Impact of Statewide Guidelines on Antibiotic Administration in the Setting of Pediatric Open Fractures

Introduction

Early antibiotic administration is a cornerstone of open fracture management. In 2020, the Arkansas Trauma System published evidence-based guidelines to standardize antibiotic timing, dosing, and duration. In the same year, state legislation permitted emergency medicine technicians to administer pre-hospital antibiotics. The impact of these system-level interventions on outcomes in pediatric open fractures remains incompletely characterized.

Methods

A single-center retrospective cohort study was performed, evaluating patients under 18 years with at least one open fracture presenting to Arkansas Children's Hospital. Outcomes before guideline publication (January 2017–December 2018) were compared with outcomes after publication (January 2022–December 2023). Timing and location of antibiotic administration were analyzed, as well as outcomes including postoperative infection, postoperative complications, readmissions, amputations, and timing of antibiotic administration. A predefined subgroup analysis was conducted for long-bone fractures.

Results

A total of 221 patients were included (86 pre-guideline, 135 post-guideline), with no statistically significant differences in age, sex, or ancestry between cohorts. Administration of antibiotics at outside hospitals increased significantly following guideline dissemination (38.37% vs 54.81%, $p = 0.0171$). Rates of postoperative infection were not significantly different between cohorts (3.49% vs 5.19%, $p = 0.55$), and no significant difference was observed in postoperative complications. Readmission rates were lower in the post-guideline cohort (3.49% vs 1.48%).

Among patients with long-bone fractures, amputation rates decreased from 2.74% to 0.00%, and outside hospital antibiotic administration increased (39.73% vs 48.81%), though differences in postoperative infection and complications were not statistically significant.

Conclusions

Statewide trauma antibiotic guidelines were associated with increased early antibiotic administration, particularly at outside hospitals. Although postoperative infection rates were unchanged, reductions in readmissions and amputations suggest potential benefits of system-level antibiotic guidance in pediatric open fracture care, especially in settings with prolonged transfer times.