The psychology of antimicrobial prescribing behaviors

How cognitive biases may impact antibiotic prescribing practices.

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Antibiotic prescribing habits are more complex than one might expect. Up to 40% of antibiotic prescriptions are inappropriate, for reasons including the wrong drug, duration, dose, or indication.[1] Excessive antimicrobial prescriptions can harm patients, the health care system, and the environment, and there continues to be overuse and misuse of antibiotics in an era in which we are quickly running out of effective treatment options against the global rise of antimicrobial resistance. For example, the increasing resistance to carbapenems among Gram-negative organisms worldwide is alarming, and the global mortality from antibiotic resistance increased slightly from 1990 to 2019, with forecasts predicting a surge of deaths attributable to drug resistance in 2050.[2] Despite the expansion of antimicrobial stewardship efforts and heightened awareness of antibiotic resistance, inappropriate prescriptions remain common. In a study of outpatients being treated for community-acquired pneumonia, only 31% of antibiotic prescriptions were consistent with guideline recommendations. The most common reasons for inappropriate prescriptions were the wrong choice and excessive duration.[3] In this article, I explore related cognitive biases and the possible ways they may influence prescribing practices.

Dual-process thinking theory

Psychologists assert that humans possess two systems of thinking for making decisions.[4] Type 1 is fast and intuitive, operating on pattern recognition for problem-solving. It requires low cognitive resources and allows one to make accurate decisions rapidly, which is useful in disciplines that function at a fast pace. Type 2 is slow and analytical, operating on methodical and thoughtful processes. Consequently, it places a higher cognitive strain on the user but allows one to appraise data more critically and look beyond patterns, and it may be more advantageous for complex problem-solving. Experts claim that we spend 95% of our time in type 1 thinking.[4] Cognitive biases are more likely to occur in the type 1 system. Stress, fatigue, sleep deprivation, and cognitive overload can also increase the risk of cognitive errors. One system is not better than the other; both are required for optimal mental performance.

Cognitive biases

A cognitive bias, or heuristic, is a mental shortcut used to make quick and efficient decisions, similar to a rule of thumb.[5] These heuristics protect us against cognitive burnout from the sheer number of decisions we make every day. These biases likely conferred a survival advantage during human evolution and are a normal part of the human brain.[6] When making important clinical decisions, these mental shortcuts can be either assets or liabilities. There are well over 100 identifiable biases. Some common biases are commission bias, optimism bias, decision fatigue, tolerance of uncertainty, loss aversion, illusory correlation, aggregate bias, affective bias, availability bias, bandwagon effect, and base-rate neglect.[7,8] I will examine the biases that can influence antibiotic prescribing habits.

Commission bias

Commission bias is the tendency toward action over inaction, because doing something is perceived to be better than doing nothing.[6] Therefore, prescribing an antibiotic is perceived to be a more appropriate intervention than watchful waiting, even when the prescription is inappropriate or harmful. As another example, antimicrobial stewardship recommendations are more likely to be accepted if they broaden instead of narrow the antibiotic spectrum or increase rather than decrease antibiotic exposure.[6] Education about the overuse and harms of antibiotics and careful consideration of the pros and cons when prescribing these medications can help overcome this bias.

Optimism bias

Closely tied to commission bias is optimism bias, which overestimates the benefit of an intervention when little to none exists, while downplaying the harm.[6] Parents of pediatric patients greatly overestimate the utility of antibiotics on the duration of symptoms in viral respiratory tract infections.[6] Although physicians recognize antimicrobial resistance as a problem, they tend to believe that it

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is driven by other prescribers in different practice settings.[6] To combat this bias, clinicians should engage in shared decision making with patients, discussing the risks and benefits of all available treatment options.

Decision fatigue

Decision fatigue refers to the decline in self-control after making repeated decisions. In a study of antibiotic prescribing patterns in primary care offices, the portion of visits resulting in an antibiotic prescription for acute respiratory conditions that never require antibiotics (e.g., acute bronchitis, other viral infections) increased as the day went on.[9] The cumulative cognitive demand from making multiple decisions can lead physicians to take the path of least resistance, which may be an inappropriate prescription. Possible solutions to address decision fatigue are mandatory breaks, modified schedules, and reduced workload.

Tolerance of uncertainty

Quite often, the diagnosis of infection is ambiguous, leading to uncertainty.[10] Some noninfectious conditions can mimic common infections. For example, venous stasis is often misdiagnosed as cellulitis.[11] When unsure, some physicians prefer to offer antibiotics to cover the possibility of an evolving infectious process. Those who have difficulty tolerating uncertainty tend to overprescribe antibiotics.[10] Improving a clinician's ability to cope with diagnostic uncertainty by encouraging transparency with patients and collaboration with colleagues may reduce unnecessary antibiotic prescriptions.[10]

Loss aversion

The tendency to avoid missing or losing something is greater than the tendency to gain something. This is known as loss aversion.[5] This can result in the prescription of antibiotics to avoid missing the small risk of a bacterial infection or using inappropriately broad-spectrum antibiotics to reduce the risk of missing the culprit pathogen.[12] To reduce loss aversion, it would be helpful to properly ascertain the risk of a particular intervention or outcome by reviewing the epidemiology of the topic or educating oneself about statistics.[13]

Illusory correlation

Another common mistake is falsely attributing an event to an intervention, known as illusory correlation.[14] When a patient experiences an improvement in symptoms after taking an antibiotic, the outcome is generally attributed to the medication, although there may be other reasons for improvement, such as natural resolution over time or the placebo effect. To combat this bias, careful consideration of confounding variables that may affect the outcome is warranted.[14]

Aggregate bias

Clinicians who believe that population studies used to inform guideline development do not apply to their patients are experiencing aggregate bias.[5] For instance, multiple national guidelines recommend against routine antibiotic prophylaxis prior to dental procedures in patients with prosthetic joints; nevertheless, many of these patients are offered antibiotics.[15] To address this bias, it is important to remind oneself that any practice that deviates from a guideline should be supported by evidence.

Affective bias

Affective bias refers to our feelings toward a patient, situation, medication, or intervention.[5] A perceived negative outcome makes a greater impact than an equally positive outcome. For example, infection relapses or treatment failures may be more easily recalled and lead to less judicious antibiotic prescribing practices (e.g., longer duration, broader spectrum).[6] Consultation with a specialist and careful review of the literature may limit the impact of this bias.[6]

Availability bias

Availability bias occurs when the ease of recall of certain events leads to an overestimation of their true probabilities.[6] For example, there is a tendency to choose an antibiotic that had recent perceived success and avoid alternatives with recent perceived failure.[6] Adherence to guidelines and re-evaluation of predictions can help mitigate this bias.

Bandwagon effect

The bandwagon effect is a form of groupthink—the tendency to do or believe something because many other people do or believe the same.[16] For example, one study found that over 80% of hospitalized elderly patients are treated with antibiotics unnecessarily, which may lead people to think this practice is the standard of care.[17] To counter this bias, it is important to revisit current practice standards to ensure they align with best available evidence.

Base-rate neglect

Base-rate neglect is the tendency to ignore the true prevalence of a disease, either inflating or reducing its base rate.[18] In a survey assessing practitioner estimates of probability of infections in a given clinical scenario, both urinary tract infections and pneumonia were overestimated, at 80% and 95%, respectively, when the true probabilities were 0% and 55%, respectively.[19] Consequently, this can lead to overprescribing antibiotics. Rather than assessing risk based on intuition, it is best to use epidemiological data and evidence-based tools or algorithms to risk stratify patients.

Summary

Antibiotic prescribing behaviors are complex. They are shaped by our personal and clinical experiences, values, beliefs, culture, emotions, desires, knowledge, education, and training. The interplay between these elements results in distinct prescribing habits among individuals, such that a straightforward infection could be treated in many different ways. Rational, evidence-based prescribing should be the goal with every antibiotic prescription. To overcome bias, some debiasing strategies are attending bias-specific teaching sessions, engaging in metacognition (e.g., questioning your thinking, having awareness of your thought processes), slowing down, and using checklists or preprinted orders. ■

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and a kinesiologist (www.worksafebc.com/en/health-care-providers/rehabilitation/post-concussion-management-program).

CATT also has additional resources for you and your patients, including the following e-learning courses:

- Concussion Awareness Training Tool for Medical Professionals (free and eligible for Mainpro+ and Maintenance of Certification credits): https://cattonline.com/course/concussion-awareness-training-tool-for-medical-professionals
- Concussion Awareness Training Tool for Workers and Workplaces: https://cattonline.com/course/concussion-awareness-training-tool-for-workers-and-workplaces

WorkSafeBC is here to support you. If you have questions or concerns about a patient with work-related concussion, speak with a WorkSafeBC medical advisor via the RACE app: www.raceconnect.ca/get-raceapp. ■

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Competing interests

None declared.

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