Medical Problem Solving in Case-Based Instruction

TEACHING CLINICAL REASONING THROUGH MEDICAL PROBLEM-SOLVING

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Today's Workshop: Medical Problem-Solving Skills

I. Defining them — Paul St. John
II. Teaching them — Herman Gordon
III. Assessing them — Susan Ellis

Goals of Case-Based Instruction (CBI)

Students

- Medical problem-solving skills
- Interpersonal & communication skills
- Practice-based learning & improvement
- Medical knowledge

Faculty & Administration

- Evidence-based curriculum design

How would you define medical problem-solving skills?

Dual-process theory of decision-making

Intuitive	Analytical
Experiential-inductive	Hypothetico-deductive
Bounded rationality	Unbounded rationality
Heuristic	Normative reasoning
Gestalt/pattern recognition	Robust decision-making
Modular responsivity	Critical, logical thought
Recognition-primed	Multiple branching
Unconscious thinking	Deliberate, purposeful

From Croskerry (2009) Academic Medicine 84:1022-1028.

Dual-process theory of clinical reasoning

Cognitive feature	Intuitive/heuristic	Analytical/systematic
Capacity	High	Limited
Automaticity	High	Low
Rate	Fast	Slow
Effort	Lower	Higher

After Croskerry (2009) Academic Medicine 84:1022-1028.

Other references: Croskerry (2009) Adv Health Sci Educ 14:27-35.
Norman (2009) Adv Health Sci Educ 14:37-49.
Pelaccia, et al. (2011) Medical Education Online 16:5890.

Dual-process theory of clinical reasoning

Cognitive feature	Intuitive/heuristic	Analytical/systematic
Capacity	High	Limited
Automaticity	High	Low
Rate	Fast	Slow
Effort	Lower	Higher
Cognitive awareness	Low	High
Reliability	Lower	Higher
Errors	More	Fewer
Scientific rigor	Lower	Higher
Users	Experts	Experts & Novices

After Croskerry (2009) Academic Medicine 84:1022-1028.

Other references: Croskerry (2009) Adv Health Sci Educ 14:27-35.
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Problem-solving skills – General

Problem-solving activity	High-level performance
Define Problem	Demonstrates the ability to construct a clear and insightful problem statement with evidence of all relevant contextual factors.
Identify Strategies	Identifies multiple approaches for solving the problem that apply within a specific context.
Propose Solutions/Hypotheses	Proposes one or more solutions/hypotheses that indicates a deep comprehension of the problem. Solution/hypotheses are sensitive to contextual factors as well as all of the following: ethical, logical, and cultural dimensions of the problem.
Evaluate Potential Solutions	Evaluation of solutions is deep and elegant (for example, contains thorough and insightful explanation) and includes, deeply and thoroughly, all of the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.
Implement Solution	Implements the solution in a manner that addresses thoroughly and deeply multiple contextual factors of the problem.
Evaluate Outcomes	Reviews results relative to the problem defined with thorough, specific considerations of need for further work.

From Association of American Colleges & Universities – Problem Solving VALUE Rubric

Problem-solving skills – Medical

Problem-solving activity	High-level performance
Define Problem	Identifies & labels problem Collects & accurately reports data Distinguishes normal from abnormal Demonstrates awareness of relevant differences
Identify Strategies	Identifies sources of information Compares & evaluates sources of information Identifies tests and explains tests Identifies pertinent positives/negatives
Propose Solutions/Hypotheses	Offers reasonable possibilities Uses pertinent positives/negatives Identifies key findings that affect the differential diagnosis
Evaluate Potential Solutions	Prioritizes problem list Identifies case elements that are not consistent with given diagnosis
Implement Solution	Reaches conclusions that are not a repetition of the findings Actively considers/includes perspectives of others
Evaluate Outcomes	Reflects on different elements of own process Recognizes cognitive errors committed in analyzing case

How would you define medical problem-solving skills?

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Herman Gordon & John Bloom

What problems do students have with problem-solving?

- Disorganized
- Challenged by how to frame problems
- Prone to cognitive error(s)
- Ineffective at conceptual blockbusting

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Cognitive errors committed by physicians & students:

- Availability error / search satisficing
- Diagnosis momentum
- Anchoring and confirmation bias
- Representativeness error
- Attribution / stereotyping error
- Affective error
- Commission bias

Groopman, *How Doctors Think*

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How do we teach students to be better problem-solvers?

- Teach a structured approach
- Promote life-long learning by encouraging reflective practices
- Work problems that push their envelopes

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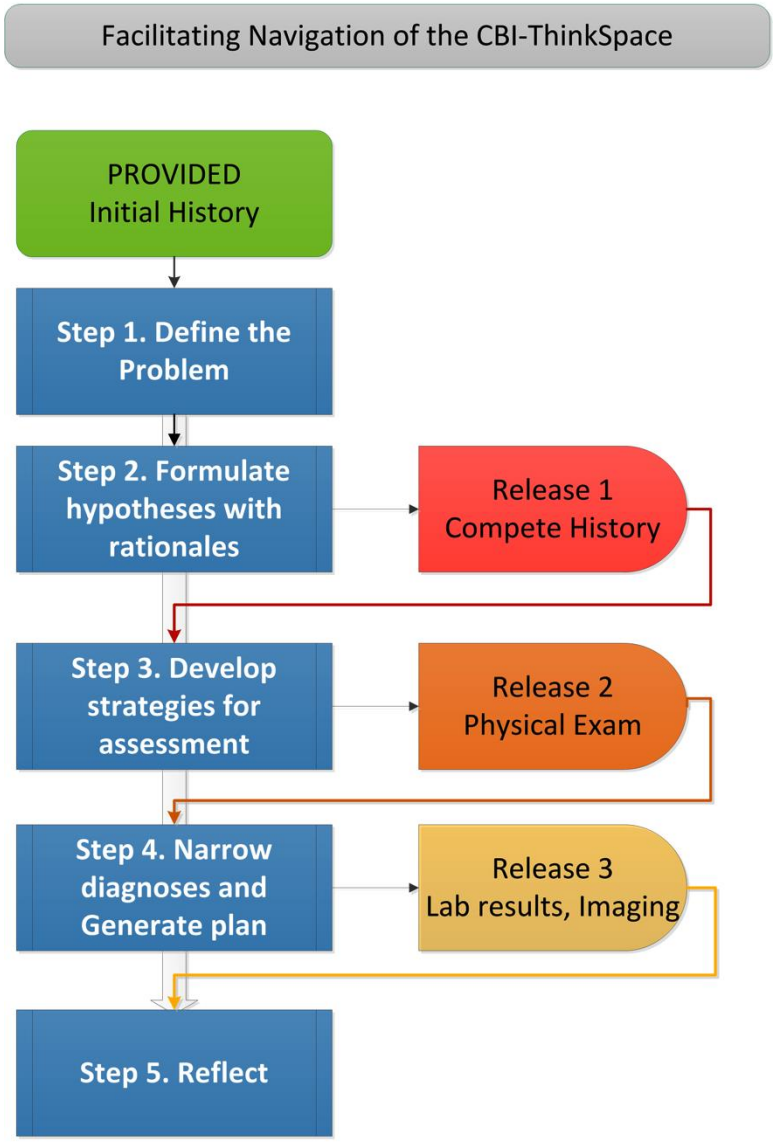
Structured Problem Solving in Case-Based Instruction, the ThinkSpace Way

- Makes students accountable to a structure
- Enables peer to peer learning



Graphic by Karen Spear Ellinwood

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What features in a case promote reflection?

- Opportunities to get stuck
- Opportunities to go off track
  - Distractors
- Opportunities to make cognitive errors

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How to write good cases to teach problem-solving?

- ✓ Appropriate to student's Zone of Proximal Development
  - Content appropriate, especially basic science
- ✓ Realistic (embedded in context)
- ✓ Requires and reinforces understanding of basic-science concepts
- ✓ Must have more than one plausible hypothesis
- ✓ Must require data-driven reasoning (must work with obtaining and applying data)
- ✓ “Land mines” invite students to make cognitive error(s)

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An Example Case from the MSS Block:

- Initial History: Ms. Peltonen is a 47-year-old woman who comes to urgent care because of hip, leg and back pain and a fall earlier today
  - Fatigued for about 6 months.
  - Prior DXA scan T-scores of -3.1 in the spine and -3.4 in the hips
  - She travelled to Kenya on a photographic safari 10 months ago.

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Case cont., Release A:

- Anemia @ 37
- Intermittent diarrhea for years

Release B:

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Case cont., Release C:

- CT chest/abdomen: no evidence of tumor; diffuse osteopenia
- Anti-tissue transglutaminase antibodies: positive

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Student Reflections:

"It is important in these cases to not only look at what is clear--osteoporosis, but keep in mind what could be causing the nutritional deficiencies that care the underlying cause of the osteoporosis."

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Student Reflections:

“The intestinal malabsorption from Celiac could lend to the patient's hypocalcemia and hypovitaminosis, and the elevated PTH could be a compensatory response....cool. The chief issue with my problem solving skills in this case is that I was side-tracked by the notion of an underlying musculoskeletal abnormality and somewhat neglected the basic notion of intestinal absorption and it's influence on metabolic panels.
Very cool case, though.”

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Student Reflections:

"I worked through this case a little differently than the first case. For the first case I tried to come up with a long list of differentials in the beginning and narrow it down towards the end. For this second case I came up with less differentials in the beginning and modified the list after each release. I felt that this method helped me to not focus on trying to make my initial hypothesis true and be more open to different possibilities."

Elements of Assessment

Stakeholder	Needs
Students	• Consistency • Acknowledgement of progress/existing skills • Accurate, informative feedback
Facilitators	• Feasible student assessment system • Training and support • Foster common understanding of student progress/needs
Society Mentors & Clerkship Directors	• Link to skills and knowledge being developed in CBI • Mechanism for building on those
Program Evaluation	• Map onto the competencies • Ability to compare learning objectives and outcomes across blocks

Challenges

- Assessment/Evaluation must be
  - Reliable & valid
  - Feasible
  - Must map onto competencies
  - Must allow for/support learner development
- Logistical Unknowns
  - Details of case format
    - Widely varied case structure
    - Timing
    - Content

Solution?

- RIME

What is RIME?

- Synthetic framework
- Describes student stage of competence & progression toward independent practice
  - Reporter
  - Interpreter
  - Manager
  - Educator
- Used in a clinical setting
  - Clinical reasoning skills are the extension of skills being developed in CBI

Why RIME?

- Clinical problem solving is an integrated behavior
  - Synthetic frameworks describe learning goals in terms of synthesis of knowledge, skills & attitudes (KSA)
- Developmental not sequential approach to assessment
  - Not a “stage” theory
- Valid, reliable & feasible
  - Easily assessed behaviors
  - Validated in a variety of settings
  - Simple to use
- Maps on to competencies
- Framework is a bridge to Societies and clerkships
  - Language of evaluation reflects KSA of clinical practice

Outcome Measures

- Student Performance in CBI
  - Grades
- Measures of clinical reasoning
  - Year 2 OSCE
- Measures of reflection

Feedback and Suggestions

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