PHYSICIAN ASSISTANT PROGRAM

NEPHROLOGY

FPMD 6021 – SPECIALTY CARE I

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FALL SEMESTER, 2010

PA 41
2010-2012
Introduction

Welcome to the Nephrology Course! This syllabus and the Website should contain all that you will need. The lectures will aim to amplify and clarify concepts rather than repeating everything that is in the syllabus.

Should you have any questions, comments or criticism during the course, my phone number is 1-6709 and my office is in the University Hospital, Nephrology, Room 4R312, e-mail: martin.gregory@hsc.utah.edu. For course content or comprehension issues, it is generally better to post to the Discussion Board than to email me. The reasons for this are:

- Several people in the class may have the same concern.
- A classmate may be able to respond faster than I can.
- Responding to postings not only helps your classmates and fosters collegiality, but also tests your understanding. It is one thing to think you know something, it is a greater order of mastery to be able to explain it. Much of your future career is going to be explaining to and persuading patients, relatives, nurses, colleagues, physicians, insurers. But perhaps the greatest value of posting a response is that you may be wrong! A little embarrassing, maybe, but there are few educational benefits as valuable as being disabused of a wrong notion. Mark Twain said it even better: "It ain't what people don't know that hurts them, it's what they know that ain't so."
- I shall not allow misleading information to stay uncorrected on the Website, so you can be confident that at the end of a thread you have the accepted view and can be confident that if your explanation stands that you got it right and expressed it well.

Martin C. Gregory, MD, PhD.
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COURSE NUMBER AND NAME:  6021 – Specialty Care I

TOTAL CREDITS:  5

COURSE DESCRIPTION:

Comprehensive study of the various body systems and common primary-care problems particular to the areas of: Cardiology, ECG Interpretation, OB/GYN, Pulmonology, Radiology, Nephrology and Laboratory Interpretations.

CLASS TITLE:  Nephrology

ACADEMIC TERM(S) OFFERED:  Fall Semester

FACULTY:  Martin Gregory, M.D., Ph.D.
          30 N. 1900 E. Rm 4R320
          581-6709

COURSE OBJECTIVES:

Nephrology Course Overall Objectives:

- To review concepts of renal physiology and to become familiar with the major disturbances in fluid, electrolyte and acid base regulation.
- To understand the methods available for the clinical assessment of renal function.
- To recognize the ways in which diseases of the glomeruli, tubules, and renal vessels show themselves, and to become able to recognize the major renal syndromes.
- To understand the pathology and pathophysiology of glomerulonephritis, interstitial nephritis, renal failure, hypertension, obstructive uropathy, stones, vesicoureteral reflux, and urinary infection.

Renal Anatomy and Physiology:
At the end of this session, the student will be able to:
1. Describe the size, situation, and blood supply of the kidneys.
2. Describe the circulation of blood within the kidneys.
3. Understand the meaning of the terms:
   - Afferent arteriole
   - Efferent arteriole
   - Glomerulus
   - Tubule
   - Nephron
   - Proximal tubule
   - Distal tubule
   - Collecting duct
4. Describe the process of glomerular filtration, and its control.
5. List the major segments of the tubule.
6. Sketch a nephron, indicating the glomerulus, and the various parts of the renal tube.

**Functions of the Kidneys:**
At the end of this session, the student will be able to:
1. List the major functions of the kidneys.
2. Describe how the kidney regulates the quantity of sodium and the quantity of water in the body.
3. Understand how regulation of the quantity of salt and water in the body controls the volume of both the extra cellular fluid and the intracellular fluid.
4. List the major anions and cations in the extracellular fluid.
5. List the major cation in the intracellular fluid.
6. Associate the major sites of reabsorption of sodium, water, glucose, bicarbonate, and potassium with the appropriate segments of the tubule.
7. Explain how the kidneys manage to dilute and to concentrate the urine.

**Tests of Renal Function:**
At the end of this session, the student will be able to:
1. Explain why BUN or serum creatinine can be used as a marker of kidney function.
2. Describe limitations of the use of BUN as a marker of kidney function.
3. Describe limitations of use of serum creatinine as a marker of kidney function.
4. Explain the concept of clearance.
5. Explain how to collect specimens for and how to calculate creatinine clearance.
6. Explain how protein enters the urine.
7. Understand the significance of proteinuria as an indicator of kidney disease, and how the amount of protein in the urine may differ in glomerular and tubular diseases.
8. Describe how dipstick analysis of the urine for protein, blood, glucose, leukocyte esterase (“white blood cells”), and nitrite can help in the diagnosis of kidney and urinary tract diseases.
9. List the “formed elements” that may be seen by microscopy of the urine sediment. Describe how microscopy of the urine sediment can assist in diagnosis of kidney and urinary tract diseases.

**Edema and Diuretics:**
At the end of this session, the student will be able to:
1. Define edema.
2. Explain mechanisms of edema formation.
3. Describe the important sites at which edema or collections of extravascular fluid may be found.
4. Describe the principles of treatment of edema.
5. Associate the major classes of diuretics with their site of action in the nephron.
6. List major side effects of various classes of diuretics.
7. List conditions other than edema in which diuretics may be used for treatment.
Hyponatremia:
At the end of this session, the student will be able to:
1. Define tonicity.
2. Define hyponatremia.
3. Classify hyponatremia into hypotonic, isotonic, and hypertonic forms.
4. Propose a diagnostic approach to the causes of hypotonic hyponatremia.

Acid-Base Disorders:
At the end of this session, the student will be able to:
1. Define acidemia, alkalemia, acidosis, and alkalosis.
2. Write the equation relating hydrogen ion concentration to pH.
3. Recall the normal values for hydrogen ion concentration, plasma carbon dioxide tension (pCO₂), and bicarbonate concentration ("total CO₂") or HCO₃⁻.
4. Use the Henderson equation.
5. Convert pH to hydrogen ion concentration (within the range 7.2-7.55).
6. Recognize a metabolic acidosis.
7. Distinguish an organic (anion gap) from an inorganic (non-anion gap) acidosis. Give several examples of each.
8. Recognize a metabolic alkalosis. Give several examples.
9. Recognize a respiratory acidosis. Give several examples.
10. Recognize a respiratory alkalosis. Give several examples.
11. Understand the principles of treating metabolic acidosis.
12. Understand the principles of treating metabolic alkalosis.

Potassium:
At the end of this session, the student will be able to:
1. State the concentration of potassium in the intracellular fluid and the extracellular fluid.
2. State the approximate amount of potassium ingested and excreted daily, and the approximate amount in the plasma, in the total extracellular fluid, and in the whole body.
3. Identify four important influences that promote movement of potassium into cells.
4. Identify five important influences that promote movement of potassium into the urine.
5. Classify causes of potassium depletion or hypokalemia. Indicate important causes.
6. Enumerate clinical features of hypokalemia.
7. Outline treatment of hypokalemia.
8. Classify causes of potassium depletion or hyperkalemia. Indicate important causes.
9. Enumerate clinical features of hyperkalemia.
10. Describe treatment of hyperkalemia.

Hypertension:
At the end of this session, the student will be able to:
1. Define normal BP, prehypertension, the two stages of hypertension.
2. Take the BP and identify common errors in its measurement.
3. Recognize the degree of variability of blood pressure, and need for taking multiple readings before deciding upon the stage of hypertension.
4. List causes of secondary hypertension.
5. Recognize that most hypertension is primary or idiopathic.
6. List the reasons for treating hypertension and identify the most important two of these.
7. Describe an approach to non pharmacologic management of hypertension.
8. List the drugs of choice for treating uncomplicated essential hypertension.
9. List the drugs which are especially indicated for diabetics with proteinuria, or renal insufficiency.

**Syndromes of Nephrology:**
At the end of this session, the student will be able to:
1. List the major syndromes of Nephrology.
2. Identify features that distinguish glomerular disease from tubular disease.
3. Define the nephrotic syndrome.
4. Define the acute nephritic syndrome.
5. Define renal failure and distinguish between acute and chronic renal failure.

**Nephrotic Syndrome:**
At the end of this session, the student will be able to:
1. List important causes of the nephrotic syndrome and identify which of these are more common in children and which are more common in adults.
2. Describe the clinical features of the nephrotic syndrome.
3. Describe important complications of the nephrotic syndrome.
4. List methods of treatment available for the nephrotic syndrome.
5. Know when to refer for nephrotic syndrome.

**Nephritic Syndrome:**
At the end of this session, the student will be able to:
1. List important causes of the acute nephritic syndrome and identify which of these are more common in children and which are more common in adults.
2. Describe the clinical features of the acute nephritic syndrome.
3. Describe important complications of the acute nephritic syndrome.
4. List methods of treatment available for the acute nephritic syndrome.
5. Know when to refer for nephritic syndrome.

**Renal Failure:**
At the end of this session, the student will be able to:
1. Define acute renal failure.
2. List the two principal causes of acute renal failure.
3. Understand the changes in urine composition that occur in pre-renal azotemia (renal underperfusion) and acute tubular necrosis.
4. Calculate the fractional excretion of sodium and explain its significance in distinguishing between renal underperfusion and acute tubular necrosis.
5. Outline the principles of investigation and treatment of acute renal failure.
7. Describe the principal clinical features of chronic renal failure.
8. List five important causes of chronic renal failure.
9. Outline the principles of investigation and treatment of chronic renal failure.
10. Define end-stage renal disease.
11. List the three means of treatment available for end-stage renal disease.
12. Describe important adjunctive treatment required by most patients receiving dialysis.
13. Recognize the critical importance of adequate dialysis for maintaining long-term health for patients with end-stage renal disease.
14. Recognize the crucial importance of vein preservation in patients with chronic renal failure.

Urinary Infection:
At the end of this session, the student will be able to:
1. Define urinary tract infection.
2. Recognize epidemiologic factors (age and gender) relevant to urinary tract infection.
3. Understand the pathogenesis of urinary tract infection.
4. Rank the common urinary pathogens in order of frequency.
5. Use the results of urinalysis and culture to distinguish urinary infection from contamination of urine sample.
6. Distinguish between cystitis (lower urinary tract infection) and complicated urinary tract infection.
7. Recognize the crucial importance of detecting and treating complicated urinary tract infection appropriately.

Stones, Obstruction, Reflux, and Analgesic Nephropathy:
At the end of this session, the student will be able to:
1. Distinguish between nephrocalcinosis, nephrolithiasis, and urolithiasis.
2. Recognize the clinical features of urinary calculi.
3. Rank the important causes and types of urinary calculi
4. Describe principles of prevention of urinary stone formation.
7. Recognize the clinical features of urinary obstruction.
8. List important causes of urinary obstruction.
11. Define vesico-ureteric reflux.
12. Recognize the consequences of vesico-ureteric reflux.
13. Describe the natural history of vesico-ureteric reflux.
15. Recognize the clinical features of analgesic nephropathy.
TEACHING METHODS:

- Lecture and discussion.
- Small group discussions in class.
- Self-assessment quizzes on WebCT.

INSTRUCTOR PERFORMANCE OBJECTIVES:

1. Help students identify useful and available learning resources.
2. Utilize a variety of classroom instructional procedures.
3. Help the class members achieve course objectives.
4. Provide a course syllabus, Web site, schedule of activities and evaluation mechanisms.
5. Help provide an environment that nurtures learning and development of a student’s self-esteem and sense of accomplishment.
6. Clarify unfamiliar or unclear ideas.
7. Facilitate learning activities.
9. Provide meaningful feedback to students.
10. Be open to meaningful feedback from students.

TOPICAL OUTLINE OF MAJOR AREAS TO BE TAUGHT:

- Renal Anatomy and Physiology
- Functions of the Kidneys
- Tests of Renal Function
- Edema and Diuretics
- Hyponatremia
- Acid-Base Disorders
- Potassium
- Hypertension
- Syndromes of Nephrology
- Nephrotic Syndrome
- Nephritic Syndrome
- Renal Failure
- Urinary Infection
- Stones, Obstruction, Reflux, and Analgesic Nephropathy

COURSE REQUIREMENTS:

1. Attendance (includes being on time) and participation.
2. Additional assignments, when required by instructor, e.g. quizzes between lectures.
3. Satisfactorily pass each proficiency examination with a "73%" or higher. (This level may be lowered, but not raised, at the instructors discretion.) One repeat is permitted. In the case of a repeat proficiency exam, the score will be averaged and the final grade for the class will be submitted as a "73%" or a "C" grade.
EVALUATION SCHEME:

- Attendance, discussion and participation are expected, and may affect your final grade.
- Proficiency examinations:
  
  The final examination will consist of 40 multiple-choice questions. Sample questions are available on the course Website. Some questions will be designed to test reasoning and understanding, not just memorization.

- After the final examination, answers with explanatory reasons will be posted on WebCT.

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<td>C+</td>
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REQUIRED TEXTS:

None.

RECOMMENDED AND/OR REFERENCE TEXTS:

(Not listed in Didactic Handbook)

- Renal and Electrolyte Disorders, R. W. Schrier 5th Ed. 0316774545, Price: $67.00
- Harrison’s Textbook of Medicine, (available on-line via library).
## CLASS SCHEDULE

**6021 Specialty Care I - Nephrology**

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<td>Tuesday, Oct 26</td>
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<td>Thursday, Oct 28</td>
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<td>Tuesday, Nov 16</td>
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<td>Friday, Dec. 3</td>
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**FINAL EXAM:** Monday, Dec. 13, 8:00am – 10:00am.

**PLEASE NOTE:** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.