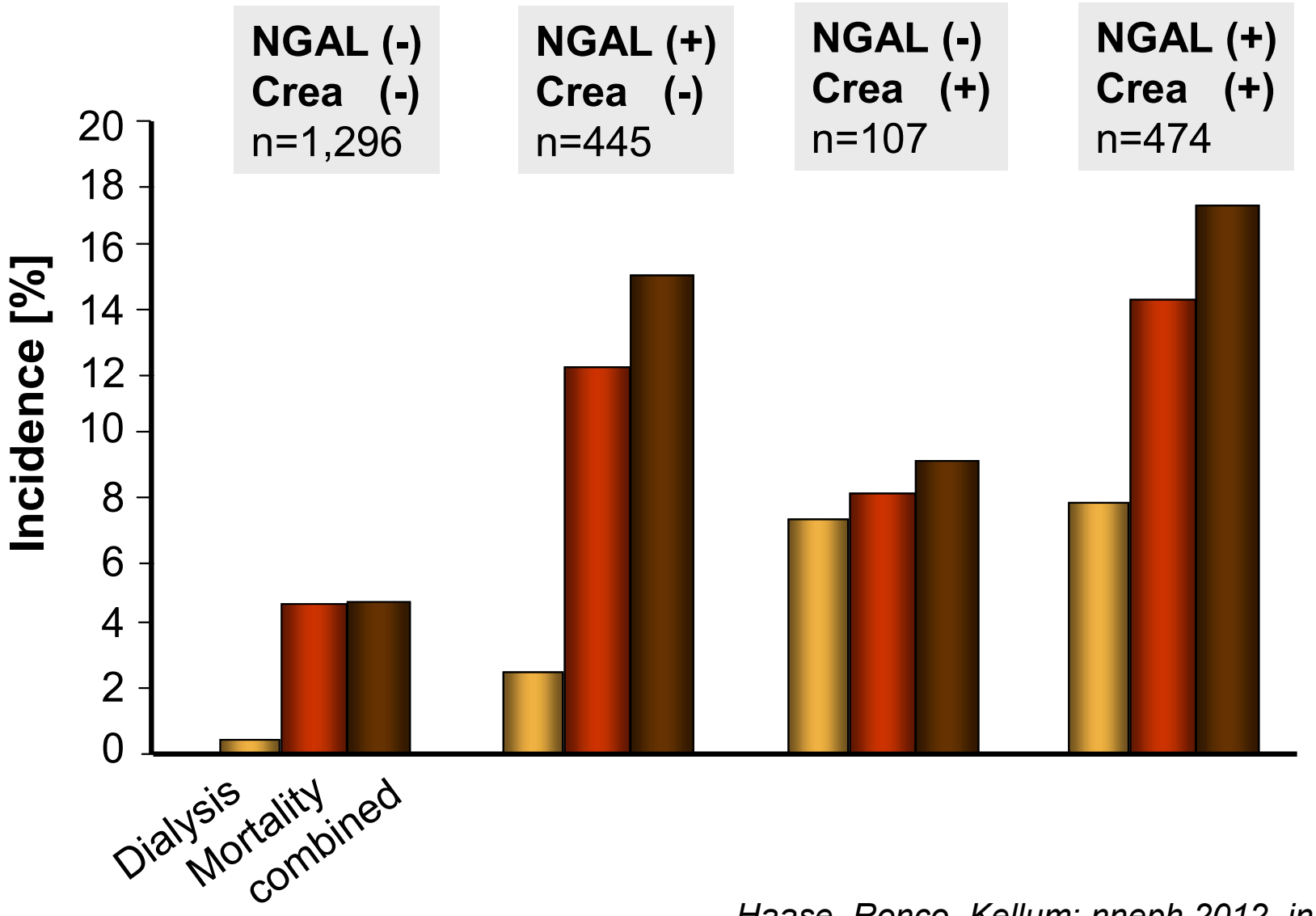



TIMP-2
IGFBP7
Interphase
Cytokinesis
Mitosis
Mitotic phase (M)
G1
S (DNA synthesis)
G2
TIMP-2
IGFBP7
G1 Cell-Cycle arrest
CyclD CDK4
CyclE CDK2
P21
P27
P53
Oxidative/Inflammatory Stress DNA damage
Oxidized proteins
Peroxidized lipids
Reactive oxygen species
Initial cellular insults
Chemical exposure
DAMPS
PAMPS
MAYO ©2012

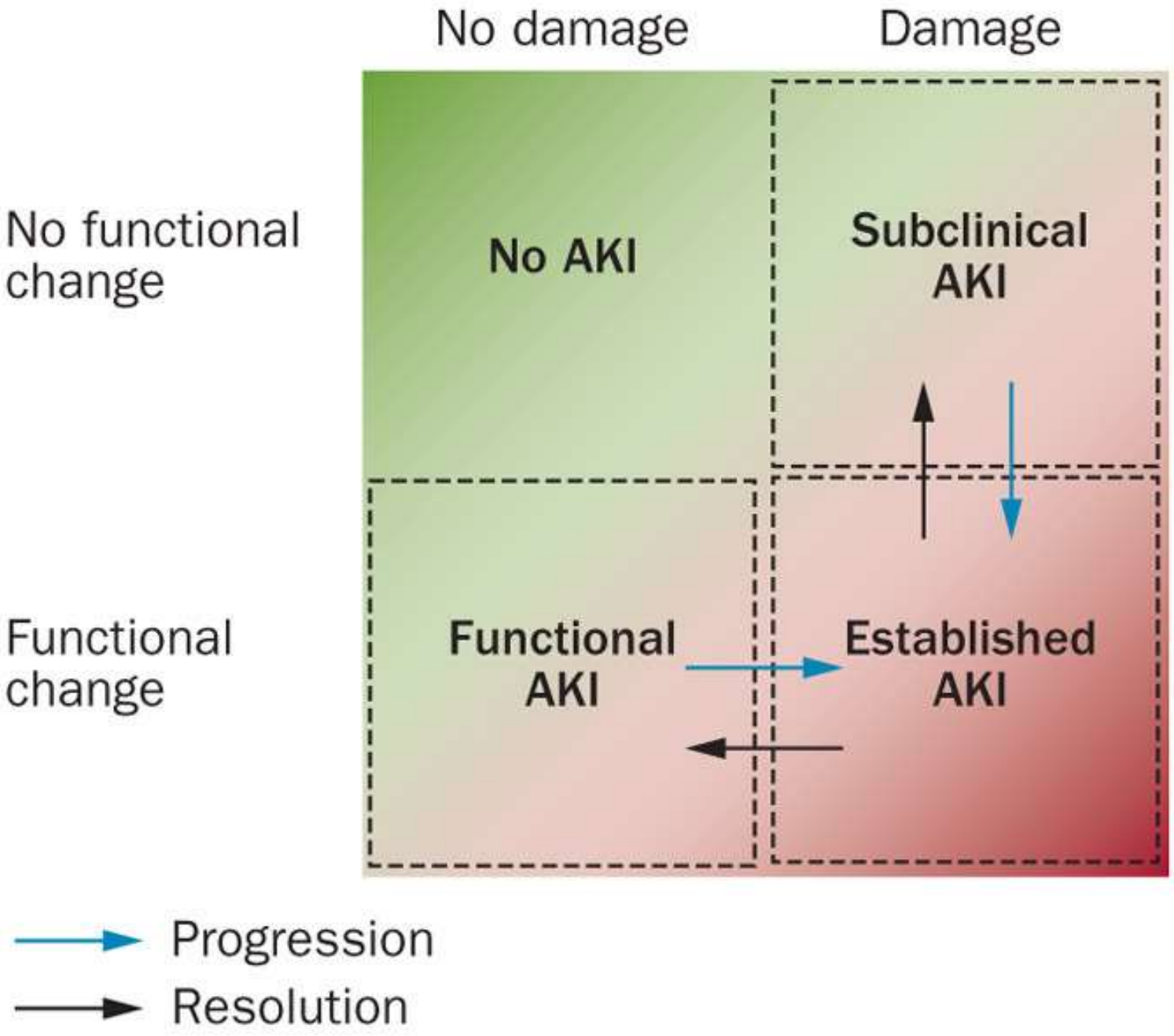
Cell Cycle Arrest Biomarkers
(*Sapphyre Study*)



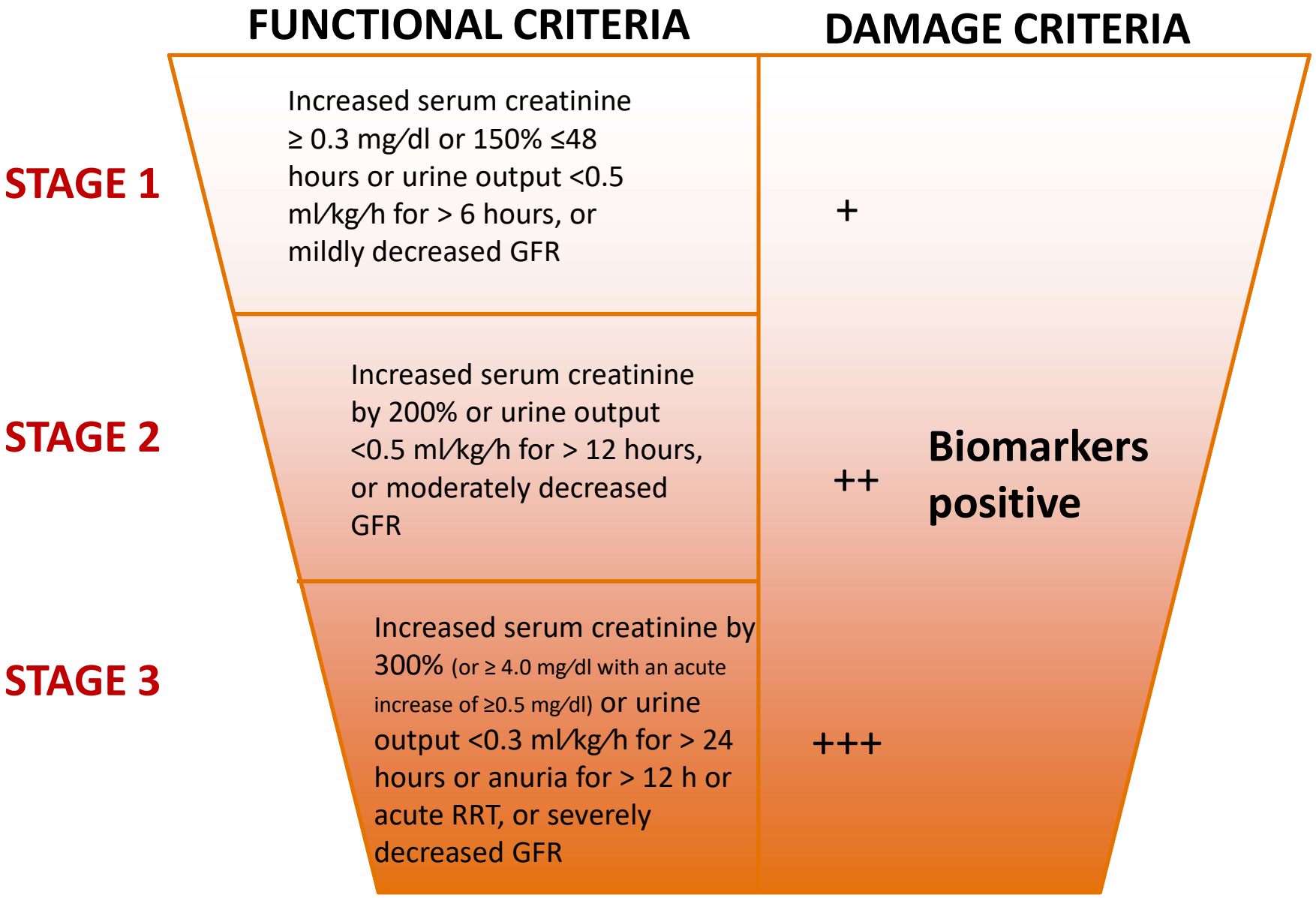
AKI outcomes



Haase, Ronco, Kellum: nneph 2012, in press


No damage
Damage
No functional change
Functional change
No AKI
Subclinical AKI
Functional AKI
Established AKI
Progression
Resolution

New ADQI diagnostic criteria for AKI

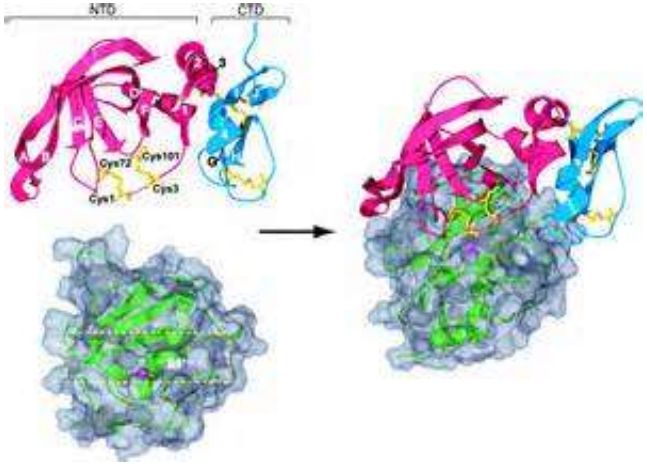


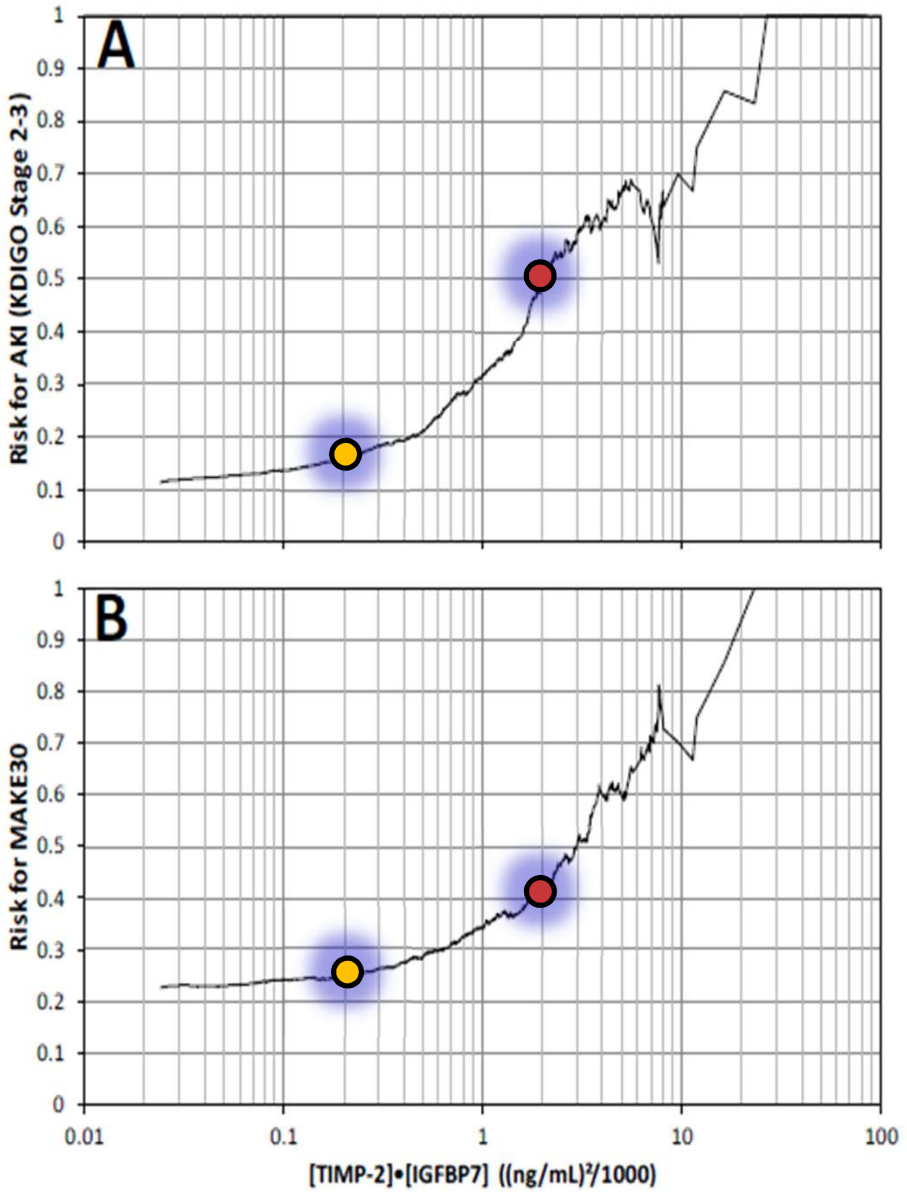
NGAL Score in CSa-AKI

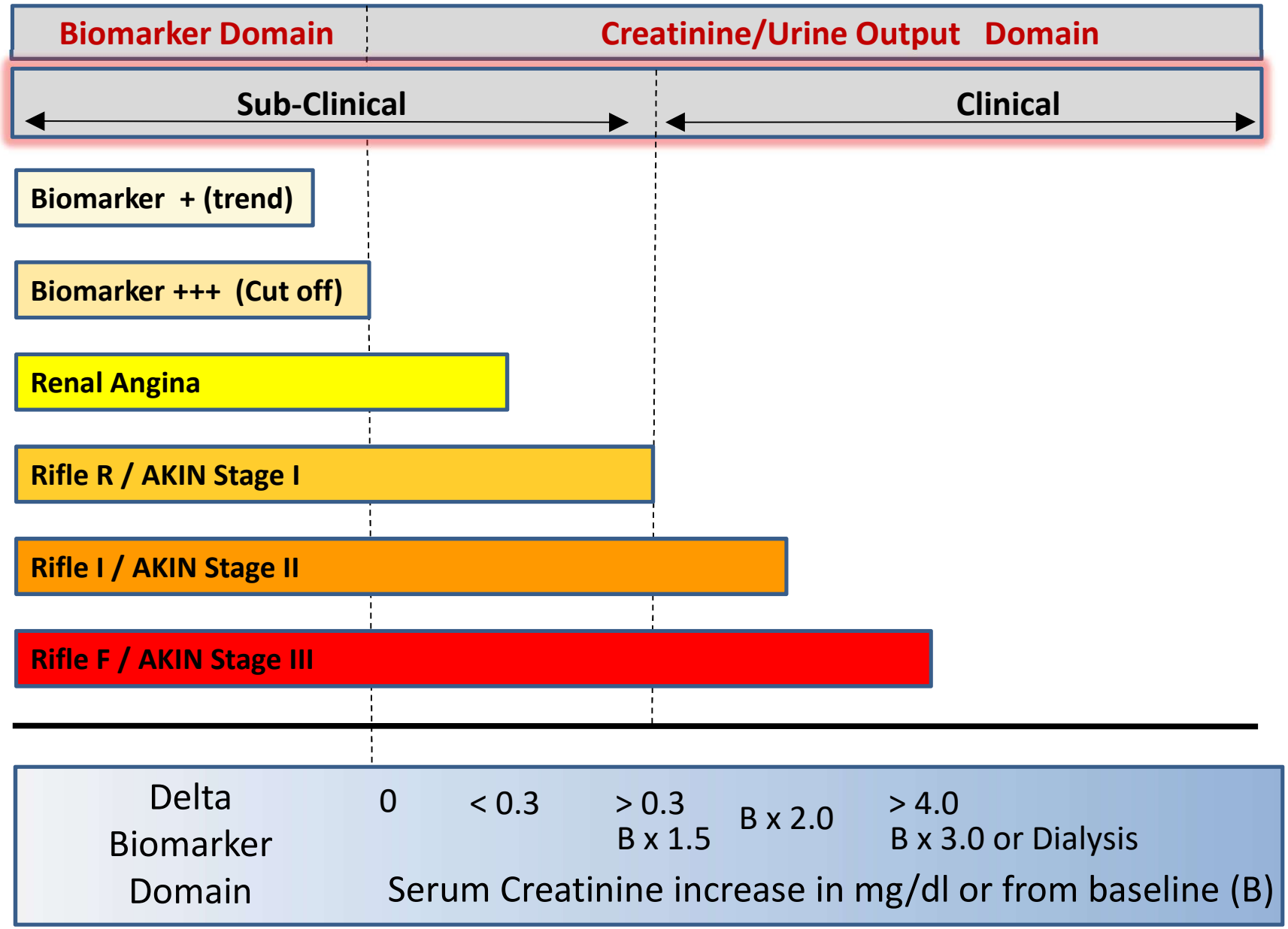
Cardiac surgery associated (CSA) acute kidney tubular damage - $NGAL_{CSA}$ Score

Concentration Sample	[ng/mL]		Delta (Δ) NGAL at following measurement	$NGAL_{CSA}$ Score	
uNGAL	<50			0	Tubular damage unlikely
pNGAL	<100				
uNGAL	50 - <150			1	Tubular damage possible
pNGAL	100 - <200				
uNGAL	150 - <1000	or	Δ > 100 + second value ≥ 125	2	Tubular damage
pNGAL	200 - <1000	or	Δ > 100 + second value ≥ 150		
uNGAL	>1000			3	Severe tubular damage
pNGAL					

Nephrocheck Quantum Thresholds






Biomarker Domain
Creatinine/Urine Output Domain
Sub-Clinical
Clinical
Biomarker + (trend)
Biomarker +++ (Cut off)
Renal Angina
Rifle R / AKIN Stage I
Rifle I / AKIN Stage II
Rifle F / AKIN Stage III
Delta Biomarker Domain
0
< 0.3
> 0.3
B x 1.5
B x 2.0
> 4.0
B x 3.0 or Dialysis
Serum Creatinine increase in mg/dl or from baseline (B)

Diagnosis and Biomarkers

- Acute Kidney Injury is a severe condition that may significantly worsen patients clinical outcomes.

- Its incidence depends on definition and diagnostic criteria utilized

- Kidney damage and kidney dysfunction may coexist or represent two separate entities in the clinical syndrome

- New Biomarkers may contribute to discriminate between acute injury and acute dysfunction and to uncover conditions of subclinical AKI

- Because……

Ronco *et al. Critical Care* 2012, 16:N
http://ccforum.com/content/16/X/N

CRITICAL CARE

VIEWPOINT

Subclinical AKI is still AKI

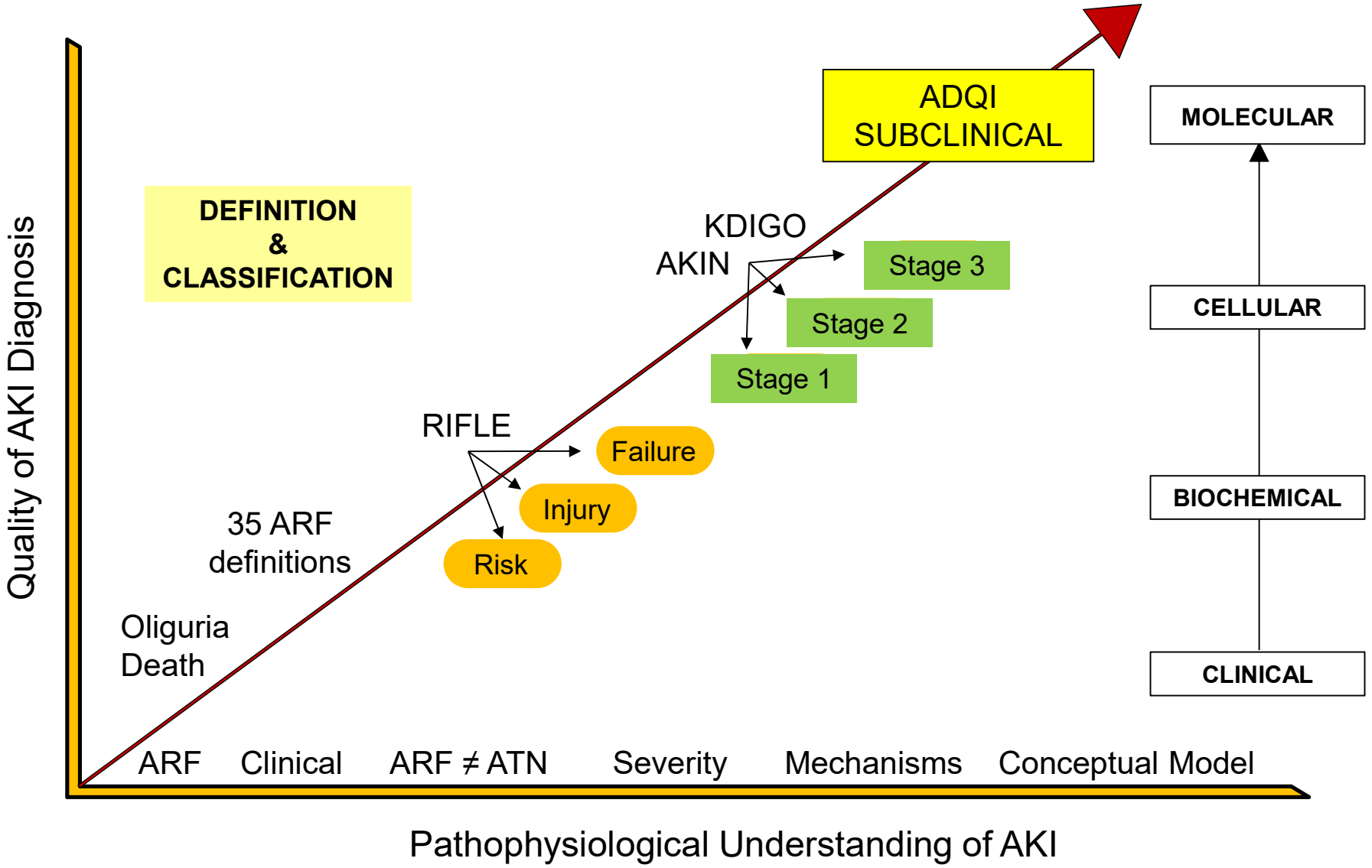
Claudio Ronco*[1], John A Kellum[2] and Michael Haase[3]

Abstract

The concept of acute kidney syndromes has shifted in recent years from acute renal failure to acute kidney injury (AKI). AKI implies injury or damage but not necessarily dysfunction. The human kidney has an important glomerular function reserve, and dysfunction becomes evident only when more than 50% of the renal mass is compromised. Recent AKI classifications include even slight changes in serum creatinine, acknowledging that this condition is associated with worse outcomes. This, however, still represents a functional criterion for AKI and implies a glomerular filtration rate alteration that may be a late phenomenon in the time course of the syndrome. An early diagnosis of AKI by using tubular damage biomarkers preceding filtration function loss is

Many terms have been used to describe acute events occurring to or involving the kidneys, such as acute renal failure, acute kidney diseases, acute kidney syndromes, or acute kidney injury (AKI). Indeed, the spectrum of such disorders has been expanding over the last decades. The diagnosis and management of acute syndromes involving the kidneys has become a multidisciplinary field concerning not only nephrology and urology but also critical care medicine, cardiology, radiology, and other fields. With this evolution, the term acute renal failure, used for many years in clinical practice, has been replaced with the term AKI. The new term implies potentially reversible kidney injury or damage occurring in a time frame of hours or days and characterizing the disorder as 'acute'. Although the term 'injury' would not necessarily encompass kidney dysfunction without damage, the diagnosis of AKI syndrome is still made on

Evolution of AKI Semantics



STEMI **CRIAKI**

NSTEMI **NCRIAKI**

Risk Factors

Anemia
Na + H_2O retention
Uremic solute retention
Ca and Phos abnormalities
Hypertension

Genetic risk factors
Acquired risk factors
low cardiac output (CO)

Increased susceptibility to insults

Chronic hypoperfusion
Apoptosis

Low cardiac output (CO)
Subclinical inflammation
Endothelial dysfunction
Accelerated atherosclerosis

Insult and initiation of kidney damage

Chronic hypoperfusion
Increased renal vascular resistance
Increased venous pressure
Embolism

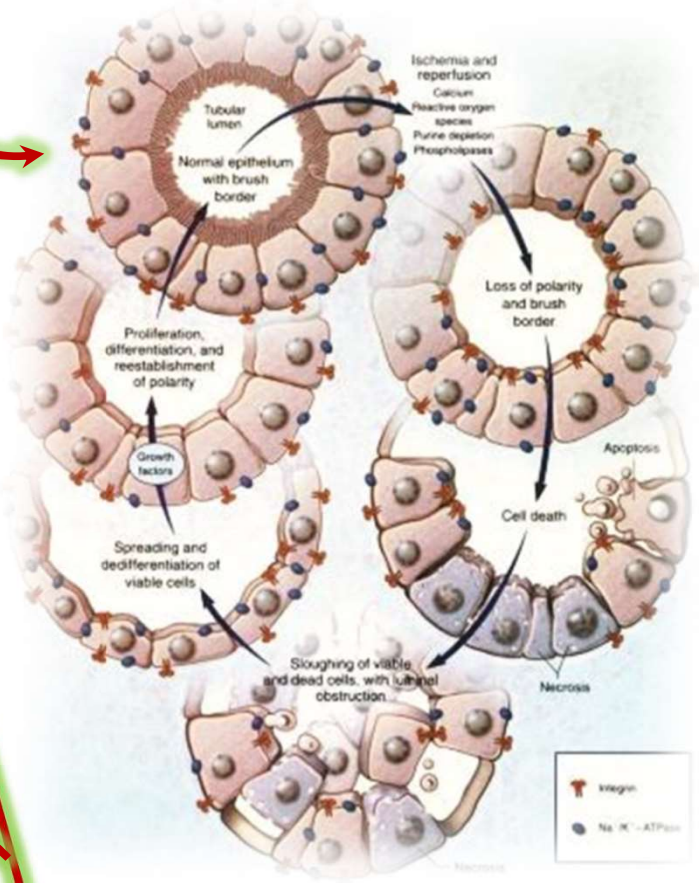
Sclerosis – Fibrosis

Anemia, hypoxia
RAA and sympathetic activation
Na + H_2O retention
Ca and Phos abnormalities
Hypertension, LVH

Anemia
Na + H_2O retention
Uremic solute retention
Ca and Phos abnormalities
Hypertension

Progression of CKD

Kidney Attack



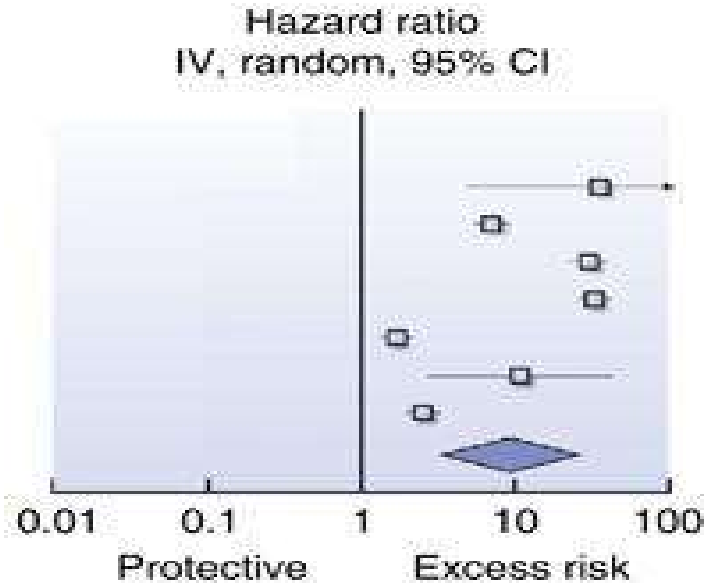
Partial Recovery

Complete Recovery

CKD and ESRD after AKI

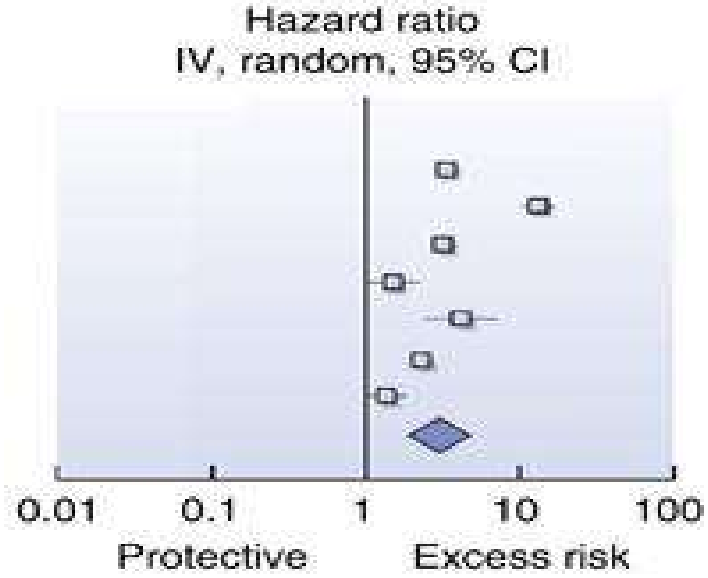
AKI to CKD

HR = 8.8
(95%CI 3.1-25.5)



AKI to ESRD

HR = 3.1
(95%CI 1.9-5.0)



Coca, et al.
Kidney Int 2012

Progression to CKD

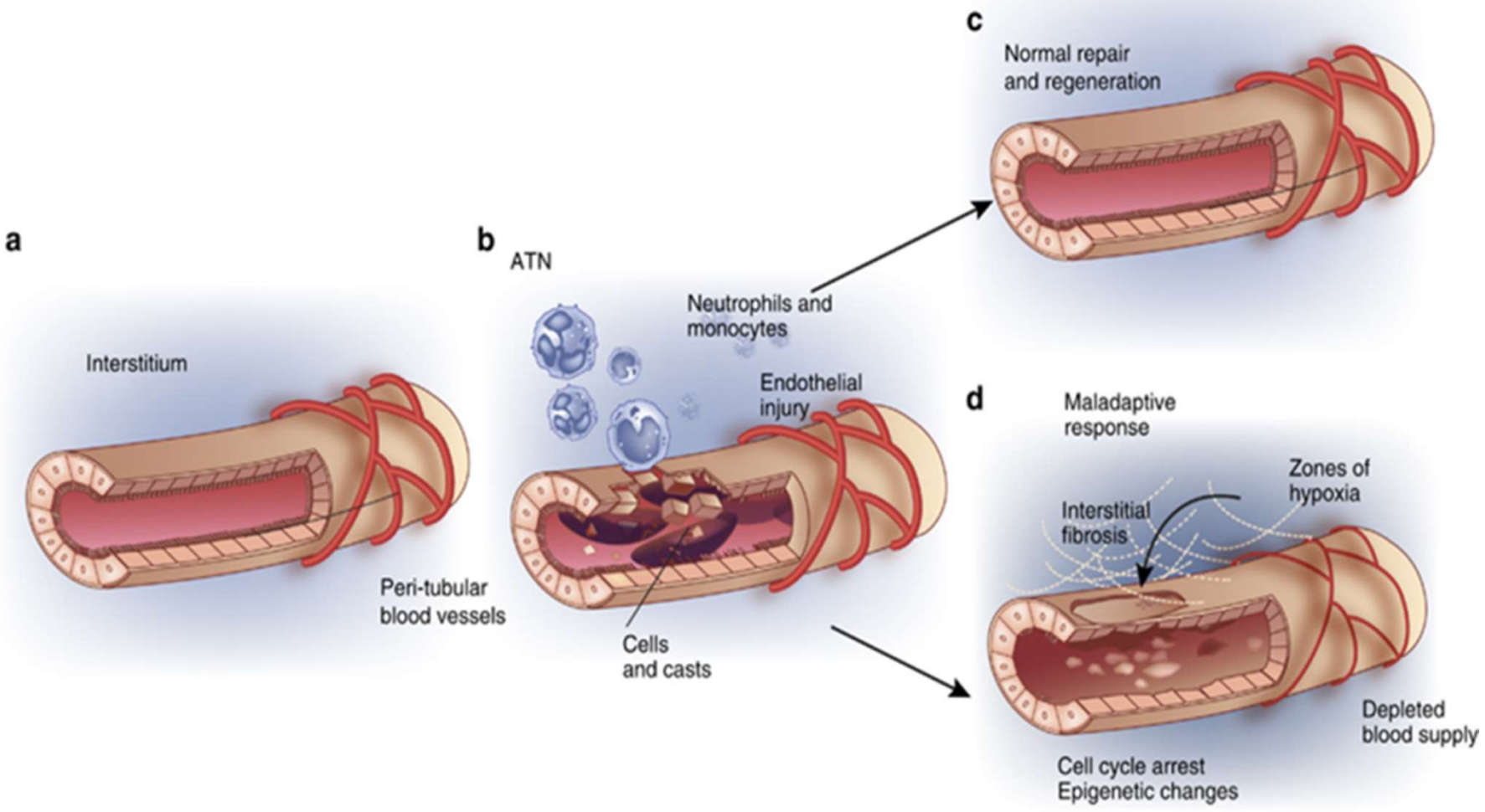
ISSUES

- Definition and characterizations of progression
- Pathophysiological mechanisms of progression
- Biochemical pathways (target for therapies)
- Risk identification and prediction of progression
- Treatment strategies to prevent/limit progression

DEFINTION AND FEATURES

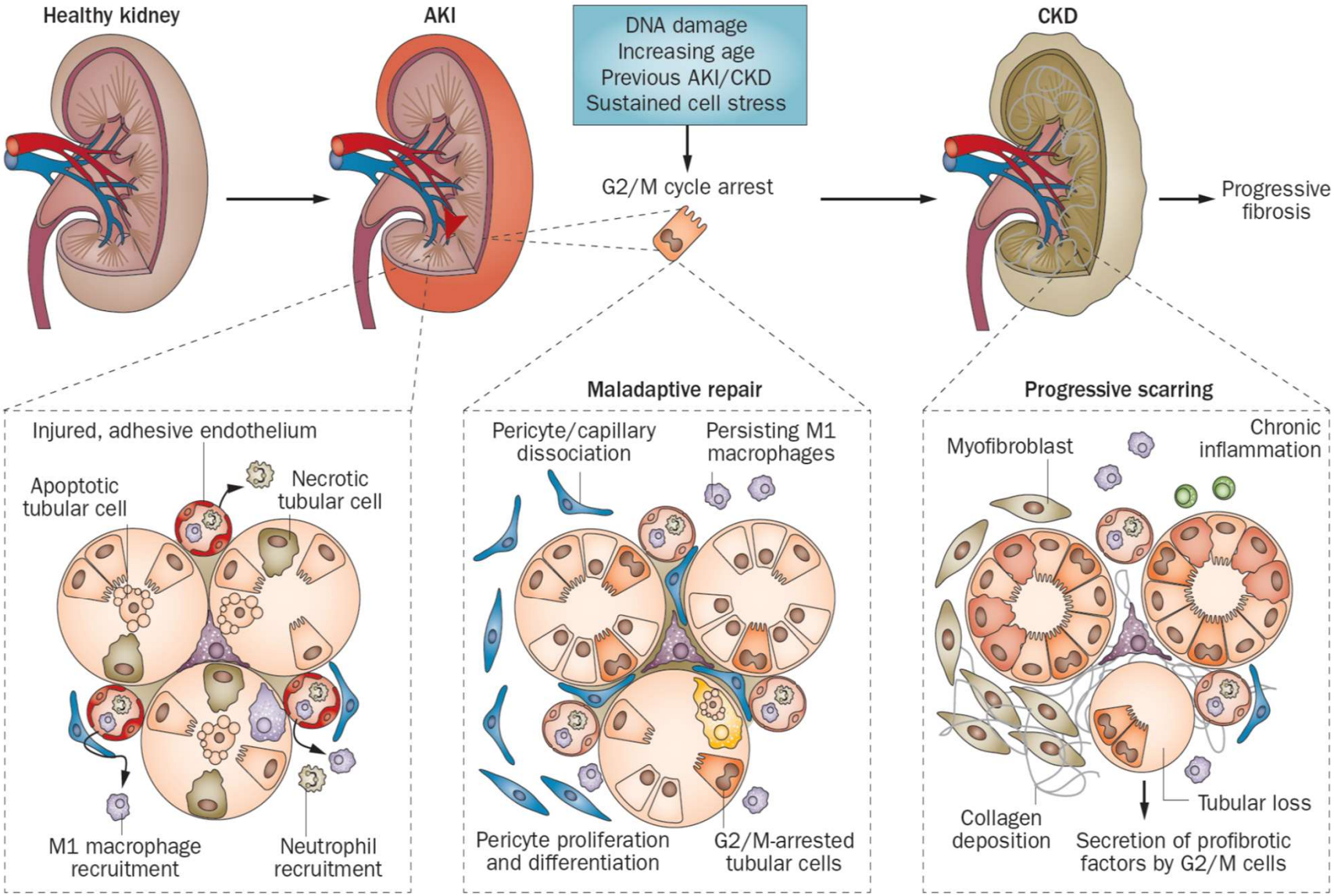
- Repair and Adaptive Repair = Normalization of structure and function within few days up to 90 days
- Maladaptive Repair
  - Loss of renal reserve
  - Abnormal tubular repair
  - Impaired vascular repair
  - Alteration in the interstitial architecture (type and activity of cells).
  - Immunological
  - Biomarker studies*
- Progression = Opposite to Recovery, leads to persistent abnormalities in structure or function, detected by biomarkers, imaging, histopathological patterns.

Why does AKI progress to CKD?



Chawla, Kimmel. Kidney Int 2012

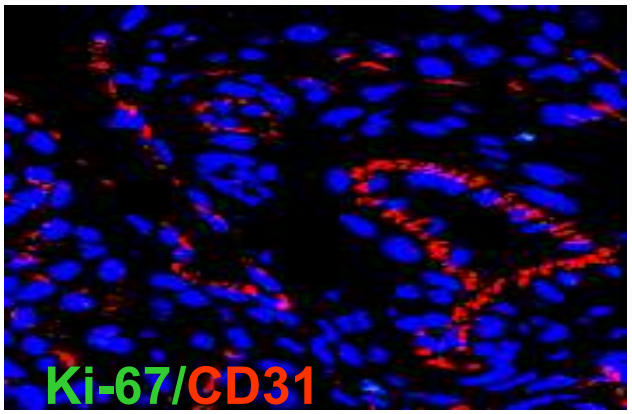
Mechanisms of maladaptive repair after AKI leading to accelerated kidney ageing and CKD

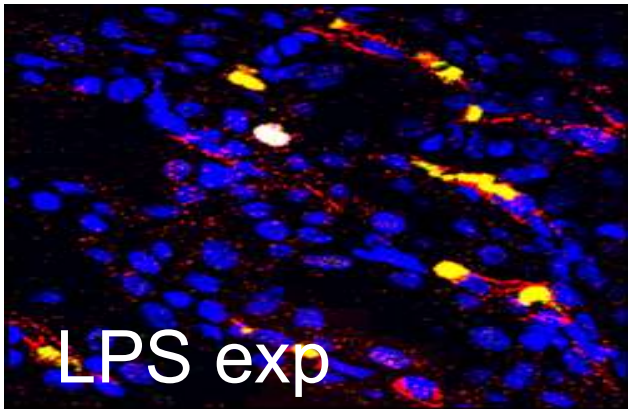


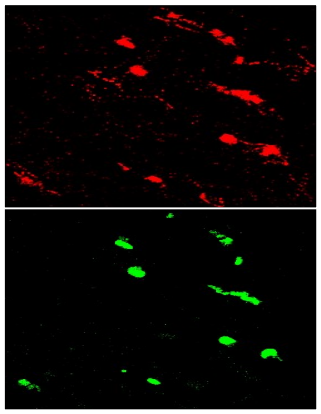
Adapted by Ferenbach et al. Nat Rev Nephrol 2015

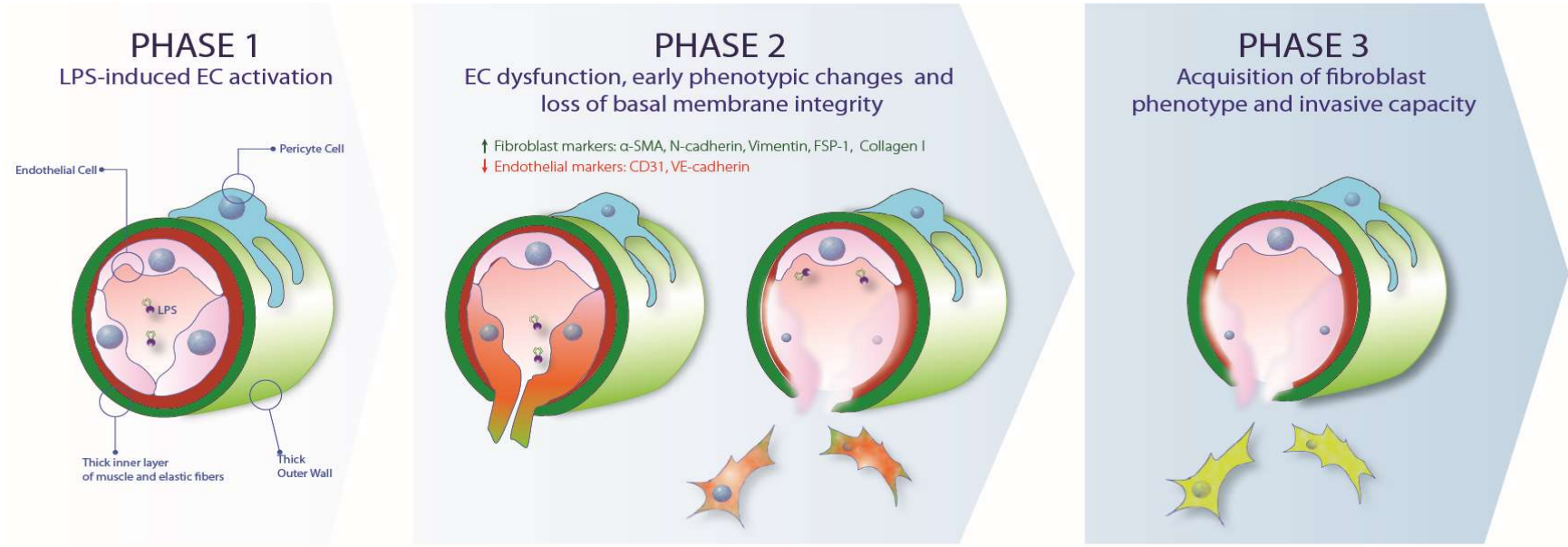
Endothelial/Mesenchymal Transition

Stasi A. & Castellano G., *Review in preparation*



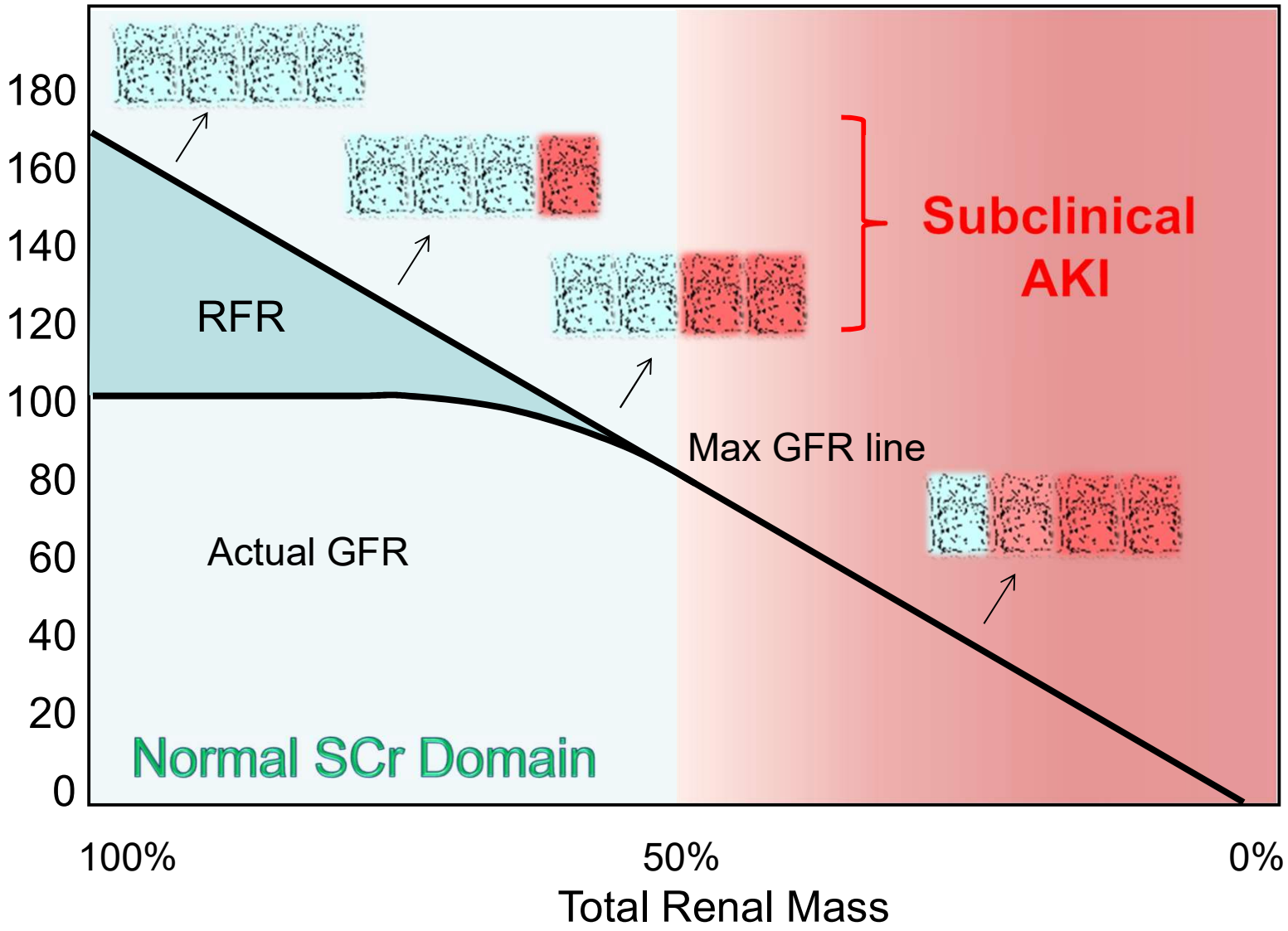


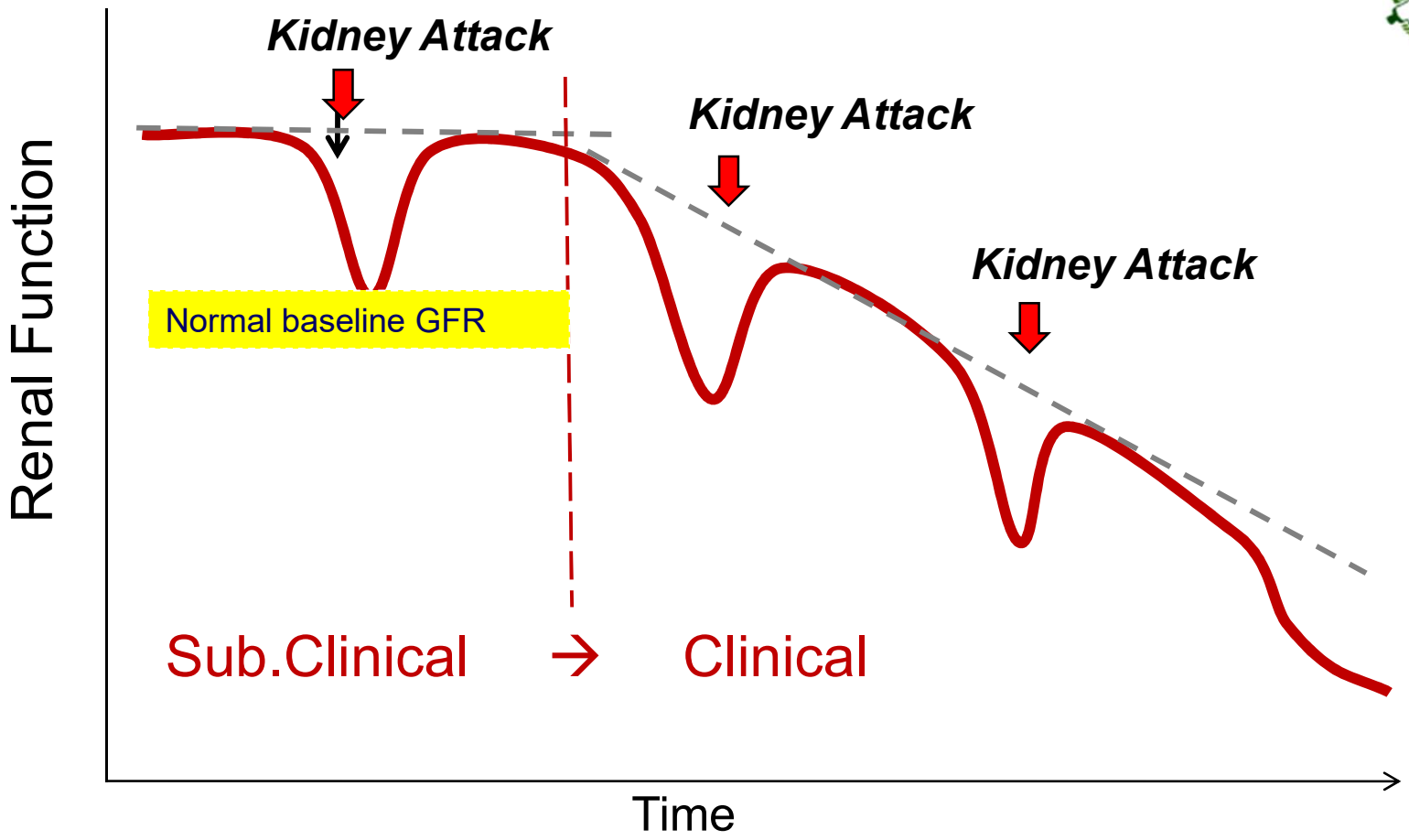




But: Different types of EMT? Beneficial or detrimental?

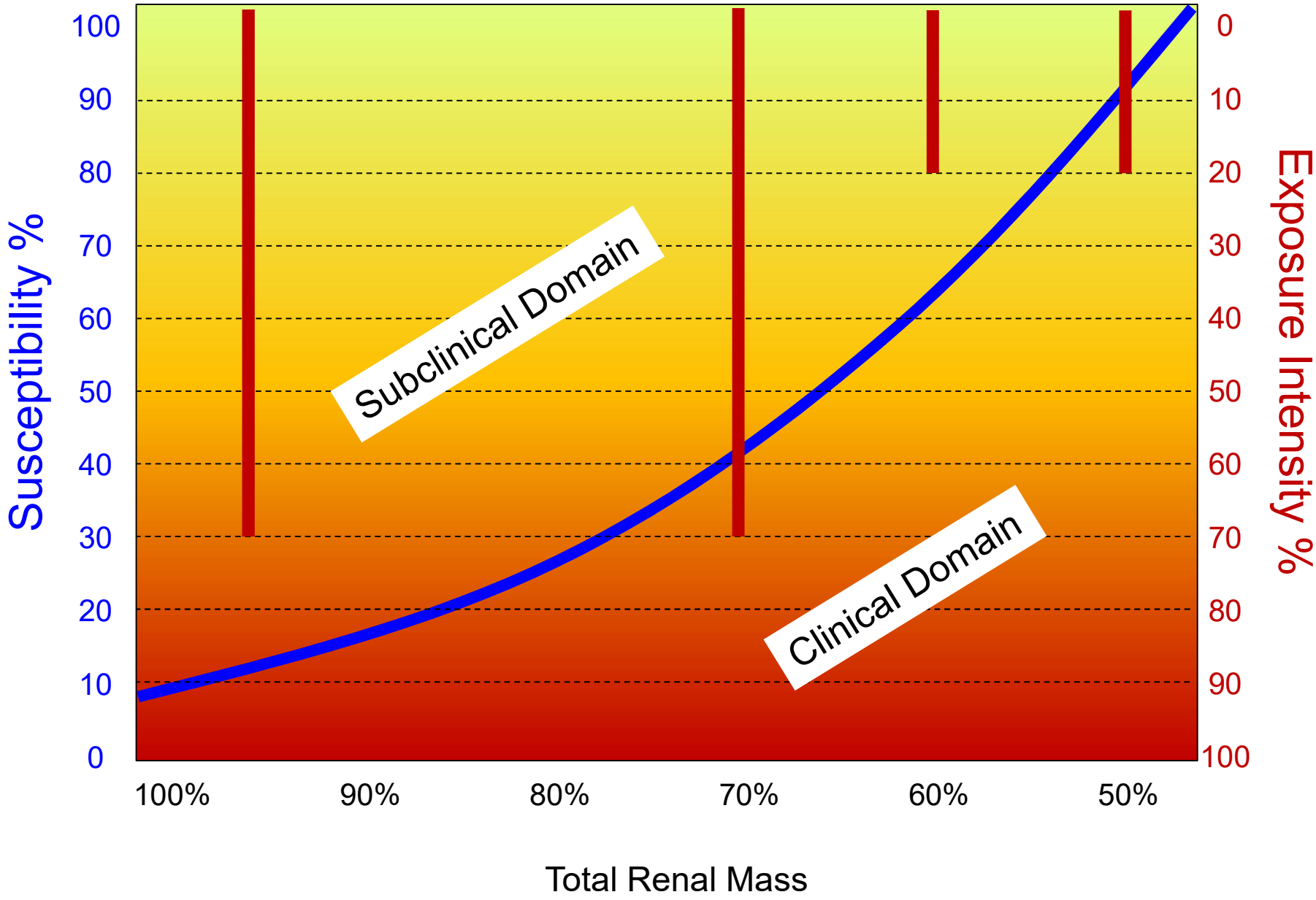
Creatinine and GFR





When Kidney Attack occurs, the reduction of GFR is compensated by recruitment of nephrons and utilization of renal functional reserve so that creatinine does not increase. If renal functional reserve is lost kidney attack produces an increase in serum creatinine and full repair and return to previous condition is not guaranteed. Repeated Kidney Attacks (heart failure decompensation, ischemia/reperfusion, contrast media, toxic drugs etc) may contribute to the progression to chronic kidney disease.

Susceptibility, Esposure and AKI Typology



Treatment of AKI after injury

New therapeutic approaches include:

1) Promotion of renal repair
2) Blockage of maladaptive repair
3) Limitation of profibrotic evolution
4) Reduction of epithelial to mesenchymal transition

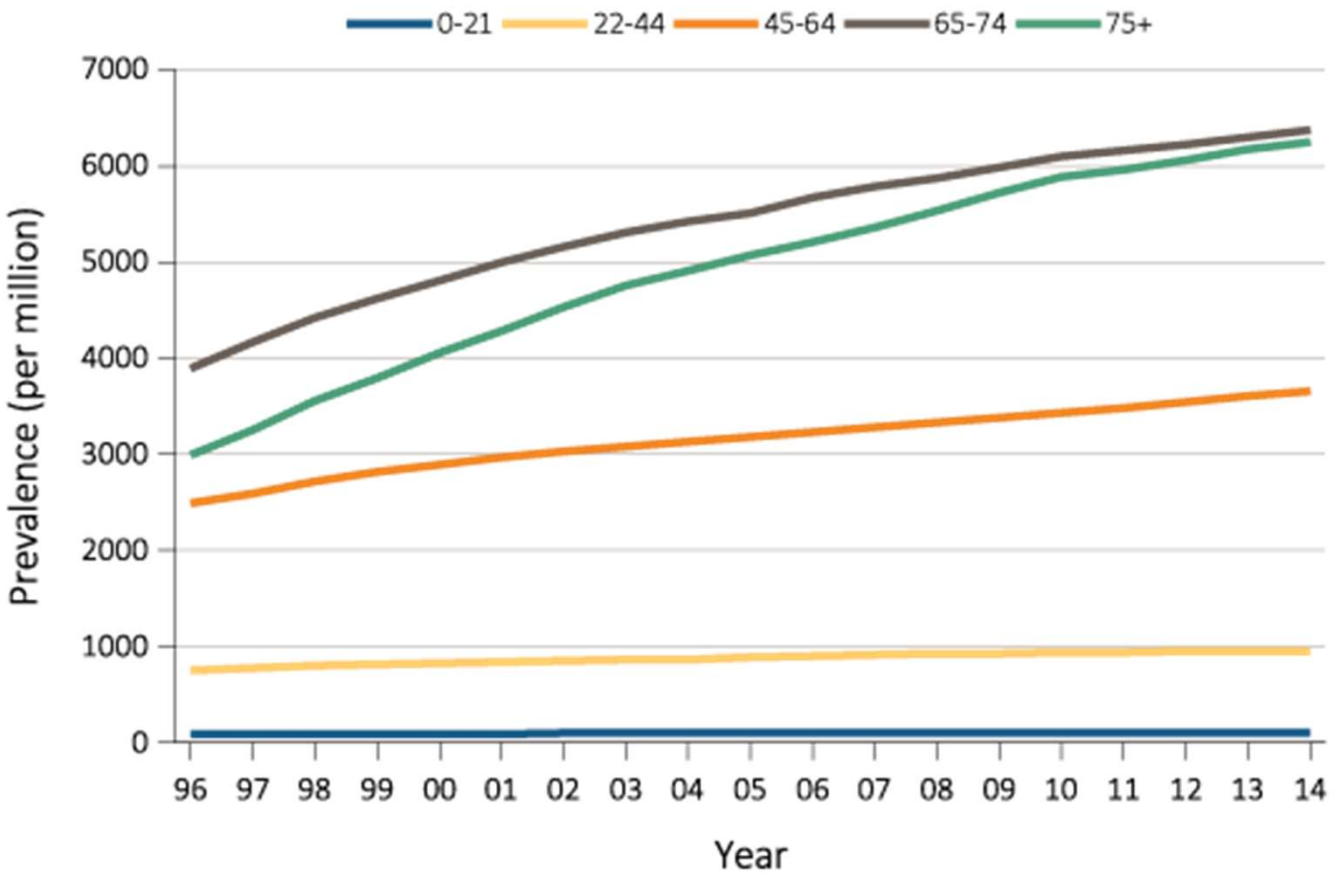
Specific treatment for elderly?

- Nothing published specifically on this topic
- Accumulated evidence supports the concept that CRRT is efficient, safe and well tolerated even in older patients
- Particular considerations for RRT in elderly are:
  - Bleeding risk
  - Vascular access
  - Hemodynamic instability

Bellomo R, Ronco C. Indications and criteria for initiating renal replacement therapy in the intensive care unit. Kidney Int 1998; 53 (suppl 66): S106-9

USRDS snapshot in 2015

Trends in adjusted* ESRD Prevalence rate (per million), by age group, in the U.S. population, 1996-2014



Clinical outcomes in the elderly

- Mortality
  - but not all, report increased mortality in elderly with AKI
- Renal Replacement Therapy
  - younger patients may require/receive RRT more often than the elderly
  - CRRT is efficient, safe and well tolerated even in older patients
  - Economic studies consistently show that older age is associated with lower hospital costs and resource intensity
  - In a Canadian survey (Essebag et al. 2002), when elderly patients where questioned about end-of-life decisions, up to 41% choose to limit certain life sustaining therapies (CPR, ventilation, ICU admission)

Clinical outcomes in the elderly

- Renal Recovery
  - controversial data; no studies focus specifically on the elderly
  - meta-analysis published in 2008 reviewed 17 studies on AKI that reported data on renal recovery
    - 31% of surviving elderly patients did not recover kidney function compared with 26% of younger patients
    - limited by significant heterogeneity among studies (comorbid factors, definition of AKI, and study design)

Schmitt R, Coca S, Kanab M, et al: Recovery of kidney function after acute kidney injury in the elderly: A systematic review and meta-analysis.Am J Kidney Dis 52:262-271, 2008

ICU and ethical perspective

- Considerations during case-by-case decision-making
  - ICU use is in general considered cost-effective
  - It has been shown that older age is associated with lower hospital and ICU costs
  - Older patients are at higher risk for poor functional outcomes (by failure to recover activities of pre-admission living and by acquiring additionnal impairments)
  - Very elderly patients can be already beyond the physiologic limits of life-expectancy and naturally near the natural end of their life.
  - The overall standard of care needed can be extremely burdensome, long and painful, as well as very expensive.
  - End-of-life wishes are difficult to predict, vary greatly between patients, and can change during the course of an illness

Cosmos A, Cost-Effectiveness of providing quality ICU care to elderly patients, ICU Management, 9 (1), 8-10, 2009

Acute renal failure in the elderly critically ill patient, Monica Bonello et al., Critical Care Nephrology Textbook

AKI in ELDERLY: Acute on Chronic Renal Disease?

CKD IN ELDERLY

- Hypertension and Diabetes (40-65 %)
- Tubulointerstitial Disorders (13 %)
- Obstructive Uropathy (10 %)
- Glomerular Disease (10 %)
- Polycistic Kidney Disease (2 %)
- Unknown (10 – 20 %)

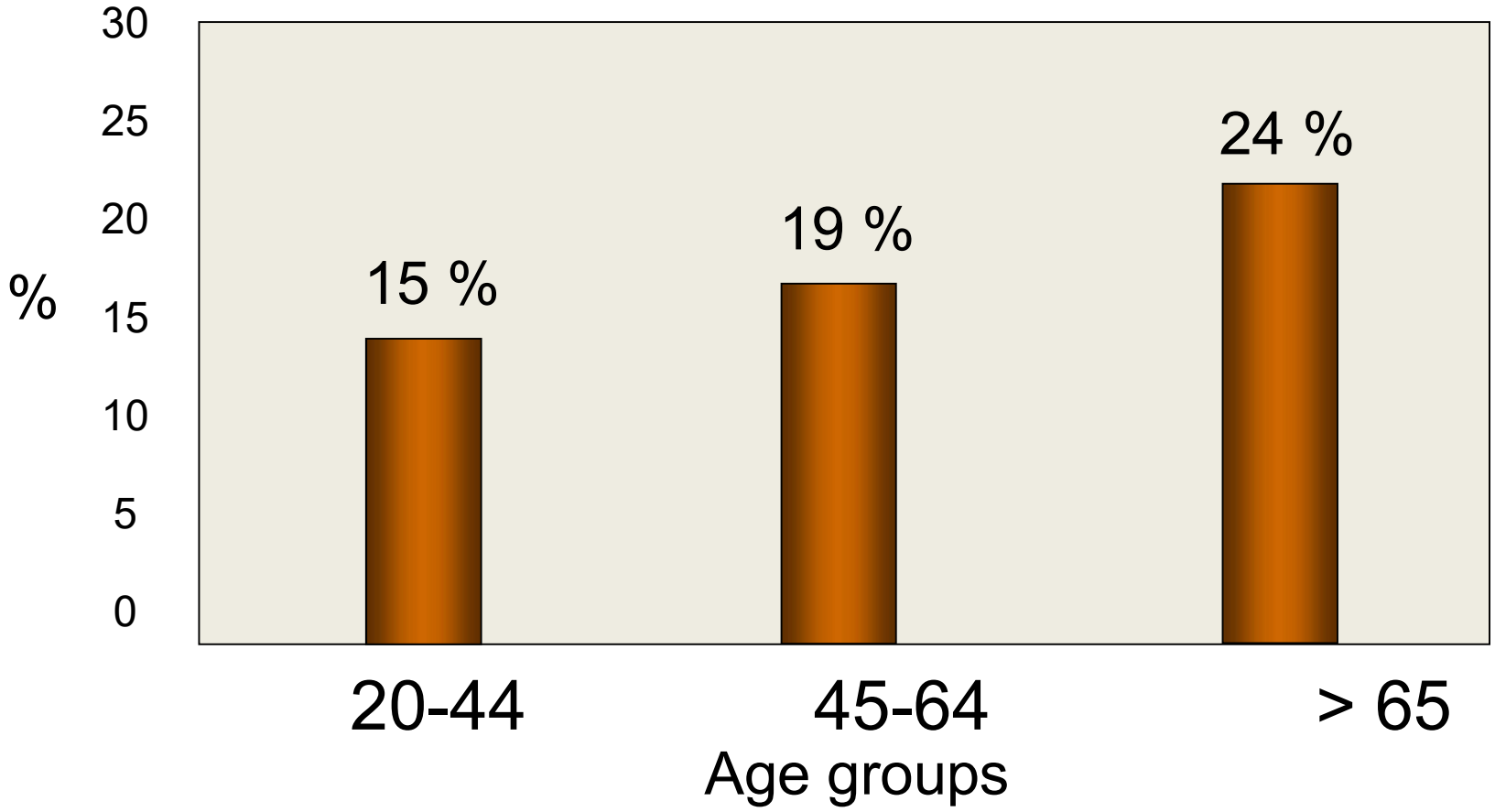
The incidence of comorbid chronic illness increases with age.

78 % of the individuals over 65 have chronic illnesses.

HD in THE ELDERLY: MORBIDITY OF ANGIOACCESS

Patients over 65 experience more access-related hospital stays than any other age group. *Woods et Al, Am J Kidney Dis, 1997*

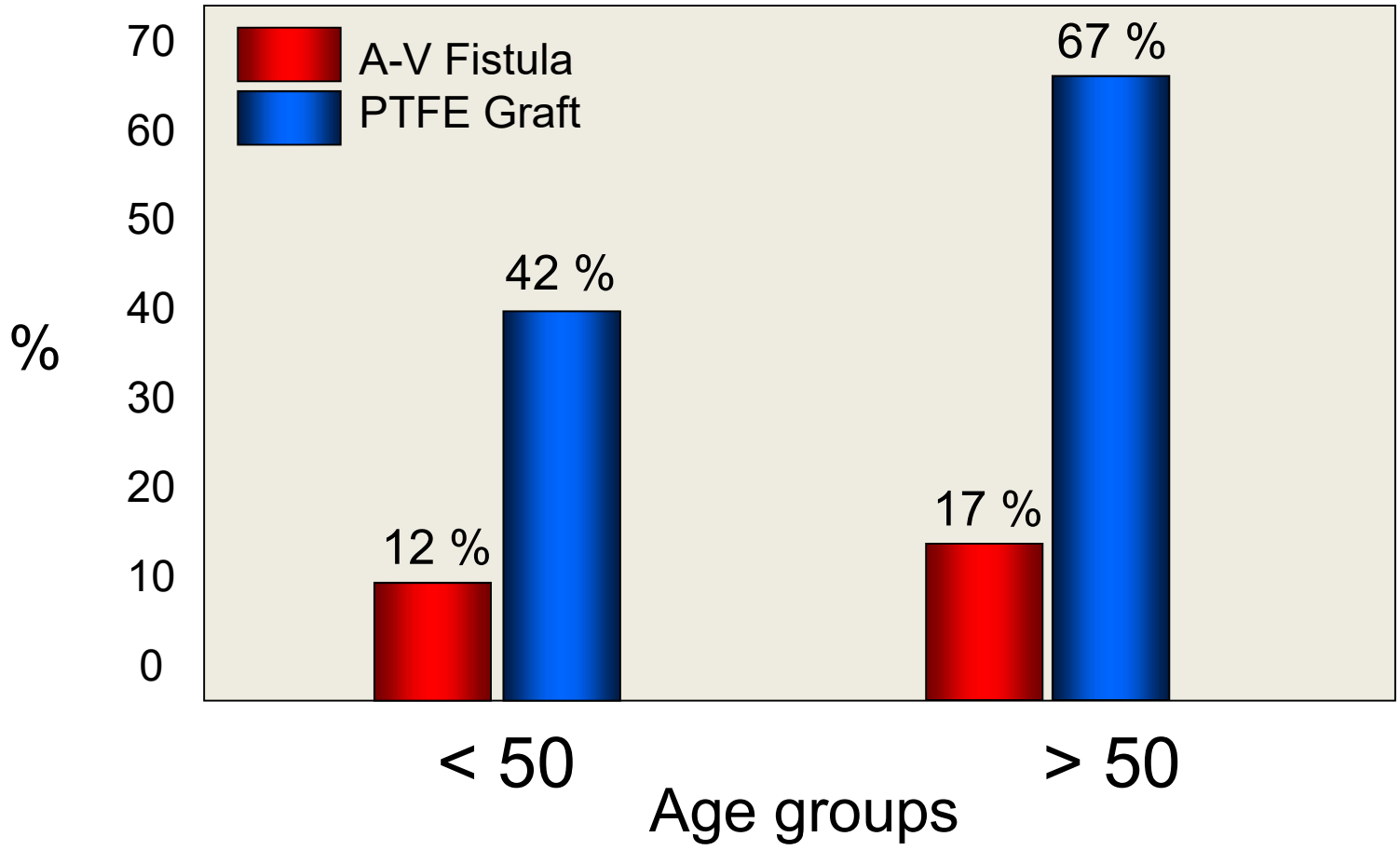
Individuals hospitalized for access related problems at 2 years



HD in THE ELDERLY: MORBIDITY OF ANGIOACCESS

Vascular Access thrombosis associated with rHEPO therapy was more common in elderly individuals. *Tang et Al, ASAIO Journal, 1992*

Thrombosis of angioaccess by age and type of access



HD in THE ELDERLY: CARDIOVASCULAR TOLERANCE

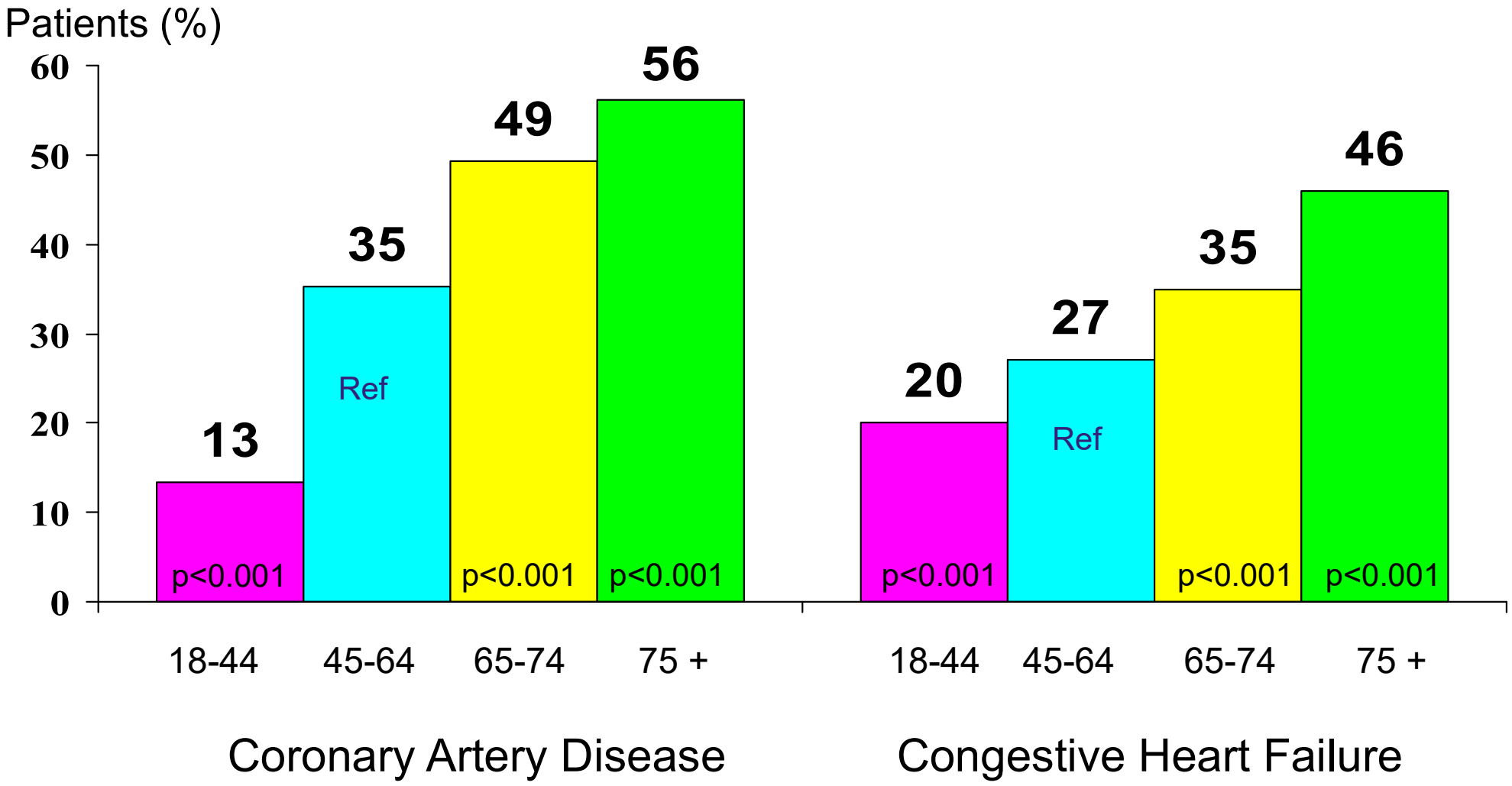
HYPOTENSION increases with age: due to greater sensitivity to blood volume changes induced by ultrafiltration, reduced compliance to fluid restriction and medical therapy and reduced baroreceptor and sympathetic response to fluid shifts

HYPERTENSION: Reduced cardiovascular compliance to interdialytic fluid gain and increased incidence of hypertension

ARRYTHMIAS: Patients over 65 have an increased risk of dialysis-induced arrhythmias and of persistent arrhythmias compared to young patients.

DIASTOLIC DYSFUNCTION: increases with age.

Prevalence of Selected Comorbidities Increase with Age



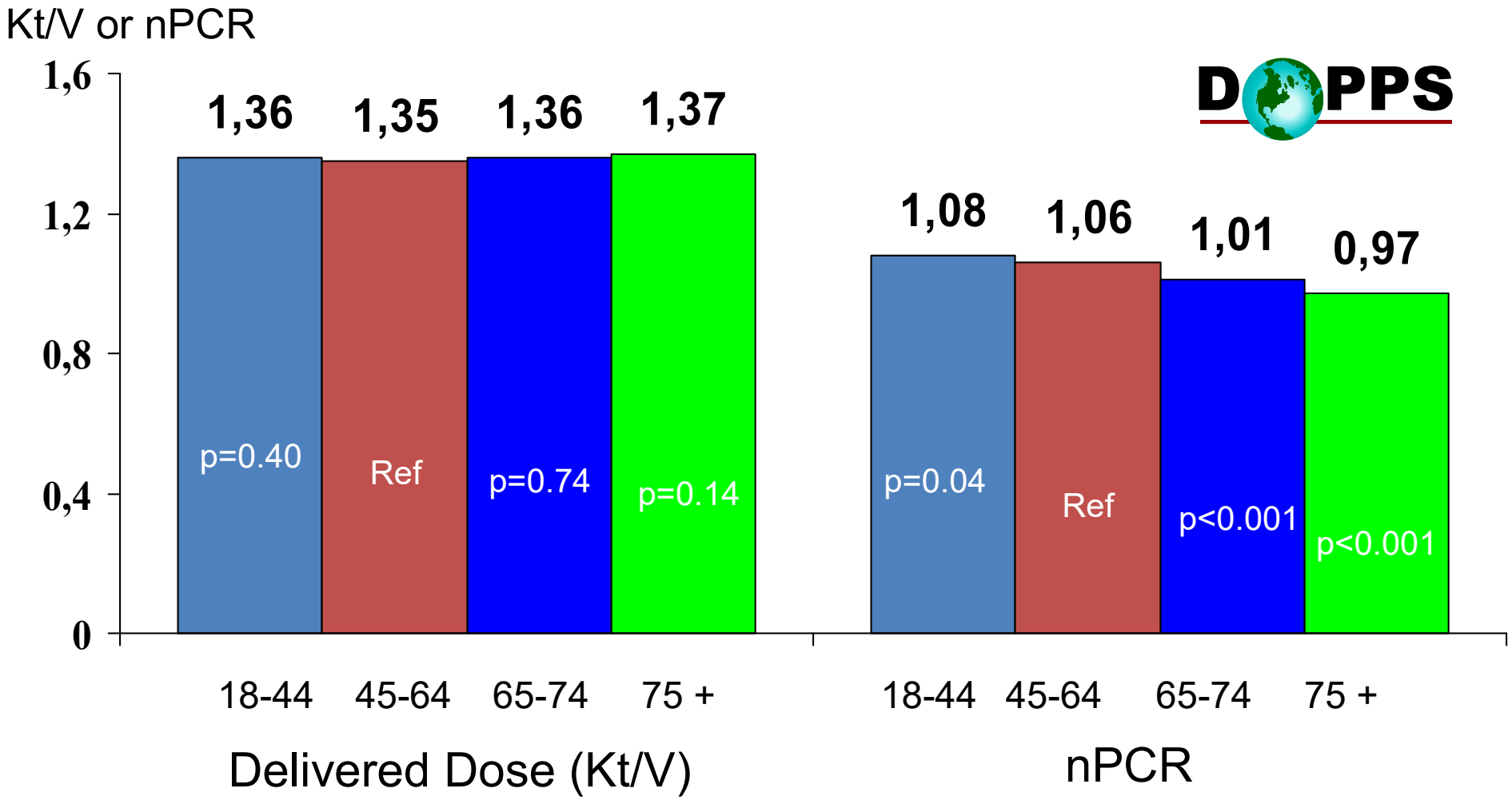
HD in THE ELDERLY: DELIVERY AND PRESCRIPTION

Can dialysis quantification be affected by AGE?

- Pathophysiology of double pool kinetics in elderly

- Altered urea distribution volume (Watson, Chertow formulas include age and a negative correlation between age and volume)

Delivered Dose is the Same among Age Groups, While nPCR Declines with Age



Prevalent Patients

HD in THE ELDERLY: NUTRITION AND METABOLISM

DOPPS

Modified Subjective Global Assessment

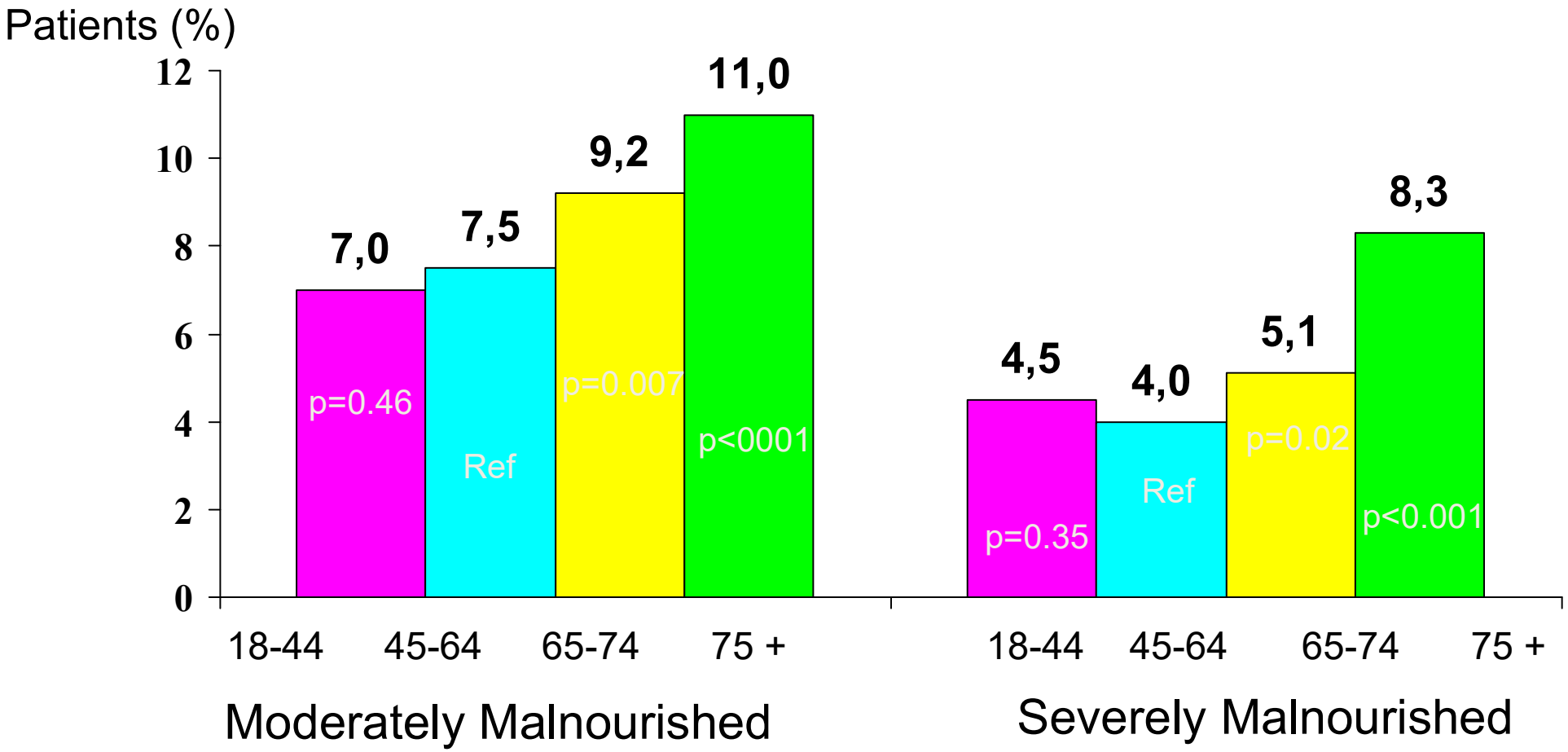
SGA Variables:

- Recent weight loss
- Visual somatic protein wasting *(Provider judgment)*
- loss of appetite, nausea/vomiting, energy level, and disease burden *(Patient reported)*

Nutritional Status:

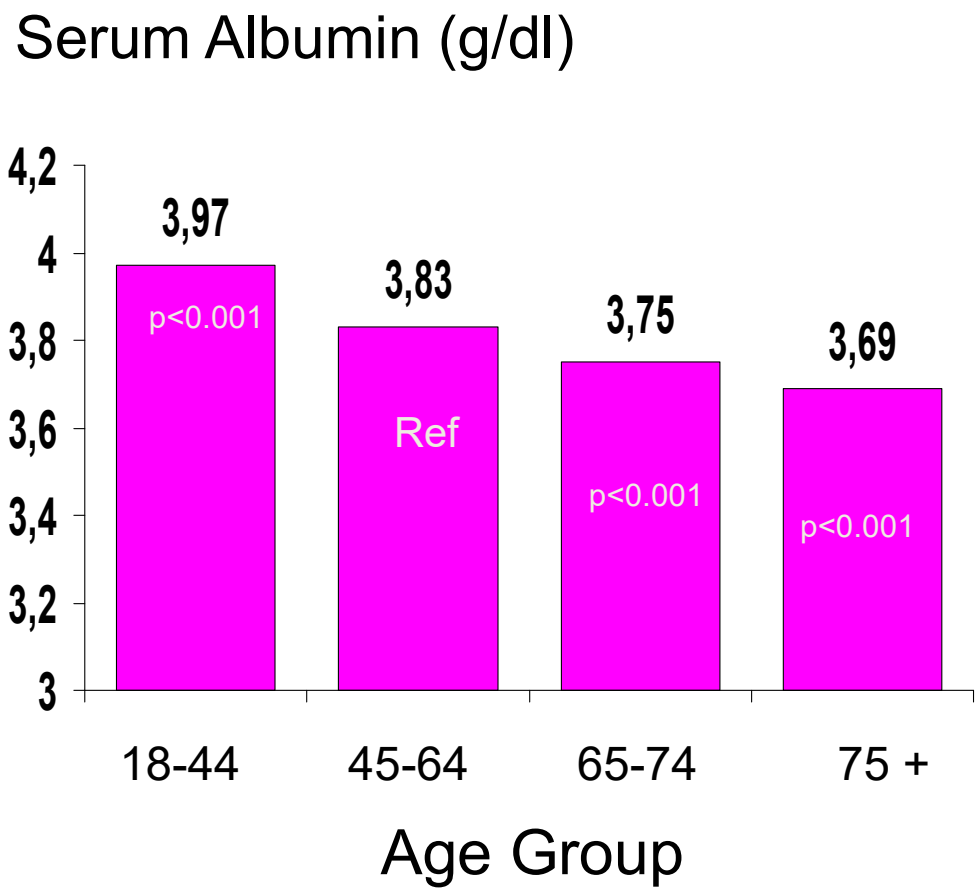
- Normal
- Moderately Malnourished
- Severely Malnourished

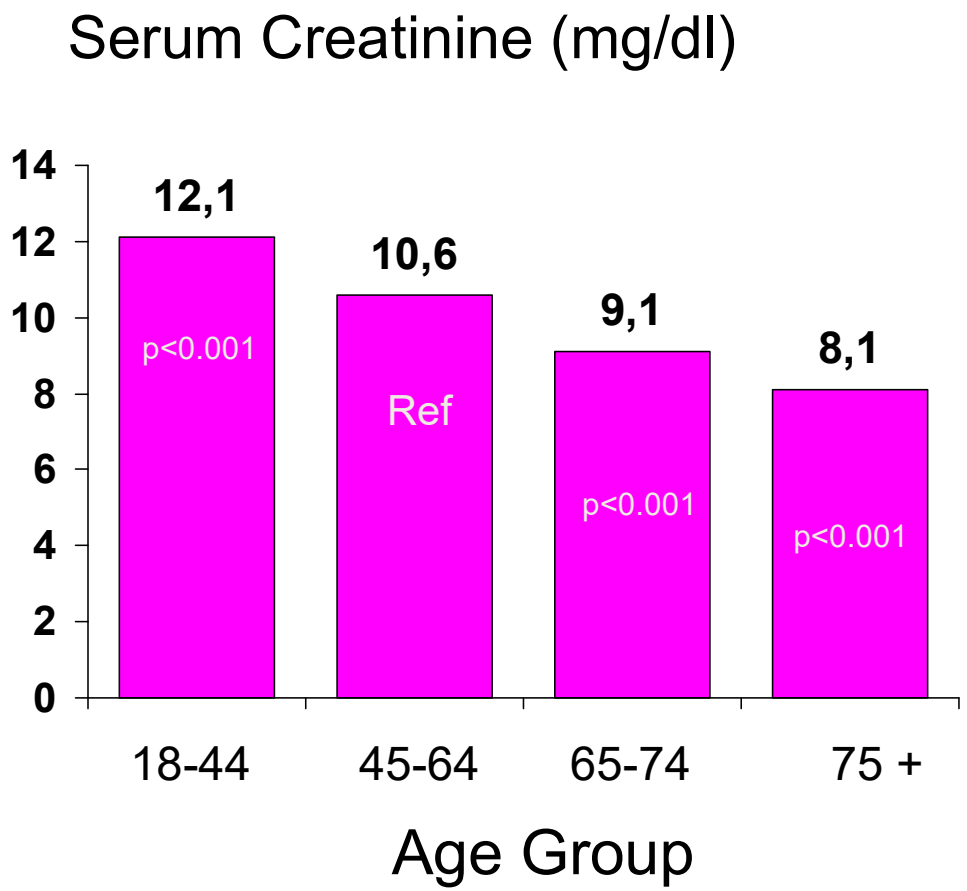
Prevalence of Malnutrition, by Subjective Global Assessment, Increases with Age



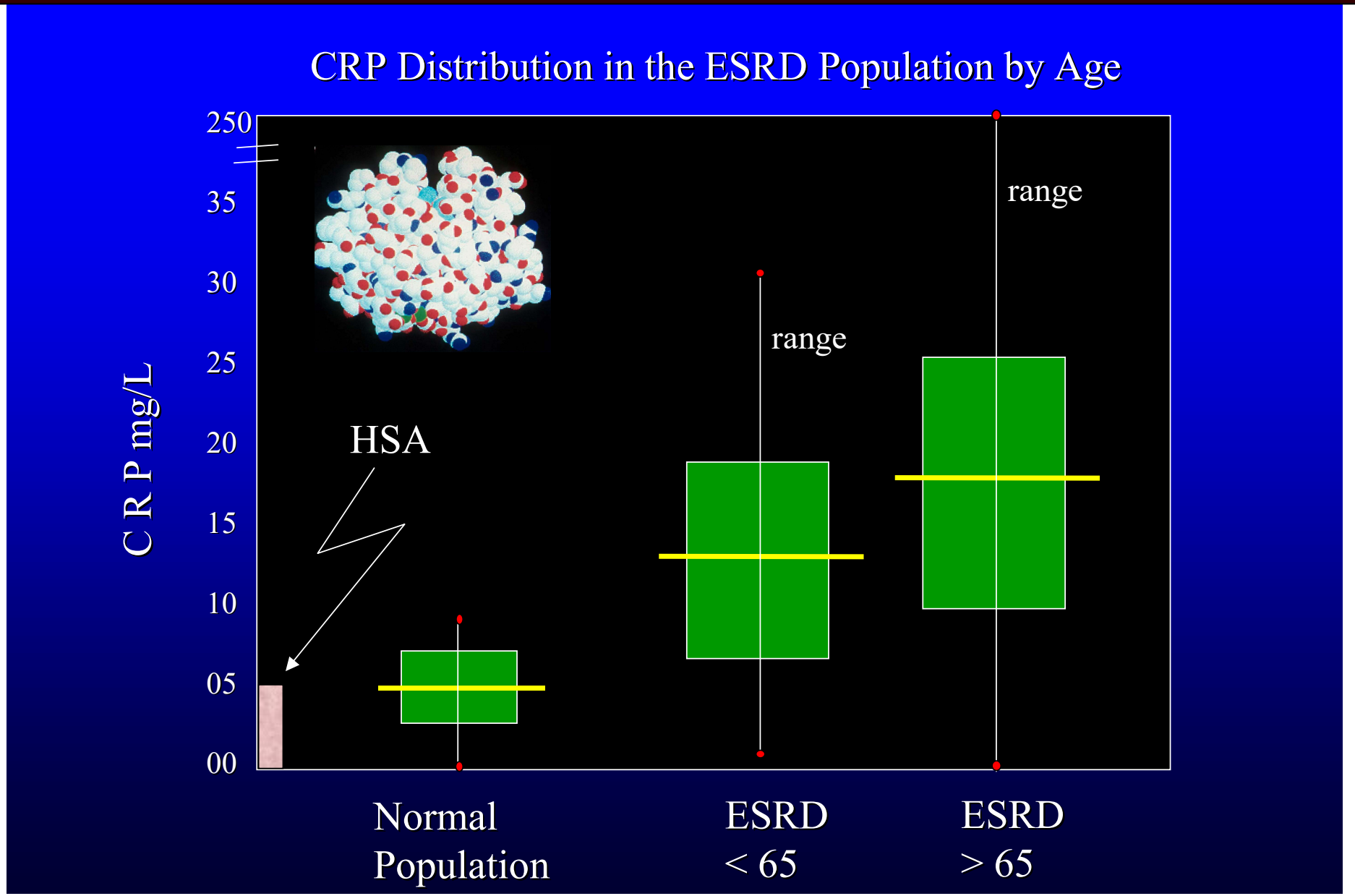
*Determined using a modified version of the Subjective Global Assessment

Serum Albumin and Serum Creatinine Values decrease with Age





HD in THE ELDERLY: Infection and chronic inflammation



Conclusions

- There is an increased incidence of elderly in ICU, and with AKI, and requiring RRT
- There are many health differences among age groups of AKI patients
- Older patients with AKI:
  - Have more comorbidities
  - Have greater incidence of unstable HD treatments
  - Have a higher incidence of sepsis
  - Have poorer nutrition
  - Have increased risk of death

Ethical Aspects of the Elderly and RRT

- The elderly as a burden to the family

  Looking after an elderly is a burden (especially if there is no hope of a substantial inheritance). Feeling of isolation and desperation is often the underlying cause for the request for dialysis withdrawal

- The elderly as a burden to the Society

  Elderly patients on dialysis contribute substantialy to increase the health care costs. Chronic illnesses require close monitoring and nursing care. Utilization of expensive health care technology for this population? Setting the limits ? (*Callahan*) - Futility ? Acute Care ?

- The elderly as a burden to the Health Care Team

  Elderly have a myriad of problems and unexpected complications. Problems are often non-medical. It is important to set realistic goals but also to have a team approach and to learn about patient's history

The elderly are a heterogeneous group and our failure to consider them individuals constitute the discrimination of ageism.

In its 1991 report, the US Institute of Medicine supported the position that age should never be a criterion when it concluded: "…*Chronological age was considered and explicitly rejected by the committee as a criterion of patient acceptance, since it does not measure the ability of individuals to benefit from a treatment*".

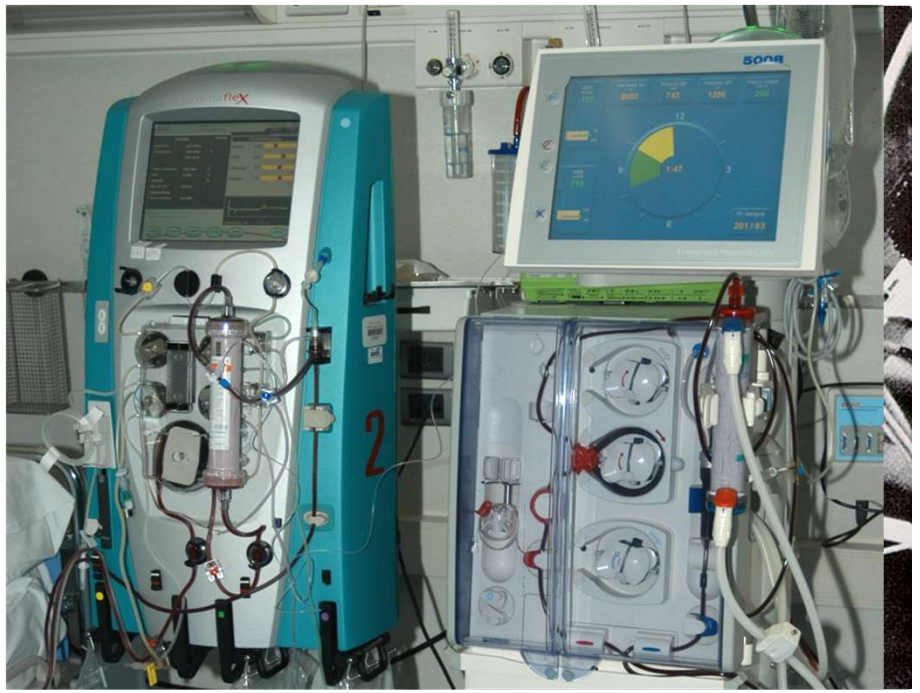
The elderly stand to lose more than any other group in society when resources such as dialysis become restricted. Support groups do not lobby vigorously against the bias of ageism.

Nephrologists, as their patients' advocates, have an obligation to fight for the needs of the elderly.

Manent Ingenia Senibus

Cicerone

There is a lot to learn from an elderly person…
….. but most of all the respect for what He has accomplished



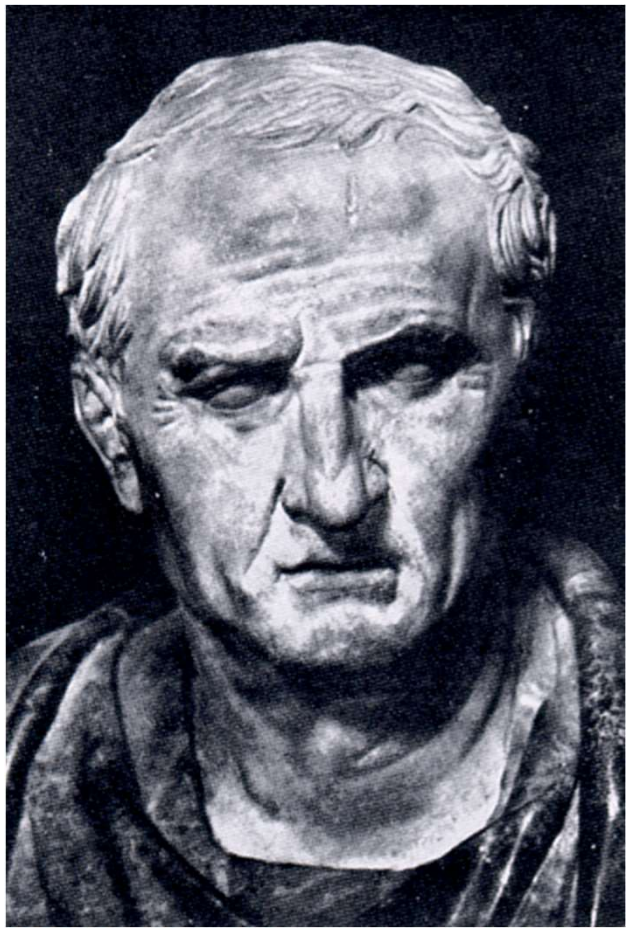
GERIATRIC NEPHROLOGY : THE TIME HAS COME

It is time to:

- pay more attention to the problems of elderly patients before and during RRT
- learn the characteristics of geriatric medicine
- cooperate with family physicians and geriatricians
- establish a new multidisciplinary approach
- consider ethical discussions in your institution

QUESTIONS

- Can age be a criterion for limiting health care delivery ?
- Futile treatments can be refused. When is it futile ?
- Can we let managed care organizations lead our decisions ?
- What to do with increasing demand and cost containment concern ?
- How to allocate funds for elderly care in limited resource environment ?
- Should we deny dialysis to some groups of elderly patients ?
- How can we combine the rights of one with those of all patients ?



Thank You for your attention

Haec habui de senectute quae dicerem. Ad quam utinam perveniatis, ut ea quae ex me audistis re experti probare possitis!

International Renal Research Institute of Vicenza