Effects of Patient-, Clinician- and Institutional-level Variation in Blood Product Transfusion Practices during Major Spine Surgery: A Multicenter Observational Study

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Outline

- Background/Study Relevance
- Study Design
- Results
- Conclusions
- Lessons Learned

Background

Multilevel spine surgery in adults is a commonly performed surgery, with 1.5 million instrumented spine cases performed per year in the United States

These procedures are characterized by a substantial risk of large-volume blood loss, varying between 0.5 - 2 L.

Advances in minimally invasive approaches, anti-fibrinolytics and autologous blood salvage have reduced blood loss and the need for blood product infusions, however allogeneic blood product administration is still required in up to 30% cases

Background

Allogenic blood product exposure is an independent risk factors of 30-day mortality and post-operative sepsis, pulmonary, and thromboembolic complications

Table 1. Approximate Per-Unit Risk for Red Blood Cell (RBC) Transfusion in the US[a]

Adverse event	Approximate risk per RBC transfusion
Febrile reaction	1:161[3]
Allergic reaction	1:345[3]
Transfusion-associated circulatory overload	1:125[3]
Transfusion-related acute lung injury	1:1250[3]
Anaphylactic reactions	1:5000[3]
Hepatitis B virus	1:1 100 000[4]
Hepatitis C virus	1:1 200 000[4]
HIV	1:1 600 000[4]

Carson, J.L., *et al.* Red Blood Cell Transfusion: 2023 AABB International Guidelines. JAMA (2023) doi:10.1001/jama.2023.12914

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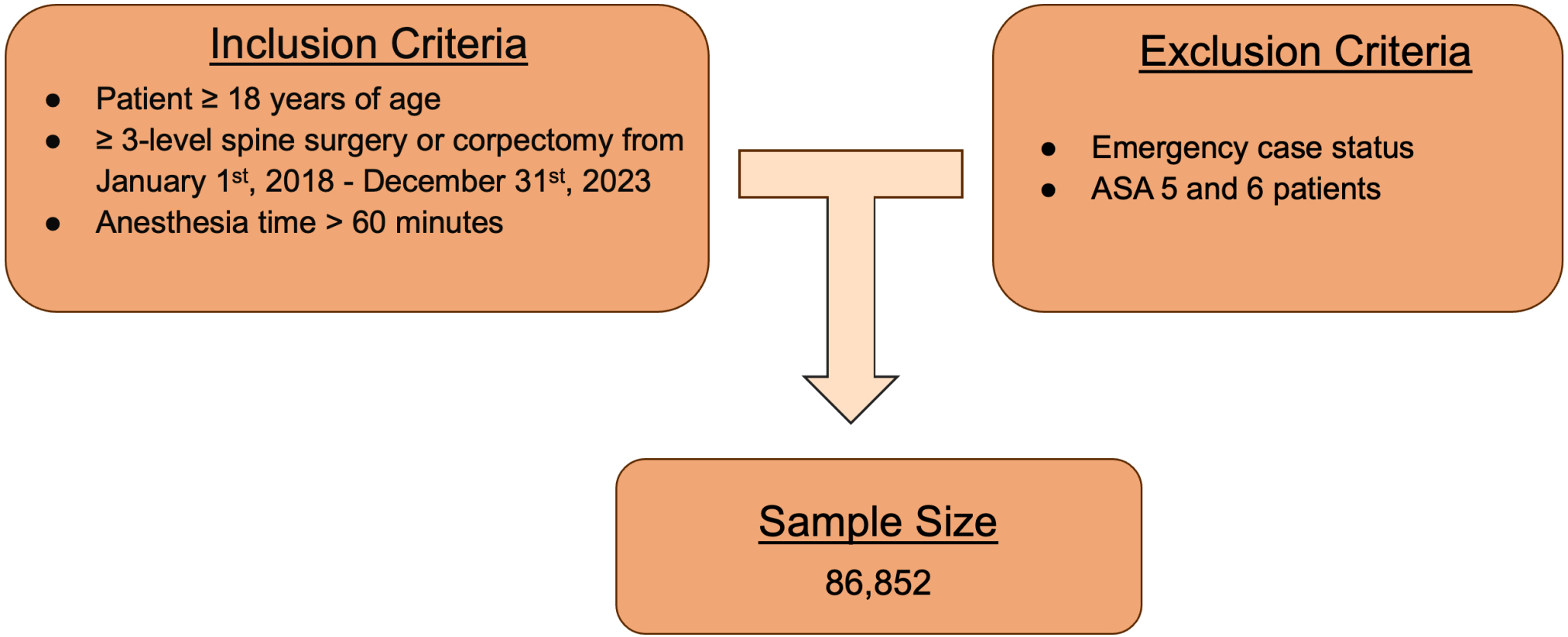
Aims

Aim 1) Describe Transfusion Practice Patterns across MPOG Institutions During Complex Spine Surgeries

Aim 2) Characterize and Quantify the Contribution of Patient-, Provider-, Surgical Case Type- and institution-Level Variation on Transfusion Practices in Patients Undergoing Complex Spine Surgeries

Study Design



Patient Level Variables:

- Demographic and Medical history
- Preop anemia and coagulation labs
- Min intraop Hgb
- Intraoperative hypotension and inotrope use
- Total crystalloid and colloid volume administered
- Total EBL

Case Level Variables:

- Surgical case duration, anesthesia duration
- Number of vertebral levels, location, surgical approach and procedure type

Provider Level Variables:

- Anesthesia Provider ID
- Surgeon Service
- Provider case volume

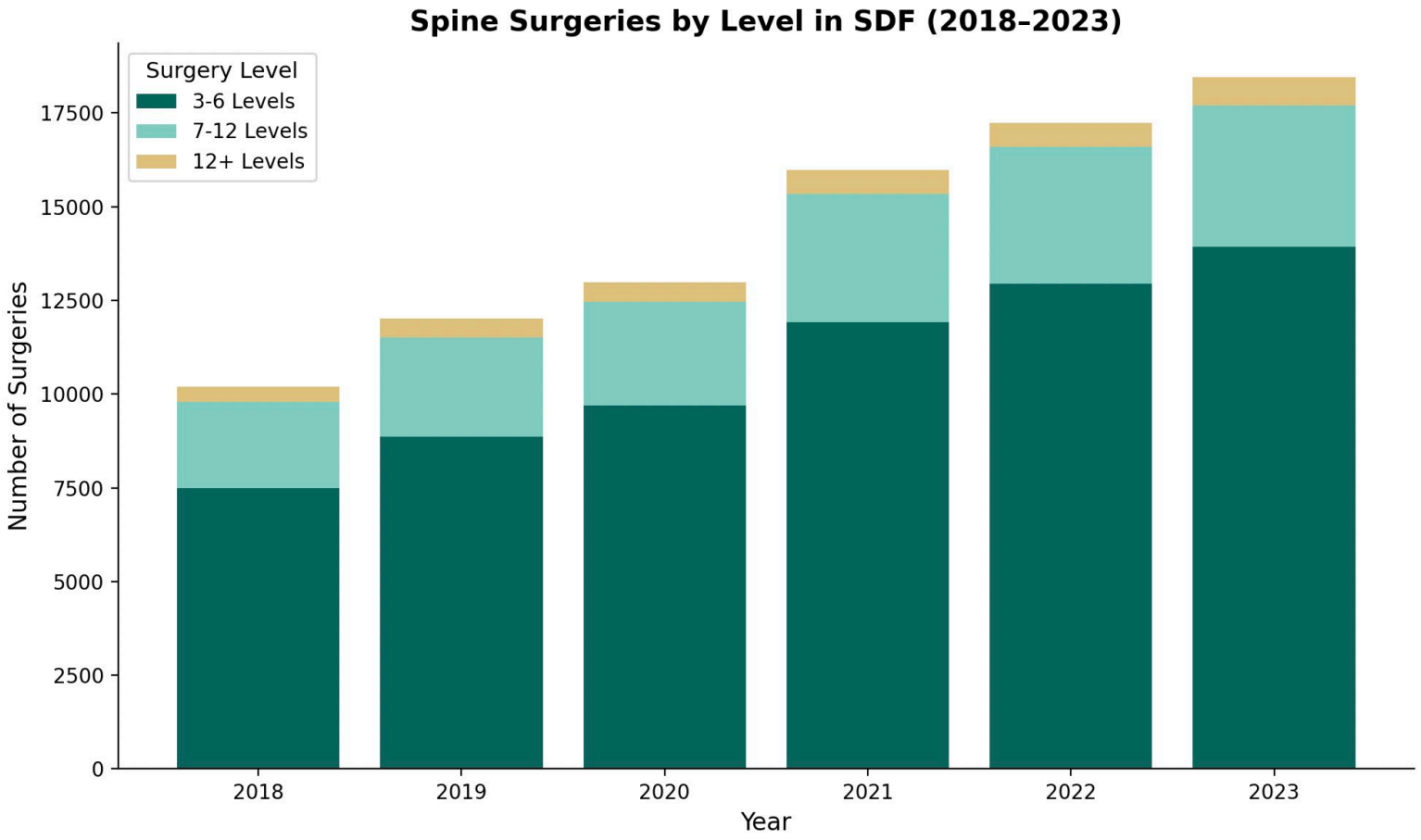
Institution Level Variables:

- Institution ID
- Institution annual case volume
- Academic practice affiliation

Results

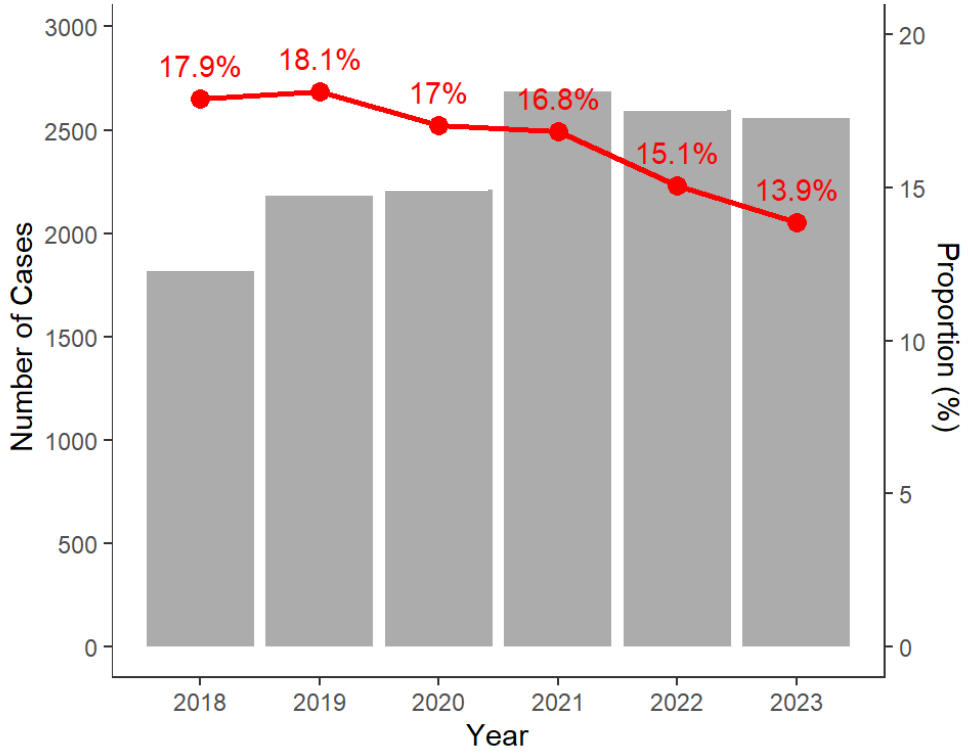
Total Cases

Spine levels	N	%
3-6 levels	64884	74.7
7-12 levels	18506	21.3
12+ levels	3462	4.0

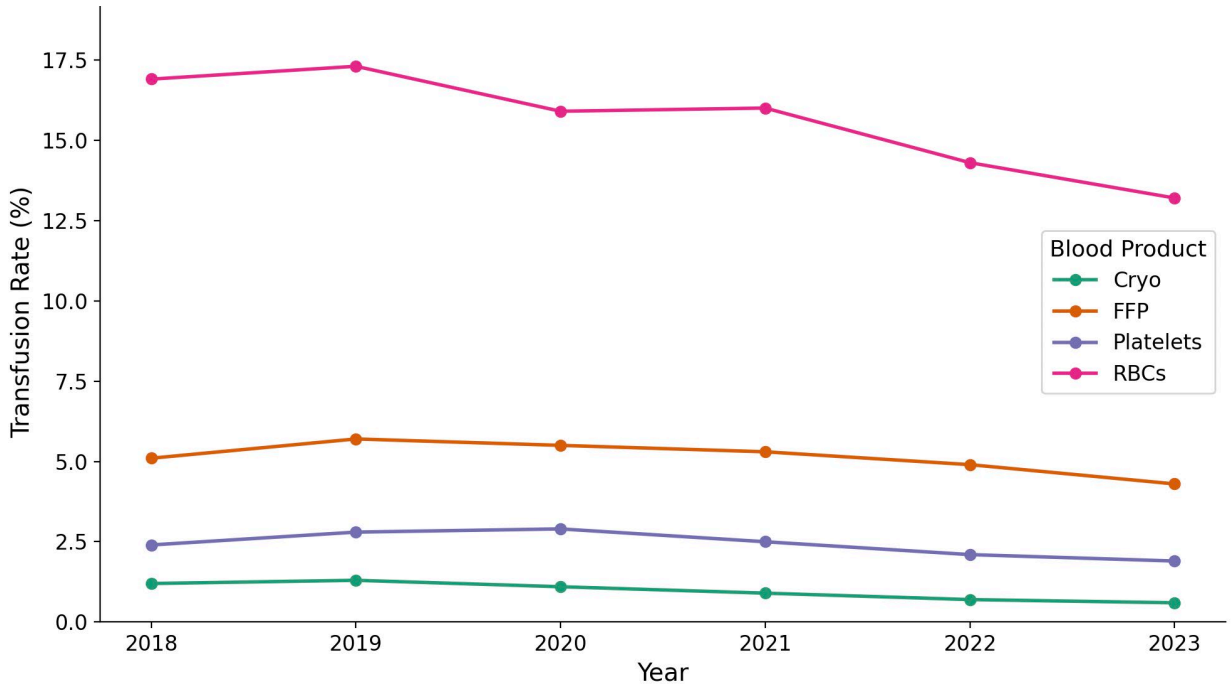


Results

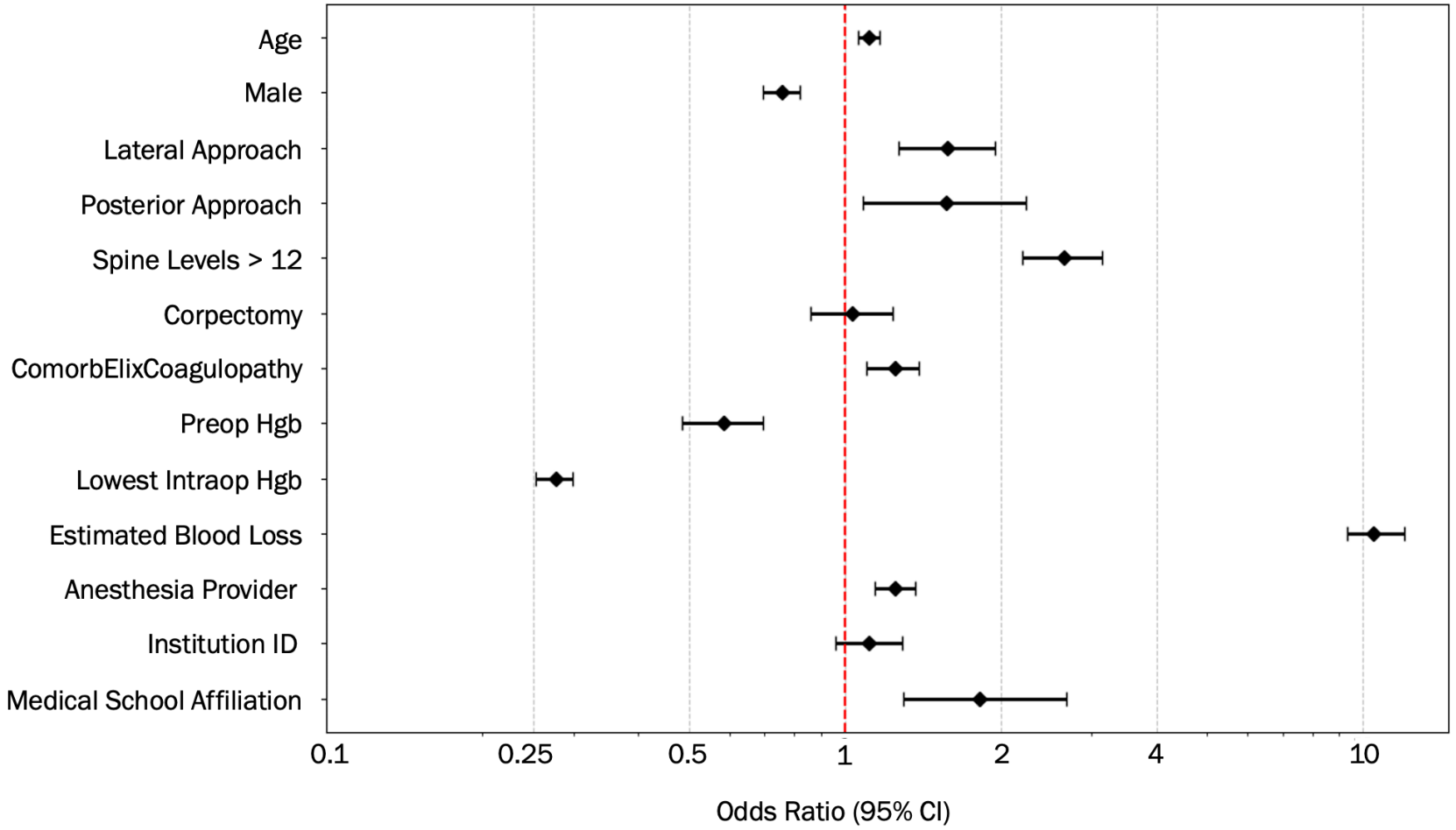
Rates of Any Blood Product Transfusion



Rates of Blood Product Transfusion by Type



Results


Age
Male
Lateral Approach
Posterior Approach
Spine Levels > 12
Corpectomy
ComorbElixCoagulopathy
Preop Hgb
Lowest Intraop Hgb
Estimated Blood Loss
Anesthesia Provider
Institution ID
Medical School Affiliation
0.1
0.25
0.5
1
2
4
10
Odds Ratio (95% CI)

Ongoing Work

- Better characterizing the variation of blood product transfusion practices in complex spine surgeries

- Using generalized linear mixed effect regression (GLMER) models, to examine the relative contributions of patient-, provider-, surgical case type-, and institution-level factors on blood product administration.

Conclusions

- Although the rate of blood product transfusion has decreased from 2018 – 2023, patients receive blood products while undergoing Non-emergent complex spine surgery

- Intraoperative transfusion of blood products in adults undergoing non-emergent complex spine surgery are associated with:
  - Age, Female and high-volume anesthesiologists
  - Surgical approach and number of spine levels
  - Intraoperative blood loss and preoperative anemia

- Better understanding of the factors associated with intraoperative transfusions can help risk stratify patients preoperatively

Lessons Learned

Understanding strengths and limitations of your dataset

Data Quality is more important than Data Quantity

Importance of Research Consultation

Thank You

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