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Survey of congenital heart surgeons' preferences for antimicrobial prophylaxis for pediatric cardiac surgery patients

Chad A. Knoderer, Emily M. Anderson, Emily M. Anderson

Patients with congenital heart defects are a unique population with generally immature immune systems. Fragility in the postoperative period may contribute to surgical site infections (SSIs), a life threatening complication for this population. The need for postoperative antimicrobial prophylaxis for these patients is a standard of care that is indisputable. When choosing an antimicrobial regimen for surgical prophylaxis, consideration should be given to balancing the prevention of nosocomial infections, avoiding emergence of bacterial resistance, and minimizing drug toxicities and cost.

Organizations including the American Society of Health-System Pharmacists (ASHP), the Society of Thoracic Surgeons (STS), the Surgical Infection Prevention (SIP) project team, the Centers for Medicare and Medicaid Services, and the U.S. Centers for Disease Control and Prevention have developed guidelines for the selection, initiation, and duration of antibiotic use in patients perioperatively (table).¹⁻⁴ Only ASHP recommendations specifically address surgical prophylaxis for children undergoing cardiac surgery, although not in extensive detail and with much extrapolation of data from adult studies. (1)

In November 2006, we surveyed 95 surgeons from 56 domestic and 4 international institutions who were all members of the Congenital Heart Surgeons' Society, and we asked them to evaluate the range of practice regarding postoperative antibiotic prophylaxis for pediatric cardiac surgeries. As expected, there was a wide variation of practice related to selection and duration of prophylaxis. Twenty-three (24%) congenital heart surgeons responded from 16 domestic and 2 international programs, but only three of the surgeons were familiar with the SIP project.

Cefazolin was the most commonly chosen antibiotic for postoperative prophylaxis. Nine (60%) of 15 surgeons who responded stated that antibiotic prophylaxis is limited to 24 to 48 hours after surgery. This is consistent with ASHP, SIP, and STS recommendations. (1-3) However, a high percentage (40%; 6 of 15) reported continuing prophylaxis until chest tubes and all invasive lines (i.e., central intravenous, arterial, and intracardiac hemodynamic monitoring) were removed. Data from a retrospective study by Maher et al. (5) might suggest that this practice may decrease SSIs. However, a prospective study has demonstrated that prolonged antibiotic prophylaxis after 48 hours does not reduce SSIs but increases antimicrobial resistance. (6) The practice of continuing prophylaxis for the duration of chest tube or invasive line placement has existed for some time and is currently not endorsed by STS. (3, 7)

Antibiotic prophylaxis guidelines do not exist for procedures such as ventricular assist device (VAD) placement, cardiac extracorporeal membrane oxygenation (ECMO), and delayed sternal closure (DSC) cases. Infection-related morbidity and mortality in patients who receive these procedures is of significant concern. Use of vancomycin-containing regimens (21/42 [50%]) and regimens containing antimicrobials with broad gram-negative or anaerobic coverage (i.e., cefoxitin, ceftazidime, ceftriaxone, gentamicin, piperacillin) were commonly reported by surgeons for VAD, ECMO, and DSC (22/42 [52%]). The majority of respondents indicated that

prophylaxis is continued for the entire duration of VAD placement, ECMO, and DSC procedures (13/15 [87%], 15/16 [94%], and 24/26 [92%], respectively). Prolonged antimicrobial exposure not only increases risk of infection with resistant bacteria, but potentially increases the possibility of fungal infection which can significantly increase mortality risk in patients receiving VAD support. (8) With technological advances in mechanical circulatory support devices and improvements in outcomes in children undergoing these procedures, a balance must be made between adequate antimicrobial prophylaxis duration and selection of antibiotic-resistant bacteria.

Our survey demonstrated that the use of antimicrobial prophylaxis for congenital heart surgery is standard. However, there is wide variation in selection and duration of prophylaxis, and areas of discordance exist between national and organizational recommendations and current practices. Prolonged use of antimicrobials leads to the increased incidence of resistant enterobacteriaceae and enterococci. (3, 6) Pharmacists play a critical role in the appropriate use of antimicrobials, and can seize this opportunity to collaborate with congenital heart surgeons to develop institution specific protocols for postoperative antibiotic prophylaxis. The development of consensus recommendations for postoperative antimicrobial prophylaxis for children after cardiac surgery, and the concurrent design of a national database to collect and assess long-term outcomes associated with those recommendations may be attainable through pharmacist and surgeon collaboration.

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