

**Pharmacology for Medical & Naturopathic Practitioners  
On-Line Certification Program for the State Board of Idaho**

**COURSE INFORMATION**

**Course Title: Pharmacology for Practitioners**

**Time Requirement:** (hours/week)

Lecture Hours: 4.5 hours/week (Total Units: 3)

**Additional Course Activities:** (hours/week)

<b>Activity</b>	<b>Hours / Week</b>
Reading Assignments	2
Exam Preparation	3
Total	5

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**COURSE PURPOSE**

**Course Goal:** Students will be gain

**Course Description:** This course is a systematic study of drugs used in the management and treatment of common disorders, with an emphasis on evidence-based guidelines and therapeutic assessments. Lectures will focus on providing students with a rational basis for drug selection and improving therapeutic outcomes. The course will explore common drugs and their corresponding therapeutic indications, mechanisms of action, adverse effects, toxicities, and drug interactions. Students will be trained to assess the benefits and risks of pharmacologic interventions in various patient care settings.

**Program Learning Outcomes:**

- **Medical Knowledge (MK)**
  - Analyze and integrate foundational information in basic sciences, pathophysiology, and pharmacotherapeutics and apply it to patient-centered quality care.
- **Patient Care (PC)**
  - Develop and implement age appropriate assessment, evaluation, and management utilizing best-practice methodologies to demonstrate competent, efficient patient-centered care, including health promotion and disease prevention.
- **Interpersonal and Communication Skills (IPCS)**
  - Demonstrate verbal, nonverbal and written skills and effectively engage with patients, patient's family, colleagues, and other interdisciplinary team members.
- **Professionalism (PROF)**
  - Demonstrate ethical values, respect, compassion, empathy, trust, integrity, and self-reflection in all patient care and community interactions.

### **Course Learning Outcomes:**

1. Select an anti-hypertensive therapy for a patient based on age, race, and comorbidities.
2. Create a treatment plan for asthma including patient education on side effects, adverse drug reactions, and monitoring.
3. Select a management plan for diabetes mellitus including patient education on side effects, adverse drug reactions, and monitoring based on the hemoglobin A1c and comorbidities.
4. Explain the adverse drug reactions and complications of prolonged NSAID use.
5. Indicate the appropriate circumstances to management of pain with opioids. Include patient education on overdose, dependence, and withdrawal in treatment planning.
6. Identify the stage of heart failure and use individual patient factors in selection of pharmacologic management.
7. Engage in continuous professional and interprofessional development to enhance team performance by listening actively and encouraging the ideas and opinions of other team members.

### **Course Instructional Objectives:**

1. Explain how pharmacokinetics and pharmacodynamics influence routes of administration, drug distribution, drug efficacy, drug toxicity, and appropriate drug selection for pharmacotherapy. (MK)
2. Identify major drugs and drug classes currently used in medical practice and describe their pharmacology, indications, contraindications, clinical applications, mechanisms of action, adverse effects, drug-drug interactions, and pharmacokinetic properties. (MK)
3. Demonstrate knowledge of the pharmacology of major drugs and drug classes currently used in medical practice, together with patient-specific factors, to select the most appropriate and effective options for treating a given disease state. (PC)
4. Determine the effectiveness of non-pharmacological therapeutic interventions in the treatment of specific disease states and conditions. (MK)
5. Describe the mechanisms of drug toxicities and approaches for managing toxicities. (MK)
6. Identify the physiological, pharmacological, and psychological effects of drug abuse and the consequences of withdrawal symptoms. (MK)
7. Integrate knowledge and principles in basic science courses to develop clinical pharmacological treatment strategies. (MK)
8. Identify monitoring strategies for assessing effectiveness of specific drugs used in the treatment of common disease states and conditions. (MK)
9. Demonstrate the ability to collaborate and effectively communicate with peers to address issues of pharmacological significance. (IPCS)
10. Assess the relative benefits versus risks of pharmacologic interventions in the management of pathological conditions. (MK)
11. Identify patient-specific pharmacokinetic parameters that influence drug selection and dosage considerations. (PC)
12. Implement important patient counseling strategies to improve compliance in patients treated with multiple treatment regimens for concomitant disorders. (PROF)

**This course meets the following Standards:**

B1.01 The curriculum must be consistent with the mission and goals of the program.

B1.02 The curriculum must include core knowledge about the established and evolving biomedical and clinical sciences and the application of this knowledge to patient care.

B1.03 The curriculum must be of sufficient breadth and depth to prepare the student for the clinical practice of medicine.

B1.04 The curriculum design must reflect sequencing that enables students to develop the competencies necessary for current and evolving clinical practice.

ANNOTATION: The concept of sequencing refers to the coordination and integration of content both horizontally and vertically across the curriculum. It does not mandate that content be delivered in separate courses with traditional discipline names. Appropriate sequencing involves considering overall program design and integration of content. Content and course sequencing are expected to build upon previously achieved student learning.

B1.07 The curriculum must include instruction related to the development of problem solving and medical decision-making skills.

B1.09 For each didactic and clinical course, the program must define and publish instructional objectives that guide student acquisition of required competencies.

ANNOTATION: Instructional objectives stated in measurable terms allow assessment of student progress in developing the competencies required for entry into practice. They address learning expectations of students and the level of student performance required for success.

B2.02 The program curriculum must include instruction in the following areas of applied medical sciences and their application in clinical practice:  
a) anatomy, b) physiology, c) pathophysiology d) pharmacology and pharmacotherapeutics, e) the genetic and molecular mechanisms of health and disease.

B2.04 The program curriculum must include instruction in interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families and other health professionals.

B2.05 The curriculum must include instruction in patient evaluation, diagnosis, and management.

ANNOTATION: Instruction in patient assessment and management includes caring for patients of all ages from initial presentation through ongoing follow-up. It includes instruction in interviewing and eliciting a medical history; performing complete and focused physical examinations; generating differential diagnoses; and ordering, and interpreting diagnostic studies. Patient management instruction addresses acute and longitudinal management. Instruction related to treatment plans is patient centered and inclusive, addressing medical issues, patient education, and referral.

## COURSE SCHEDULE

WEEK	TOPIC	READING	SLO Linkage
1	Pharmacodynamics & Pharmacokinetics	Handout	
2	Common Over-The-Counter & Prescription Drugs	Handout	
3	Review of the Autonomic Nervous System (ANS) Management & Treatment of Hypertension	Handout Handout	
4	<b>EXAMINATION I</b> Pharmacologic Management of Ischemic Heart Disease	Handout	SLO: 1-12
5	Pharmacologic Management of Heart Failure Management & Treatment of Asthma & COPD	Handout Handout	
6	Pharmacologic Management of Diabetes Mellitus	Handout	
7	<b>EXAMINATION II</b> Pharmacologic Management of Pain	Handout	SLO: 1-12
8	Treatment of Acute Musculoskeletal Disorders Treatment of Chronic Musculoskeletal Disorders	Handout Handout	
9	Treatment of Chronic Musculoskeletal Disorders (cont.) Osteoporosis and Hormone Replacement Therapy	Handout Handout	
10	<b>EXAMINATION III</b>		SLO: 1-12

## INSTRUCTIONAL MATERIALS

### **Recommended Texts and References**

1. Papadakis, M. A., McPhee, S. J., Rabow, M.W., McQuaid, K. R. (2024). Current Medical Diagnosis & Treatment 2024. Access Medicine. ISBN: 9781265556037.
2. Brunton, L. L., Knollman, B. C. (2023). Goodman & Gilman's: The Pharmacological Basis of Therapeutics (14 th ed.). Access Medicine. ISBN: 9781264258079.
3. Katzung, B. G., Vanderah, T. W. (2021). Basic & Clinical Pharmacology (15 th ed.). Access Medicine. ISBN: 978126045231
4. DiPiro, J. T., Yee, G. C., Posey, M., Haines, S. T., Nolin, T. D., Ellingrod, V. (2023). Pharmacotherapy: A Pathophysiologic Approach (12 th ed.). McGraw Hill LLC. ISBN: 9781264264544.
5. Vallerand, A. H., Sanoski, C. A. (2023). Davis's Drug Guide for Nurses (18 th ed.). F.A. Davis. ISBN: 9781719646406.
6. Gilber, D. N., Chambers, H. F., Saag, M. S., Pavia, A. T., Boucher, H. W., Black, D., Feedman, D. O., Kim, K., Schwartz, B. S. (2023). The Sanford Guide to Antimicrobial Therapy 2023 (53 rd ed.). Antimicrobial Therapy, Inc. ISBN: 9781944272234.

## Recommended Texts and References (cont.)

7. Zeind, C. S., Carvalho, M. G., Cheng, J. W., Zaiken, K., LaPointe, T. (2023). Applied Therapeutics: The Clinical Use of Drugs (12 th ed.). Wolters Kluwer. ISBN: 9781975167097.
8. Ancha, S., Auberge, C., Cash, D., Harsh, M., Hickman, J., Kounga, C. (2023). The Washington Manual of Medical Therapeutics (37th ed.). Wolters Kluwer. ISBN: 9781975190620.
9. Rudzinski, Michael J., and Bennes, J. Fred. *Drug Information Handbook for physician Assistants*. Hudson, OH: LexiComp, Inc. 2000. ISBN: 1930598327
10. Drug interaction checker... <http://www.medscape.com/druginfo/druginterchecker?src=google>
11. Drug search; <https://online.epocrates.com/rxmain.jsp>

## TEACHING METHODS AND ACTIVITIES

1. Lectures
2. Reading assignments
3. Clinical case discussions
4. Interactive review sessions

## EVALUATION OF STUDENT LEARNING

**Grading procedures:** Examinations will reflect topics discussed in class. The format of the examinations will be multiple choice, matching, and short answer. The final examination will be comprehensive and will account for 40% of the course grade. Textbooks are listed as recommended resources and references.

Assessment	Weight/%/Points
Examination I	100 points
Examination II	100 points
Final Examination (Comprehensive)	150 points
TOTAL POINTS:	350 points

### **Grading scale:**

Letter grades will be assigned only at the end of the trimester.

A = 90% to 100%

B = 80% - less than 90%

C = 70% - less than 80%

D = 60% - less than 70%

F = less than 60%

I = Incomplete

W = Withdrawal

## AS Pharmacology Instructional Objectives

### Week 1: Pharmacodynamics & Pharmacokinetics

- Define pharmacodynamics and pharmacokinetics.
- Discuss the advantages and disadvantages associated with each route of drug administration.
- Discuss the factors that influence drug absorption, drug distribution, drug metabolism, and drug elimination.
- Define the following pharmacodynamic and pharmacokinetic concepts: mechanism of drug action (MOA), agonist and antagonist, bioavailability, volume of distribution, dose-response curve, time-profile curve, onset of action, duration of action, half-life ( $t_{1/2}$ ), elimination rate, steady state blood level, loading dose, maintenance dose, and creatinine clearance.
- Distinguish between intermittent and continuous drug delivery systems.
- Discuss the role of the kidneys in determining drug elimination rates and drug dosing considerations.
- Determine drug dosage recommendations and adjustments based on creatinine clearance calculations.
- Describe agonist and antagonist drug binding characteristics in terms of affinity and efficacy.
- Describe the drug-drug interactions associated with “induction” and “inhibition” of metabolic enzymes.
- Discuss the structure-activity relationship associated with lipophilic and non-lipophilic drugs.
- Discuss the age-related factors that influence drug elimination and drug metabolic rates.
- Discuss the pharmacokinetic implications of drugs extensively bound to plasma proteins.
- Distinguish between drug additive and drug synergistic effects.

### Week 2: Common OTC and Rx Drugs

- Identify the most commonly used active ingredients in OTC and herbal products.
- Discuss the self-care guidelines of popular OTC products for the following therapeutic categories: analgesics, antipyretics, anti-inflammatory agents, antihistamines, decongestants, antitussives, expectorants, appetite suppressants, antidiarrheals, laxatives, hypnotics, stimulants, proton pump inhibitors, H<sub>2</sub> blockers, and antacids.
- Discuss the most commonly prescribed drugs and their corresponding indications, mechanisms of action, adverse effects, and efficacy.

### Week 3: Review of the Autonomic Nervous System (ANS)

- Describe the anatomical projections of the sympathetic and parasympathetic nervous system.
- Describe the neurotransmitters at various levels of the ANS and their corresponding effects on target tissues, organs, and glands.
- Discuss homeostasis and dominant cholinergic and adrenergic responses in the ANS.
- Describe the central control mechanisms in the medulla oblongata of the ANS
- Define the target organ responses to sympathetic and parasympathetic activation.
- Discuss the concept of homeostasis and dominant tone in the ANS.
- Describe the response of drugs that block the cholinergic and adrenergic receptors at target organ sites.
- Describe the response of drugs that inhibit the reuptake of norepinephrine into adrenergic neurons.
- Discuss the rational therapeutic use of muscarinic antagonists in asthma, bradycardia, motion sickness, and other disorders.
- Discuss receptor selectivity with adrenergic agonists and antagonists (e.g., beta-1 selective blockers, beta-2 receptor agonists)
- Describe the mechanism of alpha-1 adrenergic agonists in the treatment of nasal congestion and hypotension; and, describe the mechanism of alpha-1 adrenergic antagonists in the treatment of hypertension and benign prostatic hypertrophy.
- Describe the mechanism for use of alpha-2 adrenergic agonists in the treatment of hypertension.

### Week 3: Management & Treatment of Hypertension

- Define the diagnostic and treatment targets for hypertensive patients with comorbid disorders.
- Discuss the major drug classes and the patient-specific considerations used in the management and treatment of hypertension.
- Discuss the pharmacologic mechanisms of each drug class used to manage hypertension according to the site of action within the pathogenesis of hypertension.
- Describe the various drug classes used to treat hypertension and their mechanisms of action, side effects, pharmacokinetics, and cost factors.
- Describe the stepped-care approach in the management and treatment of hypertension based on disease progression and severity.
- Describe the beneficial and adverse interactions between antihypertensive drugs and other therapeutic agents.
- Discuss the non-pharmacologic and pharmacologic approaches to managing hypertension in newly diagnosed patients.
- Describe the antihypertensive agents indicated for hypertensive urgencies and emergencies.
- Discuss the antihypertensive agents of choice indicated in patients with comorbid conditions.
- Discuss the relative and absolute contraindications of antihypertensive agents in patients with concomitant disorders and conditions.
- Discuss the benefits of non-pharmacologic modalities in the management of hypertension.
- Describe the role of antihypertensive agents used in acute management of stroke.
- Discuss the use of antihypertensive agents in pregnancy.
- Discuss the antihypertensive agents of choice in population subgroups (e.g., African Americans, diabetics, geriatrics, renal failure patients).
- Discuss the use of antihypertensive agents in mild, moderate, and severe hypertension.
- Discuss the antihypertensives of choice used in patients with concomitant cardiovascular disorders (e.g., angina pectoris, heart failure, atrial fibrillation).

### Week 4: Pharmacologic Management of Ischemic Heart Disease (Angina Pectoris)

- Describe the characteristics and pathogenesis of each main type of angina pectoris.
- Describe the mechanisms of action and adverse effects of antianginal drugs.
- Describe the hemodynamic actions of antianginal drugs, including their coronary and peripheral vasodilator actions.
- Describe the effects of antianginal drugs or drug class on the determinants of myocardial oxygen consumption and/or oxygen supply (i.e., coronary blood flow).
- Discuss the actions of antianginal drugs on the arterial and venous circulation and their corresponding effects on reducing ventricular preload and afterload.
- Discuss the routes of administration, biotransformation, and excretion of antianginal drugs.
- Describe the "onset of action" and "duration of action" of antianginal agents.
- Discuss the problem of dose intervals and drug tolerance with sublingual, oral, and transdermal nitrates.
- Describe the significance of the "first-pass effect" for various nitrates products (i.e., sublingual nitrates, oral nitrates, and transdermal nitrates).

### Week 5: Pharmacologic Management of Heart Failure

- Describe heart failure with reduced ejection fraction (HFrEF) and heart failure with preserved ejection fraction (HFpEF).
- Discuss the mechanisms of action and adverse effects of drugs used in the management and treatment of heart failure.

### Week 5: Pharmacologic Management of Heart Failure (cont.)

- Describe the role of adrenoceptor agonists, adrenoceptor antagonists, vasodilators, diuretics, and ACE-inhibitors in the treatment of acute and chronic heart failure.
- Explain the effects of adrenoceptor antagonists and ACE-inhibitors on cardiac function and ventricular remodeling in the setting of heart failure.
- Describe the effects of digoxin on myocardial contractility and specialized conducting tissue.
- Describe the use of digoxin in congestive heart failure and in atrial arrhythmias.
- Describe the positive inotropic effects of the  $\beta$ -adrenoceptor-agonists and phosphodiesterase inhibitors (PDE).
- Discuss the use of atrial natriuretic peptide agonists in the management of acute severe heart failure unresponsive to other agents.
- Discuss the benefits and risks of beta-blockers, digoxin, ACE-inhibitors, ARBs, neprilysin inhibitor, vasodilators, aldosterone antagonists, and diuretics in the treatment of acute and chronic heart failure.

### Week 5: Management & Treatment of Asthma and COPD

- Describe the disease processes of asthma and COPD including airway inflammation, bronchial smooth muscle constriction, and mast cell degranulation.
- Describe the role of various chemical mediators of inflammation (e.g., histamine, leukotrienes, prostaglandins, and cytokines) in asthma and COPD.
- Explain the mechanisms of action and adverse effects of antihistamines, decongestants, bronchodilators, and corticosteroids in the management and treatment of upper and lower respiratory disorders.
- Describe the route of administration and pharmacokinetic features of inhaled, oral, and injectable drugs used in the management of asthma and COPD.
- Describe the adverse effects, drug interactions, and contraindications of antihistamines, decongestants and bronchodilators.
- Discuss the initial pharmacotherapy care plan for asthma and COPD exacerbation.
- Discuss the NIH and GINA treatment guidelines for managing asthma and COPD.
- Discuss the rationale for using specific drugs and delivery systems for patients with asthma and COPD.
- Discuss pharmacologic interventions based on patient risk factors and disease progression in COPD.
- Discuss the benefits of combined use of corticosteroids and bronchodilators in asthma and COPD.
- Discuss the role of agents in the treatment of exercise-induced asthma and allergic asthma.
- Discuss the prophylactic use of antimicrobials in the management of COPD exacerbation.
- Discuss the role of inhaled and oral corticosteroids in the treatment of asthma and COPD.
- Discuss the role of mast cell stabilizers and antihistamines in allergic asthma.
- Discuss the short-term use of oral corticosteroids during acute exacerbations of asthma and COPD.
- Discuss the different classes of inhaled, oral, and injectable bronchodilators in asthma and COPD.
- Describe the relative risks and benefits of theophylline in the management of asthma and COPD.
- Describe the advantages and disadvantages of inhaled versus oral or parenteral administration of bronchodilators and corticosteroids in asthma and COPD.
- Discuss the benefits of prescribing long-acting inhaled beta-2 selective agonists in asthma and COPD



## Week 6: Pharmacologic Management of Diabetes Mellitus

- Describe the pathophysiology of Type I and Type II diabetes mellitus.
- Discuss the long-term complications associated with poorly controlled patients with diabetes mellitus.
- Explain the mechanisms of actions and adverse effects of drugs used in Type I and Type II diabetes mellitus.
- Describe the relative roles and indications of oral and injectable products in the treatment of Type I and Type II diabetes mellitus.
- Describe the pharmacologic and non-pharmacologic approaches in the stepped-care management of Type I and Type II diabetes mellitus.
- Discuss the use of recombinant DNA insulin regimens for managing glycemic control in diabetics.
- Describe the pharmacokinetic properties (i.e., onset and duration of action) for the use of insulin preparations in “split-mixed” insulin regimens.
- Discuss the mechanisms of action of incretin products in managing glycemic control in Type II diabetes mellitus.
- Explain the benefits of selecting GLP-1 receptor agonists and SGLT-2 inhibitors for diabetics with CKD and ASCVD.
- Discuss the patient-specific factors used in selecting the most appropriate oral and/or injectable agent(s) for maximizing glycemic control in a newly diagnosed diabetic patient.
- Discuss the initial drugs of choice and add-on therapy for patients with Type II diabetes mellitus.
- Discuss lifestyle modifications in the management and treatment of diabetes mellitus.
- Discuss clinically relevant drug-drug interactions involving antihyperglycemic agents.
- Discuss lifestyle modifications in the management and treatment of diabetes mellitus.
- Discuss the management and treatment of diabetic ketoacidosis (DKA).

## Week 7: Pharmacologic Management of Pain

- Discuss the molecular mechanisms of action and adverse effects of opioid analgesics, acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, corticosteroids, antimigraine agents, topical anesthetics, and combination analgesic products.
- Identify the different pharmacologic approaches for managing pain disorders.
- Discuss the benefits and risks of various analgesic products in the management of pain and inflammatory conditions.
- Discuss the utility of over the counter (OTC) analgesic products for alleviating pain and inflammation.
- Discuss the abuse potential of opioids and how they differ from other analgesics.
- Discuss the evidence-based use of pharmacotherapy for individual pain syndromes based on patient-specific variables.
- Describe the role of non-opioid, adjuvant, and opioid analgesics in the management and treatment of neuropathic pain.
- Discuss the role of co-analgesics in managing chronic pain.
- Identify medications used for managing the side effects associated with the use of opioids and other pharmacologic agents for pain.
- Identify factors used in special patient populations, including patients with renal and hepatic disorders.
- Identify the appropriate analgesic based on the type of pain and response to prior medications.
- Select appropriate therapeutic agents based on pain severity, type of pain, and comorbid disorders.
- Discuss the rationale for combining analgesics with co-analgesics to enhance therapeutic outcomes.
- Discuss the combined analgesic, antipyretic, and anti-inflammatory properties of NSAIDs.
- Discuss the relative and absolute contraindications of NSAIDs and corticosteroids in patients with concomitant cardiovascular disorders, GI bleeding, and chronic kidney disease.

## Week 7: Pharmacologic Management of Pain (cont.)

- Discuss strategies for minimizing opioid dependence in patients with chronic pain disorders.
- Describe pharmacologic and nonpharmacologic approaches for the management and treatment of acute and chronic pain.
- Describe the risks vs. benefits of acetaminophen, NSAIDs, narcotic analgesics, and muscle relaxants and their utility in relieving different types of pain.
- Discuss potential therapeutic actions of opioids aside from analgesia in the central nervous system and other organ systems including cardiovascular, respiratory, and gastrointestinal.
- Discuss the clinical indications for the opioids and opioid antagonists and explain the basis for their use.
- Describe the analgesic effects of morphine with those of the NSAIDs, antidepressants, and other co-analgesics, particularly in relation to the treatment of neuropathic pain conditions.
- Discuss the rationale for combining opioid analgesics and NSAIDs.
- Discuss the role of muscle relaxants in the management of musculoskeletal pain.

## Week 8: Treatment of Acute Musculoskeletal Disorders

- Describe the peripheral and central pathophysiologic pathways of pain and the treatment strategies with pharmacologic and physiotherapeutic interventions.
- Discuss the distinction between acute and chronic pain syndromes.
- Describe the pathophysiologic features of neuropathic and musculoskeletal pain and the corresponding pharmacologic considerations and implications.
- Discuss the mechanisms of action, adverse effects, toxicities, drug-interactions, and cautionary considerations associated with opioids, NSAIDs, acetaminophen, skeletal muscle relaxants, topical anesthetics, capsaicin, tricyclic antidepressants (TCAs), serotonin-norepinephrine reuptake inhibitors (SNRIs), and anticonvulsants in the management and treatment of musculoskeletal pain.
- Discuss the non-pharmacological treatment modalities in the management of acute and chronic musculoskeletal pain.
- Discuss the pharmacologic considerations when managing musculoskeletal injuries associated with inflammation.
- Describe the risks of addiction and dependence associated with opioids in the management of acute and chronic musculoskeletal pain.
- Discuss the use of OTC laxatives and the FDA-approved indications for peripheral acting mu-opioid receptors antagonists (PAMORA) in the management of opioid-induced constipation.
- Discuss the use of prescription antiemetics in the management of nausea and vomiting associated with narcotic analgesics.
- Discuss pharmacologic strategies for managing hyperalgesia and allodynia associated with chronic opioids.
- Discuss the importance of recommending naloxone nasal spray and naloxone auto-injectors to caregivers who are managing care for patients taking opioids for chronic pain syndromes.
- Describe the distinction between tramadol, partial mu-opioid agonists, and pure opioid agonists.
- Discuss the advantage of celecoxib as a selective COX-2 inhibitor for managing musculoskeletal pain in patients with a history of NSAID-induced peptic ulcers.
- Discuss the use of H2 receptor antagonists, proton pump inhibitors, and misoprostol in reducing the risk for NSAID-induced ulcers.
- Describe the advantages and disadvantages of skeletal muscle relaxants in the treatment of lower back pain.
- Discuss the distinction between anti-spasmodic and anti-spasticity agents when considering the use of skeletal muscle relaxants for acute musculoskeletal pain.
- Discuss the stepped-care approach and evidence-based treatment recommendations in the treatment of acute lower back pain.

## Weeks 8-9: Treatment of Chronic Musculoskeletal Disorders

- Describe the pathogenesis and complications of osteoarthritis.
- Describe the goals of osteoarthritis management and treatment.
- Discuss the role and limitation of acetaminophen in the treatment of osteoarthritis pain.
- Describe the benefits and limitations of topical analgesics (e.g., capsaicin cream and diclofenac cream), intra-articular and oral corticosteroids, intra-articular hyaluronic derivatives, tramadol, and opioids in the treatment of osteoarthritis.
- Describe the mechanism of action of capsaicin and its efficacy in penetrating regions of osteoarthritis joints in the knee, hands, and hip.
- Discuss the risks of gastrointestinal, cardiovascular, and renal complications associated with the use of NSAIDs.
- Discuss the pharmacologic basis for supporting the use of celecoxib in patients with a moderate to high risk of GI bleeding.
- Discuss the recommended use of proton pump inhibitors, H2 receptor antagonists, and misoprostol with NSAIDs in patients with moderate to high risk of GI bleeding.
- Describe the NSAID which presents least cardiovascular risk in patients with osteoporosis and hypertension.
- Describe the NSAIDs associated with the highest risk of GI bleeding when used for longer durations greater than 5-7 days.
- Discuss the benefits and risks of selective COX-2 inhibitors in patients with hypertension, heart failure, chronic kidney disease, and peptic ulcer disease.
- Discuss the use of “preferential” COX-2 inhibitors in the treatment of osteoarthritis with concomitant renal, cardiovascular, and gastrointestinal disorders.
- Discuss the pharmacologic basis and benefit of using indomethacin in the treatment of gout.
- Describe the mechanisms of action of tramadol and its recommended role in managing osteoarthritic pain in patients who have failed or have contraindications to NSAIDs.
- Discuss the risks of tramadol use in patients taking SSRIs and in patients with a history of seizure disorders.
- Describe the potential risk for addiction and dependence with long-term tramadol use.
- Discuss the mechanism of action of duloxetine and its role in the treatment of chronic musculoskeletal pain, such as osteoarthritis.
- Describe the benefit of recommending duloxetine use in patients with chronic osteoarthritis and depression.
- Discuss the side effects of duloxetine and its limited use in patients with renal disease and liver dysfunction.
- Discuss the risks and benefits of systemic corticosteroid therapy and intra-articular corticosteroid therapy in the management of moderate to severe osteoarthritis.
- Discuss the role of intra-articular hyaluronic acid in the management of osteoarthritis.
- Discuss the position supported by the American College of Rheumatology for discouraging the use of glucosamine and chondroitin in osteoarthritis.
- Discuss the benefits and limitations of total or partial joint replacement in advanced knee and hip osteoarthritis.
- Describe the pathogenesis, clinical findings, and complications of rheumatoid arthritis (RA).
- Discuss the diagnostic scoring system used to diagnose RA.
- Discuss the treatment goals of RA.
- Discuss the limited use of NSAIDs and corticosteroids in the treatment of RA.

## Weeks 8-9: Treatment of Chronic Musculoskeletal Disorders (cont.)

- Discuss the clinical basis for suggesting that DMARDs are the mainstay pharmacologic agents for RA and should be initiated as soon as patients are diagnosed with RA.
- Discuss the classification of DMARDs and their clinical indications in RA.
- Describe the clinical benefit of methotrexate as a 1<sup>st</sup> line csDMARD in the treatment of RA.
- Discuss the mechanism of action, adverse effects, contraindications, toxicities, and cautionary considerations of tofacitinib in the treatment of RA.
- Discuss the mechanisms of action, adverse effects, contraindications, toxicities, and cautionary considerations of the conventional synthetic DMARDs: hydroxychloroquine, methotrexate, leflunomide, sulfasalazine.
- Discuss the clinical basis for recommending biologic DMARDs in the stepped-care approach in the treatment of RA.
- Discuss the mechanisms of action, adverse effects, contraindications, toxicities, and clinical considerations of the biologic DMARDs: etanercept, infliximab, adalimumab, anakinra, tocilizumab, rituximab, and abatacept.
- Discuss the clinical basis for recommending NSAIDs and corticosteroids in the short-term pain and inflammatory control of RA.
- Describe the clinical benefits of combining tofacitinib with methotrexate in patients who experience treatment failure with methotrexate.
- Describe the clinical benefits of adding folate and leucovorin to methotrexate in RA patients.
- Discuss the significance of ongoing laboratory monitoring requirements (CBC, complete metabolic panel, liver enzymes) and physical exams with DMARDs in RA.
- Discuss the cost and patient preference considerations associated with the TNF-inhibitors and biologic DMARDs in RA.
- Discuss the significance associated with ease of administration preferences and patient compliance issues with the biologic DMARDs.
- Discuss the recommended treatment algorithm in the management and treatment of RA.

## Week 9: Osteoporosis & Hormone Replacement Therapy

- Discuss the clinical background and pathogenesis of osteoporosis.
- Discuss the epidemiology of osteoporosis in the United States, based on age, sex, and other factors.
- Describe the primary and secondary causes of osteoporosis.
- Discuss the risk factors associated with osteoporosis.
- Discuss the various screening methods and criteria for determining osteopenia and osteoporosis.
- Describe the dietary and other non-pharmacologic approaches for prevention and treatment of osteoporosis.
- Discuss the pharmacologic treatment modalities for treating osteoporosis.
- Describe the pharmacologic indications, contraindications, and adverse effects associated with the various treatment options for osteoporosis.
- Describe the biological actions of estrogens, androgens, thyroxine, and glucocorticoids.
- Discuss the pharmacologic basis for prescribing estrogens, androgens, thyroxine, and corticosteroids.
- Describe the pharmacologic mechanisms of action of estrogens, androgens, thyroid, and glucocorticoids.
- Discuss the adverse effects associated with short- and long-term use of estrogen, androgen, thyroxine, glucocorticoid, and other common hormone replacement therapies.
- Discuss the risks vs. benefits of short and long-term corticosteroid therapy.
- Discuss the relative and absolute contraindications of estrogen and androgen replacement therapies.
- Describe the anabolic and catabolic properties of estrogens, androgens, thyroxine, and glucocorticoids.