Updates on NHSN Monitoring of Antimicrobial Use and Resistance

HICPAC
March, 2013

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- **Enhancing use of existing data on (HAI) antimicrobial resistance reported to NHSN**
  - Device-associated infection reporting (CLABSI, CAUTI, VAE)
  - Procedure-associated infection reporting (SSI)
- **Implementation of Antimicrobial Use and Resistance Module**
- **Assessments of antimicrobial use through the 2011 EIP Antimicrobial Use and HAI Point Prevalence Survey (PPS)**

Enhancing use of Existing Data on Antimicrobial Resistance Reported to NHSN

1. **Alert Initiative**
   - Near term initiative (January 2014)
   - Focus on data quality, build confidence in rare phenotypes
   - Potential to improve attention to "detect and prevent" awareness
2. **Summary Resistance Measures (e.g., %R)**
   - Near term initiative (Early 2014)
   - Focus on enhancing use of existing (HAI) data for group users, facility users
   - Potential for regional, state-specific reporting

1. Alert Initiative-Automated Response to Unusual Phenotypes: Three Types of Reports/Alerts

- **Immediate pop-up window (focuses on action)**
  - Trigger when saving data (event reported)
  - Proposing 3 distinct messages (VRSA, CRE, general MDRO)
  - Short message focused on immediate checking data entry, verify with lab, save isolate, transmission prevention, report to public health if applicable; no links.
  - Click to dismiss; user ideally will correct data entry errors real time

1. Alert Initiative-Automated Response to Unusual Phenotypes: Three Types of Reports/Alerts

- **Monthly alert message (focused on data quality)**
  - Monthly quality report for all users to verify validity of data entered
  - Line list of events with unusual phenotypes
    - Clickable event to go directly to event for further evaluation
    - Requires verification by user that correct data entry
    - Additional messaging about infection control, links to guidance
  - Response required for only first 3 per year (3 different patients) for some phenotypes
- **Group user (or facility) alert report generation**
  - At any user generates report of unusual phenotypes
  - Line list of each event, by phenotype,
    - Status of validation (pending validation vs. validated)
    - Potential use for inter-facility communication, reporting

1. Alert Initiative-Automated Response to Unusual Phenotypes: Eligible Phenotypes and Alert Frequency

Organism or Organism Group	Resistance Phenotype Detected	Justification	Message Frequency
***Enterobacteriaceae (i.e., E.coli, Enterobacter* spp. *Klebsiella* pneumo/oxytoca)**	Carbapenem- I or R	Uncommon	First 3
	Highly drug resistant (HDR)	Rare	All
***Escherichia coli, Klebsiella* pneum/oxytoca**	Extended-spectrum cephalosporin - I or R	IP concern	First 3
Acinetobacter baumannii	Colistin/polymixin - R	Uncommon	All
	Carbapenem - I or R	IP concern	First 3
	HDR	Rare	All
Pseudomonas aeruginosa	Colistin/polymyxin - I or R	Uncommon	All
	Carbapenem - I or R	IP concern	First 3
	HDR	Rare	All
***Enterococcus faecalis, faecium,* spp.**	Daptomycin – NS **AND** Linezolid -R	Uncommon	All
Staphylococcus aureus	Vancomycin – R	Rare	
	Daptomycin – NS **AND** Linezolid – R **AND** Vancomycin- I	Rare	
Staphylococcus, coagulase-negative	Vancomycin – R	Uncommon	

- HDR = testing I or R to at least one drug in each of 5 classes (Enterobacteriaceae, Pseudomonas) or in each of 6 classes (Acinetobacter spp.); classes include extended-spectrum cephalosporin, fluoroquinolones, aminoglycosides, carbapenems, piperacillin or piperacillin/tazobactam, ampicillin sulbactam (Acinetobacter only)

Enhancing use of Existing Data on Antimicrobial Resistance Reported to NHSN

1. **Alert Initiative**
   - Near term initiative (January 2014)
   - Focus on data quality, build confidence in rare phenotypes
   - Potential to improve attention to "detect and prevent" awareness
2. **Summary Resistance Measures (e.g., %R)**
   - Short term initiative (fall 2014)
   - Focus on enhancing use of existing data for group users, facility users
   - Potential for regional, state-specific reporting

2. Summery Resistance Measures (existing HAI data)

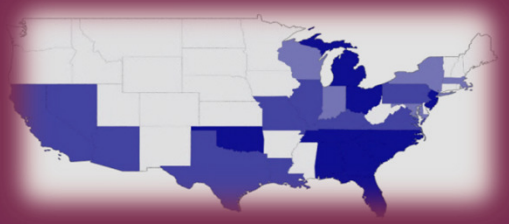
- **Line list of patients with key AR phenotypes**
  - For use by group users and facilities
  - Supplement the Alert Initiative (unusual phenotypes) to include more traditional resistance concerns; e.g.,
    - MRSA
    - VRE
- **Summary % Resistance - crude**
  - Output for group-users or facility users
  - Initial considerations – HAI type specific (i.e., SSI, CLABSI, CAUTI) % Resistance
    - Crude (% R) proportion for key phenotypes (similar to NHSN AR report)
    - Gathering requirements now, implement no earlier than early 2014
  - Exploring second "infection" based measure (e.g., CRE HAI/1000 pt-day)
  - Primary users likely State Department of Health, collaborative partner organizations, academic partners with data rights

2. Summery Resistance Measures (existing HAI data)

Adjusted Summary % Resistance

- Exploratory work started, presented to CSTE HAI subcommittee
  - Adjusted ICU CLABSI % Resistance for MRSA, CRE (IDWeek, 2012)
    - Age single most significant predictor of %R, not location (ICU, other)
    - Age adjustment rarely moved state's value/rank

		ICU Locations			
State	Isolates Tested (All)	Rank Crude	Crude %R	Rank Adjusted	Adjusted %R
A	110	1	65	4	61
B	42	2	62	13	52
C	72	3	61	2	67
D	64	4	60	8	58
E	80	5	60	7	60
F	65	6	60	3	62
G	43	7	57	1	75
..	…	…	…	…	…
Z	70	25	43	23	45



- Analysis limited
  - Excluded states with few isolates (e.g., <30 *S. aureus*), ICU only

Potential to publish summary measures by state

- Outstanding issues include sufficient rational for adjustment?
- Consider crude or adjusted into regular NHSN AR report 2011-2012

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Implementation of Antimicrobial Use and Resistance Module: Resistance Option

- **Goals**
  - Provide a mechanism for facilities to report and analyze antimicrobial resistance data from clinical specimens
    - Standard antibiograms, aid in clinical decisions
    - Identify emerging resistance early; prevent transmission early
  - Provide regional and national assessment of antimicrobial resistant pathogens of public health importance
    - Broader coverage than relying on HAI data only
    - Simplified measures of infection burden for AR pathogens
- **Operational overview**
  - Rely on electronically captured data only (no manual data entry)
  - Submit files monthly (CDA), similar to requirement for AU option
  - Protocol revisions now, implementation guidance being drafted
  - Likely time to receive data Fall 2014

Implementation of Antimicrobial Use and Resistance Module: Resistance Option

- **Eligible Facilities**
  - Acute-care (inc LTAC, INPT rehabilitation)
  - Inclusive of ED/observation (unlike CMS reporting requirements for MRSA BSI through MDRO Module)
- **Isolate-level reporting (regardless of "R" status)**
  - By month, facility wide
  - Standard filtering of test results prior to creating file
    - First eligible pathogen isolated from blood culture per patient (requiring 14 days since last positive)
    - First eligible pathogen isolated from non-blood culture source, per patient, per month
    - Eligible culture sources: blood, urine, lower respiratory, CSF
    - Eligible pathogens; common (HAI), *S. pneumoniae*, Group B Streptococcus, *Candida* spp.
    - De-duplication when same isolate tested on same day
    - Numerator data set include key susceptibility test results, key patient and hospital information
- **Denominator: admissions, patient-days, blood cultures**

NHSN Resistance Option Proposed Metrics

Metric	Simplified Calculation
% Non - susceptible	$\frac{\text{Resistant} + \text{Intermediate}}{\text{Tested}}$
Bloodstream infection % non-susceptible	$\frac{\text{Resistant from BC} + \text{Intermediate from BC}}{\text{BC Tested}}$
Hospital-onset resistance rate	$\frac{\text{Hospital-onset}^{1} \text{ isolates}}{\text{1000 Patient days}}$
Resistant bloodstream infection rate	$\frac{\text{Resistant from BC + Intermediate from BC}}{\text{100 Admissions}}$

1. Hospital onset = isolate collected ≥ 3 days from admission, include resistant +/- intermediate as appropriate
2. Only one isolate / patient

NHSN Surveillance of Antimicrobial Use in Healthcare Settings

Status update

March 2013

Use of NHSN in Antimicrobial Stewardship: NHSN Antimicrobial Use Option

- Purpose
  - Assist hospitals in collecting data on antimicrobial use
  - Feedback rates to encourage appropriate prescribing
- Operations and analysis
  - For each location and hospital wide
  - Accepts only electronically captured administration records (eMAR/Barcode)
  - Risk adjusts usage patterns based on location types (similar to experience with HAI comparisons)
- NHSN ELC-eMAR initiative
  - Funded 4 health departments to implement (2012)

Timeline for NHSN ELC-eMAR Initiative*

Calendar Quarter									
2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd
2011			**2012**				**2013**		
NHSN enabled to receive AU data via CDA		ELC eMAR funding awards			No. reporting data: 7	No. facilities reporting data: 7	No. facilities reporting data: 20	No. facilities reporting data: 40	No. facilities reporting data: 70
		Vendor Development							
				Validation Activities*					
					Facility Submission				

* Validation protocol required in NHSN ELC-eMAR project., but promote use for all reporters

Example Use of Data for a Hospital (AU Analysis Output Options): Line List Rate Tables, by Location

National Healthcare Safety Network
Rate Table - All Submitted AU Data - Antimicrobial Utilization Rates by Location
Rate per 1,000 Days Present
As of: February 3, 2012 at 3:52 PM
Date Range: All AU_RATESLOCATION

Org ID=10846 CDC Location=IN:ACUTE:CC:M Location=INMEDCC

Summary Yr/Mon	Antimicrobial Category	Antimicrobial Class	Antimicrobial Days	Days Present	Rate per 1000 Days Present
2011M01	Antibacterial	-- All --	90165	10000	9,016.500
2011M01	Antibacterial	Aminoglycosides	438	10000	43.800
2011M01	Antibacterial	Carbapenems	12	10000	1.200
2011M01	Antibacterial	Cephalosporins	57	10000	5.700
2011M01	Antibacterial	Fluoroquinolones	12	10000	1.200
2011M01	Antibacterial	Folate pathway inhibitors	6	10000	0.600

*Data is for example only

Example Use of Data for a Hospital (AU Analysis Output Options): Risk-adjusted Benchmarking of Antimicrobial Use To Guide Stewardship

Antimicrobial Class-Specific Usage Rates and Standardized Utilization Ratios (SURs)				
Anti-MRSA Intravenous				
	ABX Days			
	Observed	Predicted	SUR	Interpretation
MICU	4000	1000	4.0	Excessive
SICU	2000	2000	1.0	Consistent
Medical Ward	3000	4000	0.75	Lower Use
Surgical Ward	1000	3000	0.33	Much Lower
Hospital	170,250	171,000	0.99	Consistent

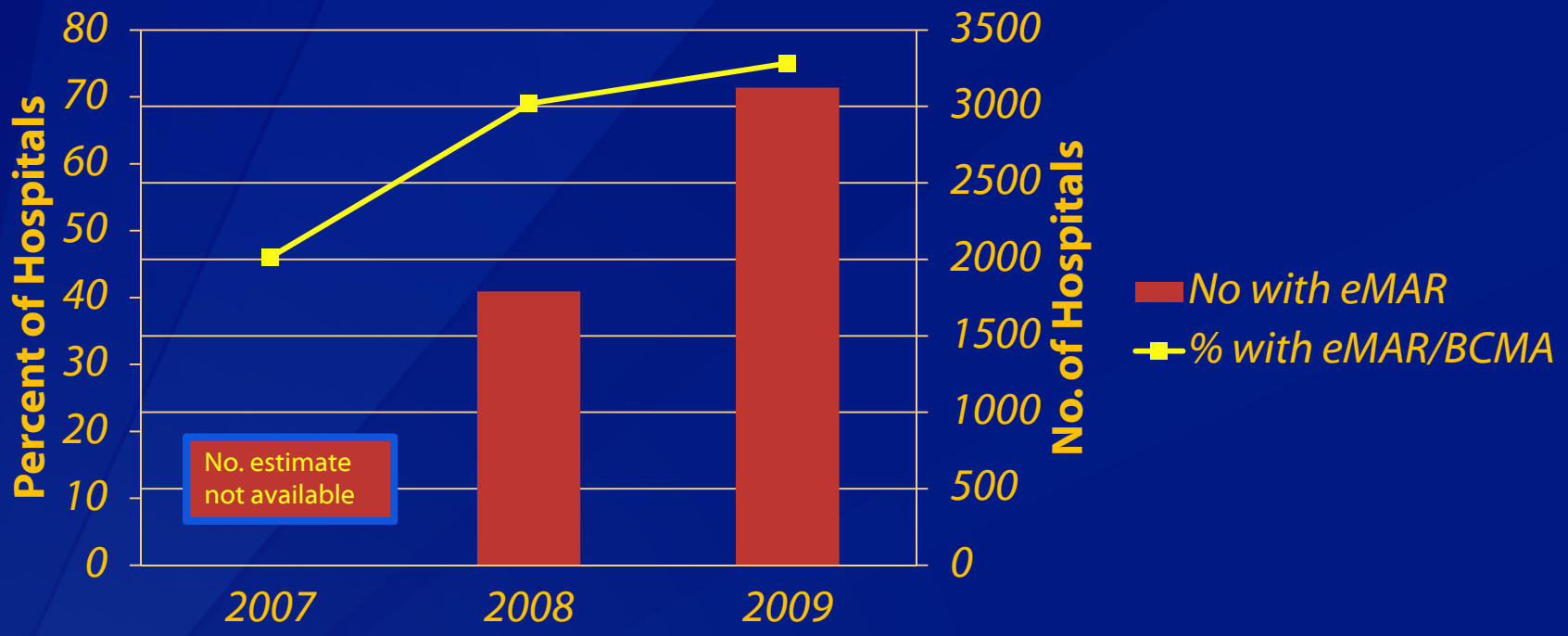
Example Data Only; SUR is a ratio of actual usage patterns compared to expected patterns given the patient population defined by the location (e.g., MICU , SICU, etc)

ELC-NHSN eMAR Initiative: Potential Scalability

Participating Vendors	Number of Healthcare Systems*	Number of Facilities*	Vendor System Scalability*
Asolva	1	9	Small
ICNet Systems	2	2	Medium
Theradoc	9	38	Large
Vigilanz	1	1	Medium
Homegrown	3	8	Small
Epic (developing for release in 2014)	-	-	Large
TOTAL	16	58	

*Subject to change; Feb 2013

Estimates in Acute care Facilities Utilizing eMAR Systems, by Year



1. 2007 estimates among 4112 surveyed hospitals. Pedersen C, ASHP National survey on informatics. Am J Health System Pharm. 2008; 65:2224-64;
2. 2008 estimate among 2603 hospitals (>100 beds) analyzed using HIMSS database Appari A, Medication administration quality and health information technology: a national study of US hospitals. J am Med Inform Assoc 2012;19:360-367
3. 2009 estimates from HIMSS database analysis posted Davis, Michael W. The State of U.S. Hospitals Relative to Achieving Meaningful Use Measurements. HIMSS Analytics; at http://www.himssanalytics.org/docs/ha_arra_100509.pdf; accessed March 6, 2013

NHSN Antimicrobial Use Option Summary

- **First version (2011) is available**
- **Currently 16 hospitals, expanding to 40 by July 2013**
  - Expect 70 by January 2014 reporting
    - 58 through ELC funding of health departments
    - 12 through voluntary efforts (Asolva)
- **Limited metrics (days of therapy, by location)**
- **Indirect Standardization to risk adjust usage patterns**
  - Standardized usage ratio (proposed); focus is on benchmarking
- **No ability**
  - To calculate "typical dose"
  - To directly sum grams used in all hospitals (just days of therapy)
- **Largest obstacle includes facility IT staff availability**