Clear Study Aims and Hypotheses in a Research Paper

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Spinal anesthesia is one of the most common modes of anesthesia for cesarean deliveries. The needle insertion site is traditionally determined by manual palpation using the Tuffier line (the horizontal line connecting the [3]

as the procedure can be completed expeditiously. Therefore, we conducted this study to investigate whether an ultrasound-assisted technique for guiding spinal anesthesia in the lateral position for cesarean delivery in obese parturients was better than the blind technique using manual palpation. We hypothesized that preprocedural ultrasound scanning would facilitate neuraxial blockade and improve the first-attempt success rate in obese parturients with difficult topographic anatomy. Our secondary outcome measures were the number of skin punctures, number of needle passes, procedure times, parturient satisfaction, changes in the intended interspace, and incidence of complications.

**KEY POINT:** The study aims and the directly corresponding study hypotheses must be clearly stated in the Introduction section of a medical research paper.

In this issue of Anesthesia & Analgesia, Li et al.1 compare ultrasound-assisted versus landmark-guided spinal anesthesia in obese parturients. In their Introduction, the authors succinctly describe the significance of the topic, outline the scientific background, and define the study rationale.2 Subsequently, they clearly describe their study aim (objective) and translate it into a specific hypothesis2—namely, that the ultrasound-guided approach (exposure of interest) improves the first-attempt success rate of spinal anesthesia (primary outcome).

From the statistical perspective, such a clear description of the study aim and hypothesis is pivotable because it is the backbone of the entire article and serves as a roadmap to the study design and data analysis.2 All study aims must be defined a priori and must not change throughout the article. Such changes suggest that authors are unclear about what they actually aimed to study, or that they found unanticipated results without clearly labeling these as post hoc observations—both of which are unacceptable.

In hypothesis-driven studies such as Li et al.’s,1 the study hypotheses directly follow the aims. Study aims refer to the broader study questions, whereas the study hypotheses are specific assumptions about the relationships between study variables, which can be statistically tested. Hypotheses must be clear and specific, and they should name and distinguish primary and secondary outcomes.

Statistical testing involves a null hypothesis, which typically states that an exposure (eg, ultrasound guidance versus landmark guidance) has no effect on some outcomes (eg, spinal anesthesia success rate). The statistical test quantifies the strength of evidence against the null hypothesis, and a “significant” result allows one to reject the null hypothesis in favor of the alternative hypothesis that the exposure does have an effect.3 While the null hypothesis is actually tested statistically, authors typically state the alternative hypothesis in the Introduction and the expected direction of the effect—as done by Li et al.1 in their article.

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REFERENCES

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