HAP 512 Principles of Clinical Pharmacology
Course Instructors: J. Hofmann Ribowsky, MS, RPAC
G. Cohan, MD

I. COURSE DESCRIPTION
This lecture component of the course introduces physician assistant students to the study of pharmacology with clinical applications. Emphasis has been placed on the integration of clinical therapeutics of various medications as well as basic principles and pharmacologic properties of clinically relevant medications. The seminar component provides an opportunity for students to deepen their understanding of the clinical use of medications. The seminars integrate content learned in Clinical Medicine units and information presented in the lecture component which runs concurrently.

CREDIT: 5 credits Lecture
1 credit Seminar

II. COURSE GOALS
At the completion of these courses, students are expected to know and apply the basic principles of drug pharmacology, know which medications to prescribe in various clinical settings, as well as realize their potential benefits, risks, side effect profiles and relative costs. Students are expected to be able to apply skills to obtain current drug information using appropriate references including peer-reviewed internet sources (including those incorporated into the following objectives), journals, tertiary references. Students will review evidenced-based drug literature and apply the information in the clinical setting. At the completion of the seminar students are expected to know which medications are appropriate to prescribe in various medical settings and to know their potential advantages, disadvantages and relative costs.

Students will be instructed in the major content areas of:
- General Pharmacologic Principles
- Drugs affecting the Autonomic Nervous System Chemotherapeutics
- Medications used in Coagulation/Hematologic Disorders
- Dermatologic Preparations
- Histaminic and antihistaminic Drugs
- Sympathomimetics
- Topical Ophthalmic preparations
- Drugs affecting the Respiratory system
- Drugs affecting the Gastrointestinal tract
- Introduction to Antihypertensives
- Treatment of dysrhythmias, angina, CHD, uncomplicated MI and CHF
- Drugs affecting the endocrine and reproductive systems
- Analgesics
- Pharmacological management of headaches/ migraines
Pharmacological management of seizure disorders
- Pharmacological management of Parkinson’s disease and dementia
- Sedatives/ hypnotics/anxiolytics
- Antivirals and antiretrovirals
- Pharmacologic management of incontinence
- Pharmacologic management of erectile dysfunction and BPH
- Nephrotoxic agents
- Anesthetics
- Anti-inflammatories/ DMARDS and immunosuppressants
- Psychopharmacology

Course Instructors
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Teaching Strategies:
Lecture:
The course will use an interactive lecture format and the emphasis will be on critical thinking and decision-making. Additionally some of the materials are presented in a web-based, voice-narrated presentation format through Blackboard. The course will present students with the opportunity to accomplish the stated objectives through lecture presentation and critical thinking/case study sessions to facilitate student’s comprehension of the course material. Supplemental readings and journal articles will be distributed as required during class. Students are advised to prepare the required readings prior to meeting, as this will make the class discussions more meaningful for all participants and better facilitate the student’s comprehension of the course material. It is expected that students will be able to demonstrate an in-depth, advanced knowledge base that reflects current theories and best practices within their discipline at a graduate level.

Seminar:
Brief lectures with a strong emphasis on the use of clinical case studies and discussion.

TEXT:

RECOMMENDED TEXTS:

V. METHODS OF EVALUATION
Lecture:
85 % of the final grade
● Exam #1 17%
● Exam #2 17%
● Exam #3 17%
● Exam #4 17%
● Final exam 17%
   TOTAL 85%

Seminar:
15% of the final grade
● Exam #1 100%

Americans with Disabilities Act
If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, 128 ECC Building (631) 632-6748. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.
Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information, go to the following web site: http://www.ehs.sunysb.edu and search Fire Safety and Evacuation/Physical Disabilities.

COURSE OBJECTIVES

1. GENERAL
   COURSE OBJECTIVES

Upon completion of this unit students should be able to:

1. Write a prescription correctly and legibly.
2. Outline the regulations regarding the prescribing of controlled substances.
3. Describe the differences between generic and brand name agents.
4. Describe the medications utilized for common medical conditions, including their mechanisms of action, basic pharmacokinetic profiles, adverse effects, toxicities, clinical important drug interactions, benefits, costs and appropriate clinical use.
5. Discuss and define the pregnancy categories and teratogenic potential of agents.
6. Describe the pharmacologic aspects of “over the counter” medications.
7. Recognize the importance of patient education and counseling when prescribing medications.
8. Discuss potential barriers to patient adherence (compliance) to medications and ways to overcome these barriers.
9. Select appropriate medications based on safety, efficacy, current guidelines and evidence-based information, cost-effectiveness.

II. LEARNING OBJECTIVES

A. General principles of pharmacology
   a. Describe routes of drug administration.
   b. Discuss the principles of pharmacokinetics and how they apply to clinical practice (drug half-lives, dosing, steady state, drug-plateau concentration).
   c. List the factors that influence drug absorption.
   d. Summarize the principles affecting drug distribution, metabolism, and excretion.
   e. Describe the various types of effects that a drug may have at a receptor including intracellular signaling mechanisms.
   f. Distinguish receptor agonists, partial agonists and antagonists.
   g. Define and recognize adverse drug reactions, and distinguish them from drug toxicities.
   h. Discuss the major types of hypersensitivity reactions.
   i. Describe basic mechanisms of drug interactions.

B. Drugs affecting the autonomic nervous system
   a. Classify cholinergic and adrenergic receptors and their subtypes.
   b. Distinguish between muscarinic and nicotinic cholinergic effects.
   c. Describe the mechanism of action, pharmacologic effects, adverse effects and therapeutic uses of representative cholinergic agonists and antagonists.
   d. Discuss the pharmacologic properties and toxicological actions of the reversible and irreversible cholinesterase inhibitors.
   e. Discuss the mechanisms of action, pharmacologic effects and therapeutic uses of neuromuscular blockers and ganglionic blocking agents.
   f. Differentiate the subclassification of adrenergic receptors and explain the effects of blocking or stimulating these receptors.
   g. Explain the mechanism of action, pharmacologic effects and therapeutic uses of selective and nonselective adrenergic agonists and antagonists.
   h. List the commonly used adrenergic agonists and antagonists and describe their therapeutic applications and adverse effects.

C. Chemotherapeutic drugs
   a. Describe the therapeutic goals of antimicrobial therapy.
   b. Discuss the factors to consider when choosing an appropriate antimicrobial agent such as patient profile, types of microorganism, site of infection and likelihood of resistance.
   c. Describe the pharmacokinetic principles and know the spectrum of activity, mechanism of action, adverse effects, contraindications, common drug interactions and relative costs of the following antimicrobial agents:
      i. Macrolides
      ii. Penicillins
      iii. Cephalosporins
iv. Fluoroquinolones
v. Sulfonamides and antifolates
vi. Tetracyclines
vii. Clindamycin
viii. Vancomycin
ix. Polymyxins
x. Chloramphenicol
xi. Monobactams
xii. Carbapenems
xiii. Aminoglycosides
xiv. Antimycobacterials (antituberculous)
xv. Oxazolidinones
xvi. Quinpristin/dalfopristin (Synercid)
d. List examples of drugs in each antimicrobial class (see above).
e. List the penicillins by class and understand the clinical use of each class.
f. Discuss the pharmacologic effects and adverse effects of the antimycobacterial agents.
g. Describe the basic principles of antimicrobial resistance, including multiple-drug-resistant-tuberculosis.
h. Distinguish the four generations of cephalosporins, including spectrum of activity and clinical indications for each generation.
i. List and describe the four generations of fluoroquinolones including clinical use for each class.
j. Explain the meaning and clinical relevance of “peak” and “trough” blood levels and be familiar with guidelines for once daily dosing.
k. Discuss the most common types of fungal diseases in humans (mycoses).
l. Explain the mechanism of action, basic pharmacologic effects of the classes of antifungal agents.
m. Identify the adverse effects and potential toxicity of antifungal agents.
n. Discuss the most common parasitic and protozoal infections.
o. Describe the basic pharmacologic properties, indications and adverse effects of the antiparasitic, antihelmintic and antiprotozoal agents.
http://hopkins-abxguide.org/ (free information, just register)
p. Cancer Treatment
i. Discuss the fundamental concepts of neoplasia and cancer chemotherapy.
ii. Define the basic mechanisms of cytotoxic actions of different antineoplastic agents.
iii. Discuss the major toxicities of antineoplastic agents.
iv. Review oncology medications by registering (free) and accessing http://www.oncologystat.com/drugs_and_regimens/drugs_and_interactions/index.html and http://www.cancer.gov/cancertopics/pdq (more cancer specific information regarding genetics, diagnosis, staging, treatment, clinical trials and prognosis)
D. **Drugs affecting coagulation and the hematological system**
   a. Describe the basic physiology of coagulation.
   b. Explain the pharmacological effects, mechanisms of action, routes of administration, available formulations, therapeutic uses and monitoring parameters for anticoagulants (i.e. heparin and low molecular weight heparin, warfarin, others) and antiplatelet drugs.

E. **Dermatological preparations**
   a. Describe the basic structure and function of the skin.
   b. Discuss the vehicles used in topical therapy and their importance for proper drug delivery.
   c. Explain the topical and systemic pharmacological therapy of mild, moderate and severe acne vulgaris.
   d. Describe the basic pharmacological principles, preparations, therapeutic indications, potential adverse effects and toxicities of the following agents:
      i. Topical antibiotics
      ii. Topical and systemic antifungals
      iii. Topical steroids
      iv. Anti-psoriatics
      v. Anti-seborrheic agents
      vi. Agents used to treat HPV (warts)
      vii. Topical immunosuppressants

F. **Histaminic and antihistaminic drugs**
   a. Discuss the physiologic responses of histamine.
   b. Distinguish the subclassifications of the histamine receptors and understand the effects of stimulating and blocking these receptors.
   c. Describe the basic pathogenesis of Type I hypersensitivity reactions i.e. allergic rhinitis, allergic reactions.
   d. Describe the indications, contraindications, sites of action, risks and benefits of the first and second-generation antihistamine (H1) blockers.
      i. **Sympathomimetics for EENT**
      e. See autonomic objectives
      f. Explain the therapeutic uses and adverse effects of topical and systemic adrenergic agents.
      i. **Topical Ophthalmic preparations**
      g. Describe the basic structure of the eye.
      h. Describe the autonomic effects on the cilary and papillary muscles and how it controls mydriasis and miosis.
      i. Explain the topical treatment of bacterial conjunctivitis.
j. Discuss the use of topical ophthalmic antivirals to treat HSV, herpes zoster and CMV eye infections.
k. Describe the pathophysiology of glaucoma.
l. Describe the mechanisms of action, efficacy, adverse effects and monitoring of agents used to treat glaucoma.

G. **Drugs affecting the Respiratory system**
   a. Describe the pathophysiology of asthma
   b. Summarize the classification of asthma and know the guidelines for treatment by accessing asthma guidelines at [http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf](http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf) and [http://www.nhlbi.nih.gov/guidelines/asthma/asthsumm.htm](http://www.nhlbi.nih.gov/guidelines/asthma/asthsumm.htm)
   c. Discuss the goals of asthma therapy.
   d. Distinguish medications indicated for immediate relief from those indicated for long-term control and maintenance.
   e. Describe the various inhalation devices and know how to use them.
   f. Explain the mechanism of action, clinical use, routes of administration and adverse effects of the following medications:
      i. Short and long-acting beta-adrenergic agonists
      ii. Corticosteroids
      iii. Ipatropium
      iv. Leukotriene antagonists/modifiers
      v. Theophylline
      vi. Mast cell stabilizers
   g. Describe the anti-inflammatory actions, indications, adverse effects and toxicities of corticosteroids.
   h. Discuss the types of steroids used as therapeutic agents for severe asthma and other inflammatory disorders.
   i. Explain the consequences of withdrawal of corticosteroids and chronic use of supraphysiologic doses of steroids.
   j. Discuss the basic mechanism of action, adverse effects, and clinical uses of antitussive agents.
   k. Identify the pathogenesis, etiology and classification of chronic obstructive lung disease (COLD) or COPD.
   l. Describe the beta-adrenergic agents, ipatropium bromide, and corticosteroids and relate them to treatment of COPD.
   m. Discuss the role of long-term oxygen therapy in the treatment of COPD.
   n. Describe the appropriate antimicrobials utilized to treat infectious exacerbations of COPD.

H. **Drugs affecting the Gastrointestinal tract**
a. Summarize the treatment goals for peptic ulcer disease (PUD) and gastroesophageal reflux disease (GERD).


c. Distinguish the antacid preparations and know the advantages and disadvantages of each type.

d. Understand the role of histamine in gastric acid secretion.

e. Explain the indications, contraindications, risks and benefits of the H2 blockers; understand the risks for drug interactions.

f. Discuss the indications, contraindications, mechanism of action, risks and benefits of the proton pump inhibitors.

g. Identify the indications, contraindications, risks and benefits of sulcrafate and misoprostol.

h. Describe the efficacy and tolerability of the treatment combinations used to eradicate Helicobacter pylori infections.

i. Distinguish the laxatives and cathartics by mechanism of action, and know the advantages and disadvantages to each.

j. Discuss the basic physiology of diarrhea.

k. Describe the mechanisms of actions and adverse effects of antidiarrheals.

l. Describe the physiology of vomiting.

m. Identify anti-emetics by mechanism of action, and know the advantages and disadvantages of each.

n. Describe the treatment of inflammatory bowel disease (Crohn’s and ulcerative colitis).

1. **Introduction to Antihypertensives**

a. Describe the basic pathophysiology and classification of hypertension.


c. Explain the mechanisms of action, basic pharmacokinetics, adverse effects, common drug interactions, advantages and disadvantages for the following classes of antihypertensives:

   i. Diuretics
   
i. Adrenergic antagonists (alpha1 and beta )
   
   iii. Vasodilators
   
   iv. Alpha2 agonists
   
   v. ACE inhibitors
   
   vi. Angiotensin II receptor blockers
   
   vii. Calcium channel antagonists
   
   viii. Renin antagonists
   
   ix. Combination agents

d. Create an anti-hypertensive regimen for case-specific populations i.e. diabetics, elderly, CHF patients, African-American pts., etc.
i. **Treatment of dysrhythmias/arrhythmias**

   e. Describe the basic electrophysiology of the heart and the main types of cardiac dysrhythmias.
   f. Describe the cardiac action potential and cardiac cycles.
   g. Distinguish the basic mechanisms of action, pharmacologic profile, adverse effects, toxicities, monitoring parameters, and therapeutic applications of the various classes of antiarrhythmic drugs.
   h. Relate the etiology of specific cardiac dysrhythmias to appropriate antiarrhythmic therapy.

i. **Prescription Writing**

   i. Describe the elements of a prescription.
   j. Distinguish outpatient prescriptions with hospital chart orders.
   k. Discuss common prescription errors and describe helpful guidelines to avoid these errors.
   l. Identify correct abbreviations, dose designations, complete drug names, and proper instructions for writing prescriptions (ISMP list of error-prone abbreviations, symbols and dose designations.

i. **Treatment of Angina, acute coronary syndrome (ACS) and uncomplicated myocardial infarction**

   m. Describe the classification of angina (stable, variant, unstable).
   n. Discuss the basic mechanisms of action, adverse effects and therapeutic applications of drugs used to treat angina (nitrates, beta adrenergic blockers, calcium channels blockers).
   o. Discuss the pathophysiology of acute myocardial infarction.
   p. Discuss the pharmacologic management of acute myocardial infarction including use of aspirin, nitrates, beta blockers, morphine sulfate, ACE inhibitors, anticoagulants/antiplatelet agents.
   q. Discuss the mechanism of action, indications and contraindications of thrombolytic therapy in the management of acute myocardial infarction.
   r. Discuss the role of beta blockers, aspirin and ACE inhibitors in the management of post MI patients.
   s. Describe the recommendations for angina and MI therapy at: http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.107.187930 and http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.107.185752 and at access treatment for ST elevation MI at uptodate.com database accessed through the HSL.
i. **Treatment of heart failure**

t. Describe the pathogenesis of heart failure as it relates to drug therapy.

u. Describe the clinical features of patients with heart failure.

v. Compare and contrast the advantages, adverse effects, and disadvantages of the various drugs used to treat heart failure (ACE inhibitors, beta blockers, carvedilol, digoxin, diuretics and spironolactone, vasodilators, nitrates, positive inotropic drugs etc.)

w. Describe the recommendations for heart failure therapy at:
   [http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.109.192064](http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.109.192064)

x. Formulate a treatment plan for heart failure patients considering individual patient characteristics, etiology and stage, and general goals of therapy.

i. **Drugs affecting the endocrine system**

y. **Diabetes**

   i. Describe the epidemiology, pathophysiology and clinical characteristics of Type 1 and Type 2 diabetes mellitus (DM).

   ii. Describe the standards of medical care for DM with updated standards posted on Blackboard.

   iii. List the goals for glycemic control in diabetics.

   iv. Identify the potential complications of diabetics.

   v. Distinguish the types of insulin available in terms of time to onset, time to peak, duration of action and route of administration including the insulin pump.

   vi. Describe the mechanism of action, route, dosage and frequency of administration, adverse effects/ warnings and role of incretin analogs in DM care.

   vii. Discuss the mechanism of action, route, dosage and frequency of administration, clinical role, and adverse effects/ warnings for the amylin analogs in DM care.

   viii. Discuss the mechanisms of action, contraindications, adverse effects and efficacy of all classes of oral and injectable hypoglycemic agents.

   ix. Recognize the need for liver enzyme monitoring in patients taking thiazolidinediones.

   x. Discuss some of the current controversy regarding Avandia and thiazolidendiones.

   xi. Formulate a treatment plan for diabetes mellitus recognizing the importance of addressing life style modifications, comorbidities and self blood glucose monitoring.

   xii. Discuss the principles of combination therapy and know the advantages and disadvantages of various combinations of hypoglycemic medications.
xiii. Identify the signs and symptoms of hypoglycemia and know how to manage it.

xiv. Apply lifestyle modifications for diabetes therapy.

z. Thyroid disease
   i. Describe the physiology of TSH, T3, T4, and the role of iodine in the synthesis of thyroid hormones.
   ii. Identify the signs and symptoms of hypothyroidism.
   iii. Discuss the use of levothyroxine replacement therapy in terms of dosing, monitoring of efficacy, adverse effects and precautions.
   iv. Identify the signs and symptoms of hyperthyroidism.
   v. Describe the mechanism of action, adverse effects, contraindications, monitoring of efficacy and toxicity of the anti-thyroid medications.
   vi. Discuss the role of beta-adrenergic antagonists in the treatment of hyperthyroidism.

aa. Pituitary disorders
   i. Describe the physiology of hormones produced by the hypothalamus, anterior and posterior pituitary.
   ii. Describe the role of dopamine agonists in the treatment of prolactin excess.
   iii. Discuss the role of growth hormone in the management of GH deficiency and insufficiency.

bb. Menopause
   i. Define menopause and the associated symptoms of signs of estrogen deficiency.
   ii. Discuss the advantages, disadvantages, and dosing, adverse effects of hormone replacement therapy.
   iii. Summarize the findings of the Women’s Health Initiative regarding risks and benefits of HRT.
   iv. Describe the findings of the Women’s Health Initiative at http://www.whi.org/findings/
   v. Discuss pharmacologic alternatives to HRT for treatment of menopausal symptoms/signs.
   vi. Summarize the mechanism of action, adverse effects, and role of bisphosphonates and selective estrogen receptor modulators.
   vii. Describe the role of parathyroid hormone and calcitonin in the treatment of osteoporosis.
   viii. Discuss the importance of patient education, preventive care and counseling regarding menopause and its treatment.

cc. Pregnancy, Contraception and infertility
   i. Discuss the role of oxytocin during pregnancy and labor.
   ii. Describe the action of oxytocin on uterine smooth muscle during labor.
iii. Describe the indications, contraindications, and adverse effects of oxytocin.

iv. Summarize the role of prostaglandin in labor augmentation.

v. Summarize the tocolytic agents with respect to mechanism of actions, route of administration, and adverse effects.

vi. Describe the physiology of the menstrual cycle.

vii. Summarize the mechanisms of hormonal contraception.

viii. Distinguish monophasic, biphasic and triphasic combination oral contraceptives and know their advantages and disadvantages.

ix. Identify the contraindications and potential risks of hormonal contraceptives.

x. Identify specific side effects (i.e. too little or too much progestogen, estrogen) of oral contraceptives and know how to manage them.

xi. List significant drug interactions, which can occur with oral contraceptives.

xii. Examine the risks and benefits of progestin only contraceptives.

xiii. Identify the indications and methods of prescribing emergency contraception.

xiv. Summarize the indications, efficacy, mechanisms and adverse effects of medical abortificents, mifepristone, Methotrexate and misoprostol.

xv. Discuss the treatment options for endometriosis and polycystic ovarian syndrome.

xvi. Discuss the role of clomiphene citrate, metformin, gonadotropins, and GnRH analogs in the treatment of female infertility.

i. Analgesics

dd. Discuss the basic physiology of nociceptive pain.

ee. Assess physical pain and be familiar with methods of quantifying pain.

ff. Explain the goals of pain management.

gg. Explain the basic pharmacokinetics, mechanism of action, therapeutic indications, adverse effects and toxicities of acetaminophen.

hh. Recognize the symptoms and signs of acetaminophen overdose and know how to treat it.

ii. Describe the mechanisms of action, indications, adverse effects, and toxicities of the non-steroidal anti-inflammatories (NSAIDS) and aspirin.

jj. List examples of agents that function as COX II inhibitors and compare the safety profiles with traditional NSAIDS.

kk. Review the risks of adverse cardiovascular events associated with COX 2 inhibitors and NSAIDS (utilize literature in websites i., j.)


mm. List the basic classifications of the opioids and provide examples from each class.

nn. Describe the different opioid receptors and their characteristic pharmacologic effects.
oo. Distinguish the most commonly used opioid analgesics and know their mechanism of action, therapeutic uses, and common adverse effects.

pp. Discuss the management of opioid adverse effects such as constipation.

qq. Examine tolerance, dependence and addiction in opioid users.

rr. Analyze the risks and benefits of combination opioids and NSAID/acetaminophen combination preparations.

ss. Discuss the basic management strategies for neuropathic pain i.e. diabetic or postherpetic neuropathy, including but not limited to carbamazepine, duloxetine, amitriptyline, gabapentin.

i. **Pharmacological management of headaches/ migraines**

   tt. Describe the various types of headaches including migraine headaches.

   uu. Discuss the role of serotonin in the pathophysiology of migraine headaches.

   vv. Discuss the mechanism of action, adverse effects, contraindications, and role of ergot alkaloids and derivatives in the treatment of migraine headaches.

   ww. Explain the role of serotonin receptor agonists (triptans) in the treatment of migraine headaches and explain their mechanism of action, adverse effects, routes of administration and clinical therapeutics.

   xx. Analyze the efficacy and adverse effects of the drugs used for prophylaxis of migraine headaches.

   yy. Summarize the role of antiemetics in treatment of migraine headache.

   zz. Discuss the pharmacotherapy of cluster headaches including the use of oxygen, ergotamines and triptans as well as prophylactic regimens.

i. **Pharmacological management of seizure disorders**

   aaa. Explain the pharmacologic basis for the use of anticonvulsants in the treatment of seizure disorders.

   bbb. Describe the basic pharmacokinetics, mechanisms of action, indications, adverse effects, monitoring parameters for the following anticonvulsants:

   1. Phenytoin
   2. Carbamazepine and oxycarbazepine
   3. Phenobarbital, primidone
   4. Valproic acid
   5. Ethosuximde
   6. Benzodiazepines
   7. Lamotrigine
   8. Felbamate
   9. Topiramate
   x. Gabapentin
   xi. Levetiracetam
   xii. Tiagabine
Pharmacological management of Parkinson’s disease and dementia

ccc. Describe the pathogenesis of Parkinson’s disease and understand the important role of dopamine.
ddd. Discuss the medications used to treat Parkinson’s disease; describe their mechanism of action and adverse effects.
eee. Discuss the pathogenesis of Alzheimer’s disease and understand the important role of acetylcholine.
fff. Discuss the medications used to treat cognitive dysfunction; know their mechanism of action, efficacy and adverse effects.

Sedative/hypnotics/anxiolytics

ggg. Explain the clinical indications for sedative-hypnotic agents.
hhh. Describe the mechanism of action, basic pharmacokinetics and adverse effects of the benzodiazepines.
iiii. Discuss the use of benzodiazepines for panic and anxiety disorders.
jjjj. Assess the symptoms of withdrawal from benzodiazepines.
kkkk. Discuss the management of insomnia.
llll. Summarize the mechanisms of action, advantages, and disadvantages of benzodiazepines, zoldipem, zaleplon in the treatment of insomnia.
mmmm. Explain the mechanism of action and clinical indications for the most commonly used barbiturates.
nnnn. Describe tolerance, dependence and abuse potential for benzodiazepines and barbiturates.
oooo. Explain the effects of combining ethanol (alcohol) with sedative-hypnotics.

Antivirals and antiretrovirals

pppp. Describe the mechanism of actions, spectrum of antiviral activity, clinical therapeutics, and common adverse effects for antiviral agents.
qqqq. Discuss the pathophysiology of HIV disease and the role of highly active antiretroviral therapy in the management of HIV/AIDS.
rrrr. Describe the current treatment guidelines for HIV at http://www.aidsinfo.nih.gov/
ssss. Explain the mechanism of action, side effects and toxicities and major drug interactions of the nucleoside reverse transcriptase inhibitors.
tttt. Examine the mechanism of action, adverse effects and toxicities, and major drug interactions of the non-nucleoside reverse transcriptase inhibitors.
uuuu. Explain the mechanism of action, adverse effects, toxicities and major drug interactions of the protease inhibitors.
i. **Pharmacologic management of urinary incontinence**

vvv. Describe the pathophysiology of the types of urinary incontinence.

www. Discuss the role of anticholinergics such as oxybutynin, tolterodine, others in the treatment of urinary incontinence.


i. **Pharmacologic management of erectile dysfunction and benign prostatic hyperplasia, BPH.**

yyy. Explain the main causes of erectile dysfunction.

zzz. Describe the basic physiology of a normal penile erection.

aaaa. Discuss the mechanism of action, route of administration, adverse effects and contraindications of the following agents:
   
   i. Sildenafil and similar agents (vardenafil, tadalafil)
   
   ii. Testosterone replacement
   
   iii. Alprostadil
   
   iv. Other agents

bbbb. Describe the basic pathophysiology of BPH.

cccc. Discuss the treatment of BPH including mechanism of action, efficacy, adverse effects of following agents:
   
   i. Alpha-adrenergic antagonists including tamsulosin
   
   ii. Finasteride, dutasteride (5-alpha reductase inhibitors)

i. **Nephrotoxic agents**

dddd. Summarize basic mechanisms of drug-induced nephrotoxicity.

eeee. List major nephrotoxic drugs and how to recognize potential nephrotoxicity.

i. **Anesthetics**

ffff. Explain the concepts of local and general anesthesia including risks and benefits for each type.

gggg. Outline the basic pharmacokinetic principles including routes of administration, mechanism of action, therapeutic indications and adverse effects of local anesthetics.

hhhh. Discuss the basic pharmacologic properties including adverse effects of the following inhalational and intravenous anesthetics:
   
   i. IV agents
      
      1. ultra short acting barbiturates
      
      2. benzodiazepines
      
      3. propofol
      
      4. ketamine
5. etomidate
6. narcotic analgesics (see pain management objectives)

ii. Inhalational agents
  1. halothane
  2. methoxyflurane
  3. enflurane
  4. isoflurane
  5. sevoflurane
  6. nitrous oxide

i. Psychopharmacology

iii. Describe the major diagnostic criteria for major depressive disorder.
jjj. Discuss the classification of antidepressants based on chemical structure and mechanism of action.
kkk. Describe the basic pharmacokinetics, potential major drug interactions, adverse effects and dosing of tricyclic antidepressants.
lll. Describe the basic pharmacokinetics, potential major drug interactions, adverse effects and dosing of selective serotonin reuptake inhibitors (SSRIs) and selective norepinephrine reuptake inhibitors.
mmmm. Describe the basic pharmacokinetics, potential major drug interactions, adverse effects and dosing of venlafaxine, desvenlafaxine, nefazodone, trazodone, bupropion, mirtazapine.
nnnn. Define the risks and benefits if the MAO inhibitors including tyramine restrictions.
oooo. Describe the diagnostic features of bipolar disorders.
pppp. Discuss the most commonly used mood stabilizers including the anticonvulsants and the role of antipsychotics in bipolar disorder.
qqqq. Describe the pharmacokinetics, potential drug interactions, serum monitoring, toxicities, and adverse effects of Lithium preparations.
rrrr. Describe the main diagnostic features of schizophrenia.
ssss. Distinguish the traditional and atypical antipsychotics and know the advantages, disadvantages, and basic mechanisms and adverse effects of each class.
tttt. Summarize the traditional antipsychotics comparing adverse effects and potency.

i. Pharmacologic management of inflammation and rheumatic diseases

uuuu. Describe inflammation, the immune response and understand the role of arachidonic acid metabolism and its products (i.e. prostaglandins) in inflammation.
vvvv. Describe the anti-inflammatory actions, indications, adverse effects and toxicities of corticosteroids.
List examples of pharmacologic agents that function as cyclooxygenase (COX) inhibitors.

Describe the mechanism of action, indications, adverse effects, toxicities of non-steroidal anti-inflammatory drugs (NSAIDS) and COX 2 inhibitors.

Compare and contrast the safety profiles of COX II inhibitors (ex: celecoxib,) and traditional NSAIDS. Discuss the recent information regarding cardiovascular risk and COX 2 inhibition.

Discuss the use of anti-inflammatories in the treatment of acute gout.

Discuss the use of antimalarials, corticosteroids, cytotoxic drugs such as cyclophosphamide in the treatment of systemic lupus erythematosus (SLE).

Summarize the role of drug modifying antirheumatic drugs (DMARDS) and other newer biologic agents such as etanercept and infliximab in the treatment of rheumatoid arthritis and other inflammatory diseases.

Discuss the basic pharmacologic principles, adverse effects/toxicities of and basic clinical uses for immunosuppressive drugs including cyclosporine, tacrolimus, glucocorticosteroids, sirolimus, azathioprine, mycophenolate mofetil.

Geriatric and pediatric considerations

Compare and contrast the pharmacokinetic and pharmacodynamic differences in premature neonates, neonates, infants, children and adolescents.

Apply Clark’s and Young’s rules when dosing medications for the pediatric population.

Write appropriate and accurate prescriptions for various pediatric patients based on weight in kilograms.

Summarize age-related changes in pharmacokinetics in the geriatric population.

Illustrate the Cockcroft and Gault equation for calculating creatinine clearance.

Discuss the importance of assessing underlying medical conditions when utilizing pharmacotherapy in the geriatric population.

Identify and assess polypharmacy and implement ways to minimize polypharmacy.

Pharmacogenomics

1. Define pharmacogenetics and pharmacogenomics.
2. Describe major concepts critical to the understanding of the field of pharmacogenomics.
3. List critically relevant genetic polymorphisms in drug metabolism enzymes and drug target receptors, and their effect on drug response with respect to adverse effects and efficacy.
4. Discuss the application of pharmacogenomics into clinical practice and how this will impact healthcare.
5. Describe the range of genetic approaches to pharmacologic treatment of disease e.g pharmacogenomics/prescription of drugs to match individual genetic profiles, gene-based drugs, gene therapy

SEMINAR OBJECTIVES:
Upon completion of the seminar the students should be able to:
1. Write a prescription correctly.
2. Evaluate medications utilized for common medical conditions, distinguishing their risks, benefits, costs and appropriate clinical use.
3. Recognize the importance of combining patient education and counseling with the prescribing of medications.
4. Explore potential barriers to patient compliance and ways to overcome them.
5. Understand and apply principles of pharmacogenomics.

TOPIC OUTLINE
1. Patient Compliance and Health Literacy
2. Prescription Writing
3. Pharmacotherapy of Hyperlipidemia and CHF
4. Pharmacotherapy of Common Psychiatric Disorders
5. Pharmacotherapy of Diabetes
6. Therapeutic Management of Asthma,
7. Pharmacotherapy of Pain
8. Antimicrobial Therapy
9. Pharmacogenomics

LEARNING OBJECTIVES

A. Individualizing Therapy and Improving Patient Adherence with Pharmacotherapy
   a. List the potential barriers to patient compliance with medical recommendations.
   b. Explore the various means of overcoming barriers to compliance.
   c. Evaluate the issues related to compliance when making therapeutic recommendations in specific clinical situations.
   d. Understand the importance of health literacy and describe techniques to enhance communication with patients.
   e. Weigh the specific challenges related to compliance in the older patient with multiple medications, comorbid conditions, and functional challenges (e.g., visual, hearing, cognitive, etc.) when prescribing medications.

B. Prescription Writing
   a. Recognize the components of a prescription.
   b. Differentiate the appropriate notations for units and frequency of dosing.
   c. Demonstrate the ability to write a prescription clearly and correctly.
   d. Know how to minimize risk for errors in prescribing.
   e. Define a controlled substance and know its classification.
   f. Distinguish regulations for the prescribing of controlled substances from those pertaining to other medications.

C. Pharmacotherapy of Hyperlipidemia and CHF
   a. Discuss the current National Cholesterol Education Program (NCEP)/Adults Treatment Panel (ATP) III guidelines for the treatment of hyperlipidemia.
   b. Explain the rationale behind aggressive lipid reduction.
   c. Differentiate the mechanisms of action, effect on lipid and lipoproteins and advantages and disadvantages of each of the drugs used in the treatment of hyperlipidemia.
   d. Distinguish the clinical features of patients with congestive heart failure (CHF).
   e. Relate pathophysiology to the rationale for treatment options in CHF.
   f. Compare and contrast the advantages and disadvantages of the various drug classes used to treat CHF.
g. Distinguish between drugs which treat symptoms of CHF from drugs which increase longevity in CHF.

h. Formulate a treatment plan for patients with CHF, considering individual characteristics, heart failure etiology, general management goals, and desired outcomes.

i. Know the medications used to control heart rate in atrial fibrillation.

D. Pharmacotherapy of Common Psychiatric Disorders
   a. Sort the commonly used antidepressants based on chemical structure and mechanism of action.
   b. Summarize the current guidelines for the treatment of major depression.
   c. Explore the clinical use of tricyclic antidepressants (TCAs), serotonin reuptake inhibitors (SSRIs), venlafaxine, bupropion, and mirtazapine in the management of depression.
   d. Compare and contrast the use of benzodiazepines and SSRIs in the management of anxiety disorders.
   e. Discuss both non-pharmacologic and pharmacologic approaches to insomnia.
   f. Describe the mechanisms of action and distinguish the advantages and disadvantages of benzodiazepines, zolpidem, zaleplon and eszopiclone in the treatment of insomnia.
   g. Explain the importance of acetylcholine in the pathophysiology of Alzheimer’s Disease.
   h. Compare and contrast the medications used to treat cognitive dysfunction in terms of mechanisms of action, advantages and disadvantages.

E. Diabetes Therapy
   a. Outline the goals and rationale for glycemic control in patients with diabetes.
   b. Compare and contrast types of insulin available in terms of time to onset, peak, duration of action, and formulation.
   c. Compare and contrast the oral agents available for non-insulin dependent diabetes in terms of mechanism of action, contraindications, advantages and disadvantages.
   d. Recognize the need for monitoring liver enzymes for patients taking “glitizones”.
   e. Discuss the use of exenatide in Type 2 DM, including indications, mechanism of action, and need for patient education.
   f. Explore the rationale for combination therapy and describe the advantages and disadvantages of using certain agents together.
   g. Recommend therapy for diabetes based on patient characteristics.
   h. Know the management of hypoglycemia.

F. Therapeutic Management of Asthma
   a. Discuss the pathophysiology of asthma.
   b. Explain the classification of asthma and describe the guidelines for treatment.
   c. Outline the goals of asthma therapy.
   d. Distinguish medications indicated for immediate relief (“rescue”) from those indicated for long-term control (“controllers”).
e. Describe the advantages of using peak flow meters and explain their correct use.
f. Distinguish the various inhalation devices and demonstrate their use.
g. Compare and contrast the mechanisms of action, clinical use, routes of administration and adverse effects of the following medications:
   a. Short and long acting beta-adrenergic agonists
   b. Corticosteroids
   c. Ipratopium
   d. Leukotriene modifiers
   e. Mast cell stabilizers
h. Provide appropriate patient education and counseling in the management of asthma.

G. Pharmacologic Management of Pain
a. Describe the therapeutic goals of pharmacological pain management.
b. Outline the principles of prescribing analgesics in order to maximize their positive effects.
c. Compare and contrast the non-opioid analgesics (acetaminophen, NSAID, COX2-selective agents) with regard to mechanism of action, therapeutic use, advantages and disadvantages.
d. Distinguish commonly used opioid analgesics in terms of mechanism of action, therapeutic uses, advantages, and disadvantages.
e. Distinguish long-acting from short-acting opioids and know how to treat “breakthrough” pain.
f. Evaluate the side effects of opioids and generate a plan to prevent and treat them.
g. Explore the use of antidepressant and anti-convulsant medications in the treatment of chronic pain.

H. Antimicrobial Therapy
a. Describe the clinical implications of antibiotic resistance and strategies to reduce its occurrence.
b. Compare empiric and presumptive antibiotic therapy.
c. Calculate a patient’s creatinine clearance based on weight and serum creatinine.
d. Distinguish antimicrobials which require dosage adjustment based on renal function from those that do not.
e. Evaluate the risk for antibiotic resistance in specific clinical situations and know the specific microorganisms of concern.
f. Correlate common sites of infection with expected class of microorganism, including gram positives, gram negatives, atypicals, anaerobes, and MRSA.
g. Recommend antibiotic therapy to treat various classes of microorganisms, including gram positives, gram negatives, atypicals, anaerobes, and MRSA.
h. List the most common pathogens responsible for community-acquired pneumonia (CAP).
i. Outline the treatment guidelines for CAP as described by the Infectious Disease Society of America (IDSA).
j. Weigh the treatment strategies for the different types of UTIs.
k. Describe the most commonly seen organisms in skin and skin-structure infections.
I. Understand the use of antibiotics for surgical prophylaxis.

I. **Pharmacogenomics**
   a. Explain major concepts critical to the understanding of the field of pharmacogenomics.
   b. List critically relevant genetic polymorphisms in drug metabolism enzymes and drug target receptors, and their effect on drug response with respect to adverse effects and efficacy.
   c. Explain the application of pharmacogenomics into clinical practice and how this will impact healthcare.
   d. Discuss the prescription of drugs to match individual genetic profiles
   e. Discuss current and future issues in the law, ethics, and health policy surrounding the use of pharmacogenomic information.