Antibiotic Stewardship in Maryland

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MARYLAND Department of Health

MISSION AND VISION

MISSION

The mission of the Prevention and Health Promotion Administration is to protect, promote and improve the health and well-being of all Marylanders and their families through provision of public health leadership and through community-based public health efforts in partnership with local health departments, providers, community based organizations, and public and private sector agencies, giving special attention to at-risk and vulnerable populations.

VISION

The Prevention and Health Promotion Administration envisions a future in which all Marylanders and their families enjoy optimal health and well-being.

Why Antibiotic Stewardship in Maryland?

1. Antibiotic stewardship works!
   - Less resistance, fewer *C. diff* infections, improved outcomes and reduced cost

2. Maryland has a high rate of inpatient antibiotic use (54% vs. 49.9%) and high rates of antibiotic resistance:
   - Over half (1,376) of inpatients on antimicrobials on survey day from 21 MD hospitals May-Aug 2011
   - Top 5 administered antimicrobials:

Antimicrobial	N (%)
Vancomycin	208 (15)
Piperacillin/Tazobactam	124 (9)
Ceftriaxone	120 (9)
Cefazolin	114 (8)
Levofloxacin	94 (7)

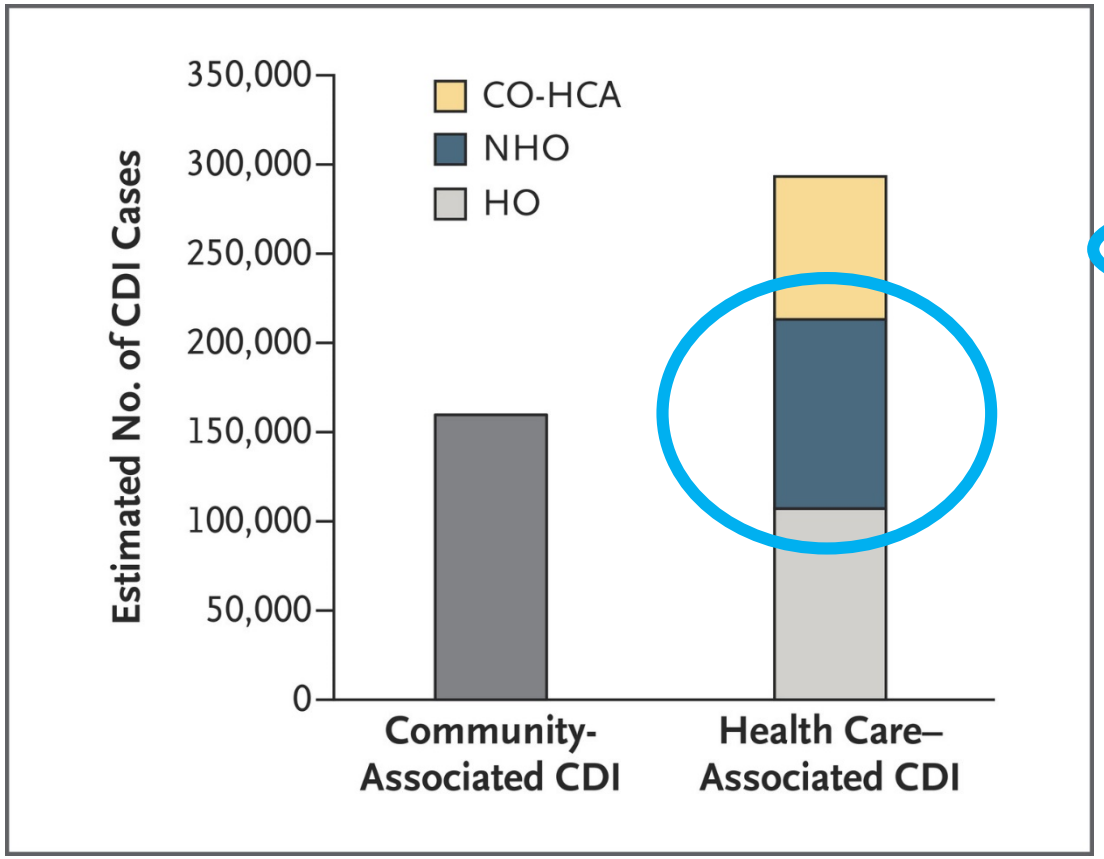
Magill et al, *Multistate point prevalence survey of health care associated infections*, NEJM, 2014, 370(13):1198-208

Why Antibiotic Stewardship in Maryland?

- **CRE (carbapenem resistant Enterobacteriaceae)**[1]
  - State of MD required CRE surveillance: 599 (2014) and 791 (2015) unique pts
  - 2013 statewide aggregate antibiogram: high level resistance to gram negative bacteria in all 5 regions of state
- ***Acinetobacter baumanii***[3]
  - 2010: 34% of mechanically ventilated pts infected/colonized (63% in LTC)
  - 24% of those ventilated were multidrug-resistant
- **CDI (*Clostridium difficile* infection)**[2]
  - Among 10 CDC Emerging Infections Program participating states for CDI surveillance, MD top 3 highest rates for both community and healthcare onset CDI
- **Extended Spectrum Beta Lactamase (ESBL)**
  - 2013 Maryland outbreak of ESBL-*E. coli* UTI showed 46% colonization on one unit

1. Status Report: Antibiotic Resistance in Maryland: Addressing the Urgent Threats: http://phpa.dhmh.maryland.gov/IDEHASharedDocuments/Status%20Report%20-%20Antibiotic%20Resistance%20in%20Maryland.pdf
2. Lessa et al, *Burden of Clostridium difficile infection in the U.S.*, NEJM, 2015:372:825-34.
3. Thom et al, *Assessing the burden of Acinetobacter baumannii in Maryland:* Infect Control Hosp Epidemiol.2012;33(9):883-8.

Estimated US burden of *C. difficile* by location of stool collection and inpatient healthcare exposure, 2011



CO-HCA = community-onset, healthcare–associated infection

NHO = nursing home-onset

HO = hospital-onset

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*Clostridioides difficile** in Maryland

2011-2015 = total 7,147 cases	
Healthcare facility onset (HCFO)	Total = 3,262 Hospitalized = 1,699 **LTCF = 1,535 (47%)**
Community Onset (CO)	Total = 3,696 Community associated = 2,291 Healthcare facility-associated = 1,296

*The bacterium formerly known as *Clostridium difficile*

Maryland survey of *Acinetobacter* infection in mechanically ventilated patients in acute and LTC facilities

	A. baumannii	MDR-*A. baumannii**
Acute care patients (n = 222)	36 (16%)	20 (9%)
LTCF patients (n = 136)	85 (63%)	67 (49%)
TOTAL (n = 358)	121 (34%)	87 (24%)

What is an ESBL?

- **E**xtended-**S**pectrum **B**eta-**L**actamase
- Enzymes commonly produced by Enterobacteriaceae (gram-negative bacteria that normally colonize the gut, and which can cause invasive infections in vulnerable patients)
- Mediate resistance to some of the antibiotics most commonly used to treat enteric bacteria (e.g. Cefotaxime, Ceftazidime, Ceftriaxone, Aztreonam)
- Don’t affect drugs like Cefoxitin, Imipenem or Meropenem because of different chemical structure
- Exposure to healthcare settings is a risk factor for ESBL colonization

ESBL treatment options

- Empiric therapy made complicated
  - 3rd-gen cephalosporins (normally used for serious CA infections) not effective
    - Delayed adequate therapy → increased risk of death

- Carbapenems (imipenem, meropenem, etc.) are drugs of choice
  - High cost
  - IV-only
  - May select for carbapenem-resistant strains (**CRE**)

Possible "outbreak" of antibiotic-resistant UTI?

- May 21: MDH notified by LHD of 4 residents from Facility A w/ UTI who tested (+) for ESBL-producing organisms since early in year
- May 28: 1 additional resident with ESBL
- June 14: 2 more residents with ESBL

Possible "outbreak" of antibiotic-resistant UTI?

- Cases located on the same floor, same unit of Facility A
- Symptoms included dysuria, hematuria, lethargy, vomiting, altered mental status, increase in falls
- Cultures taken from urine specimens
- Organisms: *Proteus mirabilis*, *Escherichia coli*

What's going on?

- Did the number of UTI's risen above baseline? Was this an outbreak?
- Were the ESBL-producing organisms for all affected residents similar? Was it being transmitted among the residents?
- What recommendations could be made to stop transmission and end this "outbreak"?
- What considerations should be made for empiric treatment of UTI in the facility?

Antibiogram of urine cultures

					Cephalosporins, Monobactam								Penicillins		Quinolones				Penicillin Combinations				Aminoglycosides			Cephamycins, Carbapenems		
Cases	**Unit**	**Cx date**	**Spec Type**	**Organism**	**Cefazolin**	**Cephalothin**	**Cefuroxime**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Aztreonam**	**Ampicillin**	**Piperacillin**	**Ciprofloxacin**	**Levofloxacin**	**Tetracycline**	**Trimeth/Sulf**	**Amox/Clav**	**AM/Sulbac**	**Piper/Tazo**	**Ticar/CLA**	**Amikacin**	**Gentamicin**	**Tobramycin**	**Cefoxitin**	**Imipenem**	**Nitrofurantoin**
Case 1	2	9/17/12		E. coli	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	S	S	S	S	S	S	S	S
Case 2	2	9/7/12		E. coli	R	R	R	R	R	R	R	R	R	R	R	R	R	R	I	R	S	S	S	S	R	S	S	S
Case 3	1	1/16/13	Urine	Proteus	S	S						S	S	S	R	R	R	S	S	S	S	S	I	S	S		S	R
Case 4	1	1/23/13	Urine	E. coli	R	R	R	R	R	R	R	R	R	R	R	I	R	R	R	R	S	I	S	S	R	S	S	S
Case 5	1	2/13/13	Urine	E. coli	R	R	R	R	R	R	R	R	R	R	R	R	R	R	I	R	S	I	S	S	R	S	S	S
Case 6	1	4/7/13	Urine	E. coli	R	R	R	R	R	R	R	R	R	R	R	R	R	R	I	R	S	I	S	S	R	S	S	S
Case 7	1	5/17/13	Urine	E. coli	R	R	R	R	R	R	R	R	R	R	R	R	R	S	I	R	S	S	S	S	R	S	S	S
Case 8	1		Urine	E. coli	R	R	R	R	R	R	R	R	R	R	R	R	R	S	I	I	S	I	S	S	R	S	S	S

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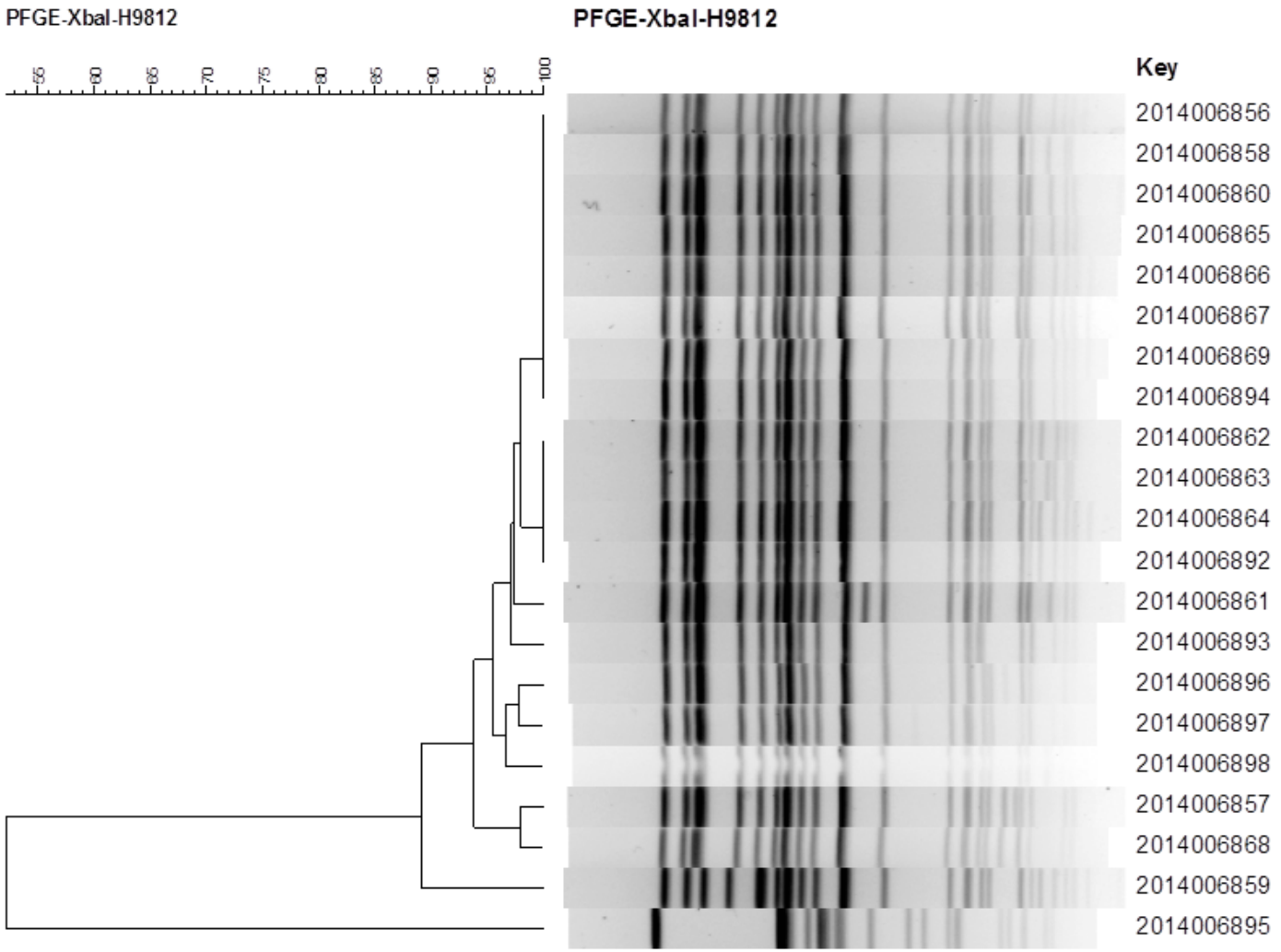
PFGE results from ESBL outbreak



- One dominant outbreak strain sharing >90% similarity in PFGE pattern
- One isolate is not part of this dominant strain.

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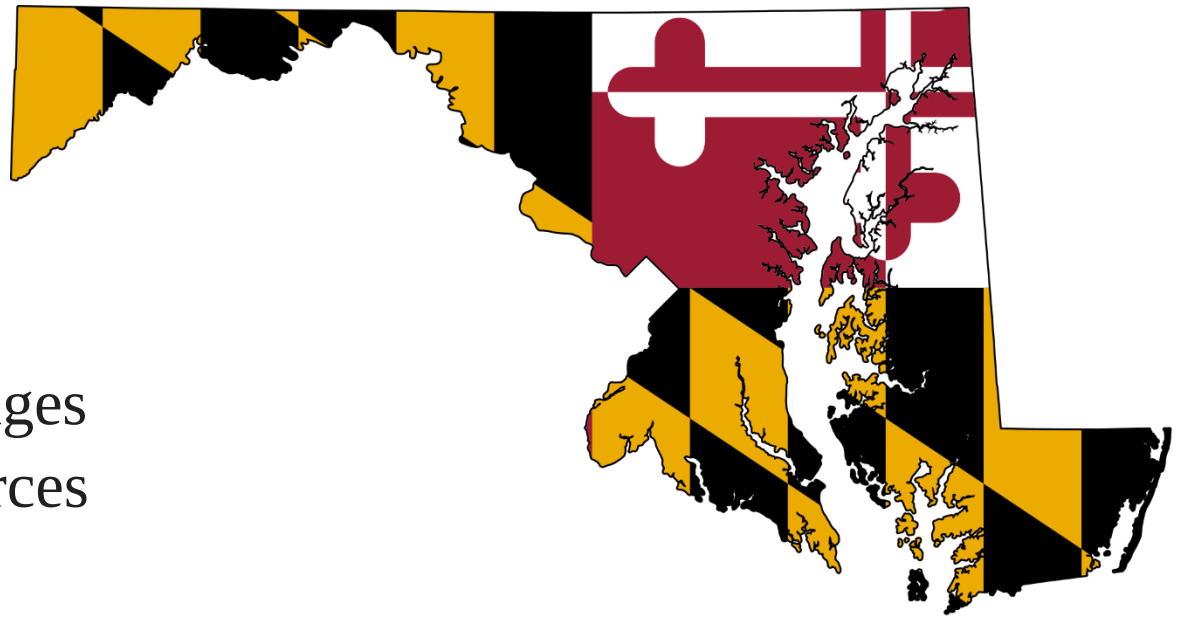
CAAUSE: MD Campaign for Appropriate Antibiotic Use

- Multidisciplinary collaborative formed in January 2016
  - Acute, LTC, community, academic, state, pharmacy, ID, IP
- Objective: to encourage proper antibiotic use and decrease drug resistance rates in MD by broadly promoting antibiotic stewardship
- Outcome: 100% of participating facilities meet the CDC 7 Core Elements
- Goal: Work with Acute and LTC to develop facilities to be prepared to meet the Joint Commission standards and the anticipated 2017 CMS Conditions of Participation as proposed by the CMS Proposed Rule 482.42 and CMS 81 FR 68688

Advantages of a Statewide Collaborative

- A statewide collaborative can:
  - Promote sharing of:
    - best practices,
    - resource utilization,
    - expertise,
    - new information
  - Identify common goals and challenges
  - Consolidate information and resources



Goals of MD CAAUSE Collaborative

Stepwise implementation:

Phase 1: Commitment letter, identify leaders, identify antibiotic use metrics and establish baseline

Phase 2: Collect data, implement 1-2 stewardship interventions

Phase 3: Continue activities, evaluate effectiveness

CAAUSE Stewardship Collaborative Activities

- Engage, enroll, assist facilities
- Host learning webinars/meeting
- Share successes/barriers with implementing stewardship
- Involve Stewardship Champions at each facility
- Identify metric and baseline for antibiotic usage
- Implement and Report: interventions, metrics and outcomes
- Helped facilities prepare for CMS Conditions

Benefits to joining CAAUSE

- Meet CMS regulations as they take effect
- Opportunity to network with subject matter experts in antibiotic stewardship from acute and long term care settings
- Receive education on the fundamentals of antibiotic stewardship in long term care settings
- Learn about successes and barriers to implementing stewardship in peer facilities

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CAAUSE — Phase 1

- Ended December 31, 2016 (acute care) / January 31, 2017 (LTC)
- Facilities:
  - Submitted signed commitment letters from facility administrators
  - Identified and provided contact information to the collaborative for facility champion(s) in charge of the antibiotic stewardship program
  - Identified ≥1 metric for measuring success, and began collection of baseline data
  - Included identifying a method for quantifying antibiotic usage within their facility
    - Days of Therapy (DOT – gold standard)
    - Defined Daily Dose (DDD)
    - Purchasing data
    - administration data
    - other source
  - Facilities will receive recognition for completing Phase 1 activities

CAAUSE — Phase 2

- Ended December 31, 2017
- Facilities:
  - Collected outcome measure data
  - Identified and implemented ≥1 specific intervention to improve antibiotic use
    - Antibiotic time out
    - Ending use of antibiotics for asymptomatic bacteriuria
    - Reduced vancomycin toxicity
- Facilities will receive recognition for completing Phase 2 activities

CAAUSE — Phase 3 (and beyond!)

- Will end December 31, 2018 with potential to carry forward
  - Activities will continue to align with ongoing national perspective
  - Facilities will evaluate antibiotic stewardship program effectiveness and implement additional interventions as needed
  - Successful approaches will be disseminated at local/national venues and via publications

Send us your ideas!!

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