

Nudge Units to Improve the Delivery of Health Care

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The final common pathway for the application of nearly every advance in medicine is human behavior. No matter how effective a drug, how protective a vaccine, or how targeted a therapy may be, a clinician usually has to prescribe it, and a patient accept and use it as directed, for it to improve health. Clinicians' and patients' environments influence their decisions about taking these actions, and the seemingly subtle design of information and choices can have outsized effects on our behavior. When the "choice architecture" is designed to influence behavior in a predictable way but without restricting choice, it is often called a "nudge."

Key information and important choices are constantly being presented in health care.¹ Consider the way in which a physician offers influenza vaccination, or the default settings in electronic health records (EHRs) for the duration of a new opioid prescription. Yet often, these frames or default options are selected haphazardly, without attention to the shared goals of overcoming common barriers to vaccination or balancing pain relief against addiction risk.

Or consider the conventional deployment of order-entry systems in EHRs. Their presentation of choices is often based on conventions or design intuitions, such as listing options alphabetically or by the service providing them. Little attention is paid to the potential effect of presenting choices strategically, and typically the

relative effectiveness of alternative presentations hasn't been tested. Do we really want to list drugs for a given indication from A to Z, inadvertently guiding prescribers to choose a product that starts with a letter earlier in the alphabet when later options might be more effective, less expensive, or both?

Other industries that went digital long ago have developed expertise in presenting choices in ways that strongly influence consumer behavior. For example, airlines require consumers to actively choose whether to purchase trip insurance before they can buy a plane ticket. Amazon displays additional, complementary items alongside the purchase you are about to make. Netflix changed default settings to automatically play the next episode in a TV series to encourage binge watching. Similar opportunities exist to direct clinicians and patients toward better health care in situations where there's consensus about desired behaviors.

Such consensus, however, is often elusive in health care because the set of stakeholders, professional conventions, and ethical frameworks are more complex than in travel, retail, or entertainment. We might be comfortable with letting consumers look out for themselves when nudged to purchase travel insurance, but we expect more professional oversight when recommending a breast-cancer screening strategy, for example. Yet evolving evidence has led to multiple changes in breast-

cancer screening guidelines in recent years. Given that nudges are influential, their direction and force must be aligned with professional standards, and those standards may be controversial or evolve over time.

In 2010, British Prime Minister David Cameron created a behavioral insights team, now known as the Nudge Unit, to leverage opportunities to improve his government's efficiency through behavioral science and careful testing. The unit quickly demonstrated how nudges could influence behavior. Messages appealing to reciprocity increased organ-donor consent rates. Changes to default settings and comparisons to social norms increased tax revenues and charitable contributions. Nudge units began spreading to governments in other countries, including the United States. Although behavioral economists have been drawing attention to health care's choice architecture for some time,¹ to our knowledge, no nudge unit has been formed within a health care system.

In 2016, we launched the Penn Medicine Nudge Unit to systematically develop and test approaches using nudges to improve health care delivery. The goals are to improve health care value and outcomes, advance knowledge about how to best implement nudges for impact, evaluate our efforts, and disseminate our findings. Ideas are generated by health system leadership, frontline clinicians and staff, and members of the unit itself. Our early successes

Steps for Deploying Nudges in Health Care.	
Step	Role of a Nudge Unit
Identify opportunities	<ul style="list-style-type: none"> Work with members across the health system to identify suboptimal care Investigate the decision-making process to pinpoint a specific change that could shift behavior Work with leadership and the information technology team to evaluate intervention feasibility Prioritize opportunities with higher likelihood of success that have potential to be scaled
Measure outcomes	<ul style="list-style-type: none"> Understand the current state and potential impact of an intervention using measurable outcomes, including process measures (e.g., prescribing patterns, referral rates), utilization (e.g., imaging, emergency department visits), and patient outcomes (e.g., length of stay, readmissions, mortality)
Pragmatically implement	<ul style="list-style-type: none"> Determine potential approaches for introducing a change in choice architecture within the health care delivery system Assess the effects on clinician workflow Consider possible unintended consequences and ways of addressing them Explore feasibility of using the intervention more broadly if successful
Align stakeholders	<ul style="list-style-type: none"> Obtain buy-in from health system and clinical department leadership as well as support from clinicians at the frontline of care Consider competing priorities and solicit feedback on intervention design
Compare effectiveness	<ul style="list-style-type: none"> Use evidence-based approaches to design interventions in a testable manner, such as through randomized trials or quasi-experimental approaches Evaluate immediate changes from the intervention, sustained effects, and unintended consequences
Translate findings to scale	<ul style="list-style-type: none"> Leverage findings to further optimize nudges and expand them more broadly throughout the health system Disseminate knowledge on best practices through multiple avenues, including publication

and failures reveal some lessons about the role that nudge units can play in improving health care (see table).

First, these units can help health systems understand when it makes sense to use a nudge and when it doesn't. Nudges can be designed to remind, guide, or motivate behavior. Promising opportunities are those in which suboptimal care can be addressed by targeting a specific decision

that drives a less-than-optimal behavior. For example, when prescribing medications, physicians must decide between brand-name and generic formulations. Systems can set generics as the default choice, so that ordering them becomes the path of least resistance even as the ability to opt out and order a brand-name drug is preserved. When we implemented this change in our EHR, prescribing rates for generics in-

creased from 75% to 98%.² Clinical settings also play an important role. We found that reducing the default duration of opioid prescriptions may make sense for acute conditions often seen by clinicians in the emergency department but may be inappropriate for clinicians caring for patients with chronic pain.

Second, although nudges have typically been deployed for simple one-off decisions, we've found that they can also support more complex decision paths. For example, only 15% of our eligible patients were being referred for cardiac rehabilitation after myocardial infarction. When we asked the cardiologists why, we discovered that the process remained manual, so they had to take action to initiate the referrals — in other words, it was an opt-in system. The process was redesigned as an opt-out system in which referral for rehab was the default; patient identification was automated using the EHR; staff were notified using secure text messaging; and processes were restructured so that cardiologists signed orders in a template for referral on rounds and staff met with patients to set up rehab placement before discharge. The referral rate increased to more than 80%.

Third, stakeholder alignment is critical to nudges' success. In a less successful case, we used a top-down approach to test ways to nudge primary care physicians to prescribe statins for eligible patients. That approach was less well received because notifications came from the Nudge Unit rather than from practice managers or clinical leadership. And since we didn't engage clinicians from the

practice up front in the design, our intervention was not sufficiently embedded in their workflow.

Fourth, nudges can lead to unintended behavior that's invisible without proper evaluation. We've seen many situations in which features of a choice architecture meant to change behavior were deployed but their consequences were never evaluated. For example, one primary care practice at our institution implemented an "active choice" intervention in the EHR prompting clinicians to address gaps in recommended care. It led to a 35% relative increase in ordering of influenza vaccination and cancer screening, as compared with a control group.^{3,4} Yet over time, clinicians reported alert fatigue. So before this approach was expanded to other practices, the number of alerts was reduced and notifications were redirected to medical assistants, who could deploy orders in a template for clinicians to review. Similarly, in a randomized trial of price transparency for inpatient laboratory testing, we found that displaying prices for more expensive tests led to a small though significant decline in test order-

ing, but it was offset by increases in the ordering of less expensive tests.⁵ Although displaying prices may intuitively seem like a good idea, many prices may have been lower than clinicians expected (e.g., a basic metabolic panel was \$11). Careful evaluation of intended and unintended consequences is essential in optimizing these interventions.

Opportunities for effective nudges abound in health care because choice architectures guide our behavior whether we know it or not. As more health care decisions are made within digital environments where they can be witnessed and their context can easily be reshaped, nudging opportunities expand. Though there is some common sense involved in creating effective nudges, expertise is also required — for identifying promising targets, designing both the conceptual approach and the technical implementation, managing the politics and process of obtaining stakeholder buy-in, and evaluating impact. It doesn't take much investment to support such expertise, and given the value of its applications, most health systems would be well

served by insourcing it. Nudge units have already improved government policies around the world. We owe it to our patients to do the same for health care.

Disclosure forms provided by the authors are available at NEJM.org.

From the Penn Medicine Nudge Unit, the LDI Center for Health Incentives and Behavioral Economics, the Penn Medicine Center for Health Care Innovation, the Perelman School of Medicine, the Wharton School, University of Pennsylvania, and the Crescenz Veterans Affairs Medical Center — all in Philadelphia.

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E-Cigarettes and the Harm-Reduction Continuum

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On July 28, 2017, the recently appointed commissioner of the Food and Drug Administration (FDA), Scott Gottlieb, announced a "new comprehensive plan for tobacco and nicotine regulation." To permit both scientific deliberation and product innovation, the FDA will delay

rules on the regulation of electronic cigarettes (e-cigarettes) until August 2022. At the heart of this move is what the agency described as "a greater awareness that nicotine — while highly addictive — is delivered through products that represent a continuum of risk and is most harmful

when delivered through smoke particles in combustible cigarettes." Combusted tobacco, at one end of the continuum, is followed by regular smokeless tobacco, low-nitrosamine smokeless tobacco, e-cigarettes, and, at the other end, nicotine replacement therapy. The FDA's statement and