# CDC's HAI Regional Training Program

## *Multi-Module Slide Set Summary* prepared by

Maryland Health Care Commission and
Maryland Department of Health and Mental Hygiene

**HAI Facts:**

- 1.7 million total HAIs in U.S.
- Most are procedure related
- 99,000 deaths
- $8.5 billion overall net hospital cost
- HAIs can be prevented, saving lives and money

***INDEX:***



## Learning Objectives for Training

- Discuss practical evidence based methods for prevention of all six priority HAIs (MRSA, CDI, CLABSI, CAUTI, SSI, and VAP), including hand hygiene, contact and isolation precautions, environmental cleaning, and antimicrobial stewardship
- Review recommendations applicable to each HAI and discuss implementation strategies and challenges
- Discuss emerging challenges for infection prevention and control in non acute settings and emerging pathogens
- Identify tools and resources to support local knowledge and dissemination

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## Module 1: Foundation of Infection Prevention

- 4 major infection categories account for 75% of total HAIs: UTIs, SSIs, BSIs, & Pneumonia
- HAIs can be prevented because of the following:
  - Device contamination can be prevented at time of placement and during maintenance
  - Devices can be removed as soon as they are no longer needed
  - Systems can be implemented to ensure these steps are taken and a patient safety culture develops (ARRA; HHS Action Plan; Anthem Blue Cross; Moore Foundation; AHRQ; charismatic leaders; recruiting leadership and boards; best practices and checklists)
- Isolation has a negative impact on care provided & a patient's mental health

**Re: Hand Hygiene**

**Soap & Water:**

- **Before eating**
- **After using bathroom**
- **Visibly soiled**
- **Contact w/ any patient w/ diarrhea**
- **Before & after food preparation**

**Alcohol-based product**

- **Entering/exiting patient-occupied area**
- **Before moving between patients**
- **Before putting on sterile gloves**
- **After removing PPE including gloves**


World Health Organization's 5 Moments for Hand Hygiene

## HAI Facts:

- More than 70% of bacteria that cause HAIs are resistant to at least one of the drugs used most commonly to treat them.
- Persons infected with antimicrobial-resistant organisms are 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.

## HAI Surveillance - Devices:

$$\frac{\text{Number of Infections}}{\text{Number of Device Days}} \times 1000$$

- Infections include: CLABSIs, CAUTIs & VAPs.
- Devices include: Central lines, Urinary catheters & Ventilators)

| | CDC's Isolation Guidelines |
|---|---|
| Intensified | INTENSIFIED INTERVENTIONS<br>• Implemented for unusual infectious agent, common infectious agent with usual resistance, incidence of new cases of an infectious agent is increasing or fails to decrease despite IP precautions<br>• Useful interventions include active surveillance tests to identify all colonized/infected patients/residents, private rooms or cohorting patients, dedicated cohort staff, new admission restriction, increased environment sanitation |
| Transmission-Based | CONTACT PRECAUTIONS<br>• Gloves are worn for **all patient/resident/environment contact**; gowns, when clothing will have direct contact with the patient or potentially contaminated environmental surfaces/equipment close to patient (as opposed to anticipated contact with blood and body fluid)<br>• Private room(s) or cohorting & use of dedicated patient-care equipment<br>DROPLET PRECAUTIONS<br>• Influenza-like illness (seasonal outbreaks NOT pandemic influenza)<br>• Private room(s) or cohorting, or spatial separation of > 3 feet & use of dedicated patient-care equipment<br>• Mask patient for transport; no need for special ventilation; open door is ok<br>AIRBORNE PRECAUTIONS<br>• Active TB disease, measles, chickenpox<br>• Private room with monitored negative air pres-sure & 6-12 air ex-changes per hour with air discharge outdoors or monitored high-efficiency air filtration<br>• Wear N95 respirator when entering room; surgical mask on patient for transport |
| Standard | STANDARD PRECAUTIONS<br>• Assume blood and moist body fluids from ALL patients are colonized or infected with one or more transmissible infectious agents.<br>• PPE when contact with blood or body fluids is **anticipated**; surgical mask during lumbar puncture; safe injection practices.<br>• 5 moments for hand hygiene before, during and after contact with the patient or the patient's environment.<br>• Respiratory hygiene and cough etiquette |

# Module 2: Epidemiology and Surveillance

Healthcare is at a crossroads in the US where quality, revenue and public policy intersect. Quality initiatives not only improve patient care, but create an advantage in the marketplace.

- Nationwide pressure to manage healthcare cost & utilization
- Federal reimbursement changes that account for severity of illness
- Value based purchasing
- Declining hospital LOS
- Private insurance pay-for-performance contracts
- Tens of millions uninsured
- Public disclosure of performance
- Malpractice liability

CDC's NHSN lists criteria for 13 major site infections and 49 specific sites:

- UTIs- Most common
- SSIs- Most costly
- VAPs- Highest mortality
- CLABSIs- Most preventable

How to Prevent HAIs:

- Surveillance
- Hand hygiene
- Isolation/Precautions
- Appropriate use of devices
- Management of the environment
- Disinfection and sterilization
- Aseptic technique
- Immunizations
- Antibiotic management
- Other evidence based interventions

Why surveillance is necessary:

- Improve outcomes
- Detect clustering of disease
- Answer the questions who, when and where
- Assess impact of interventions
- Guide treatment (antimicrobials)
- Satisfy standards (TJC, State, Federal)
- Enable the public to make choices – public disclosure/reporting

Basic Elements of Surveillance:

- Define categories of infection
- Define population at risk
- Determine most efficient way to find and collect necessary data
- Tabulate/analyze/interpret data
- Report data
- Use data to drive change

Sources of Data:

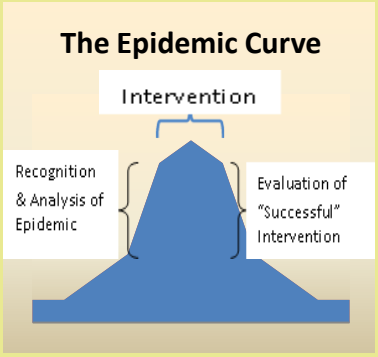
- Rounds and chart review
- Medical Records (paper & electronic)
- Healthcare personnel
- Lab reports
- Department records (Pharmacy, ADT, MICRO)
- External sources of information

"Turn surveillance data into decision making information." – Jonathan R. Edwards, M.Stat, October 2009.

# Module 3: Outbreak Investigation in Healthcare Settings

An outbreak is an increase in the incidence of a disease or clinically relevant culture results above what is normally expected. Sometimes small outbreaks are referred to as clusters. Psuedo-outbreaks generally refer to situations in which there is a rise in positive culture results without evidence of disease. This may be a surveillance artifact due to new definitions, new lab tests, change in culturing/testing frequency, new medical procedures, new practitioners, new area/population surveyed, etc.

Remember, the goal of investigation is to stop the outbreak, not to uncover every case. More exhaustive case finding efforts may not be needed, but might become important if you can't get things under control quickly.




## The Epi-Curve Facts:

1. Most outbreaks in healthcare are discovered by observant healthcare personnel

2. With successful intervention, an outbreak can be stopped!

**Worldwide Database for Nosocomial Outbreaks:**
www.outbreak-database.com

A terrific starting point in any outbreak investigation and a great resource!

**Most outbreaks don't require formal investigation!**

- 6 cases of Pseudomonas SSI following arthroscopic knee surgery due to "homemade" antiseptic reused multiple times. No new cases after switching to single use commercial antiseptic.
- MRSA skin infections in healthy newborns shortly after discharge. No further cases after enhancement of infection prevention procedures.

**Do conduct a formal investigation if an outbreak is not controlled.**

- Increase in MDRO infections and colonization. Conducted molecular typing for clonality; implemented immediate control measures including admission and periodic surveillance cultures, placing all infected/ colonized patients on contact precautions; patient staff and equipment cohorting; looking for obvious reservoir and culturing if indicated.

**Essential Investigation Components:**

1. **Establish case definition(s)** – Depending on the pathogen, definition(s) should be narrow enough to focus efforts, but broad enough to catch all cases (e.g., Any patient who developed postoperative S. *marcescens* infection between Aug 16 and Sept 28, where Aug 16 is the date of operation for the first patient who developed an infection.
2. **Confirm cases are "real"** – Must meet the criteria in the case definition.
3. **Establish background rate of disease** – Literature review of other outbreak investigations; great resource is www.outbreak-database.com.
4. **Find cases, decide if outbreak, define scope** – Find cases by looking at microbiology data, infection control surveillance records, discussions with clinicians, medical records, operative notes, pathology reports, pharmacy records, radiology reports, central service/supply records, occupational health records, hospital billing records, purchasing records, log books.
5. **Examine descriptive epidemiologic features of cases** – Line list is the most important part of the investigation since it drives all investigative efforts. The line list could include information on signs and symptoms, onset date, medications, intravenous solutions, invasive procedures, surgery, consults, lab results, location, staff contact, and host factors (e.g., age, underlying disease, etc.).
6. **Generate hypotheses** – Based on findings from line list.
7. **Test hypotheses** – Who/What to observe generally driven by the line list.
8. **Collect and test environmental samples** – Even with using the best methods, yield can still be low (e.g., 25% yield in getting the bacteria off the surface onto the swab and 25% yield getting the bacteria off the swab and into the media).
9. **Implement control measures** – Primary goal is to stop transmission, not necessarily to find the source, so various control measures should be implemented right away including reinforcing hand hygiene as well as environmental cleaning and disinfection techniques; cohorting patients/staff/equipment; removal of suspected source(s) such as multi-dose medications, antiseptics, etc; restricting the use of antibiotics to which the organism is resistant; closing the unit to new admissions; etc.
10. **Communicate results** (patients, hospital administration/staff, media/public, and lawyers) – Work with your public relations office; keep everyone informed; designate one spokesperson; keep detailed records with timeline.

## Module 4: Environmental Cleaning and Disinfection in Preventing HAIs

- Environmental cleaning: Surface cleaning to reduce bio-burden.
- Disinfection cleaning: Implies the use of a low level disinfectant to decrease bio-burden.
- It is very likely that surfaces in the Patient Zone are highly relevant in the transmission of HAI. While optimizing hand hygiene and isolation practice is clearly important there is no reason why the thoroughness of environmental hygienic cleaning should not also be optimized.
- CMS surveyors pay attention to whether hospitals follow manufacturers' directions for disinfectant contact time and hospitals are being cited for using shorter contact time (e.g., if dry time is 2 minutes, contact time of 10 minutes can be achieved by reapplying the disinfectant 5 times).

# Module 5: Special Topics in Environmental Control

Cleaning is the mechanical removal of dirt, debris and material through wiping or washing with detergents or enzymes. Ensure rigorous cleaning prior to sterilization or disinfection. The goal with sterilization and disinfection is to ensure medical and surgical instruments and devices do not transmit infectious pathogens to patients.

**Spaulding Scheme for sterilization and disinfection:**

CRITICAL…Sterilize
-Contact with sterile tissues or the vascular system

- Requires removal of all micro-organisms and spores
- Surgical instruments, vascular catheters, implants etc.
- High temperature, low temperature or liquid immersion; steam under pressure is most common method (4-30 minutes)
- Other methods: Hydrogen peroxide gas plasma, Ozone, Peracetic Acid Liquid, Ethylene Oxide gas

SEMI-CRITICAL… High-level Disinfection
-Contact with mucous membranes or non-intact skin

- Requires removal of all micro-organisms, but small numbers of bacterial spores are permissible
- Endoscopes, intubation blades, ultrasound probes
- Heat automated or liquid immersion; 2% Glutaraldehyde at 20°C is most common (20 minutes)

NON-CRITICAL… Low-level Disinfection
-Contact with intact skin

- Requires removal of common pathogens
- Patient rooms and their contents (e.g., surfaces, BP cuffs, stretchers)
- Liquid contact; many disinfectant manufacturers (10 minutes or less)

**5 Steps for Endoscope & Bronchoscope High-Level Disinfection:**

1. CLEAN: Remove debris/tissue which can impede disinfection process, flush all lumens (water and enzymatic cleaner)
2. HIGH-LEVEL DISINFECTION: Perfuse through ALL channels with disinfectant (2% Glutaraldehyde at 20°C for 20 minutes is most common)
3. RINSE: Sterile or filtered tap water followed by alcohol rinse
4. DRY: Forced air
5. STORE: Hang vertically to promote drying and avoid recontamination

# Module 6: Preventing CLABSIs

**5 Basic Steps: The CLABSI Prevention Bundle**

1. HAND HYGIENE.
2. MAXIMAL BARRIER PRECAUTIONS by wearing cap, mask, sterile gown, and gloves, as well as covering the patient with a large sterile drape that has a small opening at the insertion site.
3. CHLORHEXIDINE SKIN ANTISEPSIS of catheter insertion site except in very LBW infants.
4. NON-FEMORAL VEIN catheter insertion in adults.
5. DAILY REVIEW of line necessity; prompt removal of unnecessary lines.

## In the US…

- 46.5 million surgical procedures/year
- 5 million endoscopies/year
- 500,000 bronchoscopies/year
- Majority (2/3) of endoscopies and bronchoscopies are outpatient
- Appropriate selection and proper use of disinfection/sterilization processes is paramount to patient safety
- Failure to comply with guidelines has led to outbreaks

## Flash Sterilization…

- Not acceptable for routine sterilization
- Often used in OR for sterilization of a cleaned object required immediately (e.g., screws, plates, dropped instrument)
- Do not use flash sterilization for convenience, shortened time for routine sterilization, general implants
- Requires proper monitoring and record keeping

**If a breach in Central Line insertion technique occurs, be empowered to…**

*STOP THE LINE!*

### Impact of CLABSI…

- Increases hospital LOS to 11-23 days
- Increases costs to $7,288 - $29,156 per CLABSI episode
- Increases costs to $670 million – $2.7 billion aggregate US costs annually (adjusted by 2007 CPI)

### Impact of CAUTI…

- Most common HAI with 12-25% of all hospitalized patients having a urinary catheter inserted
- Risk of CAUTI increases by 3-7% each day that a urinary catheter is in place
- More than 1 million cases annually (hospitals+nursing homes)
- Cost to healthcare system up to $450 million annually (CMS data)
- CAUTI not documented as present on admission (POA) can no longer be coded for higher reimbursement DRG for Medicare

**To Do List in Preventing CLABSIs:**

- Engage hospital administration and staff to foster a culture of safety which includes HAI prevention.
- Upon hire and periodically thereafter, provide CLABSI prevention education to healthcare personnel involved in central line insertion/care/maintenance.
- Use an all-inclusive catheter cart/kit that contains everything needed for safe, aseptic catheter insertion.
- Use a checklist that has all CLABSI prevention bundle components listed and a healthcare worker using the checklist who is empowered to stop the procedure if a breach in aseptic technique is observed.
- After insertion, disinfect catheter hubs, needless connectors and injection ports before accessing with a 10-second alcohol scrub… scrub the hub!
- Perform surveillance using NHSN definitions for CLABSI.

## Module 7: Preventing CAUTIs

**Recommended core strategies for CAUTI Prevention:**

- Insert catheters only for appropriate indications
- Leave catheters in place only as long as needed
- Ensure that only properly trained persons insert and maintain catheters
- Insert catheters using aseptic technique and sterile equipment (acute care setting)
- Following aseptic insertion, maintain a closed drainage system
- Maintain unobstructed urine flow
- Practice hand hygiene and standard (or appropriate isolation) precautions according to CDC HICPAC guidelines

**Table on Indwelling Urinary Catheter Use**

| **A. Examples of Appropriate Indications for Use:** |
|---|
| Patient has acute urinary retention or bladder outlet obstruction |
| Need for accurate measurements of urinary output in critically ill patients |
| Selected surgical procedures:<br>• Patients undergoing urologic surgery or other surgery on contiguous structures of the genitourinary tract<br>• Anticipated prolonged duration f surgery (catheters inserted for this reason should be removed in PACU)<br>• Patients anticipated to receive large-volume infusions or diuretics during surgery<br>• Need for intraoperative monitoring of urinary output |
| To assist in healing of open sacral or perineal wounds in incontinent patients |
| Patient requires prolonged immobilization (e.g., potentially unstable thoracic or lumbar spine, multiple traumatic injuries such as pelvic fractures) |
| To improve comfort for end of life care if needed |
| **B. Examples of Inappropriate Uses:** |
| As a substitute for nursing care of the patient or resident with incontinence |
| As a means of obtaining urine for culture or other diagnostic tests when the patient can voluntarily void |
| For prolonged postoperative duration without appropriate indications (e.g., structural repair of urethra or contiguous structures, prolonged effect of epidural anesthesia, etc.) |

**HICPAC Recommendations for CAUTI Prevention**

- Indications for appropriate urinary catheter use (See Table below)
- Proper techniques for urinary catheter insertion
- Proper techniques for urinary catheter maintenance
- Guidance on implementation of quality improvement programs
- Recommended administrative infrastructure (guidelines, education/ training, supplies, documentation system, and surveillance resources)
- Identification of gaps where there is a lack of evidence to make a strong recommendation
- Guidance on surveillance

# Module 8: Preventing SSIs

SSI surveillance should be performed to:

- Identify clusters and risk factors
- Determine baseline risks
- Evaluate prevention measures
- Comparison
- Satisfy regulators

**Defining Surgical Site Infections:**

| | |
|---|---|
| Superficial incisional *(skin or subcutaneous tissue)* | Infection≤30 days after procedure and at least 1 of the following:<br>-Purulent drainage from superficial incision<br>-Organisms isolated aseptically<br>-At least 1: pain/tenderness, swelling, redness, heat AND superficial incision deliberately opened by surgeon unless culture-negative<br>-SSI diagnosed by surgeon or attending physician |
| Deep Incisional (*deep soft tissue at incision site)* | Infection ≤30 days after procedure (no implant) or ≤1year (with implant) plus 1 of the following:<br>-Purulent drainage from deep incision but not from organ/space<br>-Spontaneous dehiscence or surgical opening of deep incision unless culture-negative AND at least 1: fever, pain, or tenderness<br>-Abscess or other evidence of infection involving deep incision |
| Organ/space *(any site other than incision)* | Infection ≤30 days after procedure (no implant) or ≤1year (with implant) plus 1 of the following:<br>-Purulent drainage from a drain placed through stab wound into organ/space<br>-Organisms isolated from aseptically obtained culture of fluid or tissue<br>-Abscess or other evidence of infection involving exam, X-ray or reoperation<br>-SSI diagnosed by surgeon or attending physician |

## New CAUTI Technology…

- Portable ultrasound devices can be used to assess urine volume thereby reducing unnecessary caths in some patients
- Antiseptic or antimicrobial-impregnated catheters may reduce risk of CAUTI
- EMR systems can be used in CAUTI prevention (alerts, reminders for removal, etc)

## Methods for SSI surveillance outside of inpatient hospital setting…

- "Standard" infection prevention surveillance
- Prospective surveillance with post-discharge follow-up
- Self-reporting by patients and surgeons
- Using claims-based SSI indictors

## NHSH Risk Adjustment…

**Previous: Weighted variables** (ASA score of ≥3, wound classification, length of surgery)

**Future: Standardized Infection Ratio**
(SIR = observed # of infections/expected # of infections)

# Module 9: Preventing VAPs

**NHSN Surveillance Definition of VAP** *(Patient must fulfill each of the three categories below)*

| | |
|---|---|
| Chest Radiograph | Any one of the following:<br>1. New, progressive, or persistent infiltrate<br>2. Consolidation<br>3. Cavitation |
| Systemic Signs | Any one of the following:<br>1. Temperature >38C<br>2. WBC <4,000 or >12,000WBC/$mm^3$<br>3. For adults 70+ years old, altered mental status with no other recognized cause |
| Pulmonary Signs | Any two of the following:<br>1. New onset of purulent sputum, change in character of sputum, increase respiratory secretions, or increased suctioning requirements<br>2. New onset or worsening cough, dyspnea, or tacypnea<br>3. Rales or bronchial breath sounds<br>4. Worsening gas exchange, increased oxygen requirements, or increased ventilation demand |

**Many complications of critical care mimic VAP:**
Carcinoma
Contusion
Fibrosis
Infarction
Lymphoma
ARDA

**NHSN VAP Criteria ambiguous:**
- Subjective
- Non-specific
- Labor intensive to gather
- Potential to be gamed if hospitals' reputations and compensation are linked to VAP rates

**THEREFORE…**
FOCUS ON PREVENTION RATHER THAN RATES!

**Prevention Strategies:**
Surveillance
Elevate head of bed (*some studies suggest 45° but angle presents a practical challenge; ltd. evidence base)*
Regular oral care
Non-invasive ventilation
Daily interruption of sedation
Daily spontaneous breathing trials

## Preventing SSIs…

Perioperative antimicrobial prophylaxis - brief course of an antimicrobial agent initiated before an operation to reduce the microbial burden of intraoperative contamination in order to prevent the occurrence of SSIs:

Use a safe, inexpensive agent with an appropriate antimicrobial spectrum (narrow); use within 1 hour prior to incision (2 hrs with vancomycin and quinolones)

Provide a clear process and protocols

Implement policies and practices that meet regulatory and accreditation requirements and are aligned with evidence-based standards

Hair removal (do not use razors), surgical scrub, optimize surgeon technique, OR asepsis skin prep at operative site

## VAPs…

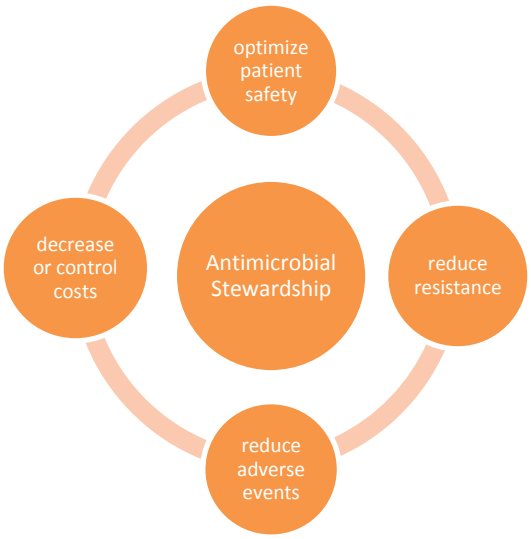
- Most common nosocomial infection in ICUs
- Affects ~5% of ventilated patients
- Increases ICU length of stay by ~5-7 days
- Crude mortality rate of 30-50%
- VAP patients about 2X as likely to die as matched patients without VAP
- Adds ~$10-$15,000 to cost of hospital stay

# Module 10: Antimicrobial Stewardship

**Antimicrobial Stewardship:** Processes designed to measure and optimize the appropriate use of antimicrobials; achieved by selecting the appropriate dose, duration of therapy and route of administration.

| Stewardship Approach | | |
|---|---|---|
| Formulary Management | Eliminate unnecessary duplication of agents | Ex. Pick 1 antibiotic in class |
| Pre-prescription approval | Phone call placed or form filled out before pharmacy dispenses antibiotic | Ex. Restrict expensive agents |
| Post-prescription approval | Downstream review of appropriateness of antibiotic therapy, usually at 24-72 hours | Ex. Focus on disease state, IV to PO conversion, or use of expensive/common agent |
| **Measurement** | | |
| What to measure | # and intervention type, initiative results, decrease in (or stable use) of antimicrobials; Data Sources include hospital purchase data, pharmacy dispensing data from billing, antibiotic administration data | |
| How to measure | **Defined Daily Dose (DDD):** Usual daily dose for adults; defined by WHO **Days of therapy (DOT):** 1 DOT = administration of a single agent at least once that day | |

## Goals of Antimicrobial Stewardship:




| Current Health Department Initiatives – Other States | |
|---|---|
| California | Partnership with health plans to identify and target education for high prescribers |
| Michigan | Webcast to improve provider/patient communication about antibiotic use |
| NYC | Computer-based clinical decision support tools to improve antibiotic prescribing |
| Indiana | Movie theater advertisements |

## Antibiotic Quick Facts:

1. 200-300 million antibiotics prescribed/year (45% for outpatient)
2. 25-40% hospitalized patients receive antibiotics (~30% unnecessary or sub-optimal; 5% experience AE)
3. *Antibiotics are unlike any other drug: use in one patient can compromise efficacy in another*
4. New antibacterial agents approved 1983-2011 steadily declining (only 15-16 antibiotics are in development; 8 have activity against key Gram-negative bacteria)

**Colonization vs Infection:**

- Colonization is the presence, growth and multiplication of the organism without observable clinical symptoms or immune reaction.
- Infection refers to the invasion of bacteria into tissue with replication of the organism. Further, infection is characterized by isolation of the organism accompanied by clinical signs of illness such as fever, elevated white blood count, purulence (pus), and clinical expression of disease such as pneumonia, BSIs, UTIs, as well as gastrointestinal and skin infections.

**4 Strategies in the Prevention of Resistance:**

1. Prevent infection
2. Diagnose and treat infection effectively
3. Use antimicrobials wisely
4. Prevent transmission

## Module 11: Gram-Positive Resistant Organisms

- Multidrug-Resistant Organisms (MDROs) are infectious agents resistant to:
  - 1 or more antimicrobials
  - all but 1 antimicrobial class
  - all antimicrobials and classes
  - 3 or more antimicrobial classes
- 16% of all HAIs are Multidrug Resistant
- Vancomycin-resistant *Enterococcus* (VRE)
  - 4% of MDR HAIs
  - Endemic in most US hospitals
  - Asymptomatic carriage (GI tract)
  - Vancomycin resistance more common in *E.faecium* vs. *E. faecalis*
- Methicillin-resistant *Staphylococcus Aureus* (MRSA)
  - Resistant to β-lactams
  - 8% of MDR HAIs
  - In community, MRSA infections are skin related
  - Endemic in most US hospitals
  - 25-30% of people colonized in nose with staph, <2% are colonized with MRSA
  - MRSA USA300, traditionally associated with community transmission, now increasingly seen in healthcare settings
- Reduce transmission with CDC/HICPAC Recommendations to Prevent Transmission of MDROs (e.g. surveillance, education, mgmt of antimicrobials)

## Module 12: MDRO Prevention and Control

- MDROs have limited treatment options and lead to worse patient outcomes
- Problematic Gram-Negative Pathogens include *Enterobacteriaceae* (*E. coli, Klebsiella spp.), Pseudomonas aeruginosa,* and *Acinetobacter baumannii*
  - 1st line treatment=penicillin derivatives
  - Last line treatment= carbapenems
- Carbapenem-resistant Enterobacteriaceae (CRE)
  - *Ex: Klebsiella pneumonia* carbapenemases (KPCs) and Metallo-β-lactamases (e.g. NDM-1)
  - Resistant to all β-lactams
- Gram-Neg. resistance mechanisms
  - Chromosomally-mediated (e.g. AmpC type β-lactamases)
  - Plasmid-mediated (e.g. ESBLs, KPCs, NDM-1)
  - Integron-mediated (e.g. VIM)
- MDRO Prevention and Ctrl
  - CDC/HICPAC Recommendations
  - Antimicrobial Mgmt
  - Surveillance
  - Active Surveillance Testing
- CRE Prevention and Control
  - Simple infection control
  - If a case is identified, begin active surveillance of cultures from patients with epi link to case

## Module 13: Preventing CDI

- Microbiology of *C. diff*
  - Gram +, spore forming rod
  - Obligate anaerobe
  - Toxin A and B required to cause CDI
  - Primarily healthcare-associated (fecal-oral)
- Current epidemic strain
  - NAP-1 or 027
  - More resistant
  - More virulent
- Diagnostics
  - Toxin testing (enzyme immunoassay, tissue culture)
  - Organism identification (PCR, stool culture, detection of glutamate dehydrogenase)
- Risk factors
  - Antimicrobial exposure **(modifiable w/ Antimicrobial Stewardship)**
  - Acquisition of *C. difficile* **(modifiable w/ Environmental and Hand Hygiene)**
  - Advanced age
  - Comorbidities
  - Immunosuppression
  - Tube feeds
- Environmental cleaning
  - Greater NY CDI Collaborative (environmental cleaning, PPE, and hand hygiene

Antimicrobial Stewardship could be best CDI preventative measure by decreasing # of patients at risk and # of patients with CDI contributing to spread

## Module 14: Adapting Recommendations to Non-Acute Settings

- Infection control may be lacking in areas as healthcare settings diversify (i.e. dialysis centers, LTCFs, etc)
- **LTCFs** have various guidelines and special considerations
  - Enhanced Standard Precautions
  - CDC Isolation Recommendations and Guidance
  - CMS Process Surveillance
  - Admission Assessments
- "Tests for Cure" or Eradication are nonexistent for MDROs, CDI, or MRSA
- Growing **dialysis** population resulting in:
  - Increase in ESRD costs
  - Outbreaks (e.g. Hepatitis C)
  - Infections (2nd common cause of death in dialysis patients)
  - 15% of all invasive MRSA
- States with initiatives engaging LTCFs
  - GA, NV, and VT

**Ambulatory Care and Surgical Centers** follow 2007 CDC/HICPAC Guideline for Isolation Precautions

- Surgical Center SSIs likely to increase due to high volume of procedures
- Use same prevention and surveillance principles and techniques as inpatient surgery
- Challenges in SSI prevention and surveillance arise in that pre-operative instructions difficult to provide, cultures might be sent off-site, follow-up for acute care admission difficult

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