

2013 Indiana Multi-Drug Resistant Organism Survey

Antibiotic resistance is a global issue that has significant impact in the field of infectious diseases. It has been recognized for several decades that up to 50% of antibiotic use is either inappropriate or unnecessary. Antibiotics are the only drugs where use in one patient can impact the effectiveness in another. Improving antibiotic use is a public health imperative.

Pharmaceutical companies are minimally involved in the development of antibiotics. From 1983-1987, sixteen new antibiotics were approved by the US Food and Drug Administration (FDA). However, from 2008-2011 only two new antibiotics were approved and neither addressed the issue of resistance. In 1990, nineteen companies developed antibiotics, but presently only four produce them. It will be five to ten years before new antibiotics are available to treat resistant organisms.

Given this lack of new antibiotics to treat multi-drug resistant organism (MDRO) infections, an aggressive infection control strategy is critical to prevent the transmission of these resistant organisms. Early detection and implementation of strict infection control measures can prevent MDROs in healthcare facilities (HCFs) from becoming a more significant threat to patients. Following contact precautions, using antibiotics wisely and minimizing device usage are all important aspects of preventing transmission. These core measures are located in the Centers for Disease Control and Prevention (CDC) Healthcare Infection Control Practices Advisory Committee (HICPAC) Guidelines, “Management of Multidrug-Resistant Organisms in Healthcare Settings, 2006” (http://www.cdc.gov/hicpac/mdro/mdro_toc.html).

Klebsiella pneumoniae and *Escherichia coli*, which are included in the family of gram-negative bacteria known as *Enterobacteriaceae*, are epidemiologically and clinically important organisms due to their level of antibiotic resistance. The carbapenem-resistant strains of these organisms are referred to as carbapenem-resistant *Enterobacteriaceae* (CRE). Types of CRE are known as *Klebsiella pneumoniae* carbapenemase (KPC) and New Delhi Metallo-beta-lactamase (NDM). CRE are an emerging, important healthcare challenge, resistant to almost all current available antibiotics and have been associated with high mortality rates (up to 40 to 50% in some studies). The gene that confers this resistance pattern is contained on plasmids, which are highly mobile and very easily spread from one bacterial cell to the next. Since these cells are harbored in the gut, the plasmids are potentially transferrable to multiple coliforms. The CDC reports CRE infections have increased from 1% to 4% in the past decade.

Healthcare providers should be concerned about CRE infections as they are associated with high rates of morbidity and mortality, serious treatment challenges, increased length of stay, and increased cost. The frequent movement of patients between acute and long term care facilities provides the opportunity for transmission of these resistant organisms. Aggressive communication between both acute and long term care facilities is important so that appropriate

intervention can take place. Further detailed guidance developed by the CDC designed to decrease transmission of CRE is located in the “2012 CRE Prevention Toolkit” at <http://www.cdc.gov/hai/pdfs/cre/CRE-guidance-508.pdf>.

To slow the evolution of resistance, healthcare providers must focus on antibiotic stewardship. Stewardship programs will enforce pathogen-directed therapy and short-course treatment. In a recent study the CDC reported that exposure to a carbapenem antibiotic increased a patient’s risk of getting an infection with a carbapenem-resistant strain by 15 times. When ordering antibiotics healthcare providers are encouraged to select appropriately for specific dose, duration, route and indication. Antibiotic use should be reassessed after 24 to 48 hours to review susceptibility results and determine if treatment can be altered. Further detailed guidance describing the development of an antibiotic stewardship program from the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA) is located at “Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship” <http://cid.oxfordjournals.org/content/44/2/159.full>.

Microbiology laboratories in all acute care facilities must implement enhanced protocols to detect carbapenemase production in *Enterobacteriaceae*. When these organisms are identified the laboratory must immediately alert acute and long term care Infection Preventionists (IPs). This will allow important control measures to be implemented, including vigorous hand hygiene practices, contact precautions, and minimizing the use of devices.

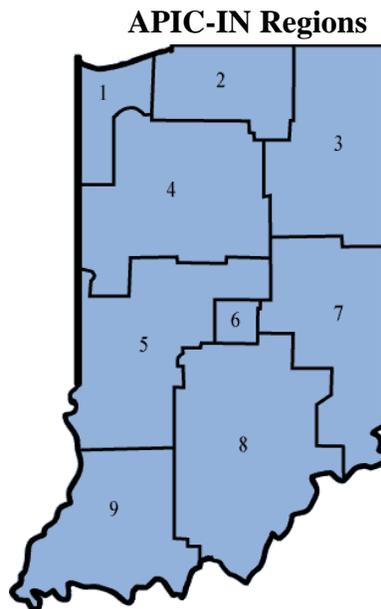
The Indiana State Department of Health (ISDH) strives to heighten awareness of the challenges posed by antibiotic resistance. The combination of a comprehensive infection prevention program and effective antibiotic stewardship will minimize the emergence and transmission of MDROs in Indiana. In order to better understand the current healthcare facility (HCF) infection control practices and CRE detection practices in Indiana, the ISDH Surveillance and Investigation Division (SID) and the ISDH Laboratory partnered to repeat surveys that were originally sent to IPs and clinical laboratories in 2011. The results from both surveys are summarized below.

Infection Preventionist Survey Summary

In 2011, the ISDH SID conducted a survey of IPs to gain a better understanding of the burden of CRE in Indiana HCFs. The survey consisted of 10 questions in electronic format on the SurveyMonkey website, with a total of 40 IPs responding. The survey results gave a better indication of HCF infection control practices, general CRE awareness, and CRE detection methods in Indiana. As a follow up to the 2011 survey, a more in-depth survey was conducted in April 2013 at the Association for Professionals in Infection Control and Epidemiology-Indiana

(APIC-IN) Spring Conference in order to achieve additional insight into the issues surrounding MDROs in HCFs. An 11-question, live survey was administered using the interactive TurningPoint program and handheld response devices. Responses were received from 71 IPs representing all 9 APIC-IN regions.

APIC-IN Region	2011 IP Response	2013 IP Response
Region 1	13%	4%
Region 2	8%	13%
Region 3	18%	10%
Region 4	8%	8%
Region 5	15%	11%
Region 6	18%	25%
Region 7	8%	6%
Region 8	3%	10%
Region 9	13%	13%

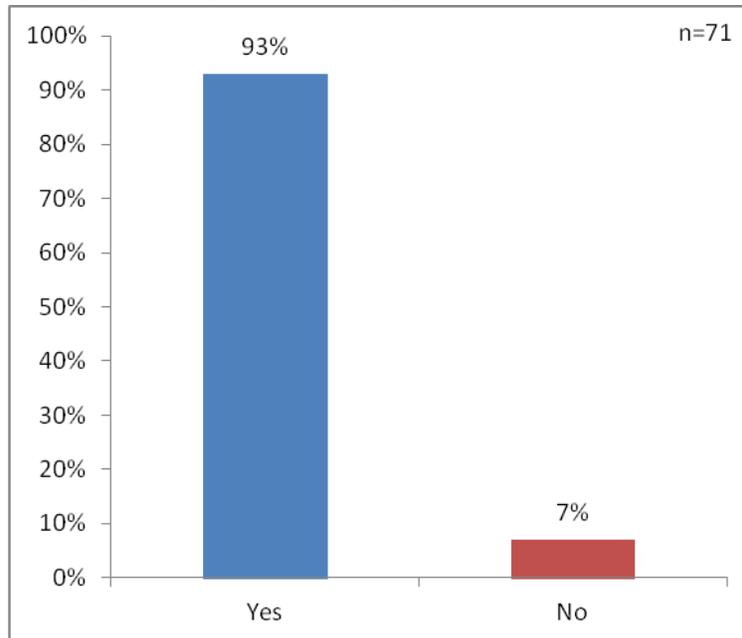


The 71 IPs represented a variety of different sized HCFs. The largest percentage (approximately 32%) represented facilities with more than 200 beds, followed closely by small facilities with only 0-50 beds (31%). Those from facilities with 101-200 beds made up 25% of the responses, while the remaining 11% were from facilities with 51-100 beds. The distribution of facility sizes was fairly similar compared to the 2011 survey results.

Bed-size	2011 IP Response	2013 IP Response
0-50 beds	28%	31%
51-100 beds	18%	11%
101-200 beds	20%	25%
>200 beds	35%	32%

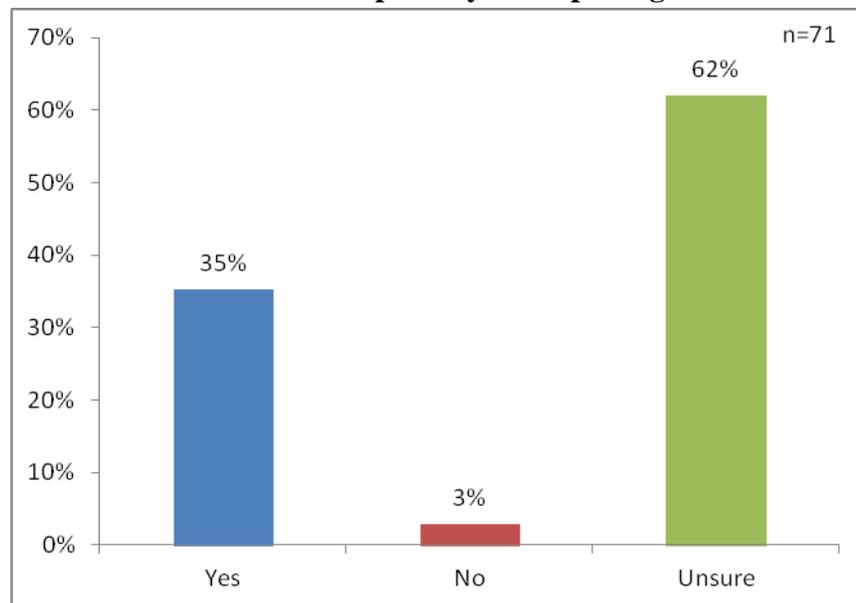
The transmission of MDROs is an important issue and one that should be addressed by every HCF. Core measures to be included in a facility’s MDRO prevention policy should include: hand hygiene, contact precautions, healthcare personnel education, device usage, patient and staff cohorting, laboratory notification, antimicrobial stewardship, and CRE screening. The IPs were asked whether their facility had such a policy and procedure in place to control the transmission of MDROs and the overwhelming majority (93%) answered “yes.” While 7% indicated they did not have a policy in place, which is of some concern, that percentage consisted of responses from only five individuals.

Does your HCF have a policy & procedure in place to control the transmission of MDROs?



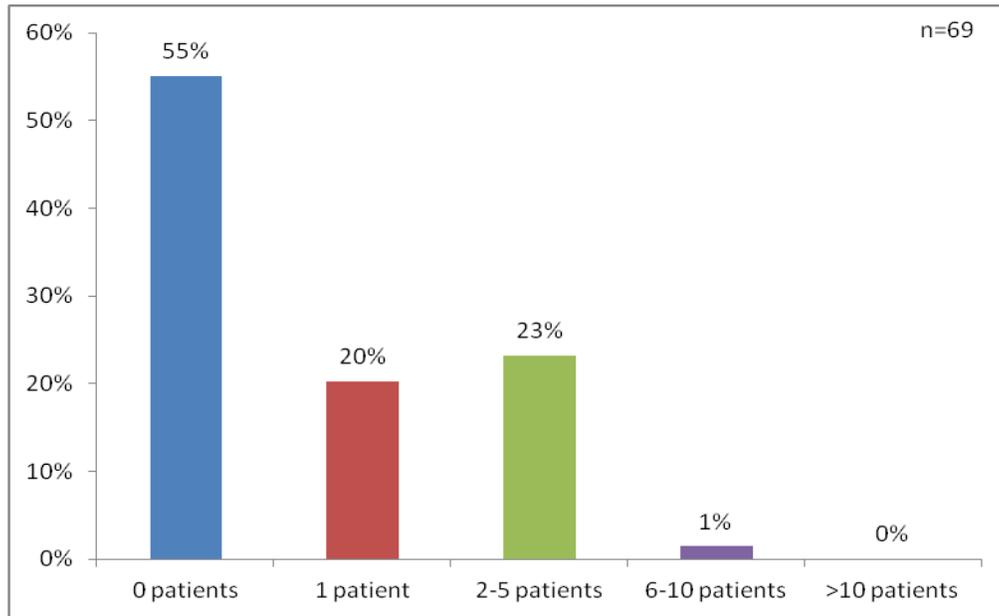
An important challenge in conducting CRE surveillance includes the recent CRE breakpoint changes in laboratory testing. These testing recommendations made by the Clinical Laboratory Standards Institute (CLSI) in January 2012 (M100-S22) involve changes to the interpretive criteria for determining susceptibility to carbapenems among *Enterobacteriaceae*. Therefore, it was important to find out if IPs were aware of testing procedures performed in their facility. The largest percentage (62%) was unaware of the laboratory’s testing procedures and so selected “unsure.” Approximately 35% indicated their facility uses the most current breakpoint guidelines while only 3% reported that their facility did not use the current guidelines. These results clearly support the need for better communication between laboratories and IPs as well as a better understanding of testing methodology.

Does your HCF laboratory perform CRE testing using the January 2012 CLSI M100-S22 susceptibility breakpoint guidelines?



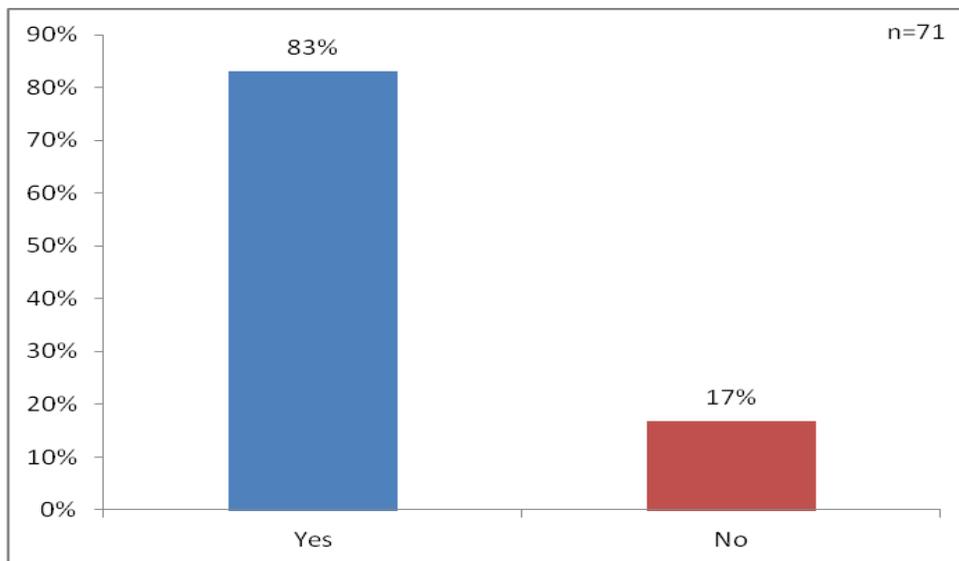
To determine the recognition of CRE in Indiana, IPs were asked how many CRE infected or colonized patients had been admitted in their HCFs in the past 12 months. Two IPs did not know how many CRE reports their facilities had admitted, so they did not participate in this question. Of the 69 responses received, 55% reported having zero CRE-infected/colonized patients in the past 12 months. This was followed by 23% reporting 2-5 patients, 20% reporting 1 patient, and 1% reporting 6-10 patients. No facilities reported having more than 10 patients with CRE. A similar question was asked in our 2011 survey, although the time period used was different. The 2011 survey asked IPs how many cases of CRE were admitted per month, but because many facilities only encountered sporadic cases of CRE, a broader time-span was suggested.

In the past 12 months how many CRE infected/colonized patients have been admitted in your HCF?



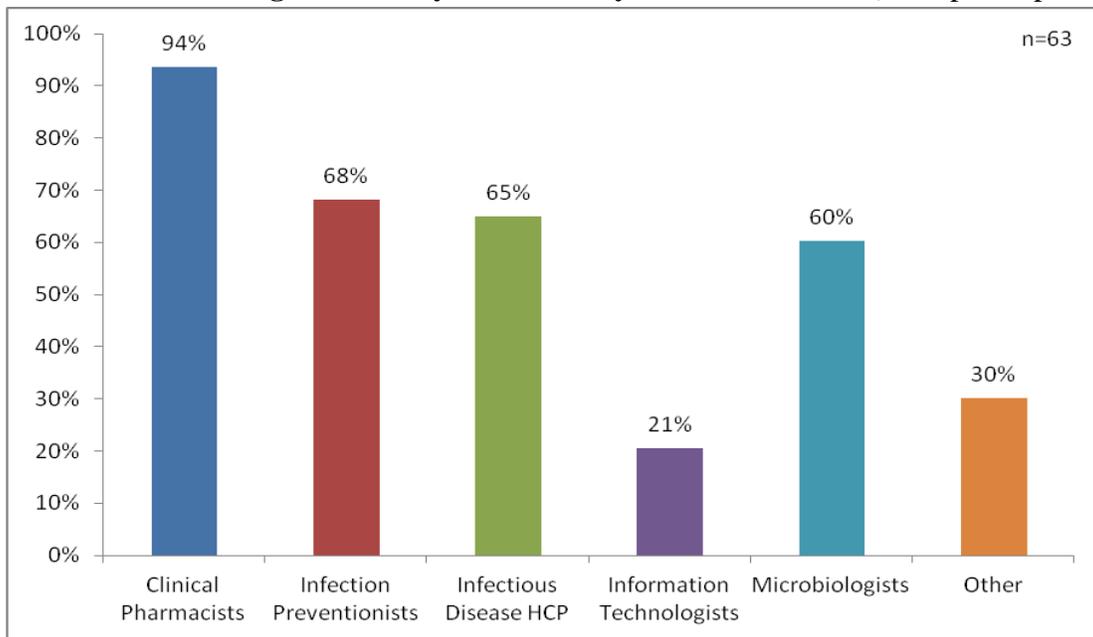
The CDC has issued guidelines for controlling CRE in HCFs, entitled “Guidance for Control of Carbapenem-resistant *Enterobacteriaceae* (CRE) 2012.” The IPs were asked if they were familiar with these recommendations and actively using them in their HCF. Results indicated approximately 83% were currently practicing the CDC recommendations while 17% were not.

Do you practice the CDC’s “Guidance for Control of CRE” (2012)?



One method to help control CRE, as well as other MDROs, is having an antimicrobial stewardship program (ASP) in place. A HCF’s ASP can involve many healthcare personnel in a variety of different roles, so the IPs were asked about their own facilities and the individuals actively involved in their ASP. Participants were allowed to make multiple selections. Eight IPs did not participate in this part of the survey, indicating they did not have an ASP at their facility. Of the 63 IPs who responded, the most common member of the healthcare team reported to be involved in an ASP was the Clinical Pharmacist, with almost 94% choosing this response. This was followed by IPs at 68%, Infectious Disease Healthcare Providers at 65%, and Microbiologists at 60%. Only 21% reported that Information Technologists were a part of an ASP. Of the respondents, 30% reported “Other”, but due to time constraints, additional information about the individuals who would be considered “Other” was unable to be collected.

Which of the following are actively involved in your HCF’s ASP? (Multiple responses)



Another critical step in reducing the transmission of MDROs is having good communication between HCFs during patient transfer. Participants were asked if their facilities have any sort of notification system in place to alert other HCFs when a patient with an MDRO is being transferred. This notification system could include a specialized form and/or direct communication during inter-facility transfer. Information shared would include whether the patient is colonized or infected with an MDRO, dates and results of cultures, indication of open wounds or indwelling devices, and current antimicrobials. The overwhelming majority (90%) indicated they had some type of notification system in place while only 10% did not have a notification system. This was an improvement from the 2011 survey where only 80% had a notification system in place.

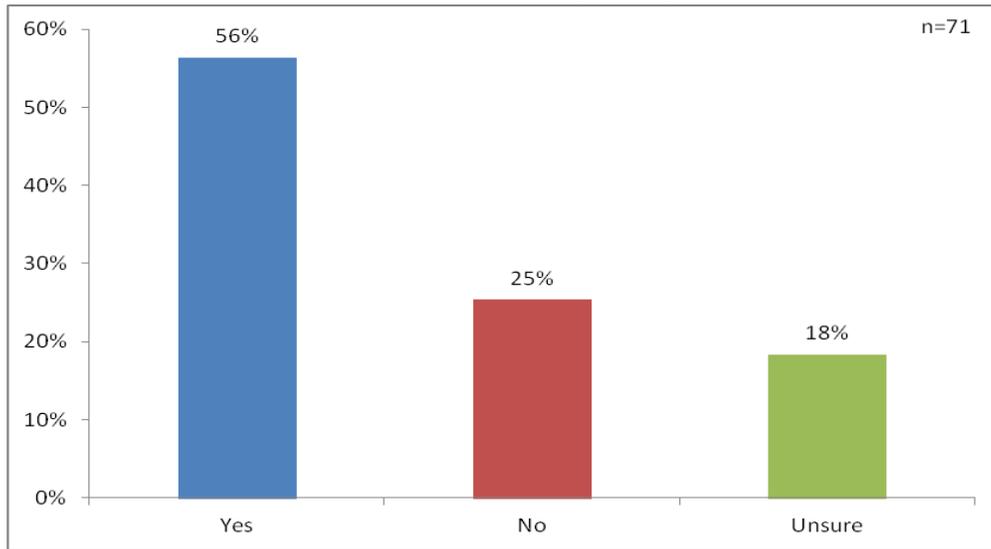
Notification system for MDRO-transferred patient?	2011 IP Response	2013 IP Response
Yes	80%	90%
No	20%	10%

The next question in the survey asked whether IPs thought CRE should be made reportable to the ISDH. Almost 54% of the 71 responding IPs did not think CRE should be reported to the ISDH. This number increased from the 2011 survey where 45% said that it should not be reported to the ISDH. Of participants, 28% were unsure whether CRE should be reported, and 18% of IPs answered “yes”, the same as the 2011 survey.

Should CRE be reported to the ISDH?	2011 Response	2013 Response
Yes	18%	18%
No	45%	54%
Unsure	38%	28%

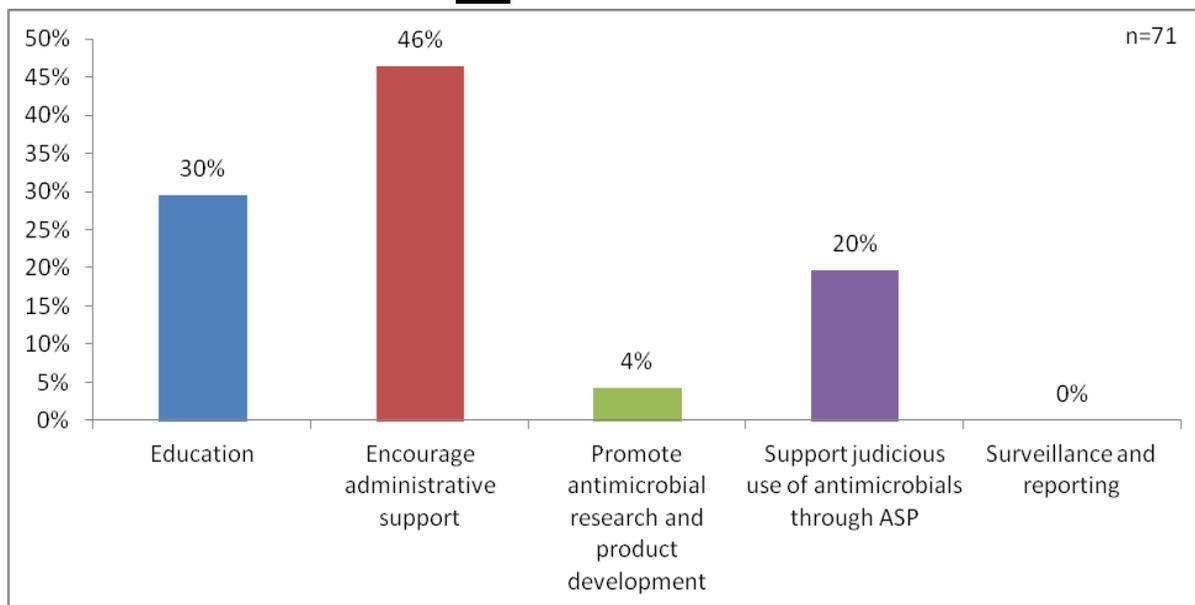
If CRE were made reportable, several reporting options are available. Since most facilities already submit certain healthcare associated infection data to the ISDH through the National Healthcare Safety Network (NHSN), we wanted to know if submitting reports through NHSN’s MDRO module (Lab ID Event) would be a satisfactory solution to CRE reporting to the ISDH. Approximately 56% indicated NHSN reporting would be an acceptable method. Approximately 25% did not think reporting through NHSN would be acceptable, and 18% were unsure.

Would submitting through NHSN’s MDRO module (Lab ID Event) be a satisfactory solution for CRE reporting to the ISDH?



The ISDH could utilize several approaches to support HCFs concerning MDRO interventions. The IPs were given several options and asked what would be the single best way that the ISDH could assist them. Of the 71 IPs who responded, the option to “encourage administrative support” was the most popular option, with 46% of the responses. This option could involve ISDH sending a letter to each facility’s administrators that details the ISDH recommendations and guidance for controlling MDROs. “Education” was also a popular choice, with almost 30% of IPs choosing this option. Approximately 18% thought that “supporting judicious use of antimicrobials through ASP” would be the best option, and only 4% thought that “promoting antimicrobial research and product development” would be the most beneficial. “Surveillance and reporting” did not receive any responses (0%).

How can the ISDH best assist HCFs in MDRO interventions?



Laboratory Survey Summary

In 2011, the ISDH Laboratory Outreach team surveyed Indiana sentinel laboratories regarding their awareness and ability to detect CRE. These clinical laboratories are the “first responders” with regard to CRE identification, antibiotic susceptibility testing, and surveillance. Therefore, this laboratory survey information is fundamental to understanding the detection and control of these organisms in Indiana. The lab responses provided the ISDH a baseline of data on the methods of antibiotic susceptibility testing being performed and the detection and reporting of CRE at the facilities. As a follow up to the first survey, a similar questionnaire was developed and sent to the sentinel laboratories in 2013 to see if heightened awareness of this problem has affected their protocols and practices.

The CDC defines CRE as resistant to third generation cephalosporins and at least one carbapenem. In 2011, only 69% of the responding laboratories that provided on-site antibiotic susceptibility testing (AST) used third generation cephalosporin and carbapenem antibiotics to flag suspect CRE isolates. However in 2013, 89% of the labs responded that they use these antibiotics to flag resistant organisms within their AST systems.

In both the 2011 and 2013 surveys, most laboratories reported that they provide antibiotic susceptibility testing using an automated system such as the Vitek or the Microscan. In addition to automated systems, laboratories can use supplemental tests to aid in the identification of

resistant organisms. The 2013 survey responses indicate that labs are using additional methods of non-automated methods of testing for detection and confirmation purposes. This implies a general improvement of testing capacity and greater awareness regarding emerging resistance.

Non-Automated Laboratory Methods Used for AST	2011 Lab Response	2013 Lab Response
Disc diffusion	33%	42%
Agar diffusion	3%	7%
Tube/Macrodilution	0%	2%
Microdilution	8%	11%
E-test	28%	44%
Other	3%	11%
NO non-automated methods are used to perform AST	53%	42%

It was reported in the 2011 survey that 37% of the laboratories that flagged potential CRE isolates did not perform any further confirmation testing such as the Modified Hodge Test (MHT) as recommended by the Clinical Laboratory Standards Institute (CLSI). In addition, only 26% of the responding labs at that time sent suspect CRE isolates to a reference laboratory for confirmatory testing. According to the 2013 survey, the number of laboratories enhancing their detection of CREs by performing the MHT and/or sending out to a reference laboratory for confirmation testing appears to have increased. These data suggest that more labs have initiated a greater testing capacity to confirm these organisms and thus improved on the quality of information needed to control and detect the CRE isolates in their facilities.

Additional CRE Testing	2011 Lab Response	2013 Lab Response
Performing MHT	37%	53%
Send suspect CRE to Reference Lab	26%	34%

Both the 2011 and 2013 CRE survey addressed reasons why laboratories did not follow the CLSI guidelines to confirm a suspect CRE isolate using the MHT and to identify which version of the CLSI guidelines labs were following. The most common reasons for not doing the MHT from both surveys were lack of training and lack of materials; however the responses in 2013 show improvement. Additionally, the 2013 data indicate that labs are using more updated versions with nearly 40% of the labs using the 2012 version and 13% using the most current version.

Reasons Labs Do Not Perform MHT	2011 Lab Response	2013 Lab Response
Lack of materials	42%	23%
Lack of training	58%	20%
Lack of personnel	25%	13%
Lack of funding	33%	10%

CLSI Version Currently In Use	2011 Lab Response	2013 Lab Response
M100-S19 / 2009	30%	17%
M100-S20 / 2010	20%	10%
M100-S21 / 2011	40%	13%
M100-S22 / 2012	(not available)	40%
M100-S23 / 2013	(not available)	13%
Other (did not know)	10%	7%

The final component of the survey assessed the reporting and actions taken by the laboratories when CRE is identified. The 2013 survey indicates that the labs greatly increased their role to take action by alerting the infection control staff, nursing area, or a physician responsible for patient care.

Action Taken if CRE is Identified	2011 Lab Response	2013 Lab Response
Notify Infection Control Dept	76%	95%
Notify Nursing Station	35%	73%
Notify Physician	41%	57%
Notify Physician and recommend treatment change	7%	7%
No further action	10%	5%

Conclusions

The combined 2013 laboratory and IP survey results demonstrate that progress has been made in overall MDRO awareness as well as the detection and reporting of CRE isolates, but there are still areas for improvement. Better communication, enhanced education, and administrative support are needed to better address issues related to MDROs. Improved communication between HCFs during patient transfer as well as between laboratories and IPs is important to a successful MDRO prevention program. In addition, periodic education for all

healthcare workers, as well patients, is beneficial in controlling MDRO transmission. IPs should be familiar with current prevention strategies and the testing methods used in their laboratories. Laboratories also need additional training opportunities and resources to be able to conduct the most current testing procedures. Finally, it is essential to have the support of administrators who are dedicated to making MDRO prevention a priority.

Antibiotic resistant organisms are a growing public health threat and the collaboration with healthcare partners is a priority of the ISDH. To systematically address antibiotic resistance in Indiana and develop a plan for the future, the ISDH has formed the Indiana Antibiotic Resistance Advisory Committee. Members include representatives from the Marion County Public Health Department (MCPHD), APIC-IN, Health Care Excel, Indianapolis Patient Safety Coalition, IU Health, Wishard Eskenazi Hospital, Indiana Hospital Association (IHA), and the ISDH. This committee is reviewing and recommending action steps for surveillance, laboratory testing, infection control, and education of healthcare providers, hospital administrators, and the public for mitigating antibiotic resistance and promoting effective antibiotic stewardship.

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