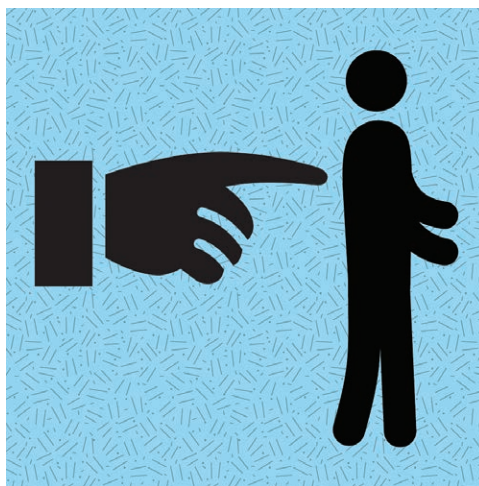


An Effective Behavioral Nudge in the Operating Room

Nita Khandelwal, M.D., Sean D. Sullivan, Ph.D.

Default order-entry lists in electronic health records are a form of a behavioral nudge. The framing and order of choices often is purposeful, intended to nudge the user to a specific choice. A nudge is a behavioral economics concept defined as any aspect of the choice architecture that influences behavior in a predictable way, without restricting options or significantly changing economic incentives. Nudges are not mandates, but rather a way to influence behavior without coercion.¹ In fact, recognizing the potential power of nudges to influence clinician and patient behavior, the University of Pennsylvania Health System has a dedicated nudge team (the Penn Medicine Nudge Unit) which systematically develops and tests nudges to improve health care delivery.²

In this issue of *ANESTHESIOLOGY*, Ershoff *et al.*³ take advantage of a natural experiment to examine whether the default dose of hydromorphone (a type of nudge) influences the quantity of hydromorphone administered intraoperatively. The authors used an interrupted time-series analysis to assess whether a change in the default dose of hydromorphone from 2 mg to 1 mg would influence the total quantity of hydromorphone administered to patients intraoperatively. For the first 72 weeks of the study period, hydromorphone was available in 2-mg vials at the study site ($n = 10,598$, Cohort 1); owing to a change in pharmaceutical supplier, there was a period of approximately 20 weeks during which hydromorphone was solely available in 1-mg vials ($n = 2,981$, Cohort 2), after which the available unit dose was changed back to 2 mg ($N = 1,431$, Cohort 3). The authors report that the change in default dose from 2-mg to 1-mg vials (change



“A nudge is a behavioral economics concept defined as any aspect of the choice architecture that influences behavior in a predictable way, without restricting options or significantly changing economic incentives.”

point 1) was associated with a 49% relative decrease in the probability of receiving a hydromorphone dose of greater than 1 mg. The reintroduction of the 2-mg vial (change point 2) was associated with a 48% relative increase in the probability of administering a dose greater than 1 mg.³

Although not intentionally designed as a nudge, in this context, the switch from 2-mg vials to 1-mg vials can be viewed as an intervention that nudges clinicians to reduce their use of opioids—and the decision to limit intraoperative hydromorphone dosing to less than or equal to 1 mg represents how clinicians responded to the nudge.

Default options are a specific type of nudge. A default option is a preselected course of action that goes into effect unless an individual takes an active step to select a different option. Large bodies of evidence support that, all things being equal, we are more likely to choose default options. Why?

Because humans are inclined to follow the path of least resistance. This is particularly true when time is limited and the trade-off does not appear to be associated with adverse consequences—as was the case here. The relative decrease in dose of intraoperative hydromorphone administered was not associated with a corresponding increase in postanesthesia care unit opioid administration or a corresponding increase in intraoperative fentanyl administration.

At the study site, similar to most institutions, discarding unused opioid requires a witness and additional documentation, both of which take time. This additional step, the authors hypothesize, may explain the relative decrease in intraoperative hydromorphone use seen when the available unit dose of hydromorphone went from 2 mg to 1 mg. Although this can

Image: J. P. Rathmell/The Noun Project.

This editorial accompanies the article on p. 981.

Accepted for publication January 27, 2020. Published online first on March 5, 2020. From the Department of Anesthesiology and Pain Medicine, School of Medicine (N.K.), and Schools of Pharmacy and Public Health (S.D.S.), University of Washington, Seattle, Washington.

Copyright © 2020, the American Society of Anesthesiologists, Inc. All Rights Reserved. *Anesthesiology* 2020; 132:942–3. DOI: 10.1097/ALN.0000000000003225

be viewed as driving the response to the nudge, we can also argue that, during this era when we are focused on improving operating room efficiency, reducing time and effort (friction costs) is an added positive benefit of the nudge.

We must also consider that Ershoff *et al.* found that during the 72-week period before the first change point during which the available hydromorphone unit dose was 2 mg, the probability of receiving a dose greater than 1 mg had a 3% relative decrease per 10-week period—a finding the authors hypothesize might be explained by an overall trend in relying less on intraoperative opioids as enhanced recovery after surgery programs were implemented. It can be argued that the added relative decrease in hydromorphone dosing to at least 1 mg in Cohort 2 was an extension of a desire to rely less on intraoperative opioids for analgesia—nudged by the change in the default choice. But if that was the case, then why didn't the full effect persist in Cohort 3? One limitation of this study is that we don't know how individual clinicians changed their behavior over time and we don't know *why* clinicians changed their behavior. However, the relative increase in hydromorphone administered on reintroduction of 2-mg vials suggests that whatever the motivation, removing the nudge resulted in some clinicians reverting back to previous behavior.

Nudges, particularly default options, have been shown to influence clinician behavior in a positive way in a variety of settings—from hand hygiene⁴ to judicious fluid use⁵ to removal of foley catheters⁶ and arterial lines.⁷ Physician prescribing behaviors for medications are no exception. For a 7-month period, the Penn Medicine Nudge Unit implemented a different change in electronic health record defaults among all specialties across the entire University of Pennsylvania Health System. Instead of changing electronic health record display defaults, an opt-out checkbox labeled “dispense as written” was added to the prescription screen, and if left unchecked the generic-equivalent medication was prescribed. During this period, there was a 23.1% increase in generic prescribing rates, which has been associated with higher adherence, lower costs to patients and improved clinical outcomes.^{2,8}

The operating room is a unique environment—one in which a single clinician is often responsible for real-time patient assessment, drug selection, and drug administration. Decisions are endless, and because time is always a factor, one simply cannot afford to think deliberately and deeply about every choice that has to be made. Purposeful policies that nudge very busy decision-oriented clinicians to do the right thing should be identified and rigorously evaluated. If done wisely,⁹ rationally, and based on evidence, effectively leveraging the power of nudges, particularly default options, to

influence clinician behavior may have great power to improve the quality of care we deliver in our operating rooms.

Competing Interests

Supported in part by National Institutes of Health grant No. K23HL144830 (Bethesda, Maryland; to Dr. Khandelwal).

Correspondence

Address correspondence to Dr. Khandelwal: khandel@uw.edu

References

1. Thaler RH, Sunstein CR: Nudge: Improving decisions about health, wealth, and happiness. Revised and expanded edition. New York, Penguin Books, 2009
2. Patel MS, Volpp KG, Asch DA: Nudge units to improve the delivery of health care. *N Engl J Med* 2018; 378:214–6
3. Ershoff BD, Grogan T, Hong JC, Chia PA, Gabel E, Cannesson M: Hydromorphone unit dose affects intraoperative dosing: An observational study. *ANESTHESIOLOGY* 2020; 132:981–91
4. Caris MG, Labuschagne HA, Dekker M, Kramer MHH, van Agtmael MA, Vandenbroucke-Grauls CMJE: Nudging to improve hand hygiene. *J Hosp Infect* 2018; 98:352–8
5. Horst S, Kawati R, Rasmussen J, Pikwer A, Castegren M, Lipcsey M: Impact of resuscitation fluid bag size availability on volume of fluid administration in the intensive care unit. *Acta Anaesthesiol Scand* 2018; 62:1261–6
6. Cornia PB, Amory JK, Fraser S, Saint S, Lipsky BA: Computer-based order entry decreases duration of indwelling urinary catheterization in hospitalized patients. *Am J Med* 2003; 114:404–7
7. Gershengorn HB, Garland A, Kramer A, Scales DC, Rubenfeld G, Wunsch H: Variation of arterial and central venous catheter use in United States intensive care units. *ANESTHESIOLOGY* 2014; 120:650–64
8. Patel MS, Day SC, Halpern SD, Hanson CW, Martinez JR, Honeywell S Jr, Volpp KG: Generic medication prescription rates after health system-wide redesign of default options within the electronic health record. *JAMA Intern Med* 2016; 176:847–8
9. Halpern SD, Ubel PA, Asch DA: Harnessing the power of default options to improve health care. *N Engl J Med* 2007; 357:1340–4