

## LEARNING OBJECTIVES

### I. Demonstrate clinical reasoning to arrive at a justifiable diagnosis (an explanation for a health-related condition)

#### I-1. Accurately, efficiently, and comprehensively collect key clinical findings needed to inform diagnostic hypotheses.

- Verifies important data firsthand and ensure sufficient unpacking has occurred.
- Performs comprehensive and accurate patient assessments.
  - Obtains the patient's history first hand and incorporates historical information obtained from the family and medical record.
  - Obtains relevant information from the physical exam skillfully.
  - Uses and supports/aids others' use of new, advanced technologies in complementing information derived from the physical exam.

#### I-2. Formulate, or contribute to, an accurate problem representation expressed in a concise summary statement that includes essential epidemiological, clinical, and psychosocial information.

- Distinguishes more relevant from less relevant information
- Recognizes that problem representation is a key step in establishing the diagnosis, but predisposes to premature closure and a focus that may be too narrow

#### I-3. Produce, or contribute to, a correctly prioritized, relevant differential diagnosis, including can't miss diagnoses.

From the ACGME milestones:

- Acquires accurate histories from patients in an efficient, prioritized, and hypothesis driven fashion that informs the differential diagnosis
- Synthesizes data to generate a prioritized differential diagnosis and problem list
- Revises the differential diagnosis appropriately when new information becomes available
- Able to appropriately utilize pragmatic, probable, and possible differential diagnoses paradigms and transition between them as appropriate to the clinical situation.

AND/OR ...

- Recognizes factors that influence a patient's ability or willingness to seek healthcare in a timely way, including healthcare literacy, socioeconomic status and financial concerns, denial of illness, physical disability, and lack of a healthcare advocate.

- Knows the primary goal of medicine—to care for the patient—may take precedence over establishing the diagnosis.
- Triage patients in different categories of urgency; distinguishes situations where the diagnosis has to be made immediately (e.g., aortic dissection), or can be paced out over time, approached through a trial of watchful waiting, or transferred to another provider
- Understands that a diagnosis may label or stereotype a patient and mask their individuality, may be stigmatizing, and may inhibit further diagnostic thinking about the patient and their problem.
- Takes into account unintended consequences of making a diagnosis, including its impact on the patient physically, emotionally, and financially.
- Describes the dual process model of decision-making and can discuss essential properties of both System 1 and 2 processes.
- Is willing to attempt metacognition and can reflect on reasoning as a learning opportunity, with partial success.
- Recognizes biases in self and others.
- Appreciates the impact that context has on cognition.
- Recognizes uncertainty and seeks help appropriately, though the advancing learner may still have discomfort in doing so (i.e., uncertainty may still be viewed as failure).

**I-4. Explain and justify the prioritization of the differential diagnosis by comparing and contrasting the patient’s findings and test results with accurate knowledge about prototypical or characteristic disease manifestations and atypical presentations, and considering pathophysiology, disease likelihood, and clinical experience.**

- Documents the thinking behind why certain diagnoses were considered or excluded. Documents how thinking evolves in view of new information, new input, or reflection.
- Explains the type of knowledge used to produce their differential diagnosis. Such knowledge is likely to be in the form of:
  - Their understanding of the prototypical/characteristic signs and symptoms associated with their two to three leading disease differential (System 1 knowledge of disease prototypes in conjunction with pattern recognition-based reasoning processes), and/or
  - Their biomedical understanding of how the organ system(s)/organ(s) associated with their top two to three differentials function under normal and abnormal conditions (System 2 knowledge of biomedical mechanisms in conjunction with causal reasoning-oriented mechanisms), and/or
  - Their experience with specific, previously experienced cases that presented in a manner similar to the signs/symptoms associated with the patient at hand

(System 1 knowledge (case exemplars) in conjunction with pattern recognition-based reasoning processes), and/or

- Their understanding of how to apply probabilistic reasoning via knowledge of the frequency with which the top two to three differentials are associated with signs/symptoms present in the case at hand) (System 2 knowledge of disease/feature frequencies in conjunction with reasoning via quasi-probabilistic analysis)

**I-5. Use decision support tools, including point-of-care resources, checklists, consultation, and second opinions to improve diagnostic accuracy and timeliness.**

- Knows how to access decision support tools and checklists in real time to assist in formulating an appropriate differential diagnosis
- Appreciates the value of different perspectives, especially on difficult cases. Seeks out consultation from specialists, and second opinions from peers when the diagnosis is unclear.
- Takes advantage of crowd-source opportunities, such as tumor boards, morning report, and case conferences, to obtain other opinions.
- Knows how to request second opinions and consultation and incorporates new input into clinical decision making.

**1-6. Use reflection, surveillance, and critical thinking to improve diagnostic performance and mitigate detrimental cognitive bias throughout the clinical encounter. Discuss and reflect on the strengths and weaknesses of cognition, the impact of contextual factors on diagnosis, and the challenges of uncertainty. Demonstrate awareness of atypical presentations, information that is missing, and key findings that don't 'fit'.**

- Describes the dual process model of decision-making and qualities and potential drawbacks of both System 1 and 2 processes.
- Reflects on their reasoning as a cornerstone of improving diagnosis, and as a learning opportunity
- Recognizes biases in self and others, usually with prompting.
- Thinks about what information is missing and what doesn't fit.
- Is well calibrated: has a sense of their own knowledge and when to slow down and when to ask for help.

**Context:**

- Appreciates the impact that context has on cognition: Physician context factors: fatigue, sleep deprivation, distractions, workload, etc. Patient factors: Psychosocial issues, personal goals, priorities, and beliefs, etc.

### **Uncertainty:**

- Tolerates and acknowledges uncertainty. Avoids attaching a diagnosis to a patient before sufficient information has been unpacked. Avoids excess testing in the quest for certainty.
- Accepts that uncertainty and ambiguity are inevitable aspects of clinical care. Understands that there is always some degree of uncertainty about any assigned diagnosis, and that other diagnoses are always possible.
- Understands that medical knowledge is constantly advancing, and that the evidence base for recommended practices is constantly changing.
- Understands that the symptoms and signs of disease are highly variable among patients and evolve over time in any given patient.
- Understands that clinical “facts” in the EMR may be incorrect and that diagnostic tests are not infallible.
- Is constantly vigilant to evidence that could change the diagnosis, including additional patient history not yet provided.

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## **INDIVIDUAL COMPETENCIES (I-series) - Diagnostic Testing**

**I-1. Use these tools appropriately and efficiently in the diagnostic process: Effective interpersonal communication skills, history-taking, the physical examination, and record review; diagnostic testing; and the electronic health record and health IT resources.**

### **TEST ORDERING**

- Reviews previous tests to guide ordering.
- Uses published and local testing algorithms or protocols when appropriate. Uses disease-specific test algorithms, 'bundles' and reflexive testing appropriately.
- Knows whom to contact with test-ordering questions.
- Appreciates how pre-analytical variables impact testing plans (e.g., time-sensitive tests for drug levels, biological variability, circadian rhythm).
- Can identify unsuitable samples (e.g., insufficient volume, wrong container, sample hemolysis).
- Minimizes patient venipunctures and draw volume by correct testing ordering.
- Appreciates the cost of diagnostic testing and reimbursements related to inpatient vs outpatient testing; avoids low-value or obsolete tests; uses the ABIM "Choosing Wisely" guidelines.
- For imaging studies: Uses guidance from American College of Radiology (ACR) Image Gently and Image Wisely™ campaigns and ALARA principles for diagnostic imaging
- Appreciates the concept of turn-around-time, how to order 'stat' testing when appropriate, and the need to follow-up on tests with longer turn-around-times, such as pathology results, and tests sent to an outside reference laboratory.
- Uses a systematic approach to know whether or not ordered tests were performed.
- Appropriately orders or requests help in ordering appropriate tests for unique populations, including pediatric patients, pregnant patients, the elderly, and patients who cannot provide informed consent.

### **TEST RESULTS**

- Understands test interference, contamination, cross-reactions; familiar with the possibility of false positive or false negative tests.
- Understands effects of pre-analytical variables (e.g., time of day, fasting) and common types of pre- and post-analytical error.
- Understands reference intervals and appreciates the variability that may exist between laboratories, or between point-of-care and centralized testing results.
- Knows how to incorporate test results into clinical reasoning (i.e., can apply Bayes Theorem, use decision trees). Understands sensitivity, specificity, and pre-test probability, and how to use these to help rule in or rule out diagnostic considerations by deriving positive and negative predictive values.
- Participates in systems to ensure test results are reviewed and acted upon, including tests pending-at-discharge.



- Medical imaging: Identifies the Alliance of Medical Student Educators in Radiology (AMSER) “Don’t Miss” lesions and is aware of the significance of identifying these lesions and providing or facilitating expeditious management or intervention.
- Identifies critical laboratory test results and ECG findings (critical arrhythmias, myocardial ischemia), and critical imaging results (pneumothorax, catheter misplacements, etc.)

#### **COMMUNICATION ABOUT DIAGNOSTIC TESTING**

- Knows the importance of communicating and acting upon critical test results.
- Involves the patient in decisions about the plan for testing. Obtains informed consent skillfully, if needed. Is able to explain how commonly performed studies are performed and makes the effort to learn this information by direct or media-obtained observation (such as RadiologyInfo.org and YouTube).
- Outlines the strategy for testing. What tests might be needed. and in what sequence.
- Provides both verbal and printed test results. Explains the significance of test results and next steps.
- Interacts with the patient kindly and checks on whether he/she understands. Serves as liaison to family, as approved by the patient.

#### **ENGAGING WITH RADIOLOGISTS AND LABORATORY PROFESSIONALS**

- Knows how and when to communicate with radiologists and laboratory professionals for test selection and advice on testing strategies.
- Discusses biopsy and imaging results with the responsible pathology and radiology staff.

#### **CLINICIAN-PERFORMED TESTING**

- Recognizes when clinician-performed testing is appropriate. Understands when referral to advanced imaging personnel for repeat or more in-depth examination should be performed. Appreciates that results from clinician-performed testing may lack the sensitivity and specificity of testing performed in the main lab or imaging departments.
- Receives proper training by credentialed instructors before undertaking bedside tests, including simulation training where available.
- Performs test procedures skillfully. Correctly identifies the patient, collects the right sample, labels it promptly and appropriately, and ensures rapid and suitable transport to the lab.
- Aware of and uses safe practices when performing bedside tests to minimize risks of inadvertent punctures, exposure to infectious agents, and radiation.
- Ensures results from clinician-performed testing are documented appropriately in the medical record.

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## **INDIVIDUAL COMPETENCIES (I-series) - Health IT and the EHR**

**I-1. Use these tools appropriately and efficiently in the diagnostic process: Effective interpersonal communication skills, history-taking, the physical examination, and record review; diagnostic testing; and the electronic health record and health IT resources.**

### **General Learning Objectives**

- Uses time-saving features (e.g., order sets, diagnostic pathways, and documentation templates).
- Knows how to find relevant diagnostic information efficiently. Appreciates how the EHR is organized and uses 'search' functionality effectively. Can access 'remote' data.
- Uses advanced features to support diagnosis, such as graphical display of laboratory data, and data-aggregation tools.
- Orders diagnostic tests and consults effectively. Provides appropriate clinical information and well-formulated questions to consultants and lab/radiology professionals in test requests.
- Ensures results and consults are reviewed, documented, and acted upon appropriately and in timely fashion.
- Reads the notes of the nursing staff and other health professionals involved in the patients care. Works with these team members to ensure note content is relevant and helpful.

### **DOCUMENTATION**

- Accurately enters the details of the "H&P" via either free text or using structured data, including pertinent negatives; is careful with use of "All normal" options.
- Documents the differential diagnosis and the thinking behind why certain diagnoses were considered or excluded. Documents how thinking evolves in view of new information, new input, or reflection.
- Avoids attaching a diagnosis to a patient before it is firmly established. Knows how to use symptom-based coding if the diagnosis is uncertain.
- Maintains an accurate problem list and list of allergies; feels confident in removing problems that have resolved and incorrect allergy information.
- Encourages patient review of documentation to help ensure its accuracy.
- Takes steps to minimize the risk of harm at transitions of care. Completes discharge summaries in a timely manner, ensures the patient and the providers who will see the patient in follow-up receive copies, and notes tests and actions still pending at discharge. Uses advanced technologies or reminder systems to close the loop on pending tests
- Avoids "note bloat"; doesn't copy information into the current note that is easily found elsewhere but summarizes and reflects on it. Minimizes use of copy-paste functionality,

or if used, ensures that all notes are accurate, updated, and truthful. When appropriate, cites the source of copied material.

- Knows how to remove inaccurate problems from problem lists and how to append or annotate summaries to correct inaccurate diagnostic labels (or allergies).

### **UNINTENDED CONSEQUENCES**

- Doesn't assume EHR-based communication is effective or complete; speaks personally with clinical colleagues and diagnostic team members.
- Always acknowledges receipt of messages from other clinicians.
- Is clear on who is responsible for specific actions that need to be taken.
- Understands that key information may be missing, or if present may be inaccurate (e.g., wrong patient, wrong test, scroll-down findings).
- Knows that interacting with the EHR during the patient's visit can detract from the patient-clinician interaction and takes steps to minimize distractions the EHR may create.

### **DECISION SUPPORT**

- Uses alerts and reminders effectively to ensure appropriate follow-up.
- Uses web-based decision support systems to enhance differential diagnosis.
- Works with IT staff to optimize clinical decision support to improve diagnostic performance.

### **OTHER HEALTH IT RESOURCES**

- Communicates with patients through electronic secure portals to improve timeliness, follow-up, access to care, and care coordination.
- Recommends and uses patient-focused technology, including online portals and health-monitoring devices if appropriate to support diagnosis.
- Regularly reviews outcomes of patients, especially situations where diagnosis changed (e.g., patients returning to the ED, or hospitalized within a few weeks of a clinic visit).

**Note: A complete set of independently-derived health IT competencies and learning objectives can be found in the reference by Hersh et al.(1)**

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## **TEAM-BASED COMPETENCIES and LEARNING OBJECTIVES (T-series)**

**T. Partner effectively as part of an interprofessional diagnostic team. Communicate effectively and solicit information from all members of the team (including the patient and family) to create a shared mental model of a patient's illness and the plan for diagnostic evaluation.**

**T-1. Engage and collaborate with patients and families**, in accordance with their values and preferences when making a plan for diagnostic evaluation. Listen actively, encourage questions, and be alert to new or changing information. Explain the diagnostic process, including the patient's and family's role in helping to identify the most likely diagnosis. Share appropriately when diagnostic uncertainty exists.

**T-2. Collaborate with other healthcare professionals** (including nurses, physicians, radiologists, laboratory professionals, pharmacists, social workers, physical therapists, medical librarians, and others) and communicate effectively throughout the diagnostic process. Acknowledge and challenge authority gradients, especially between clinicians and patients/families, constructively.

**T-3. Apply effective strategies at transitions of care** to facilitate accurate and sufficient information transfer about the diagnosis, including any pending workup and areas of uncertainty. Close the loop on test result communication and clarify expectations with the team for test result follow-up.

## **LEARNING OBJECTIVES**

**T-1. Engage and collaborate with patients and families**, in accordance with their values and preferences when making a plan for diagnostic evaluation. Listen actively, encourage questions, and be alert to new or changing information. Explain the diagnostic process, including the patient's and family's role in helping to identify the most likely diagnosis. Share appropriately when diagnostic uncertainty exists.

- Asks open-ended questions designed to elicit patient's/family's understanding of the illness, their goals of care and treatment preferences.
- Tailors interactions to the expressed desires of the patient/family.

- Seeks assistance when there are barriers to effective communication, and proactively seeks solutions to engage historically marginalized populations in care. This includes consistent, appropriate use of interpreters, cultural navigators/liaisons, religious or community leaders, health educators, and interdisciplinary colleagues.
- Exhibits humility and openness when working with patients/families whose values and/or preferences differ from the providers' own, and/or from the norm.
- Values information obtained from patients'/families' and their perception of the illness and trajectory.
- Involves the patient/family throughout the care process by providing updates and creating opportunities for the patient/family to contribute at regular intervals suitable to the level of acuity and care setting.
- Devises an appropriate plan for diagnostic evaluation
  - Knows the primary goal of medicine—to care for the patient—may take precedence over establishing the diagnosis.
  - Triage patients in different categories of urgency; distinguishes situations where the diagnosis has to be made immediately (e.g., aortic dissection), or can be paced out over time, approached through a trial of watchful waiting, or transferred to another provider
  - Tolerates uncertainty and avoids labeling a patient before it is appropriate to do so. Avoids excess testing in the quest for certainty.
  - Takes into account unintended consequences of making a diagnosis, including its impact on the patient physically, emotionally, and financially. Understands that a diagnosis may label or stereotype a patient and mask their individuality, may be stigmatizing, and may inhibit further diagnostic thinking about the patient and their problem.

**T-2. Collaborate with other healthcare professionals** (including nurses, physicians, radiologists, laboratory professionals, pharmacists, social workers, physical therapists, medical librarians, and others) and communicate effectively throughout the diagnostic process. Acknowledge and challenge authority gradients, especially between clinicians and patients/families, constructively.

- Ensures that the team shares the same mental model of the diagnosis, any uncertainty about it, and the plan for next steps.
- Writes chart notes that outline the plan for the patient's diagnostic evaluation. Coordinates the patient's care with appropriate team members.
- Demonstrates awareness of and sensitivity to the scope of practice of team members as well as best practices for supervision of trainees and other team members as applicable.
- Communicates with patients through electronic portals to improve timely access.
- Knows how and when to engage nurses and other health professionals to assist in making diagnoses and can demonstrate this without supervision.



- Reads and utilizes written notes of all team members when developing the patient's plan of care.
- Speaks directly with radiologists and pathologists involved in the diagnostic evaluation.

**T-3. Apply effective strategies at transitions of care** to facilitate accurate and sufficient information transfer about the diagnosis, including any pending workup and areas of uncertainty. Close the loop on test result communication and clarify expectations with the team for test result follow-up.

- Communicates effectively and efficiently (verbally and through written notes) with team members, the patient, and consultants at transitions of care to ensure appropriate care coordination, including:
  - The plan of care, to minimize communication breakdowns at transitions of care.
  - The status of the diagnostic evaluation: What is the working diagnosis, what remains to be excluded, what uncertainty remains, and what tests or test results are pending; clarifies who will be responsible for tests pending at discharge.

## REFERENCES(1-9)

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## SYSTEM-BASED COMPETENCIES (S-series)

### S. Identify and understand the systems factors that facilitate and contribute to timely, accurate diagnoses and error avoidance.

**S-1.** Discuss how human factors contribute to diagnostic safety and error by identifying how the work environment influences human performance. Take steps to mitigate common systems factors that detract from diagnostic quality and safety.

Use local resources (including people, teams and technology, especially the electronic health record) effectively and efficiently to optimize patients' access to care, diagnostic testing services, and appropriate experts for consultation.

**S-2. Advance a culture of continuous learning** that encourages open dialogue and learning from excellent diagnostic performance, near misses and errors.

Give and receive feedback at an individual and team level to improve subsequent diagnostic performance.

Disclose diagnostic errors and missed opportunities transparently and in a timely manner to patients, families, team members, supervisors, and appropriate quality and risk management staff.

## LEARNING OBJECTIVES

### S. Identify and understand the systems factors that facilitate and contribute to timely, accurate diagnoses and error avoidance.

- Describes how harm arises from multiple latent system flaws. Appreciates that most diagnostic errors are partly attributable to system-related shortcomings, and that Reason's "Swiss Cheese" model is so often appropriate. Can think of examples of the most common problems: Breakdowns in communication, coordinating care, finding expertise when you need it, arranging tests and consults and following up on results, ensuring appropriate follow-up, etc.
- Helps the patient navigate the healthcare system during the diagnostic journey and facilitates this to the extent possible.
- Skillfully interacts with all of the many players in the healthcare system to help arrive at a timely and accurate diagnosis; doesn't just trust that everything will happen as planned.
- Identifies recurring system-related flaws and problems to supervisors and recommends how these could be improved or fixed.

- Uses knowledge of local policies, procedures, and resources to help patients navigate and expedite their diagnostic journey

**S-2. Advance a culture of continuous learning** that encourages open dialogue and learning from excellent diagnostic performance, near misses and errors. Give and receive feedback at an individual and team level to improve subsequent diagnostic performance.

- Promotes a culture of learning; avoids assigning blame. Promotes psychological safety.
- Considers individual and system factors when preparing and sharing feedback and reinforces those factors when delivering constructive feedback and identifies trends in learners' behaviors.
- Proactively seeks feedback on diagnostic performance and takes steps to improve him- or herself as well as the broader clinical learning environment.
- Fosters a learning climate that encourages open, frequent, and constructive feedback regardless of hierarchy or role.
- Sets well-defined learning goals, establish and maintain a mindset that provides for motivation to improve, elicit targeted feedback, and pursue opportunities for repetition and refinement of performance.

**Disclose diagnostic errors and missed opportunities transparently and in a timely manner to patients, families, team members, supervisors, and appropriate quality and risk management staff.**

- Discusses and reports diagnostic errors and missed opportunities to the patients and families affected and to supervisors and the organizations risk management staff through appropriate channels.
- Accesses and completes incident reports

## **REFERENCES(1-6)**

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