variation may have influenced clinical outcomes in this study. As the authors discussed, the use of combined general and neuraxial anaesthesia may mirror the outcome of treatment at a well-trained high-surgical volume centre.[1] This suggests that better perioperative care and management may account for reduced morbidity and lead to improved survival rates regardless of the anaesthetic approach. Therefore, the clinical impact of clustering patients within hospitals may not be negligible. Propensity score weighting cannot analyse clustered data, and misspecification of hierarchically structured data can introduce severe bias.[8] To account for the clustering effects within each hospital, it would be methodologically reasonable to establish a multilevel model by incorporating cluster-specific random effects, such as hospital ID, as an additional sensitivity analysis.[9]

Finally, E-value analysis was used to evaluate the strength of associations between unmeasured confounders and the relationship between exposure and outcome.[10] However, the E-value is a relatively new method of sensitivity analysis and should be used cautiously considering its limitations and susceptibility to misinterpretation.[11] E-values are monotonically related to the effect estimates; calculation of E-values does not always remove residual confounding, and their interpretation does not necessarily offer any insight into the identities of the unmeasured confounders. E-values can be explicated only after careful consideration in the context of study design, population, exposure, outcome definition, and statistical methods.

Declarations of interest

The authors declare that they have no conflicts of interest.

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Importance of peripheral vascular disease and clamp site in elective open abdominal aneurysm repair. Comment on *Br J Anaesth* 2020; 124: 544–552

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Editor—We read with great interest the results of retrospective population-based cohort study by Salata and colleagues[1] on short-term outcomes of combined neuraxial and general anaesthesia *vs* general anaesthesia alone for elective open abdominal aortic aneurysm (AAA) repair. The study finds combined neuraxial and general anaesthesia is associated with reduced 90 day mortality and morbidity.

The authors highlight the challenges of using administrative data. In this instance there were important differences between the two groups, although the propensity score methods used by the authors did show a good balance of covariates between groups. Importantly, however, there was an increased prevalence of congestive heart failure, use of anticoagulants, and peripheral arterial disease in the general anaesthesia only group. Overall, patients in the general anaesthesia only group had a higher comorbidity burden as they were more likely to have a Charlson score $\geq$2.[2] The higher prevalence of peripheral arterial disease is particularly important as we know that a lower ankle brachial pressure index correlates with increased mortality in patients with AAAs.[3]

The inability to distinguish the site of aortic clamping is another important limitation of using administrative data. The National Vascular Registry distinguishes between complex aneurysms and infra-renal abdominal aneurysms for good reason. Its 2019 annual report shows that complex aneurysms, which include juxta-renal, supra-renal, and thoracoabdominal aneurysms have nearly a five-fold in-hospital postoperative mortality (14.7%) compared with elective open infra-renal aneurysms (3.2%), reflecting the increased complexity of both the disease and the surgery.[4]

The authors adjusted for hospital type, noting that specialised tertiary hospitals are commonly teaching institutions. They note that combined general and neuraxial anaesthesia was more likely to have been administered at non-teaching hospitals and suggest a possible explanation as time pressure, presence of trainees, and failed attempts at neuraxial anaesthesia by trainees in teaching hospitals.[1] However, an alternative explanation is that complex aneurysm repairs are more likely to be conducted in tertiary centres, and these may be less likely to be conducted with combined general and neuraxial anaesthesia because of the different perioperative challenges faced by this cohort of patients. Complex aneurysm repairs involving supra-renal and particularly supra-coeliac clamp position may be less likely to have combined general and neuraxial anaesthesia because of an active choice by the treating team. The added complexity of gut ischaemia, greater fluid shifts, and inotrope requirements and the more frequent need for short-term postoperative ventilation in elective open complex aneurysm repair may, in our opinion, serve to shift the risk/benefit ratio away from use of neuraxial anaesthesia.

In longer-term follow-up, the mortality rates between the two groups continued to diverge beyond 90 days, suggesting that there are underlying patient factors that influenced the differing mortality rates. The authors highlight that the general and neuraxial anaesthesia group had significantly lower odds for 90 day limb complications requiring secondary procedures. They postulate improved perfusion and heparin delivery secondary to reduced sympathetic tone because of neuraxial anaesthesia as a mechanism.[1] However, it may be that the observed lower limb complications are a result of the lower prevalence of peripheral arterial disease in this group.

It is unfortunate that the administrative data did not include in-hospital medication data so that the effects of different analgesic techniques could be analysed. Neuraxial anaesthesia has been associated with reduced rates of postoperative respiratory failure among other benefits.[5] It is likely that this effect on the respiratory system is attributable to the observed improved pain scores resulting in improved respiratory mechanics and a reduced need for systemic opioids with their depressive effects on respiratory drive. It would have been interesting to see what effect, if any, non-neuraxial regional techniques such as local anaesthetic infusion via rectus sheath catheters had on the rates of respiratory complications given the opioid-sparing effect of such analgesic adjuncts.

The authors' thorough analysis of the available data set should be commended. We agree that before strong recommendations are made for open AAA repairs to have combined general and neuraxial anaesthesia, further research is warranted to tackle important limitations in the data, such as the pseudorandomised nature of the data and the inability to account for clamp site, an important variable. The most recent Cochrane meta-analysis in this area included 15 RCTs, the most recent trial being more than a decade old. The challenges of experimental studies in this area are significant and this study has certainly refreshed the ongoing debate of the role of neuraxial anaesthesia in AAA repair.[5]

Declarations of interest

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