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## Reply.

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We thank the authors who have responded to our recent work on the relationship between anesthesia services and short-term colonoscopy outcomes,<sup>1</sup> and welcome the opportunity to respond to their questions concerning our methods and interpretation.

We agree there are limitations to the analysis, largely due to the nature of claims-based data. Claims-based data provide a large sample size and increased power for detecting differences in rare events, but have little depth in patient or clinician covariates, and therefore provides limited ability to control for confounding. As we suggest in our manuscript, future observational studies should be conducted where confounders that we were unable to address might be prospectively measured to understand whether the relationships we observed can be replicated. We address below specific criticisms to which the authors alluded.

First, several authors discussed our use of a Charlson score, based on inpatient diagnoses only, for comorbidity adjustment. We agree that this method likely does not fully adjust for comorbidity and recognize that other methods may have been more robust. This decision was based on the available data at the time of the analysis, and we included this as a limitation in the manuscript. Drs Hofer and Gabel, as well as others, highlight our stratified findings. In the West, where we observed the lowest use of anesthesia services (8%), the odds ratio for any 30 day outcome was highest (1.60). In the Northeast, where use of anesthesia services was highest (53%), the odds ratio was attenuated, but still elevated. These results indicate that endoscopists in the West might be selecting sicker patients to receive anesthesia services with colonoscopy compared with the Northeast where endoscopists are less selective on patient health status.

Second, we were not able to make any adjustment at the provider level. As Drs. Cummings, Hofer, Gabel, Cannesson, and Mahajan, point out, endoscopist skill and experience may

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Conflicts of interest

The authors disclose no conflicts.

influence the likelihood of adverse events following a colonoscopy. Additionally, as noted above individual provider decision-making about who should receive propofol sedation may influence the relationship with adverse events. Sicker patients, for whom propofol is preferentially selected, would be more likely to experience an adverse event. Without controlling for endoscopist skill, we observed increased risk for perforation and other adverse events, possibly due to the greater degree of sedation achieved with propofol. It will be important for future prospective studies to measure endoscopist skill and control for clustering at the individual provider level in the statistical modeling.

Finally, we were also not able to identify the administration of propofol specifically, but rather the use of anesthesia services billed with a colonoscopy at the same visit, which we assumed to be a strong surrogate for the administration of propofol. We agree with Drs Gu and Ma that our analysis does not support the conclusion that anesthesiologists in of themselves leads to increased short-term colonoscopy complications. Anesthesia professionals are an essential component of endoscopy for patients who are in need of greater skill in airway management and knowledge of sedation physiology, a higher level of monitoring, or a wider array of sedation options. However, anesthesia assistance to administer propofol is likely not necessary for screening colonoscopy in all otherwise healthy adults. One aspect not highlighted in our paper or the accompanying letters is that the alternative to anesthesia-assisted sedation is endoscopist-administered sedation, which as the comparator in our analysis, we have demonstrated to be quite safe. We would welcome a future study that could directly measure use of propofol, regardless of the professional overseeing the administration of the drug.

As some of the letters remark, we hope that the field begins a conversation regarding indiscriminate use of propofol for screening colonoscopy. While propofol may be preferred by patients and endoscopists due to the rapidity and consistency in effective sedation and recovery, this medical choice comes with deficits that are not only monetary but perhaps even adverse to patient safety. We encourage the gastroenterology community to have an honest discussion of the possible harms in addition to the benefits of propofol sedation with every patient prior to procedure, as suggested by Dr Goudra.

## Reference

1. Wernli KJ, et al. Short-term risks associated with general anesthesia during colonoscopy compared to conscious sedation in US adult population. *Gastroenterology* 2016; 150:888–894. [PubMed: 26709032]