Berliner Dialyse Seminar

Onco-Nephrology:
An Emerging New Discipline

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DISCLOSURES

Potential conflicts of interest declaration

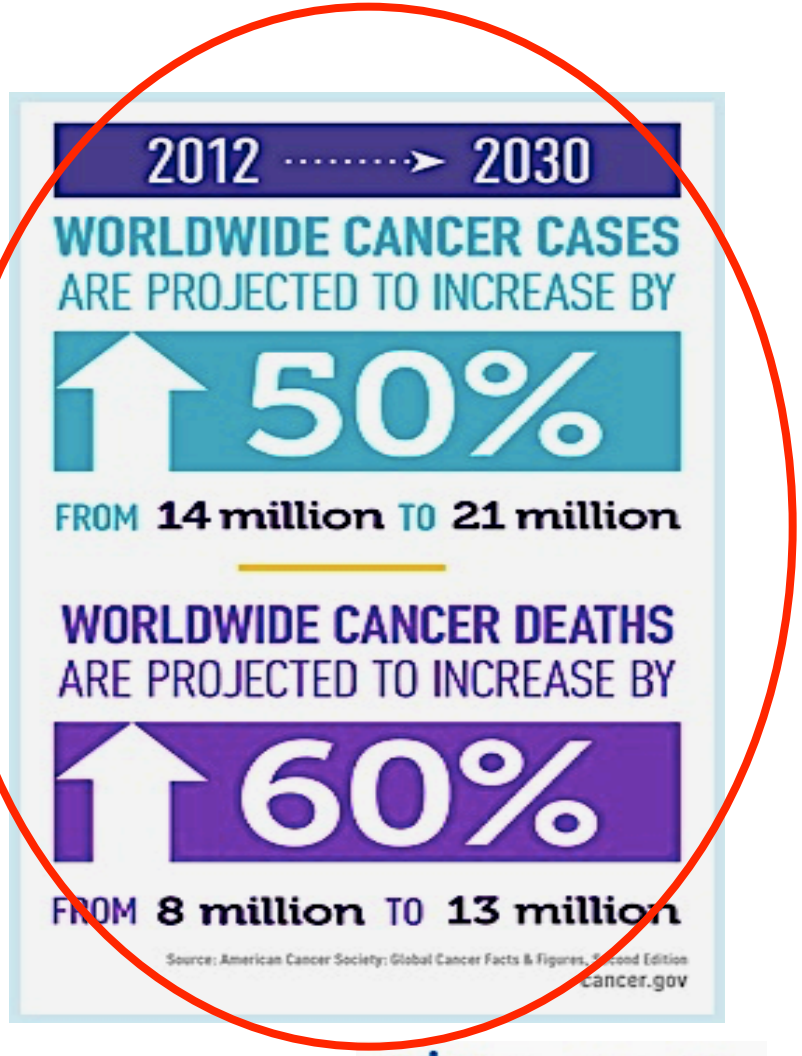
The content of the following speech is the result of efforts to achieve the maximum degree of impartiality and independence.

As a speaker, I hereby affirm that there are **no conflicts of interest** concerning the content of the following speech that are the result of employment, an advisory function or financial contributions for research projects, lectures or any other activity.

Cancer

A Common Global Problem

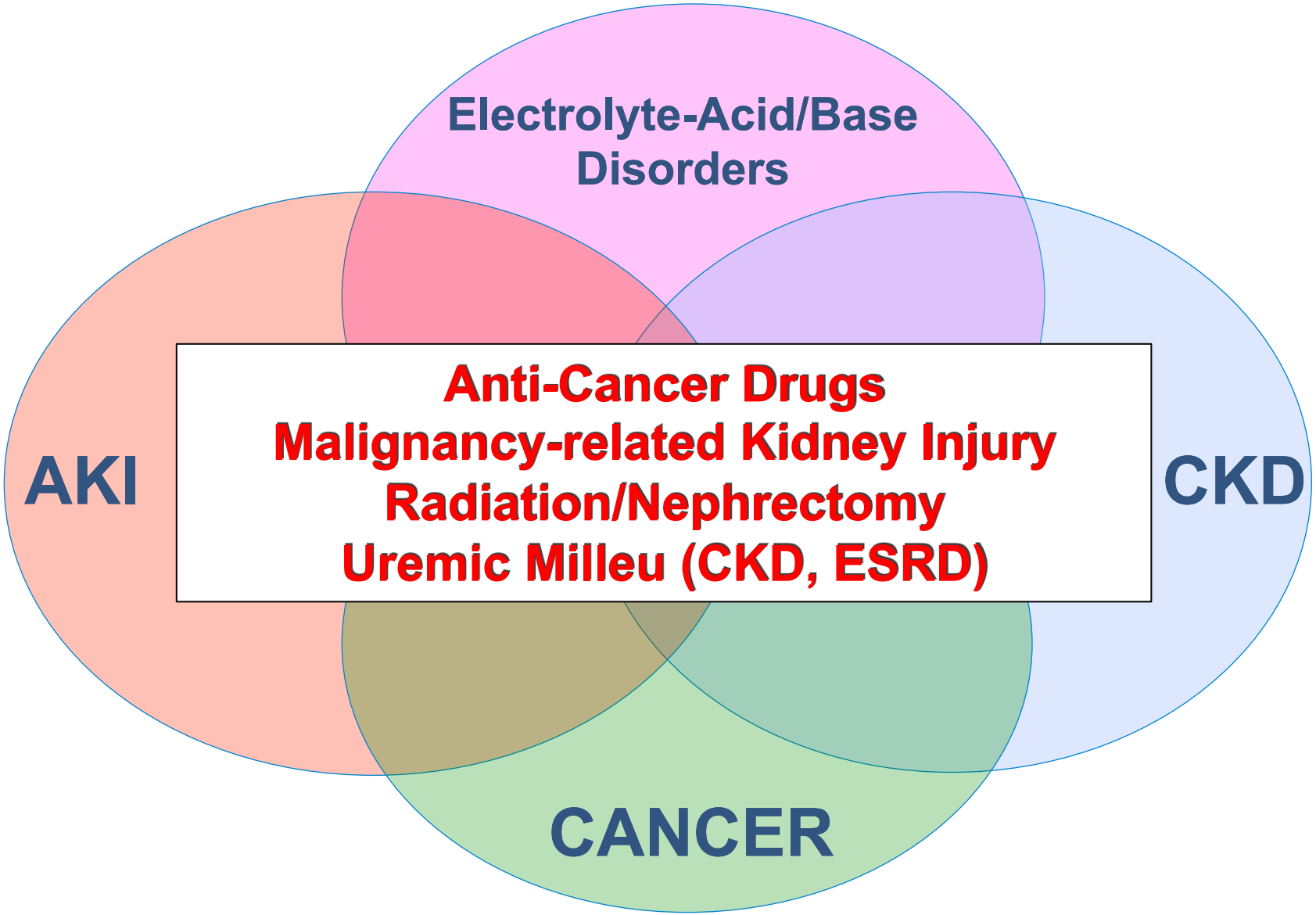
- Cancer is common and a leading cause of death worldwide
- Estimated 9.6 million deaths in 2018
- The most common causes of cancer death are the following:
  - **LUNG (1.76 MILLION DEATHS)**
  - **COLORECTAL (862,000 DEATHS)**
  - **STOMACH (783,000 DEATHS)**
  - **LIVER (782,000 DEATHS)**
  - **BREAST (627,000 DEATHS)**



World Health Organization

The Kidney-Cancer Connection

Onco-Nephrology



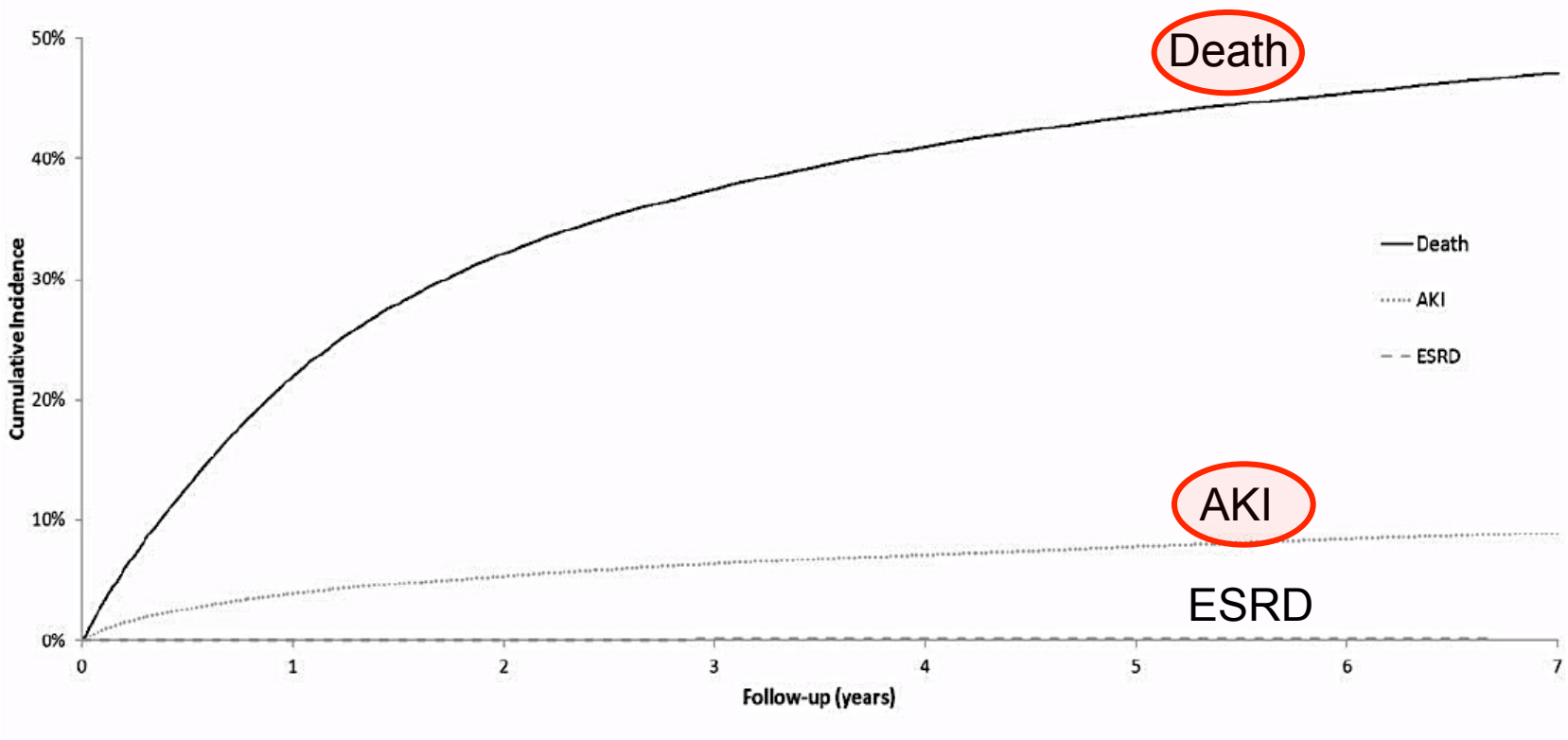
Onco-Nephrology

AKI incidence

AKI is common among cancer patients

- Ontario, Canada: 163,071 patients undergoing cancer therapy between 2007-2014
- One in 10 developed **AKI-D** or required **hospitalization**
- **Annual incidence of AKI** increased from 18 to 52 per 1000 person years
- Highest AKI incidence with myeloma (26%), bladder cancer (19%), leukemia (15%), and kidney cancer (14%)

2007-2014



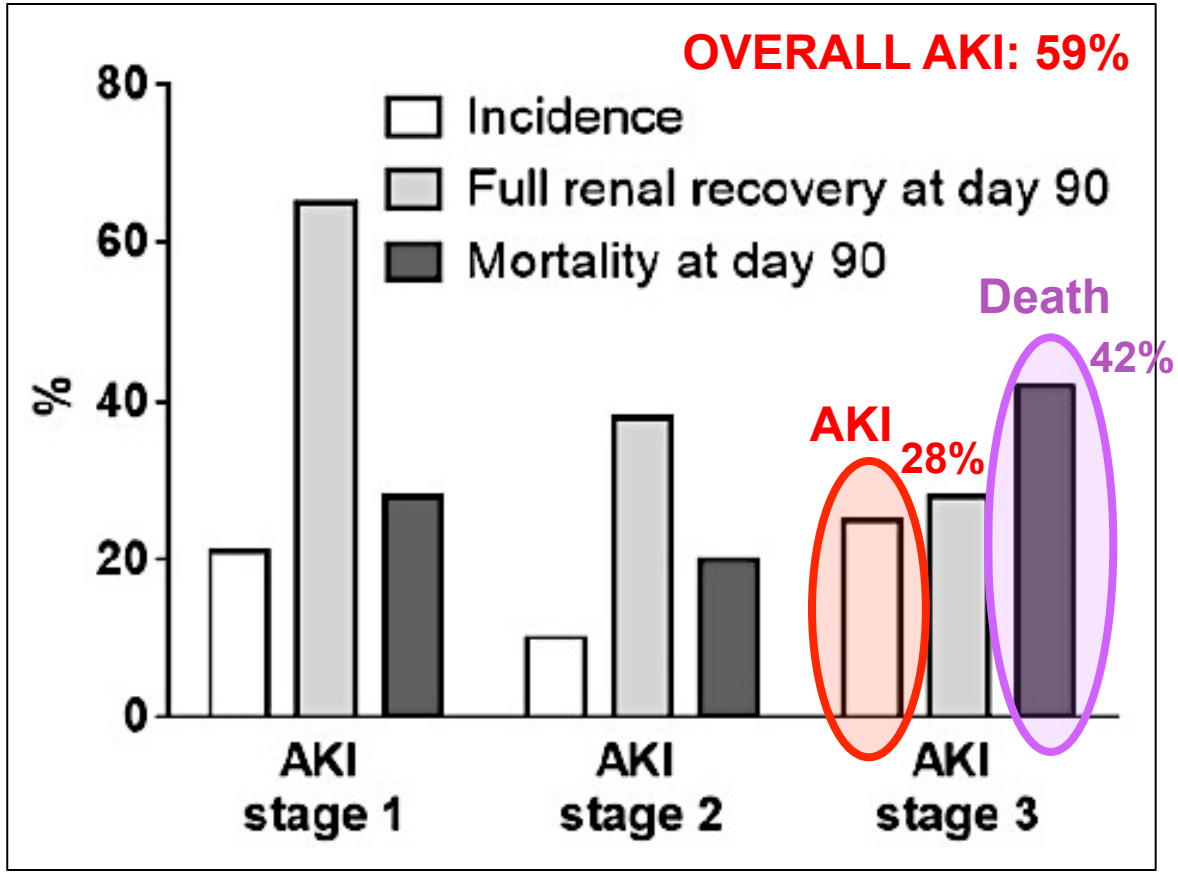
Kitchlu A, et al. J Natl Cancer Inst 2018

Onco-Nephrology

AKI in Hospitalized ICU Patients

- Single center in France over 4 years
- Solid tumors admitted to the ICU (n=204)
- KDIGO AKI (59%) and mortality (37%) are common
- Sepsis, hypovolemia, and obstruction most common causes of AKI followed by TLS, hypercalcemia, and >1 etiology
- Stage 3 AKI (28%) with higher mortality (42%)

2011-2015



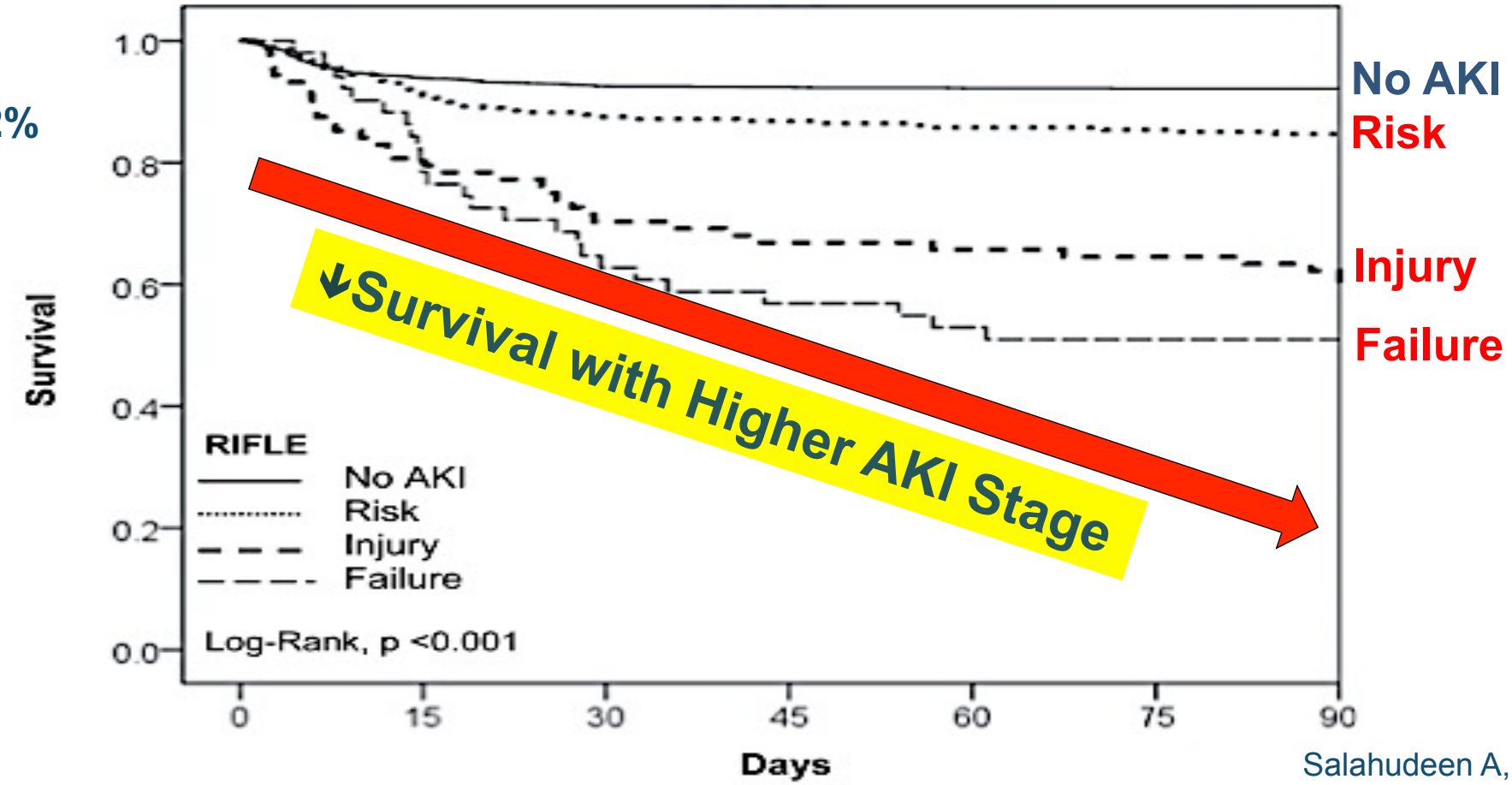
Kemlin D, et al. NDT, 2018

Onco-Nephrology

Increased Mortality with AKI

- Survival rates in **cancer patients with AKI** associated by RIFLE Criteria
- Kaplan-Meier survival curves—dose related reduction in survival

Overall AKI Incidence = 12%



Salahudeen A, et al. CJASN 2013

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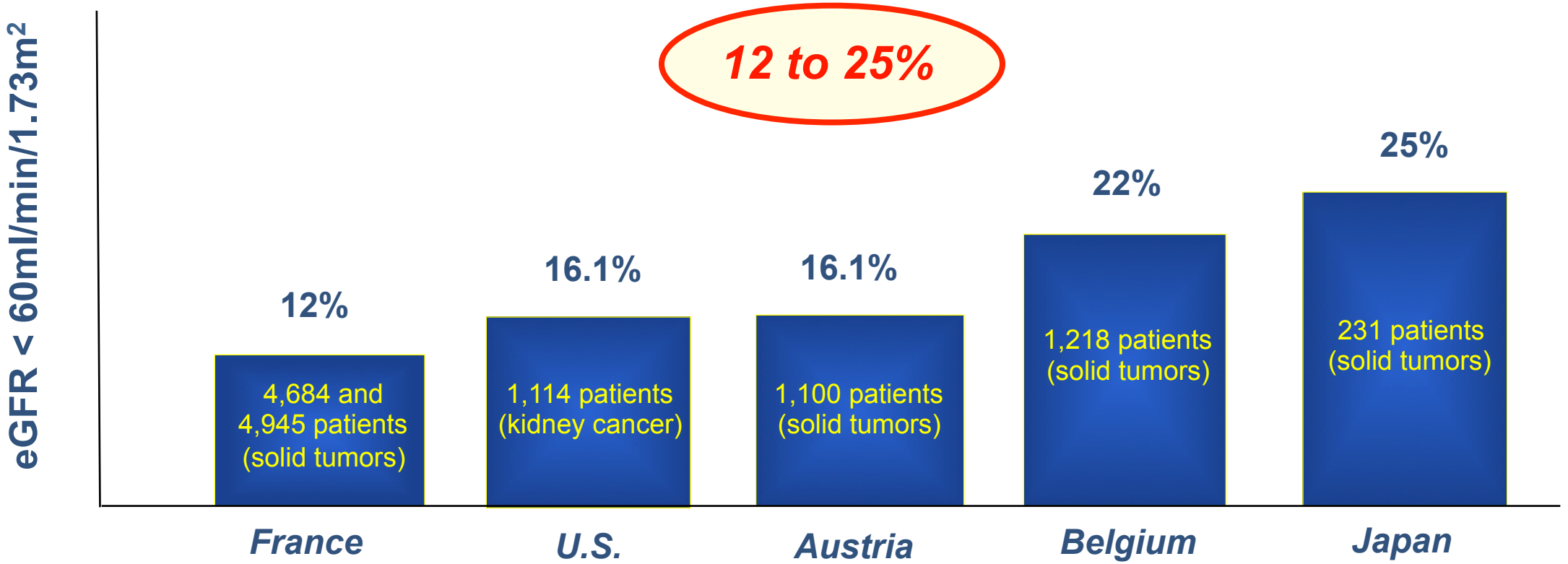
Chronic kidney disease in Cancer

- **CKD (eGFR < 60 ml/min/1.73m^2) is highly prevalent in cancer patients**



C-KIN | Cancer & the Kidney International Network

Launay-Vacher V, et al. Cancer 2007; Launay-Vacher V, et al. Semin Nephrol 2010; Janus N, et al. Br J Cancer 2010; Canter D, et al. Urology. 2011; Nakamura Y, et al. Nihon Jinzo Gakkai Shi. 2011; Königsbrügge O, et al. Thromb Res 2014

Onco-Nephrology

Increased Mortality with CKD

- **CKD in cancer patients is associated with reduced survival**
  - ***France***: CKD stage 3 (eGFR < 60ml/min/1.73m^2) **HR 1.27** for Mortality
  - ***Australia:*** CKD stage 3 (eGFR < 60ml/min/1.73m^2) **HR 1.27** for Mortality
  - ***Korea***: CKD stage 3 (eGFR 30 - 60ml/min/1.73m^2) **HR 1.12** for Mortality
    CKD stage 4 (eGFR < 30ml/min/1.73m^2) **HR 1.75** for Mortality
  - ***Japan***: CKD stage 3 (eGFR < 60ml/min/1.73m^2) is an **independent risk factor for death at 1 year**

C-KIN | Cancer & the Kidney International Network

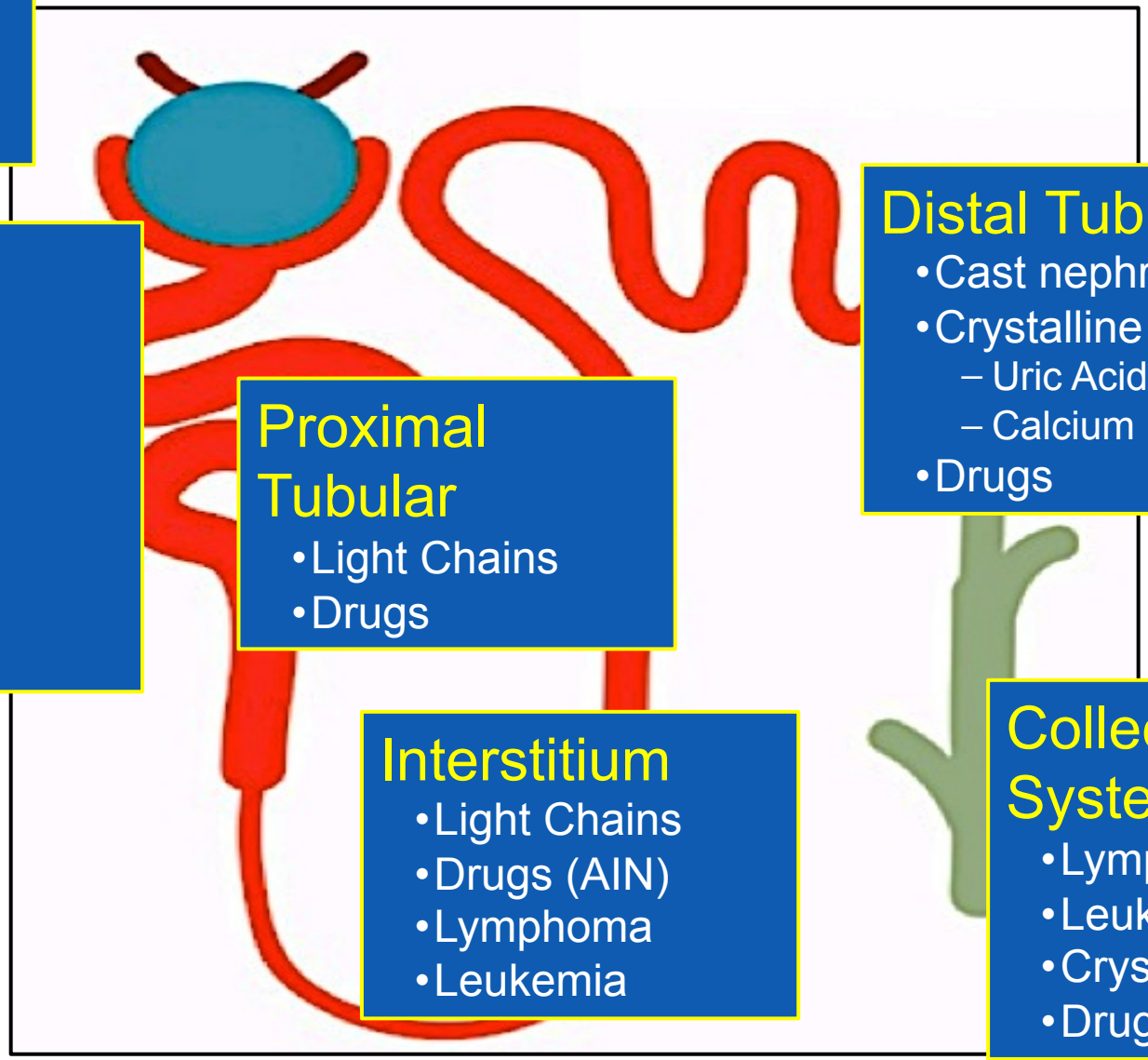
Launay-Vacher V. et al. Semin Nephrol 2010; Nakamura Y. et al. Nihon Jinzo Gakkai Shi. 2011; Na SY, et al. Am J Nephrol. 2011; Iff S., et al. Am J Kidney Dis 2014

Kidney Injury and Cancer

Sites of Kidney Injury

Vascular
- Hemodynamic
- TMA
- Drugs

Glomerular
- TMA
- MIDD/Amyloid
- Cryo GN
- PGNMID
- C3GN
- FGN/IT
- Drugs



Proximal Tubular
- Light Chains
- Drugs

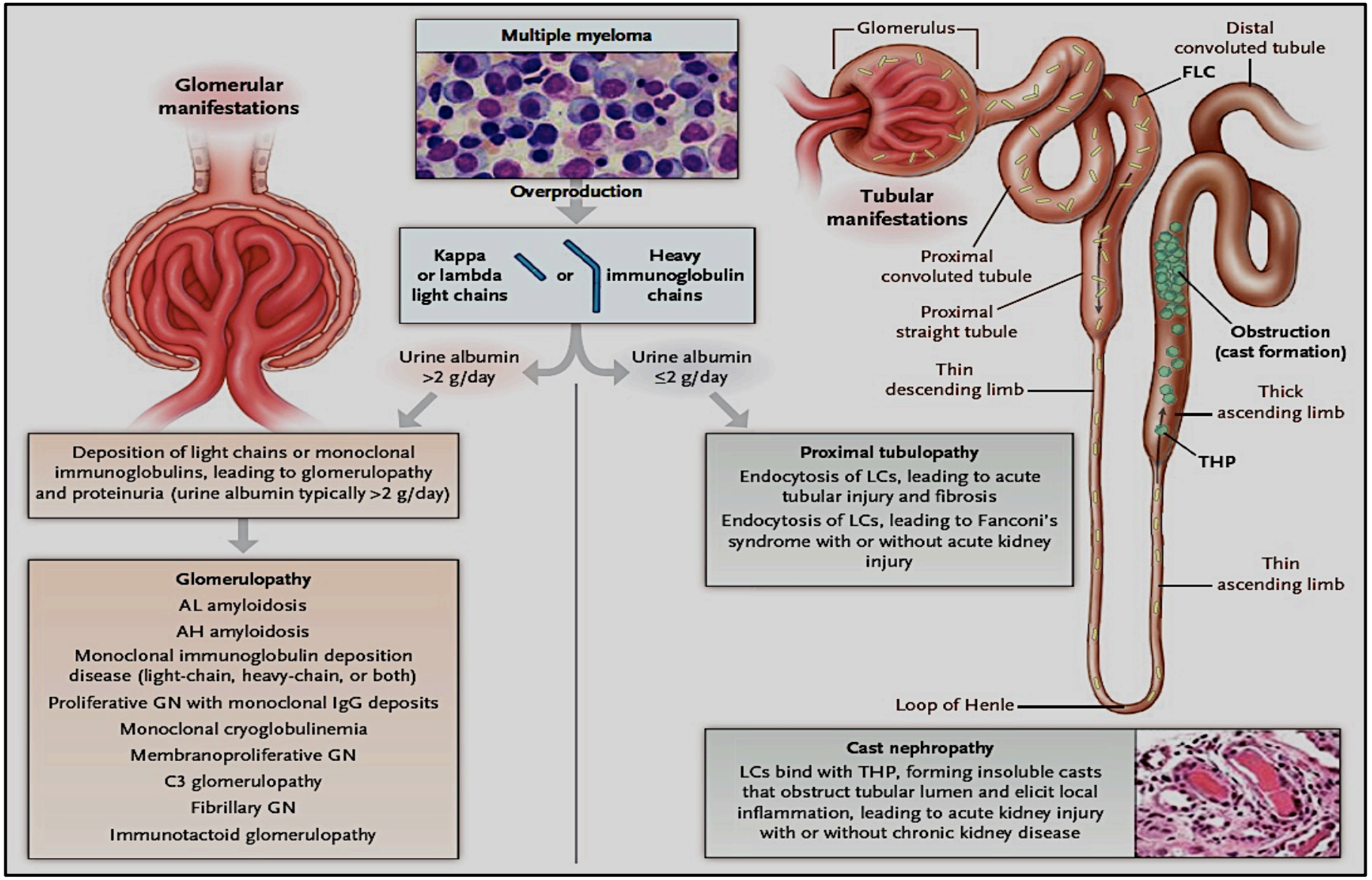
Interstitium
- Light Chains
- Drugs (AIN)
- Lymphoma
- Leukemia

Distal Tubular
- Cast nephropathy
- Crystalline nephropathy
  - Uric Acid
  - Calcium Phosphate
- Drugs

Collecting System
- Lymphoma
- Leukemia
- Crystals
- Drugs

Onco-Nephrology

Myeloma and Kidney Disease



Rosner MH and Perazella MA. NEJM 2017

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Lymphoma/Leukemia and Kidney Disease

Acute Kidney Injury (AKI) in Patients With Leukemia or Lymphoma	
Cancer-Related AKI	**Therapy-Related AKI**
Tumor infiltration of the kidneys (more common with lymphoma)	Therapy-related nephrotoxicity (including thrombotic microangiopathy, acute tubular injury, tubulointerstitial nephritis, intratubular obstruction, and glomerulonephritis)
Retroperitoneal lymphadenopathy leading to urinary tract obstruction	Tumor lysis syndrome with acute uric acid nephropathy and/or acute nephrocalcinosis
Hypercalcemia-related prerenal kidney injury	Nausea, vomiting, and diarrhea associated with prerenal azotemia
Various paraneoplastic glomerular disorders	Sepsis-associated kidney injury
Lysozymuria with acute tubular injury associated with AMoL or CMML (rare)	Nephrotoxicity (acute tubular injury and acute tubulointerstitial nephritis) from other common medications (NSAIDs, ACE inhibitors, ARBs, diuretics, antimicrobial agents)
Acute tubulointerstitial nephritis associated with hemophagocytic disease (rare)	Contrast-associated kidney injury
Disseminated intravascular coagulation (rare)	

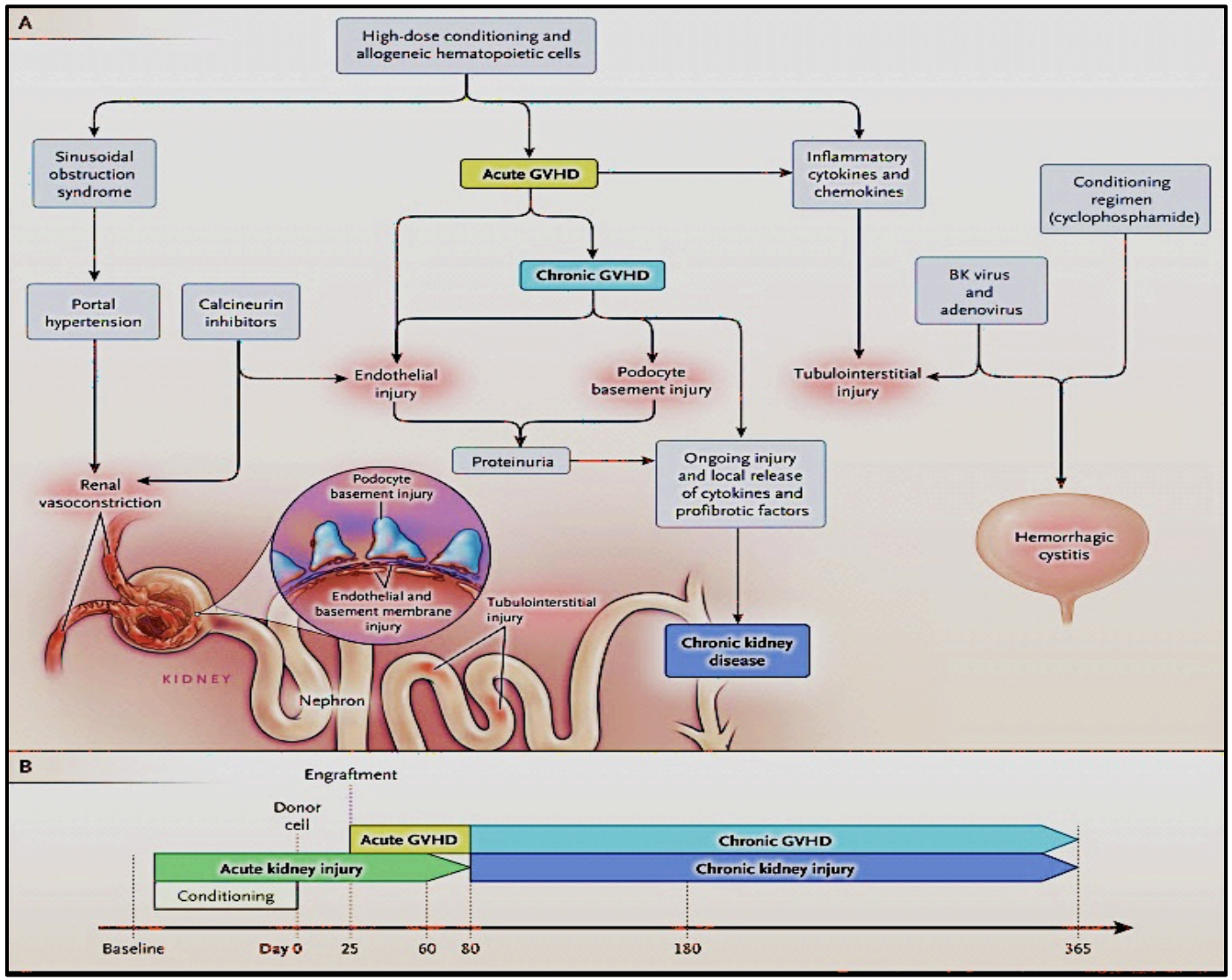
Perazella MA, Rosner MH. Oncology, 2018

Onco-Nephrology

Hematopoietic Stem Cell Transplant and Kidney Disease

AKI

- Chemotherapy
- SOS
- aTMA
- aGVHD
- Nephrotoxins
- Sepsis
- Drugs- AIN



CKD

- cTMA
- cGVHD
- Nephrotoxins
- Radiation
- Calcineurin Is
- Chemotherapy
- Drugs- CIN

Hingorani S. NEJM 2016

Onco-Nephrology
MGUS → MGRS

Defining MGRS for Hematologists/Oncologists and Nephrologists

- MGUS (plasma cells <10%, serum M protein <1 g/dL) that has kidney involvement
  - AKI, proteinuria, CKD
  - Various kidney lesions are described

Organized			Nonorganized (granular)	
Crystals	**Fibrillar**	**Microtubular**	**MIDD (Randall type)**	**Other**
Myeloma cast nephropathy	Light chain amyloidosis	Type I and type II cryoglobulinemic glomerulonephritis	LCDD	Proliferative GN with monoclonal Ig deposits
Light chain proximal tubulopathy (with or without Fanconi syndrome)	Nonamyloid	Immunotactoid GN	LHCDD	Waldenström
Crystal-storing histocytosis	Fibrillary GN*	GOMMID	HCDD	Macroglobulinemia

- Therapy initiated to reduce paraproteins
  - Prevent acute kidney injury (or help reverse AKI) and prevent development of future CKD

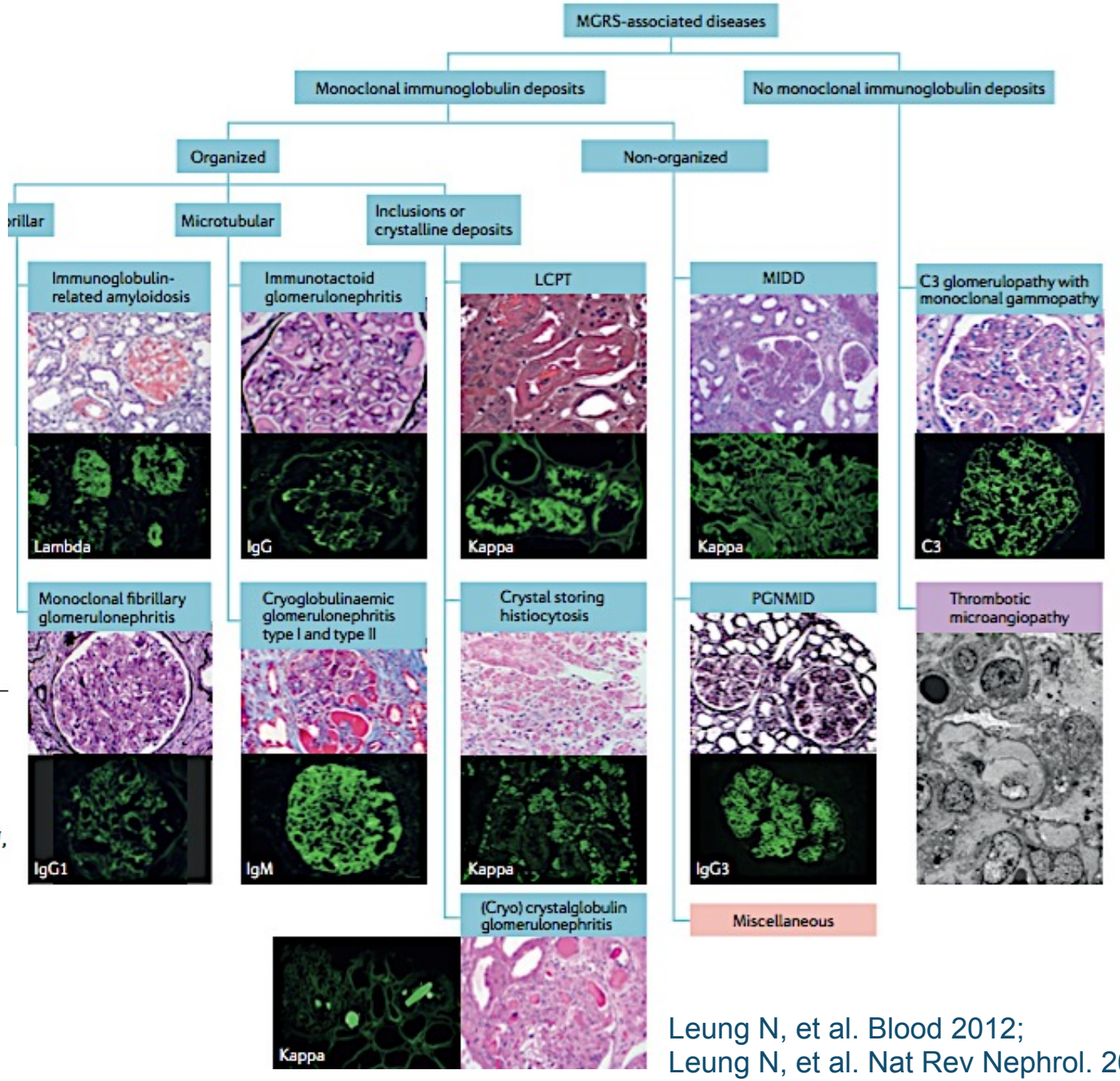
Leung N, et al. Blood 2012;
Leung N, et al. Nat Rev Nephrol. 2018

CONSENSUS STATEMENT

EXPERT CONSENSUS DOCUMENT

The evaluation of monoclonal gammopathy of renal significance: a consensus report of the International Kidney and Monoclonal Gammopathy Research Group

Nelson Leung[1], Frank Bridoux[2], Vecihi Batuman[3], Aristeidis Chaidos[4], Paul Cockwell[5], Vivette D. D'Agati[6], Angela Dispenzieri[1], Fernando C. Fervenza[1], Jean-Paul Fermand[7], Simon Gibbs[8], Julian D. Gillmore[9], Guillermo A. Herrera[10], Arnaud Jaccard[11], Dragan Jevremovic[1], Efstathios Kastritis[12], Vishal Kukreti[13], Robert A. Kyle[1], Helen J. Lachmann[9], Christopher P. Larsen[14], Heinz Ludwig[15], Glen S. Markowitz[6], Giampaolo Merlini[16], Peter Mollee[17], Maria M. Picken[18], Vincent S. Rajkumar[1], Virginie Royal[19], Paul W. Sanders[20], Sanjeev Sethi[1], Christopher P. Venner[21], Peter M. Voorhees[22], Ashutosh D. Wechalekar[9], Brendan M. Weiss[23] and Samih H. Nasr[1]*



Leung N, et al. Blood 2012;
Leung N, et al. Nat Rev Nephrol. 2018

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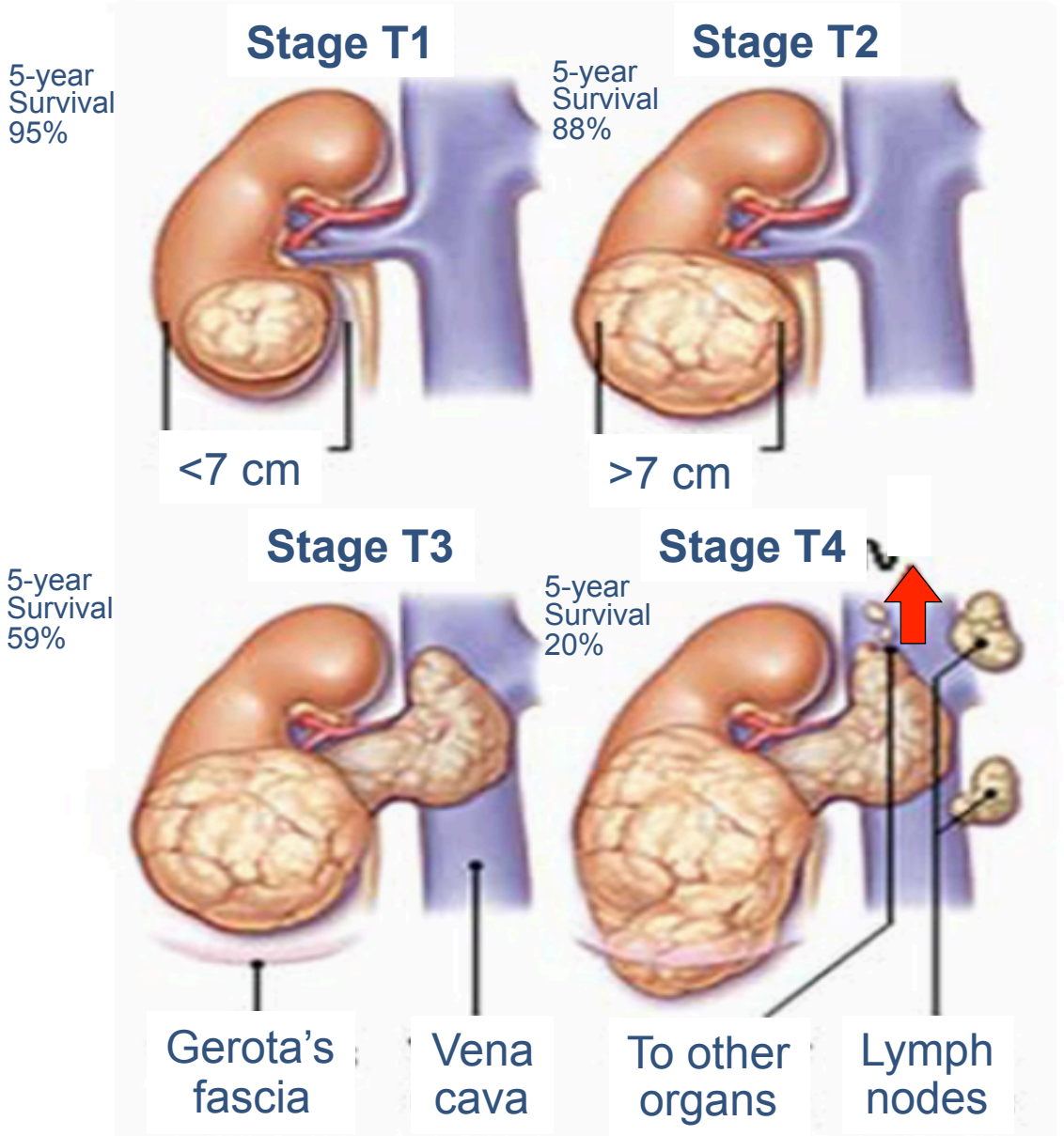
Renal Cell Carcinoma

- **Epidemiology**
  - RCC accounts for ~3% of all adult malignancies
  - RCC incidence is highest in Europe, N. America and Australia
  - Rates for new RCC have risen by 0.7% each year over the past 10 years (driven in part by imaging of small masses)



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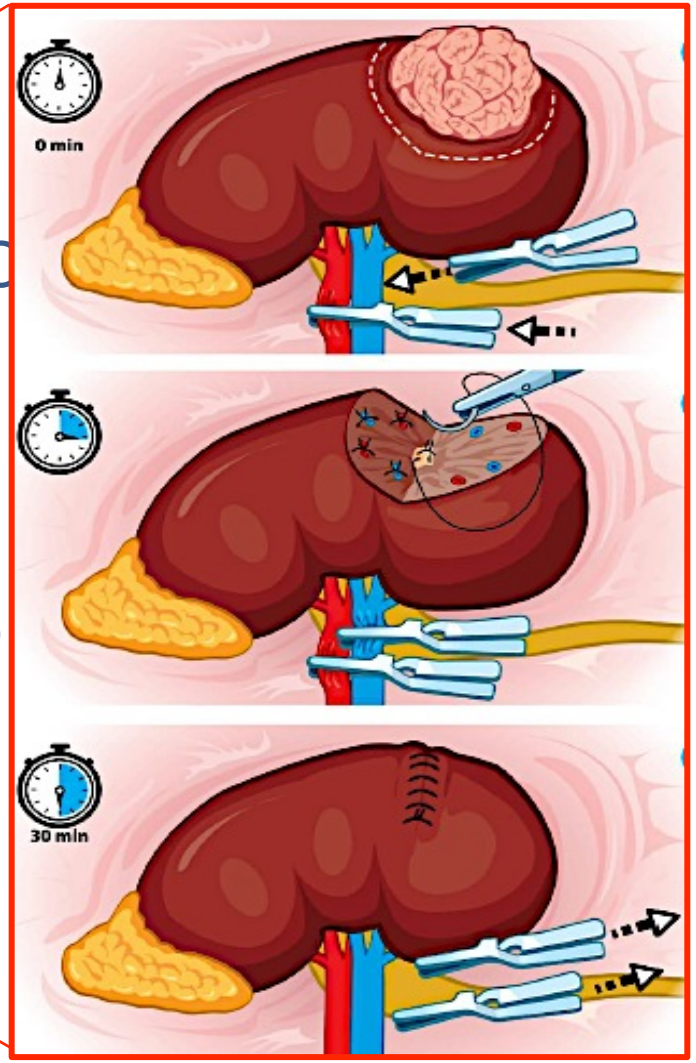
Renal Cell Carcinoma Therapy

- **Old and New drugs**
  - Conventional chemotherapy
  - Molecular targeted agents (anti-VEGF Abs, TKIs, mTC
  - Immunotherapies (IL-2, ICP inhibitors)
  - Adjuvants to surgical and percutaneous techniques
- **Surgical techniques**
  - Spare nephron loss to reduce burden of AKI and CKD
  - Total vs. partial nephrectomy
- **Percutaneous techniques**
  - Cryotherapy
  - Radiofrequency ablation



Perazella MA, Driecer R, Rosner MH. KI, 2018

Onco-Nephrology
AKI/CKD in Renal Cell Carcinoma

- Retrospective cohort study of VA patients with RCC who underwent either PN or RN (2004-2013); N = 7073 veterans; Median 39 mo F/U

Variables	PN (Partial)	RN (Radical)
N	2278	4795
Age (years), mean ± SD	62 ± 9	64 ± 10
Gender (% female)	3.5	3.7

Time point	eGFR	Total	PN	RN
Presurgery		78.5 ± 19.4	81.3 ± 18.9	77.2 ± 19.6
Immediately after surgery		60.4 ± 20.2	71.0 ± 22.2	55.3 ± 17.0
At least 180 days postsurgery		60.5 ± 20.5	74.8 ± 20.3	53.6 ± 16.7
Last eGFR obtained postsurgery	Median 39 months (21-60 months)	61.9 ± 21.8	73.8 ± 21.9	56.2 ± 19.3

Streja E, et al. NDT, 2018

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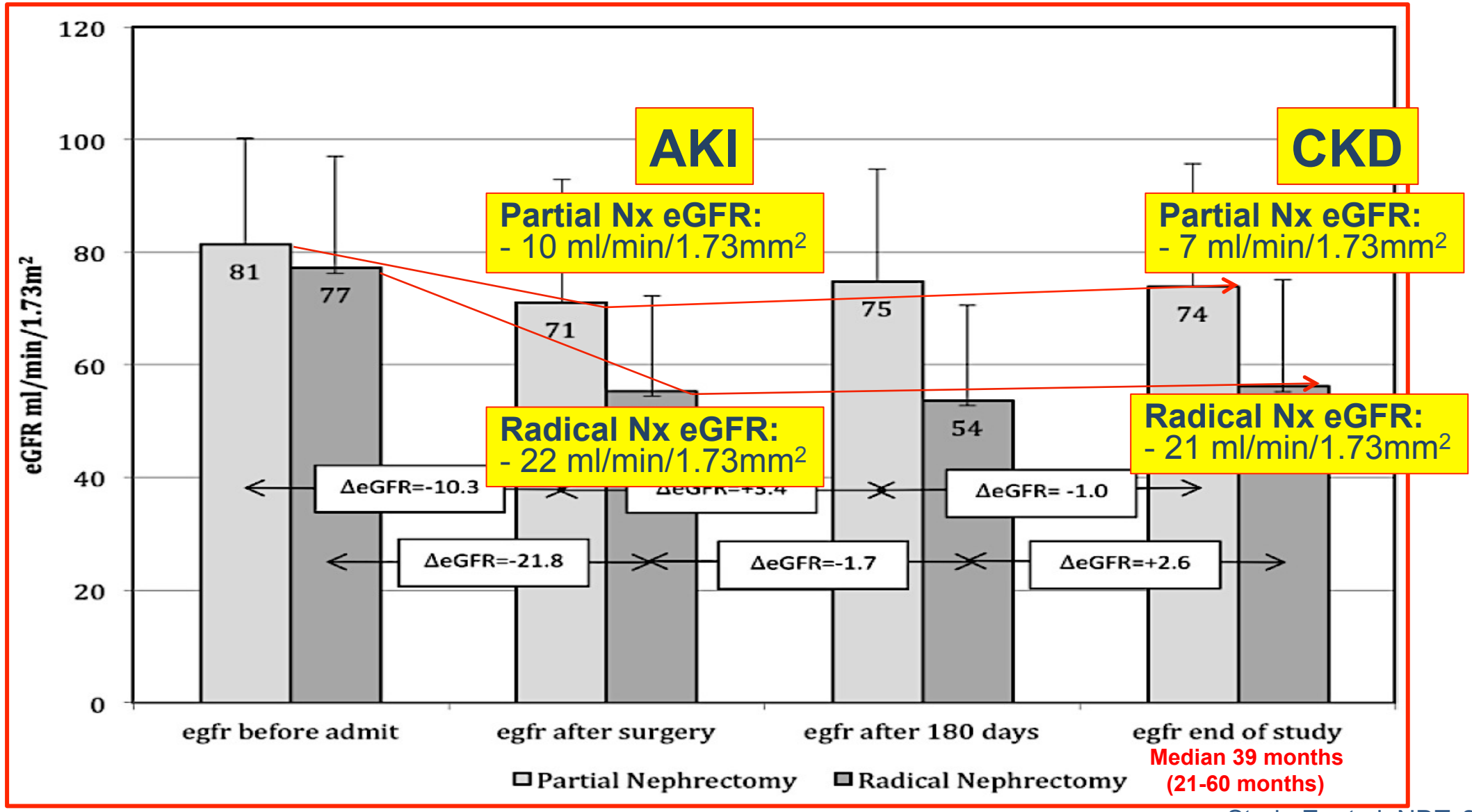
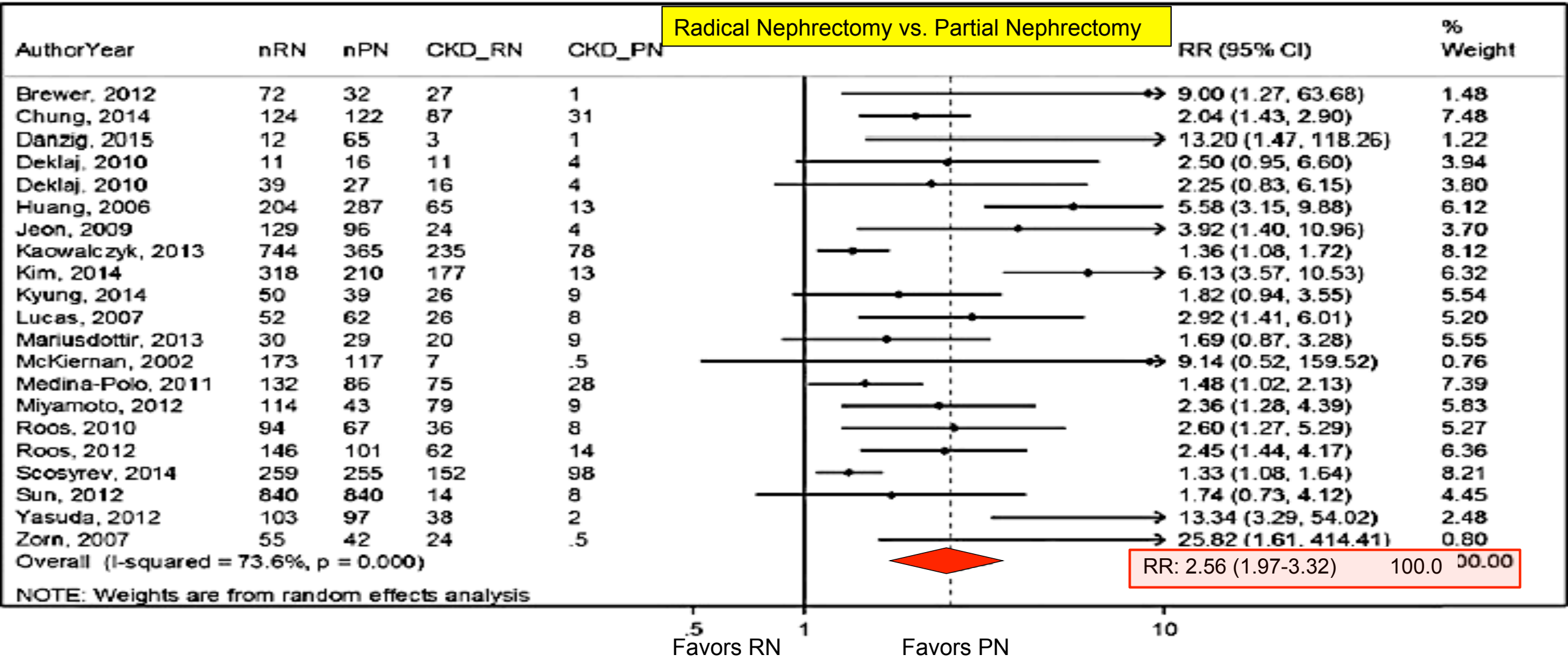
AKI/CKD in Renal Cell Carcinoma



Streja E, et al. NDT, 2018

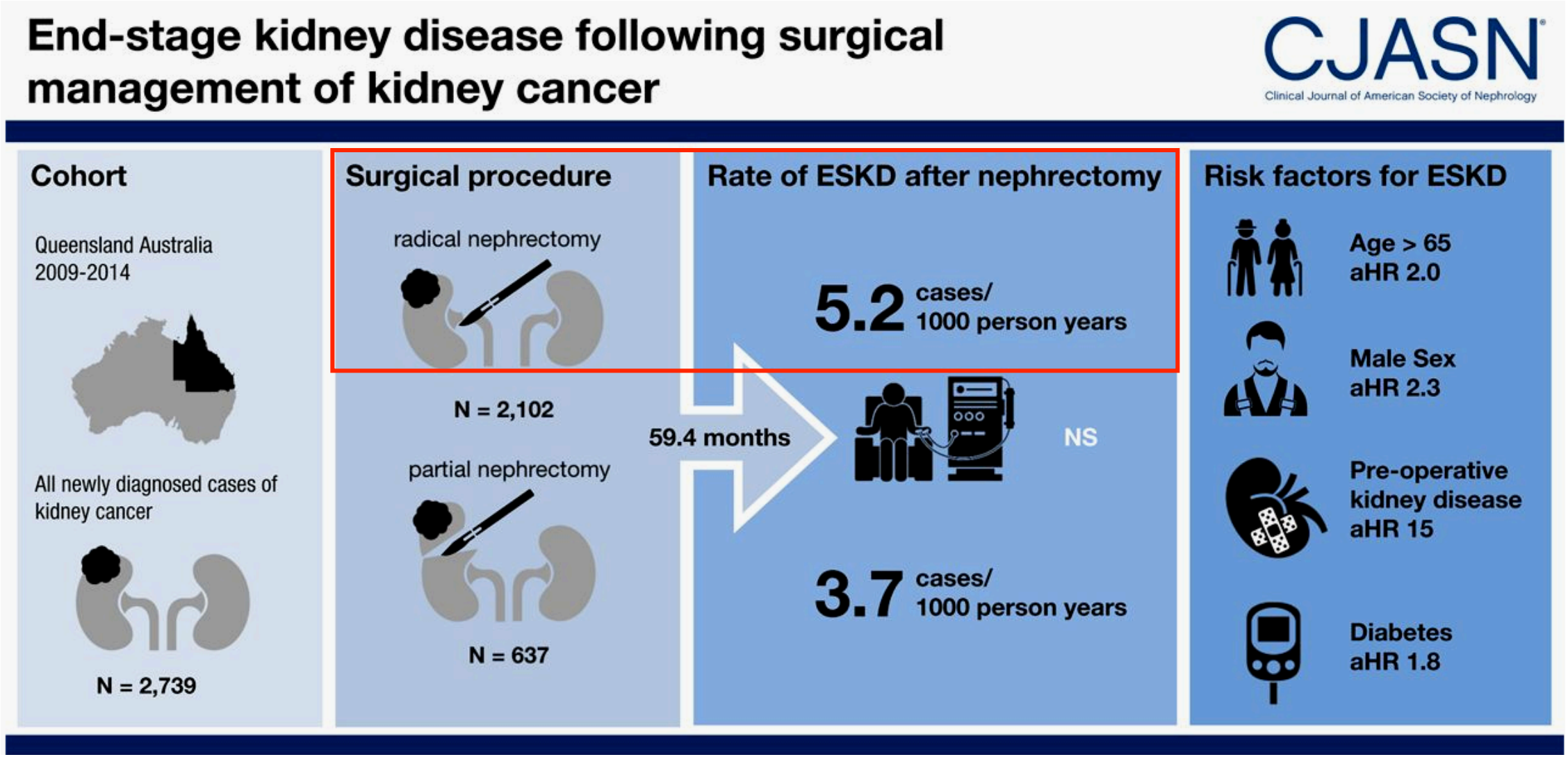
Onco-Nephrology
CKD in Renal Cancer



Risk Ratio and 95% CI of Incidence of Stage 3 CKD

Patel HD, et al. CJASN 2017

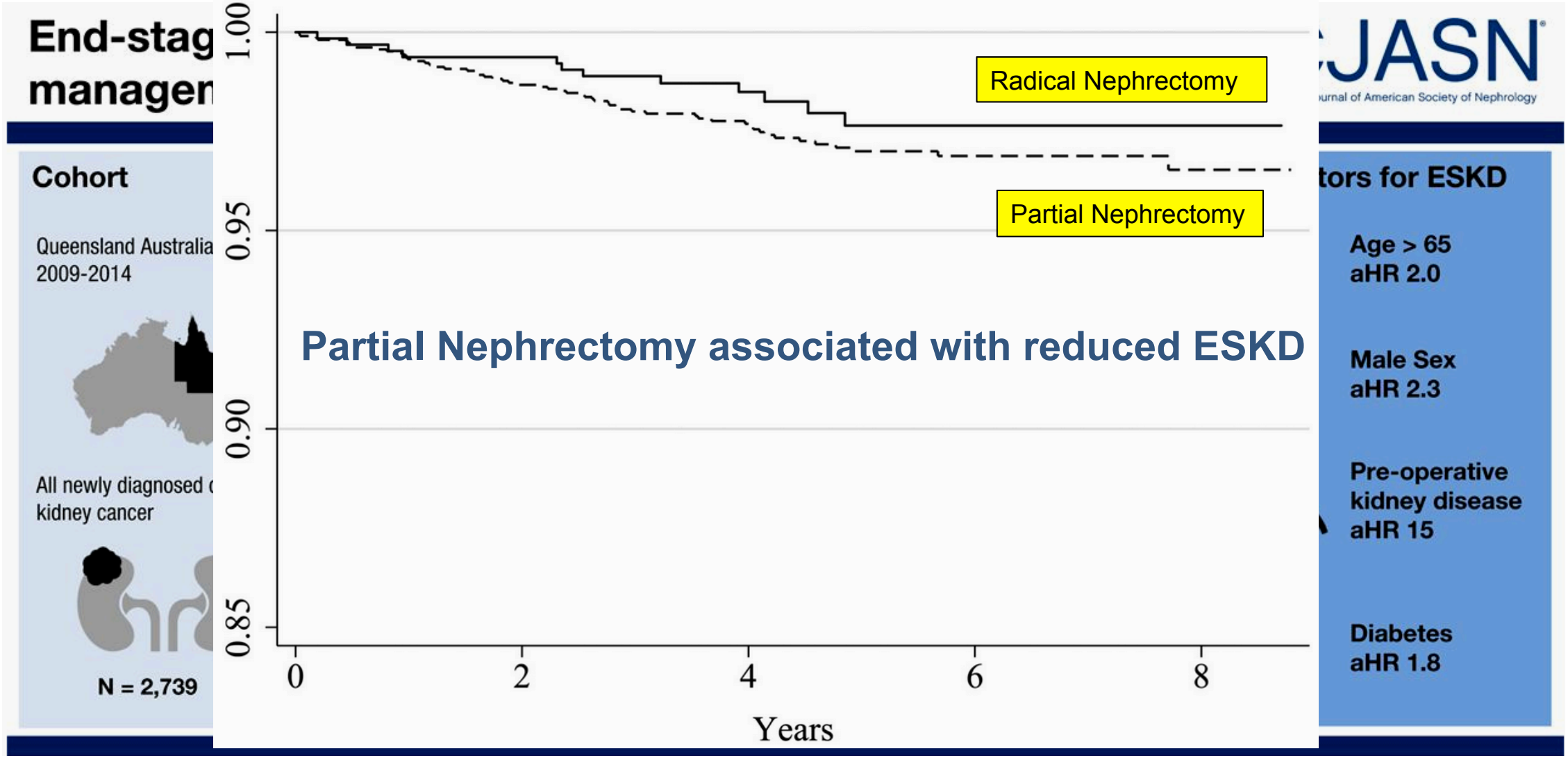
Onco-Nephrology
ESKD in Renal Cancer



Ellis RJ, et al. CJASN 2018

Onco-Nephrology

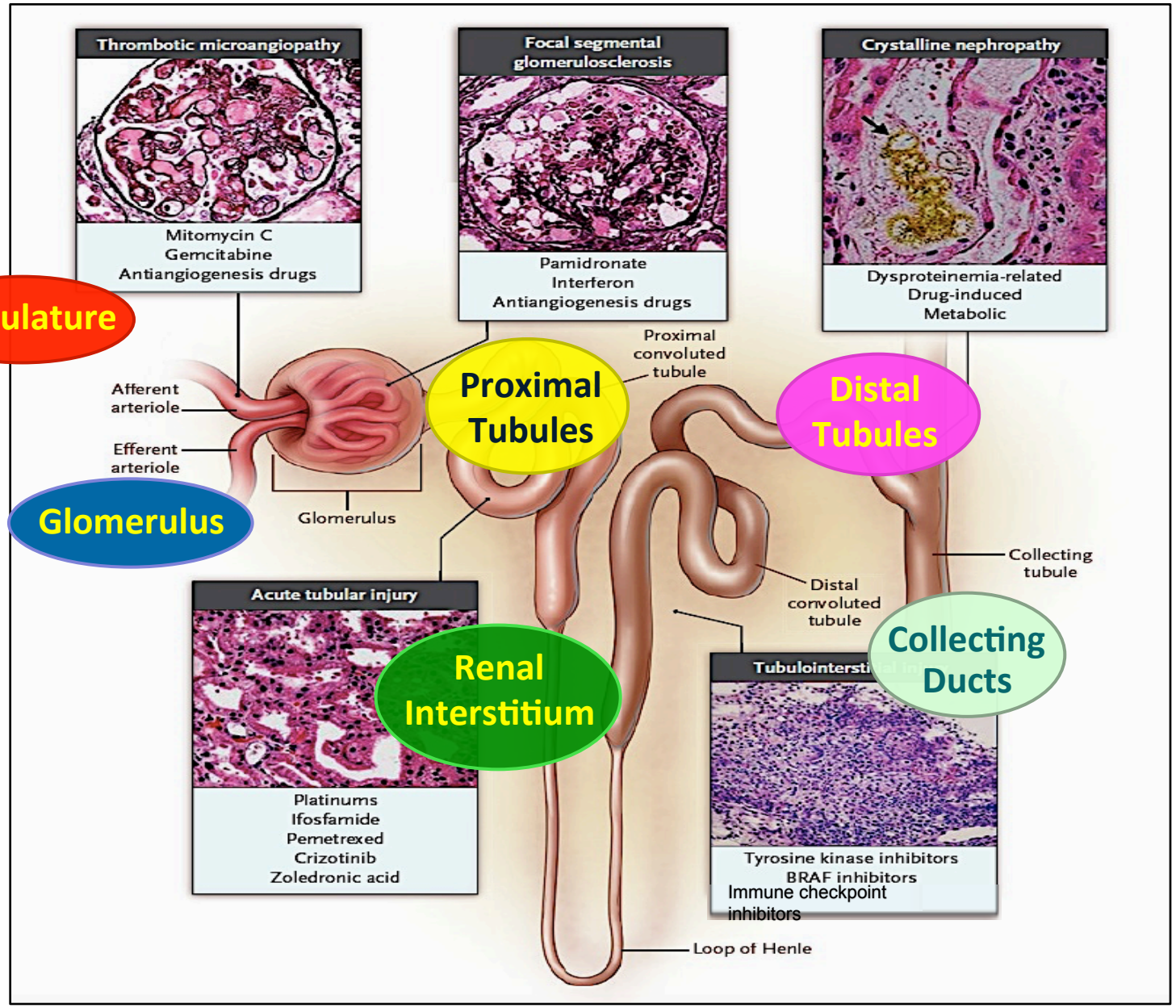
ESKD in Renal Cancer



Kaplan-Meier Curves for ESKD

Ellis RJ, et al. CJASN 2018

Anti-Cancer Drug-induced Kidney Disease



Rosner MH, Perazella MA.
NEJM 2017

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Anti-Cancer Agents

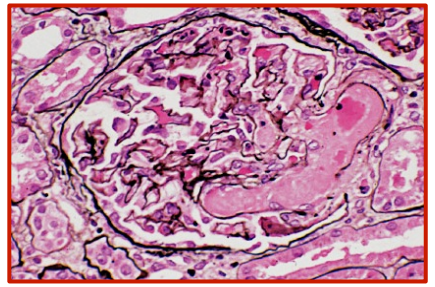
- **Conventional Agents**
  - *Cytotoxic drugs* (platins), *Alkylating agents* (ifosfamide)
  - *Antitumor antibiotics* (mitomycin C)
  - *Antimetabolites* (methotrexate, pemetrexed, pentostatin, gemcitabine, clofarabine)
- **Targeted agents**
  - *Anti-angiogenesis drugs* (anti-VEGF Ab, VEGF soluble receptors, TKIs)
  - *EGFR inhibitors, BRAF inhibitors, ALK inhibitors*
  - *Proteosome inhibitors*
- **Immunotherapies**
  - *IL-2, interferon*
  - *Immune checkpoint inhibitors* (anti-CTLA-4, anti-PD-1, anti-PDL1)
  - *Chimeric antigen receptor T cells*

Rosner MH, Perazella MA. NEJM 2017

Conventional Chemotherapeutic Agents

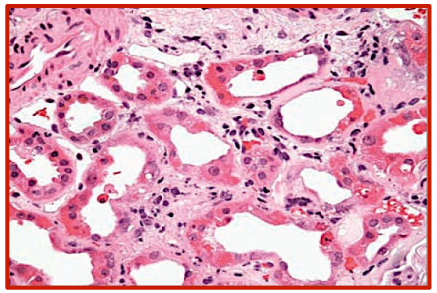
Kidney Disease

- **Gemcitabine, Mitcomycin C, Cisplatin–** **TMA**

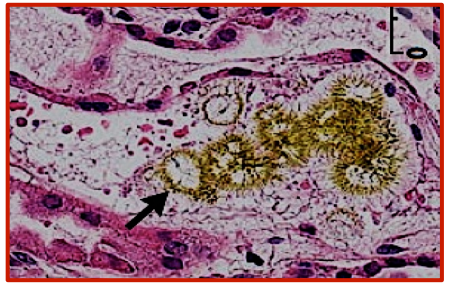


- **Pamidronate–** **Collapsing FSGS**

- **Platins, Ifosfamide, Pemetrexed, Zoledronate–** **Toxic ATI/ATN**



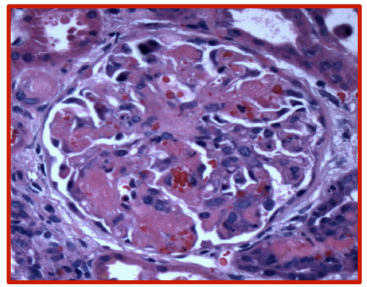
- **Methotrexate–** **Crystalline ATI**

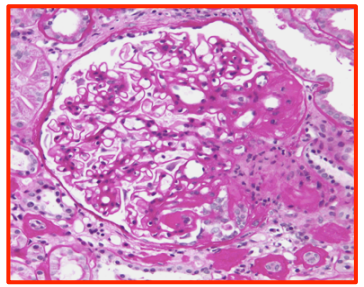


Targeted Anti-Cancer Agents

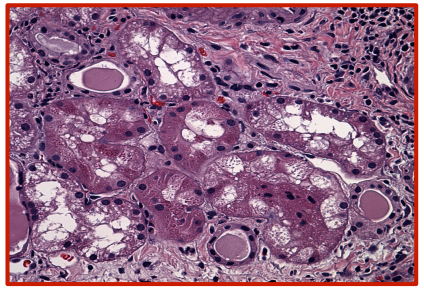
Kidney Disease

- **Anti-VEGF inhibitors–** **TMA, MCD/FSGS**

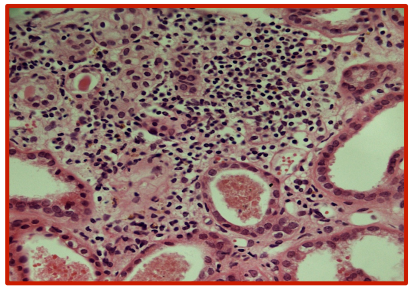




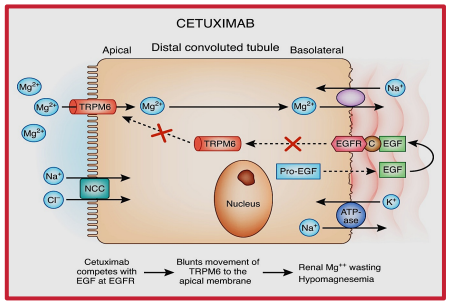
- **ALK inhibitors–** **Pseudo-AKI, ATI/ATN, Renal cysts**



- **BRAF inhibitors—** **AIN/ATN**



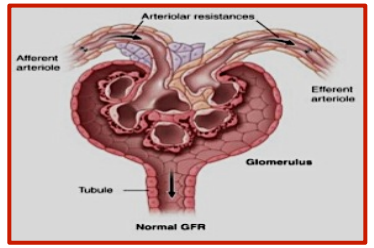
- **EGFR antibodies–** **Hypomagnesemia**

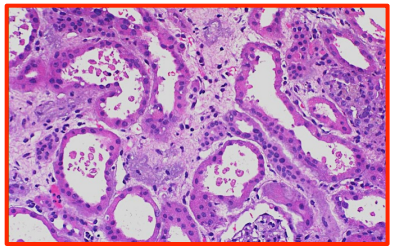


Cancer Immunotherapies

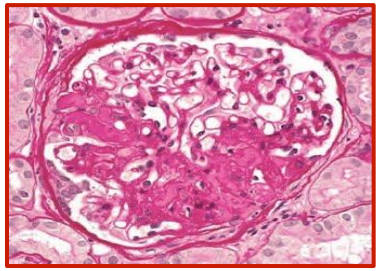
Kidney Disease

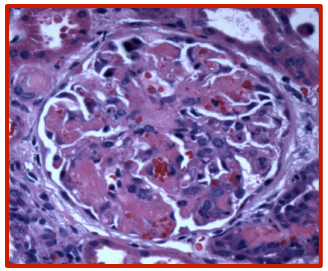
- **Interleukin-2–** **Prerenal AKI, ATN, PI-GN**



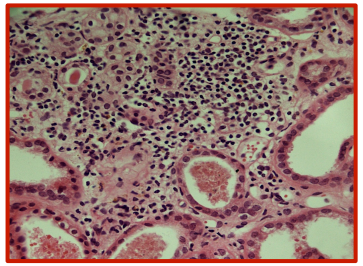


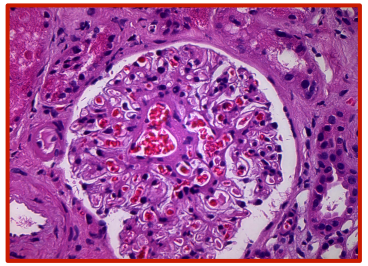
- **Interferon–** **FSGS/TMA**



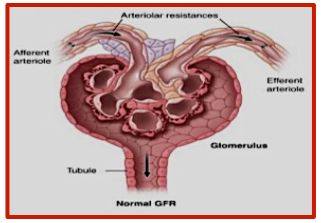


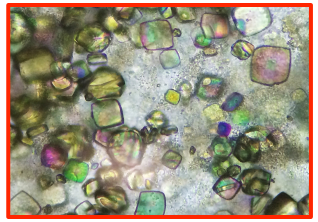
- **Immune Checkpoint Inhibitors–** **AIN/IC-GN/MCD Txp rejection**





- **CAR T-Cells–** **Prerenal AKI/ATI, TLS, electrolyte disorders**

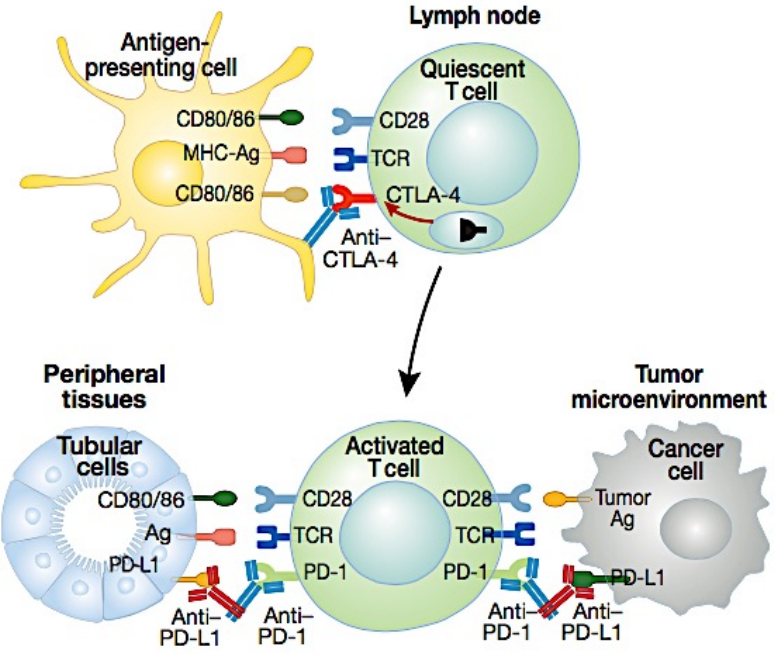




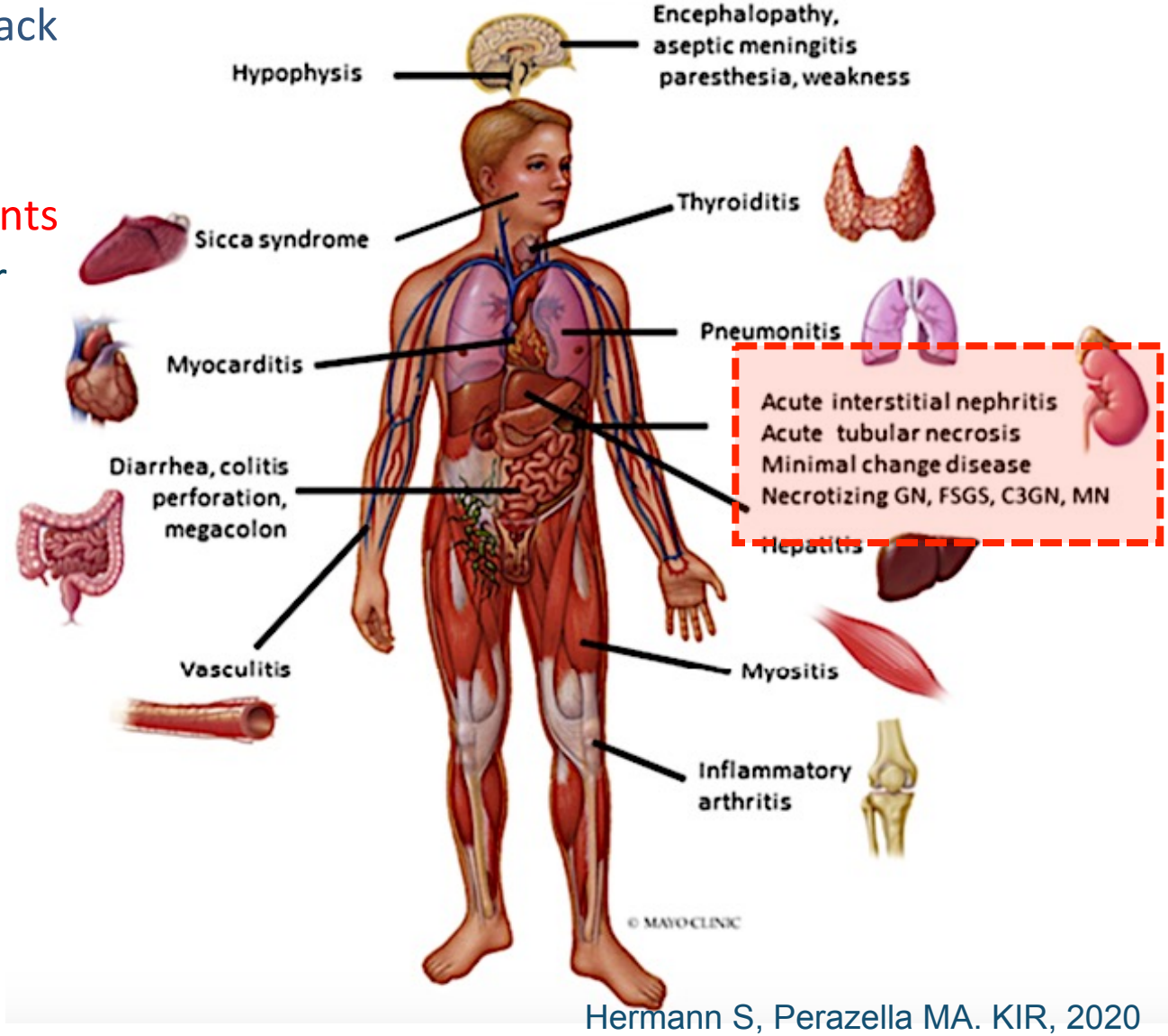
Cancer Immunotherapies

Immune Checkpoint Inhibitors and Kidney Disease

- ICPIs blunt immune checkpoints to allow T-cells to attack various cancers
- Monoclonal Abs against CTLA-4, PD-1 and PD-L1
- ICPIs are complicated by immune-related adverse events
- AKI incidence of 2-5% due primarily to ATIN, but other lesions also occur



Perazella MA, Shirali AC. KI 2020

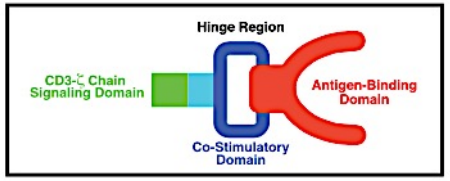


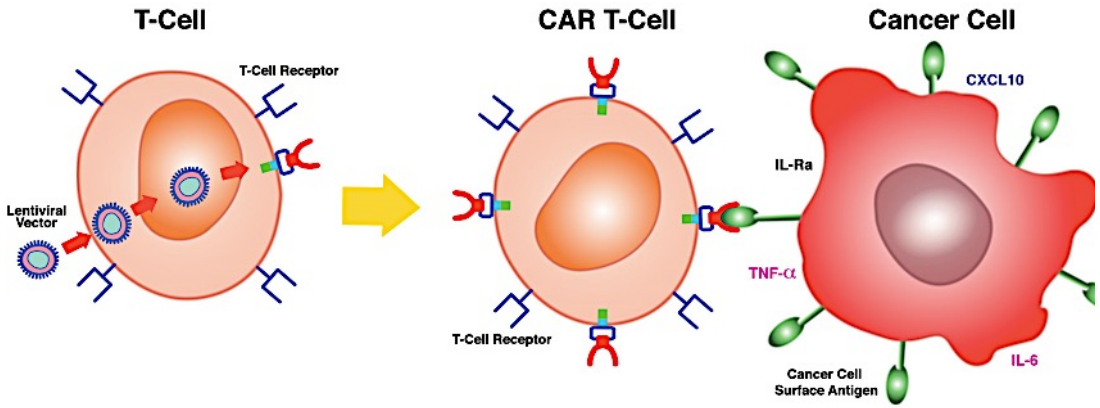
Hermann S, Perazella MA. KIR, 2020

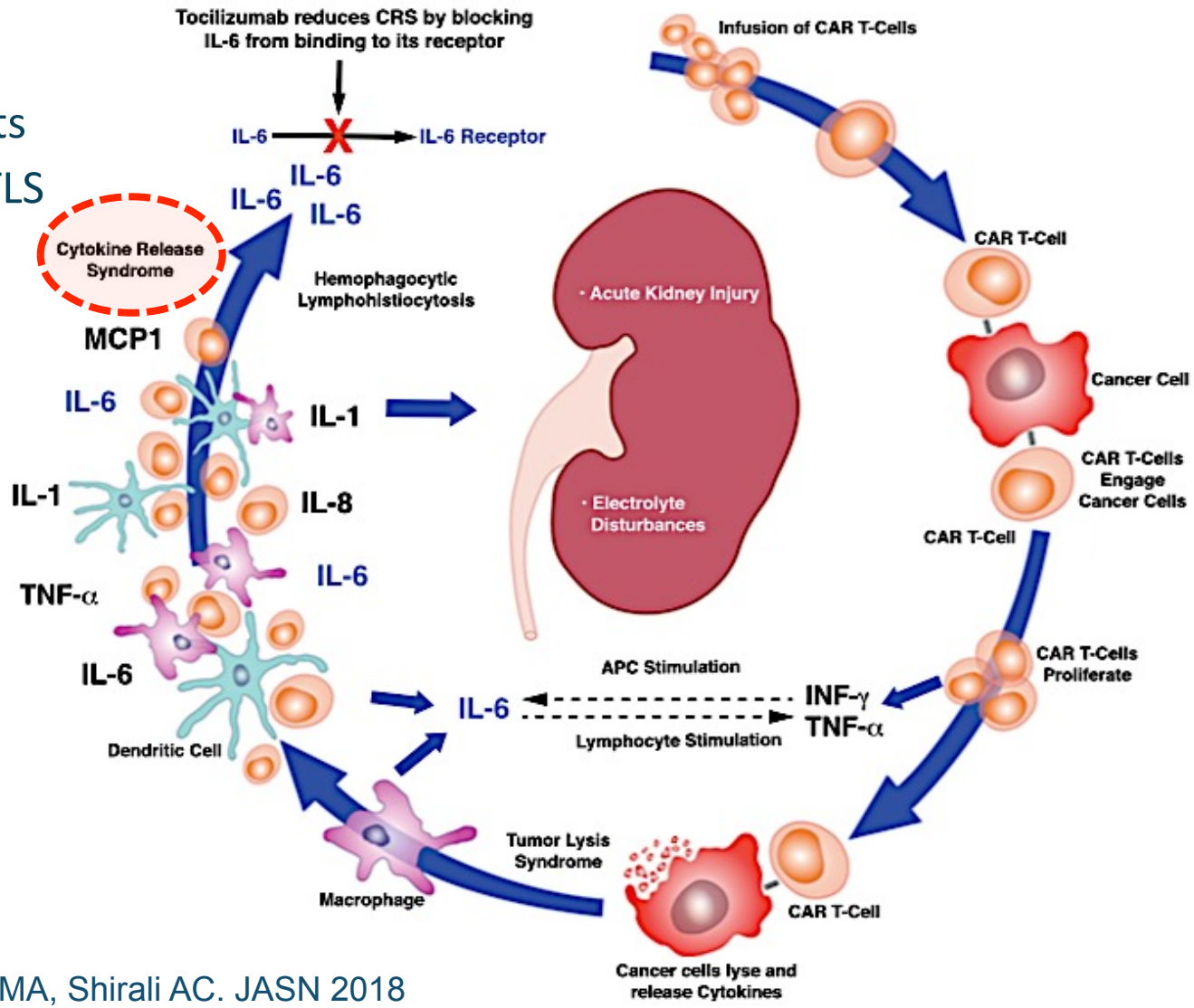
Cancer Immunotherapies

CAR T-Cell and Kidney Disease

- Harvest host T cells to create CAR T-cells to target cancers
- CD19, CD20, and CD30, etc. are the cancer Ag targets
- CAR T-cell therapy is complicated by CRS, HLH and TLS
- AKI is primarily prerenal and ATI, but may also have inflammatory lesions and uric acid nephropathy







Perazella MA, Shirali AC. JASN 2018

Onco-Nephrology

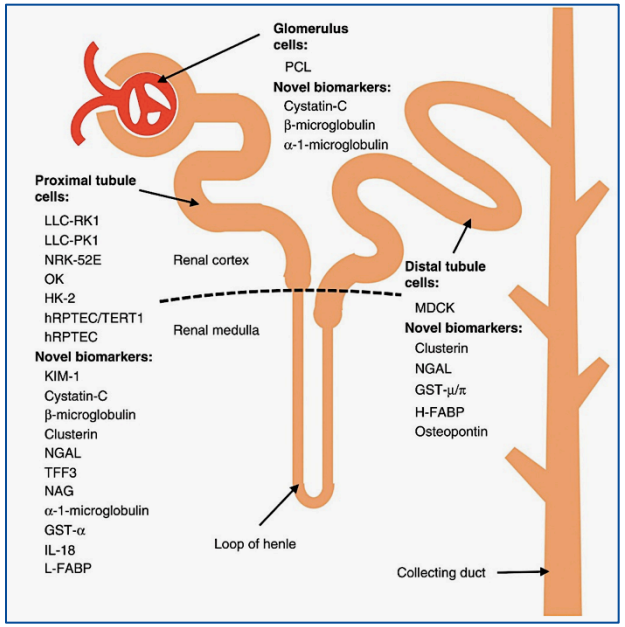
What do we need to do?

- **Basic Research in Onco-Nephrology**
- **Clinical Research in Onco-Nephrology**
- **Clinical Care in Onco-Nephrology**

Onco-Nephrology

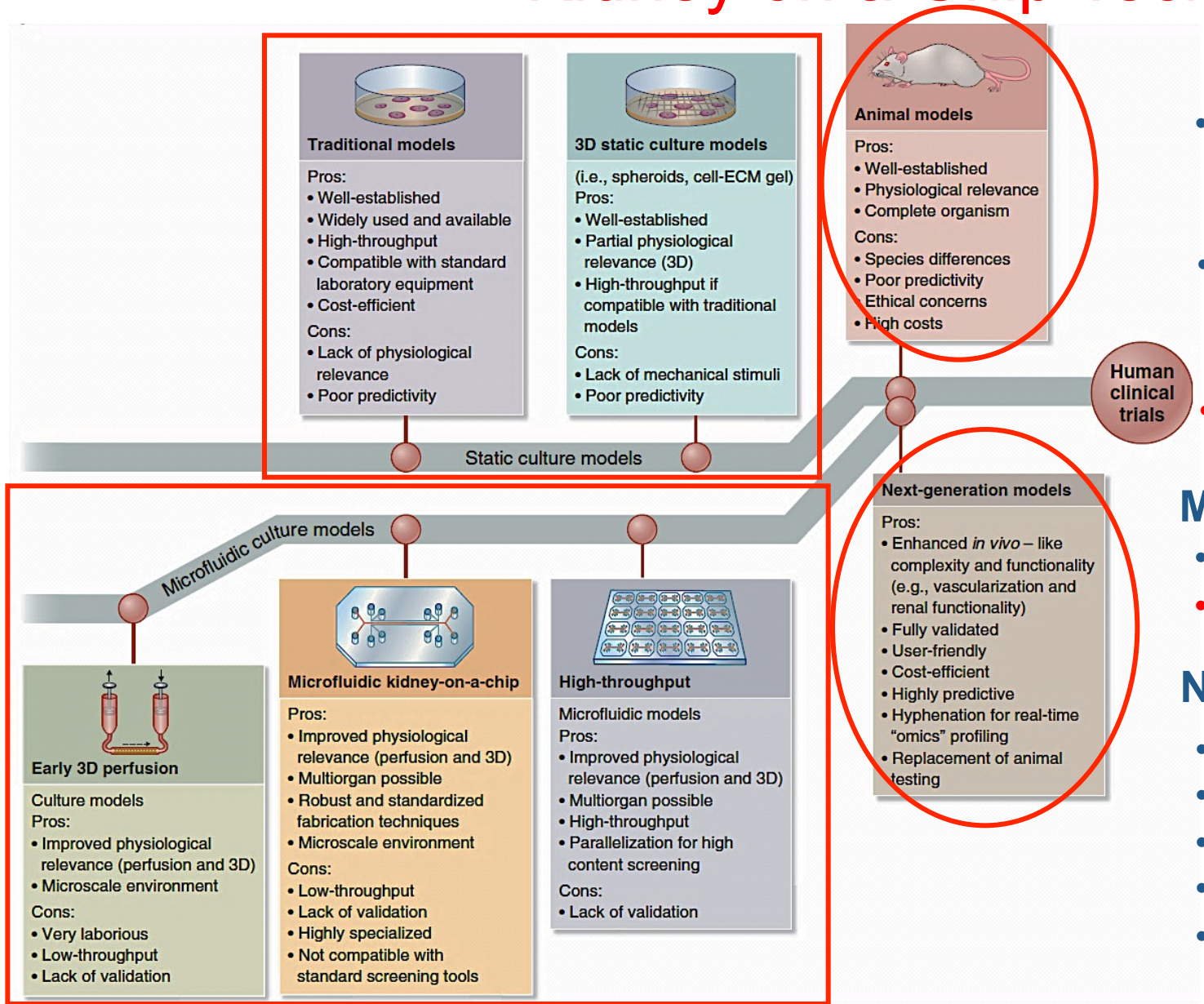
What do we need to do?

- **Basic Research in Onco-Nephrology**
  - Preclinical studies of anti-cancer agents to evaluate safety and nephrotoxicity
    - Employ novel kidney injury biomarkers
    - FDA and EMA approved 7 biomarkers
  - Utilize kidney on a chip technology



Onco-Nephrology

Kidney on a Chip Technology



Static Culture/Animal Models

- Cell cultures-well established, no or partial physiological relevance; high throughput and cost efficient
- Animal models-have physiological relevance, but costly with ethical concerns and species differences
- Both Poorly Predictive of Nephrotoxicity

Microfluiditic Culture Models

- Have Physiological Relevance
- Laborious, Lack of Validation

Next Generation Models

- Have Physiological Relevance
- User friendly
- Cost efficient
- Highly predictive of nephrotoxicity
- Replace animal models

Ashammakhi N, et al. KI 2018

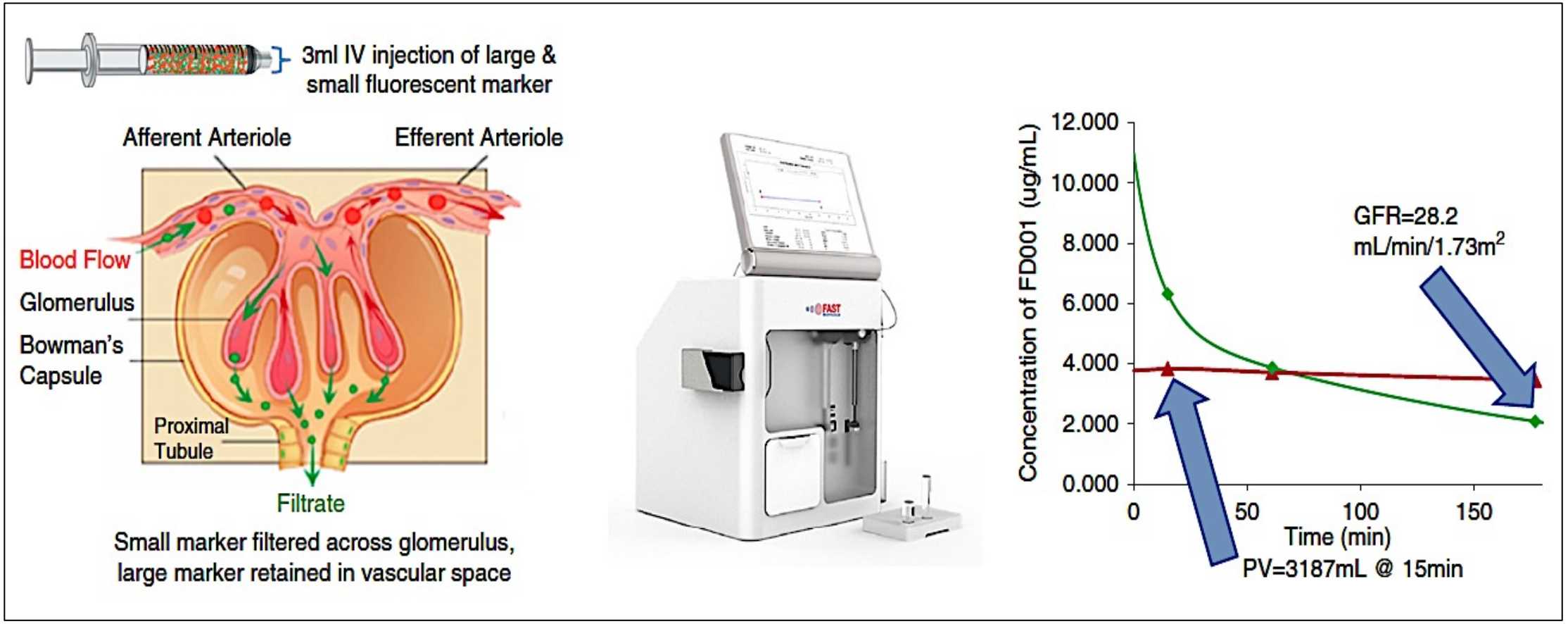
Onco-Nephrology

What do we need to do?

- **Clinical Research in Onco-Nephrology**
  - Develop better GFR estimates for drug dosing in cancer/ CKD patients
  - Include CKD patients in Clinical Oncology Trials
  - Utilize Novel Biomarkers in Clinical Oncology Trials?
  - Develop POC tests that rapidly provide 'measured GFR' in cancer patients

Onco-Nephrology

POC tests that provide ‘measured GFR’



FAST BioMedical technique to measure both GFR and plasma volume (PV). Two fluorescent markers of different molecular mass are injected: 1) small freely filtered 5-kD FITC-labeled carboxymethyl dextran and 2) large 150-kD rhodamine-labeled carboxymethyl dextran that is not filtered across the glomerulus. At three time points, a blood sample is drawn, and fluorescence is detected using a fluorometer. The raw data are converted using a software package to PV from the 15-minute sample and to measured GFR from all three samples.

McMahon B, Rosner MH. Kidney360 2020

Onco-Nephrology

POC tests that provide ‘measured GFR’

- Patented fluorescent tracer agent

Lumitrace™
(relmapirazin)

- Device
  - Transdermal fluorescence detection sensor
    - LED light source
    - Photodetector
  - Display monitor
    - Data acquisition software
    - GFR calculation software

MediBeacon transdermal GFR measurement system. The patient is administered a fluorescent tracer agent that is removed from the blood exclusively by GFR, and measured fluorescence decreases over time as the substance is cleared by the kidney through GFR. A display monitor used algorithms to calculate GFR.

McMahon B, Rosner MH. Kidney360 2020

Onco-Nephrology

What do we need to do?

- **Clinical Care in Onco-Nephrology**
  - Establish collaborative Onco-Nephrology Clinics
  - Enhance education in Onco-Nephrology
  - Promote collaboration in Onco-Nephrology

Onco-Nephrology

Onco-Nephrology Clinic

Nephrol Dial Transplant (2018) 33: 1503–1510
doi: 10.1093/ndt/gfy188
Advance Access publication 5 July 2018

ndt
Nephrology Dialysis Transplantation

Opening an onconephrology clinic: recommendations and basic requirements

Laura Cosmai[1,*], Camillo Porta[2,*], Mark A. Perazella[3], Vincent Launay-Vacher[4], Mitchell H. Rosner[5], Kenar D. Jhaveri[6], Matteo Floris[7], Antonello Pani[7], Cécile Teuma[8], Cèzary A. Szczylik[9] and Maurizio Gallieni[1,10]

[1]Onco-Nephrology Clinic, Nephrology and Dialysis Unit, San Carlo Borromeo Hospital, ASST Santi Carlo e Paolo, Milan, Italy, [2]Medical Oncology, IRCCS San Matteo University Hospital Foundation, Pavia, Italy, [3]Section of Nephrology, Department of Medicine, Yale University School of Medicine, New Haven and Veterans Administration Medical Center, West Haven, CT, USA, [4]Service ICAR, Pitié-Salpêtrière University Hospital, Paris, France, [5]Department of Medicine, University of Virginia Health System, Charlottesville, VA, USA, [6]Division of Kidney Diseases and Hypertension, Zucker School of Medicine at Hofstra/Northwell, Great Neck, NY, USA, [7]Nephrology and Dialysis Unit, G. Brotzu Hospital, Cagliari, Italy, [8]Nephrology Department, Centre Hospitalier Lyon Sud Pierre-Bénite, France, [9]Department of Oncology, University of Warsaw School of Medicine, Warsaw, Poland and [10]Department of Clinical and Biomedical Sciences "Luigi Sacco", University of Milan, Milan, Italy

Cosmai L, et al. NDT, 2018

Onco-Nephrology
ASN Educational Curriculum-2016

Online Curricula: Onco-Nephrology

Introduction to the American Society of Nephrology Onco-Nephrology Curriculum

This series of 19 chapters covers most of the important Onco-Nephrology topics. The chapters include Take Home Points and Board style questions to highlight important issues. The goal is to provide ASN members, including veteran nephrologists, newly minted nephro-clinicians, and fellowship trainees, as well as other interested healthcare providers, the building blocks upon which further information can be added as the field advances. I hope the curriculum provides the initial framework to achieve this goal.

For more information about the curriculum, the Society's efforts related to Onco-Nephrology, or ASN, please contact policy@asn-online.org or 202-640-4660.

Mark A. Perazella, MD
American Society of Nephrology

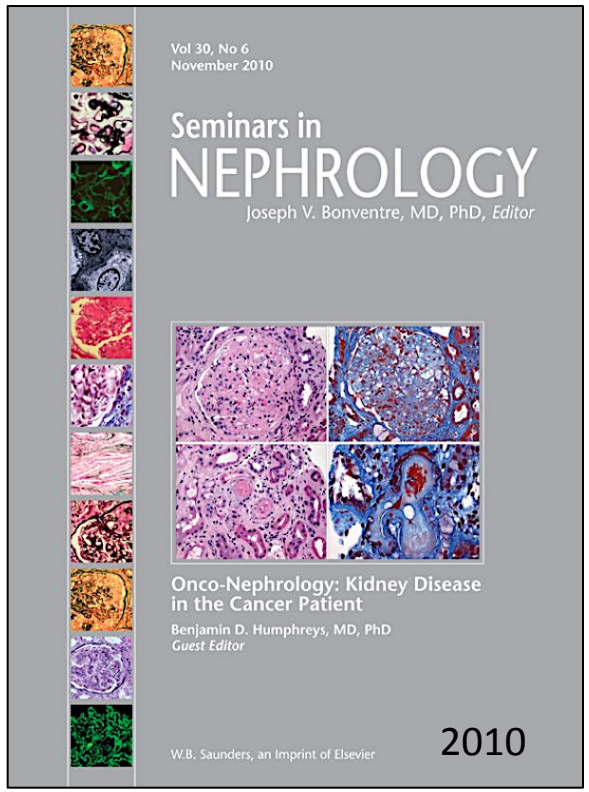
ASN On-Line Onco-Nephrology Core Curriculum

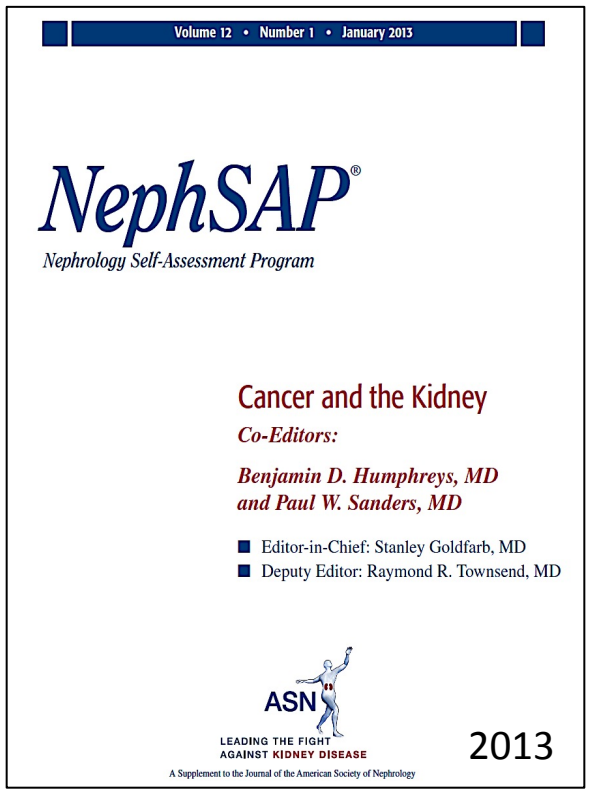
Onco-Nephrology
ASN Educational Curriculum-2016

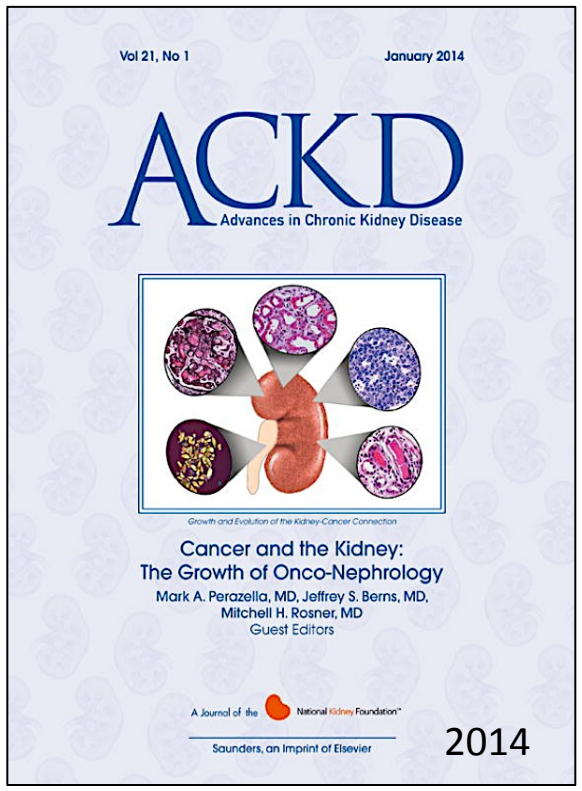
ASN On-Line Onco-Nephrology Core Curriculum

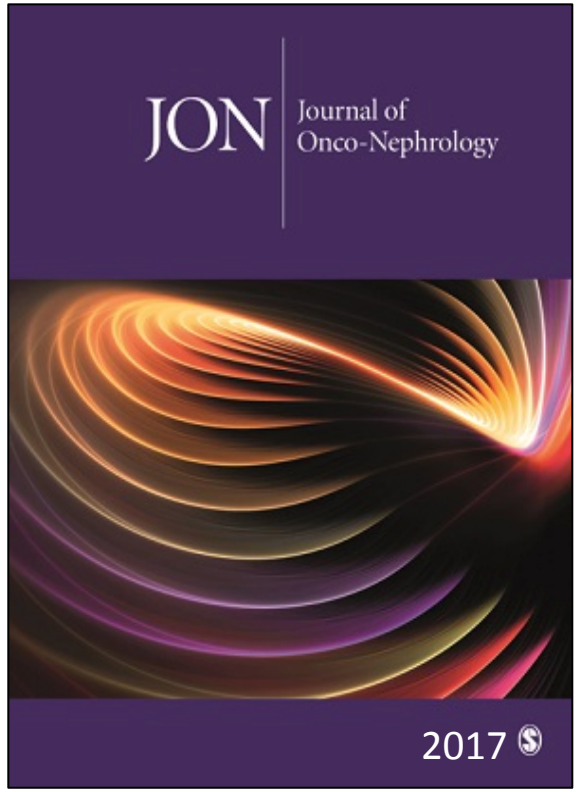
Onco-Nephrology

Educational Textbooks and Journals









Onco-Nephrology

Educational Symposia and Conferences

2011-2015

ASN

Onco-Nephrology
Cancer and the K

Course Description

Patients with cancer are susceptib
treatment. This program provides
associated with cancer. The progr
with cancer, emphasizing evidenc
newer targeted biological anti-neo
kidneys, and its treatment are pres
transplants are reviewed. This pro
of the patient following nephrecton
malignancies in patients with CKD

ASN designates this live activity fo

Course Objective(s)

Upon completion of this program,
function; 2) know how to treat acu
the effects of antineoplastic therap
with ESRD.

Co-Chairs

- Jeffrey S. Berns, MD, FASN
- Mitchell H. Rosner, MD, FASN

Sessions

Agenda
November 9, 2011 | 07:00 AM - 06
Location: 202 |

ONCO
Cancer, Ch
A symposium fo
A CME Conference desi

SATURD
September 26,
8:00am – 4:00

NORTH SHORE-LIJ
HEALTH SYSTEM FACU
Thomas P. Bradley, MD*
Steven Fishbane, MD*
Kenar D. Jhaveri, MD*
Hitesh H. Shah, MD

VISITING FACULTY
Gerald B. Appel, MD
Joseph Bonventre, MD, Ph
Bradley P. Dixon, MD
Glenn S. Markowitz, MD
Naveed Masani, MD
Vinay Nair, DO
Mark A. Perazella, MD

*Course Directors

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Friday, October 14, 201

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Organized by
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Prof. Fortunato Ciardiello

Università degli Studi della Campania Luigi Vanvitelli
biogem

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KDIGO executive conclusions

www.kidney-international.org

KDIGO Controversies Conference on onco-nephrology: understanding kidney impairment and solid-organ malignancies, and managing kidney cancer

Check for updates

OPEN

Camillo Porta[1], Aristotelis Bamias[2], Farhad R. Danesh[3], Alicja Dębska-Ślizień[4], Maurizio Gallieni[5], Morie A. Gertz[6], Jan T. Kielstein[7], Petra Tesarova[8], Germaine Wong[9,10], Michael Cheung[11], David C. Wheeler[12,13], Wolfgang C. Winkelmayer[14] and Jolanta Małyszko[15]; for Conference Participants[16]

[1]Department of Internal Medicine and Therapeutics, University of Pavia and Division of Translational Oncology, IRCCS Istituti Clinici Scientifici Maugeri, Pavia, Italy; [2]Second Propaedeutic Department of Internal Medicine, National and Kapodistrian University of Athens, Greece; [3]Section of Nephrology, The University of Texas MD Anderson Cancer Center, Houston, Texas, USA; [4]Clinical Department of Nephrology, Transplantology and Internal Medicine, Medical University of Gdańsk, Gdańsk, Poland; [5]Nephrology and Dialysis Unit, Luigi Sacco Department of Biomedical and Clinical Sciences, Università di Milano, Milan, Italy; [6]Division of Hematology, Department of Medicine, Mayo Clinic, Rochester, Minnesota, USA; [7]Medical Clinic V, Nephrology, Rheumatology, Blood Purification, Academic Teaching Hospital Braunschweig, Braunschweig, Germany; [8]Department of Oncology, 1st Faculty of Medicine, Charles University and General University Hospital, Prague, Czech Republic; [9]Centre for Kidney Research, The Children's Hospital at Westmead, Westmead, New South Wales, Australia; [10]Sydney School of Public Health, University of Sydney, New South Wales, Australia; [11]KDIGO, Brussels, Belgium; [12]Department of Renal Medicine, University College London, London, UK; [13]George Institute for Global Health, Sydney, Australia; [14]Selzman Institute for Kidney Health, Section of Nephrology, Department of Medicine, Baylor College of Medicine, Houston, Texas, USA; and [15]Department of Nephrology, Dialysis, and Internal Medicine, Medical University of Warsaw, Poland

The association between kidney disease and cancer is multifaceted and complex. Persons with chronic kidney disease (CKD) have an increased incidence of cancer, and both cancer and cancer treatments can cause impaired kidney function. Renal issues in the setting of malignancy can worsen patient outcomes and diminish the adequacy of anticancer treatments. In addition, the oncology treatment landscape is changing rapidly, and data on tolerability of novel therapies in patients with CKD are often lacking. Caring for oncology patients has become more specialized and interdisciplinary, currently requiring collaboration among specialists in nephrology, medical oncology, critical care, clinical pharmacology/pharmacy, and palliative care, in addition to surgeons and urologists. To identify key management issues in nephrology relevant to patients with malignancy, KDIGO (Kidney Disease: Improving Global Outcomes) assembled a global panel of multidisciplinary clinical and scientific expertise for a controversies conference on onco-nephrology in December 2018. This report covers issues related to kidney impairment and solid organ malignancies as well as management and treatment of kidney cancer. Knowledge gaps, areas of controversy, and research priorities are described.

Kidney International (2020) 98, 1108–1119; https://doi.org/10.1016/j.kint.2020.06.046

KEYWORDS: glomerular filtration rate; nephrotoxicity; oncology; renal cell carcinoma

Kidney disease and cancer have a multifaceted association. Persons with chronic kidney disease (CKD) have an increased incidence of cancer relative to patients without CKD.[1,2] In addition, both cancer and cancer treatments can cause impaired kidney function, including acute kidney injury (AKI) or CKD. Renal issues in the setting of malignancy can worsen patient outcomes and diminish the adequacy of anticancer treatments. Patients whose cancer is potentially curable can experience multiorgan failure requiring intensive care and kidney replacement therapy. In some countries, the amelioration of cancer mortality caused by greater treatment efficacy has resulted in a growing population of cancer survivors[3] who are at increased risk for kidney disease. Finally, advanced malignancy complicated by multiorgan illness raises questions related to the appropriateness of aggressive treatment versus palliative therapy.

The complex relationship between kidney disease and cancer is confounded by a rapidly changing treatment landscape. Caring for oncology patients has become more

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[16]See Appendix for list of Conference Participants.

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Onco-Nephrology
Collaboration

- National (AIOM, SIN) and International Scientific Society Conferences (EDTA, ASN) with onco-nephrology sessions and educational courses
- National Oncological and Urological conferences
- Epidemiological studies in Italy (surveys and other projects in progress)
- Papers published in International Journals; Textbooks on Onco-Nephrology
- Urological Guidelines on kidney cancer (AURO 2012)
- AIOM Guidelines on kidney cancer (2015-2016-2017-2018)
- TMD Project (Italian Multidisciplinary Group on GU cancers)
- Collaboration between Nefrological e Oncological International Society
- Interdisciplinary Working Group on Onco-Nephrology (AIOM-SIN) dedicated to specific projects (i.e., contrast medium use in cancer patients)

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Associazione Italiana di Oncologia Medica

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EDTA ERA
Leading European Nephrology

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The future of cancer therapy

ESMO

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Thank You!