Instructor's Guide

Teaching Cognitive Biases/Cognitive Debiasing Strategies in Clinical Decision Making: A Case-Based Discussion

Learning objectives of this tool:

1. To understand dual process theory of thinking, common cognitive biases affecting clinical decision making and examples of cognitive debiasing strategies
2. To apply cognitive debiasing strategies in minimizing committing cognitive biases in clinical decision making
3. To identify the emotive and environmental influences that increase the risk of committing cognitive biases in clinical setting
4. To evaluate the quality of one's clinical decisions through reflective thinking and self-regulation

List of resources available in this package:

1. Instructor's Guide
2. Case Scenarios on Cognitive Biases In Clinical Decision Making
3. Case Scenarios on Cognitive Biases In Clinical Decision Making: Discussion Guide and Suggested Scoring Rubric
4. Blueprint Template For Developing Case Scenarios on Cognitive Biases In Clinical Decision Making

Background:

This resource is built on the theoretical premise that there are two modes of decision making, i.e., Type 1 and Type 2.[1] This is known as the dual process theory of thinking. Type 1 decision making is the fast, intuitive, reflexive and automatized, and this is where we spend most of our time making decisions. Type 2 decision making, on the other hand, is a deliberate, analytical and purposeful form of decision making that is usually slower. Clinical decision making is a complex process that involves the interaction of these two modes of thinking although one mode of thinking is theorized to be employed at any one time.[2] Although Type 1 is often effective, it is often fraught with cognitive biases.[3] Cognitive biases are our predisposition to respond[4] that may result in flawed reasoning, which in turn, may cause medical errors.[3, 4] To minimize the risk of committing cognitive biases when making clinical decisions, a compendium of cognitive debiasing strategies have been proposed.[5,6]

The clinical cases in this resource pack are embedded with cognitive biases commonly encountered in clinical setting. The four common cognitive biases focused in these cases are: availability bias, confirmation bias, anchoring and search

satisficing (the definitions of these cognitive biases are given in Table 1 below). Each of these cases is framed in such a way as to "lead" the students into an obvious diagnosis. But besides the obvious diagnosis, there are subtle clinical cues that point to the likelihood of another more urgent or life threatening diagnosis that must be considered. The subjects should be reminded that in real situations, the failure to consider these life-threatening conditions might be detrimental to the patient.

Table 1: Explanations on Four Common Cognitive Biases

Brief explanations on four common cognitive biases:
(For more detailed discussion and for more cognitive biases, refer to recommended resources below)

1. Availability bias – this refers to our tendency to judge things as being more likely, or frequently occurring, if they readily come to mind. Therefore, a recent experience with a particular disease, for example, thoracic aortic dissection may inflate likelihood of a clinician to diagnose the patient with this disease every time when the clinician sees a case of chest pain.

2. Anchoring – this refers to our tendency to fixate our perception on to the salient features in the patient's initial presentation at an early point of the diagnostic process so much so that we fail to adjust our initial impression even in light of later information.

3. Confirmation bias – this refers to our tendency to look for confirming evidence to support the diagnosis we are "anchoring" to, while downplaying, or ignoring or not actively seeking evidences that may point to the contrary. Confirmation bias often goes together with anchoring. For example, if a clinician has anchored or fixated the diagnosis of myocardial infarction in his mind, he will have the tendency to look for evidences to support this diagnosis, e.g., ST segment elevation on electrocardiography even if the amount of elevation is very minimal. In contrast, even if the patient's chest X-ray demonstrates a widened mediastinum width with unequal pulses on examination and high blood pressure, the clinician may have ignored such important cues if he has already fixated the diagnosis of myocardial infarction in his mind!

4. Search satisficing – this refers to our tendency to stop looking or call off a search for a second diagnoses when we have found the first one. This bias can prove to be detrimental in polytrauma cases. A classic example of this bias is the tendency of the physician to call off the search for a second fracture once he thinks he is "sufficiently satisfied" with finding the first fracture of medial malleolus, when in fact, the patient may have sustained Maisonneuve fracture with a second proximal fibula fracture.

How to implement this resource

1. **Setting:** as for any problem-based learning, this resource ideally should be implemented in a small group setting

2. **Target learners:** medical students, junior residents. Other groups: student nurses, registered nurses, paramedics, EMT/paramedic students, students of allied health sciences, etc.

3. Ensure that the students have some prior basic and clinical knowledge on the following topics:
    - Anxiety disorder (case 1)
    - Cocaine (sympathomimetic) toxicity including cocaine-induced myocardial ischemia (case 1)
    - Acute gastroenteritis (case 1)
    - Malingering (case 1)
    - Diagnostic approach of headache (case 2)
    - Tension headache (case 2)
    - Meningitis (case 2)
    - Subarachnoid hemorrhage (case 2)
    - Acute coronary syndrome (case 3)
    - Upper gastrointestinal bleeding (case 3)
    - Peptic ulcer disease (case 3)
    - Hemorrhage shock (case 3)
    - Perforated viscus (case 3)
    - Spinal fracture (case 4)
    - Level of dermatomes (case 4)
    - Diagnostic approach to acute paraplegia (case 4)
    - Peripheral neuropathy (case 4)
    - Guillain-Barre syndrome (case 4)
    - Head trauma including the various types of intracranial bleed (case 5)
    - Indications for CT in head trauma (case 5)
    - Stroke – hemorrhagic and ischemic (case 5)

4. The instructor may want to allow the students to attempt the cases on their own before discussion (the instructor may want to score their responses. A suggested marking scheme is attached). If this resource is going to be used as a flipped classroom style (see point no. 12), the students' individual scores could be used as formative evaluation and the group discussions can be used as summative evaluation.

5. To simulate a time-pressured, stressful clinical setting such as a busy emergency department, the instructor may want to allow 10 minutes per case. It has been found that a doctor may arrive at a diagnosis in approximately 6 minutes and a medical student, close to 10 minutes.[7]

6. The students should be instructed to respond as if they are the doctors the in charge of these cases. They should be told to give short focused answers on

what specific diagnosis they have in mind and what steps/actions are they going to take. They should be told not to write long essays.

7. The instructor may then give a short lecture or tutorial or use one of the recommended PowerPoint slides/reference articles/textbook chapters as reading materials (see Table 2)

8. The instructor may also want to classify the various cognitive biases into different categories. Campbell et al (2007) for example, categorize them into 6 basic categories[8]: 1) Errors of over-attachment to a particular diagnosis 2) Errors due to failure to consider alternative diagnosis 3) Errors due to inheriting someone else's thinking 4) Errors in prevalence perception or estimation 5) Errors involving patient characteristics or presentation context 6) Errors associated with physician affect, personality or decision style. Alternatively, these errors could be classified into three broad categories, i.e., stereotyping, premature closure and incorrect prior probabilities.

9. A compendium of cognitive debiasing strategies[5] can be found in the article by Graber et al (2012) (see also the text box on recommended resources). Another generic, practical cognitive debiasing strategies is Graber et al's General Checklist on High Risk Situations for Diagnostic Errors (available in Word document at URL: http://tinyurl.com/nxx4pgz)

10. The instructor should remind the students again that a single classroom session on cognitive biases/cognitive debiasing strategies may give them an theoretical overview on cognitive biases/cognitive debiasing strategies but it is unlikely to be effective in real clinical setting. Students should be advised that skill of cognitive debiasing should be deliberately practiced in order to be beneficial (see more in the pitfalls section below).

11. Personal lesson learned: this resource has been used personally by one of the authors to evaluate the efficacy of an educational intervention in the form of a mnemonic checklist aimed to promote metacognition called TWED checklist ('T' = 'Threat', 'W' = 'What else', 'E' = 'Evidences' and 'D' = 'disposition influence') (See Figure 1 for the TWED checklist). In this author's experience, TWED checklist has been shown to be effective in promoting reducing risk of committing cognitive biases compared to students in the controlled group (without educational intervention).

12. This resource could also be used in a flipped classroom style. Using a flipped classroom style could be useful to have the students work out their own individual answers before sharing their answers with the entire class. To simulate the time-pressured clinical environment, the students should be advised not to spend too much time in a single case. After all, studies have shown that a clinician can form his first impression as early as within 30 seconds of interaction with their patients.[9,10] As more data become available

to the clinician, alternative illness scripts will be sought and matched to the patient's constellation of signs and symptoms.[11]

T = life or limb Threat *(What are the life or limb threatening conditions in this patient?)* Rationale: This quadrant encapsulates the rule-out-worse-case scenarios (ROWS) heuristics as a form of cognitive forcing strategy as well as to de-bias anchoring and triage cueing	**W = Wrong?** *(What if I am wrong? What else could it be?)* Rationale: To de-bias search satisficing, anchoring, confirmation, availability biases, etc
E = Evidences *(Do I have sufficient evidences for or exclude this diagnose?)* Rationale: To de-bias anchoring, confirmation bias, blind spot, myside bias, ego bias, etc	**D = Dispositional factors** *(What are the Environmental & Emotional (2Es) dispositions influencing my decision?)* Rationale: These dispositional factors that may affect our decision making. Examples: Environmental – chaotic, busy working place, Emotional – sleepiness, tiredness, anger

Figure 1 The TWED checklist and the potential cognitive biases it addresses

Recommended references to be used together with this resource:

Textbook chapters:

- Chapters 31 and 32 in Patient Safety in Emergency Medicine (edited by: Croskerry, P., Cosby, K., Schenkel, S. and Wears, R.) Lippincott Williams & Wilkins, Philadelphia, 2008.

Journal articles:

- Croskerry P. From mindless to mindful practice--cognitive bias and clinical decision making. N Engl J Med. 2013;368(26):2445-8.
- Croskerry P. A universal model of diagnostic reasoning. Acad Med. 2009;84(8):1022-8.
- Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. Acad Med. 2003;78(8):775-80.
- Norman G. Dual processing and diagnostic errors. Advances in health sciences education : theory and practice. 2009;14 Suppl 1:37-49.
- Graber ML, Kissam S, Payne VL, et al. Cognitive interventions to reduce diagnostic error: a narrative review. BMJ Qual Saf 2012;21(7):535-57.
- Campbell SG, Croskerry P, Bond WF. Profiles in patient safety: A "perfect storm" in the emergency department. Acad Emerg Med 2007;14(8):743-9.

Free web resources on cognitive biases and cognitive debiasing strategies

- Graber et al's General Checklist on High Risk Situations for Diagnostic Errors in Word document. URL: http://tinyurl.com/nxx4pgz
- PowerPoint slides on "Biases and Debiasing" by Croskerry P. URL: http://tinyurl.com/ma8ulsv
- PowerPoint slides on "Dual Process and Cognitive Bias in Clinical Decision Making" by Joan Von Feldt. URL: http://tinyurl.com/mrboldw
- CAEP 2-page card on 21 common cognitive biases URL: http://tinyurl.com/plkswj5
- Clinical Reasoning Toolkit in the Society to Improved Diagnosis in Medicine website (SIDM) URL: http://www.improvediagnosis.org/?CognitiveError
- QuantiaMD video series on Preventing Diagnostic Errors. URL: http://quantiamd.com/home/diagnosticerrors
- Agency for Healthcare Research and Quality on medical errors. URL: http://psnet.ahrq.gov/collection.aspx?taxonomyID=500
- *Diagnosis* journal. Publisher: De Gruyter URL: http://www.degruyter.com/view/j/dx
- A huge collection of other free educational resources in the Society to Improved Diagnosis in Medicine website (SIDM). URL: http://www.improvediagnosis.org/

Suggested talking points during discussion:

Besides the questions posed in the cases, the instructor is encouraged to discuss with the students on the dynamics of the cases including the following aspects:

- the most likely/obvious diagnosis in each case
- the possible cognitive biases that could have been committed by the doctors in charge
- the reasons why the doctors could have committed these cognitive biases including the circumstance/context/environment/emotive influences that might have increased the vulnerability towards these cognitive biases (e.g. busy emergency department, doctor's fatigue, etc)
- what could have been done to minimize these cognitive biases, i.e. cognitive debiasing strategies (e.g. slow down and reflect, rule-out-worst-case-scenarios heuristic, putting up management algorithm charts, etc)
- the alternative (and more urgent/life threatening) diagnoses in the cases
- what needs to be done to rule out these alternative diagnoses
- management plan for the case
- disposition decisions, i.e., whether to discharge or admit the patient

Three pitfalls to avoid when teaching cognitive biases/cognitive debiasing strategies using this resource:

1. **The learning of cognitive biases and debiasing strategies must take place in real clinical setting, not in a classroom setting**
    - By virtue that this is paper-based exercise in a classroom setting, this resource maybe useful in teaching *about* cognitive biases and debiasing strategies. But the classroom setting always lacks the ecological validity including the clinical ambience (the stress, sound, sight, smell, etc) where the clinical decision is actually made.

Cognitive debiasing strategy is a soft skill that must be honed and practiced repeatedly in real clinical setting.

- Learning cognitive biases and debiasing strategies in a mere classroom setting without actually applying them in real clinical settings is akin to learning the skill of physical examination in a classroom without actually practicing them on real patients.
- In fact, often times, even the decision maker himself may not know whether he has committed any cognitive biases or not until much later. The awareness of cognitive biases at the point of decision making is itself subjected to hindsight bias.[12]
- Nonetheless, the instructor can facilitate the discussion by intentionally asking the students to give some specific examples on how could a cognitive bias have occurred in the case and what debiasing strategy could be used to prevent this error. Example, in case 1, ask: "how could anchoring bias be committed in case 1 and what could be done to prevent this error?"

2. **Equating using cognitive debiasing strategy with making better clinical decisions**
    - While using cognitive debiasing strategies certainly improves the chance of making better clinical decisions, it does not guarantee better clinical decisions will be made. The students need to be reminded that they need to have sufficient knowledge base and experience in order to make better decisions.

3. **Getting unnecessarily bogged down on the false dilemma of Type 1 vs Type 2 decision making mode**
    - While the dual process theory model is useful to illustrate the two broad tendencies of decision making, the one area that an instructor would not want to get into is the false dilemma of whether Type 1 or Type 2 decision making is better in clinical decision making. After all, clinical decision making is a highly complex cognitive process. Both Type 1 and Type 2 decision making modes are employed in an integrated manner to arrive at a clinical decision.[2] The important thing that an instructor must stay focus on is how best to minimize these cognitive biases that ultimately translate into improved patient safety.

Effectiveness of paper-based cases in teaching cognitive biases/cognitive debiasing strategies

A number of prior studies on the using paper-based cases have produced mixed results.[13-16] Mamede et al (2010) demonstrated the effect of availability bias among the more senior second year resident students.[14] Sherbino et al (2011) showed that the application and retention cognitive forcing strategy, a type of cognitive debiasing strategy is not effective.[15] A similar study by Sherbino et al (2014) again shows that

educational intervention in cognitive forcing strategy is not effective in reducing diagnostic errors.[16]

Despite the lack of ecological validity, these clinical cases may serve as an introductory tool to teach cognitive biases and the cognitive debiasing strategies. Students can then learn more on how these cognitive biases may affect actual clinical decisions in the wards, during morbidity and mortality meetings as well as the steps they take or could have taken or observed taken by the doctors around them as cognitive debiasing strategies.

References:

1. Kahneman D. Thinking, fast and slow. Toronto, Ontario, Canada: Doubleday; 2011.
2. Croskerry P. A universal model of diagnostic reasoning. Acad Med. 2009;84(8):1022-8.
3. Croskerry P, Singhal G, Mamede S. Cognitive debiasing 1: origins of bias and theory of debiasing. BMJ Qual Saf. 2013.
4. Arnott D. Cognitive biases and decision support systems development: a design science approach. Info Systems J. 2006;16(55-78).
5. Graber ML, Kissam S, Payne VL, Meyer AN, Sorensen A, Lenfestey N, et al. Cognitive interventions to reduce diagnostic error: a narrative review. BMJ Qual Saf. 2012;21(7):535-57.
6. Croskerry P, Singhal G, Mamede S. Cognitive debiasing 2: impediments to and strategies for change. BMJ quality & safety. 2013;22 Suppl 2:ii65-ii72.
7. Norman G. Dual processing and diagnostic errors. Advances in health sciences education : theory and practice. 2009;14 Suppl 1:37-49.
8. Campbell SG, Croskerry P, Bond WF. Profiles in patient safety: A "perfect storm" in the emergency department. Acad Emerg Med 2007;14(8):743-9
9. Groopman J. How Doctors Think. 2008. Boston: Houghton Mifflin.
10. Rhoades DR, McFarland KF, Finch WH, et al. Speaking and interruptions during primary care office visits. Family medicine 2001;33(7):528-32.
11. Barrows HS, Feltovich PJ. The clinical reasoning process. Med Educ 1987;21(2):86-91.
12. Wears RL, Nemeth CP. Replacing hindsight with insight: toward better understanding of diagnostic failures. Annals of emergency medicine. 2007;49(2):206-9.
13. Graber M. Metacognitive training to reduce diagnostic errors: ready for prime time? Acad Med. 2003;78(8):781. PubMed PMID: 12915364.
14. Mamede S, van Gog T, van den Berge K, Rikers RM, van Saase JL, van Guldener C, et al. Effect of availability bias and reflective reasoning on diagnostic accuracy among internal medicine residents. JAMA. 2010;304(11):1198-203.
15. Sherbino J, Yip S, Dore KL, Siu E, Norman GR. The effectiveness of cognitive forcing strategies to decrease diagnostic error: an exploratory study. Teaching and learning in medicine. 2011;23(1):78-84.
16. Sherbino J, Kulasegaram K, Howey E, Norman G. Ineffectiveness of cognitive forcing strategies to reduce biases in diagnostic reasoning: a controlled trial. CJEM. 2014;16(1):34-40.

Supplemental resource:
Template to develop more case scenarios:

1. The case scenarios were developed by using a blueprint, so that at least two or more aspects of patient care (e.g. in history taking, physical exam, data interpretation, diagnosis etc) are tested in each of these cases (blueprint attached).

2. A blueprint template is attached for instructor to develop more cases on their own.

3. To facilitate evaluation of content validity testing, a blueprint of the domains of interest is first tabulated (the blueprint for the cases in this resource is attached)

4. The columns of the blueprint represent the various common aspects of patient care in emergency medicine: history and physical examination, data interpretation, diagnosis, initial patient management and stabilization, communication skill and administration.

5. And each row of the blueprint represents the various common sub-disciplines in emergency medicine: prehospital care, medical emergencies, surgical emergencies, pediatric emergencies, geriatric emergencies, psychiatric emergencies, trauma emergencies, toxicology, obstetrics and gynecologic emergencies and resuscitation.