an important step toward improved blood glucose control in these patients. The authors attributed the improved accuracy of glucose measurement, at least partially, to the fact that the newer generation glucose meters can "correct for hematocrit or other interferences." We have three comments.

First, the authors used blood gas analyzers as the reference method. Even though blood gas analyzers generally are considered more accurate than meters, they have never been established as a reference method in the literature. In clinical practice, the central laboratory device has been used as a reference method when assessing glucose meters because of its high accuracy.[3,4] We are wondering why the authors used blood gas analyzers rather than central laboratory devices as the reference method, and how we can interpret the accuracy of glucose meters in this article if the reference method used is not the commonly used "clinical reference method."

Second, the authors assessed the accuracy of glucose meters in a narrow range of values, which were between 70 and 250 mg/dl, with no hypoglycemic values studied. Multiple previous studies have shown that measurements by glucose meters are more accurate in the "normal physiologic" range rather than hypoglycemic or hyperglycemic values.[5–7] Thus, we are wondering how the accuracy data of this meter in a range of relatively "physiologic" glucose values could be generalized to its accuracy in a wider range of glucose values that we are concerned about in the clinical practice.

Third, we agree with the authors that patients in the operating room share similarities with patients in the intensive care units. These two populations, however, also could be vastly different. For example, one of the biggest concerns with using glucose meters with capillary samples in "critically ill patients" was impaired peripheral perfusion.[2] Although the majority of patients in this study received vasopressor treatment during their care, the dose of vasopressor was rather small and most likely just counteracted the vasodilatory effect of the anesthetics. It is difficult to determine if these patients had impaired or actually improved peripheral perfusion. These patients are very different from patients in the intensive care unit who are receiving high-dose vasopressors with other evidence of poor peripheral perfusion, such as lactatemia, acidosis, or peripheral edema. Therefore, we need to be cautious in extrapolating these results from the perioperative population to the intensive care unit population.

No doubt glucose management is an important part of standard patient care, but with the enormous amount of literature published every year regarding glucose measurement accuracy with various devices, readers should be very cautious about interpreting the results and careful before incorporating those results into their clinical practice. Many factors need to be considered when it comes to assessing device accuracy, including the reference method, range of glucose values tested, sample sources, assessment methodology, and patient populations. The details matter!

Competing Interests

The authors declare no competing interests.

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References

1. Karon BS, Donato LJ, Larsen CM, Siebenaler LK, Wells AE, Wood-Wentz CM, Shirk-Marienau ME, Curry TB: Accuracy of capillary and arterial whole blood glucose measurements using a glucose meter in patients under general anesthesia in the operating room. Anesthesiology 2017; 127:466–74
2. U.S. Food and Drug Administration: Blood glucose monitoring test system for prescription point-of-care use: Draft guidance for industry and food and drug administration staff. Draft guidance issued on January 7, 2014. Available at: http://www.fda.gov/downloads/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm380325.pdf. Accessed May 7, 2016
3. Rebel A, Rice MA, Fahy BG: Accuracy of point-of-care glucose measurements. J Diabetes Sci Technol 2012; 6:396–411
4. Burtis CA, Ashwood ER, Bruns DE, eds.: Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 4th ed. St. Louis, Missouri, Elsevier-Saunders, 2006, pp 868–71
5. Pereira AJ, Corrêa TD, de Almeida FP, Deliberato RO, Lobato Mdos S, Akamine N, Silva E, Cavalcanti AB: Inaccuracy of venous point-of-care glucose measurements in critically ill patients: A cross-sectional study. PLoS One 2015; 10:e0129568
6. Kanji S, Buffie J, Hutton B, Bunting PS, Singh A, McDonald K, Fergusson D, McIntyre LA, Hebert PC: Reliability of point-of-care testing for glucose measurement in critically ill adults. Crit Care Med 2005; 33:2778–85
7. Schifman RB, Nguyen TT, Page ST: Reliability of point-of-care capillary blood glucose measurements in the critical value range. Arch Pathol Lab Med 2014; 138:962–6

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In Reply:

We thank Drs. Liang and Rice for their insightful comments on our study.[1] There is no widely used or accepted reference method for blood glucose; therefore, the reference method used is a potentially confounding variable in studies of glucose meter accuracy. Perhaps the best choice for any study would be the predicate method for the device being studied, which for the Nova StatStrip (Nova Biomedical Corporation, USA) would be the plasma hexokinase method. The choice of reference method, however, needs to be weighed against other logistical aspects of study design. Specifically, cellular glycolysis occurring in the reference sample increases glucose meter bias as a function of time between sample draw and analysis.[2] We chose a study design that allowed us to analyze reference samples within 10 min of blood draw (a practice used in studies intended for U.S. Food and Drug Administration review). However, this required using the whole blood glucose oxidase method on a Radiometer ABL90 (Radiometer America Incorporated, USA) in a laboratory located adjacent to the operating room as the

reference method. This method was shown to have no systematic bias compared to a plasma hexokinase method, very good precision (CV 2.1%), and be unaffected by common sources of interference such as hematocrit, pH, and Po_2.[3] In our practice, we have observed that Radiometer ABL90 glucose is interchangeable with Roche (USA) plasma hexokinase glucose.

The narrow range of glucose values observed is a limitation of our study, as we pointed out in the Discussion section.[1] Some studies have found poor accuracy of glucose meters at very low and very high values, though these tend to be studies of older glucose meter technologies. Like many institutions, we have moved to more moderate glucose target ranges and adapted protocols to proactively prevent hyperglycemia while minimizing hypoglycemia, and rates of hypoglycemia are very low at our institution. We suspect that this will be an ongoing "problem" in studying glucose meter accuracy with current best practices. Manufacturing low and high glucose samples is one option but not applicable to our study comparing capillary to arterial sampling.

We agree with the third point entirely. Although many studies have reported glucose meter accuracies in the intensive care unit, very few intraoperative studies have been performed. The fact that in our study the bias and outlier rates did not differ significantly between capillary and arterial samples in the operating room suggests that there may be something different about the operating room patient population *versus* that of the intensive care unit. One possibility is that the vasodilatory effects of general anesthesia result in more accurate capillary sampling in this environment, but other explanations are certainly possible. We hope other groups will continue investigating the accuracy of capillary and arterial glucose meter testing in different critical care environments.

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References

1. Karon BS, Donato LJ, Larsen CM, Siebenaler LK, Wells AE, Wood-Wentz CM, Shirk-Marienau ME, Curry TB: Accuracy of capillary and arterial whole blood glucose measurements using a glucose meter in patients under general anesthesia in the operating room. Anesthesiology 2017; 127:466–474
2. Schroeder LF, Giacherio D, Gianchandani R, Engoren M, Shah NH: Postmarket surveillance of point-of-care glucose meters through analysis of electronic medical records. Clin Chem 2016; 62:716–24
3. Watkinson PJ, Barber VS, Amira E, James T, Taylor R, Young JD: The effects of precision, haematocrit, pH and oxygen tension on point-of-care glucose measurement in critically ill patients: A prospective study. Ann Clin Biochem 2012; 49(Pt 2):144–51

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~~Pump and Dump;~~ Anesthesiologists Lead the Feed

To the Editor:

We would like to commend the editors of the October 2017 issue for emphasizing the topic of perioperative lactation for patients having surgery. We especially appreciate the infographic by Wanderer and Rathmell,[1] titled "Anesthesia & Breastfeeding: More Often Than Not, They Are Compatible." Wanderer and Rathmell's work represents a paradigm shift in the way breastfeeding patients are managed and invites anesthesiologists to continue to support the maternal–infant dyad after delivery.

We are writing to voice our concern that many of our specialty's foundational textbooks contain timeworn recommendations including "the mother should discard milk produced within the first 24 h after anesthesia."[2] Of perhaps equal concern is that many principal anesthesia textbooks omit the subject completely, further perpetuating anecdotal and potentially disruptive practices.

In most cases it is safe for patients to resume breastfeeding as soon as they are awake and alert. It is our hope that as perioperative physician leaders, anesthesiologists will take on the role of educating breastfeeding patients presenting for surgery as well as the healthcare providers involved in their operative encounter. We believe this begins with expanding the teaching of our trainees to include the most current literature regarding this topic. We would respectfully request this be considered for future editions of comprehensive anesthesiology texts, so we may continue to be leaders at the junction of evidence-based and patient-centered practice.

Competing Interests

The authors declare no competing interests.

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This letter was sent to the author of the original article referenced above, who agrees with this letter.—Evan D. Kharasch, M.D., Ph.D., Editor-in-Chief.