



22nd Annual Chicago Infection Control Conference

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Michael Lin, MD MPH

Chicago PROTECT: Regional approach to CRE and XDRO control

All planners, editors, faculty and reviewers of this activity have no relevant financial relationships to disclose. This presentation was created without any commercial support.

Learning Objectives

At the conclusion of this course participants will be able to

- **Enable the learner to gain knowledge of emerging healthcare-associated infections pathogens.**
- **Identify effective infection control strategies to mitigate spread of multi-drug resistant organisms.**
- **Raise awareness of emerging disease threats and identify appropriate diagnostic testing, reporting and prevention methods.**
- **Raise awareness of local public health issues including opioid epidemic and immigrant health.**

To obtain credit you must:

- **Be present for the entire session**
- **Complete an evaluation form**
- **Return the evaluation form to staff**

Certificate will be sent to you by e-mail upon request.

In support of improving patient care, [Insert name of Joint Accredited Provider] is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

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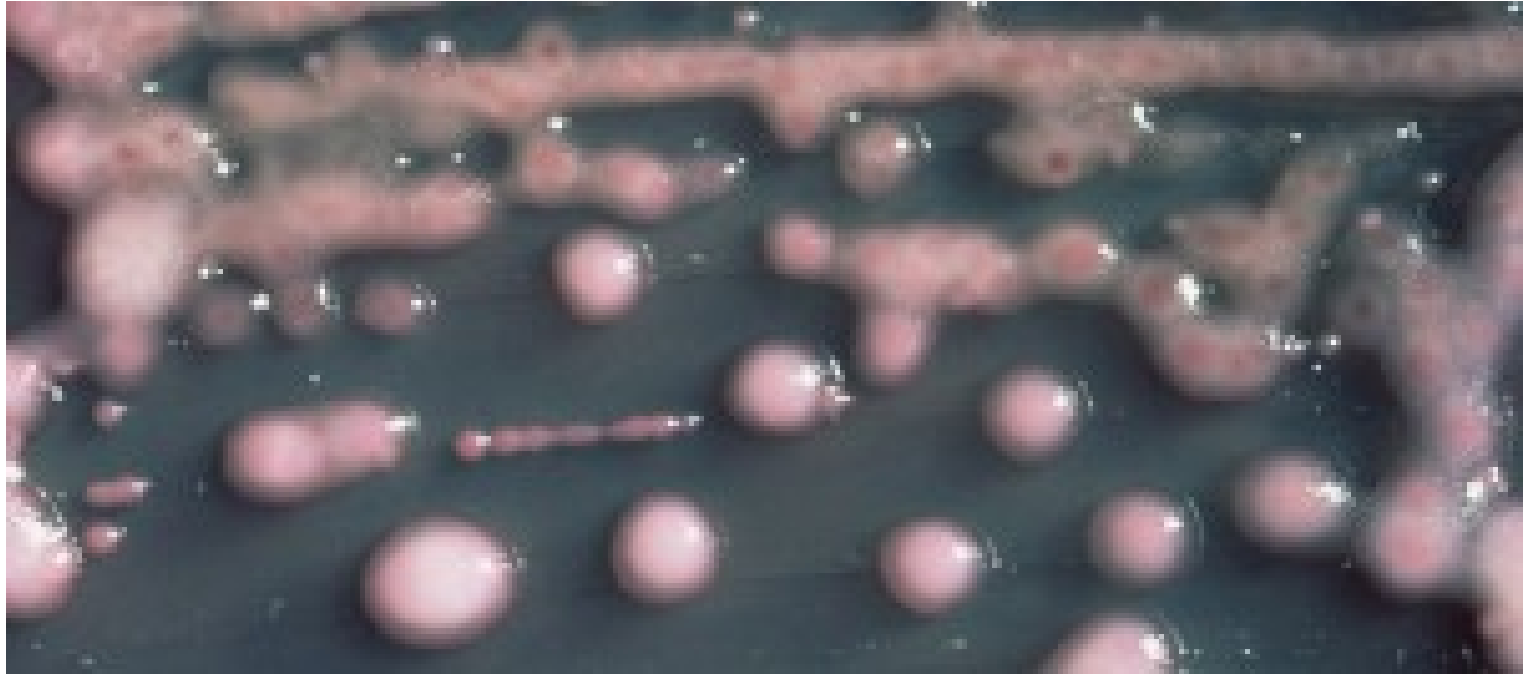
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Rush University is an approved provider for physical therapy (216.000272), occupational therapy, respiratory therapy, social work (159.001203), nutrition, speech-audiology, and psychology by the Illinois Department of Professional Regulation.

Chicago PROTECT: Regional approach to CRE and XDRO control

1. ABCs of CRE
2. Science of CRE: Epi and Control
3. Chicago PROTECT: Regional control effort

Carbapenem-resistant *Enterobacteriaceae* (CRE)



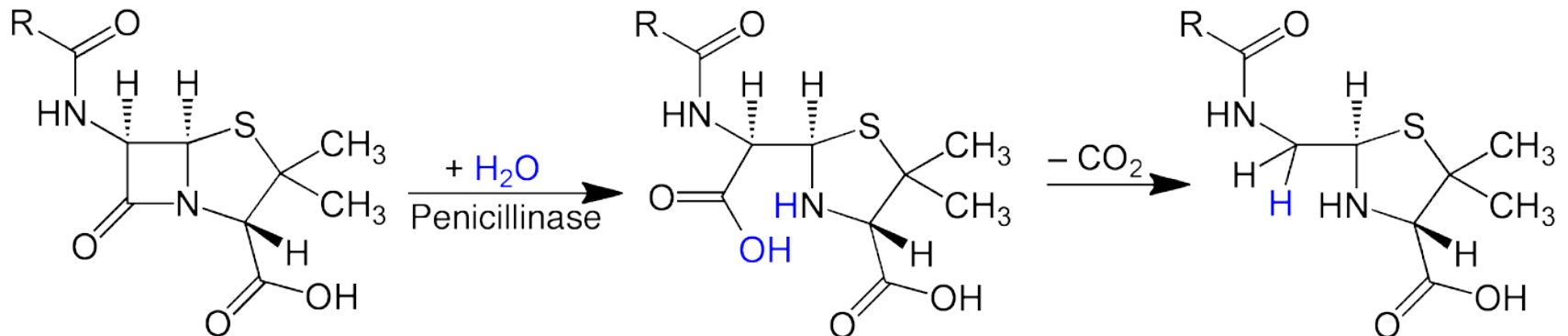
Multidrug-resistant bacteria, untreatable in many cases

β -Lactam Antibiotics

Drug class	# drugs	Example
Penicillins	2	Penicillin G
Antistaphylococcal penicillins	3	Nafcillin
Extended spectrum penicillins	4	Amoxicillin, piperacillin
1 st generation cephalosporins	3	Cefazolin
2 nd generation cephalosporins	2	Cefoxitin
3 rd generation cephalosporins	3	Ceftriaxone
4 th generation cephalosporins	1	Cefepime
5 th generation cephalosporins	1	Ceftaroline
Monobactams	1	Aztreonam
B-lactam/B-lactamase inhibitors	3	Piperacillin-tazobactam
Carbapenems	4	Imipenem
	Total = 29	

Bacteria can ‘fight off’ antibiotics with enzymes

- “β-lactamases” are enzymes that inactivate β-lactams
- “Carbapenemases” inactivate carbapenems



Carbapenems vs. carbapenemases



Important Carbapenemases

KPC

NDM

VIM

IMP

OXA-48

What are Enterobacteriaceae?

Organisms

Escherichia coli

Klebsiella pneumoniae

Enterobacter spp.

Characteristics

- Intestinal flora
 - Can colonize skin
- Spread by hands, contaminated food, and water
- Cause serious community and hospital-acquired infections (UTI, pneumonia, meningitis)

(Pseudomonas, Acinetobacter are not Enterobacteriaceae, but can carry carbapenemases)

CRE example

BLOOD CULTURE (PERIPHERAL) (Abnormal):
PROCEDURE: BLOOD CULTURE (PERIPHERAL)
SOURCE: BLOOD
COLLECTED: [REDACTED]

----- FINAL REPORT -----

FINAL REPORT [REDACTED]

GROWTH OF GRAM NEGATIVE RODS

FINAL IDENTIFICATION: KLEBSIELLA PNEUMONIAE

This isolate demonstrates carbapenemase production.

Carbapenems, cephalosporins, and penicillins are unlikely to be effective in treatment of serious infections. Contact precautions required.

----- SUSCEPTIBILITY TESTING -----

K PNEUMO

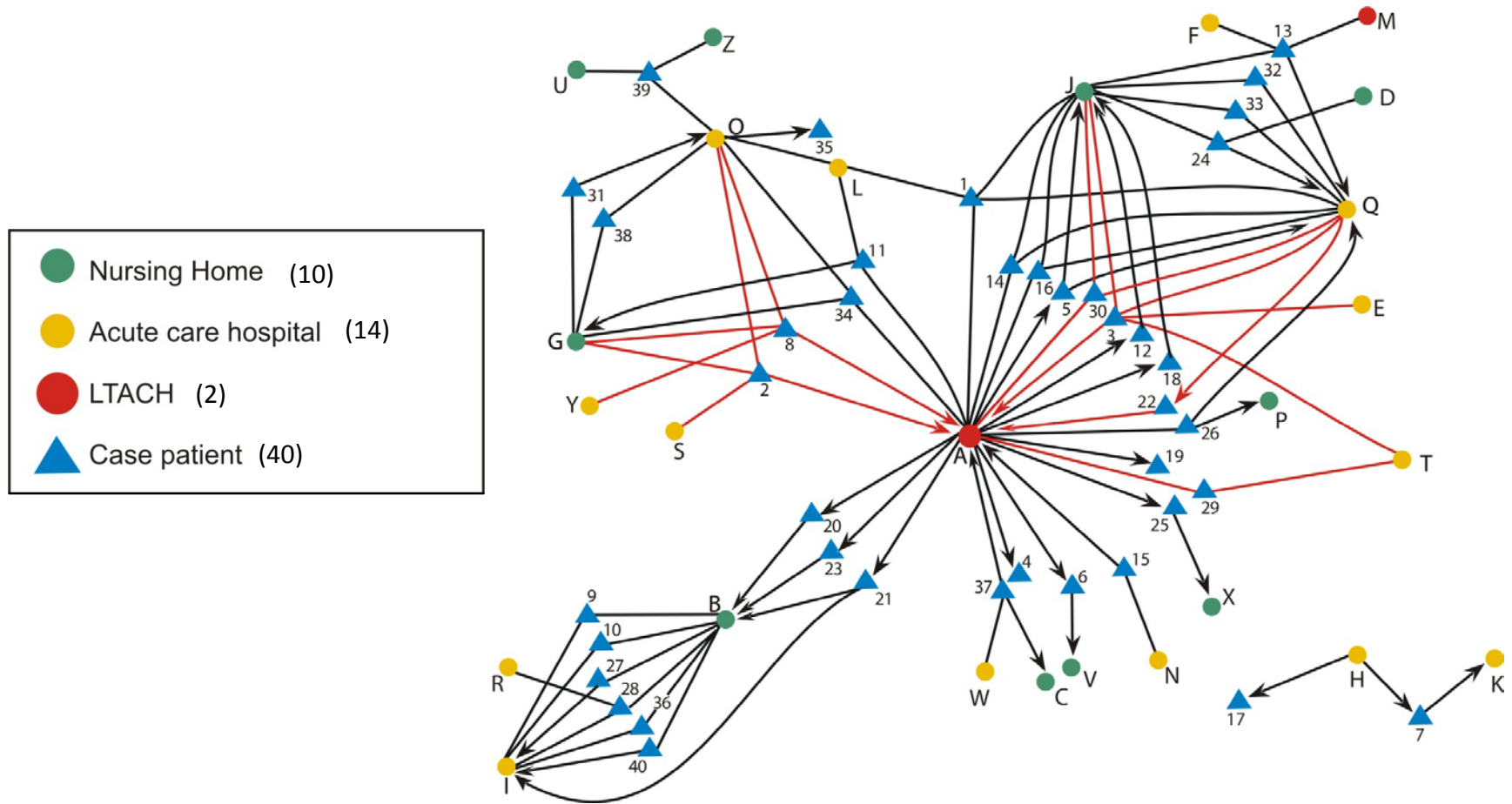
	MIC mcg/ml	MIC INTERP	MIC mcg/ml	ET INTERP
TRIMETH/SULFA	>2/38	RESISTNT		
CEFAZOLIN	>16	RESISTNT		
TIGECYCLINE			1.00	SUSCEPT
LEVOFLOXACIN	>4	RESISTNT		
CEFOXITIN	16	INTERMED		
PIP/TAZOBACTAM	>64	RESISTNT		
TICARCIL/K CLAV	>64	RESISTNT		
CEFTRIAZONE	>32	RESISTNT		
GENTAMICIN	<=4	SUSCEPT		
TOBRAMYCIN	>8	RESISTNT		
AMIKACIN	16	SUSCEPT		
IMIPENEM	8	RESISTNT		
MEROPENEM	>8	RESISTNT		
CEFEPIME	16	RESISTNT		
COLISTIN			.38	SUSCEPT
A ERTAPENEM	>4	RESISTNT		

Science of CRE: Epi and control

First two CRE cases in Chicago region (2007)

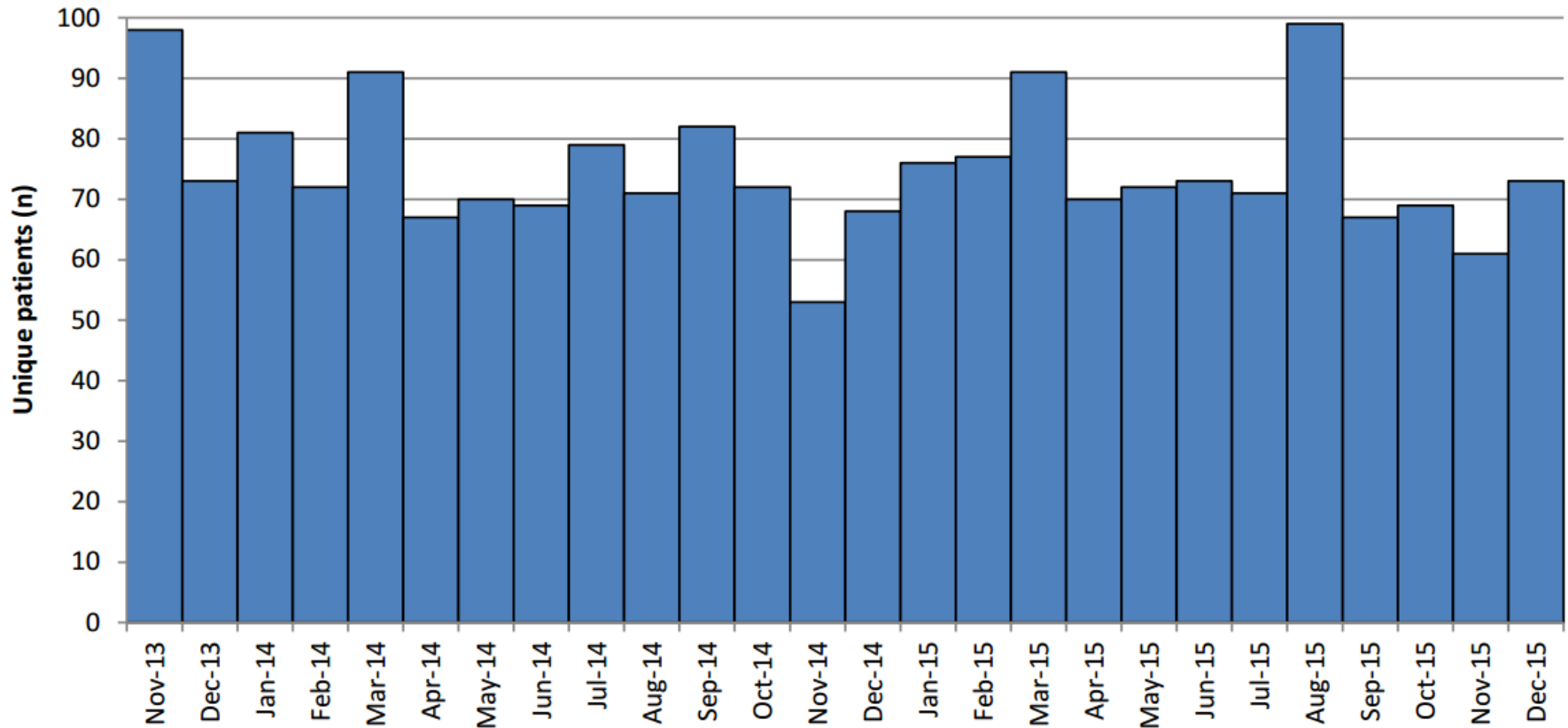


NW Indiana: Multi-Facility Outbreak



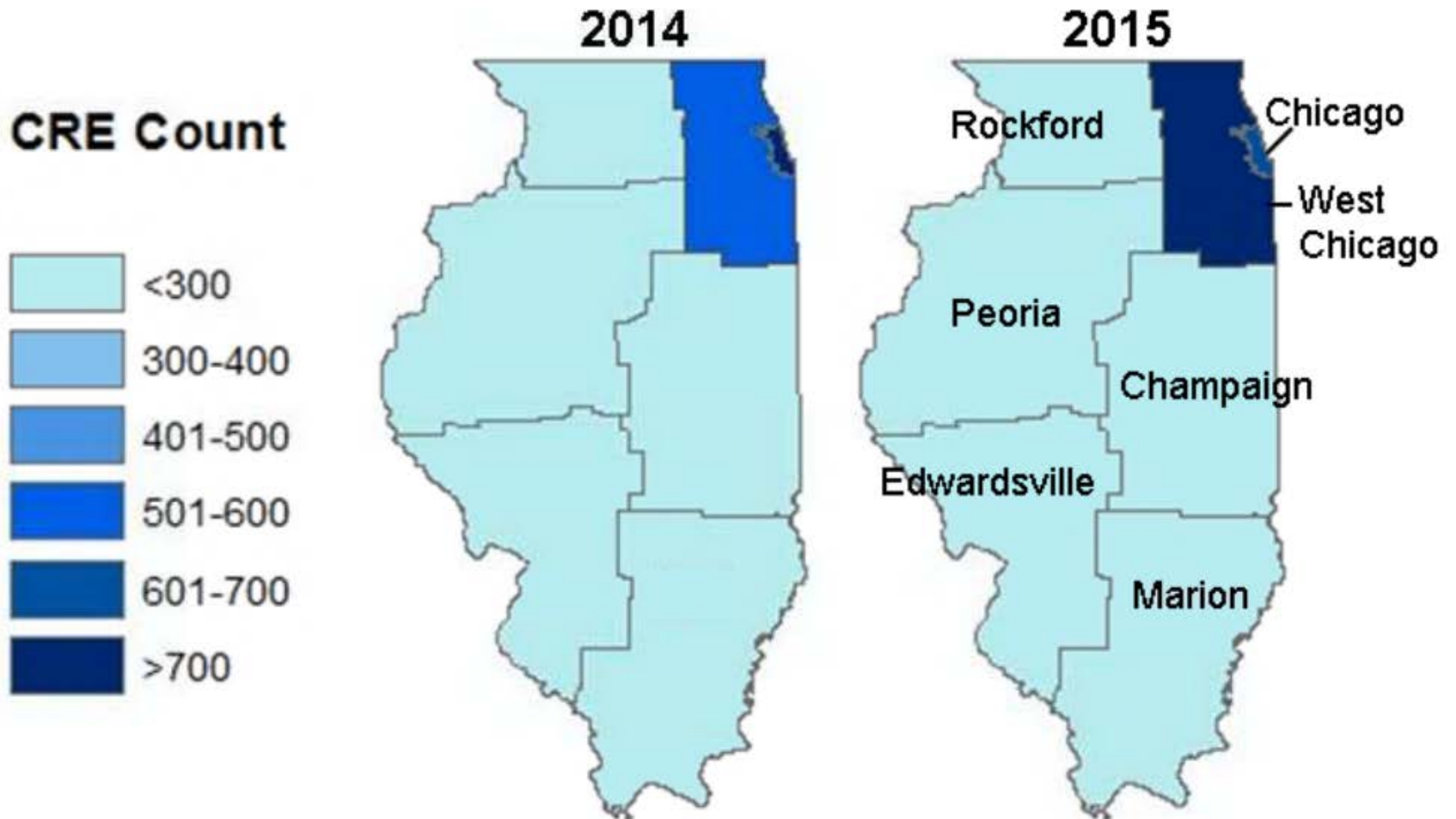
Won SY et al. CID 2011

New CRE patients, 50-100 every month

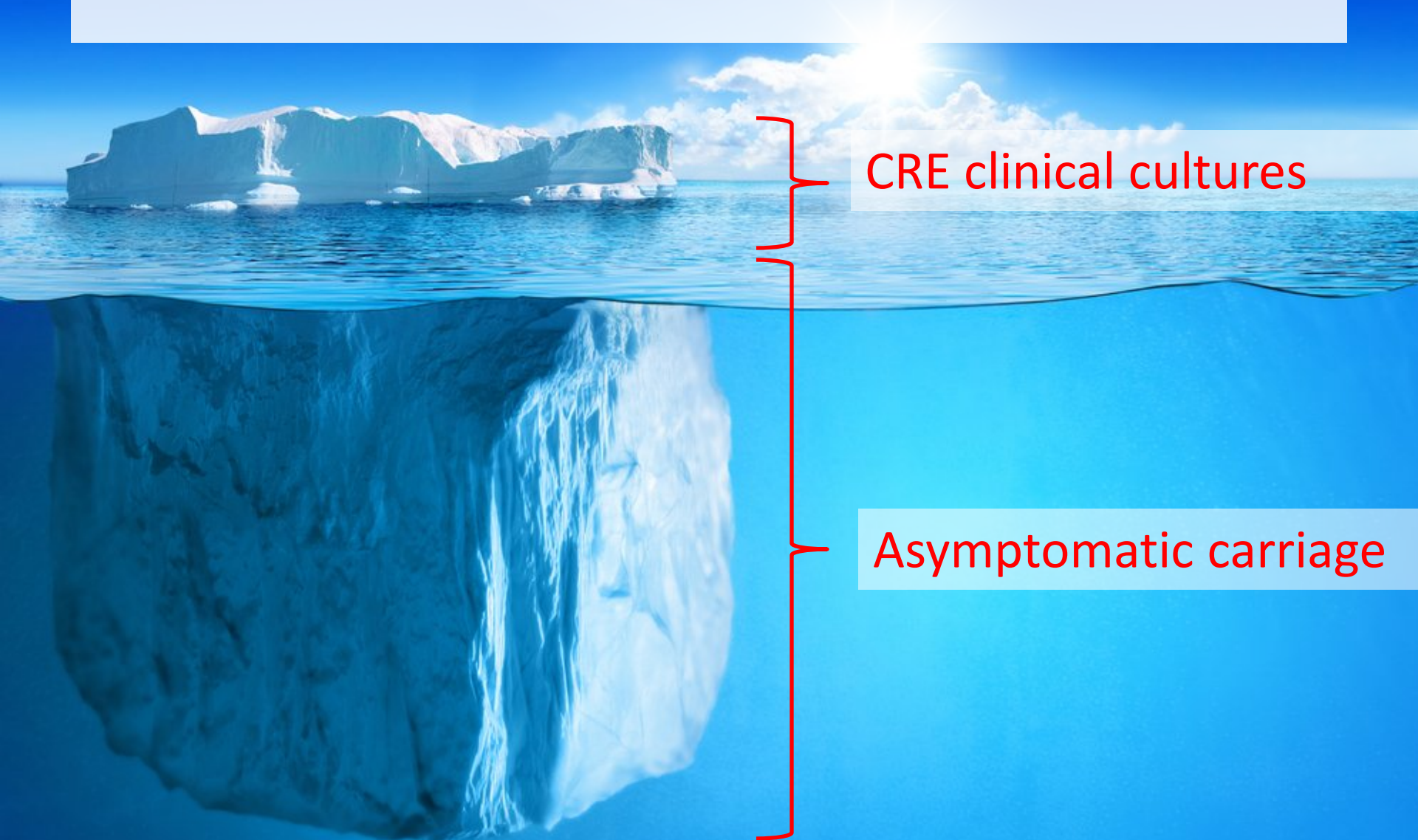


New CRE patients reported to the Illinois XDRO registry by date of earliest clinical culture, all facility types (N=1945)

CRE impacts Chicago region



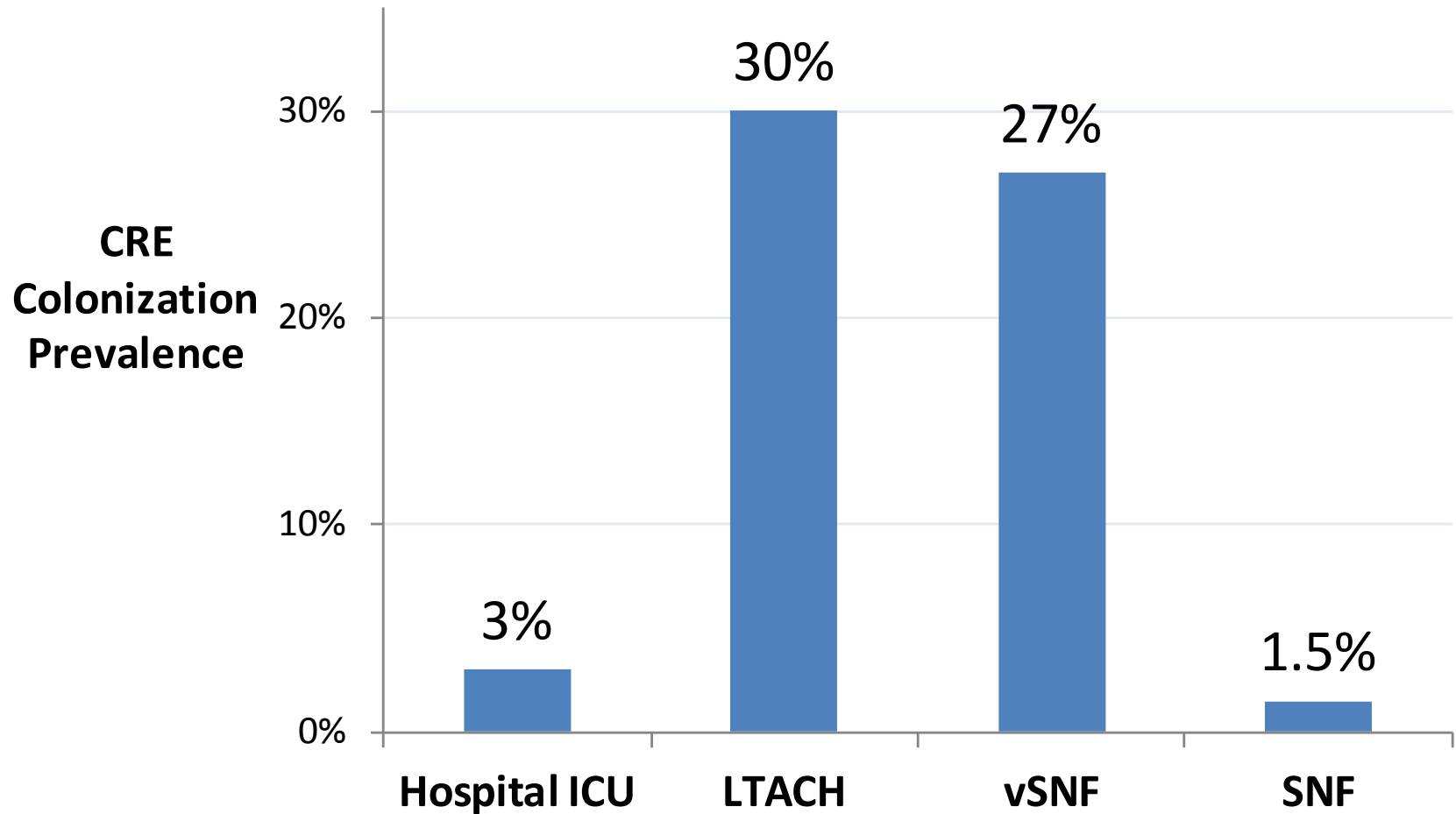
Resistance Iceberg



CRE clinical cultures

Asymptomatic carriage

Post-Acute Care Facilities: High Burden of CRE



¹ Lin MY et al, CID 2013 ; ² Prabaker K et al, ICHE 2012; unpublished REALM point prevalence surveys

Ventilator SNFs: 2016-17 REALM surveys

- Provide long-term care for residents with respiratory care needs (tracheostomy +/- mechanical ventilation)
- REALM point prevalence surveys (n=7)
 - Ventilator floor
 - 333 residents surveyed (95% participation)
 - 48% mechanical ventilation; 30% tracheostomy collar
 - 40% positive for any carbapenemase
 - Of CRE positive:
 - 49% known to facility
 - 62% in contact precautions

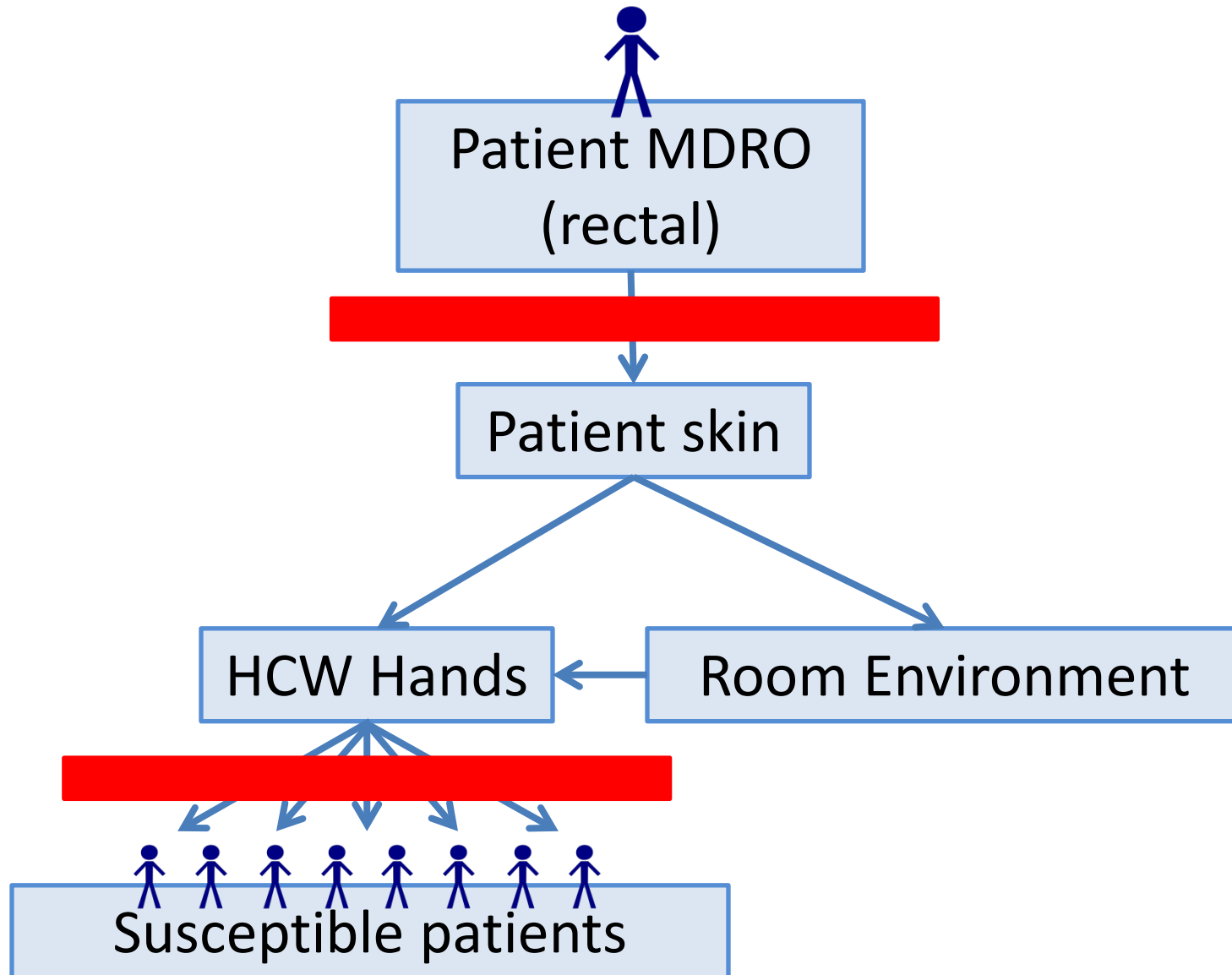
KPC	33%
NDM	3%
VIM	8%

Risk factors for CRE colonization

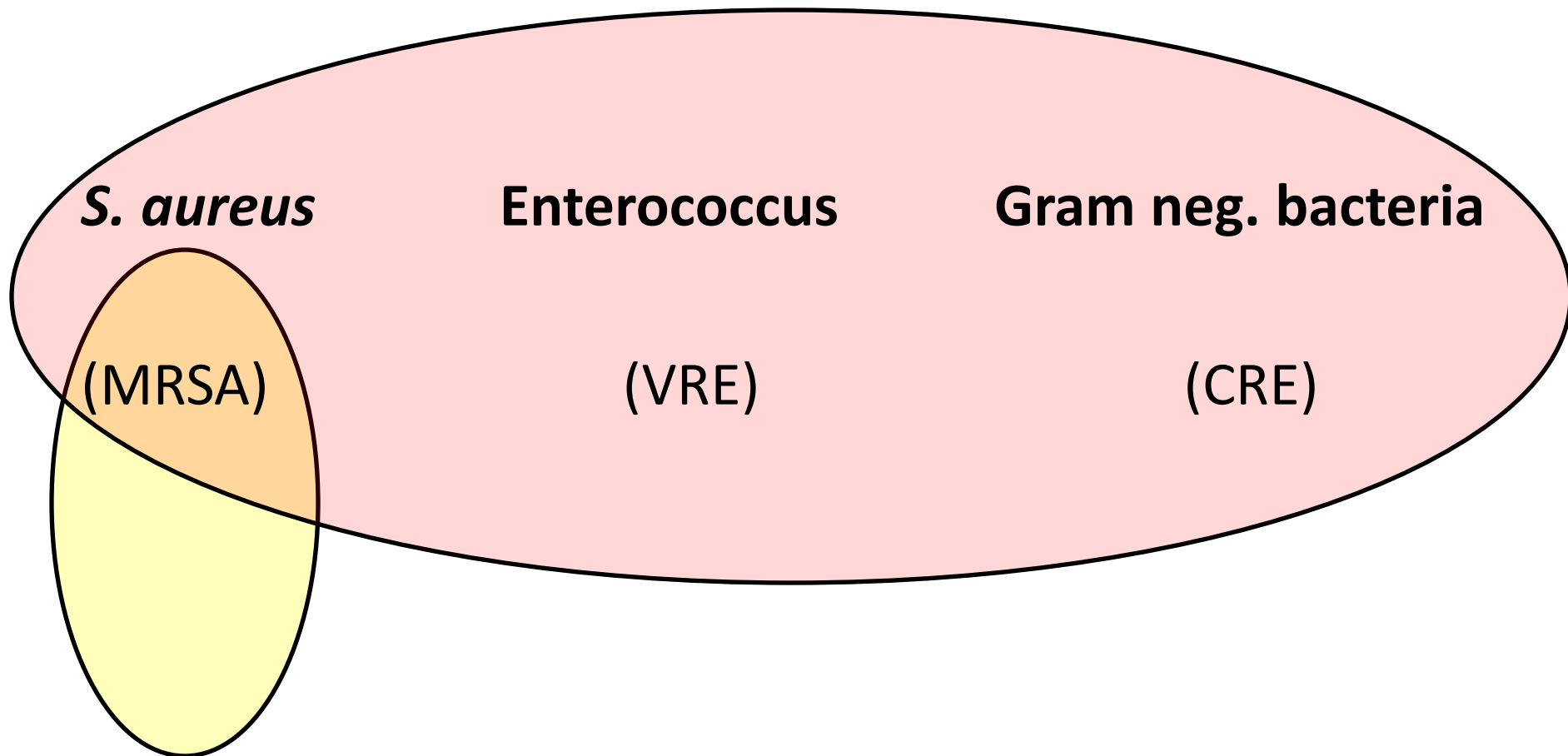
- Exposure to healthcare facilities
- Exposure to antibiotics
- **Respiratory care**; debilitation
- Older age
- Colonization pressure (high admission prevalence)

These risks are magnified in post-acute care facilities

Multidrug-resistant organism (MDRO) transmission



Controlling infections: Vertical vs. Horizontal Approach



Prevention of Colonization and Infection by *Klebsiella pneumoniae* Carbapenemase-Producing Enterobacteriaceae in Long-term Acute-Care Hospitals

Mary K. Hayden,^{1,2} Michael Y. Lin,¹ Karen Lolans,² Shayna Weiner,¹ Donald Blom,¹ Nicholas M. Moore,³ Louis Fogg,⁴ David Henry,⁵ Rosie Lyles,⁶ Caroline Thurlow,¹ Monica Sikka,¹ David Hines,⁷ and Robert A. Weinstein^{1,6}; for the Centers for Disease Control and Prevention Epicenters Program

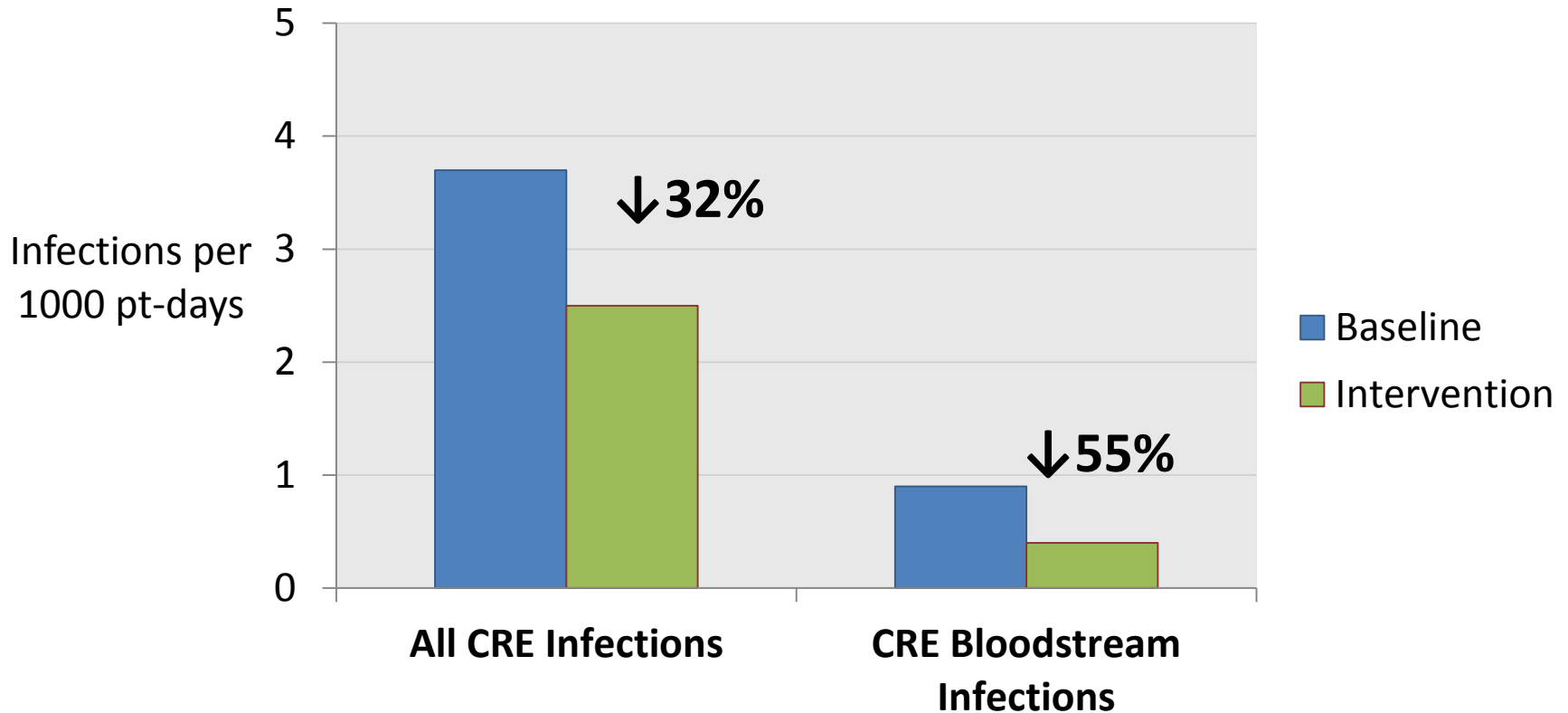
Departments of ¹Medicine, Division of Infectious Diseases, ²Pathology, ³Medical Laboratory Science, and ⁴Nursing, Rush University Medical Center, ⁵Department of Biostatistics, University of Illinois School of Public Health, ⁶Department of Medicine, Division of Infectious Diseases, Cook County Health and Hospital System, and ⁷Metro Infectious Disease Consultants LLC, Chicago, Illinois

CRE Prevention Bundle:

1. Rectal screening for CRE
2. Precautions (Contact; Cohorting)
3. Daily bathing with chlorhexidine
4. Hand hygiene / HCW education

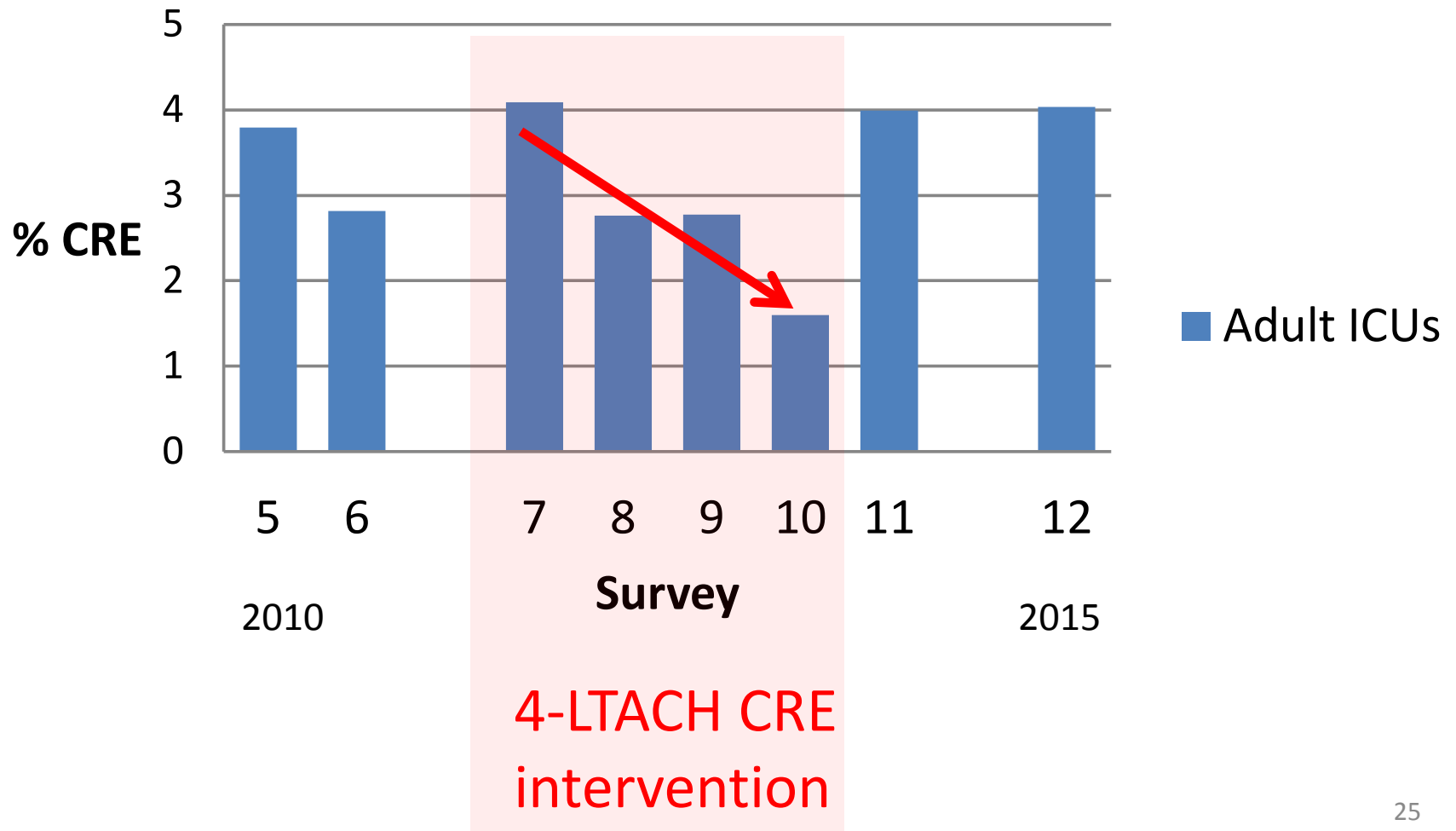
} Horizontal measures

CRE prevention bundle prevented infection

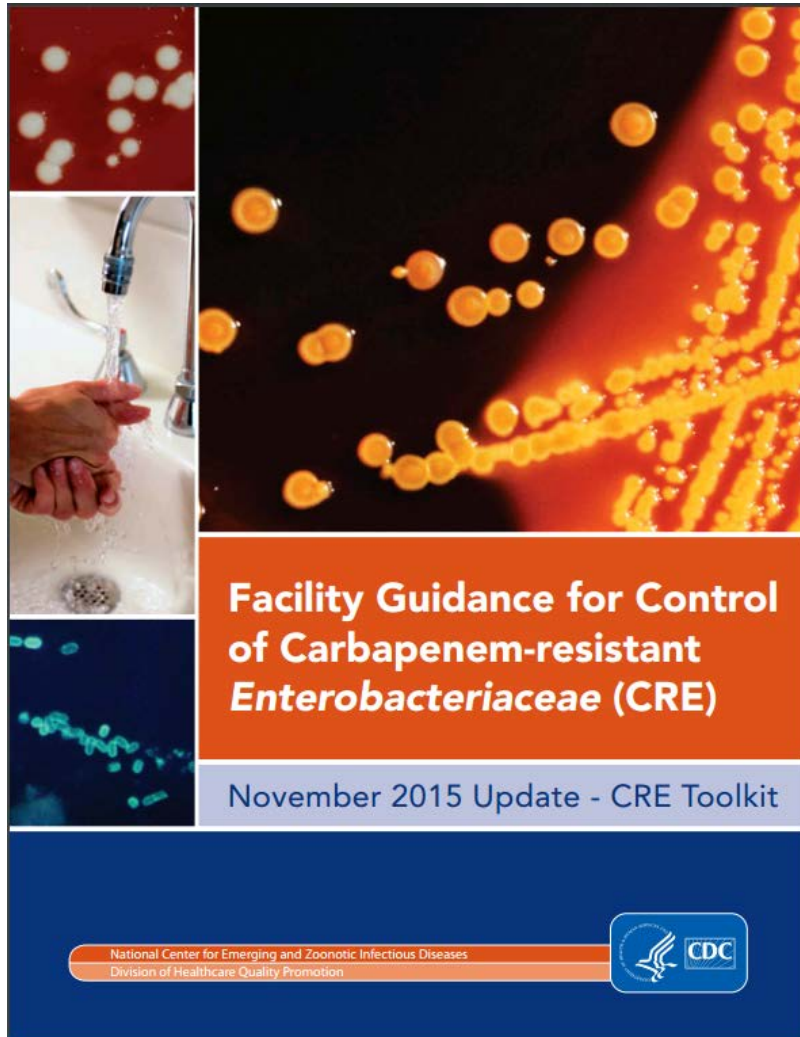


- CRE transmission: ↓50%
- Bloodstream infections due to *all pathogens*: ↓32%

Prevalence of CRE colonization among adult ICU patients



CDC's CRE Toolkit 2015



- Contains the latest science in CRE prevention
- **You can find CRE prevention bundle in this Toolkit**

<https://www.cdc.gov/hai/pdfs/cre/CRE-guidance-508.pdf>





Chicago PROTECT

- Aim: To decrease CRE transmission in a region by targeting facilities at high risk of CRE exposure and improving inter-facility communication among all facilities

Intervention	Post-Acute Care Facilities (n=15)	Hospitals (n=24+)
CRE prevention bundle	X	
XDRO registry optimization	X	X

Timeline

Year	Aims
1	<u>Preparation phase</u> : Design and recruitment
2 – 3	<u>Intervention phase</u> : Implement CRE prevention bundle at participating facilities + XDRO registry optimization
4	Analysis and reporting of results

Chicago PROTECT CRE bundle for post-acute care facilities (LTACHs/vSNFs)

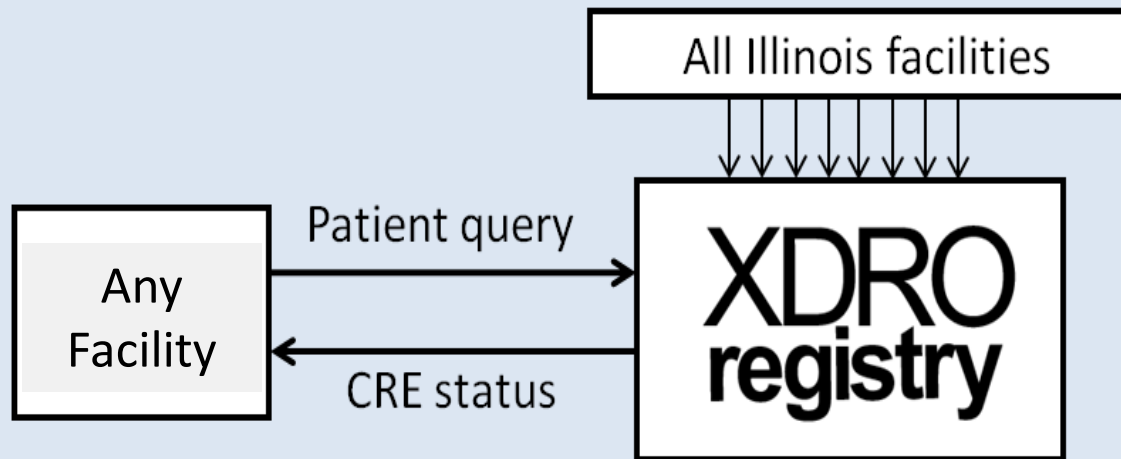
Four components

1. Screening for CRE
2. Precautions (Contact Precautions; Cohorting)
3. Daily bathing with chlorhexidine
4. Hand Hygiene / Healthcare worker education

Horizontal
measures

XDRO Registry

1. Mandatory CRE reporting

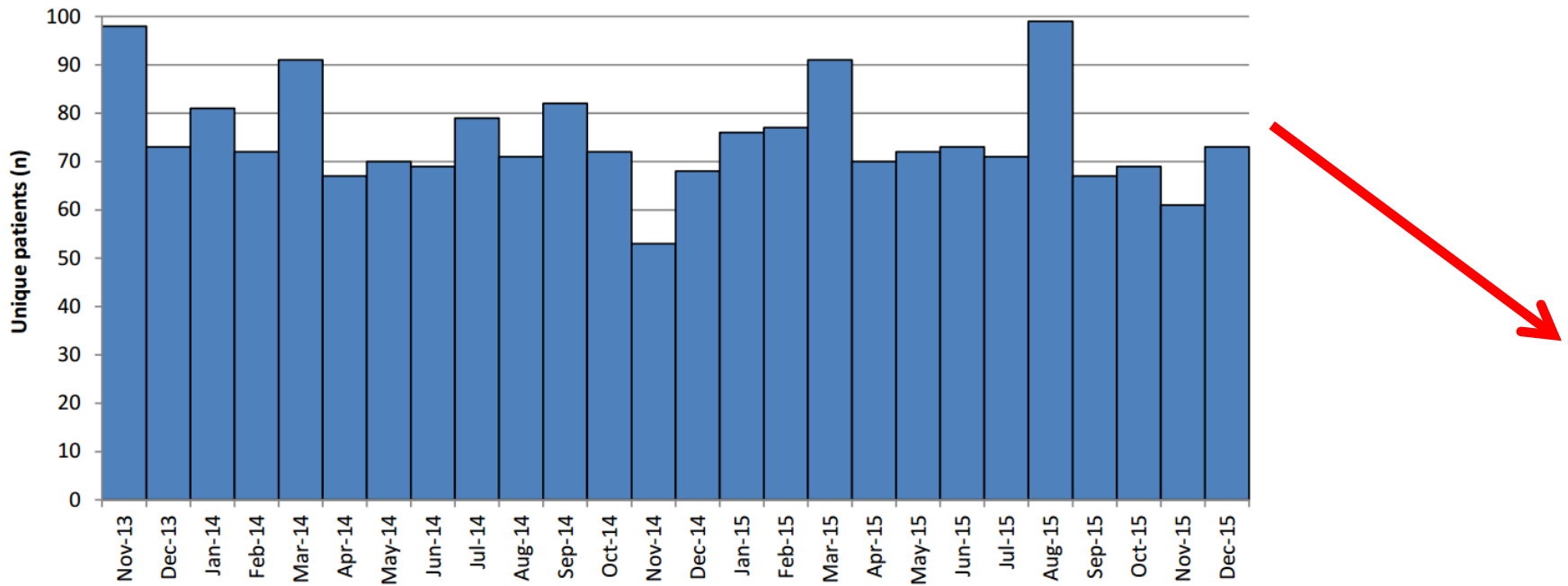


2. CRE information exchange (inter-facility communication)

Hospital priority list for XDRO registry auto-alerts

- Rank based on following factors:
 - Connectedness to other hospitals (60% weight)
 - Number of patients shared with LTACHs (30%)
 - CRE burden (10% weight)

Goal is to reduce CRE incidence



Chicago PROTECT action items

- **Post-acute care facilities (LTACHs/vSNFs)**
 - Recruitment on-going
 - CRE prevention bundle intervention starting July 2017 and continuing for 2 years
- **Hospitals**
 - IDPH is contacting hospitals to sign up for XDRO registry
 - Chicago hospitals: Participate in REALM point prevalence surveys (next up Fall 2017)

Acknowledgements

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**Hospital/LTACH/Skilled nursing
facility administrators, infection
preventionists, and front line staff**

Thank you

Questions?

Michael Lin, MD MPH

Michael_Lin@rush.edu

312-942-4811