CARROLL UNIVERSITY
PHYSICIAN ASSISTANT PROGRAM
PHA 509: CLINICAL DIAGNOSTICS I
Fall 2017

Course Number: Physician Assistant 509
Course Title: Clinical Diagnostics I
Number of Credits: 2 Credit Hours
Day/Time: Thursdays 10:00 am-12:00 am
Class times/days may need to be adjusted, *note additional dates for EKG*
Location: Carroll Center for Graduate Studies – Room 118
Prerequisites: Successful completion of Summer 2017 curriculum
Faculty: Course Director:
Ashley Cyr, MPAS, PA-C
Office Hours: By appointment
Telephone: 608-921-6661
E-mail: acyr@carrollu.edu

Course Description:
This three part course introduces physician assistant students to basic clinical laboratory medicine, radiologic imaging, EKG and cardiac diagnostics. Through a variety of teaching tools and assessments, it will give students the ability to select and interpret the results of the basic clinical laboratory and imaging diagnostic tests and procedures essential to the physician assistant’s role and responsibilities in formulating a preliminary diagnosis and management plan. Students will emerge with an understanding of the indications for various modalities and the significance of abnormal results.

Course Content:
This course is designed to help prepare the physician assistant student for entry level practice by providing them with the ability to select and interpret the appropriate basic laboratory, radiologic and cardiac diagnostic tests.

Class time will include a lecture/learner format in each specific content area, but will also include case studies demonstrating the relationship of multiple diagnostic categories in formulating a differential diagnosis and treatment plan. Content will closely follow topics covered in PHA 505 (Clinical Medicine I) and PHA 521 (Clinical Decision Making I) and will focus on the diagnostics associated with disease states and case studies as presented in PHA 505 and PHA 521.

The specific learning objectives for this course are to be used as a guide for reading, studying, and preparing for the course examinations. Students are expected to be independent, self-directed learners. Students will be responsible for reading assignments and interactive cases done via email outside of scheduled class time.

Course Goals:
To help students prepare for entry level clinical practice by:

1. Providing them with the skills necessary to formulate a preliminary differential diagnosis for a
patient given a specific case scenario/presentation.

2. Demonstrating how to determine which diagnostic tests to order based upon a patient’s clinical presentation.

3. Providing the foundation necessary to correctly interpret the results of basic laboratory, radiologic and cardiac diagnostic tests.

**Learning Outcomes**

After completion of the course, students will be able to:

1. Identify, order, and interpret appropriate labs to order based on a chief complaint
2. Interpret and suggest appropriate follow up for recommended screening labs
3. Appropriately order and read plain film imaging
4. Identify when radiation may not be indicated.
5. Determine the most appropriate radiographic test based on chief complaint and apply the clinical information to the clinical context.
6. Identify life threatening arrhythmias and rhythms or situations requiring immediate or proximate intervention on EKG.

**Student Expectations**

- Demonstrates a positive attitude toward learning
- Is on time for all scheduled classes, including timely return from breaks
- Completes readings and assignments prior to class
- Takes full responsibility for learning and self-directed learning activities
- Shows respect for self, other students, and faculty
- Refrains from revealing negative feelings through tone of voice or body language
- Refrains from disruptive activities during class including eating, talking, getting up and down, use of cell phone, etc.
- Demonstrates cooperation with and mutual respect for peers
- Responds to faculty, staff and peers readily and appropriately

**Instructor Expectations**

- Demonstrates a positive attitude towards the facilitation of learning
- Is on time for all scheduled classes
- Should the need arise, reschedules class time with appropriate and timely notification to students, faculty and staff
- Provides appropriate course materials for class preparation prior to class
- Is available for office hours or appointments to assist with questions; responds to faculty, staff, and students readily and appropriately
- Listens attentively and initiates communication which is appropriate and timely
- Identifies limitations in knowledge and provides appropriate resources for student learning
- Provides timely and constructive feedback for assignments and assessments
- Shows respect for self, students, and other faculty
- Refrains from revealing negative feelings through tone of voice or body language
- Demonstrates cooperation with and mutual respect for students, faculty and staff

**General Instructional Objectives:**

Upon successful completion of this course, the student should be able to:

1. Describe basic laboratory, radiology and cardiac diagnostic tests.
2. Distinguish between diagnostic terms such as “gold standard”, “initial”, “least invasive”, “most cost effective” and “best” in determining which diagnostic test to order based upon a patient’s clinical presentation.
3. Explain positive and negative predictive values, specificity and sensitivity as pertinent to
diagnostic testing.
4. Formulate a preliminary differential diagnosis based upon clinical presentation in order to order the appropriate diagnostic testing.
5. Evaluate and triage the need for a diagnostic test based upon a patient’s clinical presentation.
6. Choose the most appropriate diagnostic test based upon clinical presentation.
7. Interpret and evaluate diagnostic test results correctly.
8. Be familiar with risks and benefits of invasive diagnostic tests.
9. Evaluate the significance of abnormal results.
10. Distinguish between false positive and false negative results.
11. Understand the gravity of diagnostic testing errors.

Learning Objectives by Section:
At the conclusion of PHA 509 and PHA 510, the PA student will be able to:

RADIOLOGY:

A. Introduction to Radiology
   1. Review the physics of radiology: electromagnetic energy; waveform, frequency and energy; have a general understanding of how x-rays are produced
   2. Realize the detrimental biological effects on human cells, tissues and organ from x-radiation
   3. Determine the risk to benefit of each of the imaging modalities
   4. Realize the scope of diagnostic imaging

B. Basic Plain Film Radiology
   1. List the indications for plain film and identify when a plain film may not be useful
   2. Recognize an over or underexposed CXR
   3. Identify fractures/dislocations/foreign bodies on plain films
   4. Be able to rate the densities on film according to most radiolucent to radiopaque
   5. Understand what each density represents (gas, fluid, soft tissue)

C. Other Radiology Imaging
   1. Have a basic understanding of utility and indication for US, CT and MRI, nuc med and PET scans
   2. Have a basic understanding of Ultrasound as it relates to OB/GYN
   3. Identify the major indications/contraindications for US, CT, MRI, nuc med and PET scans; know the risks/benefits to each (in terms of radiation exposure, costs, etc)

D. Plain film CXR
   1. Be able to recognize a PA from an AP film, and the problems inherent in an AP film
   2. Identify the criteria for a properly exposed PA film
   3. Identify the anatomic landmarks on a PA film
   4. Understand the terminology inherent in reading a CXR report (atelectasis, pneumonitis, etc.)
   5. Specifically be able to recognize (either visually or in text form) the following:
      a. COPD/emphysema
      b. Pneumothorax (and tension pneumo)
      c. Pulmonary edema
      d. CHF (pulmonary edema with cardiomegaly)
      e. Pleural effusion
      f. Mediastinal widening
      g. Pneumonia (and their locations)
6. List the most common areas where pathology is missed
7. Identify case scenarios when extra views are needed (L-lat decub, expiratory film)

**ELECTROCARDIOGRAPHY**

**Basic Concepts**
1. Identify the site of the normal pacemaker – SA node.
2. Identify a normal EKG: P wave, QRS complex, T wave, U wave
3. Identify the clinical significance of the PR interval, QRS duration, QT interval, ST segment
4. Define depolarization and repolarization.
5. Determine axis
6. Calculate rate and rhythm

**Hypertrophy**
1. Recognize ECG changes associated with LVH and recognize strain pattern.
2. Recognize ECG changes associated with RVH
3. Recognize ECG changes of LAE and RAE

**SA and AV Nodal Conduction Abnormalities**
1. Recognize 1st degree AV block, 2nd degree AV block (types I & II), and 3rd degree AV block, and know their clinical significance.
2. Identify ECG changes of WPW and understand its clinical significance
3. Recognize LBBB.
4. Recognize RBBB.

**Myocardial Injury/Ischemia/Infarction**
1. Recognize changes in ECG associated with acute ischemia.
2. Recognize changes in ECG associated with myocardial injury
3. Recognize changes in ECG associated with acute MI
4. Identify areas of infarct by ECG leads involved.
5. Distinguish between Q wave MI and transmural MI’s
6. Distinguish between pathological Q waves and septal Q waves
7. Identify the significance of persistent ST evaluation after acute MI

**Arrhythmias**
1. Identify sinus tachycardia, sinus bradycardia, and clinical circumstances in which they may occur.
2. Recognize and distinguish between atrial fibrillation and atrial flutter.
3. Identify paroxysmal supraventricular tachycardias.
4. Identify PAC’s and distinguish them from PVC’s – know clinical significance
5. Identify V tach, V fib – clinical significance

**Drug and Electrolyte Effects**
1. Describe ECG changes of digoxin toxicity.
2. Recognize quinidine effect on ECG.
3. Recognize hypokalemia, Hyperkalemia, hypercalcemia and hypocalcemia on ECG.
4. Recognize the clinical significance and possible causes of QT interval prolongation.

**Intervention**
1. Recognize those arrhythmias that warrant pacemaker insertion.
LABORATORY MEDICINE

General Concepts:
1. Explain the importance of pretest probability of disease when ordering and interpreting laboratory test.
2. Identify the most important characteristic (sensitivity or specificity) of a test to rule-out the presence of disease.
3. Identify the most important characteristic (sensitivity or specificity) of a test to detect the presence of disease.
4. Define positive and negative likelihood ratio (PPV and NPV) based on prevalence of the disease.
5. Outline the advantages to referring to the reference range, not the “normal range” when discussing results with a patient.
6. Understand advantages and limitations of point-of-care testing.
7. Be able to describe common laboratory methodologies.

Dermatology:
The student will be familiar with the procedures and indications for the following:
1. Allergy skin/serum testing
2. KOH preps/wet preps
3. Skin scrapings
4. Excisional biopsy
5. Punch biopsy
6. Tape preps
7. PCR

Cardiovascular
1. Have a basic understanding of the metabolism of cholesterol, triglycerides and lipoproteins
2. Recognize the utility of fasting lipid panel; NCEP guidelines for acceptable levels
3. Discuss recent research into Apo B , the role of C reactive protein (CRP) and recent understanding of other factors that correlate with coronary artery disease/atherosclerosis
4. Analyze the results of a fasting lipid panel and interpret that in light of the patient’s RF’s, CHD risk equivalent; suggest appropriate therapy and goals of therapy
5. Recognize those diseases/drugs/issues that affect cholesterol metabolism and may result in false elevations/reductions in lipids.
6. Delineate the serum markers for AMI in the order in which they would appear and peak as a function of time.
7. Describe the use of serum myoglobin, its sensitivity and specificity, and advantages and limitations as a marker for AMI.
8. List the advantages and limitations of CK-MB in the diagnosis of AMI.
9. Outline the unique characteristics of the troponins that make them useful in the diagnosis, management and future outcomes, for patients with AMI.
10. Identify the conditions, other than acute myocardial infarction, that can elevate one or more of the troponins.
11. Outline the expected, non-cardiac specific laboratory findings for a patient with acute MI.
12. Describe the value and clinical usefulness of the BNP.
13. Outline the role/use of BNP in the clinical setting of a patient with CHF.

Pulmonary
1. Delineate the limitations of pulse oximetry.
2. List the components of the ABG report, and discuss their value/use in the diagnosis or management of a patient.
3. Outline the potential effects of COPD and tobacco use on the baseline ABG/pulse oximetry.
4. Identify/recognize the oxygen status for a patient, given an arterial blood gas report, or an oxygen saturation value from pulse oximetry.
5. Correlate/recognize common clinical conditions associated with metabolic and respiratory acidosis/alkalosis.
6. Delineate the role of bicarbonate (endogenous bicarbonate) in the maintenance of acid-base balance.
7. Recognize the common conditions in which the serum bicarbonate may become elevated or decreased.
8. Given the results of an arterial blood gas, correctly interpret the results/identify the acute acid-base disturbance.
9. Discuss the use of the anion gap in the interpretation of acid-base disturbances.
10. Delineate the compensatory mechanisms for metabolic and respiratory acid-base disturbances.
11. Order appropriate laboratory testing on a pleural fluid specimen.
12. Interpret pleural fluid analysis in order to diagnose a transudative vs. exudative effusion.
13. Identify the differential diagnosis resulting in a transudative and in an exudative effusion.
14. Discuss the proper collection of sputum for analysis; recognize parameters for an appropriate specimen.
15. Delineate those lab diagnostics that should be ordered when sputum is collected and sent to the laboratory.
16. Recognize the limitations of sputum analysis for tuberculosis, fungal infections, and atypical bacterial/viral infections.

**Hematology**
1. Identify the common conditions associated with a macrocytic anemia, microcytic anemia and normocytic anemia.
2. Describe the clinical use of the reticulocyte count, reticulocyte index [RI], and the reticulocyte production index [RPI].
3. Compare and contrast hemoglobin and hematocrit and describe the use of each in the evaluation of anemia.
4. Describe the laboratory (hemoglobin, RBC) abnormalities associated with alpha and beta thalassemia, sickle cell disease, hemoglobin C disease.
5. Identify the laboratory findings consistent with individuals with iron deficiency anemia, hemolytic anemia, B12 deficiency, and folate deficiency.
6. List the components of the hematology survey and additional tests used to diagnose anemias and define the reference ranges.
7. Compare and contrast the expected hematology laboratory results for a patient with iron deficiency anemia and thalassemia.
8. Explain the effects of acute/chronic inflammatory diseases on the Total Iron Binding Capacity (TIBC), serum iron, transferrin, and transferrin saturation.
9. Delineate the expected laboratory findings for a patient with anemia of chronic disease.
10. Identify the clinical utility/use of the RDW in the assessment of anemia.
11. Recognize the laboratory findings associated with Hemolytic anemia.
12. Understand the significance of each of the WBC’s in the differential and recognize the normal “balance” of these cells and what can cause a “shift” in the balance.
13. Identify the common causes of elevation of the less common WBC subpopulations [monocytes, eosinophils, basophils].
14. Delineate the clinical significance of blasts.
15. Discuss rationale for the use of the following laboratory tests in the patient presenting with a suspected coagulation disorder (hypercoagulation): Anti-phospholipid antibodies, Protein S, Protein C, Antithrombin III, Factor V.
16. Discuss the role of PT, PTT, and INR in the diagnosis, treatment, and monitoring of
coagulopathies and anticoagulant therapy.
17. Given a patient with presenting complaints and physical findings consistent with a coagulation disorder, list the appropriate laboratory tests for this patient.
18. Know the types of blood products that exist and be able to select the appropriate product for a particular patient diagnosis.
19. Recognize the signs and symptoms of transfusion reactions.

Gastroenterology:
1. Outline the laboratory tests appropriate to evaluate the liver’s synthetic function.
2. Discuss the sensitivity and specificity of ALT and AST for liver disease.
3. List the laboratory results that would be expected in the patient with acute obstructive biliary disease (stone in common bile duct).
4. Identify the most sensitive and specific lab tests for pancreatitis.
5. Delineate the distinguishing laboratory findings associated with the following conditions: Gilbert’s Syndrome, hemochromatosis, primary biliary cirrhosis, and primary sclerosing cholangitis, cholelithiasis.
6. Outline the clinical uses of ALP, and identify those conditions (hepatic and non-hepatic) in which abnormal levels are expected.
7. Identify the causes of isolated hyperbilirubinemia.
8. Describe the clinical use/value of the GGT, and those conditions in which elevations are expected.
9. Recognize the initial (earliest) lab markers for all types of viral hepatitis.
10. Understand the Hepatitis B serology results that indicate vaccination; resolved infection; chronic carrier status; and chronic infective status.
11. Identify the most likely etiology/diagnosis, given a patient history, physical exam findings, and the appropriate laboratory results, suggestive of hepatobiliary disease.
12. Order appropriate stool studies on a specimen for a patient with diarrhea.
13. Order appropriate laboratory testing for a patient with chronic diarrhea in ruling in/out malabsorption issues including lactose intolerance and celiac sprue.
14. Distinguish between colonoscopy and flexible sigmoidoscopy and their indications in clinical practice.
15. Be familiar with the benefits and limitations of stool hemoccult testing.
16. Know the indications for colon rectal cancer screening in the general population.
17. Know the usefulness of a CEA antigen level in evaluating for colon rectal cancer.
18. Be familiar with the methodology, indications, limitations and benefits of helicobacter pylori blood, breath and stool tests.
19. Know the indications and methodology for ruling in or ruling out Zoellinger Ellison syndrome.

GU/GYN
1. Interpret U/A and culture
2. Discuss 24 hour urine collections
3. Discuss utility and indications for renal ultrasound, CT renal stone, and bladder scanning
4. Discuss indications and interpretation along with limitations of pelvic imaging in nonpregnant and pregnant patients.
5. Discuss utility of quantitative beta hcg
6. Discuss and interpret STI testing including proper collection in ureteral, urine and cervical swabs.
7. Discuss collection and interpretation of wet preps
8. Discuss recommendations for collection and interpretation of Thin Prep Pap smears
9. Discuss cancer markers in ovarian cancer
**Recommended Texts and Resources to supplement lecture material:**


**Websites:**
- [http://library.med.utah.edu/kw/ecg/](http://library.med.utah.edu/kw/ecg/) Interactive ECG Tutorial

**Grading/Assessment**

The course grade for the Fall PHA 509 semester will be based upon the following:

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<thead>
<tr>
<th>Exam</th>
<th>Percentage of Grade</th>
<th>Points</th>
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<tbody>
<tr>
<td>Exam 1</td>
<td>33.3% of grade</td>
<td>100</td>
</tr>
<tr>
<td>Exam 2</td>
<td>33.3% of grade</td>
<td>100</td>
</tr>
<tr>
<td>Exam 3</td>
<td>33.3% of grade</td>
<td>100</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>300 points</strong></td>
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Individual exams content will cover EKG and/or Radiology and/or Clinical Laboratory Medicine topics based on material covered up to the exam date.

**Grading Scale:**

- A 100-93
- AB 92.99-90
- B 89.99-83
- BC 82.99-80
- C 79.99-70
- D 69.99-60
- F <59.99

Final grades will **not** be rounded up.

**Attendance and Professionalism**

Attendance at all class periods, laboratories, and practical experiences are mandatory unless otherwise indicated. Poor attendance (unexcused absences, tardiness, and unauthorized early departures), lack of preparation, and unprofessional behavior may result in a lower or failing grade and/or be reported to the program progression committee. If you will be absent, tardy, or need to be excused early you must notify the course director via e-mail or phone prior to the scheduled meeting time. Tardiness and unauthorized early departures will be considered unexcused absences unless prior notification is submitted. Unexcused absences of more than 10% of class time may result in a failing grade. Absences are excused only at the discretion of the course director and/or the PA Program Director. Students may be required to make up missed laboratory time (excused or unexcused) at the discretion of the course director.

**Examination policy:**

There will be 3 exams during the semester. Please refer to schedule for details. Exams are multiple
choice exams and are closed-book. Challenges to examination questions will be accepted for 1 week after the return of scores. Challenges must be submitted in writing via e-mail with two written sources, at least one from recommended course readings.

No books, papers, notebooks, cellphones, smartphones, I-Pods, I-Pads, Blackberry, etc. or backpacks/book bags will be allowed on or near your desk during an examination. It is recommended that students keep personal belongings in the back of the room or in lockers. Hats are prohibited during an exam. Cellphones, smartphones, I-Pods, I-Pads, Blackberry, etc. must be turned off and put away during an examination.

**Statement on Academic Integrity:**
The Carroll University Academic Integrity Policy is located in your Carroll University Student Handbook which is available on the my.carroll.edu website. Students are encouraged to familiarize themselves with it. If a student violates the Carroll University Academic Integrity Policy in any way, the instructor(s) reserve the right to impose a sanction of failure on the assignment/assessment or failure in the course. If you have questions about appropriate citations, please ask your instructor.

**Accommodation for Disabilities:**
Any requests for accommodation must be made through the Walter Young Disability Services Coordinator at Carroll University at 262-524-7621 by the student themselves. Appropriate accommodations will be evaluated based on the program technical standards once notification has been received from the Walter Young coordinator. If a student has special needs or concerns about course requirements related to religious beliefs, cultural issues, or other issues, the student must contact the Program Director with a request for accommodation.

**Modifications to the Syllabus:**
The instructor and the University reserve the right to modify, amend, or change the syllabus (schedule, course requirements, grading policy, etc.) as the curriculum and/or program require(s).

**Remediation:**
During the course, a student who scores more than 2 SD below the mean on an exam/assessment may be required to complete additional work. The student will be contacted by the course instructor and asked to meet to discuss the remediation requirements for that particular assessment. Remediation requirements will be determined by the course instructor. When an instructor requires remediation of a student it does not affect the exam/assessment grade, nor does it improve the semester or course grade. Remediation is required to ensure that course objectives are met. It is expected that assigned work for the purpose of remediation be completed in a thorough, professional and timely manner. Satisfactory completion of remediated work will be determined by the course instructor. Students may be required to complete additional work if the original remediation is deemed unsatisfactory.

Students should make every effort to resolve remediation issues with the course director. If a student is unable to resolve such issues s/he may request a review by the Didactic Subcommittee. All decisions made by the subcommittee are final. If remediation is not successfully completed by the end of the course/semester a grade of “Incomplete” will be given until the work is successfully completed. Please note that an incomplete course grade may delay program progression and/or graduation. Information regarding incomplete grades is available in the Graduate Catalog.
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<tr>
<th>Date</th>
<th>Faculty</th>
<th>Topic</th>
<th>Comments</th>
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<tbody>
<tr>
<td>9/7/2017</td>
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<td>Intro Lab/Intro to radiology/Dermatology</td>
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<tr>
<td>9/14/2017</td>
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<td>Pulmonary and cardiac Radiology</td>
<td>Chest x-rays, u/s dopplers, CT chest</td>
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<tr>
<td>9/21/2017</td>
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<td>Pulmonary</td>
<td>PFTs, abgs</td>
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<tr>
<td>9/28/2017</td>
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<td>Approach to the pulmonary patient</td>
<td>During this session we will put it all together with cases including labs, cxr/ct</td>
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<tr>
<td>10/5/2017</td>
<td>EXAM 1</td>
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<td>Covering all info presented to date</td>
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<tr>
<td>10/11/2017</td>
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<td>Cardiology labs, ECHO</td>
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<td>10/19/2017</td>
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<td>EKG</td>
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<td>EKG</td>
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<tr>
<td>10/30/2017</td>
<td></td>
<td>Approach to patient with cardiac issues</td>
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<td>During this session we will put it all together with cases including ekg, labs, and cxr</td>
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<td>11/2/2017</td>
<td>EXAM 2</td>
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<td>Covering cardiology material/ekg</td>
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<td>11/9/2017</td>
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<td>11/30/2017</td>
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<td>Gastroenterology</td>
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<tr>
<td>12/7/2017</td>
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<td>GU/GYN and approach to the patient with abdominal concerns</td>
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<td>EXAM 3</td>
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<td>Finals Week-Covering heme, GI/GU/GYN</td>
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***Indicates a time other than our usual Thursday morning 10-12 lecture session.***