Teaching and Assessing Clinical Reasoning Through Learning Conversations

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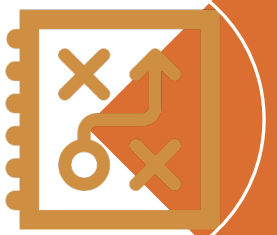
Outline

Discuss cognitive processes of diagnostic reasoning as a conceptual framework to enhancing diagnostic process



Analyze critical domains of the diagnostic reasoning process

Apply lessons learned to assessing learner diagnostic reasoning skills

The Teaching Rounds... | A presentation

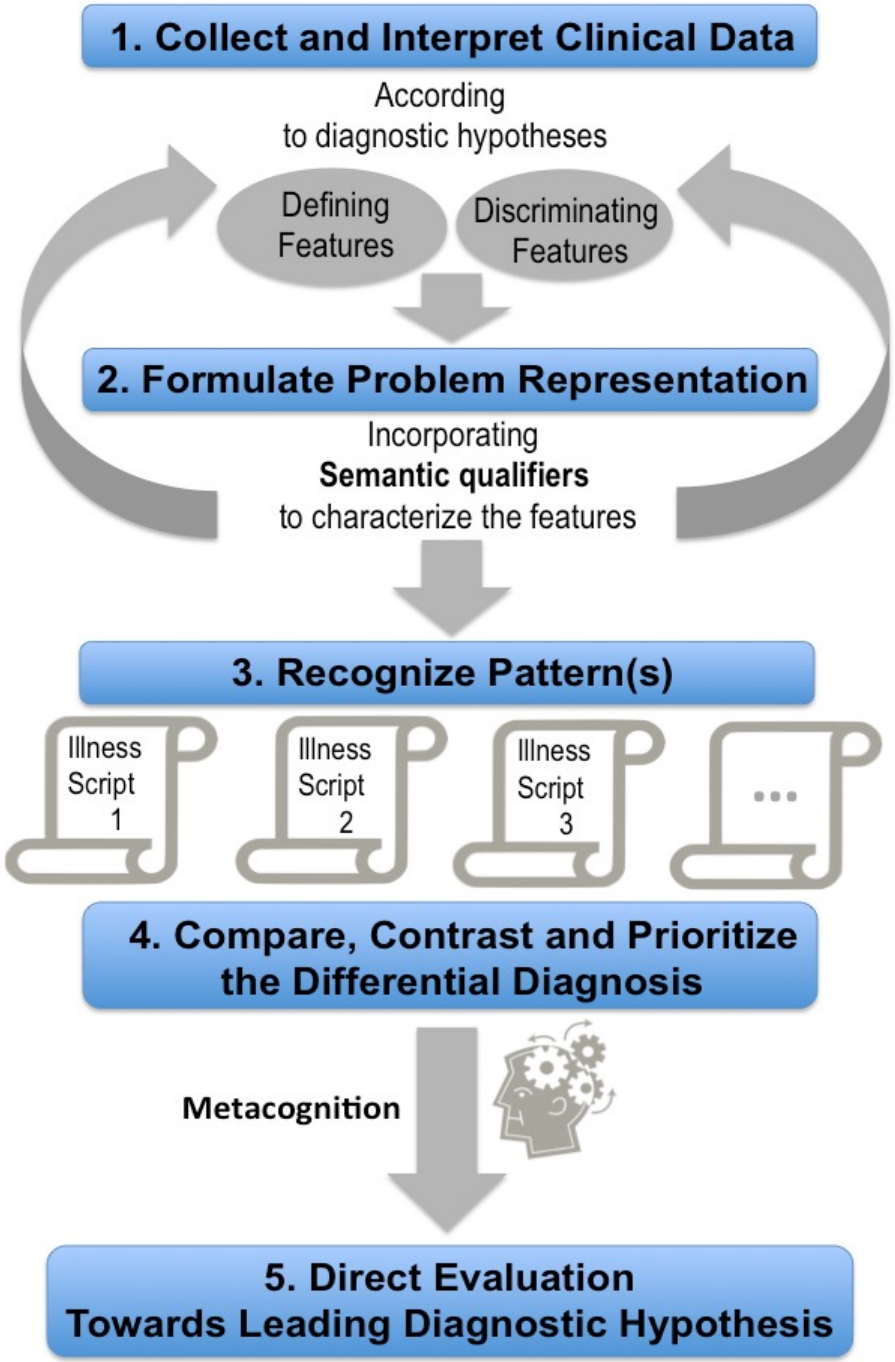
Exploration

Breakout Session 1

- Did the case presentation help to arrive at a diagnosis ?
- What characteristics of the case presentation pertaining to ‘diagnostic reasoning’ were done well?

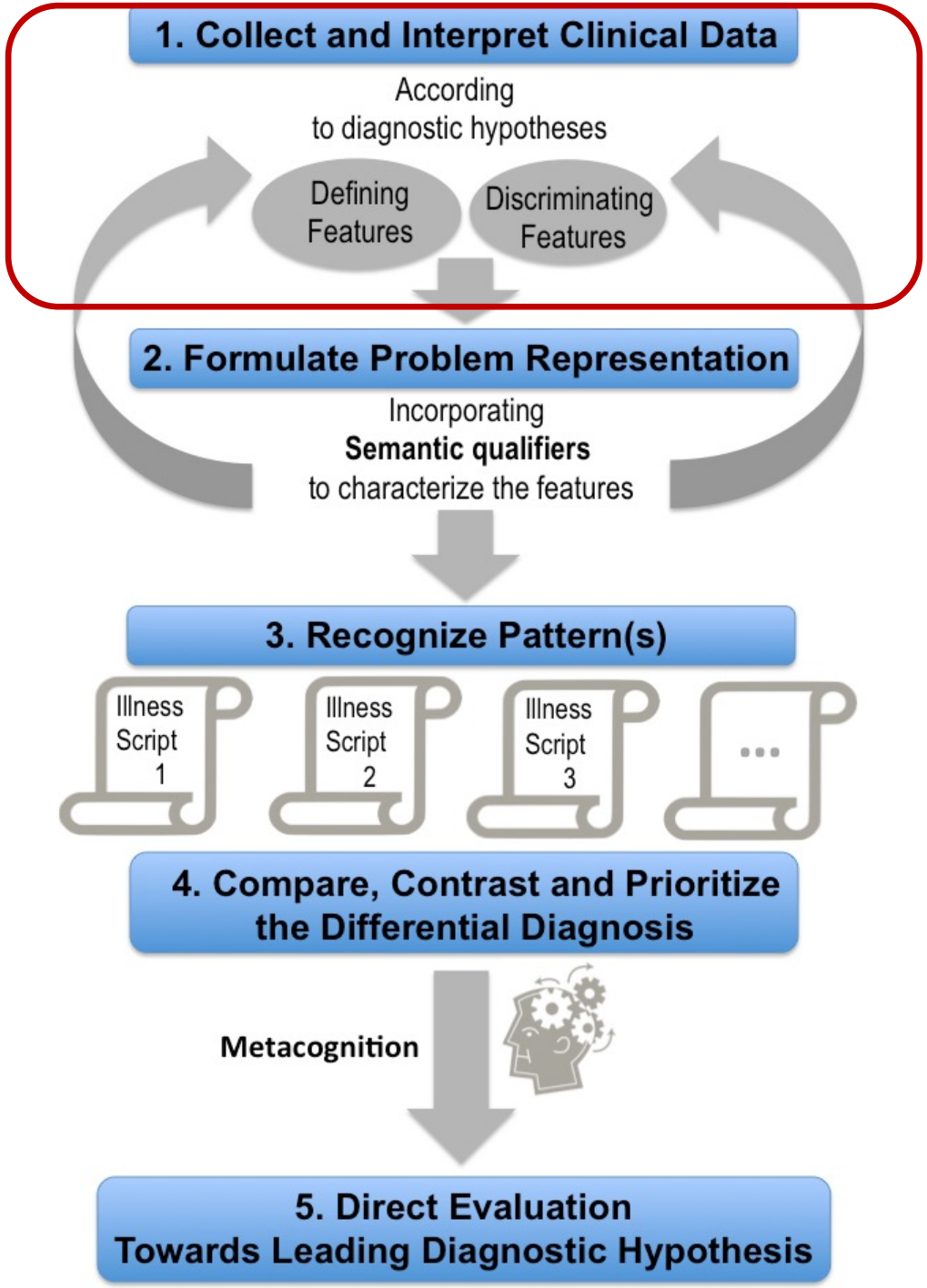
(10 min)


Reflect & Formulate



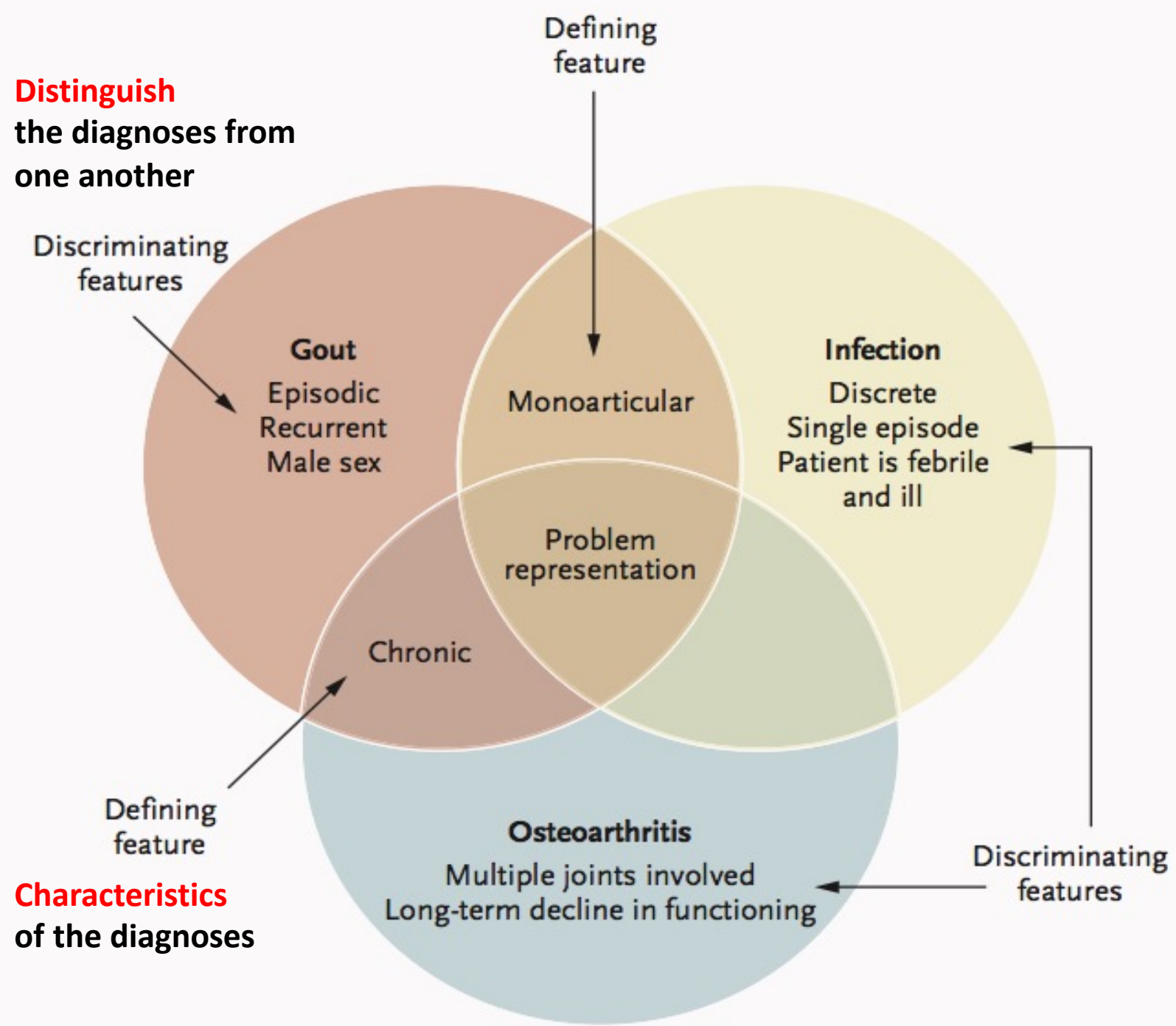
SOCIETY to IMPROVE DIAGNOSIS in MEDICINE

ART Development, Thammasitboon, et al.



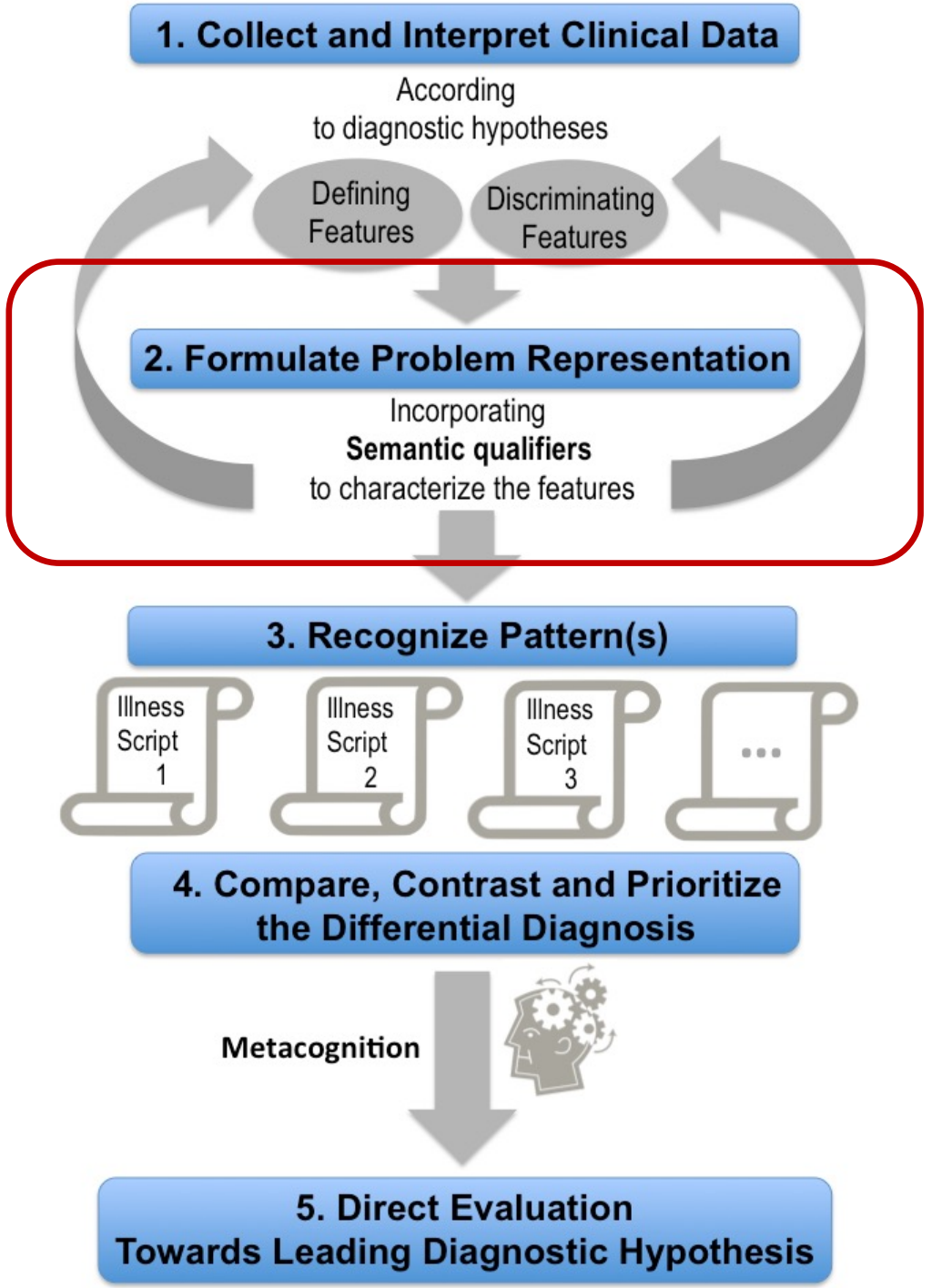
ART Development, Thammasitboon, et al.

Distinguish
the diagnoses from one another



Characteristics
of the diagnoses

What features should be collected?


1. Collect and Interpret Clinical Data
According
to diagnostic hypotheses
Defining Features
Discriminating Features
2. Formulate Problem Representation
Incorporating
Semantic qualifiers
to characterize the features
3. Recognize Pattern(s)
Illness Script 1
Illness Script 2
Illness Script 3
...
4. Compare, Contrast and Prioritize the Differential Diagnosis
Metacognition
5. Direct Evaluation Towards Leading Diagnostic Hypothesis

“Problem Representation”

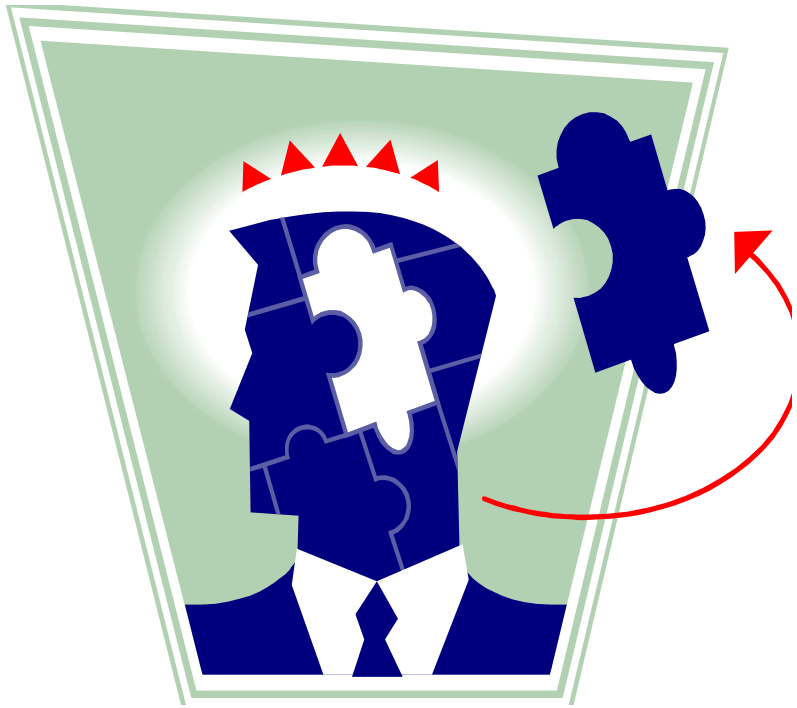
Synthesize the case in couple of sentences,

at a higher level of abstraction, the “big picture”

Problem Representation

Here's an **older** man with an **acute**, **recurrent** attack of **severe** pain in a **single**, **large** joint, a **mono-**arthritis.

This could be gout or septic arthritis."



Semantic Qualifiers

1- Pt char.	Mr. S., 72	**Older man**
2- Site	R. knee	**Mono, Large**
3- Course	Last year	**Episodic**
4- Severity	Blankets	**Severe**
5- Context	Night	**At rest**
6- Onset	Last night	**Acute**

Chang, Acad Med 1998

Semantic Qualifiers

Adjectives/descriptors with implied or explicit opposites

Impart deeper understanding of signs and symptoms.

Provide a framework to search for the diagnosis and **‘Illness scripts’.**

Problem Representation in our case?

- 17-month-old girl
- decreased intake, vomiting and cough for 3-4 days and some vomiting along with coughing at night for the
- + low grade fevers, fussiness, decreased sleep, sick contact (sibling)
- -Diarrhea

- PMH: Reflux on Zantac, ?immunization history
- History of travel to Mexico
- FHx or smokers cough, lives with siblings MGF and dog
- Exam:
  - Afebrile, HR 132, RR 32, BP 100/65, Sat 93%
  - Dry lips
  - Mild subcostal retractions with rhonchi and R sided wheezes
  - Normal Cardiac and abdomen
  - CR 4 seconds and cool feet.

Add some semantic qualifiers!

- 17-month-old girl
- decrea
  and co
  some
  cough
- + low
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- -Diarrhea

- PMH: Reflux on Zantac,
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  Sat 93%
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  - Mild subcostal retractions with rhonchi and R sided wheezes
  - Normal Cardiac and abdomen
  - CR 4 seconds and cool feet.

Mine:

This is a ***young toddler*** (<2 year old) with ***acute onset*** of URI prodrome and ***non-bilious*** vomiting followed by respiratory distress who is presenting in ***compensated shock***

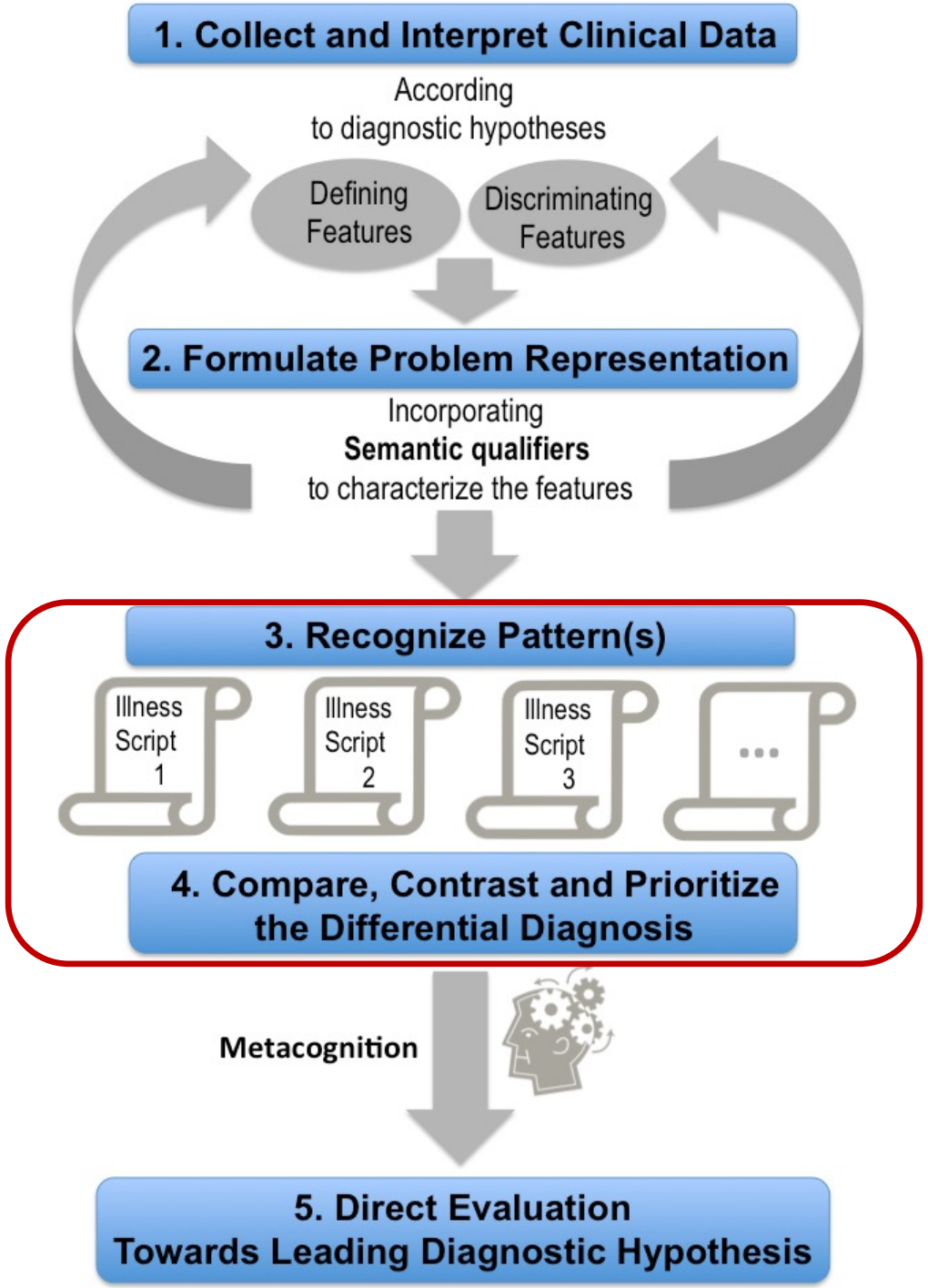
Index to search for ‘illness script’

Older man
Acute onset
Recurrent
Mono, large joint

Gout, septic arthritis

Woman
Gradual onset
Chronic
Poly, small joint

Rheumatoid arthritis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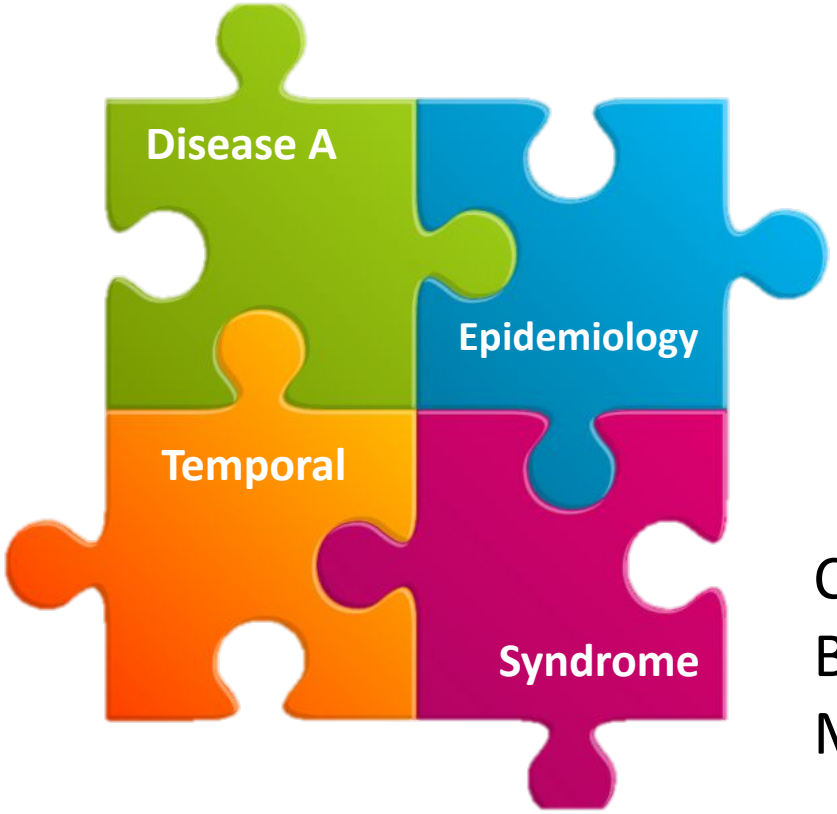
An Illness Script:

Abstract Mental Representation of an Illness



Neonate vs. Older
Immunocompromised

Acute vs. Chronic
Progressive vs. Stable

Colicky vs. Visceral pain
Bilious vs. Non-bilious
Medical vs. Surgical

The Key to Expert Pattern Recognition

Sort Out Illness Scripts

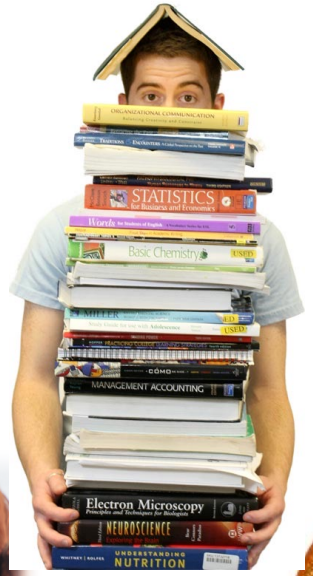
Any age, acute bilious vomiting,
distended abdomen,
constipation…

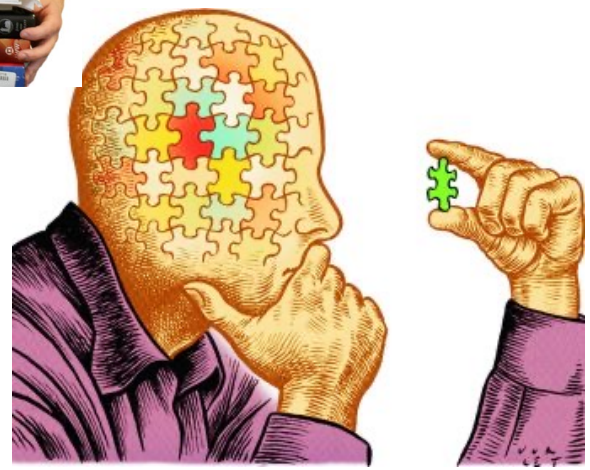
A child with bloody stool

Acute, Intermittent pain,
Currant Jelly stool,….

2-year-old, Acute painless,
Hematochezia,…

Experts Create & Compile Illness Scripts



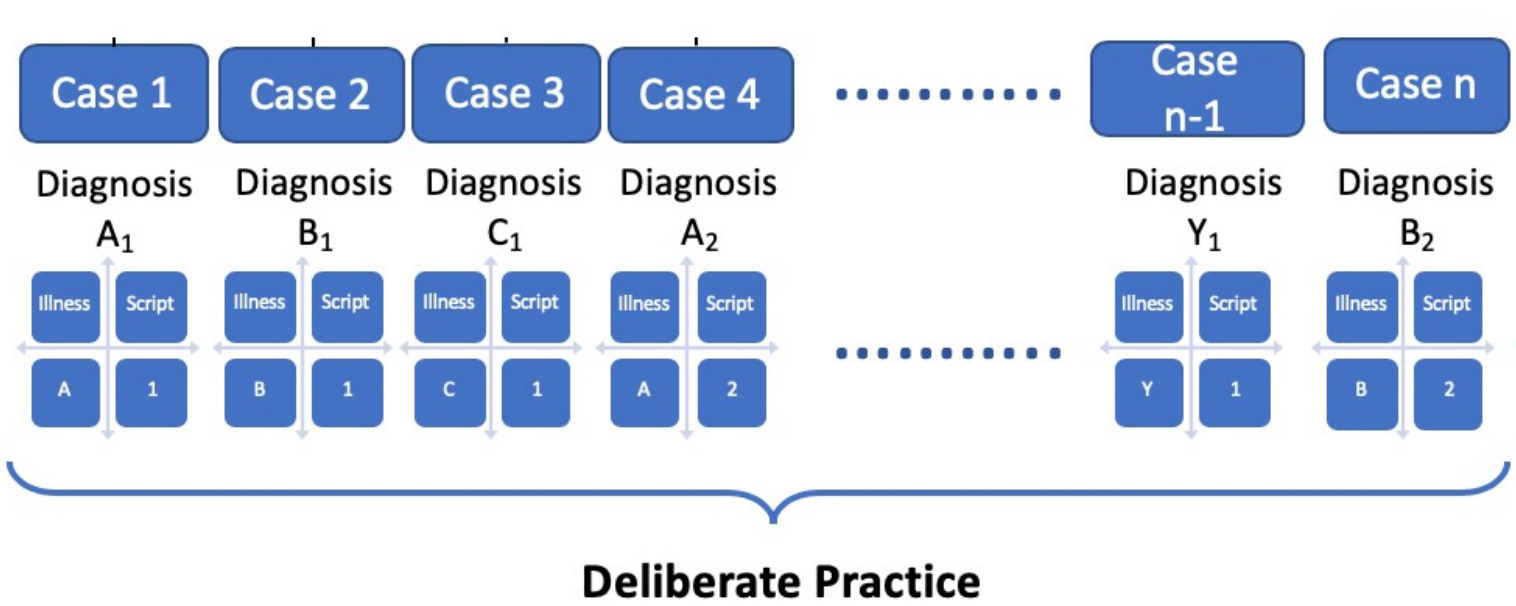


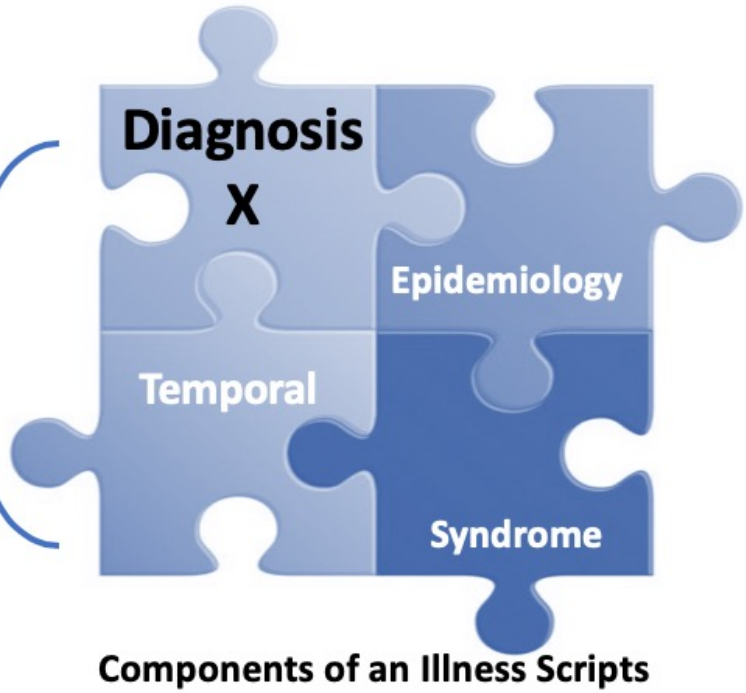
The diagnostic expertise acceleration module (DEAM): promoting the formation of organized knowledge

Brian Rissmiller, Danny Castro, Charles G. Minard, Moushumi Sur, Kevin Roy, Teri Turner & Satid Thammasitboon

To cite this article: Brian Rissmiller, Danny Castro, Charles G. Minard, Moushumi Sur, Kevin Roy, Teri Turner & Satid Thammasitboon (2019) The diagnostic expertise acceleration module (DEAM): promoting the formation of organized knowledge, Medical Education Online, 24:1, 1679945

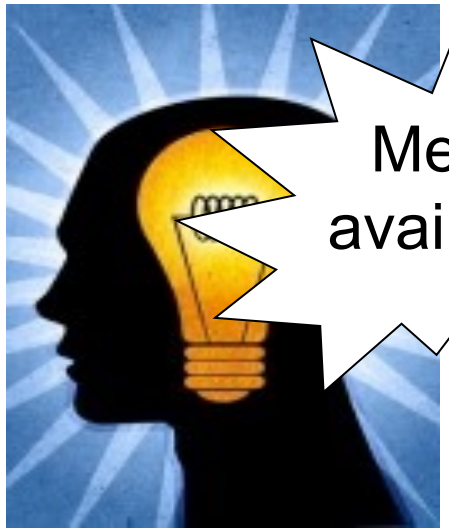
DEAM Module, Rissmiller, et al.





Components of an Illness Scripts

Novice & Pattern Recognition



Mental availability

Actual probability

Abscess

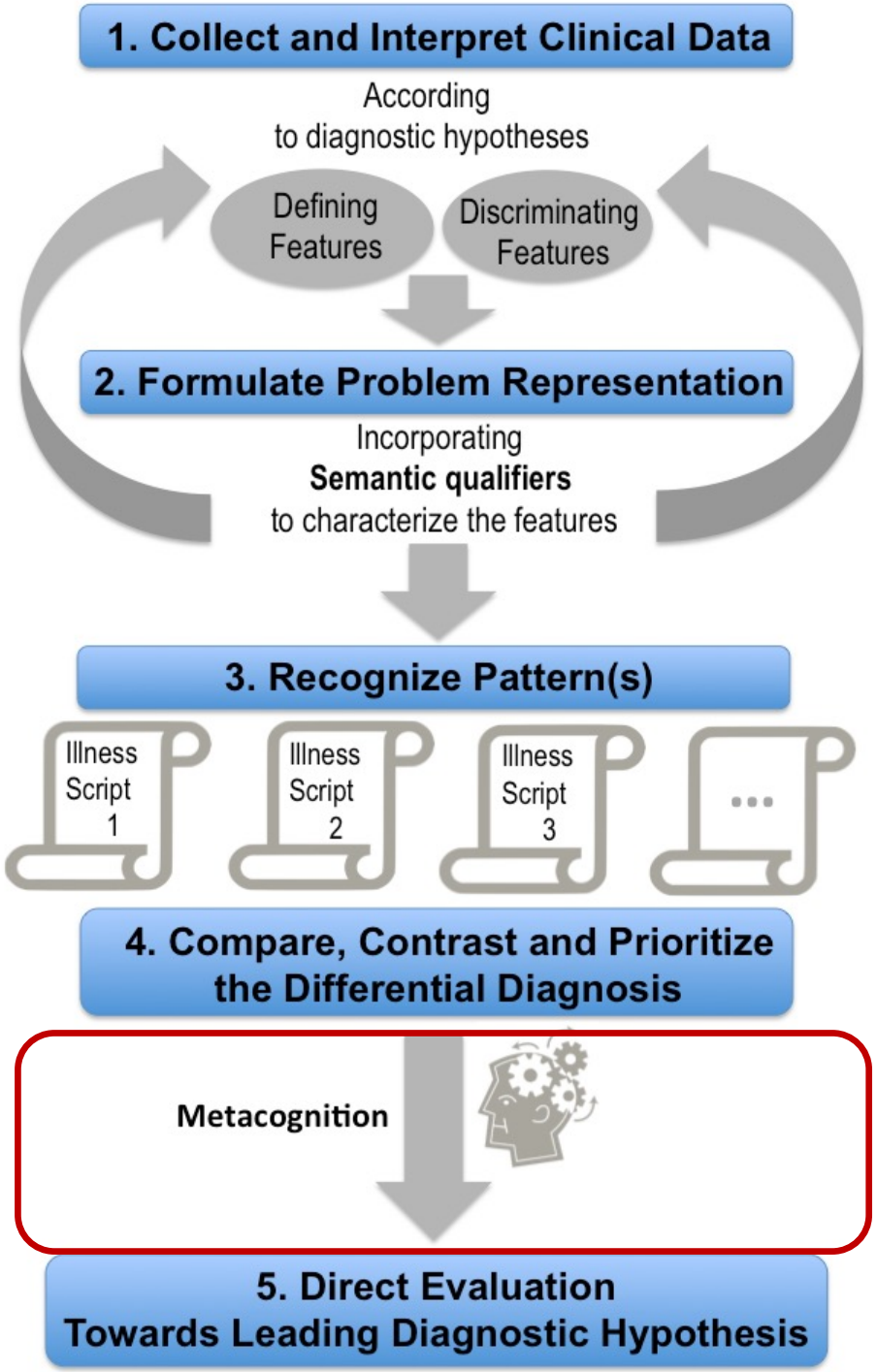
Kawasaki's

Mononucleosis

Illness scripts
- Emotional factors
- Situational factors
- Cognitive tendencies

Pharyngitis

Wrong diagnosis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Common Cognitive Tendencies/Biases

Availability Heuristic

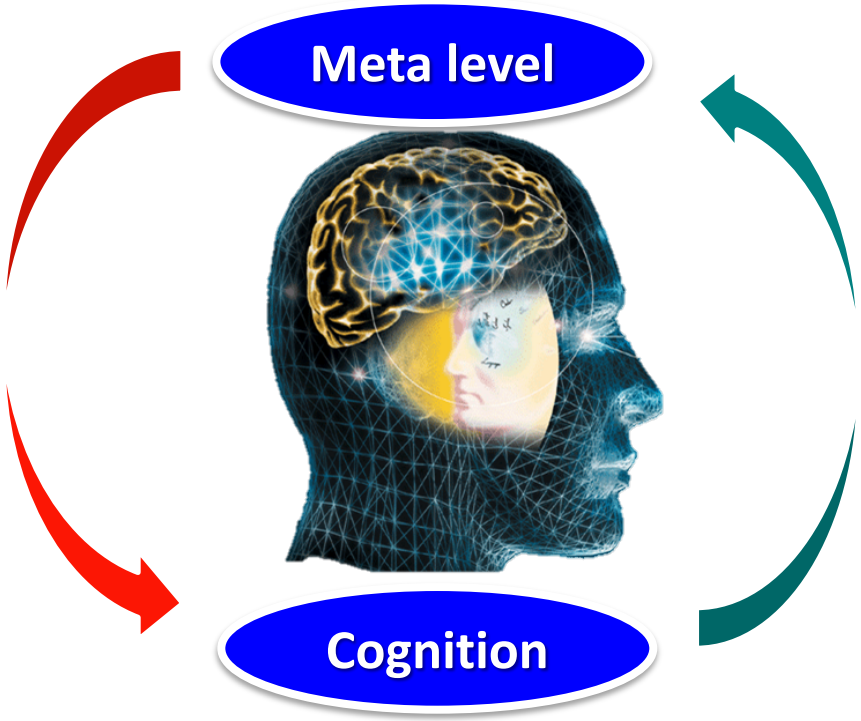
Representative Bias

Anchoring

Premature Closure

Croskerry, Cognitive Biases

Metacognition



“Thinking About Thinking”

Did I put enough effort toward solving this problem?

Did I omit anything serious/life threatening? (Do-Not-Miss)

Does it make sense?

Let’s think outside the box!

Adapted from Nelson 1990, Psych of Learning and Motivation

The Assessment of Reasoning Tool (ART)

Did the Learner…	Assessment		
	Minimal	**Partial**	**Complete**
Collect/report history and examination data in a **hypothesis-directed manner**?	• Non-directed in questioning and exam • Asked questions without clear focus on potential diagnoses	• Questioning and exam generally reflective of potential diagnoses, but some less relevant or tangential questions ☑	• Followed clear line of inquiry, directing questioning and exam to specific findings likely to increase or decrease likelihood of specific diagnoses
Articulate a complete **problem representation** using descriptive medical terminology?	• Included extraneous information • Missed key findings • Did not translate findings into medical terminology	• Generally included key clinical findings (both positive and negative) but either missed some key findings or missed important descriptive medical terminology ☑	• Gave clear synopsis of clinical problem • Emphasized important positive and negative findings using descriptive medical terminology
Articulate a **prioritized differential diagnosis** of most likely, less likely, unlikely, and "can't miss" diagnoses based on the problem representation?	• Missed key elements of differential diagnosis, including likely diagnoses or "can't miss" diagnoses	• Gave differential diagnosis that included likely and "can't miss" diagnoses but either missed key diagnoses or ranked them inappropriately	• Gave accurately ranked differential diagnosis including likely and "can't miss" diagnoses ☑
Direct evaluation/treatment towards **high priority diagnoses**?	• Directed testing and treatments toward unlikely/unimportant diagnoses • Did not order tests or treatments for most likely/ "can't miss" diagnoses	• Major focus of evaluation and treatment was likely and "can't miss" diagnoses but included non-essential testing ☑	• Efficiently directed evaluation and treatment towards most likely and "can't miss" diagnoses • Deferred tests directed towards less likely or less important diagnoses
Demonstrate the ability to **think about one's own thinking** (metacognition)? Consider asking: *Is there anything about the way you are thinking or feeling about this case that may lead to error?*	• Not able to describe the influence of cognitive tendencies or emotional/ situational factors that may have influenced decision-making ☑	• Can name one cognitive tendency or emotional/situational factor that may have influenced decision-making	
OVERALL ASSESSMENT	**NEEDS IMPROVEMENT** ☐	**MEETS COMPETENCY** ☐	**EXCELLENCE** ☐

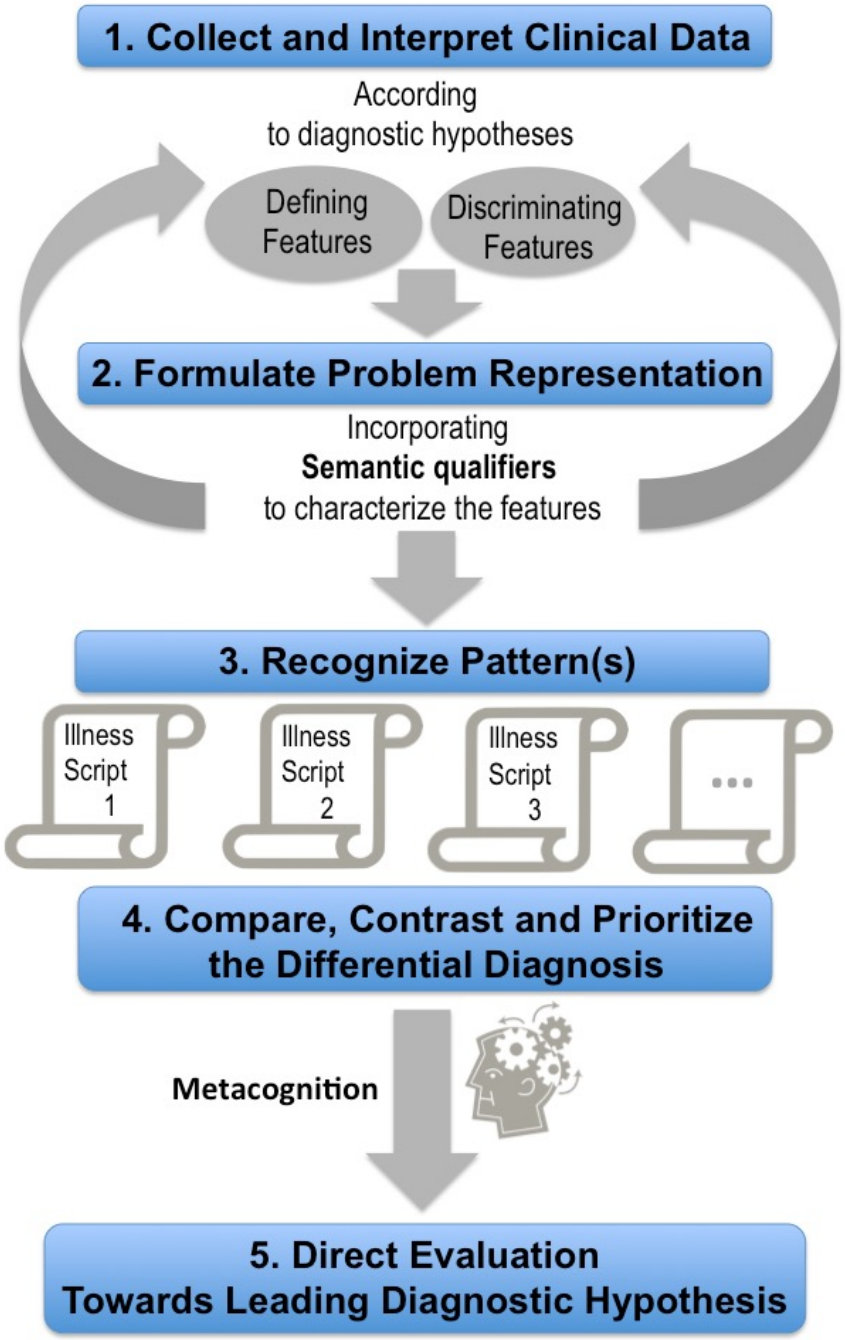
"Assessment FOR Learning"

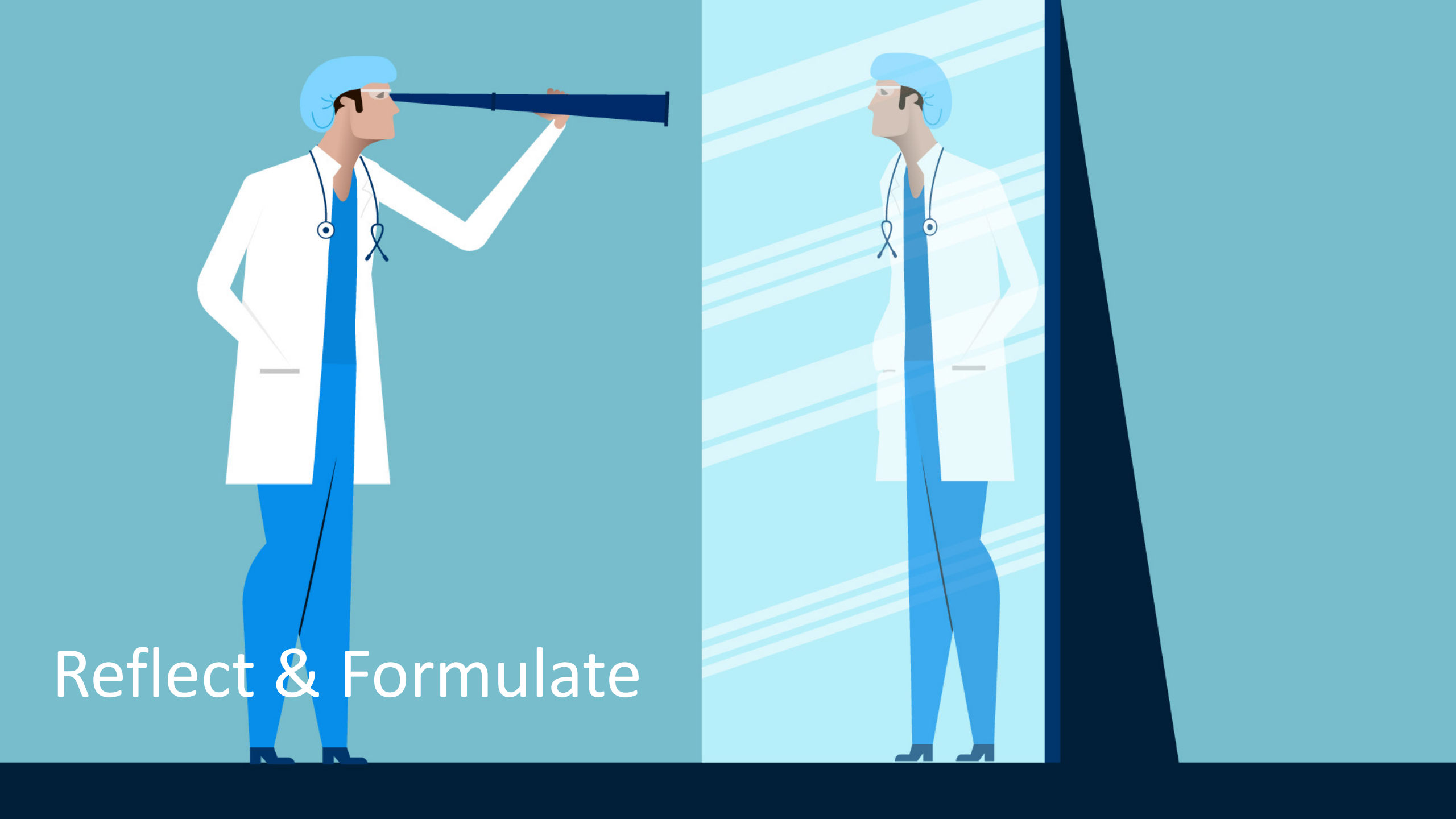
Concept Application

Breakout Session 2

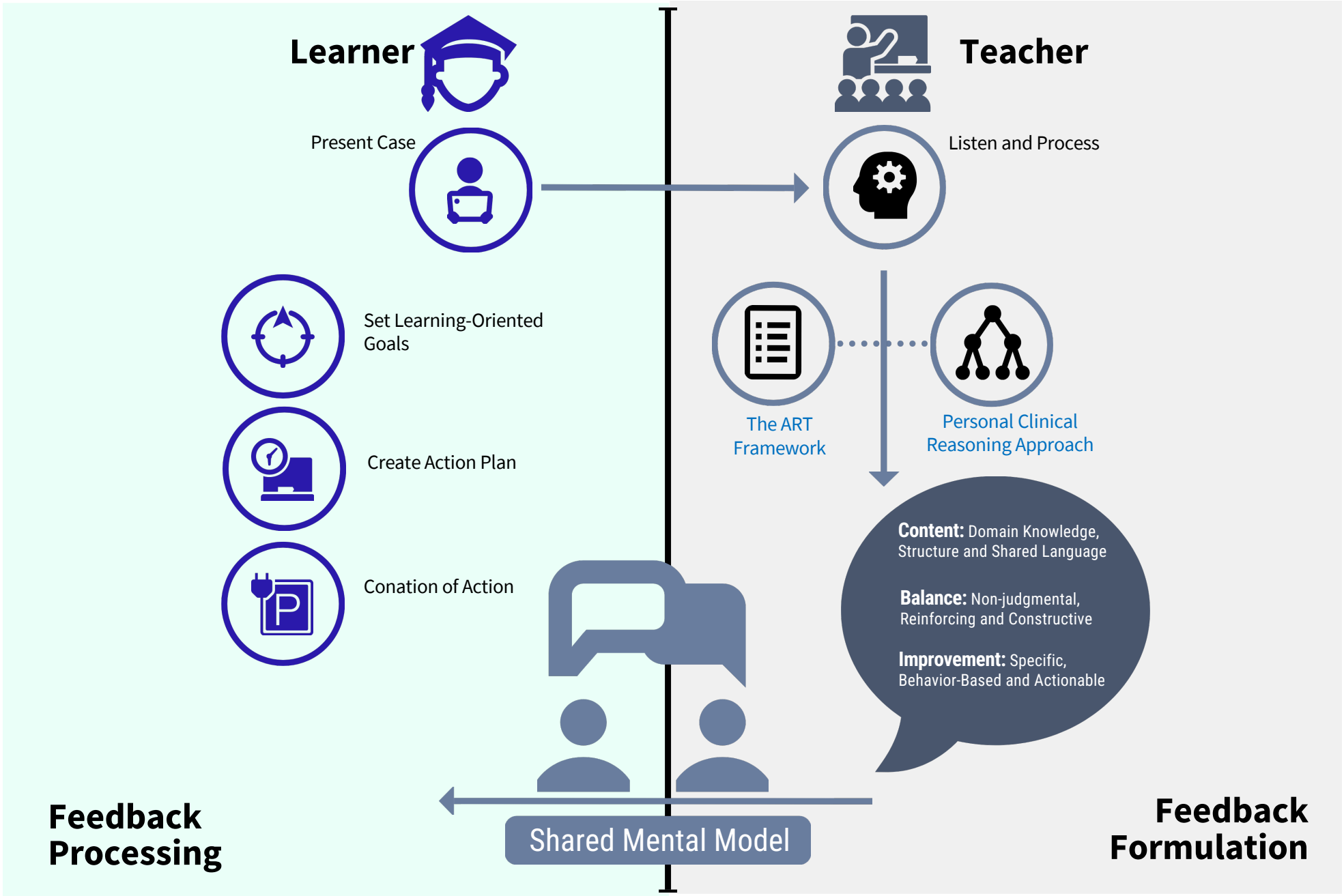
- Use the ART to assess learner presentation
- Discuss whether the tool helps you assess learner's diagnostic reasoning
- Analyze which domains are better assessed with the tool

(20 min)




Reflect & Formulate


The ART
for
Learning
Conversations


Learner
Teacher
Present Case
Listen and Process
Set Learning-Oriented Goals
Create Action Plan
Conation of Action
The ART Framework
Personal Clinical Reasoning Approach
Content: Domain Knowledge, Structure and Shared Language
Balance: Non-judgmental, Reinforcing and Constructive
Improvement: Specific, Behavior-Based and Actionable
Shared Mental Model
Feedback Processing
Feedback Formulation

Cohen, et al

Mixed Methods Research: Learner Survey & Faculty Interviews

Structures

- Framework
- Language (Terms & Behavioral Descriptors
- Organization (Primer & Guidepost)

New Opportunities

- Assessment
- Teaching
- Feedback
- Enhanced Interaction

Adaptability

- Learner Level
- Competence Level
- Domains

Challenges

- Complex Skills
- Discrimination (Minimal, Partial, Complete)
- Time Constraint

Cohen et al

The ART-R for

Competency Assessment

ART
5 Domain Rubrics
15 Descriptors
("Complete")

ART-R
5-Domain
15-item, 5-point Likert Scale

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Item 1
Item 2
Item 3
Item 4
Item 5
Item 6
.
.
.
.
Item 13
Item 14
Item 15

Rate the learner's case presentation using 5-point scale 1= Poor, 2 =Fair, 3 = Average, 4 =Good, 5 = Excellent
1. The learner's ability to follow a clear line of inquiry towards specific diagnoses when gathering information from the patient.
2. The learner's ability to direct questions in a manner that increased/decreased the likelihood of specific diagnoses when gathering information from the patient.
3. The learner's ability to conduct the physical exam in a manner that increased/decreased the likelihood of specific diagnoses.
4. The learner's ability to give a clear synopsis of the clinical problem.
5. The learner's ability to emphasize important positive and negative findings in the assessment.
6. The learner's ability to employ descriptive medical terminology (semantic qualifiers) in the assessment.
7. The learner's ability to clearly rank the differential diagnoses.
8. The learner's ability to include likely and can't miss diagnoses.
9. The learner's ability to include key diagnoses in the differential diagnosis.
10. The learner's ability to direct evaluation towards most likely and can't miss diagnoses.
11. The learner's ability to direct evaluation in an efficient order.
12. The learner's ability to defer tests directed towards less likely or less important diagnoses.
13. The learner's ability to recognize one or more potential cognitive tendencies that might have influenced decision.
14. The learner's ability to recognize one or more potential emotional/situational factors that may have influenced decision.
15. The learner's ability to describe the ways in which cognitive/emotional/situational factors may have influenced decision.

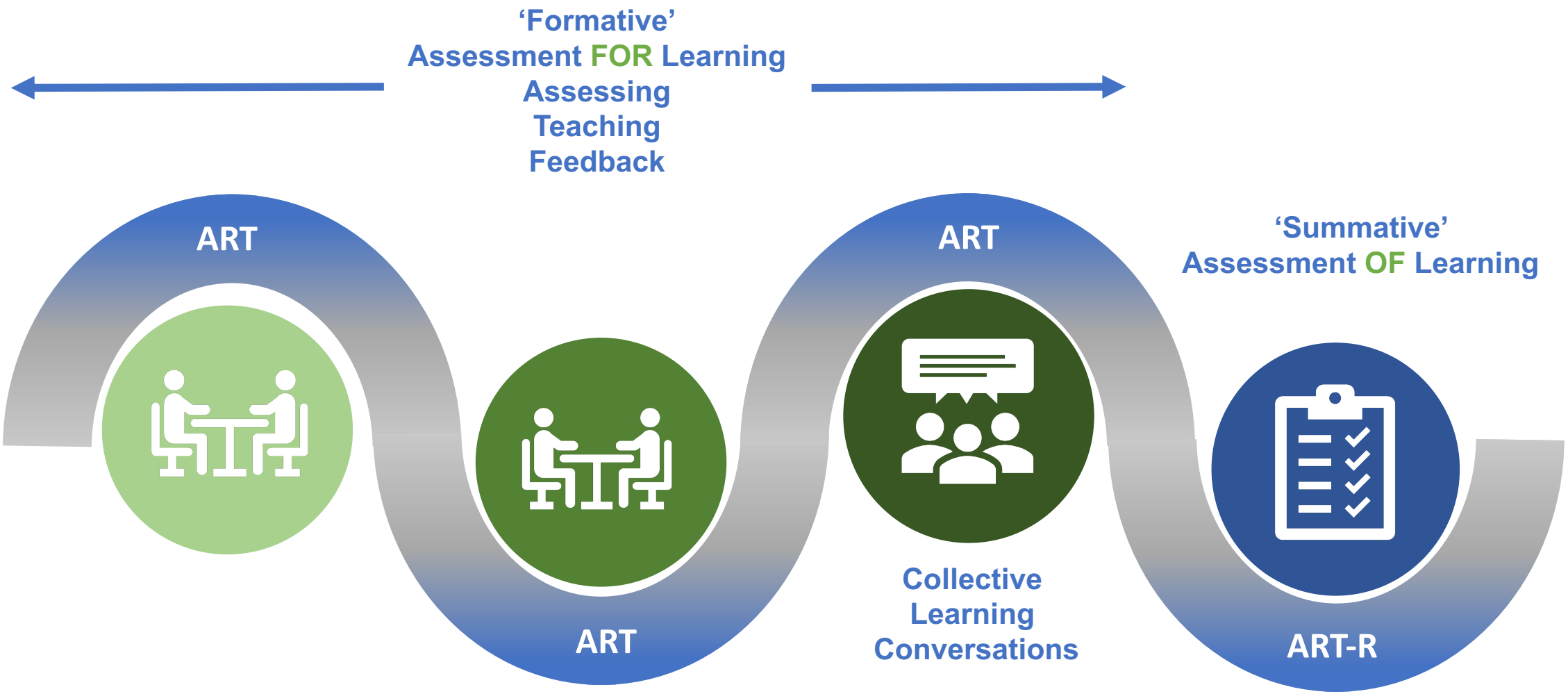
ART-R 'Reconstructed'

Validity

- Content
- Response Process
- Internal Structure
  - ART-R domains confirmed by Factor Analysis
  - Internal Consistency (Cronbach's Alpha)
- Domains are associated with Global Rating

MEDICAL TEACHER
https://doi.org/10.1080/0142159X.2020.1830960

The Synergy of ART and ART-R



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LEGEND

Red = 0.0 – 0.5 (poor)
Yellow = 0.6 – 1.0 (average)
Green = 1.1 – 1.5 (good)
Blue = 1.6 – 2.0 (very good)

Clinical Reasoning Assessment Method / Definition	Information Gathering	Hypothesis Generation	Problem Representation	Differential Diagnosis	Leading Diagnosis	Diagnostic Justification	Management / Treatment
Non-workplace-based assessments							
Comprehensive Integrated Puzzle - an extended matching crossword puzzle designed to assess a learner's ability to relate clinical vignettes to specific diagnoses and diagnostic/ therapeutic interventions	0.4	0.3	0.6	1.1	1.9	0.4	1.3
Concept Maps - a schematic method for learners to organize and represent their knowledge structures through graphical illustration of the complex processes and relationships between concepts within a subject domain	0.4	0.4	1.2	1.0	0.4	0.8	0.9
Extended Matching Questions - a written exam format consisting of a lead in question (clinical vignette) followed by multiple answer options in a list where more answer options are given than vignettes	0.2	0.3	0.2	0.8	1.7	0.3	1.3
Key Feature Examinations - problems typically consist of a clinical vignette followed by 2-3 questions that assess the critical elements ("key features") or challenging decisions that clinician's must make.	0.9	0.5	0.4	1.5	1.4	0.6	1.4
Multiple Choice Questions (vignettes) - a clinical vignette stem is followed by up to 5 alternatives, including the following question types: A (single best alternative), M (matching), X (true/false), and combinations of alternatives (a, b, c).	0.9	0.3	0.0	0.6	1.9	0.0	1.8
Multiple Essay Questions - a method wherein serial information about a clinical case is presented chronologically. After each item, the learner must document a decision. The student cannot preview subsequent items until a decision is made.	1.3	1.2	1.0	1.6	1.7	1.3	1.7
Oral Examination - a verbal exam conducted by one or more faculty through unscripted or semi-scripted questions that assess clinical reasoning and decision-making ability, as well as the professional values accounting for these decisions	1.3	1.3	1.1	1.8	1.8	1.9	1.9
Patient Management Problem -a clinical scenario is presented in real-life settings with specific resources available for solution or management. The learner is asked to choose among multiple alternatives for action and the results of the actions (i.e. labs, images, etc) are provided.	1.6	1.0	0.3	1.4	1.9	0.6	1.7
Script Concordance Tests - short clinical scenarios associated with uncertainty are followed by a series of questons (if you were thinking of x, and then you found y, this answer would become (more / less likely or neutral). Examinees' illness scripts are evaluated for agreement with scripts of an expert panel.	0.4	0.8	0.6	0.8	1.3	0.9	1.1
Short or Long Answer Questions - a question or clinical vignette is followed by one or more questions. Learners provide 1-2 sentences (for short answer) or 3+ sentences (for long answer)	0.8	1.2	1.2	1.8	1.7	1.8	1.7
Assessments in simulated clinical environments							
Objective Structured Clinical Examination- performance-based evaluations of students' clinical skills, comprised of multiple stations where examinees execute different clinical tasks incorporating standardized patients, observer ratings, short written tests and other methods to provide a comprehensive assessment	2.0	1.3	1.3	1.8	1.7	1.3	1.7
Technology- Enhanced Simulation - an educational tool or device with which the leaner physically interacts to mimic an aspect of clinical care for the purpose of teaching or assessment. It broadly encompasses a range of instruments from static plastic models to dynamic virtual reality patients	1.6	0.6	0.5	1.1	1.7	0.6	1.9
Workplace-based assessments							
Chart Stimulated Recall - a hybrid assessment format that combines chart review and an oral examination based on a learner's documentation of a patient encounter.	1.1	1.2	1.4	2.0	1.9	1.9	2.0
Direct Observation - Also known as performance observation or clinical observation, direct observation involves an instructor watching a learner in the workplace environment. Includes Mini-CEX, SCO. Generally combined with Oral presentation / oral examination	1.9	1.1	1.5	1.7	1.7	1.5	1.6
Global Assessment - Individual judgment / gestalt of learner clinical reasoning performance, often expressed on clinical rating forms (i.e. end of shift, end of clerkship.)	1.3	1.0	1.3	1.6	1.6	1.4	1.6
Oral Case Presentation - a structured, verbal report of a clinical case. The learner makes deliberate choices about what to include, what not to include, the order in which data is presented and the structure and content of the assessment and plan.	1.1	1.1	1.8	2.0	2.0	2.0	1.9
Self-Regulated Learning Microanalysis - a questioning technique that takes a learner through a series of questions (think aloud), then asks the learner to reflect on performance (can be applied in vitro or in vivo)	1.4	1.6	1.6	1.7	1.7	1.6	1.7
Think Aloud (No metacognition) - participants are given a task and asked to voice their thoughts in an unfiltered form. This technique attempts to access participants' mental processes as they work. Typically administered while completing the task (simultaneous) or immediately following completion of the task.	1.4	1.8	1.7	1.8	1.7	1.9	1.6
Written Notes - a structured written report about a patient case. Post-Encounter Notes are a type of written note with specific formats and expectations for expressing clinical reasoning, often in the form of a summary statement or encapsulation using semantic qualifiers, a problem list, and differential diagnosis.	1.2	0.6	1.4	1.9	1.7	1.6	2.0

Clinical Reasoning Assessment Methods: A Scoping Review and Practical Guidance

Daniel, Michelle MD, MHPE; Rencic, Joseph MD; Durning, Steven J. MD, PhD; Holmboe, Eric MD; Santen, Sally A. MD, PhD; Lang, Valerie MD, MHPE; Ratcliffe, Temple MD; Gordon, David MD; Heist, Brian MD, MSc; Lubarsky, Stuart MD, MHPE; Estrada, Carlos A. MD, MS; Ballard, Tiffany MD; Artino, Anthony R. Jr PhD; Sergio Da Silva, Ana PhD; Cleary, Timothy PhD; Stojan, Jennifer MD, MHPE; Gruppen, Larry D. PhD

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Academic Medicine: June 2019 - Volume 94 - Issue 6 - p 902-912
doi: 10.1097/ACM.0000000000002618

Scoping Review, Daniel, et al.

Faculty Development

Robert Trowbridge, MD, Andrew Olson, MD, Ethan Fried, MD, William Follansbee, MD, Frank Papa, DO, PhD, and Brent Smith, MD, Satid Thammasitboon, MD, MHPE

AAMC Association of American Medical Colleges

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Faculty Development

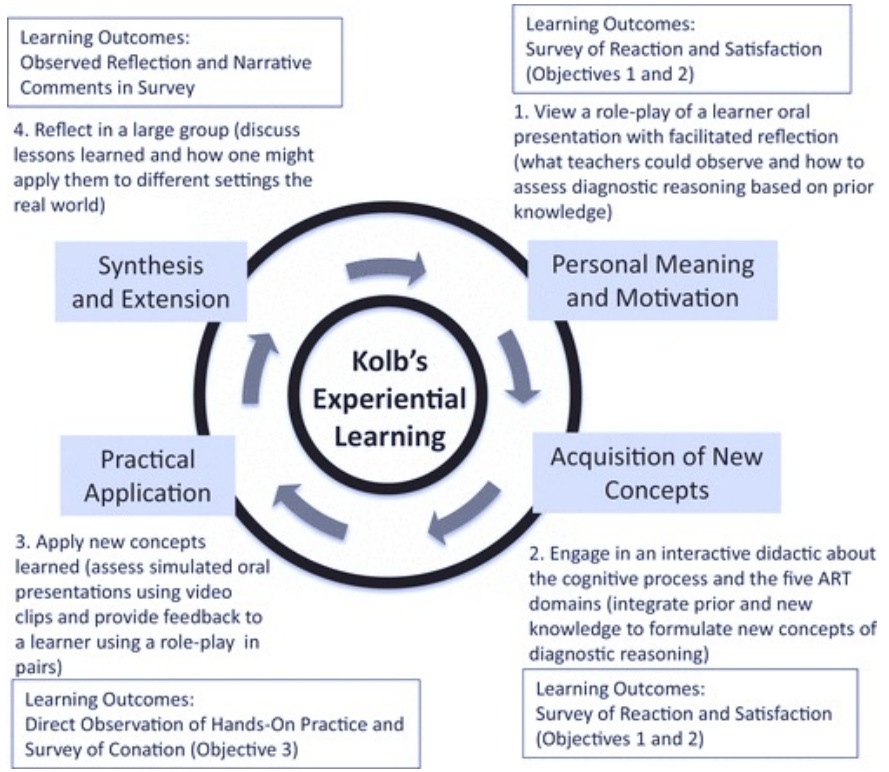
OPEN ACCESS | August 21, 2020

Teaching Diagnostic Reasoning to Faculty Using an Assessment for Learning Tool: Training the Trainer

Adam Cohen, MD, Moushumi Sur, MD, Martin Weisse, MD, Kathryn Moffett, MD, Jeffrey Lancaster, MD, Renee Saggio, MD, Geeta Singhal, MD, MEd, Satid Thammasitboon, MD, MHPE

https://doi.org/10.15766/mep_2374-8265.10938

Fac Dev, Cohen, et al.



Conclusions

- The ART is a theory-informed, behaviorally anchored rubric.
  - assess learners and structure feedback conversations in 5 domains of diagnostic reasoning

- The ART-R is a 15-item, Likert Scale assessment tool derived from the behavioral descriptors of the ART rubric.
  - Validity evidence: Content, Response Process, Internal Structure and Relation to Other Variables

- The ART and the ART-R are complementary:
  - ART is an Assessment **FOR** learning, fostering ‘Learning Conversations’.
  - ART-R is an Assessment **OF** learning, allowing summative assessment.

Let’s Teach, Learn and Collaborate!

Please provide us some feedback

Thank you