



## CORR Insights

**CORR Insights®: Does Patient Sex Affect the Rate of Mortality and Complications After Spine Surgery? A Systematic Review**

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**Where Are We Now?**

Elements of patient demographics, such as biologic sex, can have important clinical implications. Because of this, sex-related disparities in care are garnering increased focus in our specialty. Most notably, sex differences have been

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identified in bone health and osteoporosis. Proven differences in bone geometry have implications for fracture fixation and may be relevant to implant design, as evidenced by the “gender-specific knee” in total joint arthroplasty. However, few studies have prospectively addressed the effect of biological sex on spine surgery short-term adverse events. With the growing importance of providing high-value high-quality care, minimizing adverse events and maximizing outcomes remain an important national goal.

In this systematic review, Schoenfeld and colleagues evaluated 50 scientific articles related to lumbar spine surgery, patient sex, and short-term complications. The authors used rigorous and validated statistical techniques to assess and account for study heterogeneity. Ultimately, the study results demonstrated increased mortality rates without higher morbidity rates

among male patients. These findings raise several important questions. Is this result related to the inherent biological differences, or are they related to behavior differences between males and females? Given the procedural heterogeneity in spine surgery, case mix adjustment can be extremely difficult. Many of the studies analyzed relied on ICD-9 administrative coding, which often lack the precision to fully characterize procedure invasiveness. Within these studies, could males on average have longer more complex spinal procedures? Also, how did the comorbidity profiles differ between the two sexes? Overall, the study results corroborate trends in short-term adverse events seen after other surgical procedures, such as cardiac or hip fracture surgery—with men having a higher comorbidity burden and poorer outcomes [3, 4].

**Where Do We Need to Go?**

As these questions insinuate, the influence of patient sex on outcomes after spine surgery can be difficult to decipher. Although the authors put together

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an excellent systematic review, their conclusions are only as good as the data available. This study highlights the need for more prospective clinical evidence addressing the effect of biological sex in the development and treatment of spinal disease.

In spite of study limitations, differences in short-term adverse events between the sexes emphasize the importance of trying to unlock any underlying biologic mechanisms. Sexual dimorphism may be present for a variety of differences in growth/development, bone morphology, limb alignment, bone/tendon/ligament injury and healing responses. The spine degenerative process may follow a similar sexual dimorphism as in major joints. Females are known to have thinner cartilage, and report a higher prevalence of osteoarthritis with tighter associations to obesity [1, 2]. The role that hormonal differences have on intervertebral disc/local joint injury and repair are also unknown. All

areas present opportunities for future spine research.

## How Do We Get There?

With established differences in short-term adverse events between the biological sexes in observational studies, we ultimately need additional, more-sophisticated studies to confirm these results. The most relevant questions going forward include: (1) Are there any clinical interventions that will close this gap, if indeed there is one, will it decrease mortality rates in male patients? (2) What are the biological mechanisms for differences and potential biologic therapies? Specifically, basic-science studies need to evaluate inherent biologic differences between men and women in the cells and tissues of the spine. (3) A final, more-imminent issue relates to how policymakers might incorporate biologic sex into risk-adjustment algorithms. Initial CMS Medicare TKA and THA public

reporting methods of short-term adverse events and readmissions have incorporated biologic sex, but avoided incorporating other socioeconomic variables. As pay-for-performance and quality reporting reach spinal surgery, policymakers must consider the influence of biologic sex on outcomes.

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