Role of Active Surveillance in preventing MDRO infections in healthcare facilities

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Disclosures

- None
Common terms

- Define MDRO
- Define HAI
- MRSA, VRE, ESBL, CRE
- Colonization vs. Infection
- Horizontal vs. Vertical infection control measures
What is an MDRO

- MDRO - multidrug-resistant organism (generally referring to bacteria)

- No consensus definition

- Recent efforts for consensus definition* to selected microorganisms
  - MDR - Defined as non-susceptibility to at least one agent in three or more antimicrobial categories

MDRO Examples

- **MRSA:** Methicillin resistance *Staphylococcus aureus*
- **VRE:** Vancomycin resistant *Enterococci*
- **ESBL:** Extended spectrum *Beta lactamase* producing bacteria
- **CRE:** Carbenem-resistant *Enterobacteriaceae*
CRE: Carbapenem-resistant Enterobacteriaceae

- Greatest threat for humans
- Blood stream infections associated with 40% mortality*
- Currently no available safe treatment options
- New antibiotics not likely available soon
- Includes Escherichia coli - a common cause of urinary tract infections

*Patel G et al. ICHE. 2008;29:1099-106
Colonization vs. Infection

- **Colonization/Carrier** = the presence of the bacteria, but no signs of illness
  - Examples:
    - MRSA in nose or on skin
    - VRE and CRE in the intestines

- **Infection** = carrier + clinical signs of illness
  - Example: fever, abscess etc.
What is an HAI?

- **HAI**s - Healthcare-associated infections

- **Definition:** "Infections that patients acquire during the course of receiving healthcare treatment for other conditions" - CDC

- **Burden:** As per CDC, 1 in every 20 hospitalized patients have HAI
MDROs significance

- Account for 20% of HAIs

MDRO breakdown:
- MRSA: 8.5%
- ESBL: 6%
- VRE: 3%
- OTHER: 2%
- CRE: 0.5%

MDROs significance

- Associated with excess cost- $18,588 to $29,069 per patient

- Associated with excess length of hospital stay- 6.4-12.7 days

- Mortality- two-fold higher compared to susceptible infection

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<thead>
<tr>
<th>Organism</th>
<th>Healthcare setting</th>
<th>Community</th>
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<tbody>
<tr>
<td>M RSA</td>
<td>++</td>
<td>+++</td>
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<tr>
<td>VRE</td>
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<td>ESBL GNB</td>
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<tr>
<td>CRE</td>
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*Few studies report community acquired VRE
Stevenson KB et al. EID. Jun 2005; 11(6): 895–903*
Proportion of MRSA among *S. aureus* blood isolates in Europe and North America - 2012

Source: EARS-Net, TSN and CANWARD
Proportion of VRE among E. faecium blood isolates in Europe and North America - 2012

Source- EARS-Net, TSN and CANWARD
Proportion of Carbapenem resistance among *K. pneumoniae* blood isolates in Europe and North America 2012

Source: EARS-Net, TSN and CANWARD
MDRO spread in Healthcare facilities

- Patients colonized or infected with MDRO will contaminate their environment
- MDRO pathogens get on to hands of health care workers during patient care
- If health care workers do not clean their hands between patients they spread the MDRO pathogen
Inadequate disinfection of the contaminated inanimate objects can result in spread of MDRO pathogen

Preventing MDRO spread in Healthcare Setting

- Hand Hygiene
  - Health care workers

- Chlorhexidine bathing
  - Patients (in ICU)

- Environmental disinfection
  - Room or Ward
Preventing MDRO spread in Healthcare Setting

- **Vertical measures**
  - Includes horizontal measures while adding a one-size-does-not-fit-all approach
  - Each bacteria is treated differently and each patient has a unique infection prevention procedure
Vertical Measures Example

- **MRSA**
  - **Test** for its presence in **nose**
  - If positive, **decolonize** with **nasal mupirocin**
  - Place patient on **contact precautions** and in **private room**
Vertical Measures Example

- CRE and VRE
  - Test for its presence in rectum
  - If positive, place the patient on contact precautions and in private room
  - De-colonization – Cannot be done (no available medicine)
Identifying MDRO in Healthcare settings

- **Surveillance:**
  - Important component of MDRO control program
  - Provides information for decision-making
    - Detects emerging MRDO
    - Monitors trends
    - Evaluates intervention effects
Identifying MDRO in Healthcare settings

Two types:
- Passive Surveillance
- Active Surveillance
Identifying MDRO in Healthcare settings

- Passive Surveillance:
  - Simple form MDRO surveillance
  - Patients with an active infection usually have a culture sent to the microbiology lab
  - Monitoring clinical microbiology isolates for MDRO
Identifying MDRO in Healthcare settings

Salgado CD, ICHE. 2006; 27(2):116-21

Infected patients
Colonized Patients
Identifying MDRO in Healthcare settings

Active Surveillance

- Screening patients for MDRO colonization, upon admission and periodically during hospitalization
- Aimed at detecting asymptomatic carriers
Active Surveillance

- Sounds logical to prevent MDRO spread
- However, controversy in medical community
- Large multicenter studies provide conflicting results in case of MRSA prevention
  - Most studied MDRO
Large studies with conflicting results

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<tr>
<th>MRSA INFECTIONS REDUCTION</th>
<th>NO EFFECT ON MRSA INFECTIONS</th>
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*Studies showing no effect on MRSA have some serious methodological issues
Large studies with conflicting results

- In all these studies Active Surveillance was done concurrently with horizontal measures (Hand hygiene and Chlorhexidine wash in some recent trials) in intervention groups.

- None of them assessed the effect of Active Surveillance when horizontal measures (Hand hygiene and Chlorhexidine wash) are at the best standard.
Active Surveillance vs. Horizontal measures

- A recent multicenter ICU trial* in Europe found that in context of **sustained high level of horizontal measures** (Hand hygiene and Chlorhexidine wash), Active Surveillance **did not reduce** acquisition of MDRO (including MRSA, VRE)

- This continues the debate about the role of Active Surveillance for MRSA and other MDRO

Opinions against Active Surveillance

- If *horizontal measures* are practiced effectively, there is no need for Active surveillance.

- **Resource allocation** (Active surveillance is expensive—use it for horizontal measures)
  - Only 8.5% of HAI are caused by MRSA
  - 80% of HAIs by non-MDRO

- **High prevalence** of MRSA in the community
  - Decolonization is not permanent, and can acquire MRSA again.
Opinions against Active Surveillance

- Active surveillance detects MDRO carriers who require **contact precautions** and **private rooms**

- Concern about **safety and satisfaction** of patients in **contact precautions**

- Delays in **patient admission**, patients **transfers** within hospital, **discharge** to long-term care facilities- because patients identified as carriers need private rooms
Common ground

- Active Surveillance
  - All patients vs. High risk patients?

- Most skeptics agree active surveillance for high risk patients
MDRO High Risk Patients

High Risk Patients Examples:

- Patients in Intensive care units (ICUs), Bone marrow transplant units, surgical wards, Burn units
- Transferred from other facility
- LTC (Long term care facilities: Nursing homes, rehab)
- LTACH (Long term acute care hospital)
- Recently hospitalized
- Known MDRO colonization
- Patients exposed to MDRO colonized patients
MDRO High Risk Patients

- **High Risk Patients Examples:**
  - Intensive care units (ICUs), Bone marrow transplant units, surgical wards
  - Transferred from other facility
  - LTC (Long term care facilities: Nursing homes)
  - LTACH (Long term acute care hospital)
  - Recently hospitalized
  - Known MDRO colonization
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Long-term acute care hospitals (LTACHs)

- Established to manage patients with serious medical conditions that require care on an ongoing basis
- Admit patients discharged from intensive care units (acute care hospitals)
- Average length of stay in LTACH - >25 days

Long-term acute care hospitals (LTACHs)

- Concentrate patients colonized with MDRO

- Chicago study* surveyed 7 LTACHs and 24 short-stay acute care hospitals

  - 30.4% vs 3.3% of patients were colonized with CRE

Long-term acute care hospitals (LTACHs)

- LTACHs described as “perfect storm”
- Have less developed infection prevention programs

Gould CV et al CID 2006; 27(9):920-5
Patient flow among regional health care facilities


© 2009 by the Infectious Diseases Society of America
Geographical distribution of long-term acute care hospitals across the United States.


© 2009 by the Infectious Diseases Society of America
Active Surveillance to control CRE spread in Israel

- In 2006, the Israeli healthcare system began to tackle nationwide spread of CRE.
- In 2007, health ministry issued guidelines for control of CRE in Israeli hospitals.
- All acute care hospitals to perform active surveillance, on patients deemed at high risk of CRE carriage.

Active Surveillance to control CRE spread in Israel

- Active surveillance included:
  - Detecting carriers of CRE and placing them on contact precautions

- By 2008, it became apparent that LTACHs and LTC facilities are a source of reintroduction of CRE to acute care hospitals

- Systematic interventions were carried out at LTACHs and LTC facilities

Proportion of CRE carriers identified via active surveillance vs clinical cultures

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Conclusions

- The role of Active Surveillance
  - is debatable based on the published literature in preventing MRSA transmission in healthcare facilities
  - Important in an outbreak of an MDRO
  - Cannot be debated in CRE control
Questions?