KEY POINTS

- Knowledge and practice of meticulous surgical technique and appropriate antimicrobial drug use is an important component of preventing antimicrobial drug resistance.
- Antimicrobials should be administered immediately prior to surgery to ensure therapeutic levels are reached at the beginning of surgery and the patient should be re-dosed during surgery, as necessary, to maintain therapeutic levels. Prophylaxis should be discontinued within 24 hours.
- Monitoring drug resistant patterns in surgical site infections (SSI) is recommended.

Antimicrobials have had an insurmountable positive impact on human and veterinary patient care. Prophylactic antimicrobial use in patients undergoing surgical procedures has reduced the incidence of postoperative infection and the associated morbidity, mortality, and high cost of treatment. Therapeutic use of antimicrobials has saved the lives of patients that would not have survived before the discovery of antimicrobials. Antimicrobials are effective, associated with few side effects, and are relatively inexpensive. However, excessive and inappropriate use exacerbates drug resistance. Infection with a resistant organism results in an increase in cost of treatment and length of hospital stay and often higher morbidity and mortality. Rational use of existing antimicrobials and control of the spread of resistant organisms are recommended to control antimicrobial drug resistance.

What is appropriate surgical antimicrobial prophylaxis?

The goal of antimicrobial prophylaxis is to achieve serum and tissue drug levels that exceed the MICs for the organism likely to be encountered during the operation for the duration of the operation. Antimicrobial drugs should be administered within 60 minutes of beginning the surgical procedure (fluoroquinolones and vancomycin within 120 minutes). If the operation is still in progress 2 half-lives after the initial dose, administration should be repeated to ensure therapeutic levels are maintained. Successive dosing with antimicrobials with short half-lives is associated with lower SSI rates.

The majority of research has demonstrated that antimicrobial prophylaxis beyond wound closure is unnecessary. Prolonged use of antimicrobial drugs beyond the peri-operative period is associated with emergency of resistant bacterial strains. The current recommendation is that antimicrobial prophylaxis end within 24 hours of the operation. However, for cardiothoracic surgery it was recommended by the American Society of Health-System Pharmacists (ASHP) that prophylaxis is continued for up to 72 hours after the operation but the suggestion is that they can likely be discontinued within 24 hours.

What other methods are important for prevention of SSI?

Intra-operative temperature control, supplemental oxygen administration, aggressive fluid resuscitation, and pre-operative control of blood glucose may all decrease SSI rate. Adhering the Halsted’s principles of surgery including atraumatic and a septic technique, removing blood from the surgical site, and always using an instrument if one is available are critical.
Antimicrobial drug resistance

The importance of antimicrobial drug resistance has recently been highlighted: “….European Center for Disease Prevention and Control (ECDC) rated antimicrobial resistance as one of the most important infectious disease threats in Europe because of the increase in infections due to multidrug-resistant bacteria in Europe….bacteria totally, or almost totally, resistant to currently available antibiotics….”. Several reports have indicated that antibacterial drug development will not adequately address problems with antimicrobial resistance in important bacteria. A variety of interventions have been used in an attempt to eradicate or control multi-drug resistant organisms: improvements in hand hygiene; judicious use of antimicrobial drugs; infection control precautions to prevent spread; active surveillance cultures; staff education; enhanced environmental cleaning; decolonization; better sharing of information between health care organizations regarding patient’s status. Incorporation of a biosecurity program in large hospitals is recommended.

Methicillin-Resistant Staphylococcus aureus (MRSA)

MRSA are resistant to all currently available beta-lactam antimicrobials and carbapenems. MRSA is one of the most important resistant microorganisms. Hospital-acquired and community-acquired strains exist. Diagnosis of MRSA involves bacterial culture and sensitivity testing of appropriate samples. Special transport media are not required and refrigerated samples survive well during routine transport. Treatment is controversial. In human patients, superficial skin and soft tissue infections that are not associated with systemic signs can be managed with drainage with or without antimicrobials. Antimicrobials that can be considered for treatment of MRSA include clindamycin, tetracyclins and trimethoprim sulfamethoxazole, linezolid, chloramphenicol and aminoglycosides, rifampin (not alone), and vancomycin. Selection is based on the type of infection. Surveillance and decolonization strategies and prevention of MRSA transmission are important in the management of MRSA infections.