

transport in the renal tubule. Alternatively, it might be because the doses of mannitol we used were relatively low (12.5 to 25 g). Larger studies and animal models may help elucidate the effects of various types of diuretics as well as vasoactive agents on real-time urine oxygen monitoring.

### Research Support

This work was supported in part by the University of Utah Department of Anesthesiology Research Council (Salt Lake City, Utah); a University Technology Acceleration Grant from the Utah Science, Technology, and Research Initiative (USTAR; Salt Lake City, Utah); and a career development award from the National Center for Advancing Translational Sciences of the National Institutes of Health (Bethesda, Maryland) under Award Number UL1TR002538 and KL2TR002539. These organizations were not involved in study design, analysis, interpretation, or manuscript creation.

### Competing Interests

Drs. Silverton and Kuck are inventors on a patent application for the urine oxygen and flow sensing technology. This prototype is under development for commercial consideration but as of yet no commercial activity has occurred. This work was performed under a conflict of interest management plan approved by the University of Utah Conflict of Interest Office (Salt Lake City, Utah). This included disclosure of conflict of interest to patients and collaborators and an independent peer review of the data analysis. Dr. Hall declares no competing interests.

Natalie A. Silverton, M.D., F.R.C.P.C., F.A.S.E., Isaac E. Hall, M.D., M.S., Kai Kuck, Ph.D. University of Utah, Salt Lake City, Utah (N.A.S.). [natalie.silverton@hsc.utah.edu](mailto:natalie.silverton@hsc.utah.edu)

DOI: 10.1097/ALN.0000000000004114

### References

1. Chen DX: Urine oxygen monitoring in cardiac surgery: Comment. *ANESTHESIOLOGY* 2022; 136:662
2. Silverton NA, Lofgren LR, Hall IE, Stoddard GJ, Melendez NP, Van Tienderen M, Shumway S, Stringer BJ, Kang WS, Lybbert C, Kuck K: Noninvasive urine oxygen monitoring and the risk of acute kidney injury in cardiac surgery. *ANESTHESIOLOGY* 2021; 135:406–18
3. Tolley PM, Purcell A, Bolsin SN: Effect of i.v. furosemide on pelvic urinary oxygen tension in humans. *Br J Anaesth* 1999; 83:328–9

(Accepted for publication December 9, 2021. Published online first on January 20, 2022.)

## One Thousand Words...

### To the Editor:

Thank you for the vivid cover art from Maria Kojick and Eva Glasbeek<sup>1</sup> that accompanied the pair of environmental pieces from McGain *et al.*<sup>2</sup> and Struys and Eckleman<sup>3</sup> in the December 2021 issue. While the discussion in the article<sup>2</sup> and editorial<sup>3</sup> of the carbon footprint of anesthesia help contextualize this issue, this cover art drives home the message in a striking fashion. Work such as McGain's needs to be done to assess and document the impact of our current healthcare practices. Further work in this area must follow, expanding to consider better practices. Naturally, this must be done in partnership with our surgery and nursing colleagues. Hospital administrators, too, have an interest due to the cost and local regulations regarding recycling and waste management. McGain's work is a phenomenal first step. Without actual knowledge, we will not know how to improve care for patients and the environment. However, if the world's response to viruses and vaccines are any proof, many people struggle to comprehend scientific information. Thus, images like that on the December cover, which quickly conveys the heart of both McGain's and Struys' writing, are more than just welcomed: they are crucial. Visual media have been powerful agents of change in the past: recall the crying American Indian advertisement of the 1970s or the egg-and-skillet antidrug campaign of the 1980s. Kojick, laying in the epicenter of a circle of waste products, communicates our dilemma: the amount of waste from this single operation is staggering. It's hard to imagine the amount of daily waste our operating rooms create. This image transitions from the personal to the wider situation. Images work quickly and can elicit emotive responses. For better or for worse, our world often responds more to images than to nuanced writing. Thus, while research and articles are paramount, a cover like this is a wonderful adjunct for promoting the message. Please continue to utilize art in the Journal!

### Research Support

Support was provided solely from institutional and/or departmental sources.

### Competing Interests

Dr. Hester reviews some submissions to the *Mind to Mind* section of *ANESTHESIOLOGY*. The author declares no competing interests.

Douglas L. Hester, M.D., M.F.A. Vanderbilt University Medical Center, Nashville, Tennessee. [doug.hester@vumc.org](mailto:doug.hester@vumc.org)

DOI: 10.1097/ALN.0000000000004131

## References

1. Kojick M, Glasbeek E: "This is a waste of one operation...my operation." *ANESTHESIOLOGY* 2021; 135: number 6 (December) cover
2. McGain F, Sheridan N, Wickramarachchi K, Yates S, Chan B, McAlister S: Carbon footprint of general, regional, and combined anesthesia for total knee replacements. *ANESTHESIOLOGY* 2021; 135:976–91
3. Struys MMRF, Eckelman MJ: Environmental footprint of anesthesia: More than inhaled anesthetics! *ANESTHESIOLOGY* 2021; 135:937–9

(Accepted for publication December 22, 2021. Published online first on January 24, 2022.)

## An Improvement to Medication Safety—Or a Weakness?

### To the Editor:

Drug administration errors continue to occur frequently in the operating room,<sup>1</sup> and yet the safest way to administer medications in the operating room continues to be discussed. For instance, opinions vary on whether it is safer to use plain white labels *versus* color-coded labels.<sup>2</sup> The use of prefilled syringes replaces the traditional error-prone process of placing several drugs into different syringes with a streamlined process whereby a manufacturer prepares numerous syringes of the same drug, while also incorporating standardized labeling.<sup>3</sup> Another practice is the use of label printers that legibly print the name and dose of the drug with a corresponding barcode that can then be scanned by a barcode reader before administration. Label printers may also function as a "two-person" check for the correct drug selection by audibly announcing the name of the drug.<sup>4</sup>

Our institution, which uses label printers and barcode scanners in the operating room, recently had an event in which prefilled phenylephrine syringes were mistakenly substituted with a higher concentration (40 *vs.* 80 mcg/ml). Root cause analysis determined that the error was predicated on the purchasing technician team ordering the incorrect concentration and additionally "teaching" the automated medication dispensing system that the higher-concentration phenylephrine syringes were actually the lower concentration. Remarkably, it took 3 weeks before an anesthesia provider noticed and reported the concentration substitution. Psychologic factors including in-filling (when we read part of a word and our brain fills in the rest) and

confirmation bias (when the brain interprets information that confirms its expectations) were likely responsible.<sup>2,5,6</sup> In other words, multiple human errors subverted the safety technologies we had put in place. As a result of our event, our department now advocates that prefilled syringes be scanned by the label printer to obtain a visual and auditory confirmation of the prefilled drug name and concentration.

Systems approaches such as the medication administration practices described focus on building defenses to prevent human errors.<sup>7</sup> Technology is intended to make our practice safer, but overreliance on technology comes with its own risks, especially when the accuracy of technology is highly dependent on inputs provided by error-prone humans. At the end of the day, there is no substitution for reading and rereading the label.<sup>8</sup>

### Research Support

Support was provided solely from institutional and/or departmental sources.

### Competing Interests

The authors declare no competing interests.

Karolina Brook, M.D., R. Mauricio Gonzalez, M.D. Boston Medical Center, Boston, Massachusetts (K.B.). karolina.brook@bmc.org

DOI: 10.1097/ALN.00000000000004138

## References

1. Cooper L, DiGiovanni N, Schultz L, Taylor AM, Nossaman B: Influences observed on incidence and reporting of medication errors in anesthesia. *Can J Anaesth* 2012; 59:562–70
2. Webster CS: Human psychology applies to doctors too. *Anaesthesia* 2000; 55:929–30
3. Webster CS, Merry AF, Ducat CM: Safety, cost and pre-drawn emergency drugs. *Anaesthesia* 2001; 56:818–20
4. Merry AF, Webster CS, Mathew DJ: A new, safety-oriented, integrated drug administration and automated anesthesia record system. *Anesth Analg* 2001; 93:385–90
5. Green R: The psychology of human error. *Eur J Anaesthesiol* 1999; 16:148–55
6. Nott MR: Misidentification, in-filling and confirmation bias. *Anaesthesia* 2001; 56:917
7. Reason J: Human error: Models and management. *BMJ* 2000; 320:768–70
8. London MJ: Back to the OR of the future: How do we make it a good one? *ANESTHESIOLOGY* 2021; 135:206–8

(Accepted for publication January 4, 2022. Published online first on January 28, 2022.)