TITLE: Emerging Resistant Organisms - Handling CRE (Carbapenem-Resistant Enterobacteriaceae), MDRA (Multi-drug Resistant Acinetobacter), and MDRO (Multi-drug Resistant Organism)

PRINCIPLE/PURPOSE:

Antimicrobial resistance is when a microbe resists the effect of an antibiotic and therefore its growth is not stopped. Therefore, it is important for microbiology laboratories to accurately identify if a patient exhibits a resistant organism because they are difficult to treat and require costly and sometimes toxic measures to treat.

The resistant organisms identified include:

1. CRE has been defined as Enterobacteriaceae that are: (This definition was based on the current Clinical and Laboratory Standards Institute (CLSI) M100-S23 2013 and CDC.) *See Table 1.1*

 1. Nonsusceptible to one of the following carbapenems:

 meropenem or imipenem AND

 2. Resistant to all of the following third-generation cephalosporins:

 ceftriaxone, cefotaxime, and ceftazidime.

1. MDRA has been defined an isolate with resistance to 1 or more antibiotic agents in 3 or more antimicrobial categories. *See Table 1.2*
2. MDRO has been defined as isolates with resistance to carbapenems, aminoglycosides, fluoroquinolones, and third generation cephalosporins. *See Table 1.3*

SCOPE: To provide procedure for the Microbiology department in identifying and handling Carbapenem-Resistant Enterobacteriaceae (CRE) isolates, Multi-Drug Resistant Acinetobacter, and Multi-Drug Resistant Organism (MDRO).

PROCEDURE:

CRE

1. Identify organism as an Enterobacteriacae.
2. Ensure the isolate is a pure culture.
3. Based on the antibiotics reported in the LIS, examine the susceptibility patterns. \*Refer to Table 1.1 for CRE nonsusceptibility pattern
4. If the organism is an E. coli, Klebsiella, or Enterobacter and is intermediate or resistant to imipenem, meropenem or doripenem, look to see if the organism is intermediate or resistant to ≥ one 3rd generation cephalosporin. If both patterns are present, the isolate is a CRE.
5. If it is not intermediate or resistant to ≥ one 3rd generation cephalosporin, then check to see if cefotaxime or ceftriaxone MIC is greater than 1 µg/mL OR cetfazidime MIC is greater than 4µg/mL. If it does not meet the above criteria, then it is not a CRE.
6. If E. coli, Klebsiella, or Enterobacter is intermediate or resistant to imipenem, meropenem, or doripenem, then see if ertapenem, imipenem, meropenem, or doripenem’s MIC is greater than 1 µg/mL.
7. If it does not meet the above criteria, then it is not a CRE. But, if it does, then check to see if the organism is intermediate or resistant to ≥ one 3rd generation cephalosporin or if the MIC > 1 µg/mL for cefotaxime or MIC > 4 µg/mL for ceftazidime. If it does not meet this criterion, then it is not a CRE. If it does meet this criterion, then confirm the nonsusceptibility to carbapenems by disk diffusion or ETEST. If it confirms by ETEST, then it is a CRE.
8. If the organism meets the criteria for CRE, set up an ETEST and repeat the sensitivity on the Vitek 2.
9. \*Refer to Table 1.1 for antimicrobial list.
10. Refer to the ETEST procedure.
11. If the ETEST confirms the MIC from the Vitek report and its repeat, then notify the patient’s nurse and/or physician and infection control.
12. Report in the computer as a CRE and document who was notified and the date and time notified. Also note that it is reported to Infection Control.
13. After the CRE is resulted, print the report to Infection Control.

MDRA

1. Identify organism.
2. Ensure the isolate is a pure culture.
3. From the Vitek 2 Compact sensitivity report, examine for resistance to 1 or more drugs in 3 or more antimicrobial categories.
4. Refer to Table 1.2 for antimicrobial categories
5. If the organism meets the criteria for MDRA, set up an ETEST and repeat sensitivity on the Vitek 2.
6. Refer to the ETEST procedure
7. If the ETEST confirms the MIC from the Vitek report and its repeat, notify the patient’s nurse and/or physician and infection control.
8. Report in the computer as a MDRA and document who was notified and the date and time notified. Also note that it is reported to Infection Control.
9. After the MDRA is resulted, print the report to Infection Control

MDRO

1. Identify organism.
2. Ensure the isolate is a pure culture.
3. Based on the antibiotics reported in the LIS, examine for resistance to 1 or more drugs in 3 or more antimicrobial categories.
	1. \*Refer to Table 1.3 for antimicrobial categories.
4. If the organism meets the criteria for MDRO, set up an ETEST and repeat sensitivity on the Vitek 2.
	1. \*Refer to ETEST procedure
5. If the ETEST confirms the MIC from the Vitek report and its repeat, notify the patient’s nurse and/or physician and infection control.
6. Report in the computer as a MDRO and document who was notified and the date and time notified. Also note that it is reported to Infection Control.
7. After the MDRO is resulted, print the report to Infection Control.

Table 1.1

|  |
| --- |
| Enterbacteriaceae |
| Nonsusceptible to ONE of the following: | Resistant to ALL of the following: |
| Imipenem | Ceftriaxone |
| Meropenem | Ceftazidime |
|  | Cefotaxime |

Table 1.2

|  |
| --- |
| MDRA |
| Resistance to 1 or more antibiotic agents in 3 or more antimicrobial categories.  |
| Antimicrobial Category | Antimicrobial Agent |
| Aminoglycoside | Gentamicin |
|  | Tobramycin |
| Amikacin |
| Antipseudomonal carbapenems | Imipenem |
|  | Meropenem |
| Antipseudomonal fluoroquinolones | Ciprofloxacin |
|  | Levofloxacin |
| Antipseudomonal penicillins + β-lactamase inhibitors | Pipercillin-tazobactam |
|  | Ticarcillin-clavulanic acid |
| Extended-spectrum cephalosporins | Cefotaxime |
|  | Ceftriaxone |
| Ceftazidime |
| Cefepime |
| Folate pathway inhibitors | Trimethoprim-sulfametoxazole |
| Penicillins + β-lactamase inhibitors | Ampicillin-sulbactam |
| Polymixins | Colistin |
| Tetracyclines | Tetracycline |

Table 1.3

|  |  |
| --- | --- |
| Organism | MDRO |
|  Antibiotics | Imipenem (carbapenem) |
| Meropenem (carbapenem) |
| Gentamicin (aminoglycoside) |
| Levofloxacin(fluoroquinolone) |
| Ceftriaxone (third-generation cephalosporin) |
|  | Ceftazidime (third-generation cephalosporin) |

INTERPRETATION & REPORTING RESULTS:

 Reference Ranges:

 Refer to ETEST procedure.

Procedures for Abnormal Results:

Notify RN and/or Physician (once per admission) and document in LIS. Patient must be on isolation precautions.

RELATED PROCEDURES:

1. ETEST
2. Vitek 2

REFERENCES:

1. Centers for Disease Control and Prevention. Antibiotic Resistance Threats in the United States, 2013. <http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf> [Accessed 7/15/2013].
2. Snitkin ES, Zelazny AM, Thomas PJ, et al. Tracking a hospital outbreak of carbapenem-resistant Klebsiella pneumonia with whole-genome sequencing. *Sci. Transl. Med.*  2012; 4(148):148ra116.
3. Anderson KF, Lonsway DR, Rasheed JK, et al. Rising rates of carbapenem-resistant enterobacteriaceae in community hospitals: a mixed-methods review of epidemiology and microbiology practices in a network of community hospitals in the southeastern United States. *Infect. Control Hosp. Epidemiol*. 2014;35(8):978-983.
4. Yusuf E. Van Der Meeren S, Shallier A, Pierard D. Comparison of the Carba NP test with the Rapid CARB Screen Kit for the detection of carbapenemase-producing Enterobacteriaceae and Pseudomonas aeruginosa. *Eur. J. Clin. Microbiol. Infect. Dis.* 2014.
5. <http://www.cdc.gov/hai/organisms/cre/cre-toolkit/rCREprevention-AppendixB.htm>.
6. Clinical and Laboratory STandars Institute (CLSI). M100-S22 2012.

SUPPLEMENTAL MATERIALS/ADDENDUM:

See chart on following page



|  |  |  |  |
| --- | --- | --- | --- |
| Review Date | Signature | Mgmt. | Director |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |

HISTORY PAGE

SOP Number: MICRO-790

SOP Title: Handling MDRO and CRE

Written By: Jacee Farmer / Shaye K. Yarbrough

Manual in which Hard Copy of this SOP is located: Microbiology Manual IV

Distribution: no other locations

Supersedes Procedure:

SOP CHANGE CONTROL

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | Approvals |   | Action | In |
| Mgmt. | Date |  Director | Date |   | Effect |
|  √ | 12/16/14 |  |  | MDRA are not sent to the State Lab any longer. | 12/16/14 |
|  √ |  6/10/15 |   |   | Changed MDRA to MDRO.  | 6/10/15 |
|   |  12-01-15 |   |   | Added a section for MDRA and MDRO  |  12-01-15 |
|   |   |   |   |   |   |
|   |   |   |   |   |   |
|   |   |   |   |   |   |
|   |   |   |   |   |   |
|   |   |   |   |   |   |
|   |   |   |   |   |   |
|   |   |   |   |   |   |
|  |  |  |  |  |  |
| Date archived: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Reason: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initials:\_\_\_\_\_\_\_\_\_\_ |  |
|  |  |  |  |  |  |