Nudging Toward Progress: The State of Clinical Decision Support in Nephrology

By Kyle D. O'Connor and F. Perry Wilson

Clinical decision support (CDS) tools have increased in number and complexity as the electronic health record (EHR) has increased in capability. CDS tools come in many forms, including best practice alerts, customized documentation templates, order sets, and warning systems of potential harm. The promise of these tools is to provide clinicians with appropriate, useful, and actionable information at the point of care. The implementation of these tools follows a framework known as "The Five 'Rights' of CDS": 1) the right information, 2) to the right people, 3) through the right channels, 4) in the right format, and 5) at the right points in the workflow (1). The framework encourages the spirit of end-user feedback in the design of CDS tools in the EHR to avoid false positives and "alert fatigue" (2).

Several pragmatic randomized controlled trials have investigated EHR alerts across multiple disease states and settings. Selby et al. (3) found that EHR alerts, in addition to a care bundle and an educational program, improved acute kidney injury (AKI) recognition, performance of urinalyses, and increased review of medications in adult patients who were hospitalized. Furthermore, Ghazi et al. (4), in the outpatient Pragmatic Trial of Messaging to Providers About Treatment of Heart Failure (PROMPT-HF), demonstrated that EHR alerts linked with an order-set option increased guideline-directed medical therapy class prescription in patients with heart failure. Interestingly, the Electronic Alerts for Acute Kidney Injury Amelioration (ELAIA-1) study found that EHR alerts for AKI *increased* mortality within a subgroup of non-teaching hospitals, underscoring the need for randomized trials for CDS (5), even when the intervention may seem to be "common sense."

Ultimately, these studies indicate that CDS can be quite effective at changing process outcomes (e.g., medication orders) but, to date, have more mixed results in terms of clinical outcomes. To avoid alert fatigue, wherein providers begin to ignore even helpful alerts due to alert proliferation, there must be efforts to minimize the number needed to nudge (NNN), or the number of alerts needed for a successful response per patient (Figure 1). Overall, CDS interventions seek to promote an established process of care that is a best practice and yet is currently under-utilized. CDS interventions should be robustly evaluated in the context of randomization, where feasible, to show they can affect the process and, preferably, downstream clinical outcomes. At all stages, end users should be involved. ■

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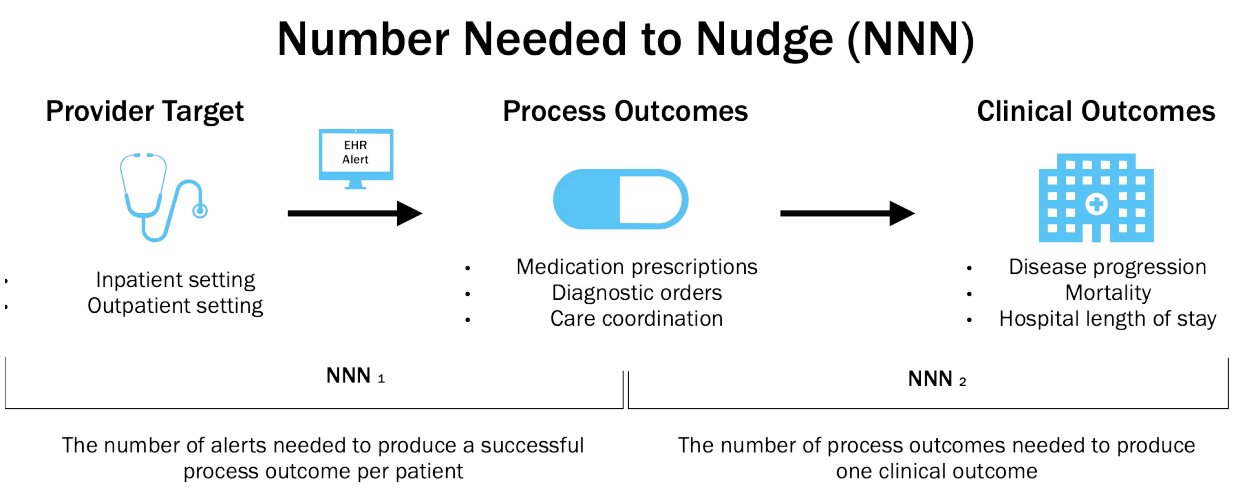
Figure 1. Avoiding alert fatigue



The NNN is a statistical concept capturing the number of alerts or "nudges" needed as an intervention to produce a successful outcome per individual patient. For a process outcome to change a clinical outcome, an NNN would need to be minimized to avoid "alert fatigue." NNN1 reflects the number of alerts needed to produce a successful response for the process outcome. NNN2 is the number of process outcomes to produce one clinical outcome.

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What Is the Future of Artificial Intelligence in Nephrology?

Concept by* KN *Editorial Board member Matthew A. Sparks and* KN *Editor-in-Chief Kenar D. Jhaveri

By ChatGPT

Artificial intelligence (AI) has the potential to revolutionize the field of nephrology, which is the study of the kidneys and their functions. With the increasing availability of electronic medical records, imaging data, and genomic data, AI can be used to analyze large amounts of data and extract meaningful insights to improve the diagnosis, treatment, and prevention of kidney diseases. Here are some of the potential applications of AI in nephrology:

1. Diagnosis: AI can be used to analyze patient data, including lab results, imaging studies, and clinical notes, to improve the accuracy of diagnosis of kidney diseases. AI algorithms can also help identify patients who are at high risk of developing kidney diseases.
2. Treatment: AI can help nephrologists select the best treatment option for each patient, based on their individual characteristics and medical history. For example, AI algorithms can help identify which medications will be most effective for a particular patient or which patients are likely to benefit from a particular type of dialysis.
3. Monitoring: AI can be used to monitor patients with kidney diseases and detect changes in their condition in real-time. This can help prevent complications and allow for early intervention when necessary.
4. Predictive analytics: AI can help predict which patients are at risk of developing kidney diseases, allowing for earlier intervention and prevention of complications.
5. Drug discovery: AI can be used to discover new drugs for the treatment of kidney diseases. AI algorithms can analyze large amounts of genomic and proteomic data to identify novel targets for drug development.

Overall, the future of AI in nephrology is promising, as it has the potential to improve the accuracy of diagnosis, treatment, and prevention of kidney diseases, leading to better outcomes for patients. However, it is important to ensure that AI is used ethically and responsibly and that patient privacy is protected. ■

ChatGPT is an artificial intelligence chatbot developed by OpenAI and launched in November 2022. It is built on large language models and has been fine-tuned (an approach to transfer learning) using both supervised and reinforcement learning techniques.