Nuclear (NOT “Nucular”) Pharmacy APPE

Course Title: Nuclear Pharmacy APPE

Purpose: The purpose of this nuclear pharmacy APPE is to demonstrate an understanding of the basic principles of radiation physics, preparation of radiopharmaceuticals, operator safety, quality control, laboratory design, radiation monitoring equipment, clinical aspects, therapeutic and diagnostic applications of radiopharmaceuticals and diagnostic agents in pharmacy practice.

Goals and Objectives:
1. Understand the basic principles of radiation physics
2. Be able to explain the concept of ALARA
3. Given any radiopharmaceutical, be able to explain how to safely compound it and perform quality control procedures
4. Explain NRC regulations regarding the receipt, transportation, and disposal of radioactive materials
5. Develop a working knowledge of the mathematics involved in nuclear medicine.
6. Be able to use the decay equation and/or decay tables to calculate activity both forward and backward in time
7. Understand generator kinetics, elution techniques and quality assurance of eluate.
8. Demonstrate knowledge of the principles of operation and procedures for quality control of the instruments, equipment and devices used in a nuclear pharmacy
9. Understand the biological effects of ionizing radiation on the body
10. Be able to identify all the components of a radiopharmaceutical kit and identify the purpose of each ingredient
11. Review the therapeutic and clinical aspects of radiopharmaceuticals and diagnostic agents
12. Understand the principles and application of radiation monitoring equipment
13. Be able to recommend an appropriate imaging agent and dose based upon liver and kidney function.
14. Understand how nuclear pharmacy differs from traditional pharmacy practice.
15. Demonstrate an ability to enter orders, prepare radiopharmaceutical kits, and dispense unit doses accurately.

Instructors: Catherine Heyneman, PharmD, MS, ANP, FASCP
Authorized Nuclear Pharmacist
Associate Professor and PIC at Advanced Isotopes of Idaho
LH 263
390-3961 (cell)
cathy@pharmacy.isu.edu

Text: Radiopharmaceuticals in Nuclear Pharmacy and Nuclear Medicine by Kowalsky & Falen, 2004 (do not purchase unless you’re convinced you’re going nuclear – Oboler Library has a copy and so does Cathy)

Lecture notes available in white binder.
Activities:

- Staff the pharmacy from 1:30 am – 5:30 am Monday through Friday
- Staff the pharmacy at other times as requested by the pharmacist
- Attend Advanced Imaging Center scans

Evaluation:

<table>
<thead>
<tr>
<th>By the end of week:</th>
<th>You should review and understand the following lecture notes from the white binder:</th>
<th>You should be able to complete the following tasks with minimal guidance:</th>
<th>You should be able to give a 5-min verbal presentation on the following products:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lectures 1-3</td>
<td>Read survey meter accurately</td>
<td>Choletec (mefrofenin) Kinevac (CCK)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do constancy checks on survey meters and single channel analyzers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practice with syringe shield</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lectures 4-6</td>
<td>Dose wrapping and shipping</td>
<td>Pulmolite (MAA) DTPA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practice with syringe shield</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lectures 7-9</td>
<td>Be competent with syringe shield</td>
<td>Cardiolite (sestamibi) Myoview (tetrofosmin) AdenoScan LexiScan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mix a kit and dispense practice doses</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Lectures 10-12</td>
<td>Mix 3 different kits and dispense doses without a blunt tip accurately</td>
<td>Sulfur Colloid UltraTag</td>
</tr>
<tr>
<td>5</td>
<td>Lectures 13-15</td>
<td>Mix all kits and dispense doses with a blunt tip accurately</td>
<td>Ceretec WBC tag In-111 oxine WBC tag</td>
</tr>
<tr>
<td>6</td>
<td>Lectures 16-17</td>
<td>Continue mixing and dispensing</td>
<td>MAG3</td>
</tr>
</tbody>
</table>

Students must also attend scans at Advanced Imaging as scheduled by the preceptor.

Product Presentation

Each presentation must cover:

- Generic and trade names for the product
- Kit composition and the chemical role of each component
- Radionuclide identity, type of emitter, half-life and energy (KeV)
- General clinical pharmacology (how does this stuff get where it’s going?)
- Indications for use
- Dosage and administration (common adult protocols)
- Contraindications
- Warnings/Precautions
- Pharmacokinetics (ADME)
- Radiation Dosimetry (which organ gets the largest dose of radioactivity?)
- Most common adverse events
- Special populations (pregnancy category, nursing, geriatrics, pediatrics)
- Any special considerations for use (must elute generator and use tech within 30 minutes, etc)
- Kit prep procedures
- QC protocol
- Storage and expiration time
All this information can be gleaned from the package insert for each product— you will only need to pull primary literature if a more difficult, patient-specific issue presents itself. To get the package insert, simply do a web search (for example, search for “www.Cardiolite.com” or do a Google search for “Cardiolite package insert” – or ask Cathy how to find ‘em if you’re having problems.

Grading: Grading will be based upon regular attendance and active participation in rotation activities. Failure to attend the scans at Advanced Imaging will result in a drop of one letter grade.

Important Notes: ● Bring a lab coat with name tag
● Never wear shorts, skirts or open toed shoes
● You can wear jammies or whatever is comfortable when you come in at 1:30 am – but dress nicely when you go to Advanced Imaging Center for scans
● HIPAA rules apply – shred ANYTHING with a patient name on it – DO NOT throw it away in the normal trash
● Never throw away anything with a radiation symbol or that has the word “radioactive” on it. These must be shredded.
● Sign in every morning and wear a dosimeter every time you enter the pharmacy. Take a reading on the dosimeter before and after. Inform the pharmacist on duty if your exposure went up 5 or more mR in any single day.
● If you arrive and the pharmacist does is more than 10 minutes late, call 237-9730 and be sure they are on their way. If you get no answer, call Cathy at 390-3961 or Nicki at 390-3962.

Faculty expectations of students: 1. To attend regularly.
2. To be punctual, prepared and attentive.
3. To be willing to participate positively and constructively.
4. To understand and abide by the procedures, regulations, and schedules described in this syllabus including compliance with the policy for academic dishonesty
5. To display the attitudes, habits and values representative of a professional student/health professional.
6. To acquire knowledge in an independent manner.
7. To interact in a professional manner with patients and other healthcare workers.

Student expectations of instructors: 1. To be punctual, prepared, and enthusiastic.
2. To be genuinely concerned about the ability of the students to perform well.
3. To provide a structure which encourages student learning.
4. To have a commitment to student learning and provide a positive learning experience.
7. To be available at least through e-mail/cell phones.
**Academic dishonesty:** "Dishonest conduct is unacceptable." Students are expected to conduct themselves honestly in all academic and professional activities. Dishonest conduct includes but is not limited to cheating and plagiarism. Any form of dishonest conduct is punishable. Students should review the policies and procedures on academic dishonesty defined in the Idaho State University Student Handbook (Section II.A.3) and in the Faculty Staff Handbook (Part 6, Section IX.A) and in the College of Pharmacy Handbook.

**Students with disabilities:** The Americans with Disabilities Act (ADA) is the civil rights guarantee for persons with disabilities in the United States. It provides protection for individuals from discrimination on the basis of disability. Idaho State University, in the spirit and letter of the law, will make every effort to make reasonable accommodations, according to section 504 of the Rehabilitation Act of 1973 and the ADA. Students with disability related needs should contact the Director of the Center for Students with Disabilities, Campus Box 8118, (208)282-3599. TTY 1-800-377-3529. In addition, the student must supply copies of official correspondence from the Center for Students with Disabilities to the Associate Dean of the College of Pharmacy. Arrangements will then be made to notify individual module directors of the student's special needs.

**Grounds for Dismissal:** Consumption of alcohol or other substances of abuse at the pharmacy will be grounds for dismissal.