CARE OF THE NEPHROLOGY PATIENT IN THE PRIMARY CARE SETTING

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OBJECTIVES

• LIST THE STAGES OF CHRONIC KIDNEY DISEASE.
• DISCUSS THE ROLE OF THIAZIDES, LOOP DIURETICS, ACE INHIBITORS, ANGIOTENSIN BLOCKERS, BETA BLOCKERS, CALCIUM CHANNEL BLOCKERS, AND ALPHA AGONISTS/BLOCKERS IN THE MANAGEMENT OF HYPERTENSION IN THE PATIENT WITH CHRONIC KIDNEY DISEASES STAGES I-V.
• DISCUSS WHEN TO REFER TO NEPHROLOGY.
• THE ROLE OF THE NURSE PRACTITIONER IN NEPHROLOGY.
ROLE OF THE NP IN NEPHROLOGY

• OUTPATIENT SETTING
  • DIALYSIS UNITS
  • CKD CLINIC
  • CKD EDUCATION

• INPATIENT SETTING

DEFINITION OF CHRONIC KIDNEY DISEASE (CKD)

• THE KIDNEY DISEASE: IMPROVING GLOBAL OUTCOMES (KDIGO) ORGANIZATION IN CONJUNCTION WITH THE NATIONAL KIDNEY FOUNDATION’S (NKF) KIDNEY DISEASE OUTCOMES QUALITY INITIATIVE (KDOQI) DEFINED CKD AS ABNORMALITIES OF KIDNEY STRUCTURE OR FUNCTION PRESENT FOR 3 MONTHS OR GREATER WITH IMPLICATIONS FOR HEALTH (2013).

• NEW GUIDELINE ALSO INCLUDES STAGING ALBUMINURIA IN DEFINITION

• RECOMMEND USING GFR TO DETERMINE RENAL FUNCTION INSTEAD OF CREATININE
  • CKD-EPIDEMIOLOGY (CKD-EPI) EQUATION IS MOST ACCURATE ACCORDING TO PANEL
CKD

- More accurate when compared with CKD-Modification of Diet in Renal Disease (CKD-MDRD) particularly in patients with higher GFR
- Both use age, gender, race, and serum creatinine to determine GFR
- MDRD can overestimate decline in certain populations (elderly, thin framed)
- MDRD is most commonly used by labs and widely accepted

Diagnosis of CKD

- 6 stages
  - CKD 3 was divided into 3A and 3B for better accuracy
- Now includes presence of albuminuria and quantification
- Must be present for at least 3 months
- Exclude certain populations: elderly (age related nephron loss), pregnancy, acute kidney injury (AKI)
EVALUATION AND TESTING OF ALBUMINURIA

- EARLY MORNING SAMPLE PREFERRED
- CAN BE DONE AS SPOT TESTING IN CLINIC OR LAB
- SPOT URINE TESTING CAN UNDERESTIMATE TOTAL QUANTITY OF ALBUMINURIA WHEN COMPARED WITH 24 HOUR URINE STUDY
- ORDER OF TESTING BY ACCURACY
  - ALBUMIN-TO-CREATININE RATIO (ACR)
  - PROTEIN-TO-CREATININE RATIO (PCR)
  - REAGENT STRIP UA FOR TOTAL PROTEIN-AUTOMATED READING
  - REAGENT STRIP UA FOR TOTAL PROTEIN-MANUAL READING (KIDNEY INTERNATIONAL SUPPLEMENTS, 2013).
ALBUMINURIA

• PREDICTS PROGNOSIS AND MORBIDITY AND MORTALITY FROM CVD EVENTS INCLUDING CVA (KIDNEY INTERNATIONAL SUPPLEMENTS, 2012).
• INFLUENCED BY BLOOD PRESSURE-HIGHER BP MORE ALBUMINURIA
• NO LARGE STUDIES HAVE BEEN DONE DIRECTING THERAPY TO REDUCTION OF ALBUMINURIA ALONE BUT IS WIDELY ACCEPTED AS GOAL OF THERAPY DESPITE BP READINGS

PROGRESSION OF CKD

• DECLINE IN CATEGORY (EXAMPLE: PATIENT DECLINES FROM CKD 3A TO 3B)
• SUSTAINED DECLINE IN GFR OF 5 OR MORE OVER THE COURSE OF 1 YEAR
• INCREASE IN ALBUMINURIA DESPITE APPROPRIATE RAAS BLOCKADE THERAPIES
REFERRAL TO NEPHROLOGY

• GFR <30 (CKD 3B-CKD 4)
• RAPID DECLINE IN GFR >25%-CONFIRMED WITH REPEAT TESTING
• NEPHROTIC RANGE PROTEINURIA, A/PCR >300 OR A/PCR >3500G
• ALBUMINURIA NOT IMPROVED DESPITE ACE/ARB THERAPIES
• CKD AND HYPERTENSION (HTN) REFRACTORY TO 4 OR MORE AGENTS
• UNCLEAR ETIOLOGY OF RENAL DISEASE
• HEREDITARY KIDNEY DISEASE, RECURRENT NEPHROLITHIASIS, CHRONIC HYPO/HYPERKALEMIA, CHRONIC ANION GAP ACIDOSIS, SECONDARY HYPERPARATHYROIDISM (SMITH, 2016).

BURDEN AND PREVALENCE OF CKD

• 9TH LEADING CAUSE OF DEATH IN THE US
• ~10% US POPULATION OR 20 MILLION PEOPLE HAVE CKD
• DIALYSIS DEPENDENT PATIENTS AND/OR RENAL TRANSPLANTATION ACCOUNT FOR 7% OF TOTAL MEDICARE BUDGET OR $47 TRILLION
• CKD CONSIDERED ONE OF THE MOST EXPENSIVE CHRONIC CONDITIONS (NEPHSAP, 2017).
• PREDICTED THAT BY 2030 10.8% POPULATION WILL HAVE STAGES CKD 3-5 (NEPHSAP, 2017).
MANAGEMENT OF CKD

- Maintain Hgb A1C 6.5%-7.0% per recommendations
  - Renally dose oral diabetic agents
  - Stop Metformin GFR <30
  - Discuss with patients glycemic control and effect on long term renal function
- BP goals <130/80 (generally)
- GFR <30 Protein intake should not exceed 0.8G/KG/Day
- Physical activity 30 min 5 days/week or as tolerated
- Low sodium diet, <2G/day
ACUTE KIDNEY INJURY (AKI)

- Defined as increase in serum creatinine of 30% or 0.3 mg/dL in 48 hours, increase 1.5 mg/dL known/presumed to have occurred within 7 days, or urine output <0.5 mg/kg x6 hours (Kidney International Supplements, 2012).

- Various causes
  - Pre-renal
    - Dehydration, overdiuresis, etc
  - Intra-renal
    - ATN, AIN
  - Post-renal
    - Obstructive uropathy (urgent referral to urology)

AKI MANAGEMENT

- Stop all nephrotoxic agents
- Renal ultrasound to determine kidney size, presence of 2 kidneys, exclude hydronephrosis/mass, can do doppler to evaluate for renal artery stenosis
- Check protein/creatinine ratio and urine electrolytes
- Monitor serum creatinine at least every 24 hours if not sooner
- Monitor urine output
- High risk of developing CKD or possible ESRD
- Increases mortality, especially with associated oliguria/anuria
- Urgent referral to nephrology
HTN MANAGEMENT IN CKD

• NKF KDOQI GUIDELINES RECOMMEND BP <130/80 (2004).
• CERTAIN SITUATIONS WHERE HIGHER TARGET BP, <140/90 IS ACCEPTABLE
  • ORTHOSTATIC HYPOTENSION
  • SEVERE PVD
  • OTHERS
• SHOULD MONITOR ALBUMINURIA IF PRESENT PRIOR TO INITIATING THERAPY
• RECOMMEND JNC-8
• IF HTN IS RESISTANT RECOMMEND RENAL US WITH DOPPLER TO EVALUATE FOR RENAL ARTERY STENOSIS
DRUGS TO AVOID/LIMIT

Table 101. Drugs Implicated in Causing Elevations in Blood Pressure

- Nonsteroidal anti-inflammatory drugs (over-the-counter and prescription), including cyclo-oxygenase type 2 (COX-2) inhibitors
- Sympathomimetic amines (e.g., phenylpropanolamines, pseudoephedrine, methylphenidate, venlafaxine)
- Ergot alkaloids
- Estrogen and estrogen analogues (e.g., oral contraceptive pills and hormone replacement therapy)
- Anabolic steroids
- Methylxanthines (e.g., theophylline, caffeine, theobromine)
- Cyclosporine, tacrolimus
- Erythropoietin
- Cocaine, phencyclidine (“angel dust”), “herbal ecstasy” (and other ephedra-containing substances)
- Nicotine
- Ethanol, disulfiram
- Withdrawal from certain drugs (e.g., beta-blockers, alpha-agonists, opioids, ethanol, calcium antagonists), naloxone
- Glycyrhyc acid
- Anesthetic agents (ketamine, desflurane)
- Gamma-hydroxybutyric acid (GABA)
- Metoclopramide

LOOP DIURETICS

- DIURETIC THERAPY
  - DISCONTINUE THIAZIDES WHEN GFR<30, NO LONGER EFFECTIVE
  - BUMETANIDE AND TORSEMIDE HAVE BETTER BIOAVAILABILITY THAN FUROSEMIDE
  - FUROSEMIDE REQUIRES MORE FREQUENT DOSING AND HIGHER DOSES
  - INCREASE FREQUENCY BEFORE DOSE

- DOSING COMPARISON OF LOOP DIURETICS
  - MODERATE RENAL DISEASE (CKD 3A-3B)
    - 40MG FUROSEMIDE = 1 MG BUMETANIDE = 20MG TORSEMIDE
  - SEVERE RENAL DISEASE (CKD 4-5)
    - FUROSEMIDE:BUMETANIDE RATIO FALLS TO 20:1

- DIURETIC RESISTANCE CAN BE CAUSED BY HF, HIGH SODIUM INTAKE, OR WORSENING GFR
A WORD ABOUT METOLAZONE

- THIAZIDE DIURETIC
- WORKS WELL WITH LOOP DIURETIC THERAPY
- GIVEN 30 MIN OR SO PRIOR TO LOOP DIURETIC
- POTENTIATES AND INCREASES DIURETIC
- 2.5MG OR 5MG ONCE DAILY DOSING-THREE TIMES/WEEK DOSING
- CAN ALSO ALLOW PT TO TAKE IF >1.5-2LB WEIGHT GAIN

ALDACONE

- DIURETIC, NOT AS POTENT AS LOOPS
- POTASSIUM SPARING
- ADDED ON FOR RESISTANT HTN
- NEED TO MONITOR POTASSIUM, USE CAUTION WHEN GIVEN WITH ACE/ARB THERAPY
- MAY NEED TO USE KAYEXALATE OR VALTESSA FOR HYPERKALEMIA
- PREFERRED FOR PRIMARY ALDOSTERONISM
- DISCONTINUE FOR GFR <30
**ACE/ARB THERAPIES**

- GREATEST ANTIPROTEINURIC EFFECT
- DO NOT USE TOGETHER-ONE OR THE OTHER
- MONITOR POTASSIUM
- MONITOR RENAL FUNCTION-IF 25% REDUCTION IN GFR STOP THERAPY
- CAN USE IF ALBUMINURIA PRESENT BUT BP AT GOAL IN LOWER DOSES

**CCB-NONDIHYDROPYRIDINES**

- DILTIAZEM/VERAPAMIL
  - HAVE ANTI-PROTEINURIC EFFECTS
  - NOT AS GOOD AS ACE/ARB THERAPY BUT CAN BE USED AS ADD ON OR MONO
  - CAUTION WITH CONCURRENT USE WITH BB THERAPY
  - DO NOT USE CONCURRENTLY WITH DIHYDROPYRIDINES
CCB-DIHYDROPYRIDINES

- AMLODIPINE, NICARDIPINE, NIFEDIPINE
  - GOOD ADD ON WITH ACE/ARB THERAPY
  - CAN CAUSE LE EDEMA, WORSE WITH CONCURRENT BB THERAPY
  - WARN PATIENTS
  - CAN USE LOW DOSE LOOP OR THIAZIDE TO HELP
  - INEXPENSIVE

CENTRALLY ACTING ALPHA-ADRENERGIC AGONISTS

- CLONIDINE, METHYLDOPA
- WORK BY REDUCING SYMPATHETIC OUTFLOW FROM BRAIN
- MINIMAL INTERACTION WITH OTHER ANTIHYPERTENSIVES
- DO NOT NEED TO REDUCE DOSING IN RENAL DISEASE
  - CLONIDINE PATCH IS GOOD CHOICE
  - STEADY STATE
  - CHANGED WEEKLY
PERIPHERAL ACTING ALPHA-ADRENERGIC BLOCKERS

- REDUCE BP BY CAUSING PERIPHERAL VASODILATION
- PRAZOSIN, TERAZOSIN, DOXAZOSIN
  - GOOD CHOICE FOR MALES WITH CONCURRENT BPH
- DO NOT NEED TO REDUCE DOSE
- CAN CAUSE ORHTOSTATIC SYMPTOMS, HEADACHE, AND TACHYCARDIA
- MOST COMMON SIDE EFFECT IS EDEMA
  - CAN ADD ON DIURETIC THERAPY

DIRECT VASODILATORS

- HYDRALAZINE, MINOXIDIL
- CAUSE SMOOTH MUSCLE RELAXATION—>VASODILATION
- NO DOSE ADJUSTMENT REQUIRED
- MOST COMMON SIDE EFFECTS: TACHYCARDIA, HEADACHE, EDEMA
- MINOXIDIL IS ACTIVE INGREDIENT IN HAIR LOSS REGIMENS—CAN CAUSE HIRSUTISM
- MAY NEED CONCURRENT BB AND DIURETIC THERAPY
- START LOW AND SLOW
  - CONSIDER HYDRALAZINE IS DOSED TID, MAY NOT BE BEST CHOICE FOR PATIENTS WITH COMPLEX MEDICATION REGIMEN
- START MINOXIDIL 2.5-5MG PO DAILY AND INCREASE AS NEEDED
QUESTIONS?

REFERENCES


