# Cognitive Bias and the Creation and Translation of Evidence Into Clinical Practice

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**The optimal translation of evidence into the clinical practice of nephrology follows validated evidence-based medicine (EBM) principles. Most importantly, the evidence-based medicine practitioner requires that the evidence, as much as possible, addresses in an unbiased manner clinical questions of importance to patients and reflects the truth. In this chapter, we evaluate how cognitive biases that affect medical decision making might systematically bias the overall management of patients with kidney disease and, thus, distort the observations about disease causation, prognosis, diagnosis, and management that are derived from analysis of administrative databases or electronic medical records of health care systems. These cognitive biases influence how questions are framed, how risk factors and health status are measured, how decisions are made, and what actions are implemented. We explore the nature of these biases and the possible places where such biases are most likely to distort clinical care and the collection of the data that is used to inform clinical practice in nephrology. To the extent that cognitive biases selectively modify diagnostic interrogations and therapeutic interventions in some patients, the resultant databases may provide a skewed picture of the health of the nephrology patient population and should be considered with some skepticism when exploited to achieve best practice.**



**Key Words:** Evidence-based medicine, Cognitive bias, Research methodologies

## INTRODUCTION

Most comprehensive discussions of barriers to a rigorous use of evidence-based medicine (EBM) in nephrology practice largely focus on the limitations of the evidence in the published medical literature. The most common limitations of the medical literature arise from either a failure to ask the clinical question of interest or from flaws in the research methodologies that result in the introduction of classic forms of bias. The impact of poor study design and of bias or confounding on the results of clinical studies is well known[1] and is discussed in a number of other articles in this issue of *Advances in Chronic Kidney Disease*. The validity of the epidemiologic studies that importantly inform the practice of nephrology is dependent on the accurate and complete record of clinical parameters and outcomes. There is, however, another critical point that has received far less attention: the potential impact of cognitive biases on the topography of clinical care and the clinical care records/databases that are exploited to provide evidence and the impact of cognitive biases on the translation of evidence into the care of individual patients. Cognitive bias differs from statistical bias. Cognitive bias can be broadly defined as those adaptive processes of human cognition that allow for rapid decision making and judgments resulting in actions. Cognitive bias reflects decisions based on previous experience or other learned behaviors, where decisions are made without detailed analytical reasoning.[2,3] In the following discussion, I will explore some of the implications of cognitive bias for an EBM-centered nephrology practice.

Cognitive biases may result in important barriers to successful implementation of an EBM nephrology practice at 2 major loci. First, cognitive biases can affect the validity or applicability of the results from clinical studies. In the design of both observational and experimental studies, cognitive biases may influence the framing of the study question and the types of data collected by protocol. In epidemiologic studies anchored in administrative databases or in electronic medical records from large health care providers, cognitive biases may distort the type of care provided and, subsequently, the clinical information measured. Cognitive bias at this point may lead to distortions in the distribution of treatments and in misclassification of patients' exposures, risk factors, and disease outcomes. A secondary point for distortion caused by cognitive bias occurs when the clinician translates evidence for the individual patient. The clinician's cognitive bias could result in discounting evidence that does not conform to prior expectations while simultaneously overemphasizing evidence that confirms one's previous beliefs. In either case, the patient is not provided an unbiased summary of the evidence, even when high-quality evidence exists. To successfully implement EBM, the nephrologist should be empowered to recognize opportunities for cognitive bias in clinical studies and, in practice, to minimize the impact of the resulting distortions of the evidence on clinical decision making.

In this chapter, I will define cognitive bias, describe some common types of bias, and consider some examples in nephrology where cognitive bias may have an impact on the evidence. Cognitive biases can be differentiated from other important biases observed in epidemiologic studies, even though cognitive biases often results in distortions of the truth similar to that seen arising from these classic biases. I will not discuss, in detail, the influence of cognitive bias and heuristics on the individual clinician's

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decision making beyond exploring how the actions of the individual clinician impact the ascertainment and recording of clinical measures in administrative and population-based databases used in epidemiologic research. Some principle take home messages from this chapter for the EBM practitioner are listed in the clinical summary.

Cognitive biases were first characterized in the context of decision making in business and, more broadly, in the context of social interactions.[2,3] Cognitive biases are described as adaptive, allowing for efficient and effective decisions about actions within a given context. Typically, these are learned from experience and allow the individual to make decisions about actions in familiar and repeated situations, where timeliness is more important than accuracy. These are generally situations where the consequence of an error is perceived to be modest and, therefore, do not require the time or energy necessary for a more analytical approach. Heuristics are the rule-based cognitive "short cuts" that informally evolve when learned behaviors from past experiences are used to guide common decisions. Heuristics allow for efficient and fast, if not more error-prone, decisions. Additionally, cognitive biases might arise simply from an inability to quickly process large amounts of information.

**CLINICAL SUMMARY**

- Cognitive biases influence clinical decision making.
- The cumulative effect of cognitive biases on databases and the results from the epidemiologic studies based on these databases may be considerable.
- Cognitive bias may impact our understanding about risk factors for, and causation of, chronic kidney disease and CKD prognosis.
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- Educational interventions to recognize and reduce cognitive bias can change clinical care and outcomes.

## COGNITIVE BIAS IN MEDICAL DECISION MAKING

Croskerry and others have written extensively on how decision making in medicine can be similarly affected by cognitive biases.[4,5] Cognitive bias in medical decision making has been most thoroughly studied in its influence on the decisions to obtain diagnostic tests and in the interpretation of diagnostic tests.[5-7] These investigators have explored the prevalence of experience-based heuristics in complex medical environments that value quick actions, such as in the emergency department.[4,6] However, these heuristics can lead to a certain degree of medical error, in particular when the heuristics emerge from experience-informed behaviors, decisions, choices, and actions. In circumstances where avoidable error attributable to processes of care is unacceptable, heuristics may be problematic. Gigerenzer and colleagues have provided a counterargument that heuristics which are potentially not as much influenced by cognitive bias, that is, heuristics that are based on rigorously evaluated parsimonious algorithms, may improve overall clinical care without increasing error.[8-10]

In most clinical circumstances, however, the heuristics that clinicians adopt are not formally evaluated but are, instead, based on personal experience. These heuristics support decision making that is fast and intuitive, rather than analytical and slow. Table 1 compares some of the characteristics of these 2 decision-making strategies: the fast/intuitive and the slow/analytical approaches.

Recognizing the most common types of cognitive biases in clinical care, those that modify knowledge about disease prognosis, the potential etiology of disease, and risk factor identification and those that inform medical decisions about diagnosis and treatment, is key to understanding how these biases might affect the corpus of medical evidence. The number of named cognitive biases is substantial, with some lists exceeding 170 named biases.[11] Many of these can be classified either according to their etiology or their impact on medical decisions. One can group cognitive biases arranged according to the cognitive need they serve. One can also classify cognitive biases in medicine according to their impact on information gathering, risk factor and disease status classification, and decision making. Using this classification framework, some common cognitive biases in medicine are listed in Table 2 and described in detail by Chapman and Elstein.[12]

Chapman and Elstein[12] have provided a framework for understanding these cognitive biases. Common types of error in data gathering and decision making in clinical practice arise from cognitive biases that may include the framing effect, representativeness, availability bias, anchoring bias, diagnostic momentum, confirmation bias, sunk cost bias, blind obedience, overconfidence bias, base-rate neglect, premature closure, hindsight bias, and outcomes bias. Table 2 lists common biases in terms of whether they are likely to affect (1) the acquisition and interpretation of clinical data, (2) the interpretation of the clinical evidence, (3) decisions about taking action, and (4) evaluation of the results of decisions. The latter will then affect the subsequent clinical care and future measurement of clinical parameters. This reiterative cycle is shown in Figure 1.

## COGNITIVE BIAS AND EPIDEMIOLOGIC-BASED EVIDENCE IN NEPHROLOGY

We now consider how cognitive biases might affect the creation of evidence and its translation to the care of the individual nephrology patient. We consider 3 ways in which cognitive biases might influence evidence as reported in the nephrology literature or as employed to inform national priorities.

Cognitive biases may increase the probability of a particular diagnosis being made or influence the tracking of exposures or surveillance for certain outcomes in particular classes of patient. Cognitive bias might lead clinicians to