

<b>Competency</b>	<b>Knowledge</b>						
<b>Sub Domain</b>	<b>Fundamental Knowledge and Clinical Reasoning</b>						
<b>Learning Objective</b>	1. Applies core scientific knowledge* acquired and integrated at the molecular, cellular, organ-system, individual, and population levels to diagnose and treat disease 2. Engages in clinical reasoning based on an understanding of the patient, pathophysiology, application of sound scientific principles, and fundamental knowledge to solve problems						
<b>Milestones</b>							
<b>Year I</b>		<b>Year II</b>		<b>Year III</b>		<b>Year IV</b>	
<b>Mid</b>	<b>End</b>	<b>Mid</b>	<b>End</b>	<b>Mid</b>	<b>End</b>	<b>Mid</b>	<b>End</b>
<ul style="list-style-type: none"> <li>Explains normal biology from the molecular to the individual (1)</li> <li>Understands the approach to solving simple clinical cases, integrating core scientific knowledge* (1,2)</li> </ul>	<ul style="list-style-type: none"> <li>Uses understanding of disease mechanisms* and patient specific data** to address simple clinical cases (1,2)</li> <li>Explains how the principles of scientific discovery can be applied to basic clinical problems (2)</li> </ul>	<ul style="list-style-type: none"> <li>Lists types of common cognitive errors in medical decision-making<sup>†</sup> (2)</li> <li>Applies core scientific knowledge* to interpretation of core clinical problems<sup>††</sup>, addressing the pathophysiology and etiology (1,2)</li> </ul>	<ul style="list-style-type: none"> <li>Applies knowledge of the principles of scientific discovery to interpretation of basic clinical problems (2)</li> <li>Integrates understanding of core scientific knowledge*, patient specific data**, and population-based factors to solve simple clinical cases and make decisions for patient care (1,2)</li> </ul>	<ul style="list-style-type: none"> <li>Integrates core scientific knowledge* to gather and accurately interpret patient data and manage clinical problems (1,2)</li> <li>Recognizes common cognitive errors in patient care<sup>†</sup> (2)</li> </ul>	<ul style="list-style-type: none"> <li>Applies core scientific knowledge* to problem solving in a dynamic clinical environment<sup>†</sup> and addressing core clinical problems for each major specialty<sup>††</sup> (1,2)</li> <li>Monitors and avoids common cognitive errors<sup>†</sup> (2)</li> </ul>	<ul style="list-style-type: none"> <li>Utilizes principles of scientific discovery to analyze and solve complex clinical problems (2)</li> </ul>	<ul style="list-style-type: none"> <li>Integrates understanding of core scientific knowledge*, patient specific data**, and population-based factors to solve complex clinical problems (1,2)</li> </ul>

## APPENDIX:

### \* **Core Scientific Knowledge** (from: [AAMC-HHMI Scientific Foundations for Future Physicians](#), 2009)

- Apply knowledge of molecular, biochemical, cellular, and systems-level mechanisms that maintain homeostasis, and of the dysregulation of these mechanisms, to the prevention, diagnosis, and management of disease.
- Apply major principles of physics and chemistry to explain normal biology, pathobiology of significant diseases, and the mechanisms of action of major technologies used in the prevention, diagnosis, and treatment of disease.
- Use the principles of genetic transmission, molecular biology of the human genome, and population genetics to infer and calculate risk of disease, to institute an action plan to mitigate this risk, to obtain and interpret family history and ancestry data, to order genetic tests, to guide therapeutic decision making, and to assess patient risk.
- Apply the principles of the cellular and molecular basis of immune and nonimmune host defense mechanisms in health and disease to determine the etiology of disease, identify preventive measures, and predict response to therapies.
- Apply the mechanisms of general and disease-specific pathological processes in health and disease to the prevention, diagnosis, management, and prognosis of critical human disorders.
- Apply principles of the biology of microorganisms in normal physiology and disease to explain the etiology of disease, identify preventive measures, and predict response to therapies.
- Apply principles of pharmacology to evaluate options for safe, rational, and optimally beneficial drug therapy.
- Apply quantitative knowledge and reasoning – including integration of data, modeling, computation, and analysis – and informatics tools to diagnostic and therapeutic clinical decision making.

**\*\*Patient specific data:** for example – demographics, patient history and physical exam, habits, lifestyle, culture, and genetics

### <sup>†</sup>**Critical clinical decision-making cognitive functions and common problem solving skills to adopt and avoid**

#### **Heuristics:**

- Recognizes acutely ill from sub-acutely ill
- Recognizes medical emergencies
- Utilizes differential diagnosis to develop care plan
- Utilizes evolution of physical exam findings to modify treatment course
- Anticipating disease course, recognizes when patient responds/fails to respond to treatment

#### **Examples of common clinical problem solving skills:**

- Anticipates and responds to changes in patient acuity and evolution of clinical condition (*see Heuristics*)
- Able to exercise sound clinical judgment in both time-open and time-limited clinical encounters
- Utilizes algorithmic decision-making when appropriate
- Demonstrates ability to personalize clinical reasoning to construct and apply appropriate prototypes of disease

#### **Cognitive errors**

- Context errors – limits possible consideration to only one set of diagnostic possibilities
- Availability error – chooses a diagnosis that is familiar over the more rare diagnosis
- Premature closure – once a decision is made, other possibilities are not considered

†† **Examples of common core problem lists for the major specialties:**

**Internal Medicine** – antibiotics and infection (UTI, skin, pneumonia), abdominal pain, altered mental status, anemia, chest pain, cough, dyspnea, syncope, fluid and electrolyte imbalance, GI bleeding, acute renal failure, CHF, COPD/asthma, DVT/PE, diabetes mellitus, liver disease, life threatening illness

**Ob/Gyn** – labor and delivery, pregnancy complications, pregnancy and abdominal procedures, abnormal pelvic masses and bleeding, abnormal pap, menopause, vaginitis

**Pediatrics** – exams for different age groups, asthma, croup, pneumonia, foreign body aspiration, abdominal pain, diarrhea, vomiting, rash, limp, seizure, headache, malignancy, congenital heart disease, sickle cell anemia, cerebral palsy, attention deficit hyperactivity disorder

**Primary Care** – alcohol or illicit drug use, anemia, arrhythmia, arthritis, asthma, back pain, bronchitis, COPD, delirium/dementia, diabetes, dizziness, fever, GERD, hyperlipidemia, hypertension, hypothyroidism, obesity, UTI

**Psychiatry** – depression, anxiety, social withdrawal, disruptive and agitated behavior, substance use, unexplained physical complaints, personality disorders, bipolar disorders, psychotic disorders, delirium, PTSD, panic disorders, dementia, autism

**Surgery** – abdominal pain, fluids, nutrition, shock, anesthesia, laparoscopy, plastic and burns, vascular, colorectal, hernias, organ specific surgery