

MDRO in LTCF: Forming Networks to Control the Problem

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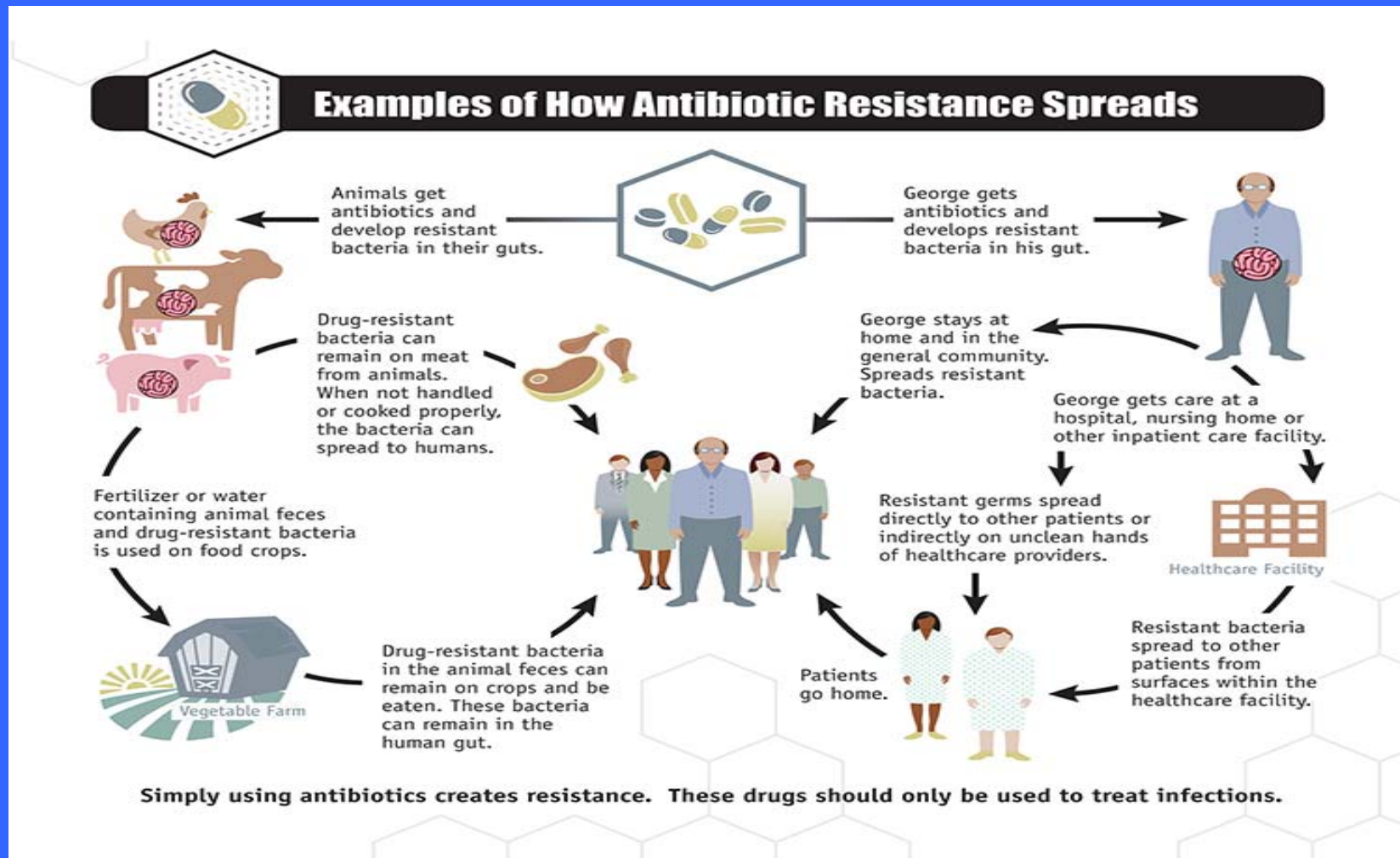
Surveillance Networks

Antibiotic Resistance

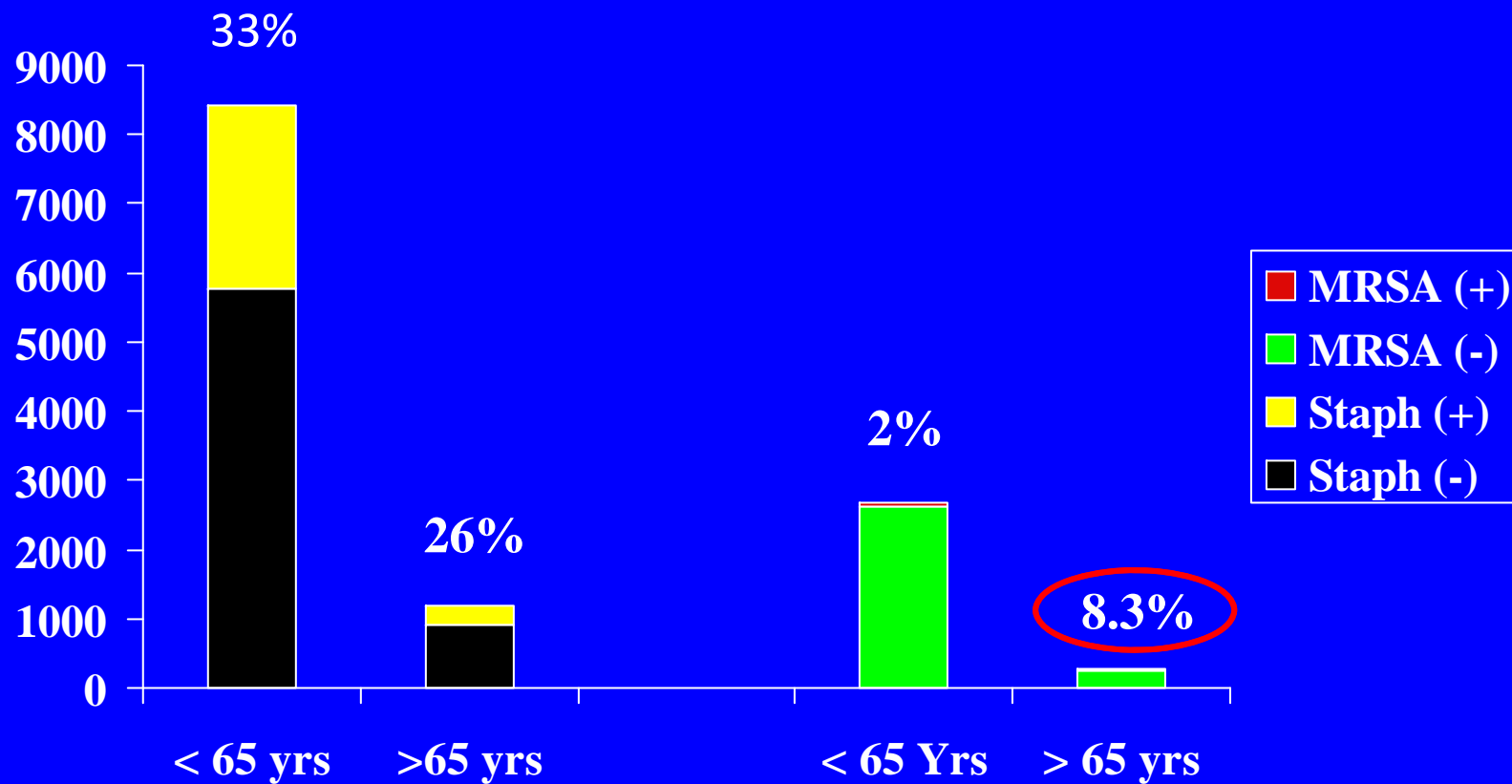
- The scope of the problem is huge
- Extends beyond LTCF
- Focus on relationship with hospitals
- What has been done?
 - MRSA across the healthcare continuum
- Newer challenges
- What we can do!

Antibiotic Resistance

The Scope of the Problem



S. aureus Colonization US Population Survey 2001-02



Graham P., et al. Ann Intern Med 2006;144:318.

MRSA Infection & Acuity French Facilities (n=43) 1995

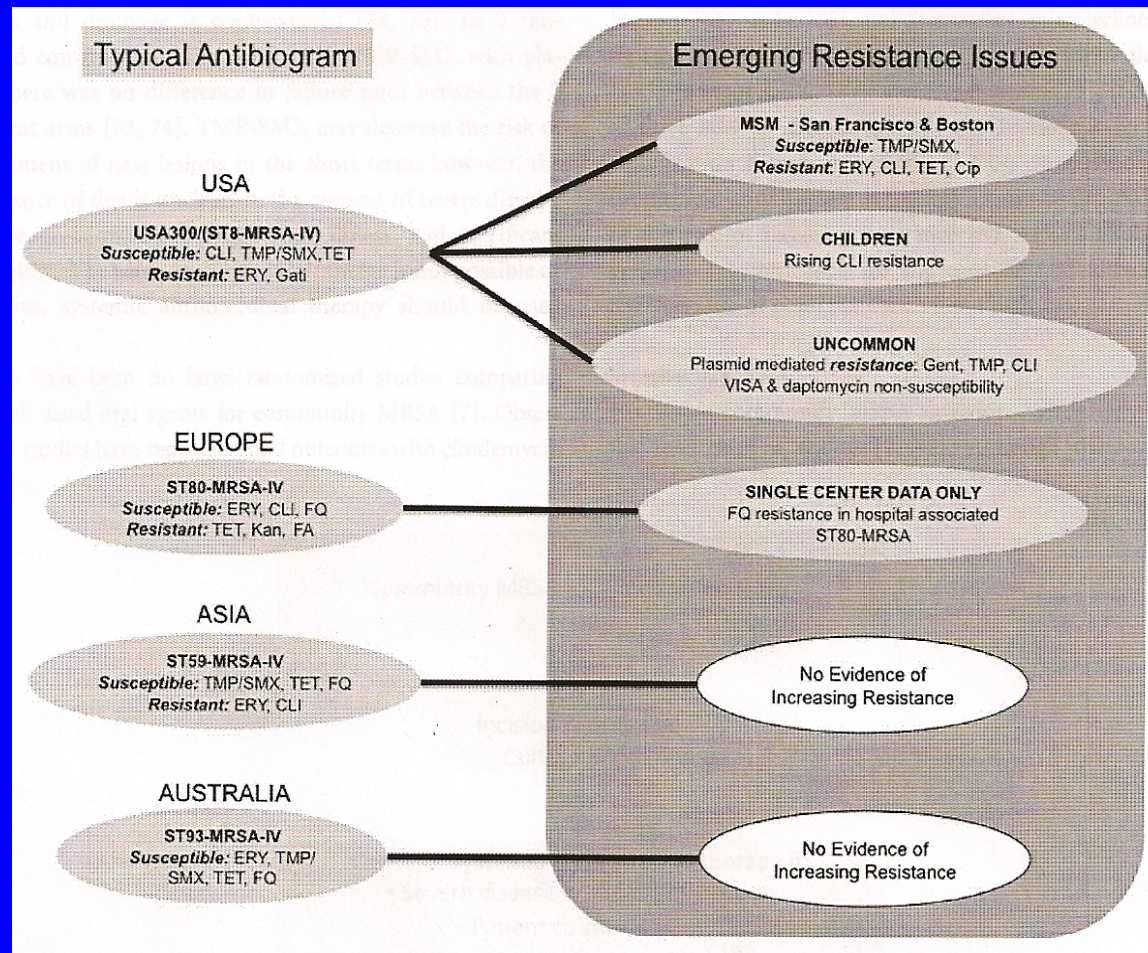
Mean New MRSA cases/1000 pt-days

ICU	2.82 (0.88-4.24)
Surgical	0.85 (0.42-1.16)
Medical	0.56 (0.34-0.88)
Pediatrics	0.0 (0.0-0.05)
Rehabilitation	0.57 (0.28-1.33)
Long-term care	0.15 (0.08-0.28)

Hopital Propre II Study Group ICHE 1999;20:478.

MRSA

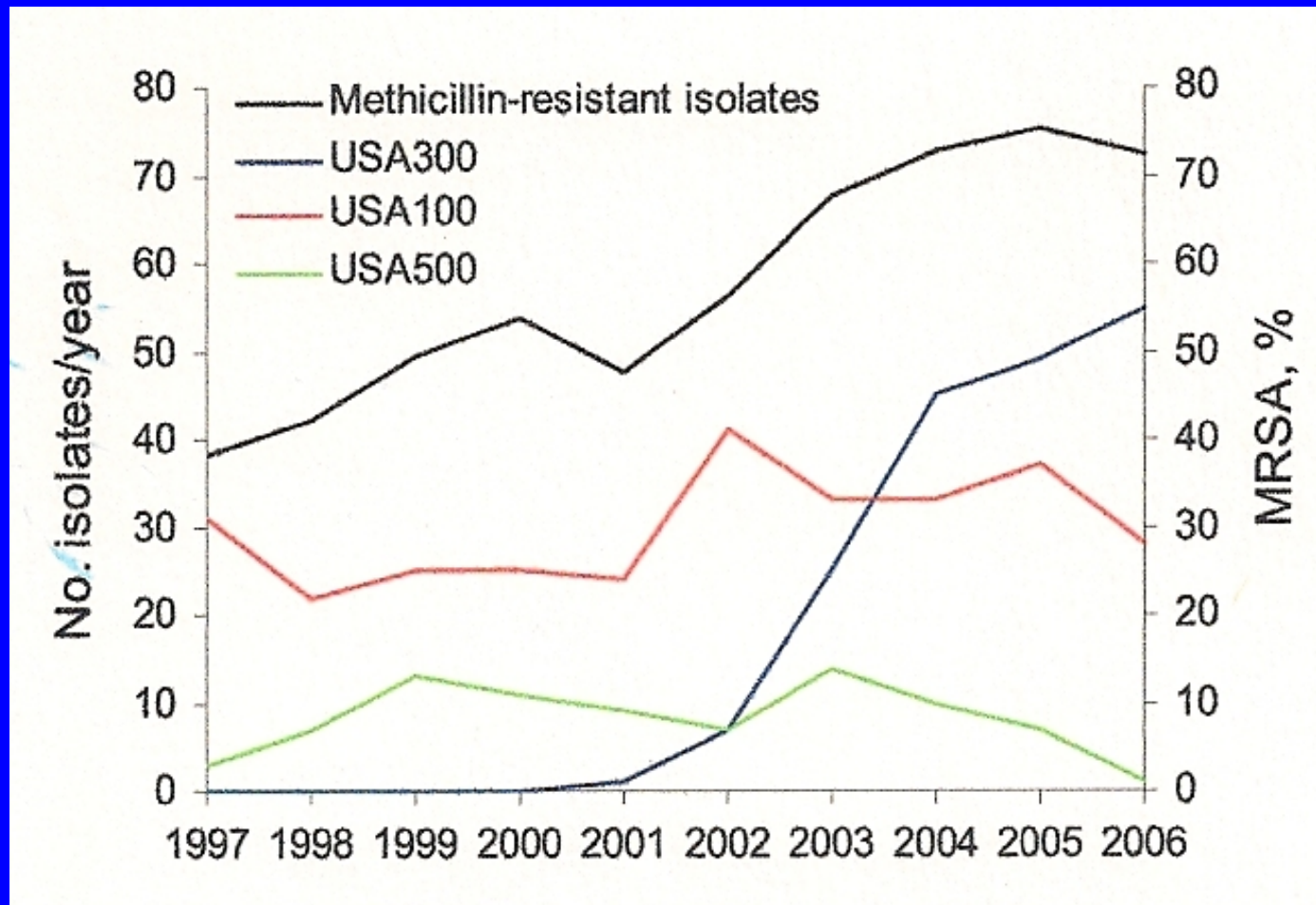
Evolving Pathogen



Chua K et al. CID 2011;52:99.

MRSA in LTCF

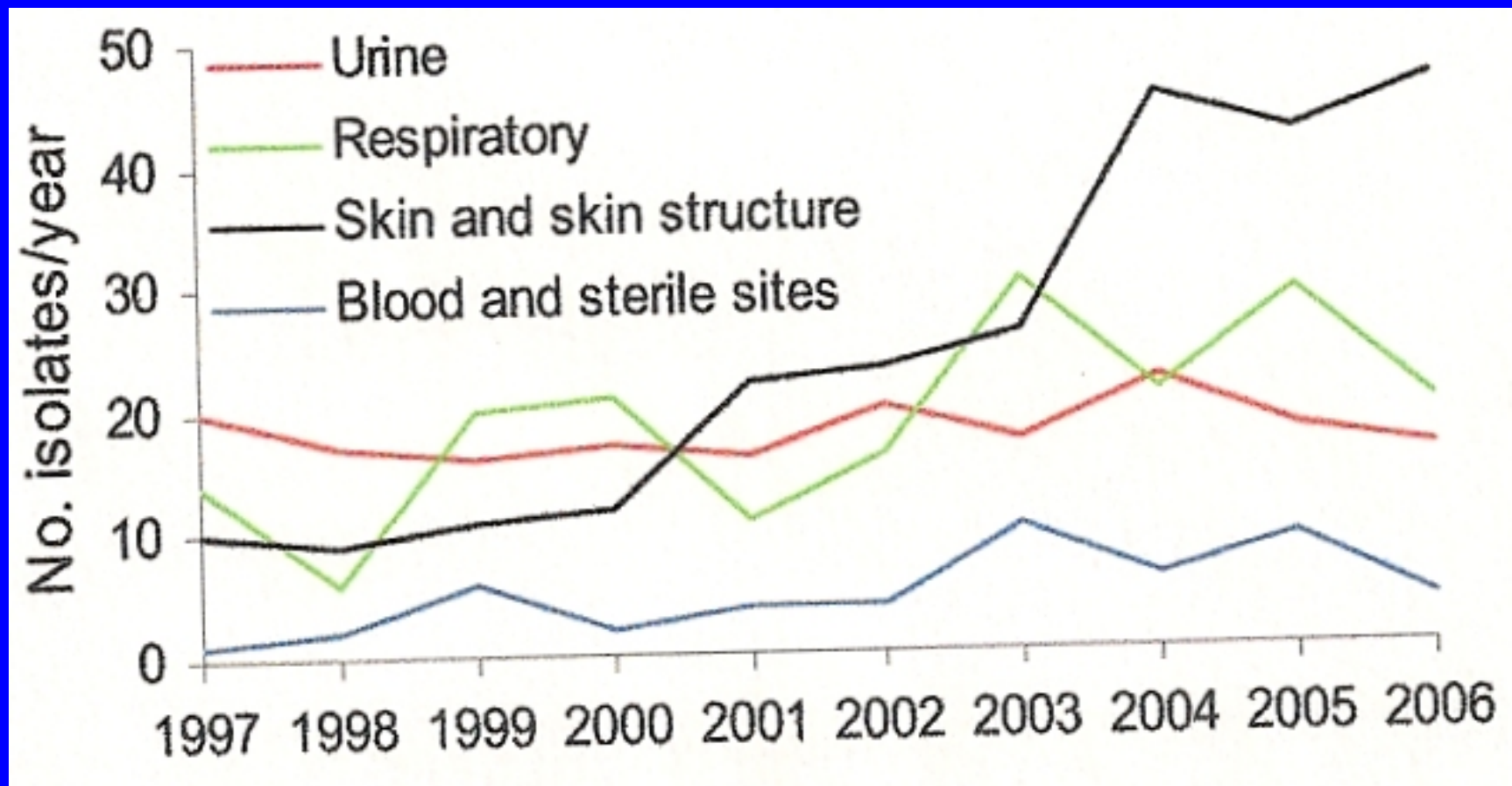
Change in Strains



Tattevin P et al. Emerg Infect Dis 2009;15:953.

CA-MRSA in LTCF

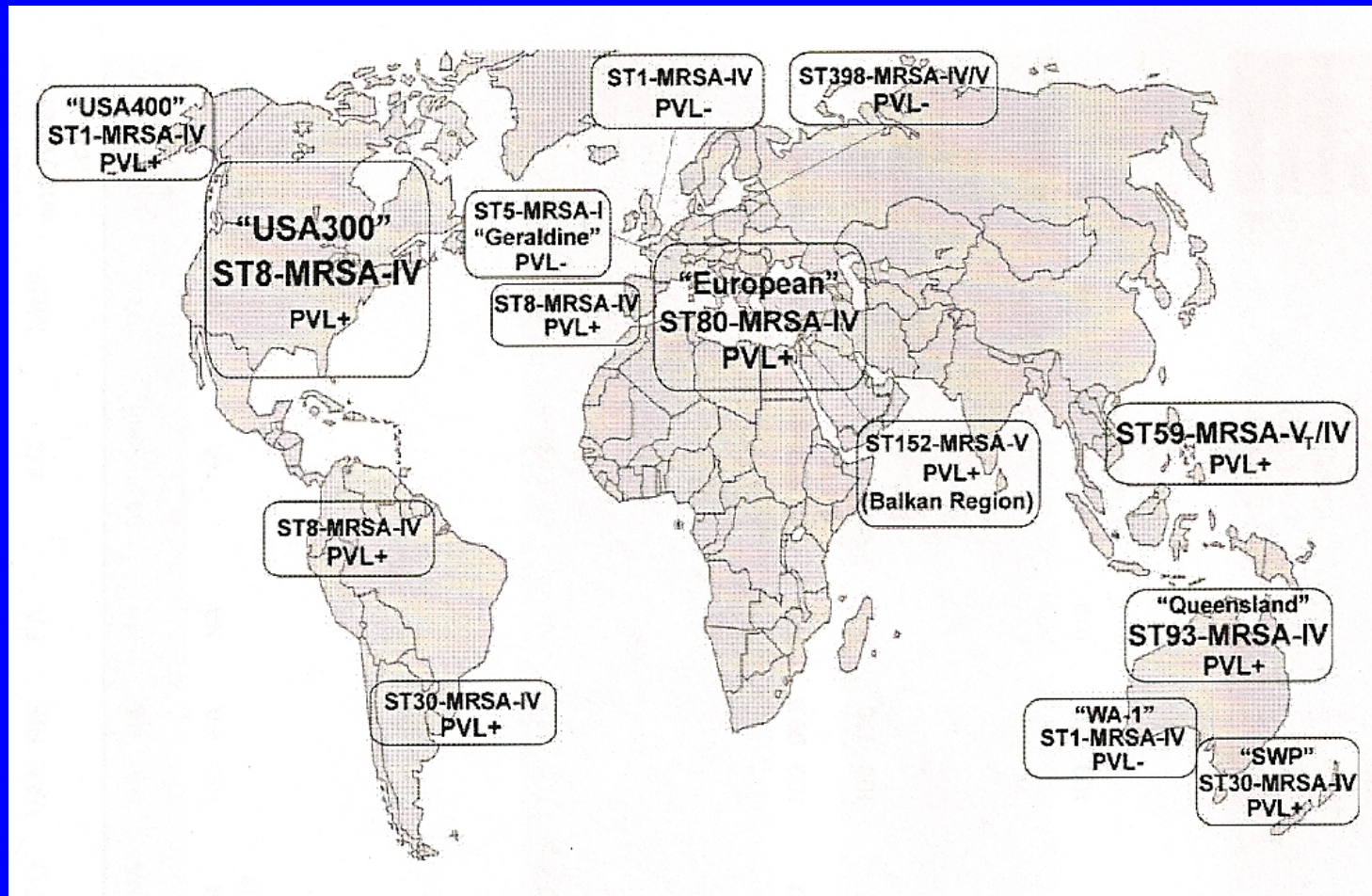
Change in Infections



Tattevin P et al. Emerg Infect Dis 2009;15:953.

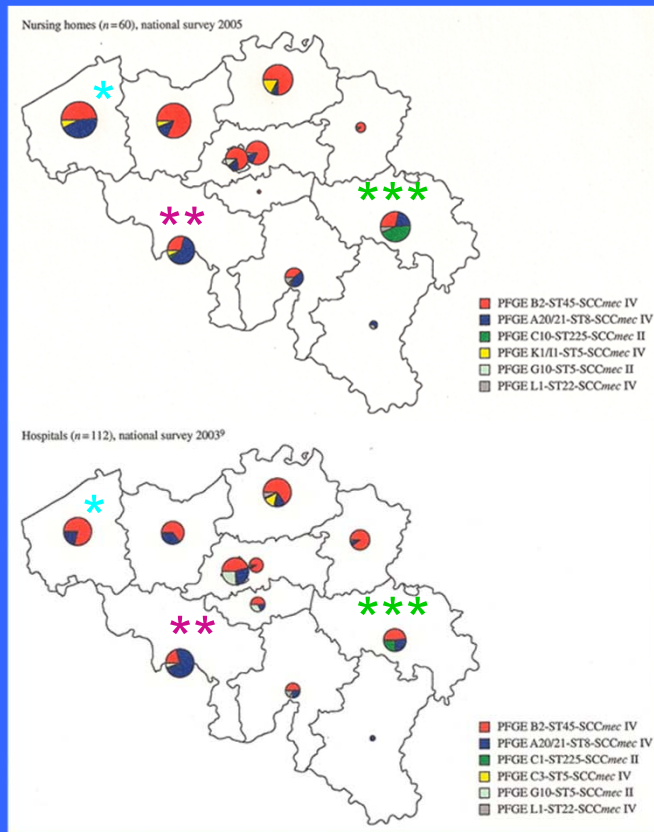
CA-MRSA

All Epidemiology is Local!



Chua K et al. CID 2011;52:99.

MRSA in Belgium LTCF vs Hospitals



Denis O et al. JAC 2009;64:129

- Identical strains
- Parallel ↓ hospital rates
- Significant association
 - prior hospitalization yr
 - known carrier
 - antibiotics 3 months
 - impaired mobility
 - wounds
 - no MRSA program
 - no ATB formulary

MRSA in 26 LTCF Orange County 2009-11

Characteristics	Median value (IQR)
No. admissions yr	263 (138-520)
< 65 yrs age (%)	22.5 (4-40)
Admitted from hospital (%)	81.9 (56.6-93.8)
Residents with devices (%)	2.2 (1.2-7.1)
MRSA history (%)	16 (11-22)
MRSA point prevalence	26.3 (16-34)
No. spa types per NH	5 (4-8)

Hudson LO et al. J Clin Microbiol 2013;51:3788.

MRSA in 26 LTCF

Dominant Strains

TABLE 3 Ten most frequently found *spa* types among MRSA isolates from residents of nursing homes in Orange County, California^a

Rank	<i>spa</i> type	MLST ^b	Frequency	%	Cumulative %
1	t242	5	273	32.7	32.7
2	t008	8	222	26.6	59.3
3	t002	5	195	23.4	82.6
4	t127	474	12	1.4	84.1
5	t306	5	11	1.3	85.4
6	t088	105	10	1.2	86.6
7	t037	239	7	0.8	87.4
8	t024	8	6	0.7	88.1
9	t068	8	6	0.7	88.9
10	t548	5	6	0.7	89.6
	Other		87	10.4	100.0

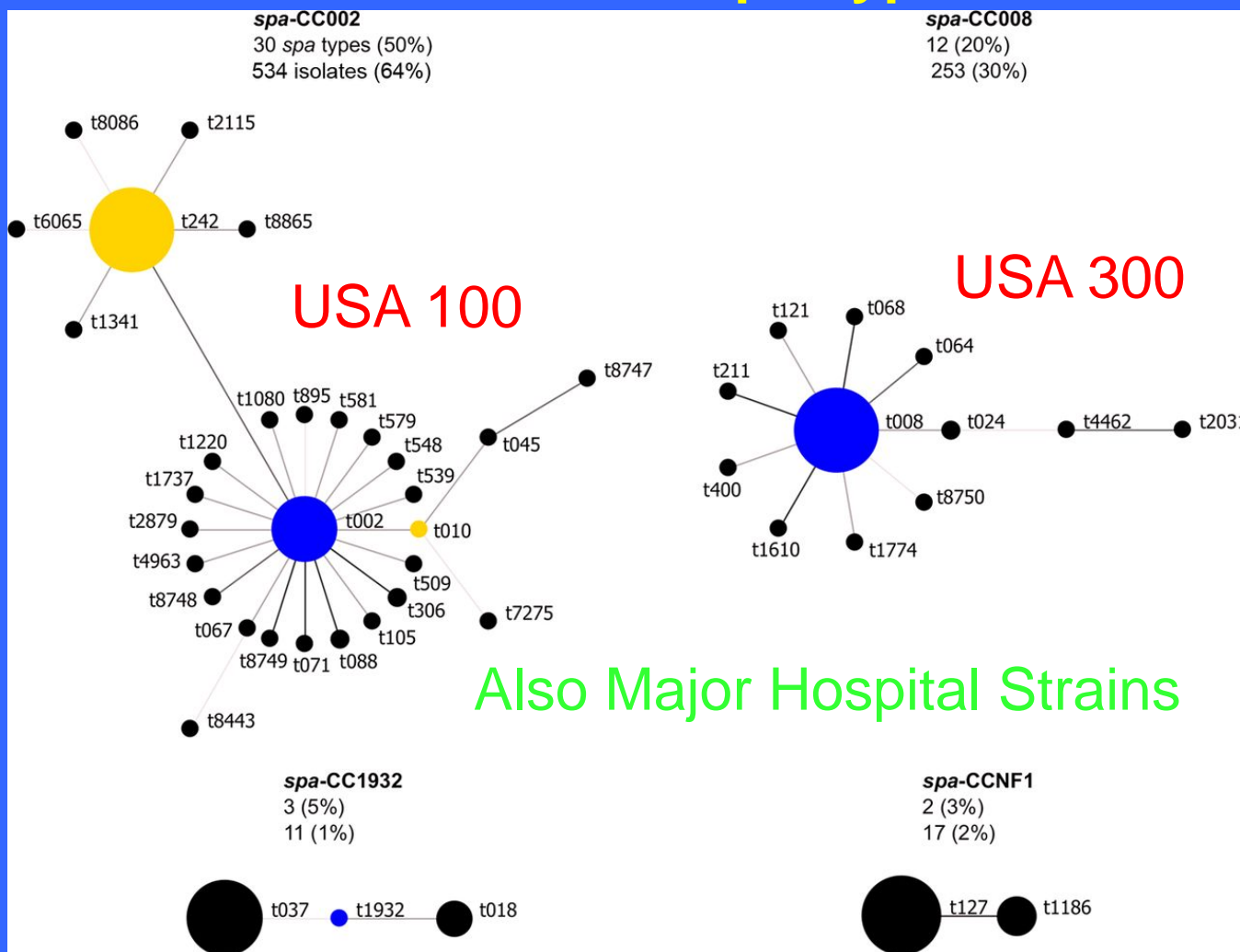
Hudson LO et al. J Clin Microbiol 2013;51:3788.

TABLE 2 Summary of characteristics of the 837 MRSA carriage isolates from nursing home residents in Orange County, California

Characteristic	No. of isolates (%)			
	Total MRSA	t008	t242	t002
Total	837	222 (26.5)	273 (32.6)	195 (23.3)
Admission	269 (32.1)	64 (23.8)	90 (33.5)	69 (25.7)
Point prevalence	568 (67.9)	158 (27.8)	183 (32.2)	126 (22.2)
Resident has history of MRSA	201 (24.0)	53 (26.4)	58 (28.9)	58 (28.9)
Resident living in shared room	795 (95.0 ^a)	219 (27.5)	257 (32.3)	179 (22.5)

Hudson LO et al. J Clin Microbiol 2013;51:3788.

Relatedness of Spa Types



Hudson LO et al. J Clin Microbiol. 2013;51:3788.

MRSA in LTCF

Hospital – NH Interactions

- Influx of strains from hospitals
- High point prevalences
- Also intra-facility transmission
- LTCF significant reservoir for MRSA
- Greater genetic diversity
- Target for regional MRSA control strategies

Hudson LO et al. J Clin Microbiol. 2013;51:3788

MRSA in Hospitals & LTCF

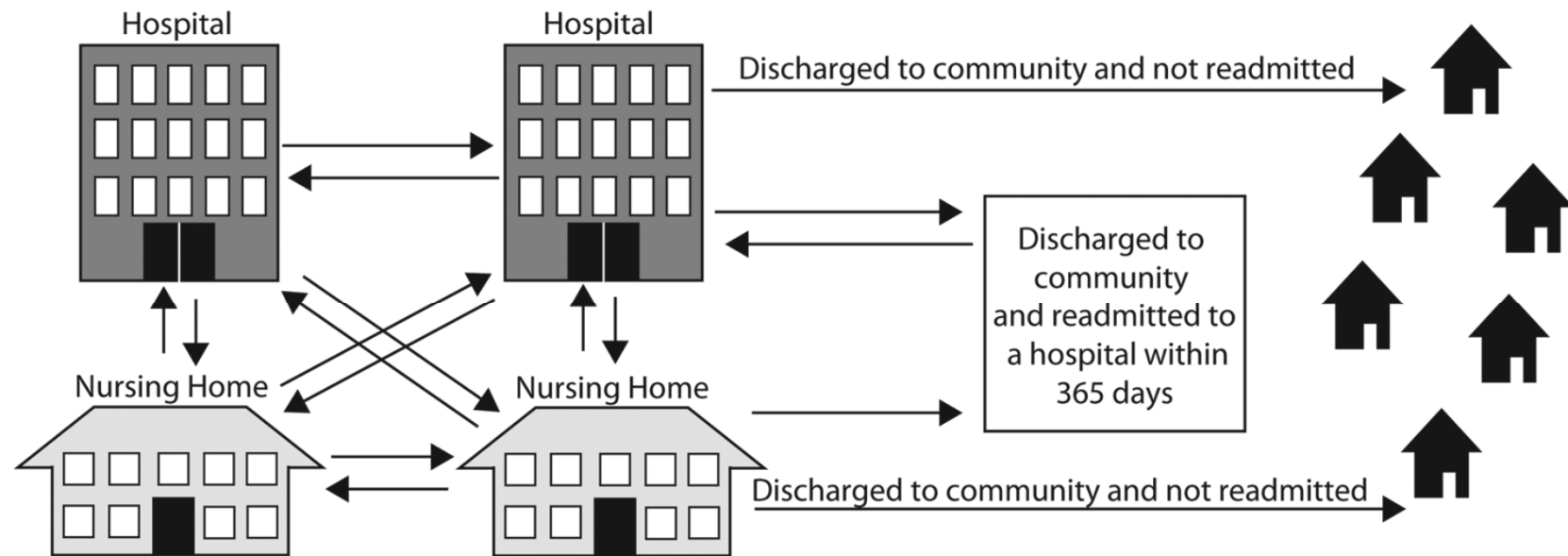
Contact Isolation in NH

- Model based on data from:
 - 71 LTCF, 24 hospitals, 5 LTACHs
- Assumptions
 - MRSA infection risk
 - 5% on admission, 10% during stay
 - MRSA carriers
- Contact Isolation
 - single rooms or cohort
 - HCW - gowns & gloves on entry
 - residents – gown & gloves on exit

Hospitals & LTCF

Preventing MRSA Transmission

Overview of Patient Movement in RHEA Among Healthcare Facilities (Hospitals and Nursing Homes) and the Community

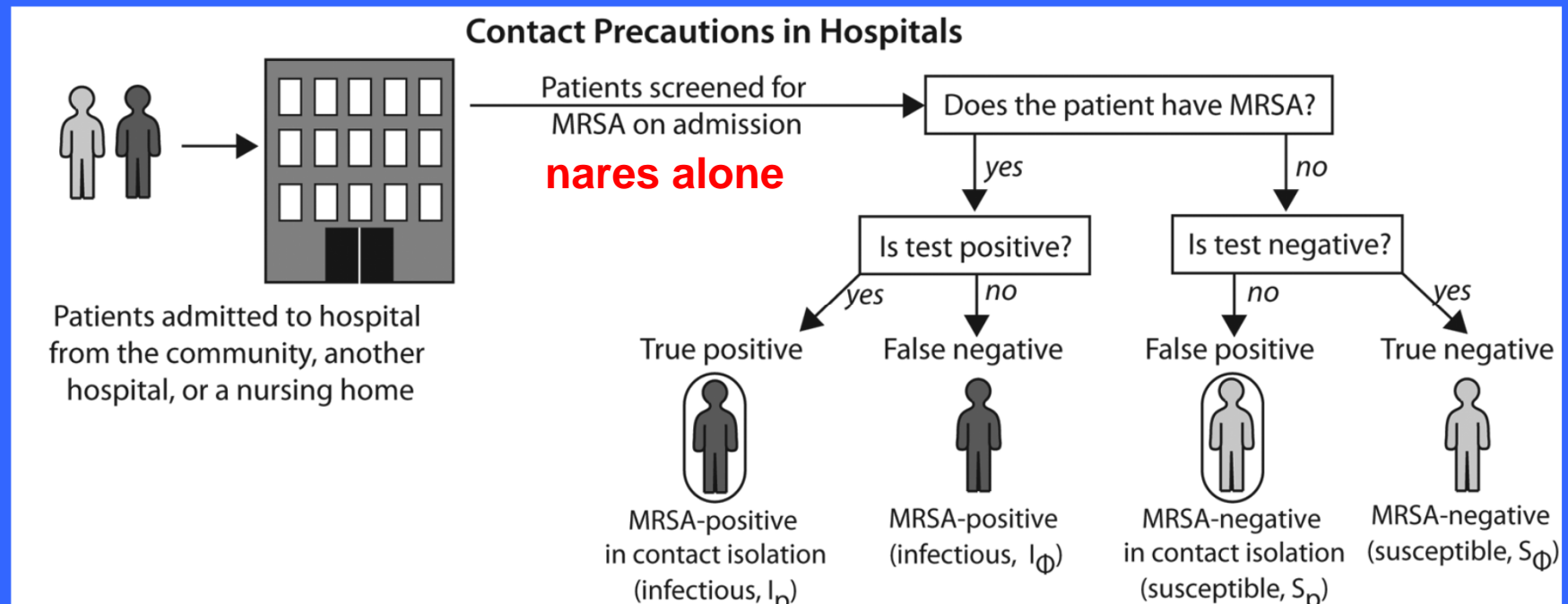


In each healthcare facility: New MRSA cases = $\beta S_{\Phi} I_{\Phi} + \beta(1-\theta) S_p I_{\Phi} + \beta(1-\theta) S_{\Phi} I_p + \beta(1-\theta)^2 S_p I_p$
 where β = ward/facility's transmission coefficient; S_p = susceptible under precautions; S_{Φ} = susceptible under no precautions;
 I_p = infectious under precautions; I_{Φ} = infectious under no precautions; and θ = contact precaution adherence

Lee BY et al. ICHE 2013;34:151

Hospitals & LTCF

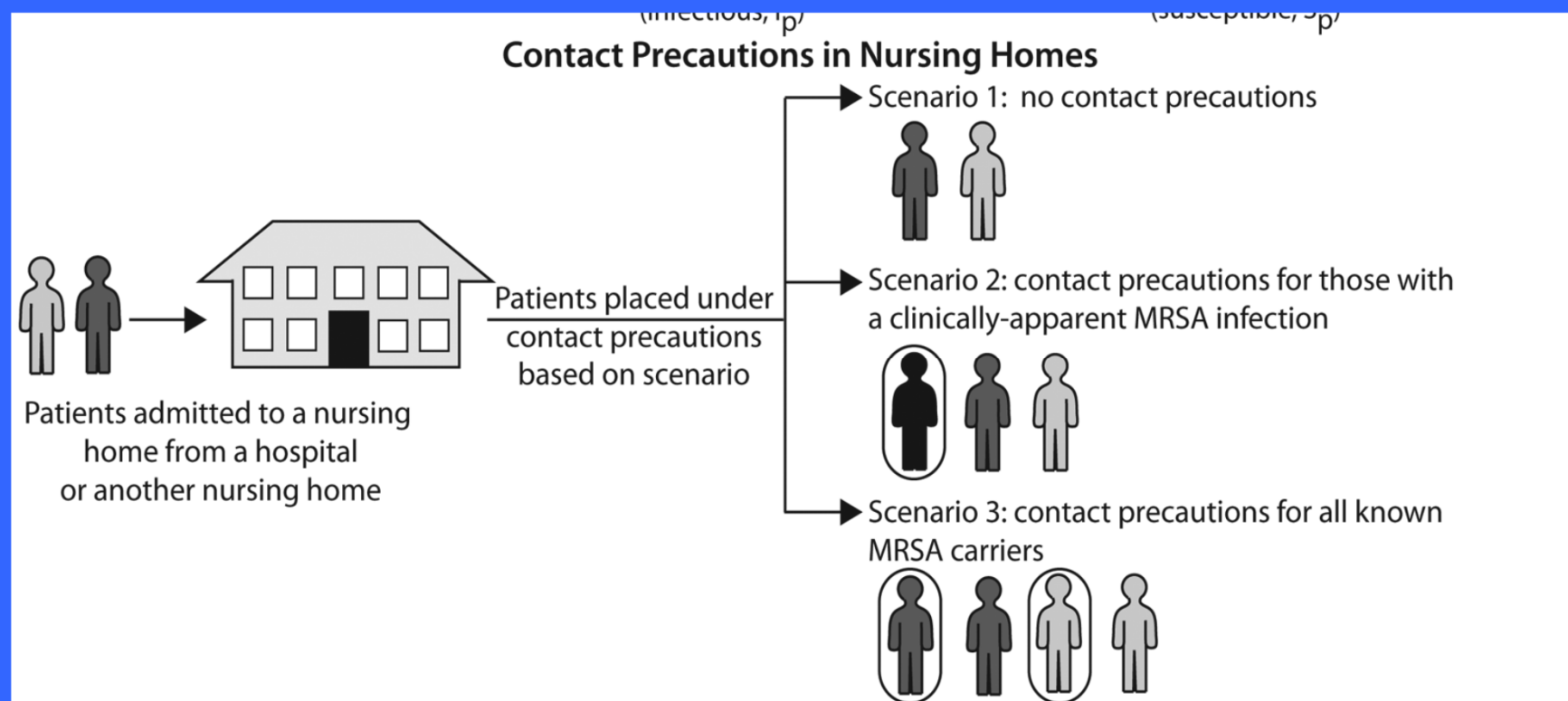
Preventing MRSA Transmission



Lee BY et al. ICHE 2013;34:151

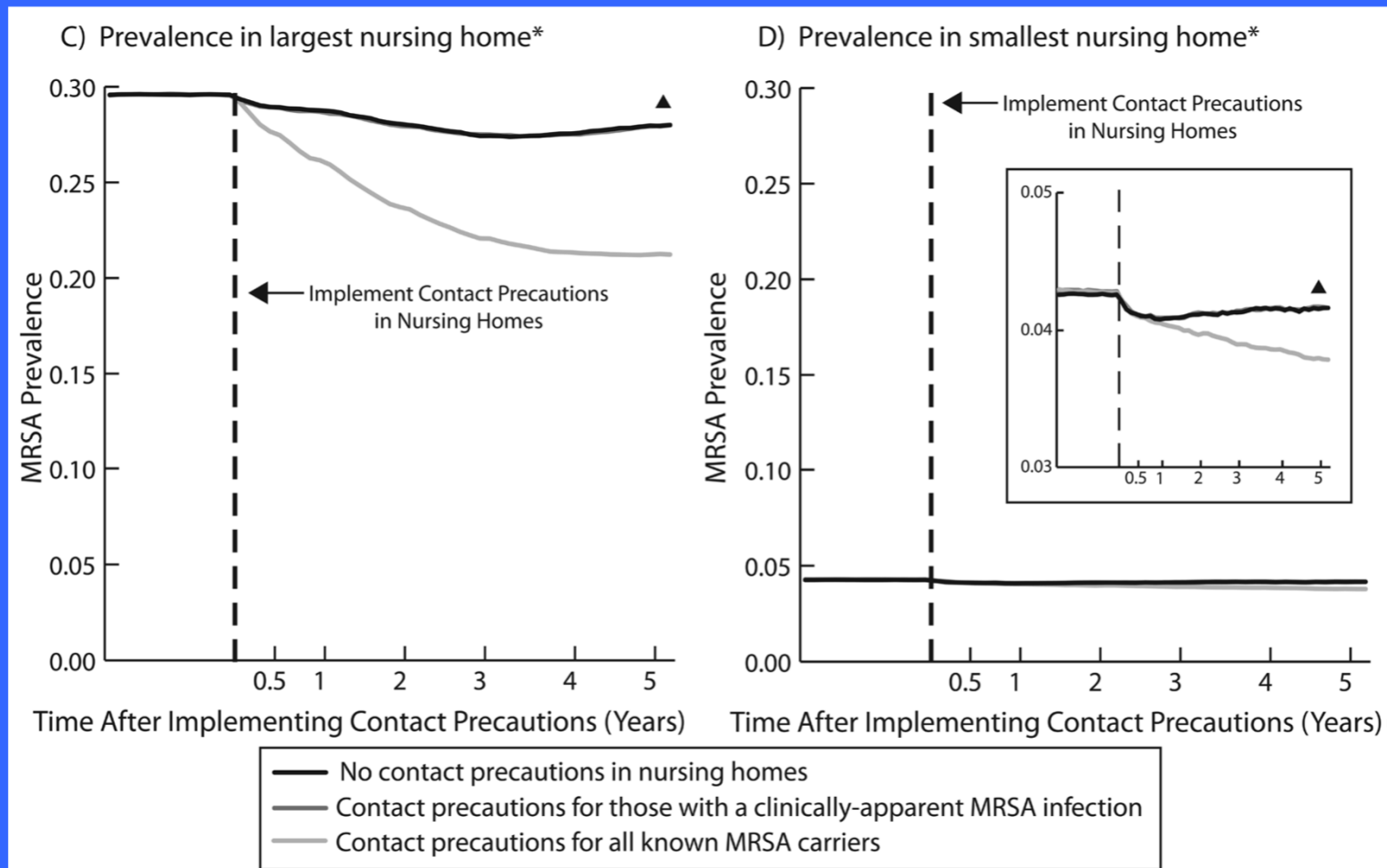
Hospitals & LTCF

Preventing MRSA Transmission



Lee BY et al. ICHE 2013;34:151

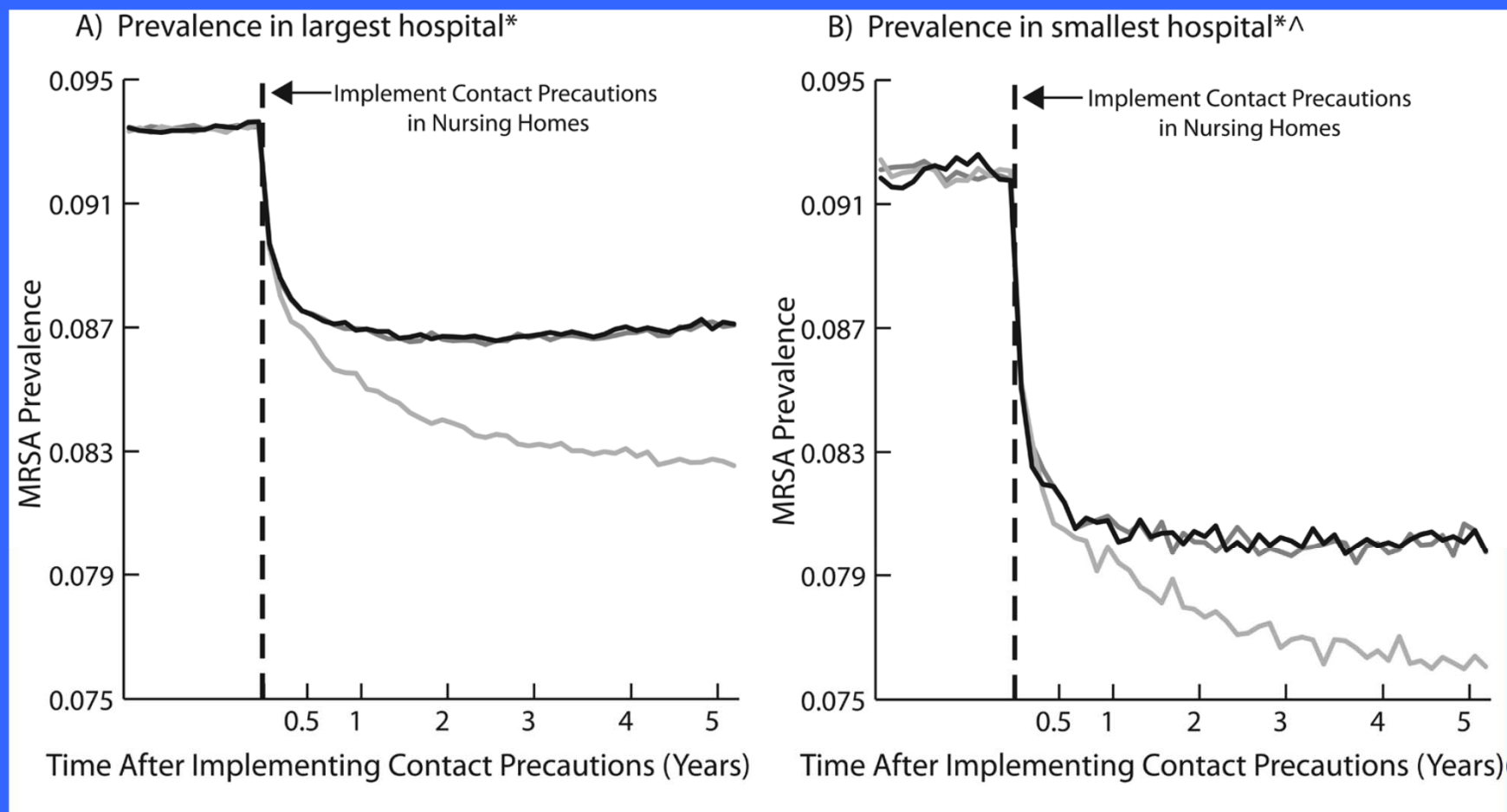
Isolation in LTCF Impact on MRSA



Lee BY et al. ICHE 2013;34:151

MRSA in Hospitals

Impact Isolation in LTCF



Lee BY et al. ICHE 2013;34:151

Isolation in LTCF

Impact on MRSA

- Assume 50% adherence contact isolation
- MRSA infected
 - 0.4% reduction NH only
 - no effect in hospitals
- MRSA carriers
 - 14.2% median decrease (2.1-21.8%) in NH
 - 2.3% decrease in hospitals (0-7.1%)
 - After 5 yrs, 4876 fewer carriers in the region
- Model needs validation

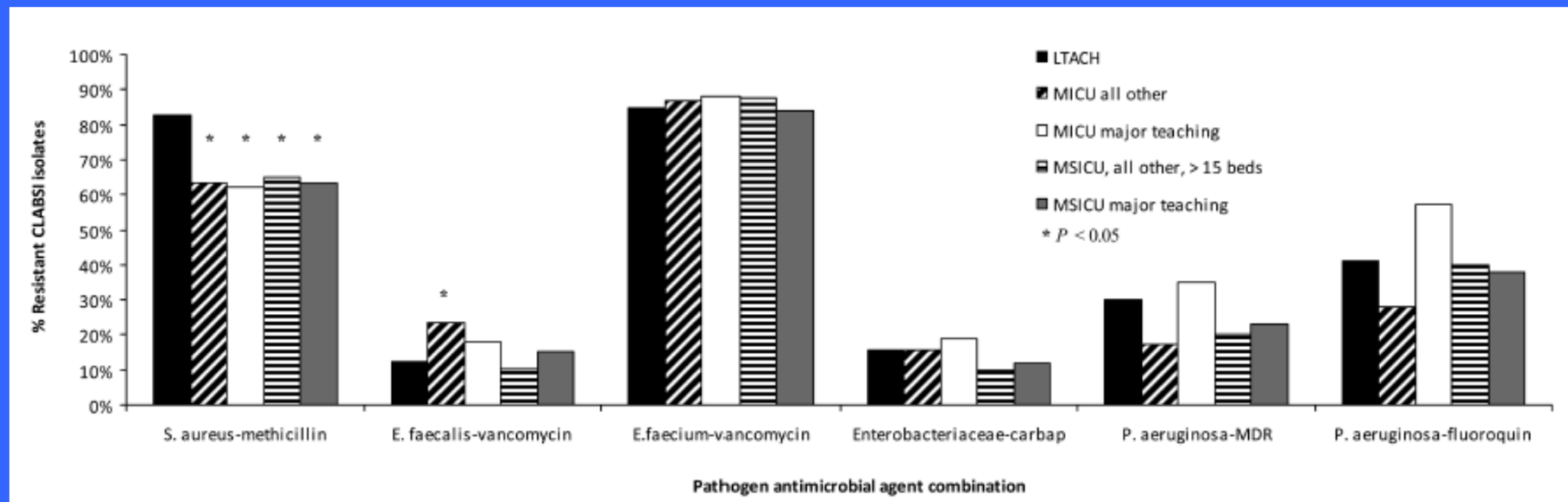
Lee BY et al. ICHE 2013;34:151

NHSN Reporting MDROs & Devices in LTACHs

- Secure web-based
- Report monthly
- Required all LTACHs (2012)
- Standardized methods & definitions
- Device module –CLABSI, CAUTI, VAP
- CSLI – intermediate or resistant
 - MRSA, VRE, CRE, MDR-*Pseudomonas*,
 - Quinolone^R – *Pseudomonas*

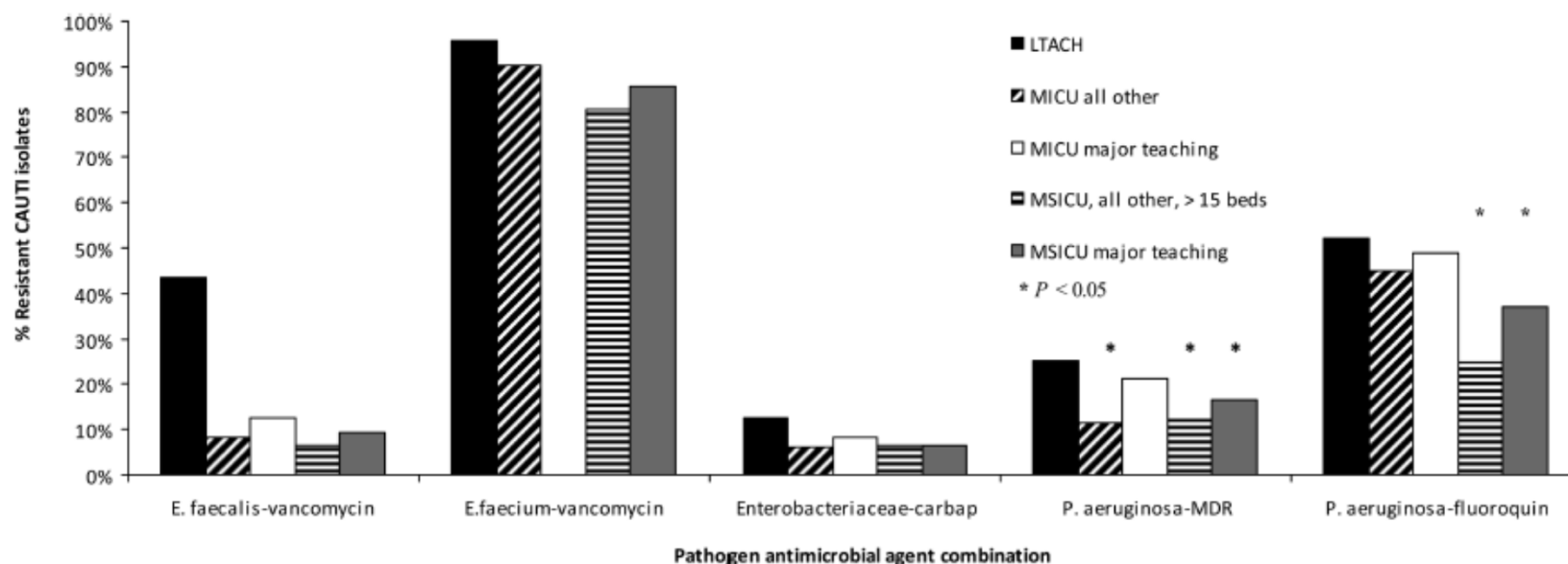
Chitnis A et al. ICHE 2012;33:993

MDRO & CLABSI NHSN 2009-2010



Chitnis A et al. ICHE 2012;33:993

MDRO & CA-UTI NHSN 2009-2010



Chitnis A et al. ICHE 2012;33:993

NHSN Reporting MDROs

- LTACHs vs ICUs (HAIs)
 - higher rates of CLABSI & CAUTI
 - similar central catheter (CVC) use
 - lower urinary catheter or ventilator use
- LTACHs vs ICUs (MDROs)
 - more CAUTI - MDR & quinolone^R *Pseudomonas*
 - CRE (+) CAUTI 42% vs 18-20% vs 8-9%
 - more MRSA CLABSI
 - more vanco^R *E. faecalis*

Chitnis A et al. ICHE 2012;33:993

NHSN Reporting Limitations

- Limited participation LTACHs
- May not be generalizable to all facilities
- Unable to trend device use & related-HAIs, and MDROs
- Reasons for device HAIs & MDROs not assessed
 - antibiotic use
 - patient factors
 - culturing & infection control practices
- MDRO reported only for HAIs & not colonization

Chitnis A et al. ICHE 2012;33:993

Regional Networks

Michigan 2012-2013

- 30/129 facilities invited to participate
- 6 month data collection period
- Report *E. coli* or *K. pneumoniae*
 - I or R to any carbapenem
- Modified Hodge test
- Standardized data collection forms
- Secure fax data submission
- Community-onset
 - < 3 days after admission

Brennan B et al. ICHE 2014;35:342.

Michigan CRE Network 2012-2013

TABLE 3. Incidence Rates of Carbapenem-Resistant Enterobacteriaceae (CRE) by Region in Michigan

Variable	No. of facilities	Total no. of patient-days	No. (%) of cases	Crude incidence rate (95% CI) ^a	<i>p</i> ^b
East	11	654,635	81 (79)	1.24 (0.98–1.54)	Ref
West	4	194,029	10 (10)	0.52 (0.25–0.95)	.006
Mid-North	2	83,118	3 (3)	0.36 (0.07–1.06)	.023
LTAC facilities	4	27,281	8 (8)	2.93 (1.26–5.78)	

Michigan CRE Network 2012-2013

Characteristic	Cases
Age median (range)	63 (20-95)
<i>K. pneumoniae</i> (N/%)	89 (87)
Urine (N/%)	62 (61)
Respiratory (N/%)	16 (15)
Blood (N/%)	10 (10)
Admitted from LTCF/SNF (N/%)	27 (36)
Admitted from Acute Care	11 (15)
Admitted from LTACH (N/%)	4 (5)
At least one device (N/%)	56 (63)
At least one co-morbidity	76 (87)

Brennan B et al. ICHE 2014;35:342.

Michigan CRE Network 2012-2013

TABLE 6. Cases of Carbapenem-Resistant Enterobacteriaceae Stratified by Centers for Disease Control and Prevention LabID Onset Type

Variable	Proportion (%) of cases
Overall	
Healthcare onset	36/102 (35)
Community onset	66/102 (65)
Previous healthcare exposure	
Healthcare onset ^a	14/16 (88)
Community onset ^b	33/44 (75)

Brennan B et al. ICHE 2014;35:342.

Regional CRE Network Oregon Survey

Characteristic	Cases
Response rate	59/140 (42%)
Private	73%
Corporation	61%
Independent	36%
Long-term custodial care	97%
SNF/rehabilitation	87%
Unaware of CRE	48%
MDRO documented on admission	75%
MDRO documented on transfer	79%

Pfeiffer CD et al. ICHE 2014;35:356

Oregon CRE Network

LTCF Practices (n=59 pts)

TABLE 2. Reported Long-Term Care Facility Infection Control Practices Implemented for 59 Patients Infected or Colonized with Multidrug-Resistant Organisms (MDROs), Oregon

Variable	No. (%) of patients (<i>n</i> = 59)	
	Implemented for active infection	Implemented for colonization
Private room	42 (71)	16 (27)
Contact precautions	56 (95)	31 (52)
Dedicated equipment	52 (88)	19 (32)
Follow-up testing for MDRO status	47 (81)	26 (44)

Pfeiffer CD et al. ICHE 2014;35:356

Forming Inter-Facility Networks

MDRO Control

- Antibiotic resistance increasing problem
- More MDROs to control
- Not an isolated LTCF problem
- Need to communicate & work together
- Increased access cheap technology
- Standardized definitions
- Standardized reporting
- Find & implement better solutions