

Trends in Blood Product and Blood Conservation Device Utilization in Lumbar Spinal Fusion: A Population-Based Study (2013–2023)

Giannakis P^{1,2}, Poeran J^{1,2}, Illescas A^{1,2}, Wang J^{1,2}, Rowe JE^{1,2}, Zehetner A³, Liu J^{1,2}, Memtsoudis SG^{1,2}, Cozowicz C³

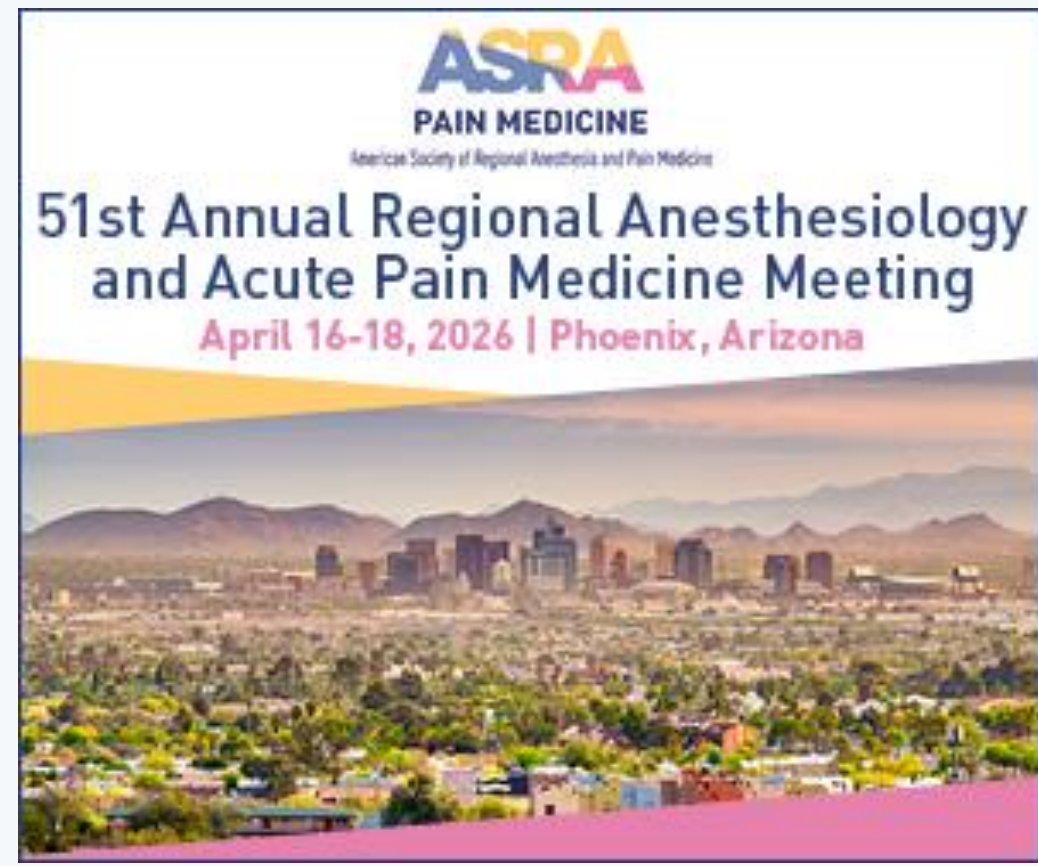
¹Hospital for Special Surgery, New York, NY

²Weill Cornell Medicine, New York, NY

³Paracelsus Medical University, Vienna, Austria



**Weill Cornell
Medicine**



INTRODUCTION

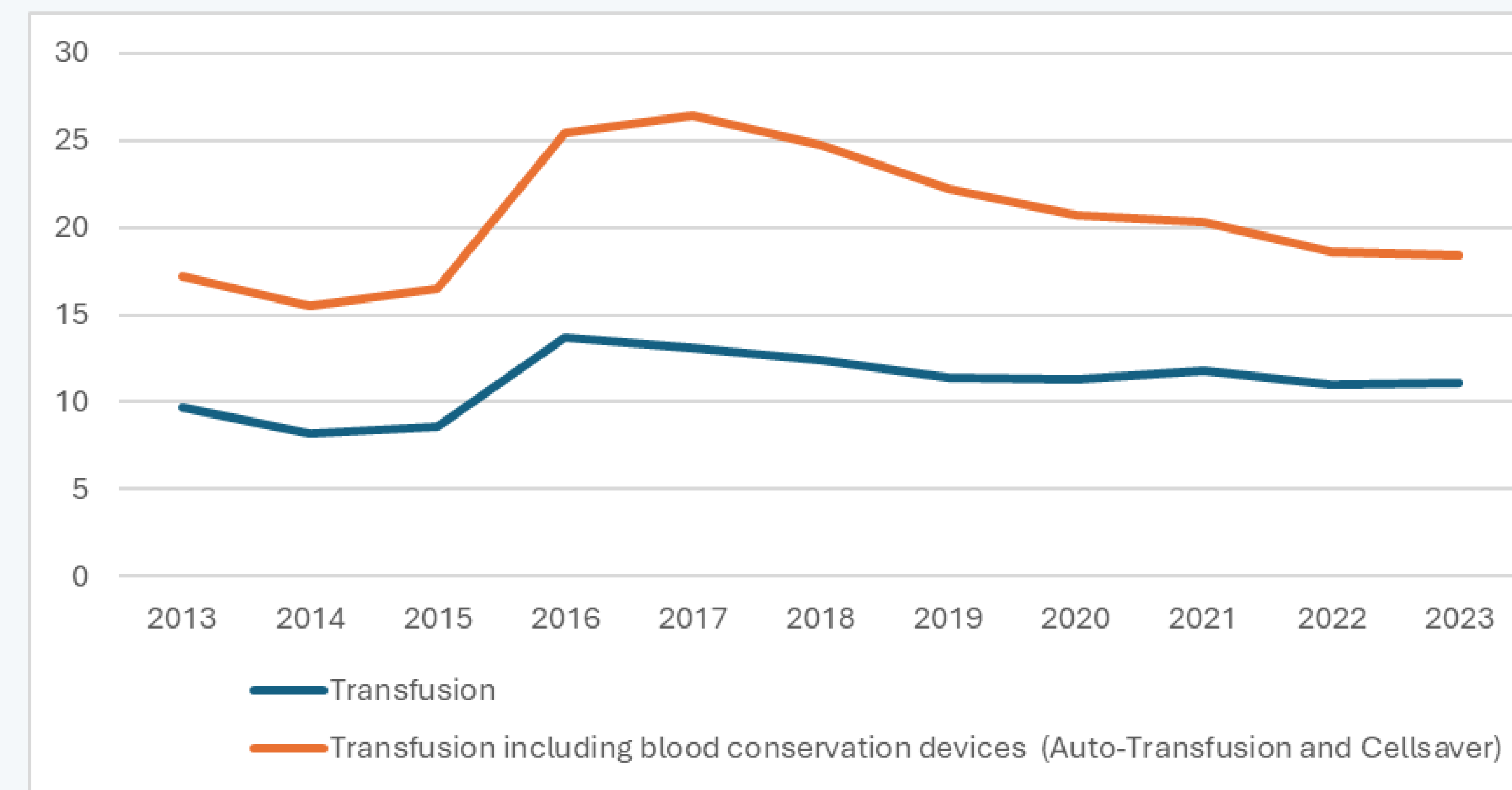
- **Background:** Lumbar spinal fusion surgery is frequently associated with substantial blood loss and perioperative blood transfusion.
- **Rationale:** Over the past decade, evolving surgical techniques, transfusion and pharmacologic strategies, and blood conservation technologies may have altered patterns of blood product utilization. Contemporary nationwide data describing these trends, remain limited.
- **Objective:** We evaluated temporal trends in blood product and blood conservation strategy utilization among patients undergoing lumbar spinal fusion surgery in the United States.

METHODS

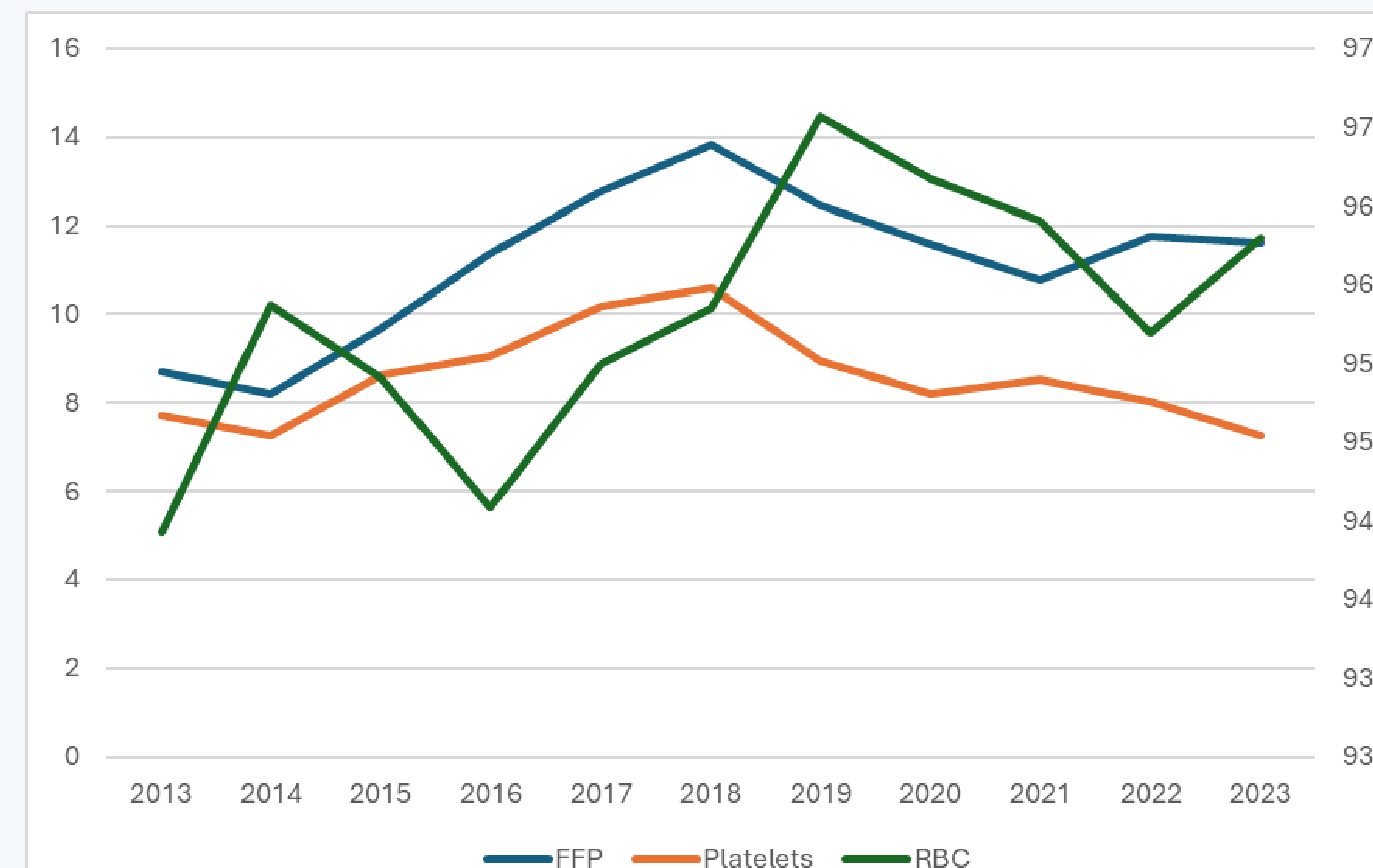
- **Design:** Retrospective observational study (IRB#2012-050)
- **Setting:** US Premier Healthcare Database claims data from 2013–2023
- **Population:** Adult patients undergoing elective lumbar spinal fusion (n=440,331); single-level (n=272,495) or multi-level (n=167,836) lumbar spinal fusion.
- **Variables:** Utilization of allogeneic blood products (pRBCs, FFPs, platelets, and whole blood), blood conservation devices (cell saver and autotransfusion), and TXA was assessed.
- **Statistical Methods:** Secular trends were examined for the overall cohort and stratified by procedure complexity. Linear trends were evaluated using Cochran–Armitage tests. Patterns of combined blood product use were also analyzed.

These findings underscore the importance of stratified analyses and continued optimization of evidence-based blood management practices.

Secular trends in use of any transfusion during lumbar fusion surgery



TXA Secular trends in use of FFP, platelets and PRBC transfusion



RESULTS

- **Any transfusion, overall:** overall increased (2013: 9.7% versus 2023: 11.1%; $p<0.001$); **peaked in 2016** (13.7%) then decreased
- **Any transfusion, by procedure:** decreased in **single-level** (2013: 6.6% versus 2023: 4.6%; $p<0.001$) and **multi-level** (2013: 24.6% versus 19.6%; $p<0.001$)
- **Blood product use, among transfused:** pRBCs predominated among transfused patients (94.4%–96.3%), FFP and platelets remained consistently less frequently used (generally <15%)
pRBCs with FFP was the most common combination; single-level (3.3%), multi-level (7.6%)
- **Use of blood conservation strategies:** Cell saver and autotransfusion utilization increased (2013: 17.2% versus 2023: 18.4%; $p<0.001$), with higher use in multi-level procedures
- **Tranexamic acid utilization:** increased markedly (2013: 0.9% versus 2023: 31.6%; $p<0.001$), more rapid adoption among multi-level fusion

DISCUSSION

- Overall transfusion rates fluctuated over the study period: **Simpson's Paradox: transfusion rates declined significantly within both single- and multi-level surgeries**, suggesting improvements in perioperative blood management over time.
- **Concurrent increases in TXA and blood conservation device utilization:** evolving strategies to reduce allogeneic blood exposure in lumbar spinal fusion surgery.

References →

