Patient, Doctor, and Society

1. Describe the physician's responsibility to patients, society, and the profession.
2. Describe evidence-based medicine and approaches to accessing the medical literature.
3. Define public health, and how public health relates to clinical medicine.
4. Articulate how one's own identities and privilege can impact one's perspectives and interactions with patients and colleagues
5. Define explicit and implicit bias
6. Describe cultural humility and its importance in working with diverse patient populations, including (but not limited to) diversity in gender, age, culture, race, religion, disabilities, and sexual orientation.
7. Define health equity
8. Explain how social and economic factors can contribute to health outcomes for individuals and communities.
9. Describe how systems and institutions can impact health outcomes for individuals and communities
10. Define the core components of clinical reasoning.
11. Demonstrate effective communication skills when interacting with patients and colleagues.

Fundamentals of Medicine

Block 1

1. Apply principles of thermodynamics and discuss the biochemical mechanisms of energy generation, utilization and conservation in the context of human physiology.
2. Understand the concept of energy homeostasis, and distinguish between anabolic and catabolic metabolic pathways.
3. Appreciate the diverse biological functions of biological building blocks (nucleotides, amino acids, lipids, carbohydrates) and explain the biosynthesis and degradation pathways of these molecules during physiologic and pathologic situations.
4. Explain the mechanisms of DNA replication, mutation, repair and recombination.
5. Describe the organization and structure of genes and explain the process of gene expression from transcription to translation, including transcriptional regulation, RNA processing and degradation, structure of tRNA and ribosomes, post-translational modifications, and protein turnover.
6. Perform a patient interview to obtain a history of present illness when encountering a patient.
7. Demonstrate effective communication skills when interacting with patients and colleagues.

Block 2

1. Recognize how genetic traits are transmitted in families and populations, and be able to calculate associated risks, and describe how genetic alternations manifest in a phenotype, and explanations for phenotypic variability.
2. Define the concept of genomic medicine, and understand the role of genetics in current and future health care.
3. Describe the early events of embryogenesis, the generation of the three germ layers during gastrulation, and general body patterning that occurs during development.

4. Describe, compare and contrast the four basic tissues (epithelia, connective tissue, muscle tissue and nerve tissue) that make up organ systems of the body in terms of structure, function, and location.
5. Describe the specialized tissues of cartilage, bone, and blood, including associated cells and structures of these tissues.
6. Describe and identify characteristics of arteries, veins and capillaries at the microscopic level and understand the structure and function of the endothelium.
7. Describe the general organization of the major arteries and veins in the human body.
8. Describe the organization of the peripheral nervous system including its distribution, signaling cascade and functions.
9. Describe the organization of the thoracic and abdominal cavities, in particular with respect to cross-sectional anatomy and medical imaging.
10. Perform a patient interview to obtain a basic history when encountering a patient.
11. Demonstrate effective communication skills when interacting with patients and colleagues.
12. Operate an ultrasound device to obtain a sonographic image when encountering a patient.

Block 3

1. Describe basic pharmacodynamic terms including receptor agonists, antagonists and the differences between the types of antagonists, K_D, therapeutic index, therapeutic window, EC50 and ED50.
2. Explain concepts of Absorption, Distribution, Metabolism and Excretion; calculate various pharmacokinetic parameters relevant to dosing medications, and explain influences on patient variation to drug response.
3. Describe basic mechanism of drug interactions, drug toxicity, and features of major toxidromes.
4. Explain the basic process of drug development and the drug approval process.
5. Describe the organization of the autonomic nervous system, the neurotransmitters and receptors associated with the ANS, and pharmacologic activities of drugs used to mimic or inhibit ANS activities.

6. Describe how various signals are transmitted (including second messenger pathways), regulated, and terminated.
7. Define homeostasis, give examples of positive and negative feedback and feed-forward mechanisms in the context of physiology and distinguish between the concepts of steady-state and equilibrium.
8. Describe the major fluid compartments of the body and calculate volumes of the intracellular and extracellular compartments and the total body water.
9. List the factors that influence diffusion of a small molecule: a) in solution and b) across a membrane and distinguish between diffusion and flux.
10. Compare and contrast osmotic and hydrostatic pressure, distinguish between osmolarity, osmolality and tonicity, calculate approximate osmotic strengths and predict the effect of solutions of differing osmotic strengths on cell volume.
11. Distinguish between penetrating and non-penetrating solutes.
12. Describe different fluid replacement solutions and give examples of situations in which these might be used.
13. Describe how the principles of diffusion apply to charged solutes, compare and contrast diffusion potentials and reversal potentials and calculate the reversal potentials for ions using the Nernst equation.
14. Describe the role of the Na^+/K^+ ATPase in the generation of the membrane potential and in the maintenance of cell volume.

15. Distinguish between channels and pores, passive and facilitated diffusion and primary and secondary active transport and give examples of each.
16. Compare and contrast the pathways and fates of cytosolic proteins versus proteins synthesized at the endoplasmic reticulum and destined for the secretory pathway.
17. Describe processing, sorting and trafficking of proteins as they progress through the secretory pathway and explain how a cell recognizes proteins that are destined for degradation.
18. Describe the organization and function of cytoskeletal elements.
19. Describe apical and basolateral specializations, including location and function of each.
20. Describe the specialized junctions involved in cell communication, cell-to-cell adhesion and cell-to-matrix interactions.
21. Explain the components and mechanisms of the cell cycle, including checkpoints and regulation of progression through the stages, and recognize the components and regulation of apoptosis.
22. Describe the movement of ions during an action potential.
23. Define the core components of clinical reasoning
24. Define the core components of history-taking when presented with a clinical case.
25. Define the core components of a physical examination.
26. Demonstrate effective information-gathering skills when taking a patient history.
27. Demonstrate effective information-gathering skills when performing a physical examination.
28. Demonstrate effective communication skills when interacting with patients and colleagues.
29. Demonstrate professionalism through preparedness and participation in activities.

Block 4

1. Define the functions of the physical, chemical, and cellular components of the immune system.
2. Describe the molecular and cellular mechanisms involved in the recognition, responses, and subsequent destruction of a pathogen by components of the innate immune system.
3. Explain the process of receptor generation and development of B and T lymphocytes and the ability to discriminate between self and non-self (foreign).
4. Describe the role of MHC molecules, antigen processing and presentation in the activation of an adaptive immune response.
5. Describe the cellular mechanisms of humoral and cell-mediated immune responses that lead to protective immunity.
6. Explain the mechanisms that regulate immune responses and their role in autoimmunity.
7. Identify differences between systemic and mucosal immunity and influences provided by the microbiota.
8. Discriminate between the classes of hypersensitivity reactions and apply appropriate reaction mechanisms to immune-mediated diseases.
9. Describe immune-related diseases and mechanisms of innate and adaptive immunodeficiencies.
10. Explain immunologic memory, define principles of vaccination and generation of immunotherapies.
11. Describe pharmaceuticals impacting immune function.
12. Analyze and interpret cellular responses to various forms of injury.
13. Identify and describe the fundamental processes of inflammation and tissue repair.
14. Explain the pathophysiological mechanisms underlying common hemodynamic disorders and diseases of the immune system.
15. Understand the principles of neoplasia, including the molecular basis of cancer.
16. Apply knowledge of pathology to clinical scenarios and case studies, demonstrating an ability to connect basic science with clinical practice.

17. Define the core components of clinical reasoning
18. Define the core components of history-taking when presented with a clinical case.
19. Define the core components of a physical examination.
20. Demonstrate effective information-gathering skills when taking a patient history
21. Demonstrate effective information-gathering skills when performing a physical examination.
22. Demonstrate effective communication skills when interacting with patients and colleagues.
23. Demonstrate professionalism through preparedness and participation in activities.

Block 5

1. Distinguish key principles of microbial structure, physiology, and genetics for each of the four major microbes: bacteria, viruses, fungi, and parasites.
2. Differentiate and understand host immune response to pathogens for common infections
3. Explain the epidemiology of infectious diseases and key methods for diagnosis for each of the four major microbes: bacteria, viruses, fungi, parasites
4. Describe pharmacology of antimicrobial agents and subsequent development of antimicrobial resistance.

Cardiovascular

1. Describe the anatomy of the cardiovascular system and understand the function of the various components.
2. Draw or trace the normal transit of blood through the cardiovascular system, labeling typical pressures at each point.
3. Draw the normal conduction pathway of the heart and correlate that conduction with the ECG waveform.
4. Describe the factors that control the cardiovascular system's response to changes in demand.
5. Recognize the common imaging modalities used in cardiovascular medicine and list the uses, benefits and limitations of each.
6. For each major disease state discussed, describe the epidemiology and typical presenting features of that disease or condition.
7. Link the pathophysiologic features of a disease state with the treatments discussed (e.g. why are ACE inhibitors beneficial in heart failure?).
8. Identify common pathologic conditions from either specimens or imaging studies demonstrating the pathology.
9. Define the core components of clinical reasoning.
10. Define the core components of history-taking when presented with a clinical case.
11. Define the core components of a physical examination.
12. Demonstrate effective information-gathering skills when taking a patient history.
13. Demonstrate effective information-gathering skills when performing a physical examination.
14. Demonstrate effective communication skills when interacting with patients and colleagues.
15. Demonstrate professionalism through preparedness and participation in activities.
16. Perform a hypothesis-driven history based on a patient's presenting symptom(s).
17. Perform a hypothesis-driven physical examination based on a patient's presenting symptom(s).
18. Use point-of-care diagnostics (ie. stethoscope, ultrasound) effectively during clinical encounters.

19. Use relevant history and exam information to generate hypotheses and distinguish illness scripts.
20. Use relevant history and exam information to construct a problem representation.
21. Define core components of oral presentations and clinical documentation.
22. Recognize common diagnostic and screening tests (ie. labs, imaging) following a clinical encounter.
23. Demonstrate basic oral presentation and documentation skills following a clinical encounter.

Pulmonary

1. Identify normal histologic structures at various levels of the respiratory system from the upper airway down to the alveolar spaces.
2. Identify anatomic structures of the respiratory system, their relationships to each other, and functional deficits associated with abnormalities of these structures.
3. Identify key components of the history in patients with respiratory symptoms and explain the meaning of abnormal signs from the physical exam to develop differential diagnoses and to explain the underlying pathophysiology of the disease process(es).
4. Recognize normal respiratory physiology including the seven key difficult concepts. The students will then be able to apply their knowledge of basic physiology to understand the pathophysiologic mechanisms of disease states of the respiratory system.
5. Identify disease states from examining gross anatomic sections, as well as, histologic/microbiologic slides. Students should be able to:
   a. Define the entity or process
   b. Recognize the histologic hallmark of the disease
   c. Identify the functional deficit created by the entity or process
   d. Predict the temporal profile (timeline) this process will have

6. Recognize various disease processes of the respiratory system: (obstructive lung diseases, restrictive lung diseases, vascular diseases, sleep disorders, pleural diseases, neoplastic diseases, and infectious diseases). Students should be able to:

   a. Identify typical symptoms associated with each pathologic process
   b. Identify typical signs of the process on physical exam
   c. Be able to identify basic radiographic findings for the disease state
   d. Explain the underlying pathophysiology/pathology of the disease
   e. Formulate initial diagnostic/treatment plans for the disease

7. Students will be able to interpret the various diagnostic tests used in Pulmonary Medicine including:

   a. Pulmonary function tests
   b. Chest radiography
   c. Arterial blood gases for analysis of acid/base status & alveolar-arterial oxygen

8. Integrate information from prior course modules (Fundamentals of Medicine, Cardiovascular Module) with respiratory medicine to critically assess clinical case presentations
9. Demonstrate professional behavior, interprofessional collaboration, history and physical exam techniques, patient and family education skills during a simulated patient experience.

10. Apply the scientific concepts gained toward preventive health care regarding smoking cessation.
11. Perform a hypothesis-driven pulmonary history and when present with a patient.
12. Perform a hypothesis-driven pulmonary examination including specific maneuvers and/or POCUS when presented with a patient.
13. Apply core elements of clinical reasoning when presented with a clinical case.

Gastrointestinal

1. Describe in your own words the normal function of each part of the GI tract at the tissue, cellular and molecular levels.
2. Explain causes and identify symptoms associated with the GI pathologies discussed during the module or covered in non-classroom assignments.
3. Compare and contrast pathological states with normal gut function.
4. Analyze and interpret laboratory test results and diagnostic images of the gut.
5. Explain how GI related conditions impact whole body homeostasis and functioning of other organ systems.
6. Propose strategies for diagnosing and treating GI related conditions in patients at all stages of life.
7. Identify and discuss nutritional, psychosocial and economic factors that influence and impinge upon GI related health care at all stages of life.
8. Perform a hypothesis driven gastrointestinal history when presented with a patient.
9. Perform a hypothesis driven gastrointestinal physical examination, including specific maneuvers and/or POCUS when presented with a patient.
10. Apply the core elements of clinical reasoning when presented with a clinical case.

Renal

1. Identify the functional anatomy and structure of the urinary system and to apply the knowledge in understanding physiology and pathology
2. Recall the embryology and development of the urinary system and to apply the knowledge in understanding associated developmental defects
3. Explain important histological features of the kidney, especially as they apply to function
4. Analyze core content in understanding normal and abnormal urinary system function particularly in the areas of genetics, cell biology, physiology, pharmacology, and immunology
5. Assess body fluid homeostasis and to analyze associated disturbances
6. Correlate the fundamentals of kidney physiology with the regulation of fluid, electrolyte, acid-base, and blood pressure homeostasis in an integrative fashion with other organ systems
7. Assess and integrate clinical history and physical examination data for the diagnosis and treatment of water, electrolyte, and acid-base homeostasis disorders
8. Assess and integrate histology, clinical history, and physical examination data for the diagnosis and treatment of urinary system pathologies
9. Identify abnormal urinary system processes associated with changes in life style (e.g., diet and environment) or life cycle (e.g., aging and pregnancy)
10. Appraise the epidemiology of kidney disease
11. Perform a hypothesis-driven urinary system history when presented with a patient
12. Perform a hypothesis-driven urinary system physical exam including specific maneuvers and/or POCUS when presented with a patient
13. Apply the core elements of clinical reasoning when presented with a clinical case

Neuroscience

1. Identify the basic cellular and molecular processes of neurons and glia.
2. Describe the functional organization of the pathways in the nervous system that mediate sensory input, central integration and decision-making, and motor output.
3. Form an integrated understanding of normal and abnormal behavior based on molecular, cellular and systems neuroscience.
4. Recognize the genetic and environmental mechanisms that control the normal development of the nervous system and regulate the response of the nervous system to injury or disease.
5. Identify the anatomical site and physiological deficit based on a set of signs and symptoms. Predict the functional deficit(s) given a specific neuroanatomical lesion.
6. Describe the behavioral manifestations of psychiatric disorders and understand their anatomical and neurochemical basis.
7. Perform a differential diagnosis of neurological and psychiatric disorders and plan intervention / treatment strategies (including pharmacological approaches).
8. Describe the three dimensional anatomy of the neck, cranial cavity, face and orbit. Identify key anatomical features of each.
9. Describe the pharmacology of drugs used in the treatment of diseases of the nervous system, including their major mechanism, major adverse effects, and key drug interactions.
10. Identify and describe brain pathology as it relates to damage and disease.
11. Summarize how the scientific method is used to evaluate and treat nervous system diseases and to solve research questions.
12. Foster and develop individual and team-based problem-solving, information assimilation and presentation skills.
13. Describe the behavioral stages of human development.
14. Understand the cultural and societal influences and impact on disease.

Musculoskeletal and Skin

1. Identify the muscular, ligamentous and osseous structures governing movement and stability of the spine and extremities.
2. Describe basic skin structure, microanatomy, and physiology
3. Explain the biochemical and physiologic mechanisms regulating the normal contraction and relaxation of skeletal muscle.
4. Describe the underlying disease mechanisms and clinical presentations of patients with inherited and acquired metabolic disorders impacting skeletal muscle, joint disease, and integrity of bone.
5. Explain the biochemical and physiologic basis of bone development, remodeling, and the response to fracture and the disorders associated with abnormal bone remodeling, mineralization, and growth.
6. Recognize abnormal ranges of peripheral and axial joint motion and understand the mechanisms whereby inflammatory and degenerative disorders affect joint function.
7. Apply a systematic approach to describing skin eruptions and communicate skin examination findings using appropriate dermatologic terms
8. Differentiate infectious, nutritional, phototoxic, inflammatory and neoplastic skin conditions.
9. Explain the epidemiology, clinical manifestations, diagnostic evaluation, and therapeutic strategies for the management of patients with rheumatologic diseases.
10. Describe the mechanisms of action and toxicities of medications employed in the management of patients with musculoskeletal, articular, and cutaneous disorders

11. Communicate effectively with and understand the roles and responsibilities of rehabilitation therapists.
12. Develop empathy for patients with disabilities.
13. Define the core components of clinical reasoning.
14. Define the core components of history-taking when presented with a clinical case.
15. Define the core components of a MSK physical examination
16. Demonstrate effective information-gathering skills when performing a physical examination.
17. Demonstrate effective communication skills when interacting with patients and colleagues.
18. Demonstrate professionalism through preparedness and participation in activities.
19. Perform a hypothesis-driven history based on a patient's presenting symptom(s).
20. Perform a hypothesis-driven physical examination based on a patient's presenting symptoms(s).
21. Use point-of-care diagnostics (ie. Stethoscope, ultrasound) effectively during clinical encounters
22. Use relevant history exam information to generate hypotheses and distinguish illness scripts.
23. Use relevant history and exam information to construct a problem representation.
24. Define core components of oral presentations and clinical documentations.
25. Recognize common diagnostic and screening tests (ie. Labs, imaging) following a clinical encounter.
26. Demonstrate basic oral presentation and documentation skills following a clinical encounter.

Endocrine

1. The students will have acquired knowledge of the principles and mechanisms of neuroendocrine and endocrine structure and function.
2. The students will develop an integrative approach to learning that addresses
   (a) endocrine glands and their hormones
   (b) hormone sites of biosynthesis, action, and metabolism
   (c) hormone impact on overall body physiology and metabolism
   (d) disease states resulting from various endocrinopathies.
3. The students will have an understanding of physiology and pathophysiology of the endocrine system as it affects development, growth, metabolism and reproduction.
4. The students will have acquired the skills to utilize the knowledge of basic physiology to explain normal and abnormal neuroendocrine and endocrine function and to apply this information to recognizing, understanding, and addressing clinical endocrine disorders.

Reproductive Systems

1. Identify the anatomy of the male and female pelvis and correlate anatomic structures with corresponding radiologic images. Be able to identify anatomic landmarks and organs/structures in a dissected pelvis.
2. Describe normal and abnormal histology of the male and female reproductive organs.
3. Describe normal male and female development, causes of abnormal development, and the implications of abnormal development.
4. Identify benign and malignant lesions of the following organs. Explain the differential diagnosis based on the clinical symptoms of a patient with diseases that affect each of the listed organs. Discuss the treatment and prognosis of these diseases
   Female reproductive organs:
   a. Uterus
   b. Cervix
   c. Vagina

d. Ovary
e. Fallopian tube
f. Vulva

Male reproductive organs:

a. Testis
b. Epididymis
c. Prostate
d. Penis
e. Scrotum

5. Discuss the risk factors, pathophysiology, diagnostic methods, and treatments for sexually transmitted diseases (STD).
6. Describe the anatomy of the breast. Discuss the common benign and malignant breast diseases. Be able to correlate radiologic images of the breast with the disease. Discuss the treatment and prognosis.
7. Describe the normal menstrual cycle and the causes of menstrual disorders. Be able to discuss the differential diagnosis and to review therapeutic options.
8. Discuss physiological changes across the menopausal transition and their treatment.
9. Describe sexual function and the major causes of sexual dysfunction in the male.
10. Discuss the mechanism of action, failure rate, and contraindications of the different types of contraception.
11. Discuss the physiology and pathophysiology of pregnancy, labor and delivery, and lactation.
12. Describe the indications, techniques available, and potential complications for termination of pregnancy
13. Discuss the causes, diagnostic methods, and the treatment of early pregnancy failure
14. Describe normal and abnormal development of the placenta and of placental tumors.
15. Describe the process of fetal development and normal labor and delivery.
16. Discuss maternal physiological changes and common complications of pregnancy and delivery
17. Discuss medical ethics as it applies to reproductive medicine
18. Describe normal fertility and the major causes of infertility in the male and female
19. Understand pharmacology of drugs associated with reproductive medicine
20. Describe sexual response in male and female

CRISP Objectives

21. Define the core components of clinical reasoning.
22. Define the core components of history-taking when presented with a clinical case.
23. Define the core components of a physical examination.
24. Demonstrate effective information-gathering skills when taking a patient history.
25. Demonstrate effective information-gathering skills when performing a physical examination.
26. Demonstrate effective communication skills when interacting with patients and colleagues.
27. Demonstrate professionalism through preparedness and participation in activities.
28. Perform a hypothesis-driven history based on a patient's presenting symptom(s).
29. Perform a hypothesis-driven physical examination based on a patient's presenting symptom(s).
30. Use point-of-care diagnostics (ie. stethoscope, ultrasound) effectively during clinical encounters.
31. Use relevant history and exam information to generate hypotheses and distinguish illness scripts.
32. Use relevant history and exam information to construct a problem representation.
33. Define core components of oral presentations and clinical documentation.
34. Recognize common diagnostic and screening tests (ie. labs, imaging) following a clinical encounter.
35. Demonstrate basic oral presentation and documentation skills following a clinical encounter.

Hematology/Oncology

1. Form an integrated understanding of the physiology, biochemistry of hematopoiesis and production/function of hematopoietic cells (erythrocytes, leukocytes, and platelets)
2. Recognize peripheral blood and bone marrow cellular morphology.
3. Distinguish between the different types of anemia.
4. Describe the production and function of the coagulation and fibrinolytic processes.
5. Differentiate nutritional factors and vitamins affecting hematopoiesis
6. Recognize the different blood products and describe how they are used.
7. Recognize transfusion reactions and describe the pathophysiology and prevention strategies.
8. Describe the principles of neoplasia.
9. Describe the pathophysiologic basis of pediatric / adult benign and malignant hematologic disorders and be able to create a differential diagnosis and plan intervention / treatment strategies.
10. Describe basic principles of chemotherapy, radiation, tumor board consultation, anticoagulants and pharmacogenomics.
11. Describe basic imaging modalities in diagnosis of hematopoietic tumors.

CRISP Objectives

12. Define the core components of clinical reasoning.
13. Define the core components of history taking when presented with a clinical case.
14. Define the core components of a physical examination.
15. Demonstrate effective information-gathering skills when taking a patient history.
16. Demonstrate effective information-gathering skills when performing a physical examination.
17. Demonstrate effective communication skills when interacting with patients and colleagues
18. Demonstrate professionalism through preparedness and participation in activities
19. Perform a hypothesis-driven history based on a patient's presenting symptom(s).
20. Perform a hypothesis-driven physical examination based on a patient's presenting symptom(s).
21. Use point-of-care diagnostics (ie. stethoscope, ultrasound) effectively during clinical encounters.
22. Use relevant history and exam information to generate hypotheses and distinguish illness scripts.
23. Use relevant history and exam information to construct a problem representation.
24. Define core components of oral presentations and clinical documentation.
25. Recognize common diagnostic and screening tests (ie. labs, imaging) following a clinical encounter.
26. Demonstrate basic oral presentation and documentation skills following a clinical encounter.

Evidence-Based Medicine

- Detect the most common biases that can affect the results of observational, diagnostic, screening, and therapeutic studies,
- Interpret p-values and confidence intervals,
- Calculate and interpret measures of diagnostic test accuracy,
- Calculate and interpret measures of benefit and harm of treatments and exposures,
- Recognize the impact of confounding and ways that the impact can be reduced,
- Interpret figures, graphs, and tables from studies

Learning Communities

WELLNESS

- Recognize when help is needed
- List individualized strategies for responding to stress

PROFESSIONALISM

- Demonstrate compassion, integrity, and respect for others
- Communicate effectively with team members
- Recall and critique examples of responsiveness to patient needs that supersedes self-interest
- Recall and critique examples of sensitivity and responsiveness to a diverse patient population, including but not limited to diversity in gender, age, culture, race, religion, disabilities, and sexual orientation
- Identify gaps in knowledge and skills
- Set learning and improvement goals
- Identify and perform learning activities that address one's learning needs
- List strategies for soliciting feedback for improvement

ETHICS

- Describe basic principles of professionalism, autonomy, confidentiality, and end of life care
- Apply basic principles of biomedical ethics to real clinical situations