Variation in Definitions and Isolation Procedures for Multidrug-resistant Gram-negative Bacilli: a Survey of the SHEA Research Network

Marci Drees, MD, MS,[1,2]* Lisa Pineles, MA,[3] Anthony D. Harris, MD, MPH,[3] and Daniel J. Morgan, MD, MS[3,4]

[1]Christiana Care Health System, Wilmington, DE, [2]Jefferson Medical College, Thomas Jefferson University, Philadelphia, PA,
[3]University of Maryland School of Medicine, Baltimore, MD, [4]VA Maryland Healthcare System, Baltimore, MD

*Corresponding Author:
Dept of Medicine, Suite 2E70
4755 Ogletown-Stanton Rd,
Newark, DE 19718
302-733-5602; 302-733-6386 (f)
mdrees@christianacare.org

Presentation #1603

ABSTRACT (revised):

Background: The emergence of multidrug-resistant Gram-negative bacilli (MDR-GNB), including *Klebsiella*, *Acinetobacter* and *Pseudomonas*, has been a major challenge for healthcare facilities. There is little guidance as to how to isolate patients harboring these organisms.

Methods: We conducted an online cross-sectional survey of members of the SHEA Research Network (SRN) during Nov 2012-Feb 2013 to assess infection control practices regarding MDR-GNB. The survey included definitions and infection control procedures related to MDR-GNB.

Results: Of 170 SRN members, 66 responded (39% response rate), representing 26 states and 15 countries. Participants varied regarding definitions of "multidrug resistant," with 14 unique definitions for *Acinetobacter*, 18 for *Pseudomonas*, and 22 for *Enterobacteriaceae* species. The most common definition for each was resistance to ≥3 classes of antimicrobials (25-43%). Substantial variation existed in isolation practices for patients with MDR-GNB. Most (≥80%) facilities reported experience with each MDR-GNB isolate and 78% have encountered pan-resistant MDR-GNB (i.e., susceptible only to colisitin). Approximately 20% of facilities did not isolate for MDR *Pseudomonas* or *Acinetobacter* and > 50% allowed removal of isolation for patients with known MDR-GNB.

Conclusion: Facilities vary significantly in their approach to prevent MDR-GNB transmission. Inconsistent definitions of MDR may hinder communication during patient transfers. Many (20- 36%) hospitals remove isolation for MDR-GNB without requiring negative cultures and 15-26% do not isolate certain MDR-GNB at all. Inconsistent definitions and use of isolation practices may be contributing to the ongoing epidemic of MDR-GNB.

INTRODUCTION:

- CDC produced guidelines for management of multidrug-resistant (MDR) organisms[1] and use of isolation precautions in healthcare settings [2] in 2006-07
  - Only very general guidance regarding multidrug-resistant Gram-negative bacteria (MDR-GNB) provided
  - Standard & contact isolation described but individual judgment advised for organisms "of clinical and epidemiological significance"
- CDC has since published specific recommendations for carbapenem-resistant *Enterobacteriaceae* (CRE),[3,4] which recommended contact isolation and enhanced surveillance
- Even for methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE), controversy remains regarding implementation of contact isolation, including:
  - Duration of isolation
  - When/how to remove patients from isolation
  - Whether continuation of isolation upon hospital readmission is necessary
- MDR-GNB pose additional challenges:
  - Lack of standard definitions of "multidrug resistant"
  - Greater difficulty in identification by routine laboratory methods
  - Limited available treatment options, making prevention imperative

STUDY AIMS:

- To evaluate experience with MDR-GNB & current infection control practices, microbiology laboratory capacity for MDR-GNB
- To compare practices for MDR-GNB with those for MRSA and VRE
- To evaluate acceptance of recommended strategies for CRE prevention

METHODS:

Study Design and Participants

- Cross-sectional survey sent to U.S. and international Society for Healthcare Epidemiology of America (SHEA) Research Network members
- The SHEA Research Network is a consortium of >200 hospitals that has successfully conducted multicenter research projects in healthcare epidemiology.[5]

Survey Distribution

- Survey created using SurveyMonkey®
- Distributed it via the SHEA Research Network to all site primary investigators' email addresses between November 2012 and February 2013
  - Multiple reminders sent and small incentive offered

Definitions and Statistical Analysis

- MDR definitions categorized compared to joint CDC/European Centre for Disease Prevention and Control (ECDC) interim definition of MDR[6] (resistant to at least one agent in ≥ 3 antibiotic classes)
  - More stringent: requiring resistance to >3 classes to be considered "MDR" for isolation purposes
  - Less stringent: requiring resistance to <3 classes to be considered "MDR"
- Descriptive statistics, including means and medians, were used to describe the percentage of respondents for each question
- Respondents stratified by US vs. international location

RESULTS:

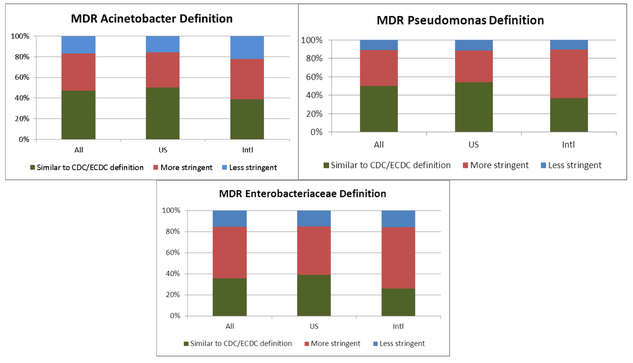
- After excluding duplicates, 66 of 170 eligible SHEA Research Network member primary investigators completed survey (response rate, 39%)
- Institutions represented 26 states and 15 countries
  - 46 (70%) based in the US

Distribution of SHEA Research Network members responding to survey.

MDR Definitions

- Most commonly selected definition of MDR for each organism was "resistance to three or more classes of antimicrobials"
  - 29 (44%) for *Acinetobacter* species
  - 32 (48%) for *Pseudomonas* species
  - 23 (35%) for *Enterobacteriaceae* species
- Because criteria could be combined in a variety of ways, multiple unique definitions reported:
  - 14 for *Acinetobacter* species
  - 18 for *Pseudomonas* species
  - 22 for *Enterobacteriaceae* species

Comparison of Reported Definitions to CDC/ECDC MDR Definition



Contact isolation practices for multidrug resistant bacteria, reported by SHEA Research Network members.

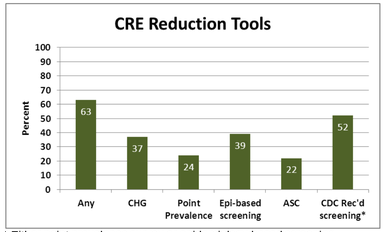
	MRSA %	VRE %	ESBL %	CRE %	MDR* Pseudo-monas %	MDR* Acineto-bacter %
Isolate this organism (n=66)	93.9	93.9	74.2	93.9	81.8	84.9
US (n = 46)	100.0	100.0	87.0	95.7	87.0	89.1
International (n = 20)	80.0	80.0	45.0	90.0	70.0	75.0
Duration of isolation:						
During active illness	6.5	9.7	8.2	6.5	7.4	7.1
Duration of hospitalization	12.9	11.3	26.5	12.9	27.8	28.6
Until negative surveillance cultures	64.5	50.0	32.7	29.0	35.2	33.9
Indefinitely	11.3	24.2	34.7	43.5	31.5	33.9
How soon cultures may be obtained:**						
After completion of antibiotics	45.0	54.8	37.5	44.4	42.8	42.1
After hospital discharge	15.0	19.4	25.0	22.2	14.3	21.1
< 3 months	12.5	19.4	12.5	27.8	28.6	26.3
≥1 year	7.5	6.5	0.0	5.6	0.0	5.3
Isolate readmitted patients:						
Yes	77.8	74.6	55.6	72.1	53.2	58.1
Allow cohorting	54.5	42.4	21.2	18.1	19.7	21.2
Perform active surveillance in at least one area of hospital	75.8	34.8	18.2	21.2	7.5	15.2

*MDR = multidrug resistance, as defined by the respondent for isolation/infection control purposes
** If negative surveillance cultures required

Experience with MDR-GNB

- ≥ 90% reported experience with MRSA, VRE and ESBL-producing organisms
- ≥ 80% reported experience with CRE, MDR *Pseudomonas* and MDR *Acinetobacter*
- Experience with any MDR bacteria resistant to all available antimicrobials except colistin:
  - 62% *Acinetobacter*
  - 59% *Pseudomonas*
  - 52% *Enterobacteriaceae*
  - Only 22% reported none of above

Control of CRE



* Either point prevalence survey or epidemiology-based screening

Laboratory Identification

- 40 (61%) had implemented updated CLSI breakpoints[7] for Gram-negative bacteria
- 40 (61%) used modified Hodge testing
- Of those who had not implemented CLSI breakpoints (n=26), half did not perform modified Hodge test either

CONCLUSIONS

- Highly resistant Gram-negative bacteria are widespread, yet a number of questions remain about the most effective ways to limit further spread.
- Lack of use of standard definitions for multidrug resistance hinders understanding of and communication regarding these organisms.
- International sites tended to use a more stringent definition of MDR, thus isolating fewer patients.
- Compared to MRSA and VRE, greater variation in isolation practices was identified with the emerging pathogens CRE and other MDR-GNB.
  - One quarter reported discontinuing isolation for CRE without requiring negative surveillance cultures, contrary to CDC recommendations.
- Public health agencies need to promote standard definitions and management to enable broader initiatives to limit further emergence of MDR-GNB.

REFERENCES

1. Siegel JD, et al. *Am J Infect Control* 2007;35(10 Suppl 2):S165-93.
2. Siegel JD, et al. *Am J Infect Control* 2007;35(10 Suppl 2):S65-164.
3. CDC. *MMWR* 2009;58(10):256-260.
4. CDC. http://www.cdc.gov/hai/organisms/cre/cre-toolkit/
5. Morgan DJ, et al. *Clin Infect Dis* 2012;55(7):923-929.
6. Magiorakos AP, et al. *Clin Microbiol Infect* 2012;18(3):268-281.
7. CLSI. *CLSI document M100-S23.* Vol 30. No. 1 ed. Wayne, Pennsylvania: Clinical and Laboratory Standards Institute; January 2010.

ACKNOWLEDGMENTS: This study was supported financially by the Society for Healthcare Epidemiology of America (SHEA). The authors would like to thank SHEA and the SHEA Research Network for their support of this study and for their participation.
All authors have no financial disclosures related to this abstract.