unlike what happened in the current incident. Is this due to a drug error wherein phenylephrine was given instead of ephedrine or due to a writing error?

Finally, the added examples to the American Society of Anesthesiologists (ASA) Physical Status Classification System approved by the ASA House of Delegates on October 15, 2014 considered pregnancy to be ASA II. The current study by Lee *et al.* stratified some pregnant patients as ASA I, which does not comply with the latest updates of the ASA Physical Status Classification System.[5]

Competing Interests

The author declares no competing interests.

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(Accepted for publication December 21, 2017.)

Left Lateral Table Tilt for Elective Cesarean Delivery under Spinal Anesthesia Should Not Be Abandoned

To the Editor:

We have read with interest an article by Lee *et al.* published in the August 2017 issue of Anesthesiology.[1] We wish to congratulate the authors for evaluating the effects of supine positioning compared with a 15° left uterine displacement tilt on neonatal acid-base status in healthy, nonlaboring, term women scheduled for elective cesarean delivery under spinal anesthesia when systolic blood pressure was maintained using a crystalloid preemptive bolus and a phenylephrine infusion.

The authors found no effect of maternal positioning on neonatal acid-base status and concluded that the supine position was not *inferior* to the tilted left uterine displacement position. Because the study was conducted on nonlaboring healthy women, however, as stated in its limitations, we suggest that the tilted left uterine displacement position should not be abandoned despite the findings of this study. Even though there were no changes in neonatal acid-base status, the study's results actually indicate the *superiority* of a 15° tilted left uterine displacement position as compared with the supine position. Patients who were in the supine position had statistically significant lower systolic blood pressures and cardiac outputs, and required significantly higher mean doses of phenylephrine during the first 15 min after placement of spinal anesthesia to maintain their blood pressure, as compared with the tilted left uterine displacement group. We believe that based on this study the supine position may serve as a safe alternative to the left uterine displacement position in above-mentioned patients only when 15° tilt is not feasible, which realistically should be extremely rare under elective conditions.

Furthermore, the authors emphasize the "disadvantage" of using base excess values because they are a "calculated value." A clarification between estimated/approximated values *versus* calculated values should be addressed. A calculated value is deemed accurate, like any measured value, but estimated/approximated values may not be. The calculated value for bicarbonate/base excess concentration is derived from the Henderson-Hasselbalch equation using measured values for both the carbon dioxide pressure and hydrogen ion concentration. It is not an estimate, which could be inaccurate. Therefore, the calculated value for bicarbonate/base excess would only be inaccurate if the measured value for either the carbon dioxide pressure or the hydrogen ion concentration is incorrect, and thus there is no disadvantage to using a calculated value, despite this being incorrectly asserted by the authors.

Lastly, we wish to address some clerical/typographic errors. Among the study participants, the authors included parturients with American Society of Anesthesiologists Physical Status I and II and excluded patients with autonomic neuropathy (*e.g.*, diabetes mellitus for greater than 10 yr). Generally, a healthy term pregnant patient is classified as no less than American Society of Anesthesiologists Physical Status II. The extent of time needed for a diabetic patient to become neuropathic is unknown and highly variable depending on many factors. We also believe the authors meant "LUD [left uterine displacement] placement is intended to reduce/prevent supine hypotensive syndrome in the pregnant patient"[2] and not to prevent spinal-induced maternal hypotension, as the authors stated in their discussion. These two physiologic factors (sympathetic block induced by neuraxial anesthesia and aortocaval compression by the gravid uterus) are not synonymous, one with the other, and should not be confused as being related to each other. Neuraxial block causes hypotension by blocking preganglionic sympathetic fibers of which there are 14 pairs (T1–L2); the degree of hypotension is directly related to the number of segments blocked. In basic physiology, it has been known equally as long that reducing

preload (by compressing the inferior vena cava) is a definite risk factor for developing hypotension even absent a pharmacologic blockade of preganglionic sympathetic fibers. Therefore, supine hypotension during pregnancy has no relationship to that induced by neuraxial anesthesia, albeit neuraxial anesthesia may worsen the consequences of reduced preload occurring by not adhering to the principles of the left uterine displacement position. Given that cardiac output is related to preload, afterload, contractility, and heart rate, any factor may independently compromise it, and combinations of factors are, of course, more likely to affect this response. Neuraxial blocks with local anesthetics can reduce cardiac output by reducing all four factors; aortocaval compression only affects preload. This is a critical difference that cannot, and must not, be confused.

Competing Interests

The authors declare no competing interests.

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(Accepted for publication December 21, 2017.)

In Reply:

We are gratified, but not surprised, by the interest in our recent article,[1] given that we examined one of the oldest recommendations regarding maternal position for cesarean delivery. In their letters, Riley *et al.*[2] and Shayegan *et al.*[3] correctly note that cardiac output was slightly lower among women kept supine, and that more phenylephrine was required (probably related). The goal of anesthetic management, however, is not to maintain specific hemodynamic parameters, but rather to maintain adequate or optimal conditions for mother and fetus. There is no evidence that the lower cardiac output or increased phenylephrine requirements caused any injury, nor any plausible mechanism by which these levels of cardiac output should be harmful. It is probable, as suggested by Dyer *et al.*[4] in their work on the effects of phenylephrine as the vasopressor for management of spinal hypotension, that the maternal cardiac output may be significantly higher than it needs to be, especially once spinal anesthesia is established. In fact, Dyer *et al.* proposed that phenylephrine is the optimal vasopressor to use during spinal anesthesia *because* it decreases cardiac output, offsetting the increase in cardiac output that results from the decreased systemic vascular resistance.[4] Because the purpose of maternal cardiac output is to maintain maternal and fetal homeostasis, any increase above this level may be "unnecessary." Looking at specific numbers, in our study, using the NICOM cardiac output monitor (Cheetah Medical Inc., USA), maternal cardiac output before spinal anesthesia was 8.1 l/min in the supine position and 8.4 l/min in the tilted position; this increased to over 9 l/min in both groups after spinal anesthesia.[1] Therefore, the measured "decrease" in cardiac output with higher phenylephrine dosing, both in our study[1] and in Dyer *et al.*'s[4] (where boluses were given) may be mostly a return to prespinal baseline due to restoration of systemic vascular resistance.

Riley *et al.*[2] are correct that some women may benefit from tilting or other forms of uterine displacement. Indeed, uterine displacement can and should be used in women who develop severe or unresponsive hypotension after spinal anesthesia, and perhaps in women with a history of supine hypotension during the pregnancy. Despite decades of practice and tradition, however, the *evidence* that the tilt maneuver, regardless of the degree at which it was provided, actually improves maternal or fetal conditions with contemporary neuraxial anesthesia practice is almost nonexistent. It may not be appropriate to subject all women to a maneuver that they do not feel comfortable with, and most surgeons dislike, when very few of them benefit. Clinicians also should acknowledge that 15° of left tilt is not achieved reliably in practice, and therefore, most cesarean deliveries around the world are performed under conditions very similar to those evaluated in our supine study group.

Regarding the accuracy of using base excess as our primary outcome, we agree with Shayegan *et al.*[3] that using the calculated value of base excess derived from the measured values for both carbon dioxide pressure and pH is valid. Our goal was to acknowledge the difference between the "calculated" nature of base excess from the "measured" nature of pH, and emphasize our belief that base excess results in a better assessment of fetal acid-base status than pH, given that the latter is affected by acute changes in partial pressure of carbon dioxide.

Shayegan *et al.*[3] also questioned our decision to exclude from our study women with a greater than 10-yr history of diabetes due to concerns about autonomic neuropathy; we acknowledge that the onset of diabetic autonomic neuropathy is highly variable, and that subclinical signs may be detected relatively early in the course of the disease. This approach was essentially an empirical decision to ensure that patients who were likely to have significant clinical symptoms not be included. In reality, because the study was conducted at NewYork Presbyterian/the Allen Hospital, a community hospital serving a healthy, low-risk obstetric population, very few diabetic patients were enrolled, and these few women had gestational diabetes only. We agree that the physiologic mechanisms underlying supine hypotensive syndrome are obviously distinct from the mechanisms underlying hypotension due to neuraxial anesthesia, although the former may be additive with the latter.