# Increased Risk of Infections Following Blood Transfusions in Anterior Cervical Spine Surgery

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## Introduction

Studies in transfusion of allogeneic blood have demonstrated an immunomodulatory effect that may increase the risk of infection. Spinal surgery is considered to have a relatively elevated risk of blood loss with increased associated transfusion requirements due to bone and epidural bleeding. To date, there have been few studies on the issue of postoperative infections following transfusions in cervical spinal surgery.

## Methods

Retrospective study using the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database. Data from patients undergoing elective anterior cervical spinal surgery between 2011 and 2014 was obtained. Outcomes were defined as those that may be associated with: superficial wound infection, urinary tract infection (UTI), deep wound infection, pneumonia, organ space surgical site infection (SSI), sepsis, and wound dehiscence. Multivariate logistic regression analysis was used to adjust for factors that were associated with infection in univariate analysis.

## Results

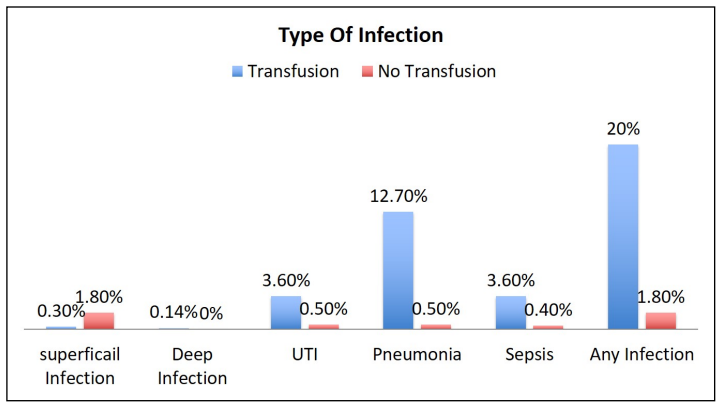
A total of 12,623 patients were included: 55 patients had postoperative transfusions (0.4%), while 240 patients had infections (1.9%). In univariate analysis, transfusion was associated with increased odds of infection (odds ratio (OR) = 13.4, 95% CI: 6.9 - 26.4). Multivariate logistic regression analysis with adjustment for confounding factors demonstrated further increased odds of infection following transfusion (adjusted OR = 14.9, 95%CI: 1.1 - 187.5). Additional subgroup analyses indicated that duration of surgery was not an interacting factor.

**Table 1. Unadjusted Results**

| | Transfusion | No Transfusion | P |
|---|---|---|---|
| Age | 60.6 +/- 13.3 | 54.1 +/- 11.6 | < 0.0001 |
| Gender (Males) | 40.0% | 48.3% | 0.4472 |
| Weight | 166.4 +/- 52.7 | 190.1 +/- 46.2 | 0.0001 |
| Preop ASA | 2.2 +/- 0.6 | 2.0 +/- 0.3 | < 0.0001 |
| Smoke | 38.2% | 29.8% | 0.1850 |
| Duration of Surgery | 395.3 +/- 79.4 | 191.6 +/- 78.0 | < 0.0001 |
| PreOP Albumin | 3.7 +/- 0.8 | 4.2 +/- 0.5 | < 0.0001 |
| PreOp HCT | 36.5 +/- 5.1 | 41.4 +/- 4.0 | < 0.0001 |
| PreOP INR | 1.0 +/-0.1 | 1.0 +/- 0.2 | 0.1815 |

**Table 2. Unadjusted Results**

| | Transfusion | No Transfusion | P |
|---|---|---|---|
| Organ Space SSI | 0.09% | 0% | 0.8263 |
| Wound Dehiscence | 0.02% | 0% | 0.9088 |
| Deep Wound Infection | 0.14% | 0% | 0.7788 |
| Superficial Wound Infection | 0.3% | 1.8% | 0.0433 |
| Any SSI | 0.56% | 1.8% | 0.2120 |
| UTI | 3.6% | 0.5% | 0.0012 |
| Pneumonia | 12.7% | 0.5% | < 0.0001 |
| Sepsis | 3.6% | 0.4% | 0.0003 |
| Any Infection | 20.0% | 1.8% | < 0.0001 |




## Conclusions

Allogeneic blood transfusion was significantly associated with increased risk of infection in elective anterior cervical spinal surgery cases. This supports the immunomodulatory hypothesis, and suggests that interventions to reduce blood loss and transfusion may reduce post-operative infections. However, caution should be applied in inferring any causative effect due to the prospect of other unknown confounding factors.

## Future Direction

Additional analyses should be conducted on matched comparisons, propensity score analysis, and machine learning methods. We also hope to look at other variants not monitored in NSQIP such as the number of blood transfusion units given and the use of cell-saver. Furthermore, increased risk of infection should be investigated in other spine diagnoses such as lumbar stenosis/decompression. Alternatively, another study focus is whether or not interventions that reduce transfusion, such as TXA, reduce infection.