CLINICAL REASONING: USING THE LEARNED SKILLS TO TEACH

https://www.aliem.com/2014/02/expertise-clinical-decision-making/

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Goals and Objectives

- At the end of this workshops, faculty should be able to:
  - *Understand and apply the dual processing cognitive theory explaining clinical reasoning.*
  - *Define illness scripts, problem presentation, and semantic qualifiers, and apply them to teaching clinical reasoning.*
  - *Understand how (method) to teach clinical reasoning.*

Introduction

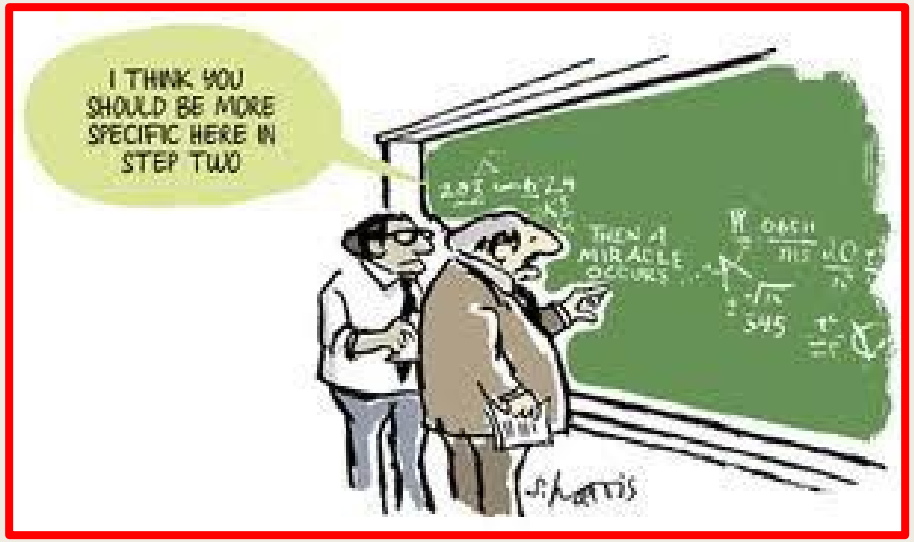
(Bowen, JL. Educational Strategies to Promote clinical Diagnostic Reasoning. *N Engl J Med*, .2006;355:2217-25.)

- Clinical educators must diagnose a patient's clinical problem AND the students' knowledge and skills.

- To assess if students possess accurate and effective clinical diagnosing skills, teachers need to consider the following:
  - *What exactly is clinical reasoning?*
  - *How do doctors think?*
  - *How do students learn in the clinical setting?*

Exercise 1

10 minutes to:



1. Define clinical reasoning.

2. Describe how do you think doctors think.

3. Describe how do you think students learn clinical reasoning in a clinical learning environment.

Clinical Reasoning Defined

- There are many conceptualizations of clinical reasoning including multiple theoretical frameworks, research methodologies, and assessment approaches. (Young M, Thormas A., Lubarsky S et. al. Drawing Boundaries: The Difficulty in Defining Clinical Reasoning. *Acad Med.* 2018: Jan. 23)
  - *To implement a SYSTEMATIC way of teaching, we will only discuss one theoretical framework (the most common).*

- Clinical Reasoning Definitions:
  - *"the **cognitive operations** allowing clinicians to observe, collect, and analyze information that ultimately leads to an action (i.e. diagnosis and therapy). Clinical reasoning refers to the **steps up to and including establishing the diagnosis and treatment**, which **differs from clinical decision making** where the emphasis is on the decision step (establishing the diagnosis and treatment). "* *(Holmboe E, Durning S. Assessing clinical reasoning: moving from in vitro to in vivo. Diagnosis 2014; 1(1): 111.)*
  - *A **process** in which clinicians collect, process, and interpret patient information to develop an action plan.* (Department of Internal Medicine, Carver College of Medicine. Retrieves on March 3, 2018 from https://medicine.uiowa.edu/internalmedicine/education/master-clinician-program/information-students/clinical-and-diagnostic-reasoning)
  - *"Clinical reasoning is a **complex cognitive process** that involves data gathering, hypothesis generation, hypothesis testing and refinement, the development of a differential diagnosis, the selection of a working diagnosis, and the implementation of a management plan."* (Weinstein A, Gupta S, Pinto-Powel R, et.al. Diagnosing and Remediating Clinical Reasoning Difficulties: A Faculty Development Workshop. *MedEdPORTAL.* 2017;13:10650.)

How do doctors think?

(Gigante J. Teaching Clinical Reasoning Skills to Help your Learners “Get” the Diangosis. *Pediat Therapeut.* 2012; 3(4).)

- *“Expert clinicians **unconsciously** run through checklists, leap past details and take short cuts to reach correct diagnosis”.* (Gigante J. Teaching Clinical Reasoning Skills to Help your Learners “Get” the Diangosis. *Pediat Therapeut.* 2012; 3(4).)

- Expert clinicians store and recall knowledge as **illness scripts** (diseases, conditions or syndromes) which are directly linked to problem representations which trigger clinical memory (stored knowledge) which is then accessible for reasoning. (Bowen J. Educational Strategies to Promote Clinical Diagnostic Reasoning. *N Engl J Med.* 2006; 355:2217-25)

- Expert clinicians have experience and, thus, many illness scripts. (Bowen J. Educational Strategies to Promote Clinical Diagnostic Reasoning. *N Engl J Med.* 2006; 355:2217-25)

Another way of explaining how doctors think:

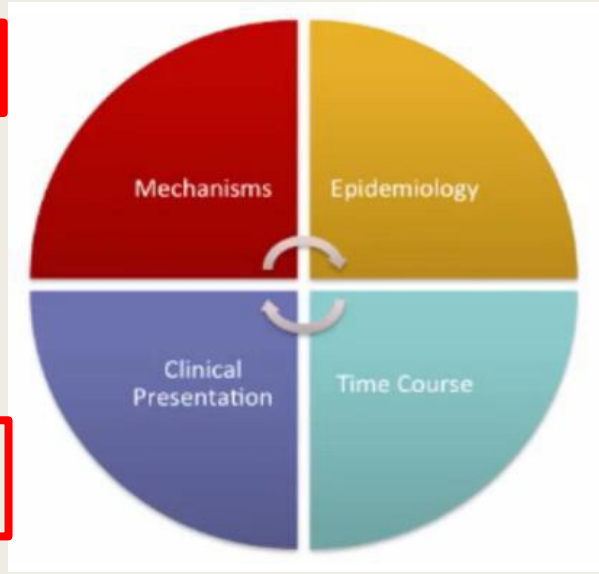
- Exhaustive method
  - *Gather every bit of data possible, don't miss a thing! Then try to come up with a diagnosis.*
- Hypothesis generation
  - *Propose an explanatory hypothesis- see if it "fits" the story. Revise as you go along.*
- Pattern recognition
  - *Know it when you see it- you've seen it before*
- **In reality- clinicians use a combination of ALL these methods that involve System 1 and System 2 thinking**

Weinstein A, Gupta S, Pinto-Powel R, et.al. Diagnosing and Remediating Clinical Reasoning Difficulties: A Faculty Development Workshop. MedEdPORTAL. 2017;13:10650.

What is an illness script?

- An organized mental summary or construct that clinicians use to create clinical memory.
- They are based on experiential knowledge about diseases and conditions.
- Illness scripts structure: **predisposing condition, pathophysiologic insult, and clinical consequences.**
  - *Epidemiology*
  - *Time course*
  - *Pathophysiology*
  - *Salient symptoms and signs*
  - *(Diagnostics)*
  - *(Treatment)*

Pathophysiology of this disease



Who gets it

Symptoms, PE findings, lab findings typical of this disease

Typical time course of this disease

Gigante J. Teaching Clinical Reasoning Skills to Help your Learners "Get" the Diangosis. *Pediat Therapeut.* 2012; 3(4).
Ghea R, Connor DM, Kohlwes J, Manesh R. Illness Scripts. *Journal of General Internal Medicine.* Retrieved on March 1 2018 from http://www.sgim.org/web-only/clinical-reasoning-exercises

Expert Organization of Information

Illness script

Epidemiology: who gets it?

- Demographics (Age, Gender and Race or Ethnicity).
- Risk Factors: Other Conditions
- Exposers

Temporal Course: How does this disease present with respect to time?

- Duration of Prodrome or Symptoms: Hyperacute, Acute, Subacute, Chronic
- Pattern of Prodrome or Symptoms: Constant (Stable or worsening), Episodic (Waxing and waning, Biphasic or Interment).

Pathophysiology: What are the biomedical causes of this disease?

- What are the known derangements in: Anatomy, Physiology, Immunology, Biochemical pathways, Genetics, and Metabolomics.
- What are known environmental contributors: Microbiology, Toxins, and Pharmacology.

Clinical presentation (Syndrome Statement)

- Key and Differentiating Features ± MUST HAVE & REJECTING Features.

https://www.slideshare.net/MuhammedElhadyMuhamm/facilitation-of-clinical-reasoning-during-bedside-teaching-workshop-for-clinical-preceptors

- They represent the clinicians knowledge of a particular disease and may be short or long, detailed or summarized, may include a mental representation of a specific patient, depending on the clinician's experience.

- Experts develop their illness scripts by:
  - *Mentally storing the features or characteristics of a disease and the probability of them being present, therefore they can estimate the likelihood of a diagnosis when a feature or characteristic is present or absent.*
  - *Emphasizing (in their mental store) distinguishing characteristics (defining and discriminating clinical features) called **anchor points**, that alter the likelihood of a diagnosis and helps differentiate it from other diagnosis.*
  - *Develops a list of disease mimickers or differentials.*

- **Are illness scripts enough for every clinical case?**

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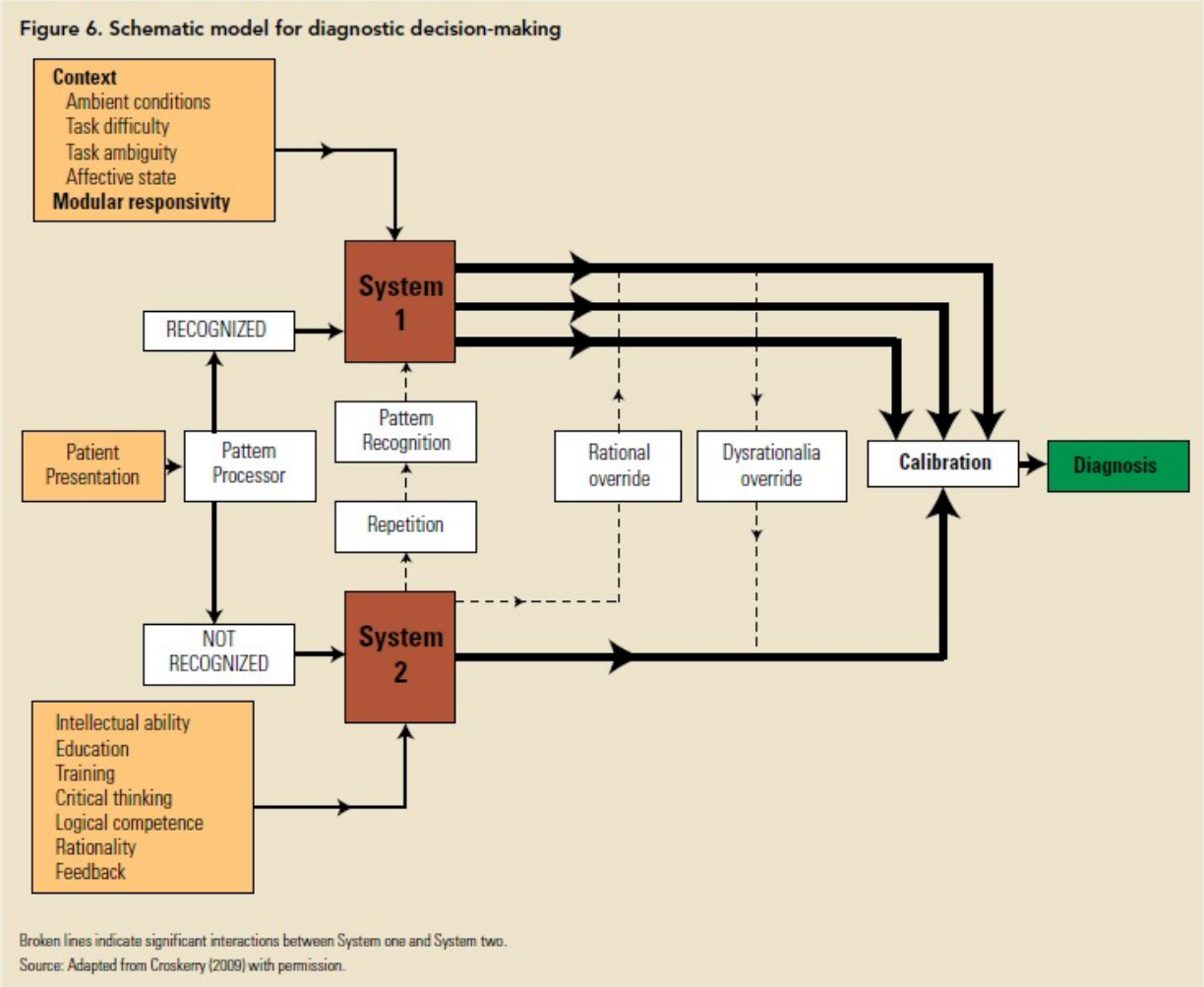
Cognitive Theories of Clinical Reasoning

- System 1- intuitive (non-analytical), fast, used by experts, **based on pattern recognition.**
- System 2- analytical, rational, slower, deliberate, reliable and focuses on hypothetical-deductive reasoning.
  - *For complex cases*
  - *Ill defined cases*
  - *Unusual clinical findings*
  - *Little experience with case*
- When System 2 overrides System 1- **Rational Override.**
- When System 1 overrides System 2- dysrational override



Manesh R, Connor DM, Kohlwes J, Dual Process Theory (System 1 and System 2 Clinical Reasoning). *Journal of General Internal Medicine.* Retrieved on March 1 2018 from http://www.sgim.org/web-only/clinical-reasoning-exercises

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Bowen J. Educational Strategies to Promote Clinical Diagnostic Reasoning. *N Engl J Med.* 2006; 355:2217-25)

- The activation of one or the other system depends on prior experience with a clinical presentation and if the clinician has an illness script, for that specific diagnosis, stored in memory.

- In reality, both processes are used simultaneously and clinicians oscillate between the two with all cases (or at least they should).

- Expert clinicians arrive quickly to a diagnosis from activation of System 1 and then, to avoid mistakes, they check this diagnosis using System 2.

- It seems easy enough, but it is not:
  - *The cycle of clinical reasoning is an iterative process that never ends.*
  - *It is complex to learn and harder to teach.*
  - *Thus, it is separated into specific steps, within a cycle, which are commonly known as "decision making".*

Manesh R, Connor DM, Kohlwes J, Dual Process Theory (System 1 and System 2 Clinical Reasoning). *Journal of General Internal Medicine.* Retrieved on March 1 2018 from http://www.sgim.org/web-only/clinical-reasoning-exercises
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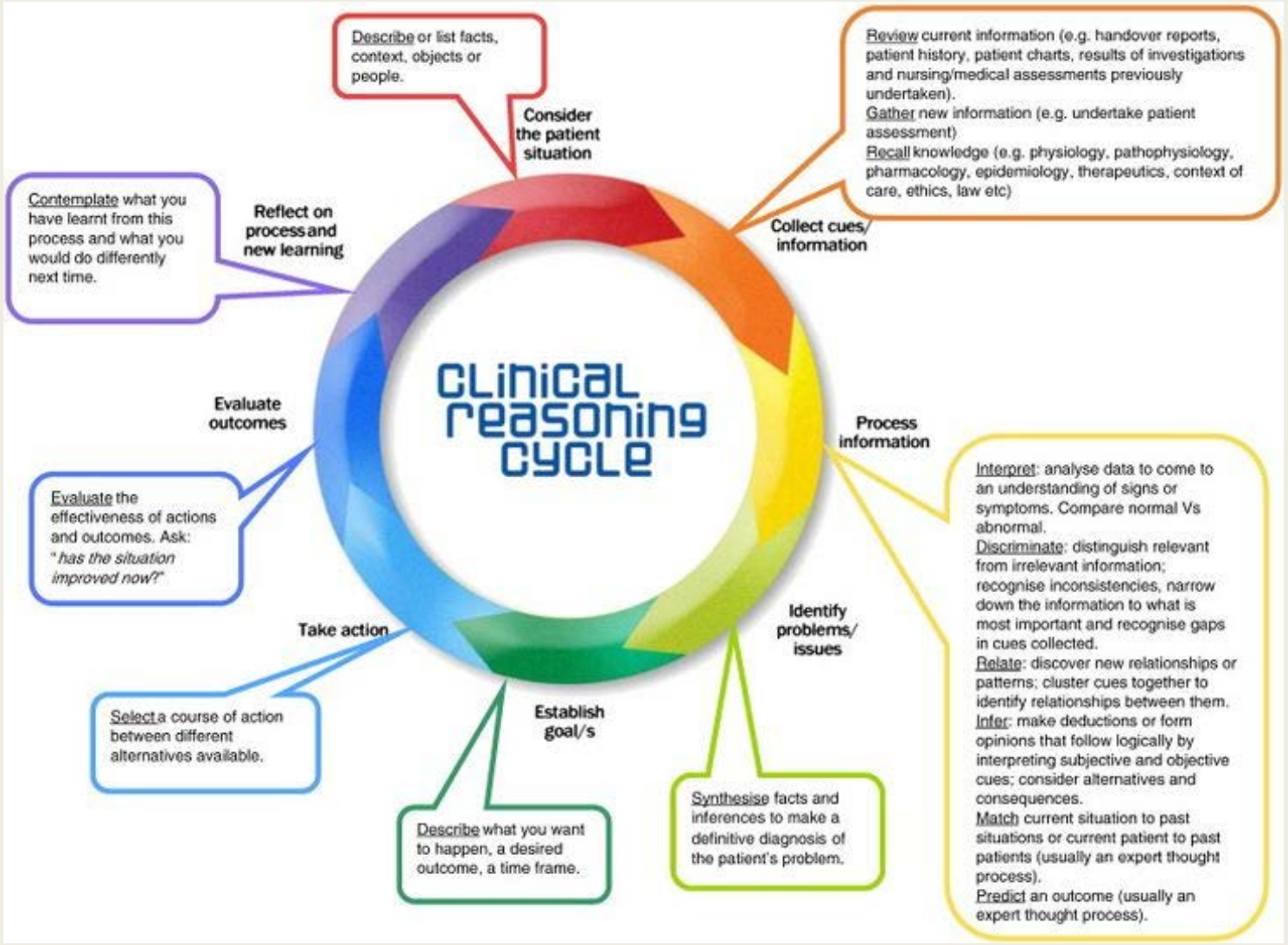

https://www.pinterest.com/rejoiceing/nursing/

Students Learning Process

- Students organize medical knowledge according to how they are taught- systems based, case based, etc.
- Recall is best when the question can be answered by the manner of how the curriculum is organized (this is ONE of the reasons why a systems based curriculum with lots of clinical correlations is better than a discipline based curriculum).
- The clinical setting requires that the student constructs a story, based on the patient's history and physical exam, and then compare it to their knowledge, thus the process may be slow.
- **Students need to make connections between clinical encounters and their knowledge to be able to later on retrieve this knowledge when presented with a clinical feature.**

Bowen, JL. Educational Strategies to Promote clinical Diagnostic Reasoning. *N Engl J Med*, .2006;355:2217-25.

Why should we teach clinical reasoning?

- There really is not enough time to rely on time and experience so that students, by themselves and without any guidance and help, develop the knowledge and skills necessary to apply systems 1 and 2.

- Exposure to cases, especially difficult ones, helps students acquire and store knowledge in an illness script fashion which later they can retrieve.

- Clinical reasoning is essential to care for patients, to communicate with collogues, and to educate others.

Gigante J. Teaching Clinical Reasoning Skills to Help your Learners “Get” the Diangosis. *Pediat Therapeut.* 2012; 3(4).
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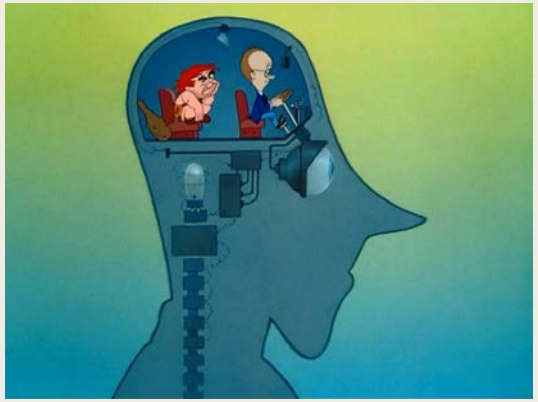
How can we teach students clinical reasoning?

- Deliberate Practice
  - *Teachers need to develop teaching sessions where clinical reasoning is taught and practiced.*
  - *The process has to be simplified into the clinical decision making steps.*
  - *The goal is to achieve the ability to apply both systems (non-analytical and analytical) to a given clinical case, systematically.*
    - Develop illness scripts.
    - Learn how to think analytically.

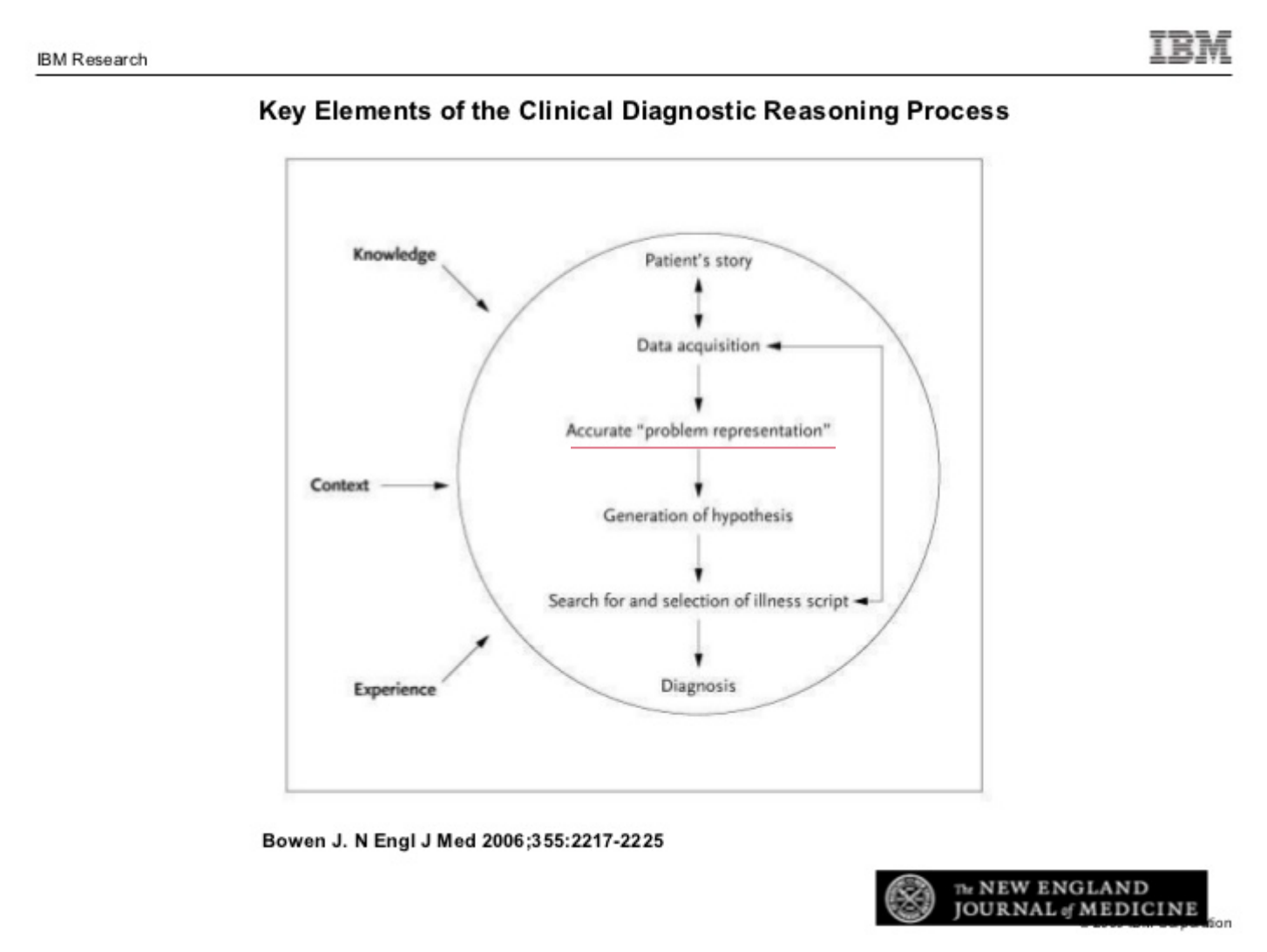
Benitez J. Expertise in Clinical Decision Making. Retrieved on March 2 2018 from https://www.aliem.com/2014/02/expertise-clinical-decision-making/ Academic Life in Emergency Medicine Webpage.

TEACHING CLINICAL REASONING TO MEDICAL STUDENTS



http://www.news-gazette.com/arts-entertainment/local/2015-06-29/richard-j-leskosky-mental-processes-characters-nothing-new.html

Teach students to systematically go through the Clinical Reasoning Process:



Clinical Reasoning Process

Simplified Components

1 **Gather information about the patient**

2 **Organize & interpret this information**

3 **Select the most likely diagnosis**

4 **Select a treatment plan**

More specifically- what should we teach students?

- Become more refined at data gathering (history, physical exam, laboratories, imaging etc.).
- Correctly **organize** and **interpret** the data into an accurate problem representation.
- Correctly hypothesize the most probable diagnosis ("working diagnosis") and the differential diagnosis.
  - *Develop or refine illness scripts for both, the working diagnosis and the differential diagnosis.*
- Decide on a course of action (management/treatment plan).
- Re-assess the patient, the diagnosis, and the outcomes of the actions taken.

Clinical Reasoning Process
From the patient story to the diagnosis

Gather clinical information

History taking

Physical exam

Labs, studies

Organize & interpret the information

1.Risk factors, clinical findings (signs and symptoms)

→**Problem representation**

2. List of possible diagnoses

→ **Differential diagnosis**

3. Narrow the list of possibilities

→ **Prioritized differential diagnosis**

Select a diagnosis

After testing your hypotheses, decide which one fits your patient the best.

→ **Working diagnosis**

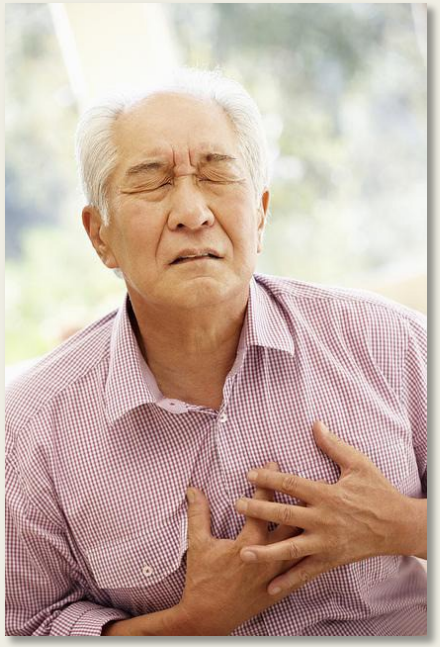
Data gathering includes:

- History
- Physical exam findings
- Results of laboratory testing.
- Results of imaging studies.

Gather information about the patient

Bowen J. Educational Strategies to Promote Clinical Diagnostic Reasoning. *N Engl J Med.* 2006; 355:2217-25)

Case Example



An 80 year old male presents to the emergency department with chest pain.

- *What do you want to know and do?*

Gather information about the patient

Common Questions in the History

- *How sick is this patient?*
- *What are some of the causes of the chest pain I know?*
- *Which of these causes of chest pain is most likely in this case?*
- *Which of these are less likely but critical not to miss?*
- *Does he have risk factors for CAD?*

Gather information about the patient

Physical Exam

- General appearance
- Vital signs
- Examination of heart and lungs.
- Examination of abdomen.
- Examination of extremities.

Gather information about the patient

Laboratories

- *Need for testing based on pre test probability*

Gather information about the patient

Probability of Coronary Artery Disease

Once all these initial evaluations are complete, it is possible to estimate a patient's probability of existing CAD before proceeding with stress testing or coronary angiography (Table 2).

Table 2: Pretest Probability of Coronary Artery Disease (CAD) by Age, Gender, and Symptom Status*

Age, (years)†	Gender	Typical or Definite Angina Pectoris	Atypical or Probable Angina Pectoris	Nonanginal Chest Pain	No Symptoms
30-39	Male	Intermediate	Intermediate	Low	Very low
	Female	Intermediate	Very low	Very low	Very low
40-49	Male	High	Intermediate	Intermediate	Low
	Female	Intermediate	Low	Very low	Very low
50-59	Male	High	Intermediate	Intermediate	Low
	Female	Intermediate	Intermediate	Low	Very low
60-69	Male	High	Intermediate	Intermediate	Low
	Female	High	Intermediate	Intermediate	Low

Adapted from Gibbons RJ, Balady GJ, Beasley JW, et al: ACC/AHA guidelines for exercise testing: Executive summary. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Exercise Testing). Circulation 1997;96:345-354.

* High probability, >90%; intermediate, 10%—90%; low, <10%; very low, <5%.
† No data exist for patients aged >30 years or <69 years, but it can be assumed that the prevalence of CAD increases with age. In a few cases, patients at the extremes of each decade may have probabilities slightly outside the high or low range.

Stress Testing

Stress testing is another method for determining the presence of flow-limiting, functionally significant coronary artery disease. All stress testing techniques include

Key features of organizing and interpreting the information

- Data synthesis & problem representation development
- Illness script scanning/refinement

OR

- Illness script development
- Differential diagnosis formulation
- Awareness of cognitive biases

Organize & interpret this information

Key features of **organizing and interpreting the information**

- Data synthesis & problem representation development

- Illness script scanning/refinement

OR

- Illness script development

- Differential diagnosis formulation

- Awareness of cognitive biases

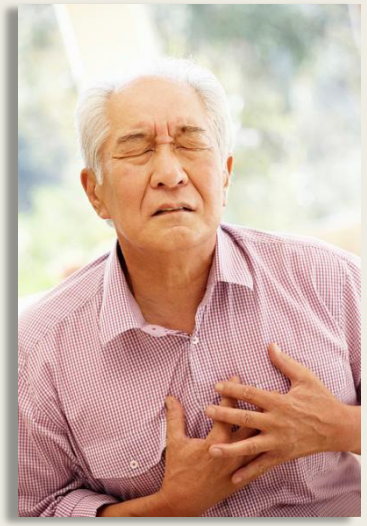
Organize & interpret this information

Data synthesis & problem representation development

- Data synthesis:
  - *What are the **key features** from the history and PE?*
    - Tempo/course of the CC/HPI
    - Age, exposures, other risk factors
    - General appearance on exam
  - *What features of the patient's history and PE findings are **normal vs. abnormal?***
  - *Can the patient's illness be characterized as a particular **syndrome?***
  - *What are the **key features** from the history and PE?*
    - Tempo/course of the CC/HPI
    - Age, exposures, other risk factors
    - General appearance on exam

Organize & interpret this information

Case example



History:

80 year old with a **40 pack** year history of **cigarette** smoking Describes **acute onset** of **crushing** chest pain associated with shortness of breath **at rest**.

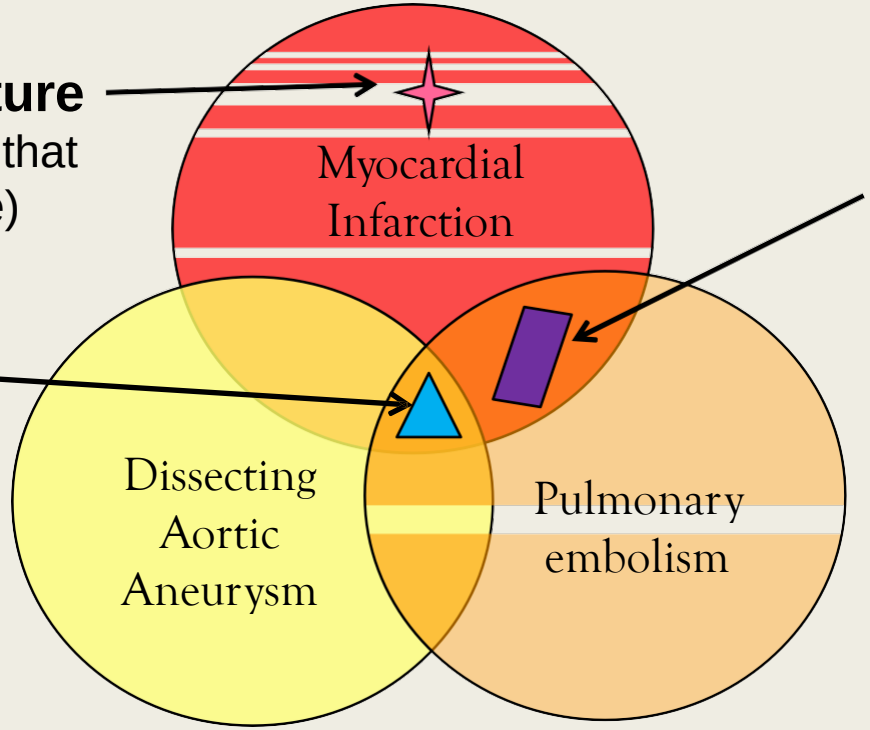
The patient has a **history of** coronary artery disease with a **prior MI** and stent placement at age 74.

He has a **family history** of his dad with a MI at age 60.

Organize & interpret this information

Identifying Differentiating & Key Features

Clues or anchor points, that can help generate a differential diagnosis and distinguish between diseases with shared characteristics



Key Feature
(unique to that disease)

Differentiating Feature
(unique to a subset of diseases)

Syndrome
(constellation of signs and symptoms that are common to several diseases)

Organize & interpret this information

Bowen, 2006
Organizing Knowledge and Information, Dr. Catherine Lucey

Data synthesis & Problem Representation development

- One sentence summary (summary)
- Highlights the defining features of the case.
- Is a summary of the clinician's thoughts.
- Helps generate the differential diagnosis.
- Is the "one liner" statements that should be used during rounds, presentation, and patient notes to summarize patient cases.
- It is updated as the clinician gathers more data.
- It is how clinicians really communicate with one another.

Organize & interpret this information

Olenik J, Kohlwes J, Manesh RS, Connor D. Problem Representation. *Journal of General Internal Medicine.* Retrieved on March 1 2018 from http://www.sgim.org/web-only/clinical-reasoning-exercises

Data synthesis & Problem Representation Development

- Should answer three questions:
  - *Who is the patient- demographics and risk factors.*
  - *What is the temporal pattern of the illness- length (hyperacute, acute, subacute, chronic) and tempo (stable, progressive, resolving, intermittent, waxing and waning).*
  - *What is the clinical syndrome- key signs and symptoms.*
- Should activate illness scripts so clinicians can compare and prioritize the diff dx.
- Failure to generate an appropriate problem representation may result in a broad diff. dx. that is based on isolated findings.

Organize & interpret this information

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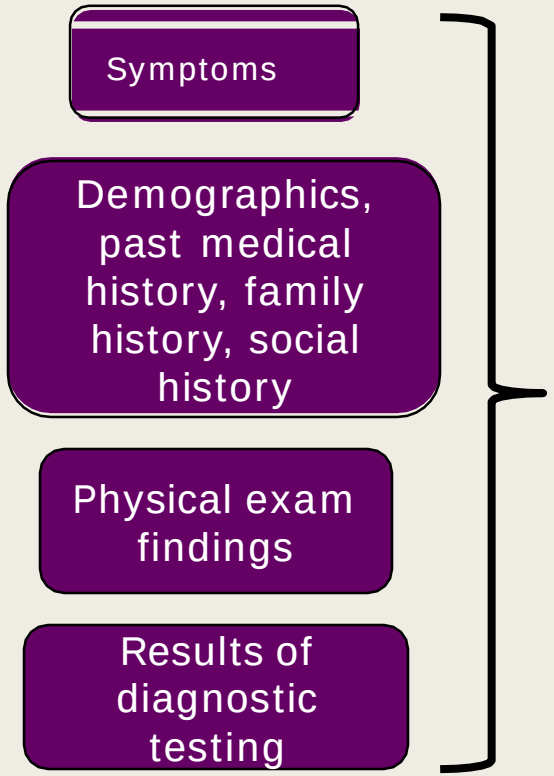
Data synthesis & Problem Representation Development

- Problem representations are rarely used and need to be required deliberately so that learners understand how to develop them.
- As learners gain expertise, they refine the problem representations which makes it easier to develop and/or activate illness scripts.



Problem representation: constellation of noteworthy clinical findings (the "clinical picture")

Organize & interpret this information

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Case Example
Problem Representation

Organize & interpret this information

Patient chief complaint

80 year old man with sudden onset of crushing retrosternal chest pain

Patient demographics
+ findings in the history

80 year old man who is a 40 pack year smoker with a h/o HTN, hyperlipidemia, previous MI and stent placement at age 74. Pain is associated with SOB at rest

Patient demographics
+ findings in the history
+ findings on physical examination

80 year old smoker with HTN, hyperlipidemia and previous CAD who comes in with crushing retrosternal CP and SOB. On exam has bibasilar crackles and an S3 gallop.

*In the clinical documentation, the **problem representation** is articulated as a **summary statement.***

Data synthesis & Problem Representation Development *Summary Statement*

Organize & interpret this information

- Remember, a good problem representation and its summary statement, must answer:
  - *Who is the patient- demographics and risk factors.*
  - *What is the temporal pattern of the illness- length (hyperacute, acute, subacute, chronic) and tempo (stable, progressive, resolving, intermittent, waxing and waning).*
  - *What is the clinical syndrome- key signs and symptoms.*
- It also MUST contain discriminating features and pertinent patient details that are converted into **semantic qualifiers.**

Olenik J, Kohlwes J, Manesh RS, Connor D. Problem Representation. *Journal of General Internal Medicine.* Retrieved on March 1 2018 from http://www.sgim.org/web-only/clinical-reasoning-exercises

Fleming A, Cutrer W, Reimschisel T, Gigante J. You Too Can Teach Clinical Reasoning! *Pediatrics. 2012;* 130(5): 795-797.

Semantic Qualifiers

Organize & interpret this information

- Semantic qualifiers are medical terminology.
- They are abstract representation of a case finding.
- They help clinicians compare and contrast findings to arrive to a diff. dx.
- Generally exist in divergent pairs.
  - *acute vs. chronic*
  - *sharp vs. dull*
  - *bilateral vs. unilateral*
  - *constant vs. intermittent*
  - *mild vs. severe*
  - *at rest vs. with activity*

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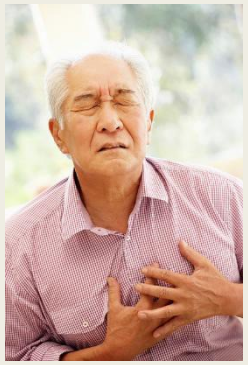
Case example

Organize & interpret this information

Key findings in our patient

WITHOUT SEMANTIC QUALIFIERS	WITH SEMANTIC QUALIFIERS
CHEST PAIN	ACUTE ONSET, **SEVERE**, CRUSHING CHEST PAIN
SOB	CHEST PAIN AT REST
HISTORY OF CORONARY ARTERY DISEASE	ACUTELY SHORT OF BREATH AT REST
FAM HX OF MI, 40 PACK YEAR HX OF CIGARRETTE SMOKING	CHRONIC RISK FACTORS INCLUDE HX OF CAD + FAM HX OF EARLY MI, 40 PACK/YEAR OF CIGARRETTES

Data synthesis & Problem Representation Development *Summary Statement*



Organize & interpret this information

Case example

80 year old man with history of coronary artery disease and previous stent, +family history of early myocardial infarction, and 40 pack year history of cigarette smoking presents with acute onset of severe crushing chest pain and shortness of breath at rest. On exam he appears ill and has bibasilar crackles and an S3 gallop.

Exercise 2

10 minutes to:

- Develop a summary statement for this case using semantic:

17 y/o female patient with a history of 1 ear infection who presents to the emergency room with a 3 day history of fever (40-41 degrees C) and abdominal pain. The pain was in the peri-umbilical region, dull and started as a 6/10. Now it is in the right lower quadrant and is 10/10 pain. She has vomited twice and has not eaten anything for the last 2 days.

Adapted from: Fleming A, Cutrer W, Reimschisel T, Gigante J. You Too Can Teach Clinical Reasoning! *Pediatrics. 2012;* 130(5): 795-797.

Key features of organizing and interpreting the information

- Data synthesis & problem representation development
- Illness script scanning/refinement

OR

- Illness script development
- Differential diagnosis formulation
- Awareness of cognitive biases

Organize & interpret this information

Illness Script Scanning

Organize & interpret this information

- With a good problem representation, clinicians (including medical students) will unconsciously scan to see if they already have an illness script that bests match the patient presentation.

- If there is an illness script then, they will use it to develop the diff. dx., the working dx. and a course of action (diagnosing/treatment).

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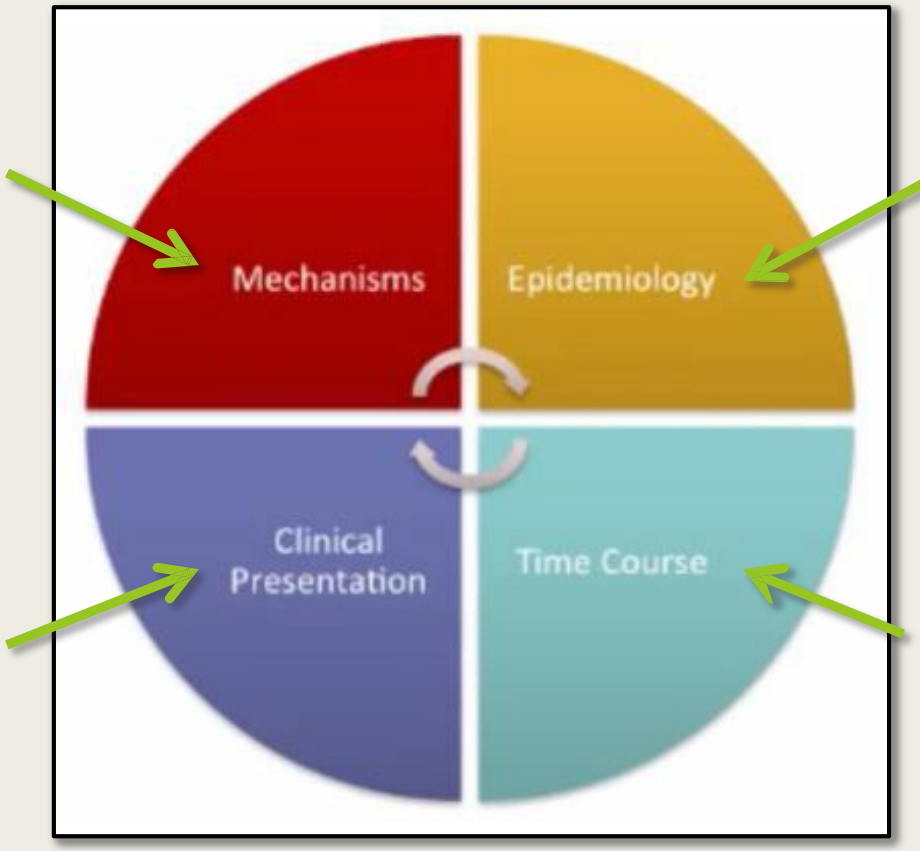
Remember...

Illness Scripts

Pathophysiology of this disease



Who gets it

Symptoms, PE findings, lab findings typical of this disease

Typical time course of this disease

Organize & interpret this information

Organizing Knowledge and Information, Dr. Catherine Lucey

Illness Script of an MI:

Epidemiology: middle age and older, males > females, HTN, hyperlipidemia, +history of coronary artery disease, +cigarette smoking, +family history of early CAD.

Pathophysiology: impaired blood flow and hypoxia of myocardial tissue leading to cell death.

Clinical Presentation: chest pain, SOB, diaphoresis, syncope/arrhythmia, signs of heart failure on exam.

Time course: acute onset chest pain with gradual worsening; exertional.

Organize & interpret this information

Illness Script & Differential Diagnosis Development

Organize & interpret this information

- Lack of experience equals lack of a robust number/content of illness scripts.
- With a good problem representation, clinicians and medical students can develop/refine illness scripts to include in their working memory.
- Illness script development and thus, pattern recognition, should be based on the knowledge of the typical presentation of a problem and as many variations as possible (atypical presentations).
  - *Thus the activation or creation of illness scripts follows a hypothesis driven method.*
- Because a patient presentation may be similar in one or more diagnosis, the process of developing illness scripts includes developing a working dx and a diff. dx.

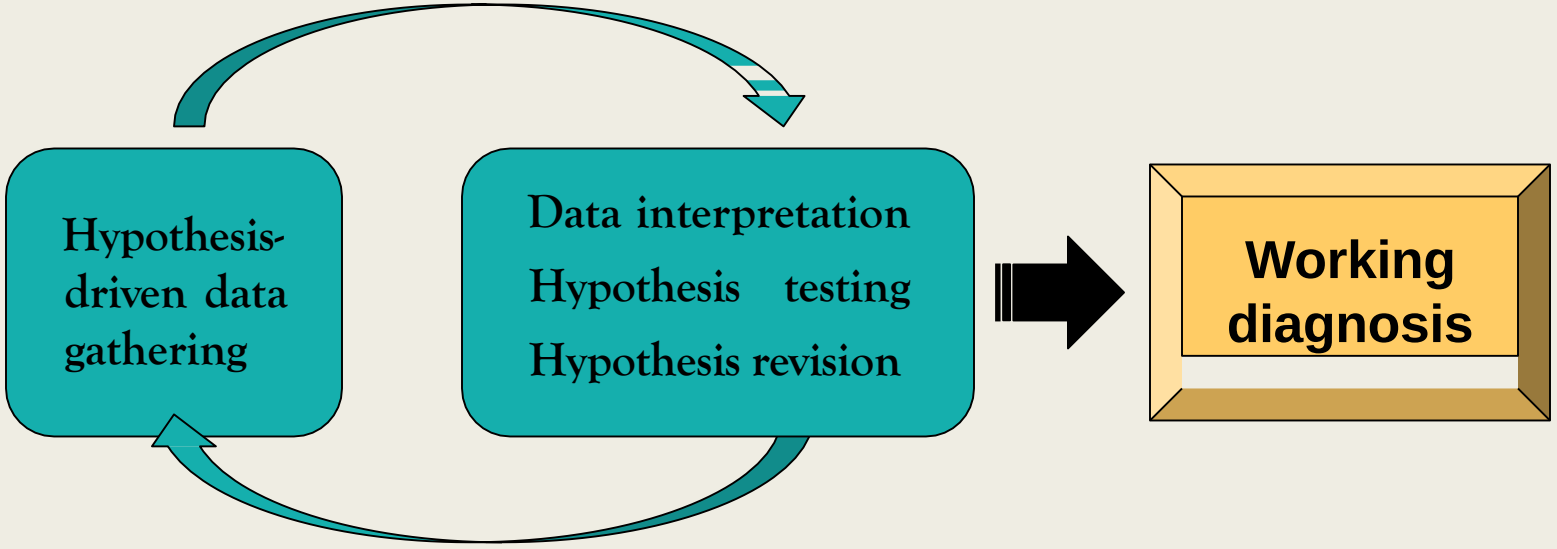
Illness Script & Differential Diagnosis Development

Organize & interpret this information

The Working Diagnosis

The diagnosis considered ***most likely*** at a given point in the data gathering process.

Select the most likely diagnosis



Can change at any point if new clinical information alters the differential diagnosis accordingly (e.g., new sx's, PE findings, or study results inconsistent with previous working diagnosis).

Illness Script & Differential Diagnosis Development

Organize & interpret this information

- Comparing and contrasting the most probable (working) diagnosis and its differential, is the best way, not only to teach clinical reasoning, but also to develop robust illness scripts.

- The comparison should include:
  - *Predisposing conditions*
  - *Pathophysiologic insult*
  - *Clinical consequences (signs, and symptoms)*

Select the most likely diagnosis

Fleming A, Cutrer W, Reimschisel T, Gigante J. You Too Can Teach Clinical Reasoning! *Pediatrics. 2012;* 130(5): 795-797

Exercise 3

10 minutes to:

- Compare illness scripts for the most likely diagnosis (working diagnosis) and at least two differential diagnosis for this case.

17 y/o female patient with a history of 1 ear infection who presents to the emergency room with a 3 day history of fever (40-41 degrees C) and abdominal pain. The pain was in the peri-umbilical region, dull and started as a 6/10. Now it is in the right lower quadrant and is 10/10 pain. She has vomited twice and has not eaten anything for the last 2 days.

Adapted from: Fleming A, Cutrer W, Reimschisel T, Gigante J. You Too Can Teach Clinical Reasoning! *Pediatrics. 2012;* 130(5): 795-797.

Key features of organizing and interpreting the information

- Data synthesis & problem representation development
- Illness script scanning/refinement

OR

- Illness script development
- Differential diagnosis formulation
- Awareness of cognitive biases

Organize & interpret this information

Common cognitive biases

Organize & interpret this information

- ***Anchoring bias***
  - Tendency to latch on to first symptom or finding, and failing to adjust despite later information that does not fit.
    - *e.g., Pulmonary embolism can cause chest pain and shortness of breath, so it must be that. Not sure why the fever of 102.*

Select the most likely diagnosis

- ***Availability bias***
  - Tendency to have a recent case influence your judgment
    - *e.g., Just saw a case of pneumothorax present just like this, so this patient likely has a pneumothorax.*

- ***Ascertainment /Stereotype bias***
  - Tendency to let a stereotype explain the symptom
    - *e.g., People who smoke get pneumonia, so that's probably the cause of this patient's symptoms.*

Croskerry P. Achieving Quality in Clinical Decision making: Cognitive Strategies and Detection of Bias. *Acad Emerg Med.* 2002; 9(11): 1184-1204.

Common cognitive biases

Organize & interpret this information

- ***Representativeness***
  - Tendency to focus on the prototypical of a disease. Data similar to this category are overemphasized and atypical variants may be overlooked or missed.
- ***Outcome****:*
  - Tendency to favor a diagnosis associated with effective treatment options or a favorable outcome.

Select the most likely diagnosis

- ***Overconfidence:***
  - Tendency to overestimate one's competence. Decisions are based more on opinion than a carefully collected evidence.
- ***Confirmation:***
  - Tendency to look only for those cues that confirm a diagnosis rather than those that disconfirm it.

Croskerry P. Achieving Quality in Clinical Decision making: Cognitive Strategies and Detection of Bias. *Acad Emerg Med.* 2002; 9(11): 1184-1204.

Cognitive biases- awareness and prevention

Organize & interpret this information

Metacognition: *thinking about your own thinking*

Select the most likely diagnosis

"It distinguishes…the thinking of experts from that of nonexperts." (Croskerry 2003)

Croskerry P. Achieving Quality in Clinical Decision making: Cognitive Strategies and Detection of Bias. *Acad Emerg Med.* 2002; 9(11): 1184-1204.

Cognitive biases- awareness and prevention

Organize & interpret this information

Select the most likely diagnosis

- *Stop and think:*
  - What else could this be?
  - Does anything not fit in this story?
  - Could more than one thing be happening with this patient?

Croskerry P. Achieving Quality in Clinical Decision making: Cognitive Strategies and Detection of Bias. *Acad Emerg Med.* 2002; 9(11): 1184-1204.

Steps for Teaching Clinical Reasoning

1. Student present the data about the patient (draft 1 of the problem presentation).
2. Discuss relevant semantic qualifiers.
3. Re-construct the problem presentation as a summary statement using semantic qualifiers.
4. Hypothesis, based on knowledge and prior illness scripts, most probable diagnosis (working diagnosis).
5. Compare (predisposing conditions, pathophysiologic insult and clinical consequences) the working diagnosis and at least X diff. dx.
6. Select the illness script that best matches the patient's presentation.
7. Evaluate for cognitive biases.
8. Confirm the working diagnosis.
9. Develop a plan.
10. Re-assess patient and go through the process again.

Fleming A, Cutrer W, Reimschisel T, Gigante J. You Too Can Teach Clinical Reasoning! *Pediatrics. 2012;* 130(5): 795-797.

Goals and Objectives

- At the end of this workshops, faculty should be able to:
  - *Understand and apply the dual processing cognitive theory explaining clinical reasoning.*
  - *Define illness scripts, problem presentation, and semantic qualifiers, and apply them to teaching clinical reasoning.*
  - *Understand how (method) to teach clinical reasoning.*

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