Teaching Clinical Reasoning

Faculty Development Series for Clinical Teachers 201

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  • Course Director of Resident and Student as Teacher
• Gaby Berger, MD, University of Washington
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• Dennis Beatty, MD, University of Vermont
Objectives:

Following this session, attendees should be able to:

• Define clinical reasoning
• Utilize the following tools 1) Illness Scripts 3) Diagnostic Schema 3) Problem Representation
• Describe how clinicians at different levels of experience may use the above concepts differently
• Utilize the “Assessment of Clinical Reasoning Tool” and the “One-Minute Preceptor”
Clinical reasoning involves the “synthesis of myriad clinical and investigative data to generate and prioritize an appropriate differential diagnosis and inform safe and targeted management plans.”

Thampy et al 2019
So. Much. Theory.

- Bayes Theorem
- Causal reasoning
- Diagnostic discrimination
- Cognitive Biases
- Diagnostic Verification
Let’s simplify to three basic tools

- Illness scripts
- Diagnostic Schema
- Problem representation
Dual Process Theory

System 1

System 2

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Dual Process Theory

Master clinician

System 1
- Fast
- Automatic

Pattern recognized?
- yes
  - Repetition Practice
  - System 1
- no
  - System 2
    - Slow
    - Analytical

Diagnosis
- Override

Learner

Adapted from: Clinical Decision Making, Karolina Kucybala, MD and Gaby Berger, MD, University of Washington, 2020
The typical presentation of a disease

“What’s the typical story of this disease?”
### Diagnosis

<table>
<thead>
<tr>
<th>Predisposing Condition</th>
<th>Migraine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset teens to 40’s</td>
<td></td>
</tr>
<tr>
<td>Female &gt; Male</td>
<td></td>
</tr>
<tr>
<td>Genetic predisposition</td>
<td></td>
</tr>
<tr>
<td>Many possible triggers (dietary factors, sleep disruption, bright lights, etc)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pathophysiologic Insult</th>
<th>Aura caused by spreading cortical depression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vasodilation/Vasoconstriction</td>
</tr>
<tr>
<td></td>
<td>Trigeminovascular reflex</td>
</tr>
<tr>
<td></td>
<td>Decreased serotonin levels</td>
</tr>
<tr>
<td></td>
<td>Lasts 4-72 hrs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinical Consequences</th>
<th>Often unilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Throbbing/pulsating pain</td>
</tr>
<tr>
<td></td>
<td>Light and/or sound sensitivity</td>
</tr>
<tr>
<td></td>
<td>Aura in 20%</td>
</tr>
<tr>
<td></td>
<td>Abortives: NSAIDS, triptans, ergots.</td>
</tr>
<tr>
<td></td>
<td>Prophylaxis: beta blockers, TCAs, Ca channel blockers, etc</td>
</tr>
</tbody>
</table>

### Illness scripts

1. **Predisposing conditions**
   - Epidemiology
   - Risk Factors

2. **Pathophysiologic insult**
   - Pathophysiology
   - Time Course

3. **Clinical Consequences**
   - Signs and Symptoms
   - Diagnostics
   - Treatments
25 y/o female presents with recurrent right frontal headaches

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Tension-type Headache</th>
<th>Migraine</th>
<th>Cluster Headache</th>
<th>Trigeminal Neuralgia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Predisposing Condition</strong></td>
<td>Most common primary headache</td>
<td>Onset teens to 40’s Female &gt; Male Genetic predisposition Many possible triggers (dietary factors, sleep disruption, bright lights, etc)</td>
<td>Onset age late 20’s-30’s Male &gt; Female Common triggers: Alcohol, lack of sleep, REM sleep</td>
<td>Usually Age &gt; 50 Female &gt; Male</td>
</tr>
<tr>
<td><strong>Pathophysiologic Insult</strong></td>
<td>Muscle contractions in the head and neck regions</td>
<td>Aura caused by spreading cortical depression Vasodilation/Vasoconstriction Trigeminovascular reflex Decr serotonin levels</td>
<td>Hypothalamic dysfunction Elevated neuropeptides (calcitonin gene-related peptide)</td>
<td>Severe Neuropathic pain in 5th cranial nerve (Trigeminal nerve) Nerve injury or compression</td>
</tr>
<tr>
<td><strong>Clinical Consequences</strong></td>
<td>Bilateral, band-like pain Mild to mod intensity Lasts 30 min to 4 hrs Scalp muscle tenderness Light or sound sensitivity, but NOT BOTH Not worsened by exertion</td>
<td>Often unilateral Throbbing/pulsating pain Lasts 4-72 hrs Aura in 20% Prodrome in 1/3 Light and/or sound sensitivity</td>
<td>Unilateral temporal/orbital severe pain Rapid onset, lasts 45-90 min Agitation and restlessness Ipsilateral autonomic symptoms Circadian periodicity</td>
<td>Unilateral severe shock-like pain Lasts seconds Can be triggered by facial stimuli</td>
</tr>
</tbody>
</table>
Systematic approaches to a clinical problem

“What’s your approach to this clinical problem?”
AKI  

**Extrinsic**
- **Prerenal**
  - ↓ Volume
  - ↑ Volume
  - Shunting
    - HRS
  - Meds
    - ACE/ARB
    - NSAIDS

  **Postrenal**
  - Bladder
    - BPH
  - Ureter
    - External Compression

**Intrinsic**
- ATN > Others

**Day 1 = Victim**

**Dx**
Anemia

**PRODUCTION**

- Lack of nutrients
  - B12, iron, folate
- Bone marrow disorders
  - Aplastic anemia, bone marrow infiltration
- Bone marrow suppression
  - Drugs (EtOH), chemotherapy
- Decreased trophic hormones
  - EPO
- Anemia of chronic disease
- Myelodysplastic syndromes

**DESTRUCTION**

- Extravascular
  - Intrinsic RBC defects
    - HS, SCD, PKD, G6PD, thalassemia
  - Extrinsic RBC defects
    - Liver disease, hypersplenism, infections, autoimmune hemolytic anemia
- Intravascular
  - Microangiopathic hemolytic anemia, PNH, Transfusion reactions

**BLOOD LOSS**
Diagnostic Schema: TEACHING TIPS!

- Great tool when
  - Your learner “gets stuck” building a differential or is anchoring
  - You have down time and nothing prepared
- MANY possible diagnostic schema for a given sign or symptom
- Teach YOUR approach
- Try winging it!
- Write it down and hand it to your learner afterward
A diagnostic schema on the fly
Problem representation

The one-liner, but MORE!

“Framing the clinical problem”
One sentence summary of case that addresses:

<table>
<thead>
<tr>
<th>1) Who is the patient?</th>
<th>Demographics &amp; Pertinent risk factors</th>
</tr>
</thead>
</table>
| 2) Temporal pattern of illness | Length: hyperacute, acute, subacute, chronic  
|                              | Tempo: stable, progressive, resolving, intermittent, waxing and waning |
| 3) Clinical syndrome         | Key symptoms and signs                |
A 60 yo man from rural Maine with a history of hypertension, hyperlipidemia, COPD, and a 40 pack year smoking history presents to the ER complaining of two days of increasing productive cough and dyspnea on exertion. He denies fever, sick contacts, recent travel, orthopnea, or weight changes. His initial vital signs reveal that he is afebrile and normotensive with a HR of 100, RR of 32, and SpO2 of 85% on RA. He appears dyspneic using accessory muscles, and his lung exam reveals decreased breath sounds throughout with occasional end expiratory wheezes.

**Problem representation 1:**
*This is a 60 man with a history of COPD, a 40 pack year smoking history who presents with acute shortness of breath, tachycardia, hypoxia, and wheezing.*

**Problem representation 2**
*This is a 60 man with a history of COPD who presents with acute hypoxic respiratory failure*
Case:
30 yo F presents to clinic with palpitations and shortness of breath worsening over the last 3 months. The palpitations occur intermittently, start suddenly, and last 30-45 min at a time. Yesterday she had an episode that lasted all day, so she made an appointment to be evaluated. During the episodes, she feels lightheaded and short of breath, which is scary. She has a history of major depression treated with citalopram. She recently started a new job and describes significant stress at work. She denies ankle edema and orthopnea. Her brother had sudden cardiac death while in high school.

Problem representation #1
30 yo F with history of major depression and recent job stress presents with chronic intermittent and progressive palpitations, lightheadedness, and shortness of breath

Problem representation #2
30 yo F with family hx of sudden cardiac death and on QT-prolonging medication presents with chronic intermittent and progressive palpitations, lightheadedness, and shortness of breath

Problem representation #3
30 yo F with major depression, recent job stressors, family hx of sudden cardiac death, on a QT-prolonging medication presents with chronic intermittent and progressive palpitations, lightheadedness, and shortness of breath
### Problem representation

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<td>3) clinical syndrome</td>
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### Teaching tips:
1) Accuracy and conciseness depends on the level of the learner
2) Including and excluding certain clinical components will trigger different illness scripts and diagnostic schema
Dual Process Theory

Master clinician

System 1

Pattern recognized?

System 2

Repetition Practice

Fast Automatic

Override

Slow Analytical

Diagnosis

Illness scripts
Diagnostic Schema
Problem representation

yes

no

Learner

Clinical Decision Making, Karolina Kucybala, MD and Gaby Berger, MD, University of Washington, 2020
Illness scripts
The typical story of a disease

Diagnostic Schema
Systematic approach to a clinical problem

Problem representation
The one-liner, but MORE!
Breakout room – 5 min:

Discuss:

1) An example of when you already use one of these tools

2) An opportunity in your work where you can use one
Breakout Room Debrief
Assessing Clinical Reasoning

Pre-clinical learners

Clinical learners

Assessment of Reasoning Tool, One-minute Preceptor

Objective Structured Clinical Examinations – “OSCE”

Script concordance tests, Key feature questions, Clinical integrative puzzles, virtual patients

Figure 1 Miller’s pyramid of clinical competence (supplied also as a .tif file). Adapted from Miller².

## ASSESSMENT of REASONING TOOL

### Did the Learner...

<table>
<thead>
<tr>
<th>Did the Learner...</th>
<th>Minimal</th>
<th>Partial</th>
<th>Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect/report history and examination data in a hypothesis-directed manner?</td>
<td>Non-directed in questioning and exam</td>
<td>Questioning and exam generally reflective of potential diagnoses, but some less relevant or tangential questions</td>
<td>Followed clear line of inquiry, directing questioning and exam to specific findings likely to increase or decrease likelihood of specific diagnoses</td>
</tr>
<tr>
<td>Articulate a complete problem representation using descriptive medical terminology?</td>
<td>Included extraneous information</td>
<td>Generally included key clinical findings (both positive and negative) but either missed some key findings or missed important descriptive medical terminology</td>
<td>Gave clear synopsis of clinical problem</td>
</tr>
<tr>
<td>Articulate a prioritized differential diagnosis of most likely, less likely, unlikely, and “can’t miss” diagnoses based on the problem representation?</td>
<td>Missed key elements of differential diagnosis, including likely diagnoses or “can’t miss” diagnoses</td>
<td>Gave differential diagnosis that included likely and “can’t miss” diagnoses but either missed key diagnoses or ranked them inappropriately</td>
<td>Gave accurately ranked differential diagnosis including likely and “can’t miss” diagnoses</td>
</tr>
<tr>
<td>Direct evaluation/treatment towards high priority diagnoses?</td>
<td>Directed evaluation and treatment toward unlikely/unimportant diagnoses</td>
<td>Major focus of evaluation and treatment was likely and “can’t miss” diagnoses but included non-essential testing</td>
<td>Efficiently directed evaluation and treatment towards most likely and “can’t miss” diagnoses</td>
</tr>
<tr>
<td>Demonstrate the ability to think about their own thinking (metacognition)?</td>
<td>Not able to describe the influence of cognitive tendencies or emotional/situational factors that may have influenced decision-making</td>
<td>Can name one cognitive tendency or emotional/situational factor that may have influenced decision-making</td>
<td></td>
</tr>
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</table>

### OVERALL ASSESSMENT

- **Needs Improvement**
- **Meets Competency**
- **Excellence**

**Comments:**
Microskills

1. Get a Commitment
   Focus on one learning point. Encourage students to develop their critical thinking and clinical reasoning skills. Actively engage the student, establishing their readiness and level of competence. Push the student just beyond their comfort zone and encourage them to make a decision about something, be it a diagnosis or a plan.
   Ex: “So, tell me what you think is going on with this patient.”

2. Probe for Supporting Evidence
   Uncover the basis for the student’s decision — was it a guess or was it based on a reasonable foundation of knowledge? Establish the student’s readiness and level of competency.
   Ex: “What other factors in the HPI support your diagnosis?”

3. Reinforce What Was Done Well
   The student might not realize they have done something well. Positive feedback reinforces desired behaviors, knowledge, skills, or attitudes.
   Ex: “You kept in mind the patient’s finances when you chose a medication, which will foster compliance, thereby decreasing the risk of antibiotic resistance.”

4. Give Guidance About Errors/Omissions
   Approach the student respectfully while concurrently addressing areas of need/improvement. Without timely feedback, it is difficult to improve. If mistakes are not pointed out, students may never discover that they are making these errors and hence repeat them.
   Ex: “I agree, at some point PFTs will be helpful, but when the patient is acutely ill, the results likely won’t reflect his baseline. We could gain some important information with a peak flow and pulse ox instead.”

5. Teach a General Principle
   Sharing a pearl of wisdom is your opportunity to shine, so embrace the moment! Students will apply what is shared to future experiences. Students tend to recall guiding principles, and often the individual patient may serve as a cue to recall a general rule that was taught.
   Ex: “Deciding whether or not someone with a sore throat should be started on empiric antibiotics prior to culture results can be challenging. Fortunately, there are some tested criteria that can help...”

Summarize
Consider summarizing or concluding, ending with next steps (e.g., plan for the patient, reading assignment for the student, schedule for follow-up with the student, etc.).
Assessing Clinical Reasoning at the Program Level

Individual competencies for diagnosis (I-competencies)

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

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

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.

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

I-3. Produce, or contribute to, a correctly prioritized, relevant differential diagnosis [diagnostic schema], including “can’t-miss” diagnoses.

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 [illness scripts] and atypical presentations, and considering pathophysiology, disease likelihood, and clinical experience.

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

I-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.”

Society to Improve Diagnosis in Medicine, 2019:

Olson et al. 2019, ACGME 2020
Summary

• Clinical reasoning involves the “synthesis of myriad clinical and investigative data to generate and prioritize an appropriate differential diagnosis and inform safe and targeted management plans.”
Summary cont.

Dual Process Theory

Masterclinician

System 1
- Fast
- Automatic

Pattern recognized?

Repetition Practice

System 2
- Slow
- Analytical

Override

Diagnosis

Learner

Illness scripts
The typical story of a disease

Diagnostic Schema
Systematic approach to a clinical problem

Problem representation
The one-line, but MORE!

Clinical Decision Making, Karolina Kozdoba, MD and Gaby Berger, MD, University of Washington, 2020
• Try “winging it” with a **diagnostic schema** when your learner “gets stuck”
• **Problem representations** will develop with experience to be inclusive yet succinct
• Try out the **One-Minute Preceptor** this week!
Thank you!

• Questions?
• Comments?
References


