Update in Nephrology

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Disclosures

- No financial interests to disclose
- No medication off label use will be discussed
Objectives

• Discuss recent developments in the field of nephrology that would be of interest to the practicing internist
• Define and stage acute kidney injury
• Discuss a treatment option for resistant hypertension
• Does IV fluid administration prior to IV contrast help or harm patients?
• Discuss IV access for those patients with CKD
• Discuss the effects of intensive therapy on the progression of chronic kidney disease and mortality
Acute Kidney Injury?

Two patients are admitted on the same day and diagnosed with pneumonia

- The first patient is a 49 year old female with no significant medical history
- The second patient is a 78 year old male with a PMHx of CKD (Creatinine=3.9 mg/dl), DM, PVD & HTN
- Both receive appropriate and adequate volume resuscitation
Which patient has sustained kidney injury?

1. The 49 year old female
2. The 78 year old male
3. Both patients

**49 yo Female**
- Day 1
  - creatinine=0.5 mg/dl
- Day 3
  - creatinine=0.8 mg/dl

**78 yo male**
- Day 1
  - creatinine=3.9 mg/dl
- Day 3
  - creatinine=4.1 mg/dl
Acute Kidney Injury?

Which patient has sustained kidney injury?
1. The 49 year old female
2. The 78 year old male
3. Both patients
4. Neither patient
Acute Kidney Injury?

49 yo Female
Day 1, creatinine=0.5 mg/dl
Day 3, creatinine=0.8 mg/dl

Estimated GFR change: >100 to about 70 ml/min

78 yo male
Day 1 creatinine=3.9 mg/dl
Day 3 creatinine=4.1 mg/dl

Estimated GFR change: 16 to 14 ml/min
d. Acute Renal Failure

Conceptually, easily defined:

*Loss of renal function evidenced by a decline in GFR.*

In the past, no consensus on an operational definition

- Over 35 definitions in the literature
- Range from increased creatinine > 0.3 mg/dL, to highly complex criteria.
Kidney Disease: Improving Global Outcomes (KDIGO) Clinical Practice Guideline for Acute Kidney Injury (AKI)

- AKI is defined as any of the following:
  - Increase in SCr of 0.3 mg/dl within 48 hours
  - or an increase in SCr to X1.5 times baseline, which is known or presumed to have occurred within the prior 7 days
  - or Urine volume <0.5 ml/kg/h for 6 hours

KI (2012) 2, 19-36
Staging of AKI

- After the diagnosis of AKI is established, it should be staged.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Serum creatinine</th>
<th>Urine output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.5–1.9 times baseline OR ≥0.3 mg/dl (≥26.5 µmol/l) increase</td>
<td>&lt;0.5 ml/kg/h for 6–12 hours</td>
</tr>
<tr>
<td>2</td>
<td>2.0–2.9 times baseline</td>
<td>&lt;0.5 ml/kg/h for ≥12 hours</td>
</tr>
<tr>
<td>3</td>
<td>3.0 times baseline OR Increase in serum creatinine to ≥4.0 mg/dl (≥353.6 µmol/l) OR Initiation of renal replacement therapy OR, in patients &lt;18 years, decrease in eGFR to &lt;35 ml/min per 1.73 m²</td>
<td>&lt;0.3 ml/kg/h for ≥24 hours OR Anuria for ≥12 hours</td>
</tr>
</tbody>
</table>

With increased stage of AKI, the risk for death and need for RRT increases.
Definition and diagnostic criteria for AKI

“Changes in volume status can influence serum creatinine levels and mask recognition of changes in renal function. Consequently, diagnostic criteria would be applied only after an optimal state of hydration had been achieved. The amount and type of fluid to be administered were not delineated because the amount of fluid resuscitation depends on the underlying clinical situation.”

*Mehta, Crit Care 11:R31*
Does the patient have AKI or ARF?

- AKI is the preferred terminology for an increase in serum creatinine or decrease UOP
- ARF will imply need for renal replacement therapy
Difficulties in the Diagnosis of AKI

- Serum creatinine is late marker of AKI (24 to 48 hours)
- *AKI is currently diagnosed and treated retrospectively.*
Difficulties in the Diagnosis of AKI

• Serum creatinine may vary due to:
  • Age
  • Race
  • Sex
  • Muscle mass
  • Metabolism
  • Nutritional status
  • Hydration
  • Medication

• Diagnosis of AKI vs acute myocardial infarctions
Wait What! Aren't there new tests to diagnose AKI

- Cystatin C
- NGAL
- Urinary Interleukin-18
- Urinary insulin-like growth factor-binding protein 7 (IGFBP7) and tissue inhibitor of metalloproteinases-2 (TIMP-2) have been shown to predict AKI and long-term dialysis or death.
- A point-of-care device measuring two biomarkers was approved by the US Food and Drug Administration (FDA) in 2014 (NephroCheck)
  - This is a “risk assessment test for ICU patients and is NOT intended to diagnose AKI”
Orlando VAMC

The New Orlando VA Medical Center
13800 Veterans Way
Orlando, FL 32827

Energy Plant
Warehouse
Domiciliary
*60 beds

Site for Central Florida Veterans Memorial Park
Chapel

Diagnostic & Treatment
Parking Garages

Outpatient

Inpatient
*134 beds

Community Living Center
*120 beds
Next Case

A fifty year old male presents to the emergency department with abdominal pain and a CT scan of the abdomen with intravenous contrast is ordered. He has a history of type 2 diabetes mellitus, hypertension and hyperlipidemia. His eGFR is stable at 40 ml/min.

What does recent data tell us about *Intravenous* Contrast as a cause acute kidney injury?
Risk of Acute Kidney Injury After Intravenous Contrast Media Administration

Jeremiah S. Hinson, MD, PhD, Michael R. Ehmann, MD, MPH, MS, Derek M. Fine, MD, Elliot K. Fishman, MD, FACR, Matthew F. Toerper, BS, Richard E. Rothman, MD, PhD, Eili Y. Klein, MS, PhD

Annals of Emergency Medicine
272,961 patient visits without CT scan on 115,102 patients

Excluded
1. CT scan at other visit (118,578)
2. No initial SCr (111,417)
3. No follow-up SCr (35,975)
4. ED encounter in 180 days prior to start date of study (111)
5. History of dialysis/renal transplant (485)
6. Initial SCr ≤ 0.3 or ≥ 4.0 mg/dL (255)
7. CECT <72 hours after ED departure (906)

82,729 patient visits with CT scan on 54,740 patients

Excluded
1. No initial SCr (10,830)
2. No follow-up SCr (49,937)
3. CT Scan in the prior 6 months (5,735)
4. ED encounter in 180 days prior start date of study (499)
5. History of dialysis/renal transplant (983)
6. Initial SCr ≤ 0.3 or ≥ 4.0 mg/dL (475)
7. CECT <72 hours after ED departure (1,570)

Final Inclusion
17,934 patient visits
16,801 patients

7,201 CT scans with contrast
5,499 CT scans without contrast
5,234 patients without CT
Risk of Acute Kidney Injury After Intravenous Contrast Media Administration

- Propensity-matched case-control design at one site
- The frequency of later acute kidney injury in:
  - 7,201 patients undergoing CT with IV contrast
  - 5,499 undergoing CT NO contrast
  - 5,234 with no imaging
- No difference in acute kidney injury (10.2% to 10.9%).

- This study suggests acute kidney injury after intravenous contrast CT scan is disproportionate to objective data.
- A randomized trial is needed to confirm this finding
Orlando VAMC
Intravenous Contrast Material Exposure Is Not an Independent Risk Factor for Dialysis or Mortality

McDonald et al, Radiology 273;3, 714-725
Intravenous Contrast Material Exposure Is Not an Independent Risk Factor for Dialysis or Mortality

Robert J. McDonald
Radiology Vol. 273, No. 3: 714-725

• 21,346 patient records were included
  • high-risk group: 1,916
  • medium-risk group: 4,884
  • low-risk group: 14,546

• Each study arm of the entire matched cohort:
  • 10,673 in the contrast group
  • 10,673 in the non-contrast group of scans in
Figure 1: Study flowchart. Contrast CTs = contrast-enhanced CT scans, CT = computed tomography, IA = intraarterial, IV = intravenous, noncontrast CTs = unenhanced CT scans, SCr serum creatinine = serum creatinine.

Published in: "Intravenous Contrast Material Exposure Is Not an Independent Risk Factor for Dialysis or Mortality"
Robert J. McDonald
Radiology Vol. 273, No. 3: 714-725
Figure 3: Survival analysis. The survival of the entire matched study cohort, AKI acute kidney injury risk subgroups, and comorbidity subgroups, sorted according to contrast material exposure history, is shown with Kaplan-Meier survival curves for the entire cohort (solid lines) and the subset that experienced AKI acute kidney injury 24–72 hours following CT scanning (dashed lines). SCr serum creatinine values are in milligrams per deciliter; to convert to Système International units in micromoles per liter, multiply by 88.4.

Published in: Robert J. McDonald; Jennifer S. McDonald; Rickey E. Carter; Robert P. Hartman; Richard W. Katzberg; David F. Kallmes; Eric E. Williamson; Radiology 2014, 273, 714-725. DOI: 10.1148/radiol.14132418
2014 by the Radiological Society of North America, Inc.
Intravenous Contrast Material Exposure Is Not an Independent Risk Factor for Dialysis or Mortality

Robert J. McDonald
Radiology Vol. 273, No. 3: 714-725

- The frequency of new cases of dialysis following administration of intravenous iodinated contrast material is low (<1%).
- AKI is associated with worse overall short-term outcomes (dialysis, 30-day mortality), but these outcomes were independent of contrast exposure.
- The risk associated for acute kidney injury with administration of intravenous iodinated contrast material appears to have been overstated.
Intravenous Contrast Material Exposure Is Not an Independent Risk Factor for Dialysis or Mortality

Robert J. McDonald
Radiology Vol. 273, No. 3: 714-725

- Single center study
- Retrospective data
- ICD-9 codes were used to identify co-morbidities
Contrast Induced Nephropathy: Not all patients are equal

- **Intra-arterial**
  - Cardiac catheter
  - Femoral approach with risk of atheroembolism kidney injury
  - Myocardial event with decrease cardiac output, hypotension
  - Multiple new medications
  - Bolus contrast

- **Intra-venous**
  - Peripheral IV
  - No embolic risk
  - Hemodynamically stable
  - No medication changes
  - Contrast is diluted
A 69 year old male with a history of angina is seen by a cardiologist and recommended to undergo a coronary angiogram. He has a history of CKD Stage III (eGFR of 40 ml/min by MDRD), Type 2 Diabetes and Hypertension. His medications include Lisinopril, amlodipine, and chlorthalidone. His BMI is 31 and office BP is 132/82 mm Hg.

The cardiologist has scheduled a diagnostic coronary angiogram via radial artery catheter insertion in 2 days.
Case

A recently published RCT comparing prophylactic hydration and no hydration to prevent contrast induced nephropathy concluded:

A. No difference in the incidence of CIN after 2-6 days between the two groups
B. Lower cost with no hydration when compared to the hydration group
C. Increased symptomatic heart failure in the hydration group
D. All of the above
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AMACING TRIAL

Prophylactic hydration to protect renal function from intravascular iodinated contrast material in patients at high risk of contrast-induced nephropathy (AMACING): a prospective, randomised, phase 3, controlled, open-label, non-inferiority trial

Lancet 2017;389:1312-22

Estelle C Nijssen, Roger J Rennenberg, Patty J Nelemans, Brigitte A Essers, Marga M Janssen, Marja A Vermeeren, Vincent van Ommen, Joachim E Wildberger
AMACING Trial Lancet 2017

• 660 patients with eGFR of 45-50 ml/min AND risks factors for CN, or eGRF 30-45 ml/min.
• No prophylactic hydration
• IV hydration with 0.9% NaCl, 3-4 ml/kg/h for 4 hours before/after contrast or 1 ml/kg/h 12 hours before/after contrast.
  • 50% intraarterial contrast administration
• Primary outcome: >25% increase in serum creatinine within 2-6 days
AMACING Risk Factors for CIN

eGFR of 45-50 ml/min AND risks factors for CN:

- CKD
- Diabetic Nephropathy
- Age >75 years
- Anemia
- Cardiovascular disease
- NSAID use
- Diuretic usage (volume depletion)

- Intravenous vs Intra-arterial contrast
### No prophylactic hydration vs standard prophylactic IV hydration in adults at risk for contrast-induced nephropathy

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Event rates</th>
<th>At 2 to 6 d</th>
<th>At 35 d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No prophylaxis</td>
<td>Standard prophylaxis</td>
<td>Absolute difference (95% CI)</td>
</tr>
<tr>
<td>Contrast-induced nephropathy§</td>
<td>2.6%</td>
<td>2.7%</td>
<td>-0.10 (−2.25 to 2.06)</td>
</tr>
<tr>
<td>Dialysis</td>
<td>0%</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>ICU admission</td>
<td>0%</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Symptomatic heart failure</td>
<td>0%</td>
<td>4.0%</td>
<td>-4.0 (−6.1 to −1.9)</td>
</tr>
</tbody>
</table>

‡ICU = intensive care unit; other abbreviations defined in Glossary.
§> 25% or 44 μmol/L increase in serum creatinine within 2 to 6 d.
||Criterion for noninferiority: upper limit of the 95% CI for difference between groups < 2.1%.
## AMACING Trial Lancet 2017

<table>
<thead>
<tr>
<th>Renal events within 26–35 days post-contrast</th>
<th>H+ group</th>
<th>H- group</th>
<th>Absolute difference: H-group minus H+ group (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal failure (eGFR &lt; 15 mL per min/1.73 m²)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.0000</td>
</tr>
<tr>
<td>&gt;10 eGFR unit renal function decline from baseline</td>
<td>7/260 (2.7%)</td>
<td>11/260 (4.2%)</td>
<td>1.5 (-1.60 to 4.68)</td>
<td>0.3512</td>
</tr>
<tr>
<td>Renal function decline to eGFR &lt; 30 mL per min/1.73 m²</td>
<td>7/260 (2.7%)</td>
<td>6/260 (2.3%)</td>
<td>-0.4 (-3.07 to 2.30)</td>
<td>0.7881</td>
</tr>
<tr>
<td>Both &gt;10 eGFR unit decline from baseline and a decline to eGFR &lt; 30 mL per min/1.73 m²</td>
<td>2/260 (0.8%)</td>
<td>2/260 (0.8%)</td>
<td>0.0 (-1.50 to 1.50)</td>
<td>&gt;0.9999</td>
</tr>
</tbody>
</table>

| Mortality, dialysis, and intensive care admission within 35 days post-contrast | | |
|--------------------------------|-----------------|-----------------|-----------------|-------------------|
| All-cause mortality | 0/328 | 3/332 (0.9%) | 0.9 (-0.11 to 1.92) | 0.1267 |
| Dialysis | 0/328 | 0/332 | 0 | 1.0000 |
| Intensive care admission | 0/328 | 0/332 | 0 | 1.0000 |

| Sequelae of intravenous hydration in the standard prophylactic treatment group | | |
|--------------------------------|-----------------|-----------------|-----------------|-------------------|
| Symptomatic heart failure | 13/328 (4.0%) | 0/332 | -4.0 (-6.08 to –1.85) | 0.0001 |
| Hypernatraemia | 0/328 | 0/332 | 0 | 1.0000 |
| Hypoponatraemia | 1/328 (0.3%) | 0/332 | -0.3 (-0.90 to 0.29) | 0.4970 |
| Arrhythmia | 4/328 (1.2%) | 0/332 | -1.2 (-2.41 to –0.03) | 0.0604 |

eGFR=estimated glomerular filtration rate.

**Table 3:** Incidence of major adverse events in the standard prophylactic treatment (H+) and no prophylactic treatment (H−) groups.
AMACING Trial Lancet 2017

• Previous to this study, little prospective data comparing hydration to no hydration
  • Most previous studies on prevention of CIN were comparison studies

• Single center study
• 1300 patients were planned, study enrolled 600
• Lower rate of CIN in this study than in previous studies
Orlando VAMC
IV Fluids as Prophylaxis for Contrast Induced Nephropathy: Its just IV Fluids!! What’s all the Fuss?

**Question**: How much sodium does the American Heart Association recommend per day for most adults?

**Question**: How many milligrams of salt (NaCl) and how many milligrams of sodium are in one liter of normal saline?
IV Fluids as Prophylaxis for Contrast Induced Nephropathy: It's just IV Fluids!! What's all the Fuss?

You decide to give Normal saline to your 100 kg patient at 1 ml/kg/hour for 12 hours pre and 12 hours post a CT imaging study with contrast. The patient states he is on a low sodium diet and asks how much sodium he will receive. In a patient centered answer, you reply “About ___ single servings of Lays potato chips”
IV Fluids as Prophylaxis for Contrast Induced Nephropathy: Its just IV Fluids!!

AMACING Trial Protocol:

- Standard: Your 100 kg patient receives NS IV fluids at 3-4 ml/kg/hour 4 hour pre and 4 hours post = 2400-3200 ml Total

- Long: Your 100 kg patient receives NS IV fluids @100 ml/h for 12 hours pre and 12 hours post = 2400 ml Total
Orlando VAMC Nephrology Clinic
Question

A 66 year old male is admitted for a foot ulcer and found to have osteomyelitis. He has a history of type 2 diabetes mellitus, diabetic retinopathy and CKD Stage III (eGFR is 34 ml/min). A prolong course of intravenous antibiotics is planned.

The most appropriate next step is:
1. Place a PICC line and dismiss
2. Limit access to short term IV with frequent exchange
3. Place a tunneled central venous catheter
4. Place a subcutaneous, implantable central venous access
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The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC) initiative: A summary and review of peripherally inserted central catheter and venous catheter appropriate use

*J of Hosp Med; 2016: 11:4, 306-310*
Michigan Appropriateness Guide for Intravenous Catheters (MAGIC) initiative

- For patient's stage 3b or greater CKD, insertion of devices into an arm vein was rated as inappropriate (valuing the preservation of peripheral and central veins for possible hemodialysis/creation of arteriovenous fistulae and grafts)

- Among patients with stage 3b or greater CKD, PIV access in the dorsum of the hand was recommended for an expected duration of use ≤5 days.

- The use of a tunneled small-bore central catheter (4 French or 5 French) inserted into the jugular vein was rated as appropriate in stage 3b or greater CKD patients requiring venous access for a longer duration.
Michigan Appropriateness Guide for Intravenous Catheters (MAGIC) initiative

• Detailed evaluation of the venous anatomy is an important aspect in preparation for hemodialysis arteriovenous (AV) access placement.

• Vascular problems affecting access creation are more likely to be venous than arterial.

• One of the main reasons for AV access problems is the veins of the extremity develop iatrogenic injury as a result of venipuncture or central venous access.
Michigan Appropriateness Guide for Intravenous Catheters (MAGIC) initiative

- Central vein lesions can occur anywhere within the central veins.

- The most common locations are the subclavian-cephalic arch junction (38 percent), the brachiocephalic veins (29 percent), the subclavian vein only (24 percent), and the superior vena cava (9 percent).

- Clinical judgement is paramount.
Orlando VAMC
A 61-year-old male is seen in the office for an annual exam. During his evaluation, the patient reports that his home blood pressure is averaging 147/82 mm Hg. Past medical history includes hyperlipidemia. There is no history of diabetes, and he does not use tobacco products. The patient is currently treated with losartan 100 mg daily, amlodipine 10 mg daily and chlorthalidone 25 mg daily. He states full compliance with all medications and with lifestyle modifications previously recommended. His blood pressure is 157/90 mmHg and his weight is 93 kg. His physical exam is unremarkable. Blood electrolytes and serum creatinine are within normal range. After discussion with the patient, you recommend a blood pressure goal of 130/80 mmHg.

The next step in achieving this patient’s blood pressure goals is:
A. Start spironolactone 25 mg daily
B. Start doxazosin extended release 4 mg daily
C. Start propranolol 5 mg daily
D. Increase dose of amlodipine to 10 mg twice a day
Question

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Spironolactone versus placebo, bisoprolol, and doxazosin to determine the optimal treatment for drug-resistant hypertension (PATHWAY-2): a randomised, double-blind, crossover trial

Prof Bryan Williams, FRCP, Prof Thomas M MacDonald, FRCP, Steve Morant, PhD, Prof David J Webb, FMedSci, Prof Peter Sever, FRCP, Prof Gordon McInnes, FRCP, Prof Ian Ford, PhD, Prof J Kennedy Cruickshank, FRCP, Prof Mark J Caulfield, FMedSci, Prof Jackie Salsbury, RGN, Isla Mackenzie, FRCP, Sandosh Padmanabhan, FRCP, Prof Morris J Brown, FMedSci

The Lancet
Volume 386, Issue 10008, Pages 2059-2068 (November 2015)
DOI: 10.1016/S0140-6736(15)00257-3
Spironolactone versus placebo, bisoprolol, and doxazosin to determine the optimal treatment for drug-resistant hypertension (PATHWAY-2): a randomised, double-blind, crossover trial

The Lancet
Volume 386, Issue 10008, Pages 2059-2068 (November 2015)

• 348 patients who had seated clinic systolic BP (SBP) ≥ 140 mm Hg (≥ 135 mm Hg in patients with diabetes) and home SBP ≥ 130 mm Hg after ≥ 3 months of treatment with maximal tolerated doses of 3 drug classes (angiotensin-converting enzyme inhibitors or angiotensin II–receptor blockers, calcium-channel blockers, and diuretics).
Spironolactone versus placebo, bisoprolol, and doxazosin to
determine the optimal treatment for drug-resistant hypertension
(PATHWAY-2): a randomised, double-blind, crossover trial

The Lancet
Volume 386, Issue 10008, Pages 2059-2068 (November 2015)

Interventions:
1. Spironolactone, 25 or 50 mg/d
2. Doxazosin modified-release, 4 or 8 mg/d
3. Bisoprolol, 5 or 10 mg/d
4. Or placebo

Patients received each drug for 12 weeks (lower dose for 6 weeks then
higher dose for 6 weeks) in random order without washout periods

Primary outcome:
Mean home-based SBP (measured 3 times each morning and evening
for 4 consecutive days before study visits at 6 and 12 weeks).
In resistant hypertension
Add-on spironolactone reduced systolic blood pressure over 12 weeks:

More than placebo (SBP 135 vs 144 mm Hg)
More than doxazosin (SBP 135 vs 139 mm Hg)
More than bisoprolol (SBP 135 vs 139 mm Hg)

The trial did not address the effect of renal function on dosing or prevalence of hyperkalemia as patients with an estimated glomerular filtration rate < 45 mL/min were excluded
2017 ACC/AHA Guidelines for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults

<table>
<thead>
<tr>
<th>Old guidelines</th>
<th>New guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 120 - NORMAL</td>
<td>Under 120 - NORMAL</td>
</tr>
<tr>
<td>120 - 129</td>
<td>120 - 129</td>
</tr>
<tr>
<td>HIGH NORMAL</td>
<td>ELEVATED BLOOD PRESSURE</td>
</tr>
<tr>
<td>130 - 139</td>
<td>130 - 139</td>
</tr>
<tr>
<td>HIGH NORMAL</td>
<td>STAGE 1 HYPERTENSION</td>
</tr>
<tr>
<td>OVER - 140</td>
<td>OVER - 140</td>
</tr>
<tr>
<td>HYPERTENSION</td>
<td>STAGE 2 HYPERTENSION</td>
</tr>
</tbody>
</table>
2017 ACC/AHA Guidelines

- The American College of Cardiology and the American Heart Association estimate that the changes in the guidelines will affect roughly 31.1 million Americans.
- Under the previous guidelines, 72.2 million people, or about 31.9 percent of the American adult population was classified as having hypertension.
- Under the new guidelines, roughly 103.3 million people, or about 45.6 percent of American adults will have stage 1 or stage 2 hypertension.
- 13.7% increase in hypertension overnight.
Orlando VAMC
Case

A 45 year old male presents to your office for follow up for recently diagnosed type 2 diabetes mellitus. He has a PMHx of hypertension and hyperlipidemia. He takes a combination lisinopril/hydrochlorothiazide and his BP at home is averaging 138/84 mm Hg.

His BMI is 33. Exam is unremarkable. Your review his recent labs which show a glycosylated hemoglobin of 8%, eGFR >60 ml/min. A confirmatory urine test establishes the presence of albuminuria.

An extensive discussion regarding lifestyle modifications occurred at the last visit. Today, you recommend aggressive treatment of his diabetes, hyperlipidemia and blood pressure.
Case

At the end of the visit, the patients asks, why should I do all of this, what difference will it make?

Possible answers to his question include:
1. It has been shown to slow the progression of CKD
2. It has been shown to decrease mortality
3. It may lower your risk of kidney failure
4. All of the above
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Multitarget therapy and progression of kidney disease in type 2 diabetes

Kidney International 2017:91(4):982

• 20 year follow up on the STENO 2 Trial (NEJM 2008). At the end of the trial phase, all patients were offered intensive multitarget therapy.

• Intensive-therapy group had defined targets:
  • glycated hemoglobin level of less than 6.5%
  • fasting serum total cholesterol level of less than 175 mg/dl
  • fasting serum triglyceride level of less than 150 mg/dl
  • BP goal <130/80 mm Hg
Multitarget therapy and progression of kidney disease in type 2 diabetes

*Kidney International 2017:91(4):982*

- All patients were treated with blockers of the renin–angiotensin system and aspirin

- Primary outcome was differences in lifespan with and without incident cardiovascular events
Multitarget therapy and progression of kidney disease in type 2 diabetes

*Kidney International* 2017:91(4):982
Multitarget therapy and progression of kidney disease in type 2 diabetes

*Kidney International 2017:91(4):982*
Multitarget therapy and progression of kidney disease in type 2 diabetes

Kidney International 2017:91(4):982
Multitarget therapy and progression of kidney disease in type 2 diabetes

Kidney International 2017:91(4):982

- After an additional 20 years of follow-up, those who were assigned to intensive multitarget therapy had a significantly lower annual decline in glomerular filtration rate
  - approximately 50 versus 30 percent

- Intensified, multifactorial treatment of type 2 diabetes with microalbuminuria for 7.8 years compared with conventional treatment increases median life length by 7.9 years over 21.2 years of follow-up
  - These gained years were matched by years free from cardiovascular complications.
Summary

• The diagnostic threshold for AKI is low, and should be staged appropriately
  • Reserve the term ARF for those deemed to require renal replacement therapy

• The AMACING trial suggested that the benefit of IV hydration may be overestimated and may have a harmful effects in certain patients. More trials are needed!

• Reports from large, single center institutions suggest that the risk of intravenous contrast for acute kidney injury is overestimated.
  • More data is required on the use of intra-arterial contrast.
Summary

• PATHWAY-2 reinforces the important role of spironolactone in patients with resistant hypertension.

• Try to avoid PICC line placement in patients with an eGFR <45 ml/min. Clinical judgement is required.

• Early, intensified risk factor control in patients with complicated type 2 diabetes may lower the decline of kidney function, decrease CV events and add “years of life gained”.
Thank you for your attention

Questions?

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