COURSE TITLE: Pediatric APPE
PHAR 981

REQUIRED/ELECTIVE: Required/Elective

Cognitive Educational Objectives:

A. Given a specific problem, use the 10-step Pharmacist’s Workup of Drug Therapy to identify the therapeutic problem, analyze clinical data, synthesize a plan, and evaluate the effectiveness of the plan.

B. Given a specific disease state, state the physical, social, and psychological manifestations in a pediatric patient.

C. Given a specific drug therapy plan, design an appropriate process in the pediatric patient, to include such things as method of administration, compatibilities, potential for toxicity (for example the use of preservatives), and the process for compounding a drug not commercially available in a strength or size needed for a pediatric patient.

D. Identify sources of previously acquired knowledge and incorporate these into patient problem solving skills.

Psychomotor Educational Objectives:

A. Demonstrate patient communication skills through the use of patient interviews and counseling.

B. Participate in daily rounds by communicating concerns and recommendations for pharmaceutical care to physicians, nurses, and other healthcare professionals as appropriate.

C. Demonstrate ability to retrieve information important for developing pharmacotherapeutic plan from the patient’s medical record.

D. Demonstrate ability to retrieve, summarize, and document current literature in support of clinical decision-making.

E. Demonstrate ability to write effectively and efficiently to develop and convey ideas and information.

Affective Educational Objectives:

A. Demonstrate professional poise and confidence in knowledge, ability, and capacity to perform meaningful clinical pharmacy services.
B. Develop personal characteristics of behavior and deportment reflective of high standards of professional ethics, emotional maturity, cultural sophistication, and personal and professional integrity.

C. Demonstrate a personal and moral responsibility to serve the needs of the patient, other health professionals and the pharmacy profession.

D. Demonstrate an understanding and appreciation for the healthcare delivery system and the role of each professional within the system.

Minimum Disease State Competencies

A. At the completion of the session, the student should demonstrate competencies as listed above for the following disease states:

- Otitis Media/Otitis Externa
- Reactive Airway Disease
- Pediatric and Neonatal Sepsis and Meningitis
- Formulas/Oral Rehydration Solutions/Gastroenteritis
- Immunizations
- Seizure Disorders and Febrile Seizures
- Drugs in Pregnancy and Lactation

B. Dependent upon time, faculty and student interest, or patient presentation, the student may develop above competencies in the following disease states:

- Pediatric Cough/Cold Products
- Type I Diabetes
- Bronchiolitis/Croup
- Diaper Rash/Impetigo
- Toxicology (Acetaminophen, ASA, Iron, TCA’s)

C. Dependent upon the student’s past experience and/or interests as well as the availability of the service at the practice site, the following topics are available to the student:

- VP Shunt Infections
- Pediatric Head Trauma
- Pediatric TPN
- Septic Shock
- Pediatric HIV/AIDS
- PICU Patient Care (sedative/neuromuscular blocking agents)
- Pediatric Pharmacokinetics
- Pediatric Burn
Learning Activities
The student will participate in the following activities during the pediatric experience:

A. **Patient Rounding Responsibilities**: The activities of the PharmD student will be performed under the direct supervision of a clinical pharmacy faculty member. In partial fulfillment of a commitment to provide services to pediatric patients, the PharmD student will:

1. Work directly with the physician, nurse, resident, medical student, pharmacy faculty, and other health professional in providing pharmaceutical care to each patient;

2. Use the 10-step *Pharmacist’s Workup of Drug Therapy* (PWDT), PHARME, or SOAPME as a guide for defining a patient problem, collecting and analyzing data, recommending and individualizing therapy, and monitoring patient outcomes;

3. Maintain a current and accurate medication profile for each patient. This profile should include, for each drug:
   a. The date on which therapy was begun, the dose, route, frequency and the scheduled times of administration;
   b. Evidence that the student has performed an independent assessment of the appropriateness of drug selection and drug dosage by considering the age and weight of the patient and patient factors which may modify therapeutic regimens; and
   c. An examination and assessment of possible significant drug-drug interactions.

4. Perform monitoring activities to evaluate the therapeutic regimen for each patient by considering:
   a. Those parameters necessary for the recognition of adverse drug reactions to individual drugs and drug combinations; and
b. Those parameters used to evaluate the extent to which the selected therapeutic regimen is achieving the desired therapeutic goal.

5. For each drug level determination performed, the PharmD student shall be able to provide a verbal or written interpretation to clinical pharmacy faculty and to other medical staff as requested;

6. For specific patient problems, support clinical decision-making processes by locating, retrieving, summarizing and interpreting current drug literature. This information will be shared with clinical pharmacy faculty and medical staff as requested;

7. Improve patient (or parent) understanding of drug therapy and the importance of compliance by providing a discharge counseling service. This service would be designed to supplement existing nursing or pharmacy counseling and would include a consultation with the patient’s physician in order to confirm the amount and type of information to be disseminated; and

8. Promote the safe, timely and efficient distribution of drugs from the pharmacy to the patient care area and assist with obtaining specialized dosage forms or drug request when deemed necessary.

B. **Patient Case Presentations** The student will be required to present the patient(s) on his or her service to the pharmacy faculty preceptor and others, three to five times weekly. This presentation should follow the guidelines in the PWDT format (the student may substitute the PHARME or SOAPME documentation formats as directed by the individual preceptor) and should be oriented towards patient pharmacotherapy problems. The student should be prepared to present the following:

1. Patient data:
   a. Relevant characteristics and measurements
   b. Medical illnesses, drug, and compliance histories
   c. Current status: VS, renal function, relevant lab values

2. Pharmacotherapy problems

3. Goals of intervention (desired therapeutic outcomes)

4. Therapeutic alternatives

5. Pharmacotherapeutic recommendations

6. Therapeutic drug monitoring plan
7. References

C. **Patient Grand Rounds** (1 required, 2 recommended) To be presented to clinical pharmacy faculty, other students, and other healthcare professionals.

1. Discuss in depth the clinical course of a patient, the pathophysiology of the disease state, the drug therapy, and specifics about the drugs. The student is expected to have performed a literature evaluation;

2. The presentation should last 45-50 minutes with 10-15 minutes discussion following. This should include:
   a. Presentation of the patient (10-15 minutes): brief description of course of hospitalization (to include lab data and drug calendars), response to therapy;
   b. Presentation of pathophysiology of major disease state(s) in the patient (10-15 minutes);
   c. Presentation of drug therapy and therapeutic alternatives (10-15 minutes); and
   d. Assessment of the patient’s therapy (5-10 minutes)

3. Grading: See “Presentation Evaluation Form”; and

4. Typewritten handouts will be required **THE DAY BEFORE** the presentation that include:
   a. the patient’s clinical course
   b. a drug calendar
   c. monitoring forms
   d. major points in the pathophysiology of the disease state
   e. drug therapy
   f. references must be included

D. **Literature Review Session** (1 required, 2 recommended)

1. Choose an article from the primary pediatric literature (with preceptor’s approval) within the last 6 months that deals with drug
therapy. Chosen articles must be distributed to the other students and the preceptor 2 days in advance of the journal club. All students are expected to read all the articles in advance of the presentation;

2. Presentation of the article should last 25-30 minutes. The student will be expected to critically evaluate the article following techniques described in "Evaluating the Medical Literature, Part I, Part II, and Part III" *Annals of Emergency Medicine*, Vol 12, September, October, and November, 1983, respectively, or use a format similar to the one presented in the Drug Information class. Another useful series on statistics is "Introduction to Statistics: Parts 1-6" *Annals of Emergency Medicine*, Vol 19, months Jan, March, May, July, September, and December 1990;

3. Summarize the applicability and usefulness of the study in current pediatric practice;

4. If the article compares two drugs, factor in the effect of drug cost in the recommendations; and

5. The student will be evaluated on the completeness and thoroughness of the literature evaluation, understanding of the importance of different sections of a research paper, and his or her final evaluation of the study.

E. **Written Paper** (1 required)

1. Write a paper (minimum of 2 pages, typed, single-spaced) revolving around one of the following formats describing the event in the pediatric population. The paper should be well referenced from the primary literature. It is due to the preceptor THE DAY BEFORE the oral presentation.

   a. Pharmacokinetic paper: A description of the basic elements of pharmacokinetics including absorption, distribution, metabolism, and excretion; in addition, it should include any information regarding dose/concentration response and serum concentration monitoring;

   b. Adverse Drug Reaction Report: documenting an observed drug reaction. The paper should include pertinent patient information regarding the event as well as documentation of the event in the literature;

   c. Drug information question: resolving a drug information question specific to an issue or patient problem; or
d. Inservice with typewritten handout: a requested inservice to health professionals with a well-written handout; references are required.

2. The student must summarize the contents of the paper to the preceptor and the other students in a 10-15 minute oral presentation. Do not read the paper, rather encapsulate and expand on what is contained in the writing; and

3. The student will be graded on content as well as style and completeness.

F. **Patient Counseling** (2 required)

The student is responsible for patient medication counseling for all patients on his or her service, both inpatient and outpatient. In addition, if applicable, medication histories will be obtained on all patients admitted to the student’s service. This activity will be observed and evaluated by the faculty member at least twice during the session; once near the beginning and once near the end. The student will be expected to demonstrate good communication skills with the patient and/or parent(s).

G. **Other Required Projects:**

The student may be assigned other projects by the clinical pharmacy faculty member which may involve areas of the hospital other than pediatrics. This may include such things as drug reviews, drug usage evaluation, cost-effective analysis, inservice to medical personnel, drug information questions, drug interaction assessment, or drug therapy protocol development. In addition, the student will be expected to assist the faculty member in on-going research or other projects as needed.

**Grading**

1. **Verbal Challenge:** The student will be able to demonstrate knowledge and comprehension during a verbal challenge examination of the minimum disease states listed under D. 1 above. Within each topic, the student should be able to answer questions derived from the following objectives:

   a. Discuss the pathogenesis, pathophysiology, and manifestations of the individual disease state;

   b. Interpret properly the laboratory and diagnostic data useful in making the diagnosis of the individual disease state;
c. Outline a program of treatment for a patient with the disease state considering the following:

1) age of the patient
2) results of diagnostic procedures
3) patient modifying factors
4) monitoring parameters
5) drug concentrations; and

d. Characterize and discuss the drugs used in the treatment of the disease state to include pharmacology, pharmacokinetics (to include age related differences), side effects, and monitoring parameters.

2. Scores of less than 70% of any of the required assignments will result in a failing score for the session. Unprofessional conduct or unexcused absence will result in a failing grade. The student will be evaluated as appropriate for that Advanced Pharmacy Practice Experience (APPE) using the “Clinical Evaluation Scale” form. This will be forwarded to the College at the end of the APPE session.

APPE Objectives:

A. **Otitis Media/Otitis Externa**

**Goals:**

1. Understand the differences between acute otitis media, chronic otitis media with effusion, recurrent otitis media, and chronic suppurative otitis media;

2. Review the epidemiology, causative organisms, risk factors, complications and sequelae of otitis media;

3. Review the drug therapy for treatment and prophylaxis of otitis media; and


**Objectives:** After reviewing this topic, the student should be able to:

1. State the definitions for: acute otitis media, otitis media with effusion (acute, subacute, and chronic), recurrent otitis media, chronic suppurative otitis media, and otitis externa;
2. List epidemiologic factors that have been associated with otitis media in infants and children;

3. Identify the most common organisms causing otitis media at various ages and with various disease states or predisposing anatomic abnormalities;

4. List the possible complications and sequelae of otitis media;

5. Recommend appropriate therapy for acute otitis media, chronic otitis media with effusion, and chronic suppurative otitis media;

6. Explain the rationale for high-dose amoxicillin (i.e. 75 to 90 mg/kg/day);

7. Contrast the advantages and disadvantages of newer antibiotics (i.e. cefprozil, cefuroxime axetil, loracarbef, cefixime, cefpodoxime, ceftibuten, cefdinir, azithromycin, clarithromycin, and ofloxin otic solution) approved for the treatment of acute otitis media;

8. Explain the treatment of acute otitis media with ceftriaxone;

9. Explain what role steroids may have in otitis media with effusion prior to surgical intervention;

10. Develop a monitoring plan for determining outcome in the patient with acute otitis media, chronic otitis media with effusion, and chronic suppurative otitis media;

11. Recommend appropriate antimicrobial regimens for prophylaxis of recurrent otitis media;

12. Identify the factors that place a patient at risk of developing otitis externa and the organisms most commonly involved; and

13. Recommend a treatment regimen for a patient with otitis externa.

B. **Reactive Airway Disease**

**Goals:**

1. Introduce or refamiliarize the student with the actual clinical presentation of bronchiolitis, bronchopulmonary dysplasia, RSV, croup, and asthma;

2. Review the pathophysiology of the respiratory diseases common to the pediatric population; and
3. Discuss treatment protocols and treatment controversies for the above stated respiratory diseases.

**Objectives:** After reviewing this topic, the student should be able to:

1. List the respiratory disease states common to the pediatric population, and distinguish between their different etiologies;

2. Discuss the pathophysiology of asthma, bronchiolitis, croup and bronchopulmonary dysplasia;

3. Discuss and list the pharmacologic therapies for: bronchiolitis, bronchopulmonary dysplasia (including diuretics), croup and asthma;

4. Discuss the role of the newer agents (leukotriene-receptor antagonists and 5-lipoxygenase inhibitors) in pediatric asthma;

5. Site the adverse effects and drug interactions for the agents used to treat respiratory disorders;

6. Counsel patients/parents on the proper way to use a metered-dose inhaler (including breath-activated MDIs and spacer devices) and dry-powered inhaler;

7. List the different mechanisms for developing tolerance to beta-adrenergic agents;

8. Discuss the role of steroids, both inhaled and systemic in the management of asthma;

9. Discuss the role of steroids and diuretics in the management of BPD;

10. List the drugs used in the prevention of exercise-induced asthma and how to use them;

11. Discuss the role of theophylline in asthma and know the pharmacokinetic differences between age groups for theophylline;

12. Calculate loading and maintenance doses for theophylline based on age and weight and develop a monitoring plan in a patient on the medication; and

13. Discuss the indications for and the use of medications in the treatment and for the prevention of Respiratory Syncytial virus infection in children.
14. Contrast the advantages and disadvantages of the major medications (including differences in drug formulation availability) used for quick relief and long-term control childhood asthma symptoms;

15. Identify the four classes of asthma severity used by the National Heart, Lung, and Blood Institute and outline the stepwise management of each class; and

16. Discuss treatment plans for managing an acute exacerbation of asthma in a child.

C. **Sepsis and Meningitis**

Goals:

1. Introduce the student to the methods used for ruling out sepsis and meningitis in neonates and infants; and

2. Review the pharmacologic treatment of sepsis and meningitis in neonates and infants.

Objectives: After reviewing this topic, the student should be able to:

1. Describe the workup used (including listing the necessary labs and cultures) in ruling out sepsis/meningitis;

2. Discuss the findings in the CSF cell count during meningitis (i.e. WBC, glucose, protein, RBC);

3. List the normal hematologic indices for the different age groups (preterm, neonate, infant and child);

4. List the common organisms causing sepsis/meningitis based on age group;

5. Discuss the choice of empiric antibiotics used for sepsis/meningitis;

6. Discuss the use of steroids in the management of meningitis;

7. State which organisms require rifampin prophylaxis, that need rifampin prophylaxis, the dose and duration of rifampin prophylaxis and alternatives to rifampin;

8. Discuss SIADH meningitis;
9. Discuss the use of intravenous immunoglobulin in neonatal sepsis;

10. Discuss the alternatives available [e.g., inpatient vs outpatient, no antibiotics (only symptomatic management) vs empiric antibiotics] for managing fever without a source in infants and young children;

D. **Formulas/Rehydration/Gastroenteritis**

**Goals:**

1. Introduce the student to methods of rehydration, including intravenous and oral;

2. Calculate maintenance fluids and make adjustments for the different degrees of dehydration;

3. Review the different etiologies and treatment of gastroenteritis; and

4. Introduce the student to the different pediatric enteral formulas and rehydration solutions.

**Objectives:** After reviewing this topic, the student should be able to:

1. Discuss the different etiologies of gastroenteritis, including both viral and bacterial;

2. Discuss the roles of antidiarrheal agents (i.e. antimotiliants, anticholinergics, bismuth subsalicylate, adsorbents, lactobacillus-containing compounds) in pediatric gastroenteritis;

3. Calculate maintenance fluid needs for pediatric patients;

4. Explain methods for determining rehydration fluid requirements in a dehydrated child;

5. Discuss the treatment of gastroenteritis, both supportive and pharmacologic;

6. List the general differences between pediatric oral rehydration and maintenance solutions;

7. List the differences in infant formulas with respect to type of protein, carbohydrate, fat used, and discuss the clinical conditions in which different formulas might be useful; and
8. In a general fashion, know vital statistics measures (i.e. HR, BP, RR, Temp) for neonates, infants and children.

E. **Immunizations**

**Goals:**

1. Review the recommended schedule of immunizations in the pediatric population.

2. Identify special populations for whom the following vaccines are indicated:
   
   a. Trivalent influenza vaccine
   
   b. Pneumococcal vaccine
   
   c. Hepatitis A vaccine

3. Recognized appropriate contraindications to administration of commonly used vaccines.

**Objectives:** After reviewing this topic, the student should be able to:

1. List the vaccines that are recommended at various ages during childhood;

2. List the vaccines that should be avoided in patients with the following: impaired immunity, pregnant, hospitalized, or are household members of immunocompromised individuals;

3. Explain the protection afforded by diphtheria toxoid against the organism, *Corynebacterium diphtheria*;

4. Explain the recommended dosing schedule(s) for OPV and IPV;

5. Discuss the frequency, onset, duration and treatment of fevers associated with vaccines, including DTP/DTaP and MMR;

6. List two reasons why DTP/DTaP is no longer given after the age of seven, and why Td is substituted in its place;

7. Explain the benefit of booster doses of measles vaccine and which population is most likely to benefit;
8. List disease states in which a child should receive influenza vaccines annually;

9. Explain the benefits of rubella and varicella vaccines;

10. State the current recommendations for HBIG and Hepatitis B vaccine and Hepatitis A vaccine;

11. Discuss the use of human rabies immune globulin (HRIG) and rabies vaccine in post-exposure prophylaxis; and

12. Discuss the advantages and disadvantages of combined vaccines and which ones are currently commercially available.

F. Seizure Disorders and Febrile Seizures

Goals:

1. Introduce the student to seizure disorders common to pediatric patients;

2. Learn about the roles of the different anticonvulsant agents in pediatric seizure disorder;

3. Review the pathophysiology, the risk factors and the treatment, both prophylaxis and therapeutic, of febrile seizures in the pediatric patient; and

4. Understand the advantages and disadvantages to drug therapy of febrile seizures.

Objectives: After reviewing this topic, the student should be able to:

1. Describe the differences between: partial seizures (including simple, complex, secondarily generalized), generalized (including absence, myoclonic, clonic, tonic-clonic, atonic, infantile spasms), and febrile seizures;

2. List the drugs of choice for the above mentioned seizures;

3. List in chronological order, the drugs used in management of status epilepticus;

4. State loading/initial and maintenance doses of phenytoin, phenobarbital, valproic acid, and carbamazepine for the different pediatric populations;
5. Discuss the pharmacokinetic differences between the pediatric populations and adult populations for phenytoin, phenobarbital, valproic acid and carbamazepine;

6. State the appropriate times to order free phenytoin levels;

7. State when to draw phenytoin and phenobarbital levels after loading doses, and when to draw phenytoin, valproic acid, and carbamazepine levels for patients on maintenance doses;

8. List clinically significant phenytoin, phenobarbital, valproic acid, and carbamazepine drug interactions and adverse effects; and

9. Discuss the effects of protein binding on phenytoin levels.

10. Contrast the advantages and disadvantages of recently released antiepileptic drugs (i.e. gabapentin, lamotrigine, topiramate, tiagabine, fosphenytoin) or new formulations of older antiepileptic drugs (i.e. intravenous valproic acid, extended-release carbamazepine tablets, rectal diazepam gel) to older antiepileptic drugs/formulations.

11. Describe the temperature pattern that predisposes pediatric patients towards the development of febrile seizures;

12. List the predisposing risk factors and the incidence of developing chronic epileptic seizures following a febrile seizure;

13. List the two risk factors that have been shown to be predictors of recurrent febrile seizures;

14. State the length of most febrile seizures and the point at which there should be concern about neurological damage;

15. List the drugs and their doses that are usually prescribed for antipyretic treatment of pediatric fevers; and

16. List the advantages and disadvantages of various medications that may be used in the long-term prophylaxis (include both antiepileptics which are given daily and intermittently) of febrile seizures.

G. Drugs in Pregnancy and Lactation

Goals:

1. Review the physiology of pregnancy and the passage of drugs through the placenta;
2. Review the treatment of chronic diseases (asthma, hypertension, diabetes, seizures, depression) in pregnant women;

3. Review the effects of drugs of abuse on the newborn (cocaine, alcohol, nicotine, etc.);

4. Review the physiology of breast milk production and secretion, and the process of drug excretion into breast milk; and

5. Understand the resources available to determine the risk of a medication in a pregnant or lactating mother.

Objectives: After reviewing this topic, the student should be able to:

1. Describe how drugs cross through the placenta and what maternal and/or fetal factors may affect this;

2. Develop a therapeutic regimen for the treatment of the following acute and chronic problems that may be present in a pregnant woman and be able to list the risk vs benefit to both fetus and mother of the medications he or she recommends:

<table>
<thead>
<tr>
<th>Acute Problems</th>
<th>Chronic Problems</th>
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<tbody>
<tr>
<td>nausea/vomiting</td>
<td>asthma</td>
</tr>
<tr>
<td>cough &amp; cold symptoms</td>
<td>diabetes</td>
</tr>
<tr>
<td>pain</td>
<td>hypertension</td>
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<tr>
<td>bacterial infections</td>
<td>seizures</td>
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<td></td>
<td>depression</td>
</tr>
</tbody>
</table>

3. List the effects of drugs of abuse on the newborn; including teratogenic effects, growth and developmental effects, and neonatal withdrawal syndromes:

   alcohol
   nicotine
   marijuana
   narcotics
   benzodiazepines
   amphetamines
   cocaine

4. Explain what factors influence the excretion of drugs into breast milk;

5. List factors that may help minimize infant exposure to a maternally ingested medication; and
6. Given a specific pregnancy or breast-feeding drug related question, list the resources available to solve the clinical problem, and also to justify the answer with medical literature.