

## CORRESPONDENCE

## Surgeon–anaesthesiologist team case volume and perioperative outcomes in total joint arthroplasty

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Editor—The impact of healthcare provider team characteristics on perioperative outcomes remains a topic of major interest in the medical community. Indeed, much has been published supporting the notion that higher surgeon volume is associated with a reduction in adverse events in a variety of surgeries, including orthopaedic surgery.<sup>1</sup> However, the role of surgeon–anaesthesiologist teams is less well described in this context. We therefore investigated the association between the volume of total joint arthroplasty (TJA) cases performed by the same surgeon–anaesthesiologist team and perioperative complications and length of stay (LOS).

After Institutional Review Board approval, we conducted a retrospective analysis of patients who underwent TJA procedures at a high-volume specialised orthopaedic institution from 2005 to 2014. The main effect of interest was each surgeon–anaesthesiologist team's TJA volume; this was categorised into teams with the top 10 highest TJA volume (range: 281–531 total surgeries, representing 9.2% of all included TJA cases) and those with lower volumes. Primary outcomes were the occurrence of any complication (including cardiopulmonary, gastrointestinal or renal complications; venous thromboembolism; stroke; or delirium) and prolonged LOS (>5 days). Multivariable logistic regression models measured the association between surgeon–anaesthesiologist team TJA volume (teams with the top 10 highest TJA volume compared with the rest) and outcomes. As perioperative care for TJA is highly standardised, we focused covariate adjustment on the most important patient-related characteristics previously shown to predict complication risk, age, and American Society of Anaesthesiologists physical status.<sup>2</sup>

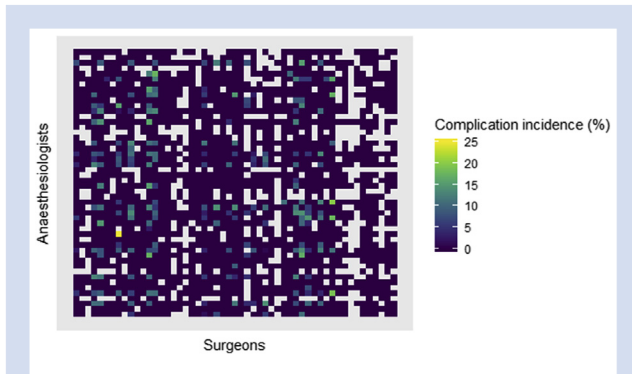
Amongst 40 437 TJA procedures performed by 2093 unique surgeon–anaesthesiologist pairs, 27.7% of cases were

performed by surgeon–anaesthesiologist teams with a volume of >100 TJA cases. Complication rates also varied greatly between surgeon–anaesthesiologist teams (Fig. 1) with the 10 highest-volume surgeon–anaesthesiologist teams (compared with the rest) having lower unadjusted complication rates and incidence of prolonged LOS (8.1% vs 9.5% and 19.6% vs 16.3%, respectively;  $P<0.01$ ). In adjusted analyses, the top 10 highest-volume surgeon–anaesthesiologist pairs had significantly lower odds of patients experiencing a complication (odds ratio [OR]: 0.86; 95% confidence interval [CI]: 0.76–0.98;  $P=0.02$ ) or prolonged LOS (OR: 0.79; 95% CI: 0.72–0.87;  $P<0.01$ ).

In this study of more than 40 000 TJA cases, we determined that teams of surgeon and anaesthesiologists who performed the highest volumes of TJA surgery together had lower odds of complications and prolonged LOS.

Although the reasons for these findings have to remain speculative, it seems feasible that many complex tasks in the perioperative period are performed more efficiently and safely by a team that harmonises and synchronises its tasks. Research into the building blocks of high-performance operating theatre teams has suggested that moving away from a 'solo' mentality and towards a team approach and improving communication are prerequisites for improving outcomes.<sup>3,4</sup> The latter is especially important in emergent situations and can lead to performance improving reductions in stress levels amongst operating theatre staff.<sup>5</sup>

Limitations of this study include the retrospective nature limiting the ability to draw conclusions based on causality. Further, the data are derived from a single institution that specialises in orthopaedic procedures, thus potentially limiting generalisability. However, our findings may provide useful targets for multi-institutional follow-up research.



**Fig 1.** Heat map depicting the incidence of complications (in %) for each individual surgeon–anaesthesiologist pair (median and inter-quartile range: 5.3%; 0–14.3%), excluding pairs with <50 surgeries that may have inflated complication incidence.

Finally, despite high levels of standardisation, it is possible that there are factors that influence outcomes after TJA that are not considered here.

In conclusion, our data suggest that surgeons and anaesthesiologists performing high volumes of joint arthroplasties together are associated with reduced odds of complications and improved LOS. If these results can be validated, programmes that facilitate the establishment of high-volume teams should be supported as a means to improve outcomes.

## Declarations of interest

SGM is a director on the boards of the American Society of Regional Anesthesia and Pain Medicine and the Society of Anesthesia and Sleep Medicine. He is a one-time consultant for Sandoz Inc. and Teikoku, and is currently on the medical advisory board of HATH. He has a pending US Patent application for a multi-catheter infusion system (US-2017-0361063). He is the owner of SGM Consulting, LLC and co-owner of FC Monmouth, LLC. None of the aforementioned relations influenced the conduct of the present study. All other authors declare no conflicts of interest.

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## Is ethnicity associated with recruitment into perioperative care studies?

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Editor—There is increasing discussion around the under-representation of ethnic minorities in research and the implications this has on the generalisability of study findings. Ethnicity is poorly defined in the medical literature which contributes to its inconsistent use in research.<sup>1</sup> In health research Bhopal<sup>2</sup> defines it as ‘a group that people belong to because of shared characteristics, including ancestral

and geographical origins, cultural traditions, and languages.’ In the UK, the national census uses five broad ethnic groups with subcategories including white, Asian, black, mixed, and other ethnicities.<sup>3</sup> Recruitment, participation, and retention of ethnic minorities is lower than their representation; these data are also under-reported.<sup>4</sup> A review of published peri-operative randomised controlled