The Chicago Experience: Importance of LTACHs in a Regional Outbreak

Mary Hayden, MD
Rush University Medical Center
Chicago, IL

Disclosure

- Sage Products, Inc. is supplying 2% chlorhexidine-impregnated cloths to facilities that are participating in a research study that I am leading and that is a follow up to work presented today.

Overview

- Overview of LTACHs
- MDROs in LTACHs
- Role of LTACHs in epidemiology of KPC in metropolitan Chicago

LTACHs

What are they?

- Provide complex inpatient services for patients in the recovery phase of severe acute illness or those with chronic critical illness
  - Ventilator dependent in need of weaning
    - G-tubes, urinary bladder catheters
  - Extended antibiotic therapy
  - Decubitus ulcer care
  - Complex infections
  - Rehabilitation needs

LTACHs

What are they?

- Free standing hospitals
  - 50-85 beds
- Hospital within a hospital
  - 30-45 beds
- Average LOS >25 days

LTACHs

Where did they come from?

- Created in 1983 by Congress
- Transfer of chronically, critically ill patients to LTACs reduced LOS, SMR, costs for short-term acute care hospitals

LTACHs

Growth over past 20 years

- 1993
  - 105 LTACs
  - 13,700 admissions
  - $484 M (Medicare payments)
- 2010
  - 412 LTACs
  - 134,700 admissions
  - $5.2 B (Medicare payments)

LTACHs are not distributed evenly across the nation, 2010

Source: MedPAC analysis of cost report data from CMS, March 2012

LTACHs

Patient Outcomes

- Average 1 year mortality 50% -63%*
- 2007 moratorium on new LTACs until CMS could determine if outcomes were improved and at what cost
  - Sundowns 12/29/2012

*Kahn JM et al JAMA 2010; 303:2253
Scheinhorn D et al Chest 2007; 131:85

LTACHs

So what's the MDRO problem?

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY SEPTEMBER 2006, VOL. 27, NO. 9

ORIGINAL ARTICLE

Antibiotic Resistance in Long-Term Acute Care Hospitals: The Perfect Storm

Carolyn V. Gould, MD, MSc; Richard Rothenberg, MD, MPH; James P. Steinberg, MD

- Multiple comorbidities
- Rates of medical device utilization high
- Colonization with resistant organisms at time of admission high
- Heavy antibiotic exposure
- Need for intensive hands on care
- Long lengths of stay

LTACHs
So what's the MDRO problem?

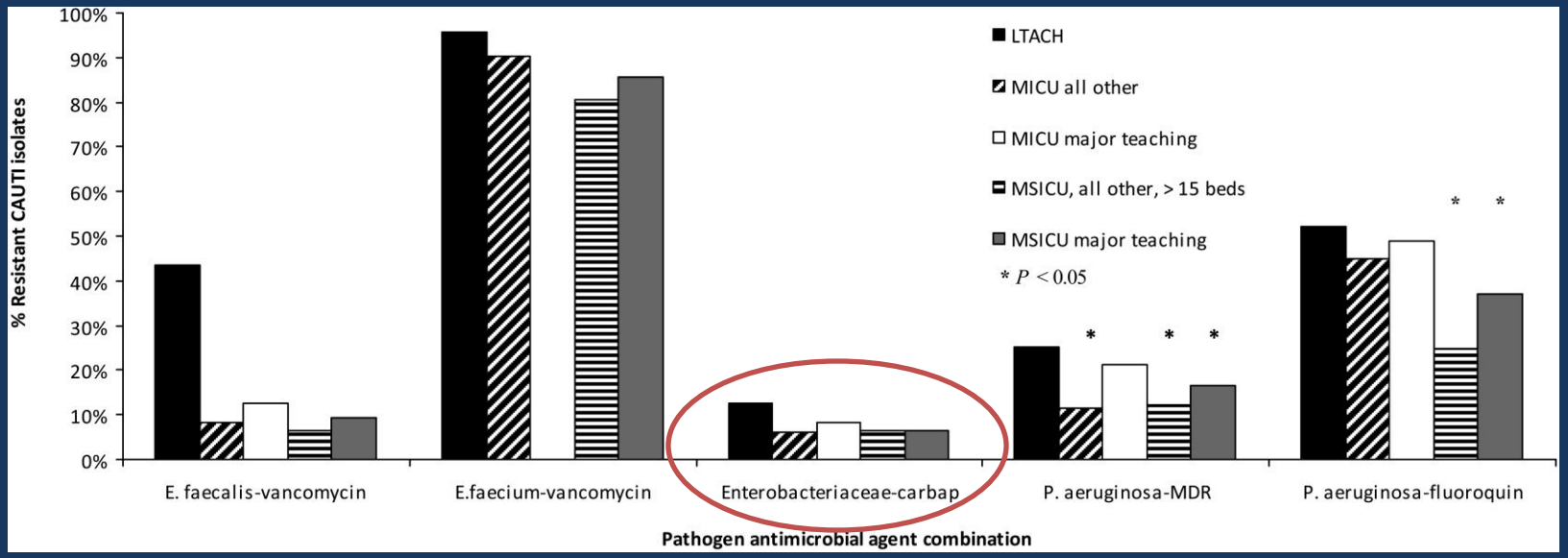
TABLE 1. Composite Antibiogram for 45 Long-Term Acute Care Hospitals (LTACHs), 2002-2003

Organism, antimicrobial	Isolates susceptible, median % (range)
Staphylococcus aureus	
Oxacillin	14 (0-43)[a]
Enterococcus species	
Vancomycin	68 (31-98)
Pseudomonas aeruginosa	
Fluoroquinolones[b]	40 (11-72)[a]
Piperacillin	77 (48-98)
Imipenem	69 (31-100)
Klebsiella pneumoniae	
Fluoroquinolones[c]	80 (23-100)
Ceftazidime	88 (19-100)
Escherichia coli	
Fluoroquinolones	55 (14-92)[a]
Ceftriaxone	92 (43-100)[a]

- Median prevalences of resistance in 90th percentile c/w NNIS ICUs

Gould C et al. ICHE 2006; 27:920.

NHSN Data, 2010
CAUTI Isolates



Chitnis AS et al. ICHE 2012, 33:993.

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journal homepage: www.ajicjournal.org

Major article

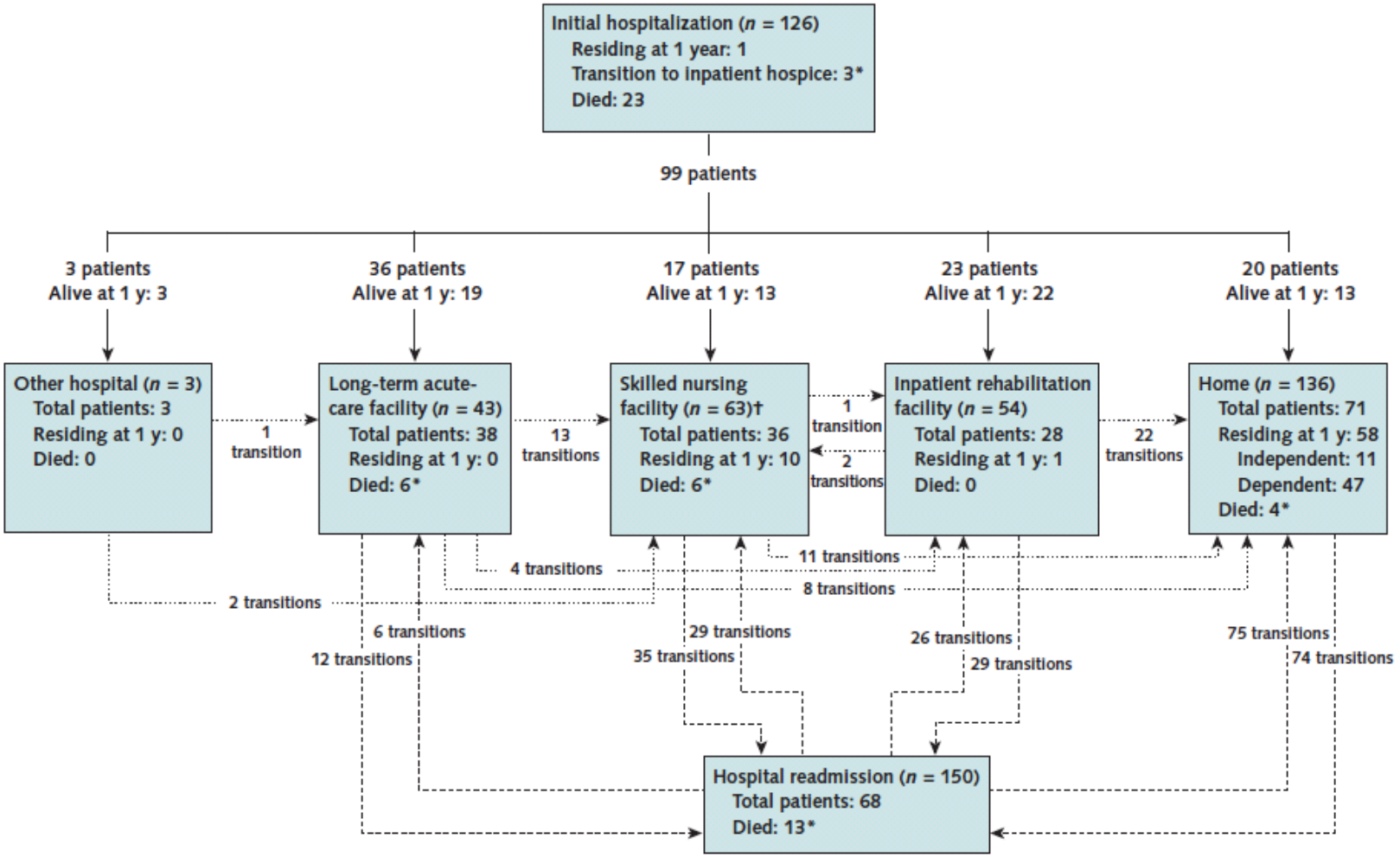
The burden of multidrug-resistant organisms on tertiary hospitals posed by patients with recent stays in long-term acute care facilities

Dror Marchaim MD [a,*], Teena Chopra MD [a], Christopher Bogan BS [a], Suchitha Bheemreddy MD [a], David Sengstock MD, MS [b], Rajasekhar Jagarlamudi MD [c], Anurag Malani MD [c], Leslie Lemanek BS [a], Judy Moshos BS-MT [a], Paul R. Lephart PhD [d], Kimberley Ku BS [a], Asma Hasan BS [a], Jiha Lee MD [a], Namir Khandker BS [a], Christopher Blunden BS [a], Sara F. Geffert MS [a], Megan Moody BS [a], Rahbar Hiro BS [a], Yujing Wang BS [a], Farah Ahmad MD [a], Tarana Mohammadi BS [a], Omar Faruque BS [a], Diixa Patel MD [a], Jason M. Pogue PharmD [e], Kayoko Hayakawa MD, PhD [a], Sorabh Dhar MD [a], Keith S. Kaye MD, MPH [a]

[a] *Division of Infectious Diseases, Detroit Medical Center, Wayne State University, Detroit, MI*
[b] *Division of Geriatrics, Oakwood Hospital, Dearborn, MI*
[c] *Division of Infectious Diseases, Saint Joseph Mercy Health System, Ann Arbor, MI*
[d] *Department of Clinical Microbiology, Detroit Medical Center, Wayne State University, Detroit, MI*
[e] *Department of Pharmacy Services, Detroit Medical Center, Wayne State University, Detroit, MI*

- Nearly 10% of patients colonized with MDR GNR had recent LTACH exposure.

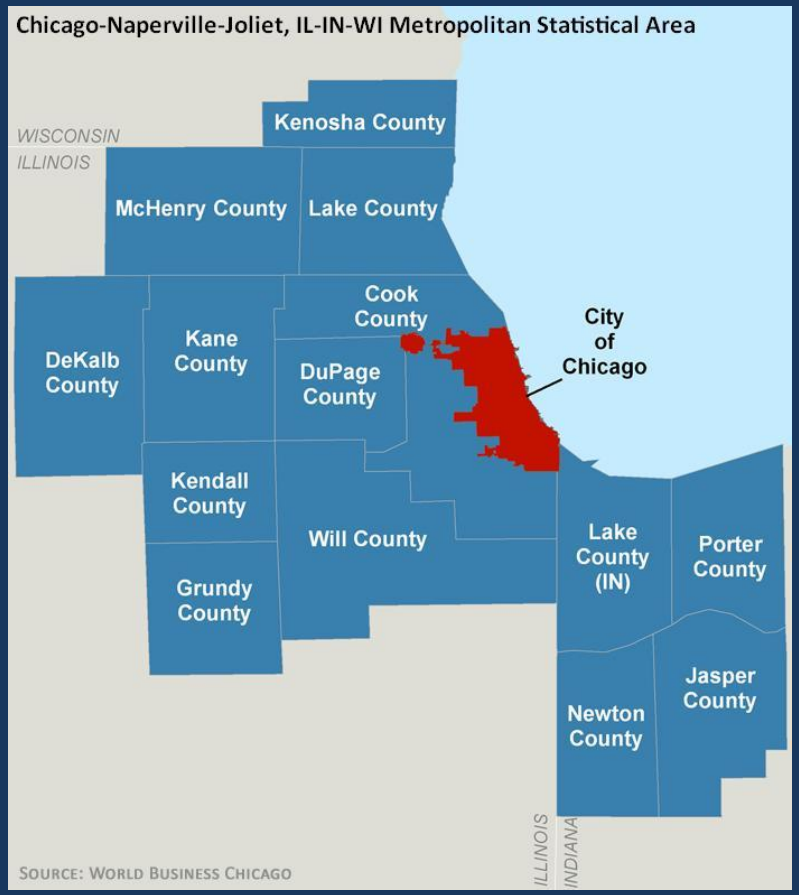
Figure 1. Trajectories of care for patients in the prolonged mechanical ventilation cohort over the first year after discharge.



Unroe M et al. Annals Internal Med 2010; 153:167.

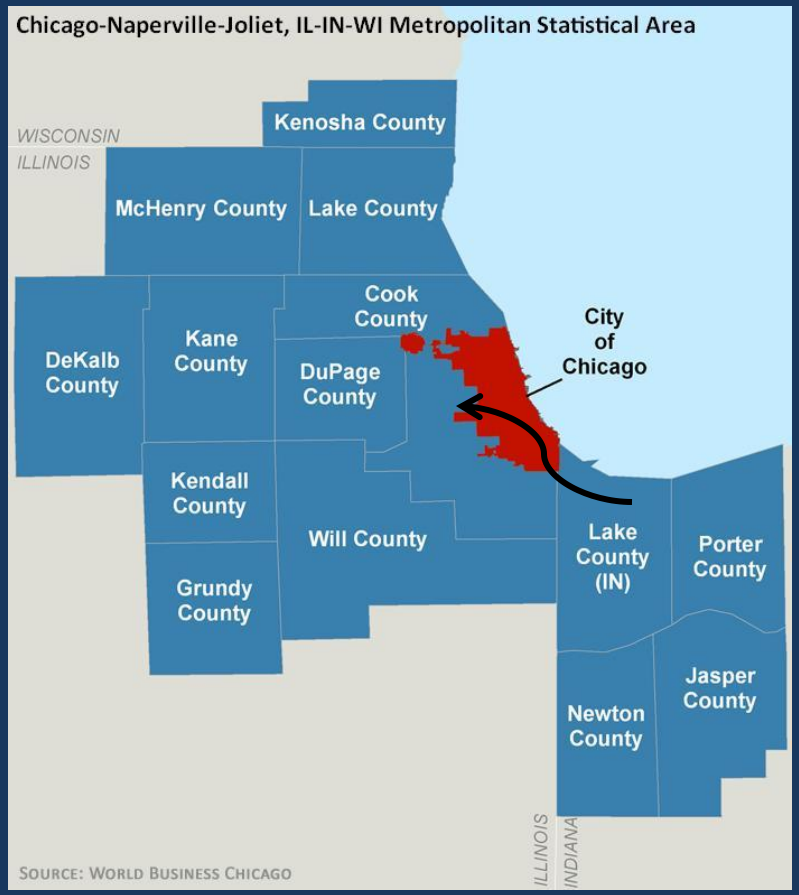
KPC in Chicago
The Role of LTACHs

Chicago by the numbers, 2011



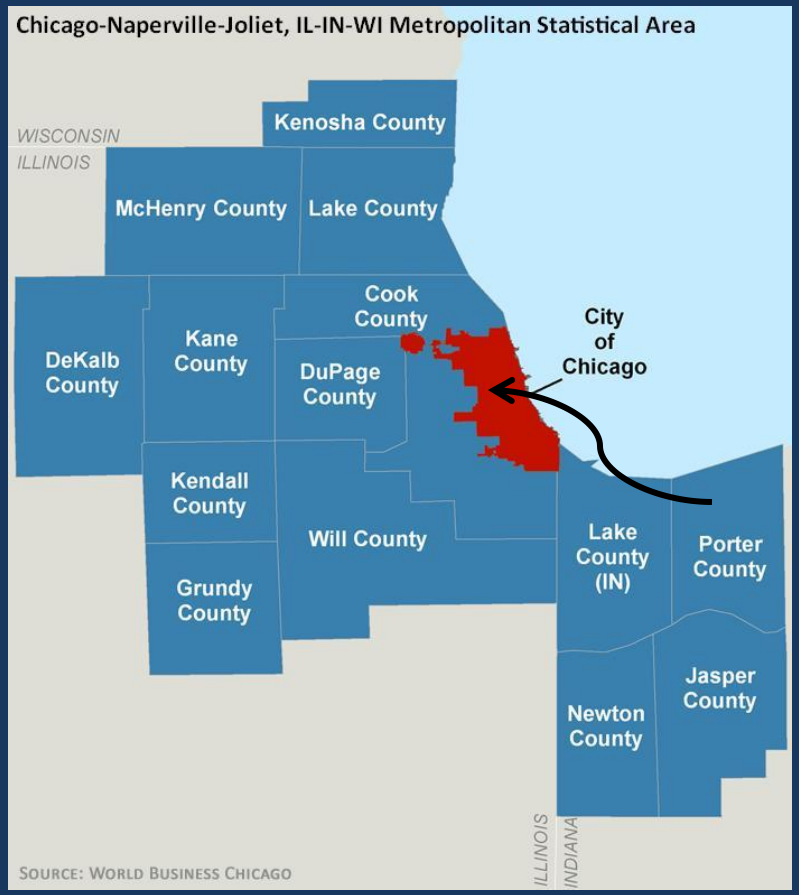
- Metropolitan Area
  - 9,504,753 population
  - 16 counties
  - 28,120 km^2

KPC in Chicago



- *bla*$_{KPC}$ first recognized in Chicago area in December 2007
- Patient transferred to a hospital in suburban Cook County from a skilled nursing facility in Northwest Indiana

KPC in Chicago



- May 2008 patient transferred from acute care hospital in Northwest Indiana to Rush
- Blood, urine, wound cultures grew bla_{KPC} positive *K pneumoniae*

Outbreak Investigation

- Case finding: Any CRE
  - 1/1/2008 – 12/31/2008
  - Surveillance of 5 regional and hospital clinical microbiology laboratory databases
    - 15 acute care hospitals
      - 3078 (91%) acute care beds in 3 counties
    - 3 long-term acute care hospitals (LTACHs)
      - 123 (100%) LTACH beds in 3 counties
    - 2 acute care hospitals (1013 beds) in 4th county
    - ≈25,000 Enterobacteriaceae isolates

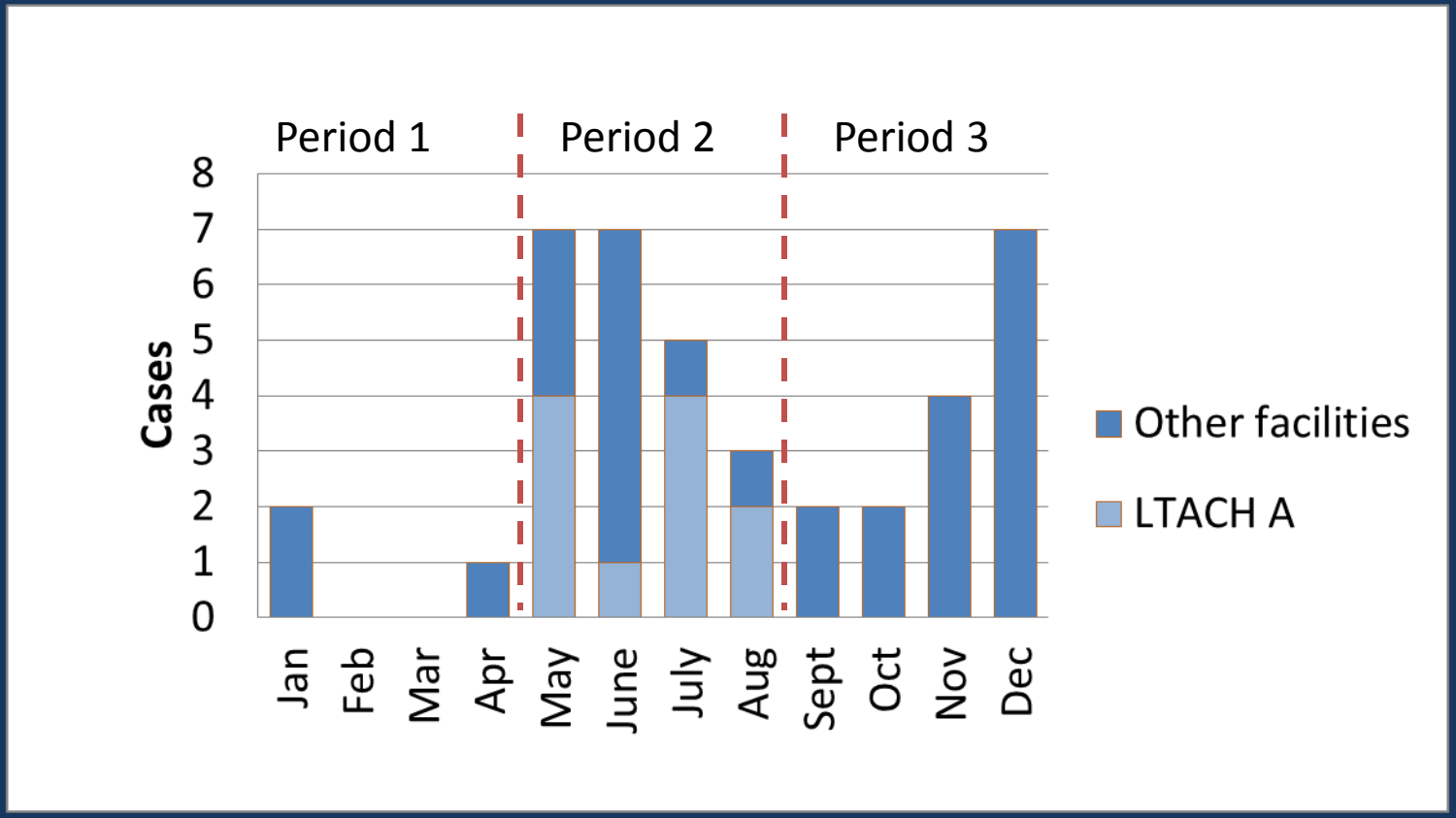
Won SY et al. CID 2011; 53:532.

Outbreak Investigation

- Medical record review
- Microbiologic analysis of available isolates
  - ID and susceptibility
  - *bla*$_{KPC}$ PCR, PFGE, MLST
- "Exposure network analysis"

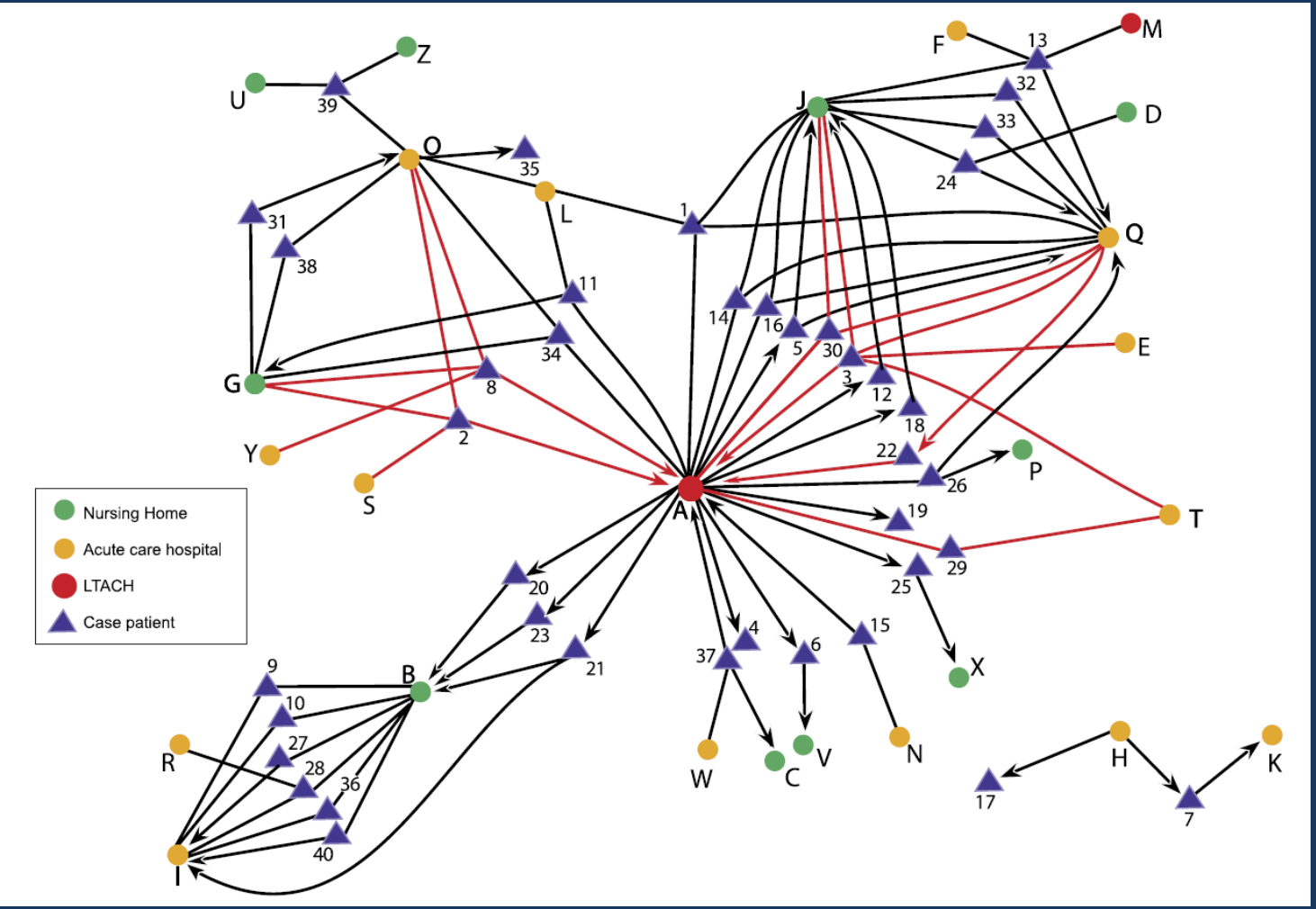
Won SY et al. CID 2011; 53:532.

Epidemic Curve January-December, 2008
40 cases



Won SY et al. CID 2011; 53:532.
Munoz-Price LS et al. ICHE 2010, 31:341.

Emergence and Rapid Regional Spread of KPC



Won SY et al. CID 2011; 53:532.

Surveillance for KPC
REALM Project

- A voluntary MDRO surveillance network of hospitals
  - Acute care hospitals in Chicago with ≥ 10 ICU beds
  - LTACHs in Cook County
- Serial point prevalence culture surveys every 6 months
- KPC surveillance began 2010
- Data survey 1 & 2

Lin MY et al. 49th Annual Scientific Meeting of the IDSA 2011, abstract 396.

REALM Project Results, 2010-2011

- 24 of 25 eligible hospitals and 7 of 7 eligible LTACHs participated in the surveys

Lin MY et al. 49th Annual Scientific Meeting of the IDSA 2011, abstract 396.

REALM Project Results, 2010-2011

Facility type	KPC positive (n)	Total (N)	Percent (95% CI)
Acute care hospital adult ICUs	30	909	3.3 (2.2 – 4.7)
LTACHs	119	391	30 (26 – 35)

- 15 of 24 acute care hospitals had KPC-colonized patients
- 7 of 7 LTACHs had KPC-colonized patients

Lin MY et al. 49th Annual Scientific Meeting of the IDSA 2011, abstract 396.

Is long-term care residence a risk factor for KPC colonization on admission to acute care hospitals in Chicago?

- Cross-sectional study of patients transferred from long-term care facilities to any of 4 Chicago area acute care hospitals
- November 2010 - June 2011
- Matched 1:1 to community patients by age, admitting clinical service, and admission date

Prabaker K et al, Infect Control Hosp Epidemiol, in press.

Is long-term care residence a risk factor for KPC colonization on admission to acute care hospitals in Chicago?

- KPC surveillance
  - Rectal swab culture within 3 days of acute care hospital admission
- Medical records reviewed

Prabaker K et al, Infect Control Hosp Epidemiol, in press.

Is long term care residence a risk factor for KPC colonization on admission to acute care hospitals in Chicago?

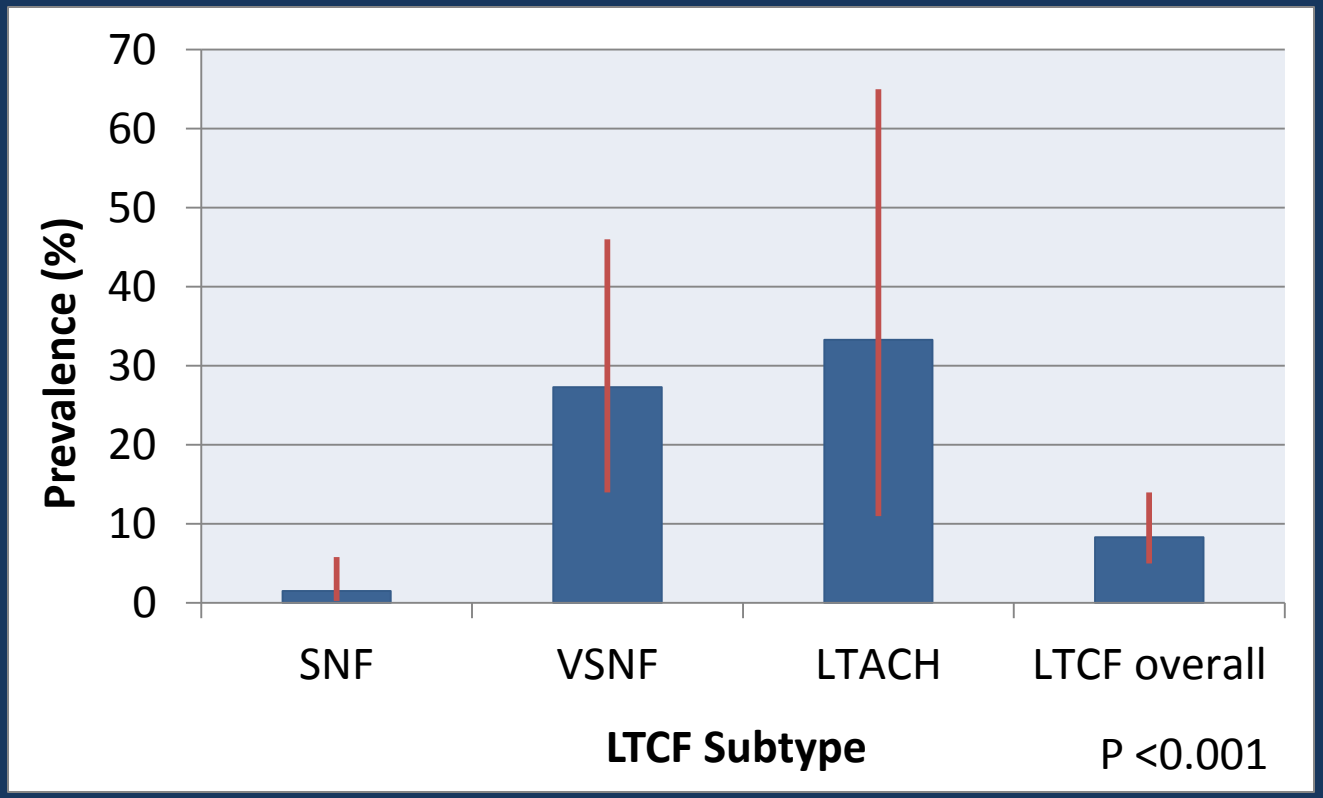
	LTCF Patients (N=180)	Community Patients (N=180)
Prevalence of KPC	15 (8.3%)	0 (0%)

P <0.001

- 15 patients admitted from 7 different LTCFs

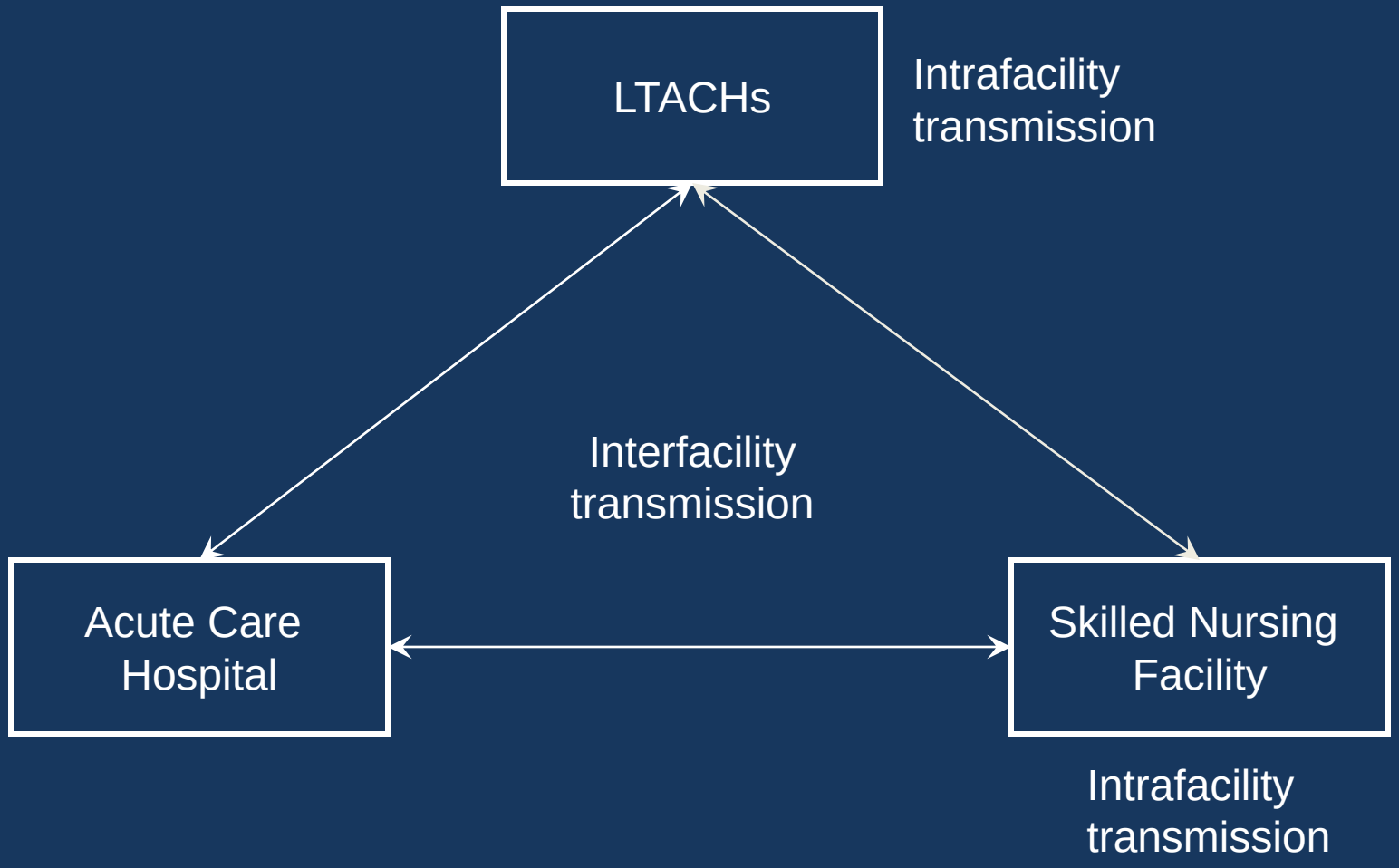
Prabaker K et al. Infection Control Hospital Epidemiol, in press.

KPC Prevalence Differed among Patients Admitted from Different Types of LTCFs



Prabaker K et al, Infect Control Hosp Epidemiol , in press.

Hypothesis: Epidemiology of Regional KPC Spread



Regional KPC Control Plan

- Decrease cross-transmission of KPC in high-prevalence healthcare facilities
  - Infection prevention bundle
- Improve communication of KPC status among transferring healthcare facilities
- Legislation to enhance infection control in SNFs

Development of Infection Prevention Bundle

- Is patients' skin contaminated/colonized with KPC?
- Is inanimate healthcare environment contaminated with KPC?

Anatomic Sites of Patient Colonization and Environmental Contamination with KPC

- Cross-sectional culture survey
- 6 LTACHs in Cook County, IL
- Study subjects
  - KPC+
  - KPC-
- February 2011 – June 2011
- Sites cultured
  - Patients' skin
  - Non-skin sites
  - Environmental surfaces in patients' rooms and common areas

Thurlow CJ et al. Infect Control Hosp Epidemiol, in press.

KPC Common on Skin

- 33 patients cultured
- 24 patients any anatomic site KPC-positive
  - 23 (96%) patients ≥1 skin site KPC-positive
    - 19 (79%) inguinal area
    - 18 (75%) axillae
    - 6 (25%) upper back
    - 6 (25%) antecubital fossae
  - 49/96 (51%) skin cultures KPC-positive

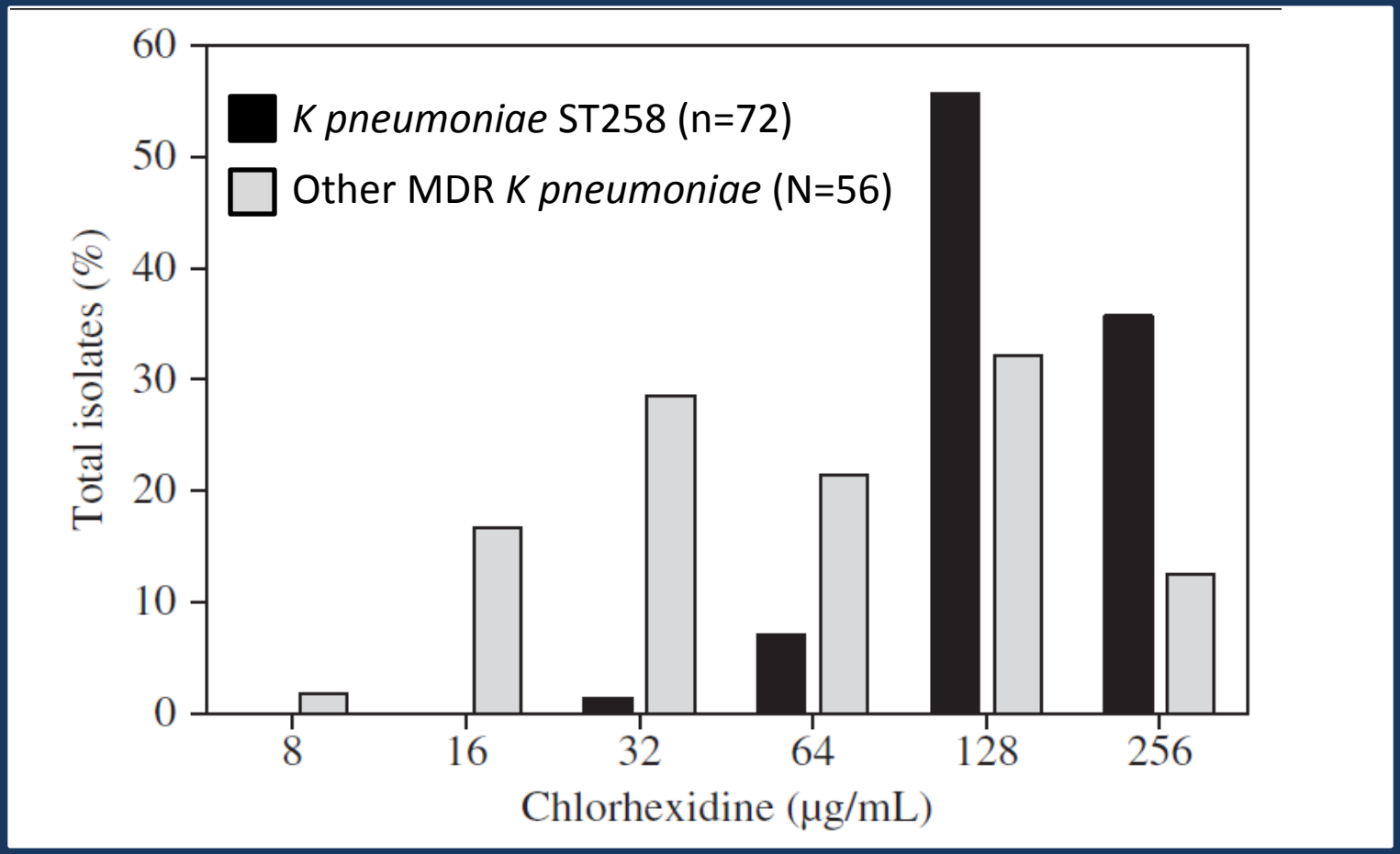
Thurlow CJ Infect Control Hosp Epidemiol, in press.

KPC Rare in Environment

- 371 environmental surfaces cultured
  - 2 (0.5%) sites grew KPC-positive *K pneumoniae*
  - 57 (15%) grew other carbapenem-resistant gram-negative bacteria
    - 53 *Acinetobacter baumanii*
    - *2 Pseudomonas aeruginosa*
    - 1 *Achromobacter xylosoxidans*
    - 1 *Chryseobacterium indologenes*

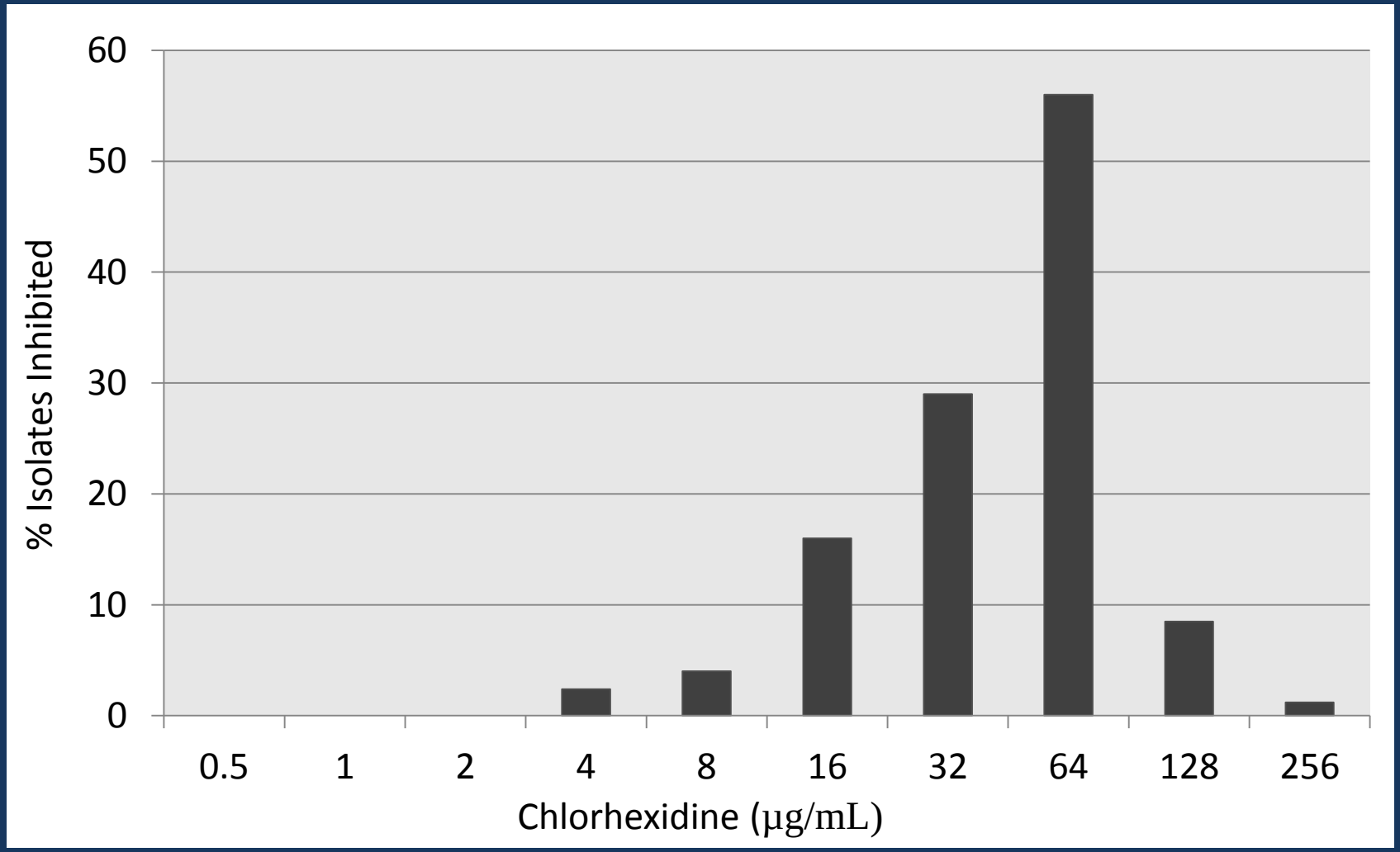
Thurlow CJ et al. Infect Control Hosp Epidemiol, in press.

Reduced Susceptibility of *K pneumoniae* ST258 to Chlorhexidine



Naparstek L et al JHI 2012, 81:15.

KPC-Positive *K pneumoniae* (N=82)



Thurlow CJ et al. Infect Control Hosp Epidemiol, in press.

What we learned

- KPC prevalence high in LTACHs in Metropolitan Chicago
  - VSNFs may also have high prevalence
  - SNFs without ventilator units appear to be less affected

What we learned

- Skin of LTACH patients is frequently colonized/contaminated with KPC
  - Chlorhexidine MICs moderate
- KPC environmental contamination in LTACHs uncommon

What we learned

- KPC prevalence low in acute care hospitals in Chicago
- Frequent transfer of KPC-positive patients between acute and long term care facilities
  - KPC will become more common in acute care hospitals unless problem is controlled in long term care facilities

Regional KPC Control Plan: KPC Control in LTACHs

- Aims
  - To determine the effect of implementing an infection control bundle in Chicago LTACHs on the prevalence of KPC-producing *Enterobacteriaceae* at the LTACHs
  - To determine the effect of implementing an infection control bundle in Chicago LTACHs on the prevalence of KPC-producing *Enterobacteriaceae* in acute care hospital ICUs in Chicago

Regional KPC Control Plan: KPC Control in LTACHs

- Design: Stepped wedge randomized cluster
- Setting: 4 of 5 LTACHs in Chicago
- January 2011 – June 2013

		Time				
		1	**2**	**3**	**4**	**5**
LTACH	**1**	0	X	X	X	X
	2	0	0	X	X	X
	3	0	0	0	X	X
	4	0	0	0	0	X

Regional KPC Control Plan: KPC Control in LTACHs

- Primary outcome
  - KPC prevalence in LTACHs
- Secondary outcomes in LTACHs
  - KPC incidence
  - KPC clinical isolates
  - Device-associated infections
  - Clinical isolates of MRSA, VRE, carbapenem-resistant *A baumannii* and *P aeruginosa*
  - CDI

Regional KPC Control Plan: KPC Control in LTACHs

- Secondary outcome (regional)
  - Prevalence of KPC in acute care hospitals in Chicago

Regional KPC Control Plan: KPC Control in LTACHs

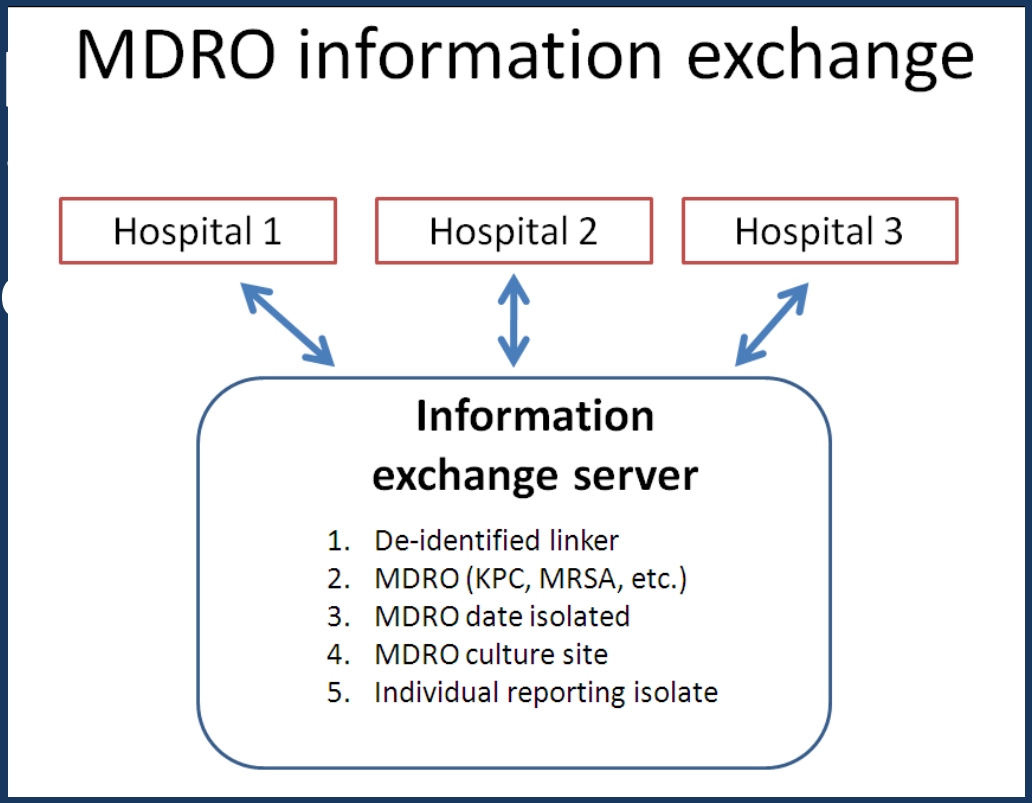
- Intervention: KPC Control Bundle
  - Active surveillance
    - Admission and biweekly surveillance
  - Cohort of KPC+ patients
    - Dedicated nurses and patient care technicians
  - Universal contact isolation in HAUs
  - Patient skin antisepsis
    - Daily CHG bathing
  - Improve general infection control measures
    - Hand hygiene

Regional KPC Control Plan: KPC Control in LTACHs

- Adherence Monitoring
  - CHG bathing
    - Observations
    - Measurement of CHG and KPC on patients' skin
  - Hand hygiene
    - Observations
    - Hand cultures
    - Measure alcohol foam and hand soap usage

Regional KPC Control Project: Enhanced Communication of KPC status

- Interfacility MDRO transfer form
- CRE a re
- Electron
  exchang



Illinois House Bill 1096

- Amends the Nursing Home Care Act
- "….a skilled nursing facility shall designate a person or persons as Infection Prevention and Control Professionals to develop and implement policies governing control of infections and communicable diseases."
- Effective on January 1, 2012

Team KPC

- Stephanie Black
- Don Blom
- Deb Burdsall
- Mary Driscoll
- Sue Gerber
- Carolyn Gould
- David Hines
- Bala Hota
- John Jernigan
- Alex Kallen
- Michael Lin
- Karen Lolans
- Rosie Lyles-Banks
- Nicholas Moore
- Shawn Nelson
- Silvia Munoz-Price
- Kavitha Prabaker
- Shoaib Safiullah
- Monica Sikka
- Caroline Thurlow
- Bill Trick
- Shawn Vasoo
- Mike Vernon
- Shayna Weiner
- Bob Weinstein
- Sarah Won
- Foglia Family Foundation
- CDC Prevention Epicenters Program