Drug-resistant pathogens are a growing threat in healthcare settings.
- Each year nearly 2 million patients in the United States get a hospital-acquired infection
- Of those patients, about 90,000 die as a result of their infection
- More than 70% of the bacteria that cause hospital-acquired infections are resistant to at least one of the drugs most commonly used to treat them
- Persons infected with drug-resistant organisms are more likely to have longer hospital stays and require treatment with second- or third-choice drugs that may be less effective, more toxic, and/or more expensive

Risk factors that promote antimicrobial resistance in healthcare settings include:
- Extensive use of antimicrobials
- Previous exposure to antimicrobials
- Critically ill
- Elderly
- History of invasive procedures
- Underlying medical conditions

Examples of epidemiologically significant drug resistant pathogens:
- **Clostridium difficile**
  Clostridium difficile is an anaerobic gram positive spore-forming bacterium. It produces toxins that cause *Clostridium difficile* associated diarrhea (CDAD). The disease is responsible for significant morbidity and increased hospital cost. Some patients develop a severe form of disease (pseudomembranous colitis) that can be fatal. CDAD usually develops among patients who have been in the hospital and treated with broad-spectrum antibiotics. The *Clostridium difficile* spore is difficult to destroy and may be spread from patient to patient via contact with the environment and hands of health care workers.

- **Extended-spectrum beta-lactam organisms**
  Extended-spectrum beta-lactamases (ESBL) are enzymes that confer resistance to most beta-lactam antibiotics, including penicillins and cephalosporins. Infections with ESBL-producing organisms have been associated with poor outcomes. Currently, carbapenems (imipenem®) constitute the best treatment option for infections caused by such organisms. ESBL have been found exclusively in gram negative organisms, primarily in *Klebsiella pneumoniae*, *Klebsiella oxytoca*, and *Escherichia coli* but also in *Salmonella*, *Proteus*, *Enterobacter*, *Citrobacter*, *Serratia*, and *Pseudomonas*. 
• Other examples of antibiotic resistant bacteria with potential epidemiologic importance in a healthcare setting:
  o Carbapenemase producing Klebsiella pneumoniae (KPC) resistant to carbapenems
  o Pseudomonas aeruginosa and Acinetobacter baumannii resistant to aminoglycosides, cephalosporins, quinolones, penicillins, monobactams, and imipenem.
  o Staphylococcus aureus with either intermediate or complete resistant to vancomycin (VISA / VRSA).
  o Vancomycin resistance Enterococcus (VRE)
  o Methicillin resistant Staphylococcus aureus (MRSA)

CDC Campaign to Prevent Antimicrobial Resistance in Healthcare Settings

12 Steps to Prevent Antimicrobial Resistance Among Hospitalized Adults

Prevent Infection

Step 1. Vaccinate
- Give influenza/pneumococcal vaccine to at-risk patients before discharge
- Get influenza vaccine annually

Step 2. Get the Catheters out
- Use catheters only when essential
- Use the correct catheter
- Use proper insertion and catheter-care protocols
- Remove catheters when they are no longer essential

Diagnose and Treat Infection Effectively

Step 3. Target the pathogen
- Culture the patient
- Target empiric therapy to likely pathogens and local antibiogram
- Target definitive therapy to known pathogens and antimicrobial susceptibility test results

Step 4. Access the experts
- Consult infectious diseases experts for patients with serious infections
Use Antimicrobials Wisely

**Step 5. Practice antimicrobial control**
- Engage in local antimicrobial control efforts.

**Step 6. Use local data**
- Know your antibiogram.
- Know your patient population.

**Step 7. Treat infection, not contamination**
- Use proper antisepsis for blood and other cultures.
- Culture the blood, not the skin or catheter hub.
- Use proper methods to obtain and process all cultures.

**Step 8. Treat infection, not colonization**
- Treat pneumonia, not the tracheal aspirate.
- Treat bacteremia, not the catheter tip or hub.
- Treat urinary tract infection, not the indwelling catheter.

**Step 9. Know when to say "no" to vanco**
- Treat infection, not contaminants or colonization.
- Fever in a patient with an intravenous catheter is not a routine indication for vancomycin.

**Step 10. Stop antimicrobial treatment:**
- When infection is cured.
- When cultures are negative and infection is unlikely
- When infection is not diagnosed.

**Prevent transmission**

**Step 11. Isolate the pathogen**
- Use standard infection control precautions.
- Contain infectious body fluids. (Follow airborne, droplet, and contact precautions.)
- When in doubt, consult infection control experts.

**Step 12. Break the chain of contagion**
- Stay home when you are sick.
- Keep your hands clean.
- Set an example.

**Reference:**
CDC Campaign to Prevent Antimicrobial Resistance in Healthcare Settings. Accessed at:
UpToDate® 2006 Extended-spectrum beta-lactamases