The Effect of Transfusion on Short-Term, Perioperative Outcomes in Patients Undergoing Elective Spine Surgery

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Introduction

While red blood cell (RBC) transfusion used to be considered a benign treatment of suboptimal hematocrit levels peri-operatively, studies in various surgical specialties have revealed potential deleterious effects.

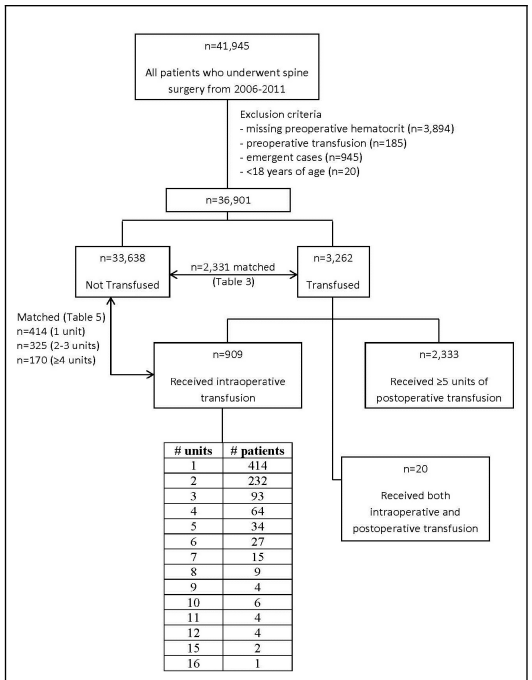
We assessed the impact of intra- and postoperative transfusion on postoperative morbidity and mortality in patients undergoing elective spine surgery.

Methods

We identified 36,901 adult patients in the 2006-2011 American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database.

Patients who received intra- or post-operative transfusion were matched to those who did not, using propensity scores; we analyzed baseline factors and comorbidities previously suggested affecting spine surgery outcomes, preoperative hematocrit levels, and length of surgery.

Logistic regression predicted adverse postoperative outcomes. Sensitivity analyses were done separately according to surgical subspecialty. NSQIP reports outcomes to 30 days from surgery.



Flowchart of patients included in the study

Results 1

Prolonged length of stay, complications, unplanned return to OR, and 30-day mortality were more frequent among transfused than non-transfused patients.

	No Transfusion (N = 33,638) 91.2%	Transfusion (N = 3,262) 8.8%	P Value
Total length of hospital stay, days			
mean ± SD	4 ± 7	8 ± 11	<0.001
median	2	5	
Prolonged LOS (>4 days)	25.1%	78.4%	<0.001
Minor postoperative complications‡	2.7%	9.0%	<0.001
Major postoperative complications§	4.7%	17.1%	<0.001
Any postoperative complication¶	6.6%	21.6%	<0.001
Return to the OR	2.8%	8.8%	<0.001
30 day mortality	0.3%	1.3%	<0.001

Frequency of outcomes stratified by transfusion status

Results 2

Upon matching, preoperative hematocrit and LOS were no longer significantly different between transfused and non-transfused patients.

However, after matching and adding unbalanced covariates to the final model, transfusion remained directly and adversely associated with several negative outcomes: a prolonged length of stay (LOS) in hospital (OR 2.6, 95% CI 2.3-2.9); more postoperative complications (OR 1.6, 95% CI 1.4-1.9); and increased return to surgery within 30 days (OR 1.7, 95% CI 1.3-2.2).

Adverse Outcomes	Transfusion vs. No Transfusion Odds Ratios (95% CI)		
	Logistic Regression†	Final sample after matching on propensity score‡, preoperative hematocrit level, and length of surgery	Final sample after matching on propensity score‡, preoperative hematocrit level, and length of surgery plus unbalanced covariates δ
Prolonged LOS (>4 days)	10.8 (9.9-11.8)	2.6 (2.3-3.0)	2.6 (2.3-2.9)
Minor complications	3.6 (3.1-4.1)	1.6 (1.3-2.1)	1.6 (1.2-2.0)
Major complications	4.2 (3.8-4.7)	1.7 (1.4-2.0)	1.7 (1.4-2.0)
Any postoperative complication	3.9 (3.6-4.3)	1.6 (1.4-1.9)	1.6 (1.4-1.9)
30 day return to the OR	3.4 (2.9-3.9)	1.7 (1.3-2.1)	1.7 (1.3-2.2)
30 day mortality	4.7 (3.3-6.8)	0.9 (0.5-1.8)	0.8 (0.4-1.6)

Comparisons for adverse outcomes between transfusion groups using different analysis methods

Results 3

Sensitivity analyses confirmed these findings separately in patients operated on by neurological and orthopedic surgeons (data not shown).

Conclusions

RBC transfusion increased LOS and postoperative morbidity in patients undergoing elective spine surgery, independent of preoperative hematocrit level and patient comorbidities.

With increasing attention to enhancing patient outcomes, while controlling healthcare expenditures, minimizing peri-operative blood loss should be a priority in elective spine surgery, and RBC transfusion must be administered judiciously.

References

1. ACS NSQIP. 2011 User Guide. October 2012
2. Dekutoski. Orthopedics. 22(1 Suppl):155-7.1999
3. Nuttall et al. Spine 25(5):596-601.2000
4. Keating. Am J Orthop 48:655-65.1999
5. Kennedy et al. Spine 36(26):E1736-43.2011

Limitations

In NSQIP, patients who have received up to 4 units of packed red blood cell or whole blood postoperatively are listed as non-transfused. Therefore, we may have underestimated the impact of transfusion on postoperative outcomes.

Due to retrospective nature of the study, we cannot establish, nor can we reject, a cause and effect relationship between transfusion and postoperative outcomes.