



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

*Magiorakos, A. P. et al. Clin Microbiol Infect 2012; 18(3), 268-81

MDRO Examples

- ▶ MRSA: **M**ethicillin resistance *Staphylococcus aureus*
- ▶ VRE: **V**ancomycin resistant enterococci
- ▶ ESBL: **E**xtended spectrum **b**eta lactamase producing bacteria
- ▶ CRE: **C**arbapenem-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

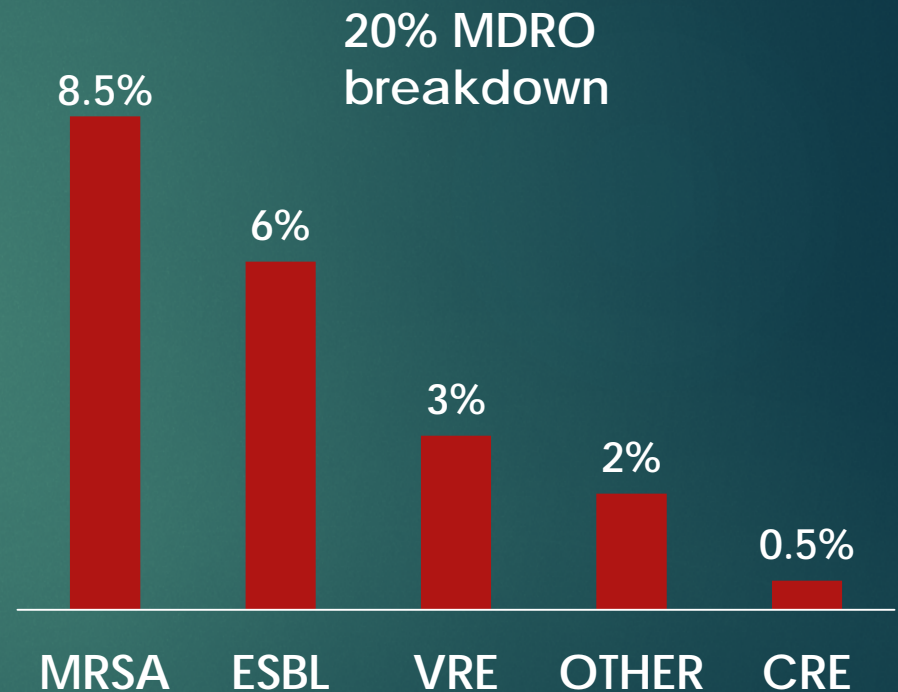
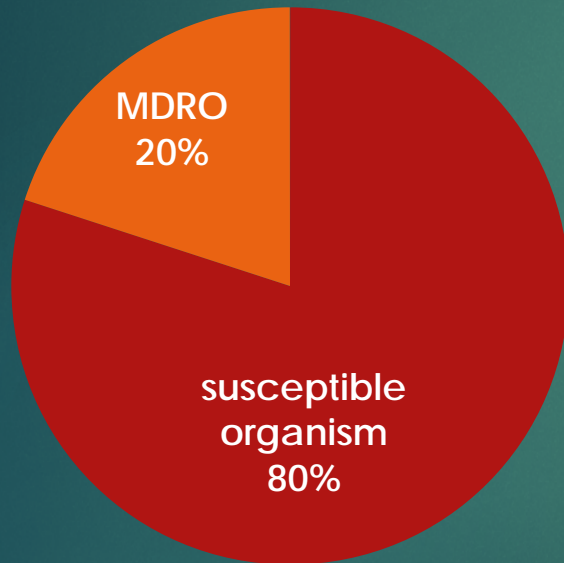
- ▶ **Colonization/Carrier** = the presence of the bacteria, but no signs of illness
 - ▶ Examples:
 - ▶ MRSA in nose or on skin
 - ▶ VRE and CRE in the intestines
- ▶ **Infection** = carrier + clinical signs of illness
 - ▶ Example: fever, abscess etc.

What is an HAI?

- ▶ HAIs- 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



MDROs significance

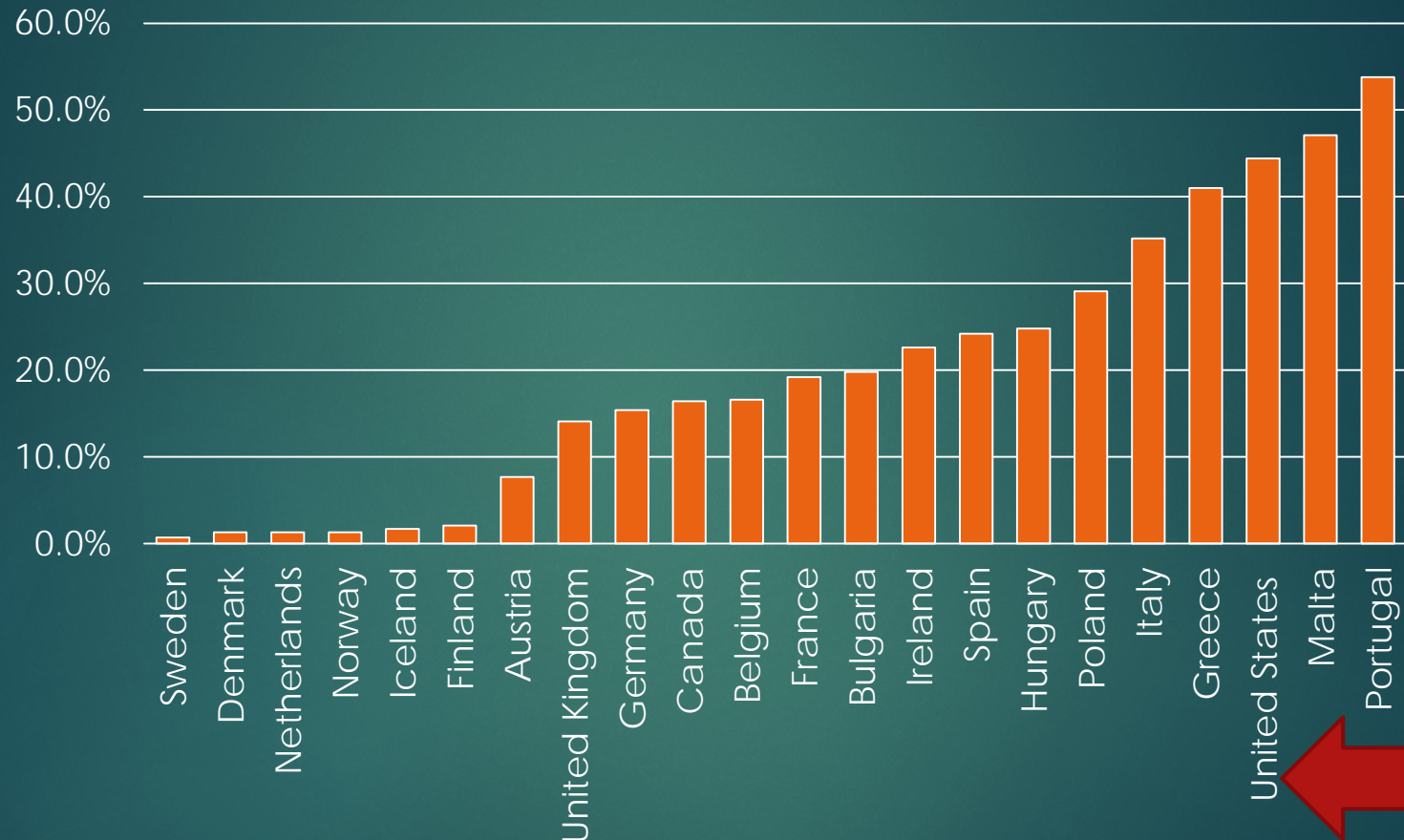
- ▶ Associated with excess cost- **\$18,588 to \$29,069** per patient
- ▶ Associated with excess length of hospital stay- **6.4-12.7 days**
- ▶ Mortality- **two-fold** higher compared to susceptible infection

MDRO distribution in the US

Organism	Healthcare setting	Community
MRSA	++	+++
VRE	++	-*
ESBL GNB	++	+
CRE	++	-

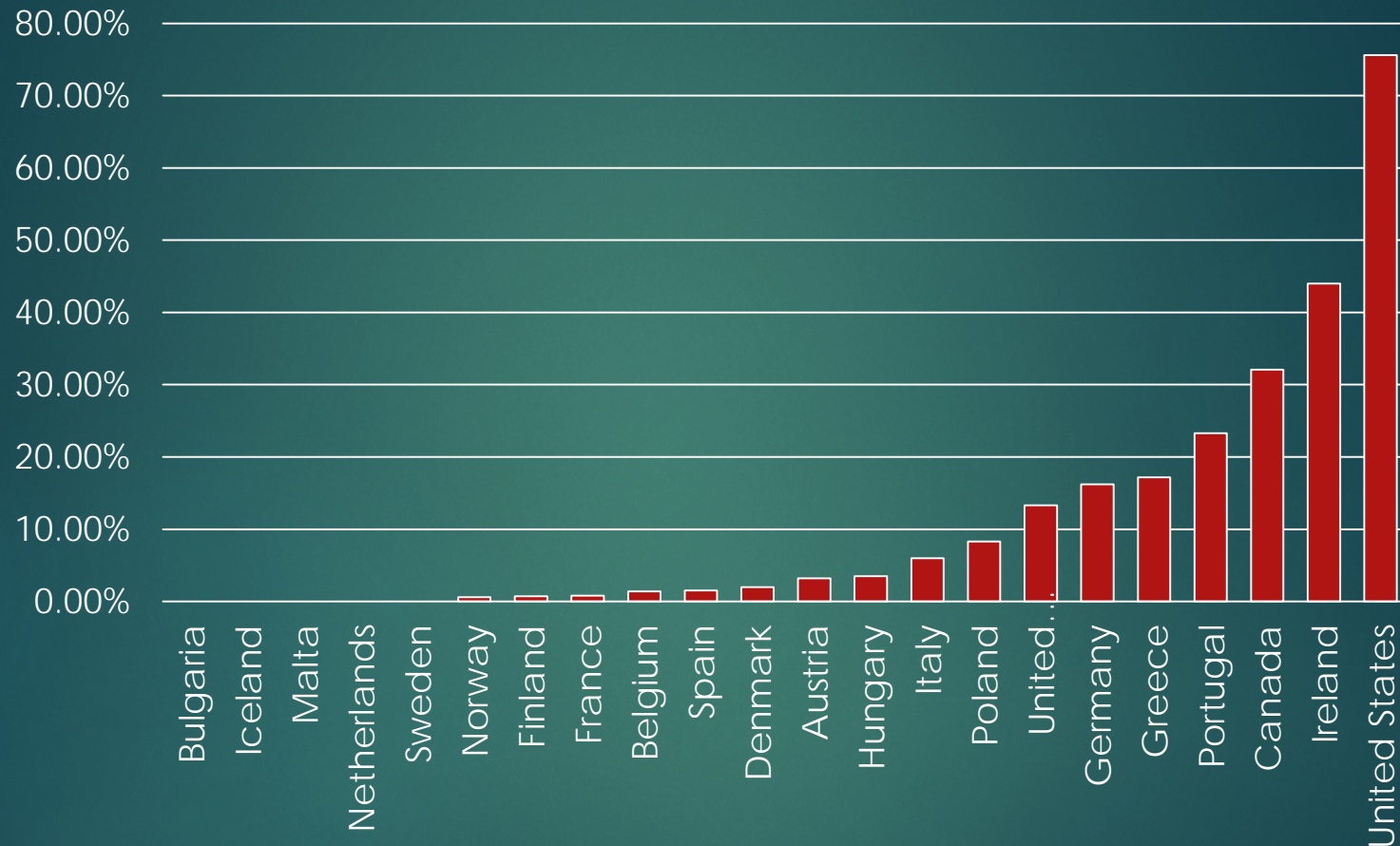
*Few studies report community acquired VRE
Stevenson KB et al. EID. Jun 2005; 11(6): 895–903

Proportion of MRSA among *S. aureus* blood isolates in Europe and North America- 2012



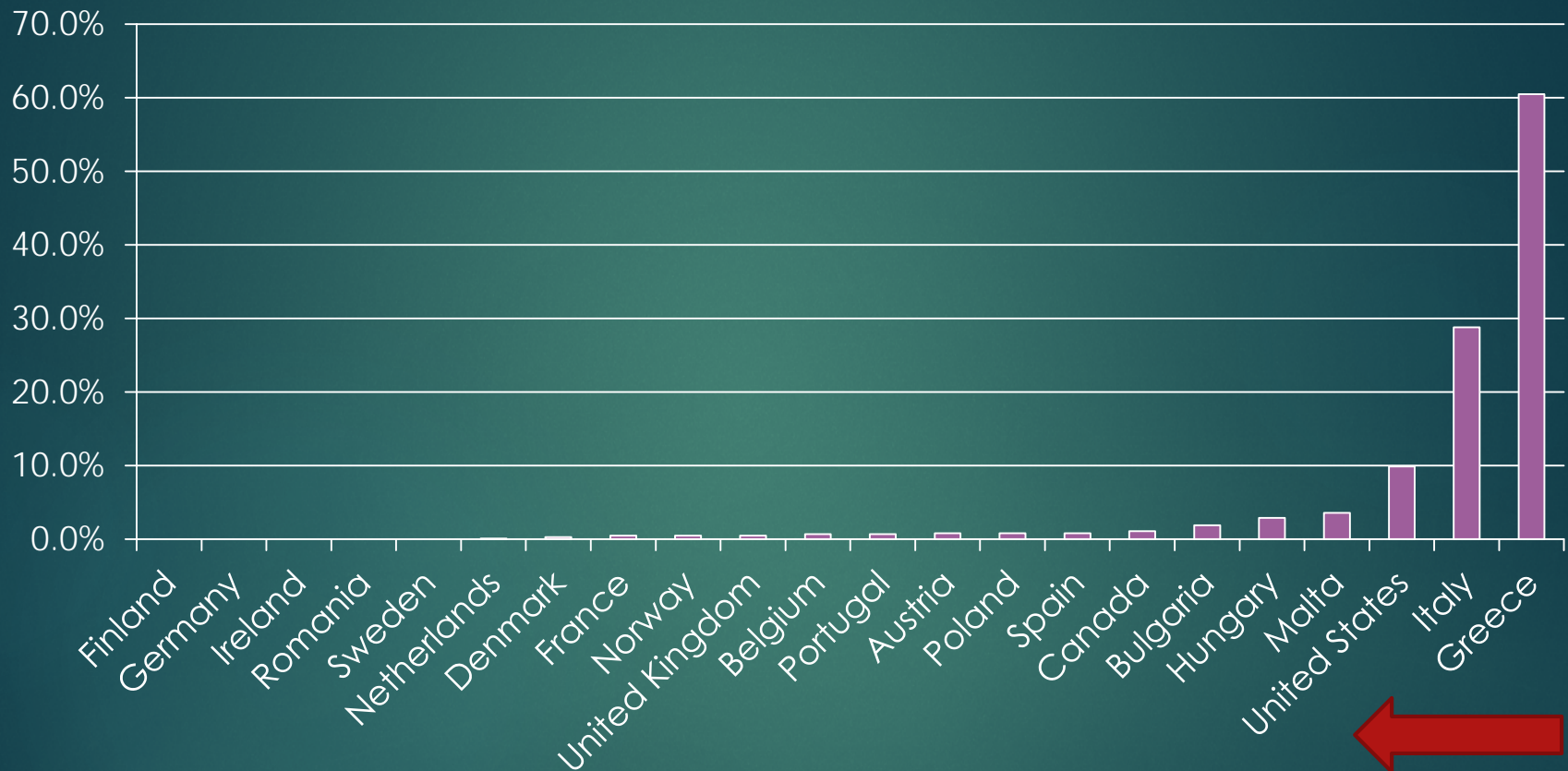
Source- EARS-Net, TSN and CANWARD

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

MDRO spread in Healthcare facilities

- ▶ Inadequate disinfection of the contaminated inanimate objects can result in spread of MDRO pathogen



Abstract: The Risk of Hand and Glove Contamination after Contact with a VRE (+) Patient Environment. Hayden M, ICAAC, 2001, Chicago, IL.

X represents VRE culture positive sites

Preventing MDRO spread in Healthcare Setting

- ▶ **Hand Hygiene**
 - ▶ Health care workers
- ▶ **Chlorhexidine bathing**
 - ▶ Patients (in ICU)
- ▶ **Environmental disinfection**
 - ▶ Room or Ward

Horizontal
measures

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
 - Monitor trends
 - Evaluate intervention effects

Identifying MDRO in Healthcare settings

- ▶ Two types:
 - ▶ Passive Surveillance
 - ▶ Active Surveillance

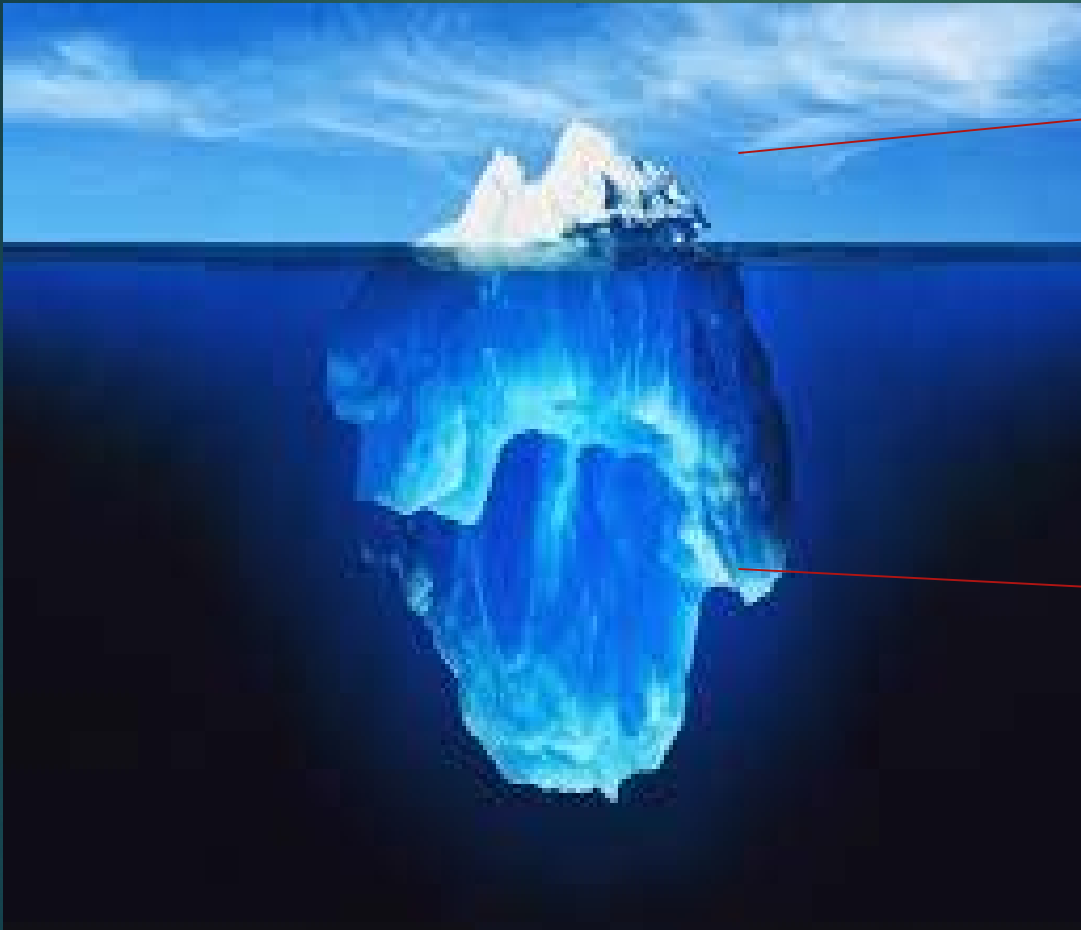


Identifying MDRO in Healthcare settings

▶ 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



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



MRSA INFECTIONS REDUCTION	NO EFFECT ON MRSA INFECTIONS
Robiseck A, et al. Ann Intern Med. 2008 . Mar 18;148(6):409-18	Harbarth S, et al. JAMA. 2008 Mar 12;299(10):1149-57*
Jain R, et al. NEJM. Apr 2011; 364:1419-1430	Huskins WC, et al. NEJM. Apr 2011; 364:1407-1428*
Lee AS, et al. BMJ Open. 2013;3: e00312	Huang SS, et al. NEJM. June 2013; 368:2255-2265

*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

*G Derde LP, et al. Lancet ID. 2014; 14: 31–39

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

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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

Weinstein R A , and Munoz-Price L S CID. 2009;49:438-443

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

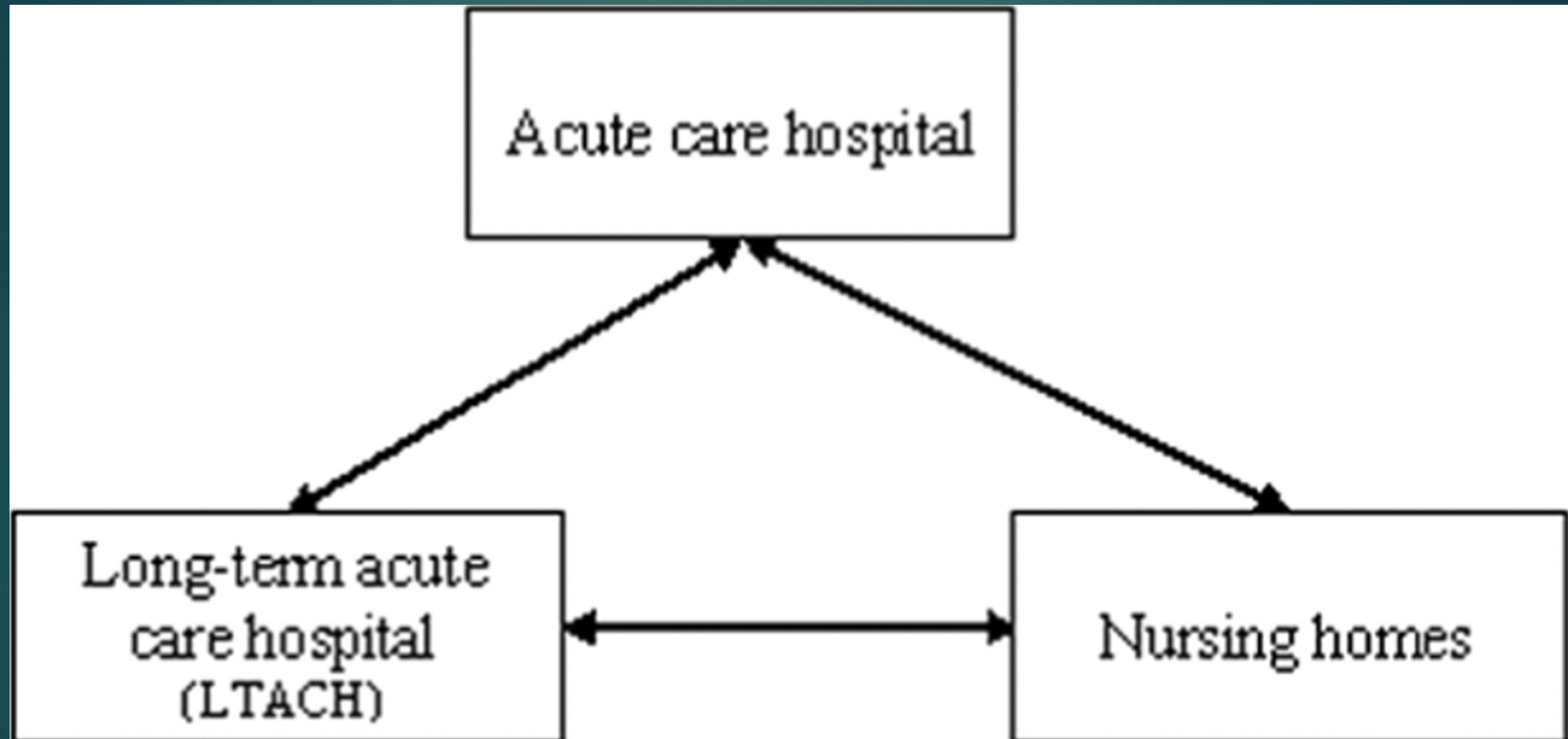
*Lin MY et al CID **2013**; 57 (9):1246-1252.

Long-term acute care hospitals (LTACHs)

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

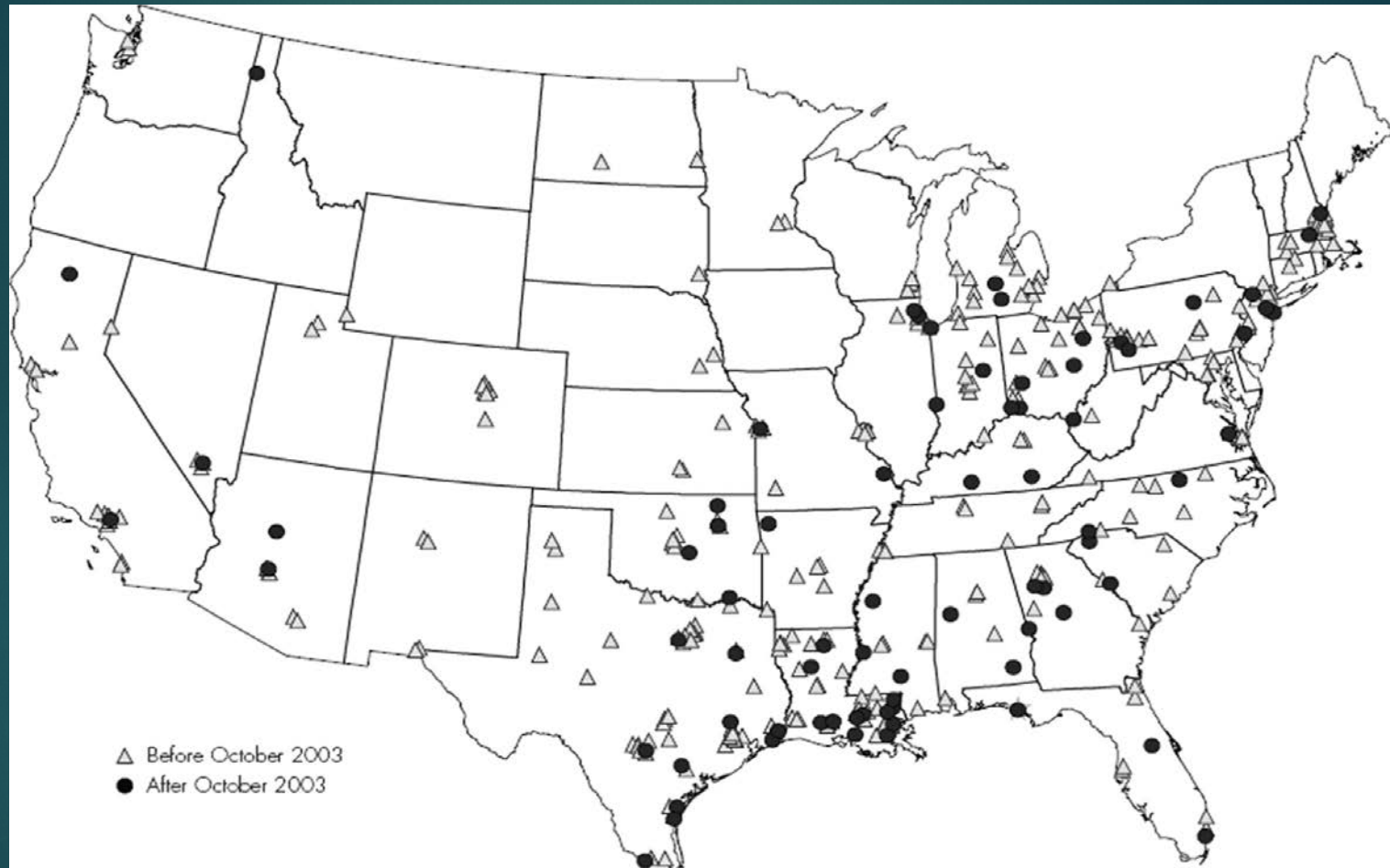
Gould CV et al CID **2006**; 27(9):920–5

Patient flow among regional health care facilities



Weinstein R A , and Munoz-Price L S Clin
Infect Dis. 2009;49:438-443

Geographical distribution of long-term acute care hospitals across the United States.



Weinstein R A , and Munoz-Price L S Clin Infect Dis. 2009;49:438-443

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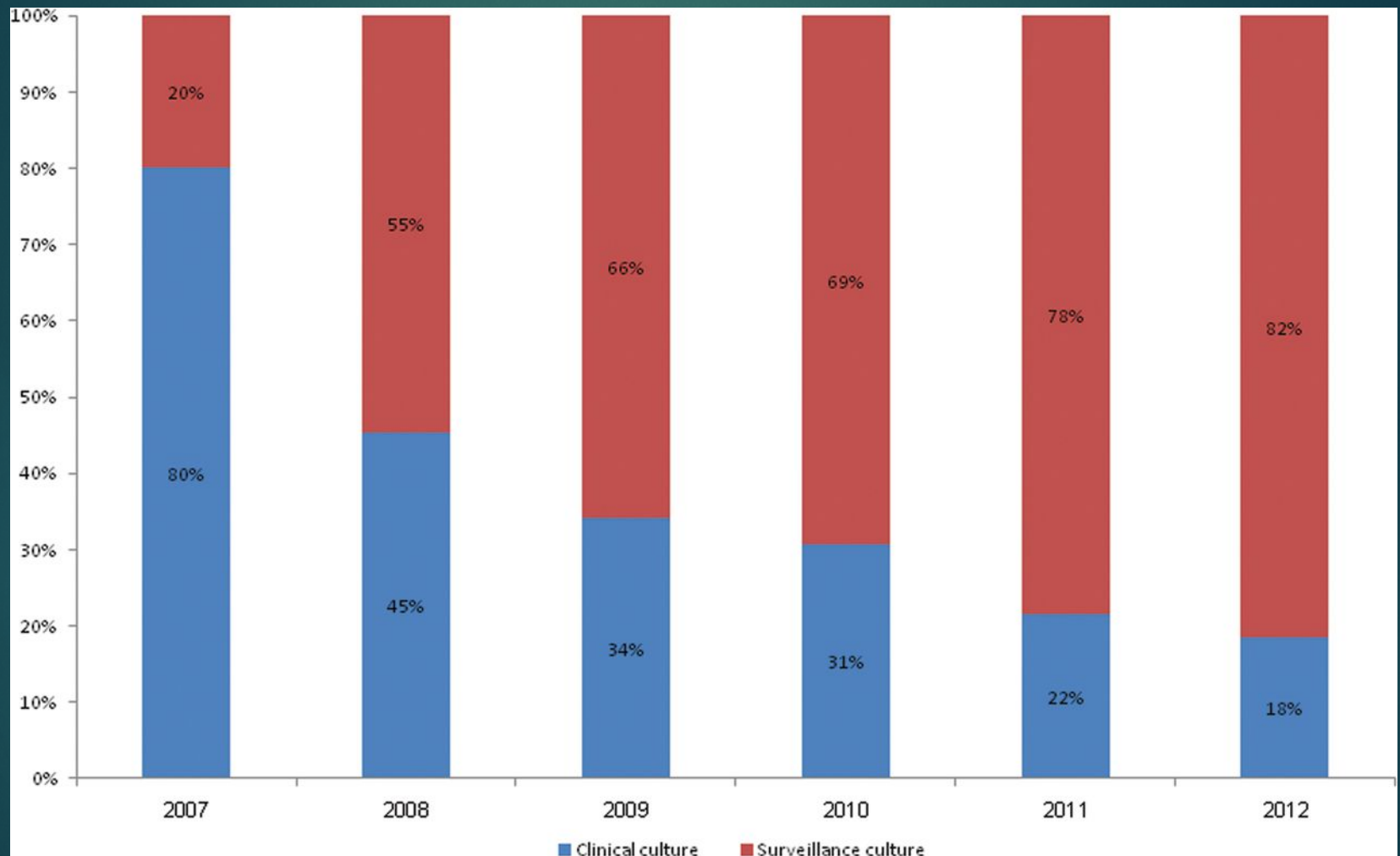
Active Surveillance to control CRE spread in Israel

- ▶ 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



Schwaber M J , and Carmeli Y Clin Infect Dis. 2014;58:697-703

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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?