

Prophylactic Antibiotic Regimens and Infection following Posterior Cervical Decompression and Fusion in a National Sample

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INTRODUCTION:

Preoperative prophylactic antibiotics are the standard of care for preventing post-surgical infection in spine surgery. However, evidence is still unclear on which antibiotic regimen should be selected for primary spine surgeries (1). In addition, as multi-antibiotic prophylaxis continues to grow in usage, there is an absence of evidence that these regimens reduce the risk of infection. Using a nationally representative payer database, we investigate whether 1st generation cephalosporins alone reduce the 30-day risk of surgical site infection (SSI), sepsis, and pneumonia relative to patients prescribed other antibiotic regimens.

METHODS:

Using the Premier Healthcare database, patients undergoing primary PCDF between January 2016 and December 2022 were queried. Antibiotic regimen for each patient was defined as the antibiotics billed for during the surgical encounter. Occurrence of post-discharge infection complications, SSI, sepsis, and pneumonia, in the 30-day window were recorded as well as time to complication. Patients were excluded if any ICD-10 codes associated with these complications were present at the surgery encounter. Kaplan Meier curves for each antibiotic regimen were visualized. A Cox Proportional Hazards (CoxPH) model was developed for each post-discharge infection complication with covariates adjusting for patient age, demographics, geographic region, multilevel surgery, and Elixhauser comorbidities.

RESULTS:

38,342 patients underwent primary PCDF during the study period. Leading antibiotic regimens were Cefazolin + Vancomycin (13,841), Cefazolin (12,390), Vancomycin (2,554), Cefazolin + Other (2,443), Vancomycin + Other (6,396) and Other where Other was any non-Cefazolin or Vancomycin antibiotic. The most common drugs in the “Other” category were Gentamicin and Clindamycin. Penicillin (3.9-6.7%) and Cephalosporin (10.8-20.9%) allergy were significantly in non-Cefazolin antibiotic regimens. Perioperative anaphylaxis during the surgery encounter occurred twice in the Cefazolin cohort, once in the Cefazolin + Vancomycin cohort, and 3 times in the Vancomycin + Other cohort. In Kaplan Meier curves, Cefazolin only and Cefazolin + Vancomycin groups had the lowest risk of post-surgical infections across all outcomes (Figure 1). In adjusted Cox Proportional Hazards models, patients prescribed Vancomycin (HR = 1.37 [95% CI: 1.01,1.88], p = 0.0456) and Other (HR = 1.84 [95% CI: 1.14,2.96], p = 0.0118) antibiotic regimens were at significantly greater risk of surgical site infection relative to Cefazolin alone. Almost all antibiotic regimens except Vancomycin alone had significantly greater risk of sepsis in CoxPH models (Figure 2).

DISCUSSION AND CONCLUSION:

In conclusion, patients receiving Cefazolin only had less post-surgical infection complications than other antibiotic regimens. This effect persisted in adjusted CoxPH analysis where Cefazolin only was non-inferior or significantly protective relative to all other antibiotic regimens. Prescribing Vancomycin alone increases risk of surgical site infection, which brings into question its efficacy as a substitute. Vancomycin + Other and Cefazolin + Other multidrug regimens categorically increased risk of post-surgical infection. These results are supported by literature in other medical fields showing that multi-antibiotic regimens can cause microbiome dysregulation that predisposes patients to infection more than additional antibiotic coverage protects against infection risk. The significant associations found between antibiotic selection and post-surgical infection signifies the need for further prospective investigation that will build consensus on antibiotic selection for infection prophylaxis in PCDF. Furthermore, investigation should be undertaken to determine which circumstances truly necessitate the use of multidrug or non-cefazolin regimens.

