

An Update on Multidrug Resistant Gram Negative Bacteria

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No Disclosures

2011-2015 Case Definition

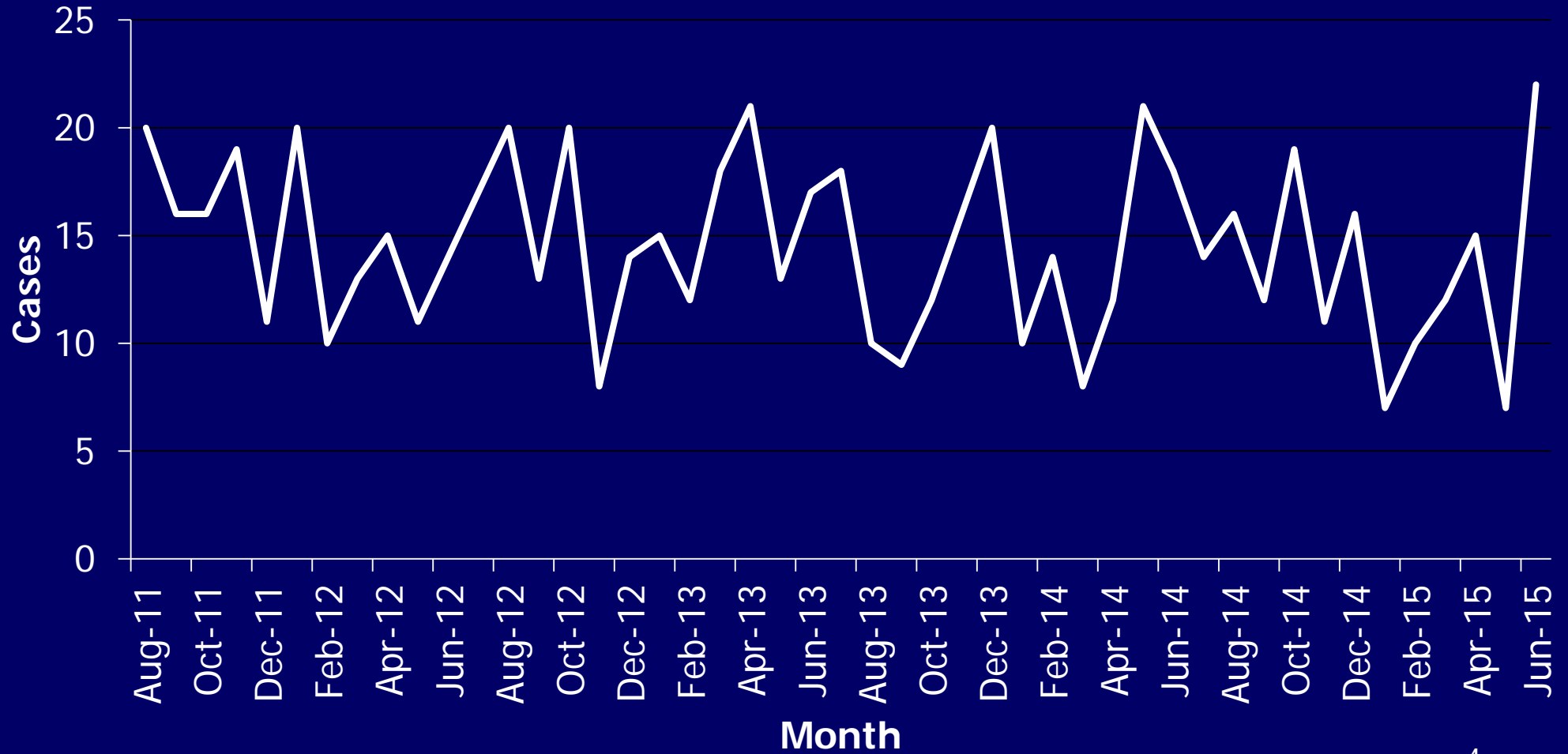
Category	Organism	Carbapenem susceptibility phenotype
Carbapenem-nonsusceptible Enterobacteriaceae	<i>Escherichia coli</i> <i>Klebsiella pneumoniae</i> <i>Klebsiella oxytoca</i> <i>Enterobacter cloacae</i> <i>Enterobacter aerogenes</i>	Intermediate or resistant to: Imipenem (MIC >1), Meropenem (MIC >1), or Doripenem (MIC >1) AND resistant to: Ceftazidime (MIC >8), Ceftriaxone (MIC >2), and Cefotaxime (MIC >2)
Carbapenem-nonsusceptible <i>Acinetobacter baumannii</i>	<i>Acinetobacter baumannii</i> <i>Acinetobacter baumannii</i> complex <i>Acinetobacter calcoaceticus-baumannii</i> complex	Intermediate or resistant to: Imipenem (MIC >4), Meropenem (MIC >4), or Doripenem (MIC >1)

Specimens: urine and normally sterile sites

Patients: HD3 resident

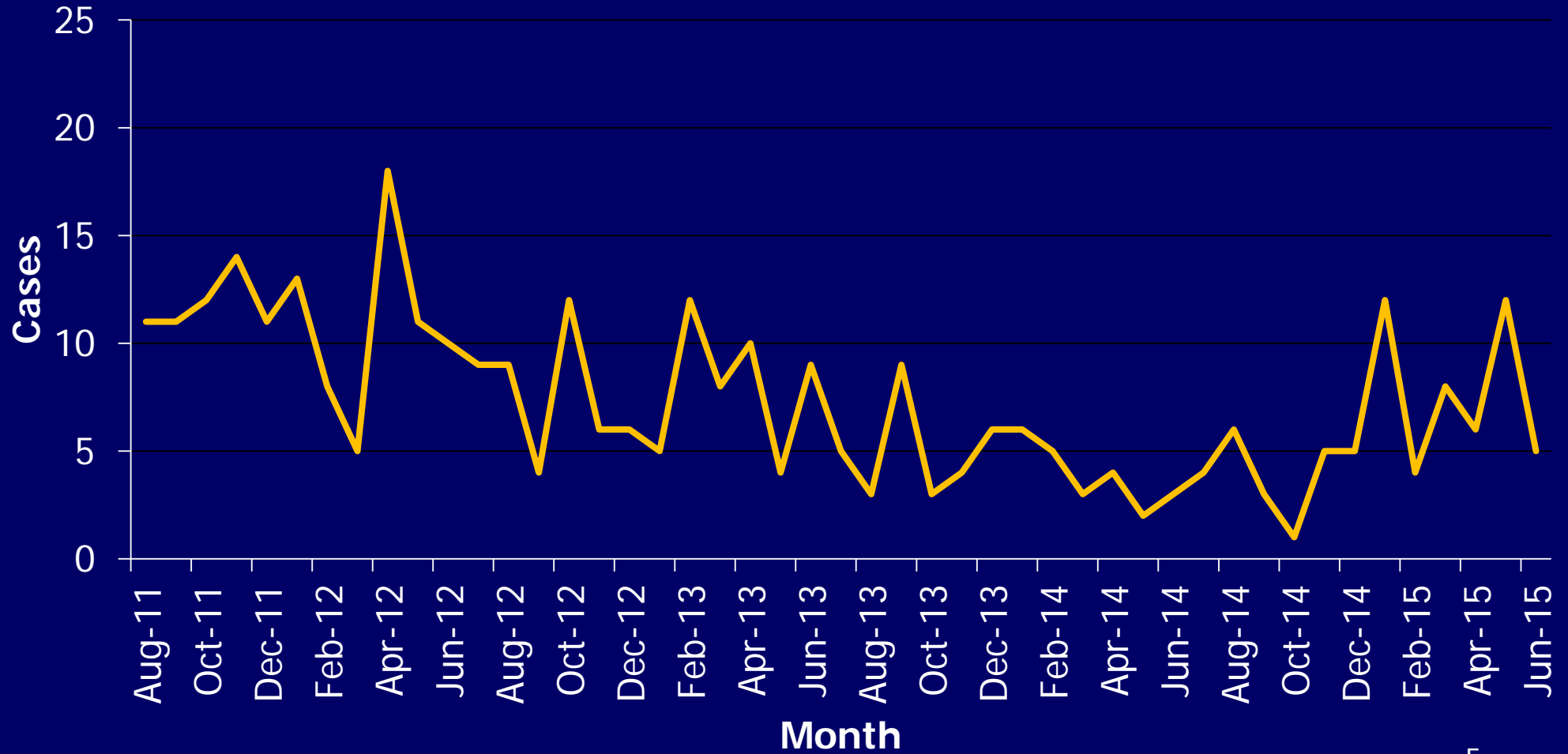
CRE

Atlanta, Aug 2011– Jun 2015



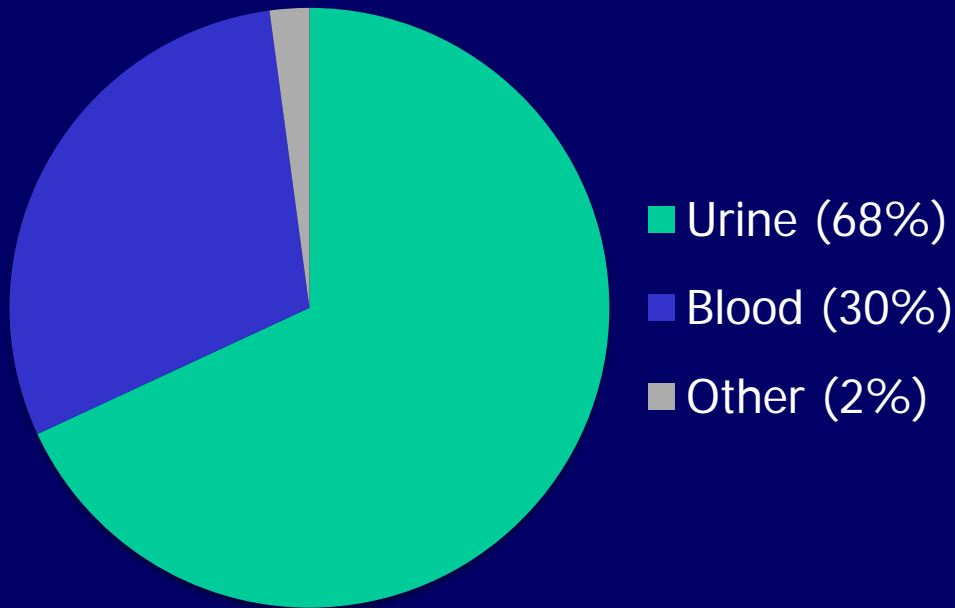
CRAB

Atlanta, Aug 2011 – Jun 2015

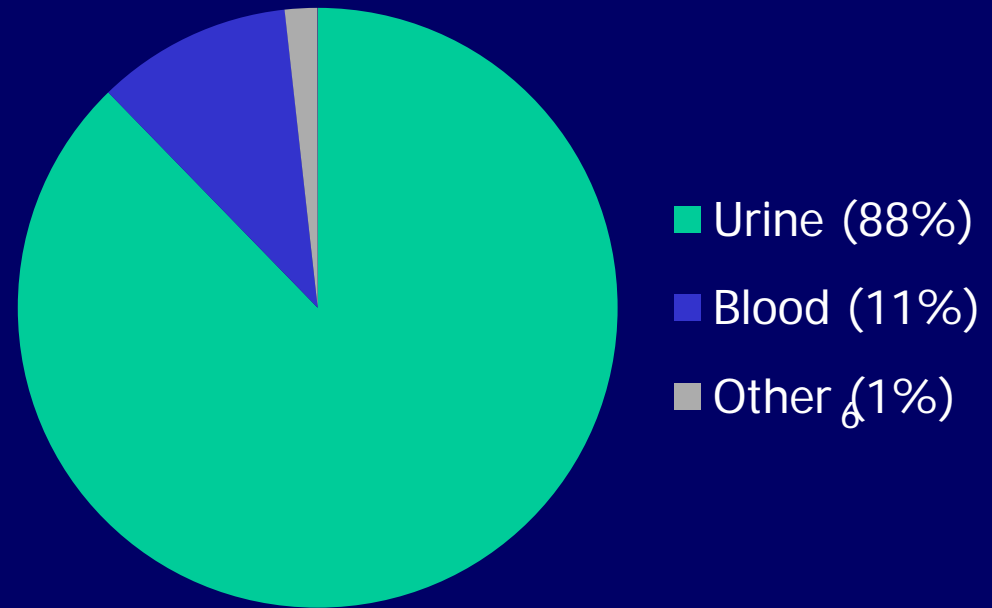


Source and Organism, Georgia, 2014

Acinetobacter, n=47

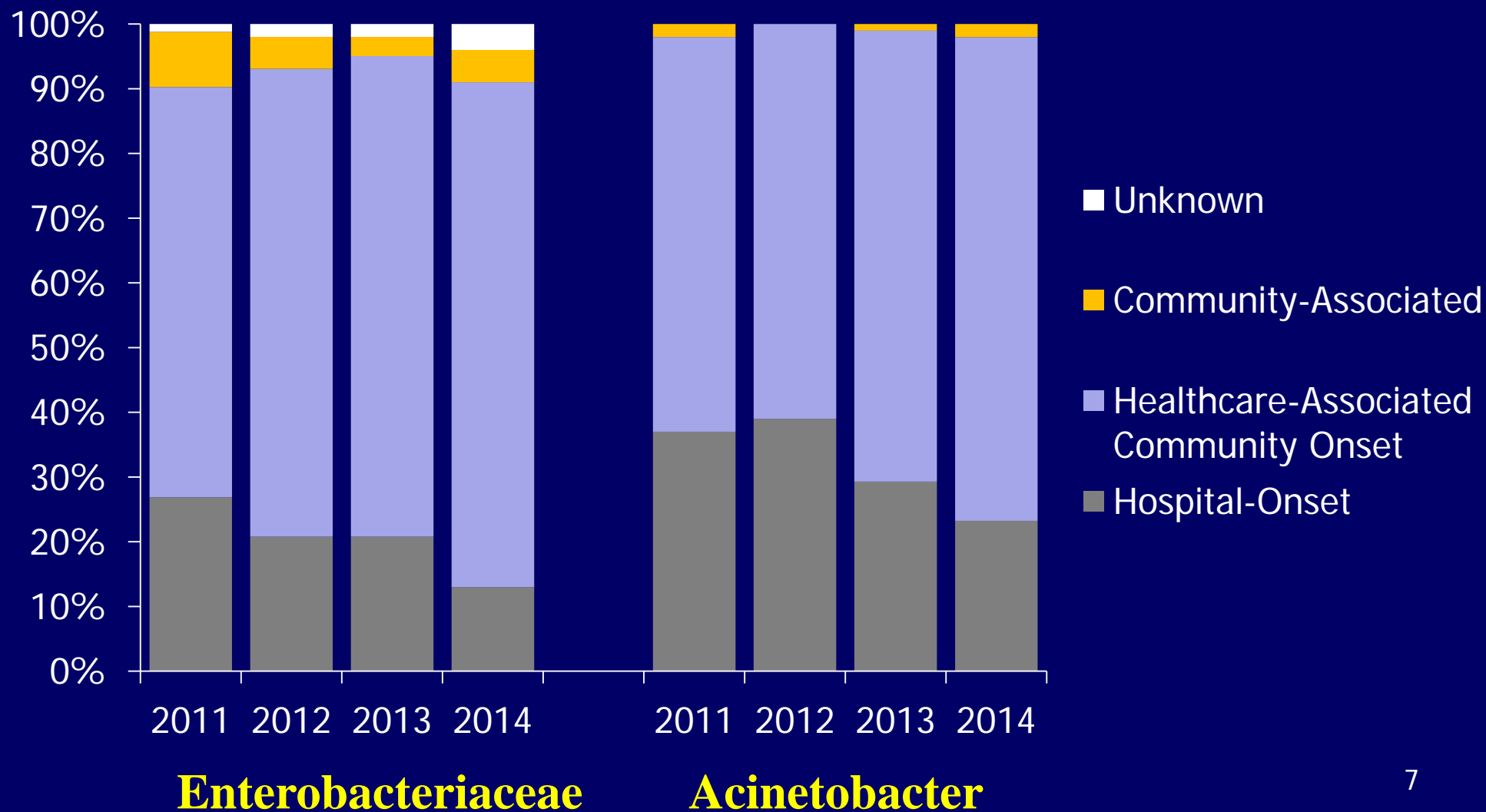


Enterobacteriaceae, n=171



4 other sources: 2 pleural, 1 synovial fluid, 1 bone

Time of Onset of CRE, Georgia Aug 2011 – Dec 2014



CRE in 7 EIPs, 2012-2013

Organism Distribution

Emerging Infections Program Site	Total No.	CRE Organism or Isolate, No. (%)				
		<i>Enterobacter aerogenes</i>	<i>Enterobacter cloacae</i> Complex	<i>Escherichia coli</i>	<i>Klebsiella pneumoniae</i>	<i>Klebsiella oxytoca</i>
Colorado ^b	27	7 (25.9)	10 (37.0)	3 (11.1)	7 (25.9)	0
Georgia	356	22 (6.2)	38 (10.7)	56 (15.7)	235 (66.0)	5 (1.4)
Maryland ^b	92	8 (8.7)	6 (6.5)	9 (9.8)	69 (75.0)	0
Minnesota	71	29 (40.8)	16 (22.5)	10 (14.1)	16 (22.5)	0
New Mexico ^b	6	2 (33.3)	0	3 (50.0)	1 (16.7)	0
New York ^b	27	3 (11.1)	2 (7.4)	5 (18.5)	17 (63.0)	0
Oregon	20	4 (20.0)	7 (35.0)	3 (15.0)	6 (30.0)	0
Total	599	75 (12.5)	79 (13.2)	89 (14.9)	351 (58.6)	5 (0.8)

CRE in 7 EIPs, 2012-2013

Carbapenemase Production

Emerging Infections Program Site	Total No.	Isolates Submitted for Carbapenemase Testing	No. of Carbapenemase-Producing Isolates/Total No. of Isolates Submitted for Testing (%) ^a
Colorado ^b	27	16 (59.3)	5/16 (31.3)
Georgia	356	75 (21.1)	48/75 (64.0)
Maryland ^b	92	17 (18.5)	13/17 (76.5)
Minnesota	71	58 (81.7)	17/58 (29.3)
New Mexico ^b	6	^c	^c
New York ^b	27	9 (33.3)	5/9 (55.6)
Oregon	20	13 (65.0)	2/13 (15.4)
Total	599	188 (31.4)	90/188 (47.9)

CRE in 7 EIPs, 2012-2013

Incidence Rates

Emerging Infections Program Site	Incident CRE Cases ^a			
	No. of Cases		Crude Annual Incidence Rate/100 000 Population	
	2012 ^b	2013	2012 ^b	2013
Colorado		27		1.05
Georgia	175	181	4.58	4.68
Maryland		92		4.80
Minnesota	31	40	1.82	2.32
New Mexico		6		0.89
New York		27		3.60
Oregon	6	14	0.35	0.82
Total	212	387	2.94	2.93

Collection Location	
Short-stay acute care hospital	198/584 (33.9)
Outside acute care hospital	386/584 (66.1)
Outpatient setting or emergency department	253/386 (65.5)
Long-term care facility	104/386 (26.9)
Long-term acute care facility	29/386 (7.5)
Culture Source	
Urine	520/599 (86.8)
Blood ^a	68/599 (11.4)
Peritoneal fluid	8/599 (1.3)
Pleural fluid	3/599 (0.5)
Other normally sterile sites	7/599 (1.2)
Infection Types	
Lower urinary tract infection	392/559 (70.0)
Bacteremia	68/559 (12.2)
Septic shock	17/559 (3.0)
Pneumonia	16/559 (2.9)
Other infection types ^b	47/559 (8.4)

Health Care Exposures During Prior Year

Acute care hospitalization	399/531 (75.1)
Resident of a long-term care facility	259/531 (48.8)
Admission to a long-term acute care hospital ^c	42/318 (13.2)
Inpatient or outpatient surgery	194/531 (36.5)
Current maintenance dialysis	60/531 (11.3)
Indwelling device (2 calendar days prior to culture)	382/525 (72.8)
Urinary catheter	285/382 (74.6)
Central venous catheter	163/382 (42.7)
Gastrostomy or jejunostomy tube	151/382 (39.2)
Trachoestomy	120/382 (31.4)
Other device	81/382 (21.2)

2011-2015 Case Definition

Category	Organism	Carbapenem susceptibility phenotype
Carbapenem-nonsusceptible Enterobacteriaceae	<i>Escherichia coli</i> <i>Klebsiella pneumoniae</i> <i>Klebsiella oxytoca</i> <i>Enterobacter cloacae</i> <i>Enterobacter aerogenes</i>	Intermediate or resistant to: Imipenem (MIC >1), Meropenem (MIC >1), or Doripenem (MIC >1) AND resistant to: Ceftazidime (MIC >8), Ceftriaxone (MIC >2), and Cefotaxime (MIC >2)

Specimens: urine and normally sterile sites

Patients: HD3 resident

2016 Case Definition

Category	Organism	Carbapenem susceptibility phenotype
Carbapenem-nonsusceptible Enterobacteriaceae	<i>Escherichia coli</i> <i>Klebsiella pneumoniae</i> <i>Klebsiella oxytoca</i> <i>Enterobacter cloacae</i> <i>Enterobacter aerogenes</i>	Intermediate or resistant to: Imipenem (MIC >4 2), Meropenem (MIC >4 2), Doripenem (MIC >4 2) or Ertapenem (MIC >1) AND resistant to: Ceftazidime (MIC >8), Ceftriaxone (MIC >2), and Cefotaxime (MIC >2)

Specimens: urine and normally sterile sites

Patients: HD3 resident

CRE Definitions Study

Table 1. Summary of 11 phenotype-based definitions evaluated for reliability in identifying carbapenemase producers among carbapenem-resistant *Enterobacteriaceae*, United States, January 1, 2011–January 30, 2014*

Antimicrobial included	Study inclusion criteria	Definition†										
		1	2	3	4	5	6	7	8	9	10	11
Any carbapenem‡	NS				R		R	R		NS§	R	
Any carbapenem (without ertapenem)		NS	NS	NS		R						NS
≥2 carbapenems‡									NS§			
All third-generation cephalosporins tested			R				R					
Any third-generation cephalosporins tested				R				R				
Cefepime										R	R	R

CRE Definitions Study



Table 3. False-positive and selected false-negative results in a study evaluating phenotype-based definitions for reliability in identifying carbapenemase producers among carbapenem-resistant enterobacterial isolates from 6 US Emerging Infections Program sites, January 1, 2011–January 30, 2014

Result	No. isolates/no. tested (%), by definition no., N = 307*										
	1	2	3	4	5	6	7	8	9	10	11
False-positive	117/307 (38.1)	82/307 (26.7)	91/307 (29.6)	169/307 (55.0)	57/307 (18.6)	146/307 (47.6)	153/307 (49.8)	60/307 (19.5)	37/307 (12.1)	34/307 (11.1)	17/307 (5.5)
Selected false-negative	12/307 (3.9)	15/307 (4.9)	13/307 (4.2)	2/307 (0.7)	17/307 (5.5)	7/307 (2.3)	4/307 (1.3)	27/307 (8.8)	85/307 (27.7)	85/307 (27.7)	85/307 (27.7)

*False-positive isolates are those meeting the definition but not found to produce a carbapenemase. Selected false-negative isolates were selected on the basis of nonsusceptibility to ≥ 1 carbapenem not meeting the definition but found to produce a carbapenemase. Definitions: 1, nonsusceptible to any

CRE Definitions Study

Result	1	2	3	4
False-positive	117/307 (38.1)	82/307 (26.7)	91/307 (29.6)	169/307 (55.0)
Selected false-negative	12/307 (3.9)	15/307 (4.9)	13/307 (4.2)	2/307 (0.7)

CRE Definition Change

- Definition 4 (R to any carbapenem) used by
 - National Healthcare Safety Network
 - Council of State and Territorial Epidemiologists
- Public health interest in carbapenem-resistance, not carbapenemase-production

CRE Lab Practices in Georgia

- Lab survey, Nov 2015
 - 14/24 labs use the modified Hodge test
 - No labs are doing PCR routinely
 - How many labs using 2010 or later CLSI breakpoints for CRE?
- Infection prevention
 - How many isolate for CRE?
 - How many screen for CRE?

MULTIDRUG-RESISTANT PSEUDOMONAS AERUGINOSA



6,700

MULTIDRUG-RESISTANT
PSEUDOMONAS
INFECTIONS



440

DEATHS



51,000

PSEUDOMONAS
INFECTIONS
PER YEAR

THREAT LEVEL
SERIOUS



This bacteria is a serious concern and requires prompt and sustained action to ensure the problem does not grow.

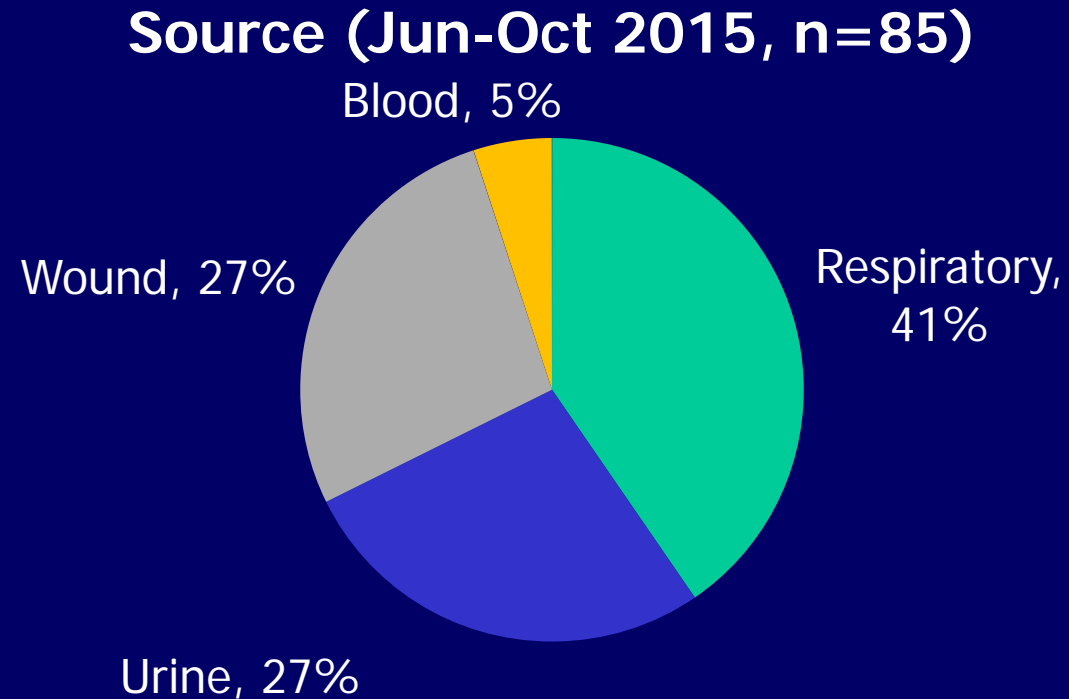
- ~8% of all infections in CDC surveillance (NHSN)
 - Pneumonia, surgical site, and bloodstream infections
 - 13% of severe infections are multidrug resistant
- Intrinsically resistant to many commonly used antibiotics via multiple resistance mechanisms

Pseudomonas Surveillance Pilot

- Sentinel surveillance in two labs in HD3
- Case definition
 - Isolation of carbapenem resistant *P. aeruginosa* from any specimen source except stool, rectal, or nasal swabs.

Pseudomonas Pilot Data from 2 Sentinel Sites in Georgia

Month	N	Carbapenem Resistant	
6-2015	134	17	(12.7%)
7-2015	139	16	(11.5%)
8-2015	132	16	(12.1%)
9-2015	157	25	(15.9%)
10-2015	138	11	(8.0%)
11-2015	140	15	(10.7%)
TOTAL	840	100	(11.9%)



2016 Case Definition

Category	Organism	Carbapenem susceptibility phenotype
Carbapenem-Resistant <i>Pseudomonas aeruginosa</i>	<i>Pseudomonas aeruginosa</i>	Resistant to: Imipenem (MIC >4), Meropenem (MIC >4), or Doripenem (MIC >4)

Specimens: to be determined

Patients: HD3 resident

- Tentatively starting July 2016
- No change to your workflow
- Please put any carbapenem-resistant organism in EIP bin
- Updates to queries (and alerts) coming soon

Summary

- Georgia has a high but stable incidence of CRE compared to other regions in the US
- Most CRE associated with healthcare
- New surveillance definitions for CRE
 - Better sensitivity and alignment
 - No changes to your workflow
- New surveillance for carbapenem resistance in *Pseudomonas* to better define the problem

Acknowledgements

- Chris Bower
- MuGSI Team in GA
 - Surveillance Officers
 - Labs, IPs
- THANK YOU!