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Eliminating Gender-, Racial- and Age-Biases in Medical Diagnostic Reasoning

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Abstract: Empirical studies suggest that gender, racial, or age biases exist in a significant number of clinicians, resulting in errors in diagnostic reasoning. Croskerry (2003; 2013) endorses a ‘cognitive forcing’ approach to achieve de-biasing in clinicians, involving critical self-reflection on one’s own diagnostic reasoning. However, studies suggest that cognitive forcing is ineffective in reducing biases in clinicians. A more effective approach to exposing underlying biases in clinicians involves ideally diverse group-based critiques of medical decisions.

Keywords: age bias, cognitive forcing, gender bias, medical diagnostic reasoning, racial bias, shared-mind approach

1. Introduction: Setting up the problem

According to dual process theories of human decision making, human decisions are informed by ‘cold’ cognitive systems and ‘hot’ affective systems (Phelps, Lempert & Sokol-Hessner, 2014). From this, it follows that human decision making can be negatively affected by either cognitive biases or affective biases or both. Whether or not these distinctions involve a false dichotomy is beyond the scope of this paper. Although my focus will be on cognitive biases and their roles in medical decision-making, these distinctions have a purely taxonomic function and there is no underlying assumption that cognitive biases are immune to affective influences. But exactly what is a cognitive bias? Clearly, an operational definition is required. According to Haselton, Nettle and Andrews (2005), a cognitive bias involves a departure from accepted standards of rationality morphing into an idiosyncratic standard. In the context of diagnostic reasoning in medicine, such departures from rationality could lead to faulty diagnoses thereby jeopardizing the well-being of the patient (Croskerry, 2013). Assuming that clinicians are prone to cognitive biases, it is important to determine if there are ways to resolve these biases. However, are cognitive biases in medical decision making commonplace? There is much evidence to suggest that it is.

A variety of studies have gathered evidence of age-based biases in medical decision making. Arslanian-Engoren (2000), using group discussion sessions, found that triage nurses do not consider myocardial infarctions to be a high likelihood diagnosis in younger or middle-aged women. Kvituk, Shaver, Blood, and Shepard (1986), using a questionnaire directed at physical therapists, found that physical therapists are less ambitious in their goals with respect to elderly patients as opposed to younger patients. Further, Uncapher and Arean (2000) sent out a survey to 595 general practitioners regarding their treatment of suicidal ideation in patients. The results of their survey indicate that almost all physicians recognize signs of depression in their patients, although they are less aggressive in treating suicidal ideation in older patients vs. younger patients. Finally, Yellen, Cella and Leslie (1994) found that oncologists tend to treat cancers less aggressively in the elderly as opposed to younger patients.

Moreover, several studies have documented gender biases in medical decision making such as the study by Arslanian-Engoren (2000) cited above, where the authors found that...
myocardial infarctions are regarded by triage nurses as a higher likelihood diagnosis in younger men vs. younger women. Along the same lines, Richards et al. (2000) found that when men and women go to hospitals with chest pains, men are more likely to be diagnosed with coronary heart disease than women. Borkhoff et al. (2008) studied responses of 71 physicians in Ontario to female and male patients presenting with symptoms of knee osteoarthritis. The authors found that the chances of an orthopedic surgeon recommending total knee arthroplasty for men was 22 times greater than the odds of recommending this treatment for female patients (Borkhoff et al., 2008). Similar findings were obtained by Fraenkel, Suter, Weis and Hawker (2014).

Finally, there is ample evidence in the literature of racial bias amongst physicians. In particular, Sabin, Nosek, Greenwald and Nevara (2009) found that physicians tend to favor white patients over African American patients, which may affect diagnosis and treatment. The authors also found that white doctors were more likely to show a racial bias than African American doctors (Sabin et al., 2009). On the other hand, Williams et al. (2015) report that there is no clear evidence that senior medical students exhibit either racial or gender bias when making diagnostic decisions regarding cardiac care based on their review of vignette patients. This is encouraging, if true, since it may be the case that up and coming physicians demonstrate less racial and gender bias than their predecessors. Regardless, there are countless articles in the literature documenting racial bias in medical decision-making. For example, Flores, Orson and Tomany-Korman (2005) found that physicians were significantly less likely to refer Hispanic or African American children to specialists as opposed to non-minority children. Pletcher, Kertesz, Kohn and Gonzales (2008) report that with respect to hospital visits for pain, non-minority patients were significantly more likely to be prescribed opioids for pain by attending physicians than either Hispanic patients or African American patients. As a final example of racial biases in medicine, Omologa, Stolfi and Mitsnefs (2006) found that African American children with renal failure were significantly less likely to receive a renal transplant from a live donor than non-minority children. Instead, the authors report that African American pediatric patients were given cadaver donor grafts (Omologa et al., 2006).

And so, it would appear from a review of the medical literature that cognitive biases are a very real problem in medical diagnoses and that this problem therefore needs to be addressed if every patient regardless of race, ethnicity, age or gender is to have access to the best medical opinions free of irrational biases. In the remainder of this paper, I shall discuss two potential methods of cognitive de-biasing. There is first of all the work of Pat Croskerry, who has written extensively on how to mitigate cognitive biases in medical decision-making using cognitive forcing, which involves amongst other things critical self-reflection (Croskerry, 2003, 2005, 2013; Croskerry & Nimmo, 2011; Croskerry, Singhal, & Mamede, 2013a; Croskerry, Singhal, & Mamede, 2013b). However, as Sherbino, Dore, Siu and Norman (2011) and Sherbino, Kulasegaram. Howey and Norman (2014) have suggested, it is not at all clear that cognitive forcing is effective in reducing cognitive biases in medical diagnostic reasoning. As I shall argue, a possible reason for the apparent failure of cognitive forcing as a method of de-biasing is that many cognitive biases are unconscious and hence they are not necessarily amenable to critical self-reflection. A number of researchers have in fact alluded to the unconscious nature of cognitive biases in medical reasoning including Sabin et al. (2009), Stone and Moskowitz (2011), Teal, Gill, Green and Crandall. (2012) and Miller et al. (2013).

Although many biases may be immune to critical self-reflection due to their unconscious nature, these residual biases are amenable to critiques from peers who may be able to infer their existence and influence from what a given individual says and does. Or at the very least, if
medical diagnoses are ‘shared’ across a team of diagnosticians and assuming these diagnosticians are from diverse backgrounds, this has the potential to minimize the effect of unconscious biases of individual members of the team. That is, biases of one person could be diluted or even filtered out in the context of a team of medical decision-makers. This alternative method of mitigating cognitive biases in medical contexts that I shall propose has its origins in a broader method of medical decision-making developed by Epstein and Street (2011) and by Epstein (2013) called the shared-mind approach. The shared-mind approach distributes decisions across a number of individuals. I shall argue in this paper that the shared-mind approach to medical decision making has great potential to mitigate the influence of cognitive biases.

2. Croskerry’s cognitive forcing method for achieving de-biasing

In the medical literature, Pat Croskerry is one of the leading proponents of a meta-cognitive strategy for de-biasing known as cognitive forcing (Croskerry, 2003, 2005, 2013; Croskerry & Nimmo, 2011; Croskerry et al., 2013a; Croskerry et al., 2013b). In essence, cognitive forcing involves critical self-reflection on one’s own thinking, i.e., thinking about thinking or meta-cognition (Croskerry, 2003). This requires being able to stand back from one’s thinking that shapes a diagnosis (‘de-anchoring’) along with a sincere attempt to correct any discernable cognitive errors upon self-reflection using a cognitive forcing corrective strategy (Croskerry, 2003). To apply a cognitive forcing strategy, one must first learn the strategy, discern whether one’s thinking involves a cognitive error that can be fixed by the strategy, and then apply the strategy to help eliminate or minimize the error (Croskerry, 2003).

Croskerry (2005) outlines a number of cognitive forcing strategies that can be used to reduce cognitive errors in medical diagnostic reasoning. First, there is the strategy ‘develop insight/awareness’ which involves identifying any cognitive dispositions that may lead to errors along with using examples of how these dispositions actually do lead to errors (Croskerry, 2005). Second, there is the technique ‘consider alternatives’ where the clinician re-thinks their diagnoses by looking for alternative interpretations of symptoms known as differential diagnosis (Croskerry, 2005). A third method of de-biasing proposed by Croskerry (2005) involves learning and using objective probability theory along with distinguishing between causation and correlation. Additional strategies proposed by Croskerry (2005) include less reliance on memory to increase diagnostic precision, acquiring as much information as possible to make the decision making task easier, reduce time pressure by providing sufficient time to make a diagnostic decision along with using simulation training as practice for actual diagnostic situations (in the same way that a pilot trains for flying a plane through simulations).

To illustrate the role of cognitive errors in medical decision-making and how cognitive forcing strategies can help to overcome them, Croskerry et al. (2013a) present several case studies based on actual cases involving diagnostic errors due to underlying biases. For example, Croskerry et al. (2013a) cite the case of a 19 year-old mildly obese psychiatric female patient who presented respiratory symptoms at hospital after being referred by her psychiatrists to rule out pneumonia. Attending clinicians attributed her symptoms to anxiety given her psychiatric condition. Soon after, the patient suffered a heart attack and died (Croskerry et al., 2013a). The authors attribute the patient’s death to misdiagnosis due to several cognitive errors including the framing effect (not seeing the patient as in danger of dying given her age and psychiatric condition), diagnostic momentum (seeing her as having anxiety vs. cardiac problems given her psychiatric diagnoses) and premature diagnostic closure (Croskerry et al., 2013a). Croskerry et
al. (2013a) argue that this situation could have been avoided if the attending physician had employed cognitive forcing strategies to achieve a more bias-free diagnosis. For example, the physician might have employed the forcing strategy of differential diagnosis along with acquiring more information about the patient’s medical history. Such applications of cognitive forcing strategy may have given rise to a more accurate diagnosis which could have resulted in the patient’s remaining alive.

3. A fly in the meta-cognitive ointment: Unconscious biases

As promising as the cognitive forcing approach may seem as a potential cognitive de-biasing technique, there is some skepticism in the literature regarding its efficacy. Sherbino et al. (2011) and Sherbino et al. (2014) suggest that cognitive forcing may not be effective in reducing cognitive biases. In Sherbino et al. (2014), 198 senior medical students at McMaster University who were on emergency room (ER) rotations were randomly placed in either an ‘intervention’ group where cognitive forcing strategies were employed or in a control group where no such strategies were used. The authors found that there was no statistically significant difference between the intervention group and the control group in terms of the average number of diagnostic errors during the rotations (Sherbino et al., 2014). The authors then concluded that there is no evidence that cognitive forcing helps to reduce errors in diagnostic reasoning (Sherbino et al., 2014). This randomized study conducted by Sherbino et al. (2014) was preceded by a pilot study performed by Sherbino et al. (2011) in which a smaller group of senior medical students (n = 56) were given cognitive forcing training to determine if this training is effective in reducing cognitive errors in diagnostic reasoning. The authors found that over half of the students did not retain the forcing strategies in the short term, and amongst those who did retain them, there was no obvious reduction in diagnostic errors (Sherbino et al., 2011). Moreover, even these subjects lost retention of the learned forcing strategies over the long term (Sherbino et al., 2011).

I would argue that one reason (even if not the only reason) that cognitive forcing is not maximally effective is that it does not address unconscious biases to which a given clinician does not have access during critical self-reflection. There is ample evidence in the literature that unconscious cognitive biases exist. For example, Miller et al. (2013) conducted a survey of medical students between 2008 and 2011 to determine if they had an implicit anti-obesity bias using the Implicit Association Test (IAT). Further, each participant was also asked to respond to a semantic differential item that measured their explicit biases (Miller et al., 2013). The researchers found that while 33% of the participants reported an explicit anti-obesity bias, over 50% demonstrated an implicit anti-obesity bias (Miller et al., 2013). Of those who demonstrated an implicit anti-obesity bias, only two-thirds of them were aware of this bias, which indicates that a significant number of these medical students had an unconscious anti-obesity bias (Miller et al., 2013). If we relate these findings to the case study involving the 19 year old mildly obese psychiatric patient discussed above, it is possible that one factor leading to error in diagnosis was an unconscious anti-obesity bias on the part of the attending physician. It is possible that the attending physician did not take the respiratory symptoms reported by the patient as seriously as they might have owing to an implicit anti-obesity bias or perhaps other implicit biases (e.g., a bias against persons with psychiatric problems). These types of biases cannot always be addressed by metacognitive approaches such as cognitive forcing since cognitive forcing requires reflection on errors of which one is aware.
There is additional evidence of unconscious cognitive biases affecting medical decision-making in the literature. For example, Sabin et al. (2009) used results obtained from the Race Attitude Implicit Association Test (IAT) administered to 2,535 medical doctors and to a larger general population (N = 404,277) to measure implicit and explicit racial biases. It was found that with the exception of African American doctors that virtually all of the medical doctors exhibited strong implicit racial biases and that these biases exceeded any explicit racial biases self-reported by the doctors (Sabin et al., 2009). Moreover, the level of discrepancy between implicit vs. explicit biases exhibited in the medical doctors was commensurate with the discrepancy in the general population. This indicates a partial lack of awareness of racial biases on the part of the doctors and on the part of the general population. Further, Haider et al. (2011) found evidence of unconscious racial and social class bias in medical students. If there are unconscious biases in clinicians regarding race and obesity, there are likely unconscious biases regarding other attributes such as gender and age. In fact, a recent study conducted at Yale University by Moss-Racusin, Dovidio and Bresco (2012) found evidence of unconscious gender bias in science faculty who were more likely to hire a male applicant than a female applicant for a lab manager position. As argued above, unconscious bias cannot be addressed by meta-cognitive strategies such as cognitive forcing since forcing requires awareness of what one is thinking. In the next section, I shall propose a method for dealing with all cognitive biases, whether conscious or unconscious, which draws on the shared mind approach of Epstein and Street (2011) and Epstein (2013).

4. A shared mind approach to mitigating cognitive biases

Epstein and Street (2011) and Epstein (2013) outline what they call the shared mind approach to medical decision-making. The main idea behind the shared mind approach is that the components of important medical decisions regarding treatment and desired outcomes are distributed amongst the clinicians, nurses, family and the patient (Epstein & Street, 2011; Epstein, 2013). A key assumption behind this approach is that distributed decisions tend to have better outcomes vs. individual-based decisions (Epstein & Street, 2011; Epstein, 2013). For example, one component of the shared mind approach is sharing information with the patient, which helps ensure that the patient is making a truly informed decision thereby augmenting autonomy (Epstein & Street, 2011; Epstein, 2013). Another component of the shared mind approach is what the authors refer to as shared deliberation or shared cognitive load between clinicians, family and patient. The idea here is that multiple perspectives tend to be better than a single perspective since individuals may not have the whole story (Epstein & Street, 2011; Epstein, 2013). Moreover, shared deliberation supposedly helps the patient cope with anxiety in the face of uncertainty (Epstein & Street, 2011; Epstein, 2013). A final component of the shared mind approach involves a distributed decision so that decision-making is seen more as a social activity rather than an individual one given that the decision results from a shared deliberation process (Epstein & Street, 2011; Epstein, 2013).

The purpose of introducing the shared mind approach is not to argue for it as a tool for joint clinician-family-patient decision-making, which is beyond the scope of this paper, but rather as a technique that can be adapted for reducing unconscious (as well as conscious) cognitive biases for clinicians making medical diagnoses. When a patient presents with symptoms in a hospital or clinical setting, a shared mind approach to diagnosis would involve a team of clinicians pooling their resources such as knowledge and experience in making a
This team approach adumbrates critical self-reflection with team reflection involving criticisms of the deliberations of fellow team members. Moreover, the team brings to the table multiple perspectives in arriving at a diagnosis which may result in a more accurate diagnosis since one physician acting on their own may overlook possibilities that others may notice. But what is important in terms of unconscious biases is that if one physician has, for example, a racial bias, this bias may be noticed by other members of the team and brought to that physician’s attention. Further, the effect of the bias in terms of arriving at a diagnosis will either be eliminated or reduced, resulting in a more objective diagnosis in the sense that it does not depend on an idiosyncratic and irrational point of view.

Clearly, the chances of unconscious biases being caught by others increases if the team is more diverse in terms of gender, race, age and ethnicity amongst other features. As was mentioned above, the study by Sabin et al. (2009) suggests that African American physicians are not as prone to unconscious racial biases as other physicians. Thus, if the clinical team sharing the diagnosis involves an African American physician, this person may notice racial biases in their colleagues and make them explicit. However, suppose that in a worst case scenario some implicit cognitive biases such as gender bias or race bias are not made explicit during the team’s shared deliberations and team reflection. If the biases are not shared amongst all members of the team, at the very least, this weakens or dilutes or perhaps even filters out the effect of the bias on the shared diagnostic deliberations. For example, suppose one member of the team has gender biases but no-one else does. Then that person’s vote is just one vote on the team and so this may reduce or dilute the effect of the bias on the shared decision.

Returning to the case study outlined by Croskerry et al. (2013a) involving the 19 year old mildly obese psychiatric female patient presenting with respiratory symptoms, there was a clear misdiagnosis on the part of the attending physician that played a role in the patient’s death. It was suggested by Croskerry et al. (2013a) that a number of cognitive biases were at work in the diagnostic reasoning including a framing effect and premature diagnostic closure. Another possibility noted above [and not mentioned by Croskerry et al. (2013a)] is that the physician may have had an implicit anti-obesity bias or perhaps even an implicit gender-bias that may not have been made manifest upon critical self-reflection. As noted above, there is evidence to suggest that gender-biased physicians are more likely to diagnose young males with cardiac disease as opposed to young females (Arslanian-Engoren, 2000). The virtue of a shared mind approach in this case is that there would have been a team of physicians involved so that such biases could be made manifest through team reflection and deflated or at least the biases may have been diluted even if not made manifest.

5. Concluding remarks

In this paper, I have argued that there is clear evidence in the medical literature of both explicit and implicit gender, racial and age-related cognitive biases on the part of physicians engaging in medical diagnoses. Such biases impinge on the right or at least on the reasonable expectation of patients to an optimal diagnosis free of biases. The proposal by Pat Croskerry that physicians should be trained with cognitive forcing to reduce these biases is admirable although it does not appear to bear fruit. Sherbino et al. (2011) and Sherbino et al. (2014) have raised warranted skepticism about both the efficacy and the long-term retention rate of cognitive forcing strategies for reducing diagnostic error. I have suggested that one possible reason for the apparent failure of cognitive forcing in reducing errors in diagnostic reasoning is that cognitive biases are often
unconscious, so that critical self-reflection that requires awareness of one’s own thought processes will not be effective. There is evidence in the medical literature of the existence of unconscious biases amongst medical students and physicians including anti-obesity biases (Miller et al., 2013), gender biases (Moss-Racusin et al., 2012) and racial biases (Haider et al., 2011). I have thus suggested the adaptation of the shared mind approach discussed by Epstein and Street (2011) and Epstein (2013) to medical diagnosis. Specifically, a shared mind approach to medical diagnosis would involve shared information, experience, deliberation and decisions across a team of physicians. Any unconscious biases possessed by a team member will either be made manifest by other members of the team (through witnessing the person’s words and actions) or at least diluted since that team member is only one cog in the wheel.

References


