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### QUESTION 3: should prophylactic antibiotic prophylaxis be repeated during spine surgery? If so, when?

**RECOMMENDATION:** In most uncomplicated spinal procedures, a single preoperative dose of prophylactic antibiotics is sufficient. Prophylactic antibiotics should be redosed intraoperatively for procedures lasting longer than twice the half-life of the antibiotic, or if there is excessive blood loss (blood loss > 1,500 mL) in order to ensure therapeutic levels.

**LEVEL OF EVIDENCE:** Limited

**DELEGATE VOTE:** Agree: 93%, Disagree: 0%, Abstain: 7% (Super Majority, Strong Consensus)

#### RATIONALE

There are no randomized spine studies that compare the effectiveness of redosing prophylactic antibiotics during surgery to preoperative antibiotics alone. Therefore, this review was expanded to include other surgical subspecialties. Several major guidelines including those from the North American Spine Society (NASS), Infectious Disease Society of America (IDSA) and Surgical Infection Society (SIS) have made similar recommendations supported by pharmacokinetic data and retrospective studies [1,2]. Furthermore, the Centers for Disease Control and Prevention (CDC) recently noted that there is insufficient-quality evidence to make a recommendation regarding whether or not antibiotics should be redosed intraoperatively [3].

In a prospective study of 57 subjects undergoing elective surgery, an analysis of intraoperative serum cefazolin concentrations at approximately 3.5 hours after receiving a preoperative dose showed that antibiotic concentrations dropped below the minimum inhibitory concentration (MIC) for methicillin-susceptible *Staphylococcus aureus* (MSSA) and *Escherichia Coli* (*E. Coli*) [4]. Ohge and colleagues found that cefazolin concentrations had dropped below 80% of the MIC in the adipose tissue and peritoneum for multiple bacteria three hours after the preoperative dose was administered [5]. In a prospective study of 11 elective instrumented spinal procedures with a large expected blood loss, estimated blood loss (EBL) was found to have a strong negative correlation with cefazolin tissue concentrations ( $r = -0.66$ ,  $p = 0.5$ ). Based on the pharmacokinetic values, the authors recommended that procedures with an EBL greater than 1,500 mL should receive an additional dose of cefazolin [6].

In a retrospective study of 1,548 patients undergoing cardiac surgery, intraoperative redosing for procedures lasting greater than

400 minutes was shown to reduce the risk of surgical site infections (SSIs) (adjusted OR 0.44, 95% CI 0.23-0.86) [7]. Similarly, Scher et al. demonstrated that for surgeries longer than three hours, patients who were redosed with cefazolin intraoperatively had a lower SSI rate than those who only received preoperative cefazolin (6.1% vs. 1.3%,  $p < 0.01$ ) [8]. In another retrospective review of 4,078 patients undergoing various general surgery procedures, cases with an EBL of greater than 500 mL or those that were not redosed intraoperatively during longer cases were associated with a higher rate of SSI [9].

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