ANTIMICROBIAL RESISTANCE & PATIENT SAFETY PORTAL

Phenotype Definitions: Antimicrobial Resistance HAI Data

The following are definitions for the phenotypes listed in the Antimicrobial Resistance & Patient Safety Portal. For all pathogens included in the AR HAI dataset, there is a select group of antimicrobials for which susceptibility test results must be reported to the National Healthcare Safety Network (NHSN); these pathogen-antimicrobial combinations are then used to define the phenotypes below. Susceptibility results for each pathogen were reported to NHSN using the final category interpretations (see key below). Phenotype definitions are regularly updated to maintain consistency with the NHSN data entry requirements. For more information about the AR Patient Safety Portal Antimicrobial Resistance HAI dataset, visit: https://arpsp.cdc.gov/about?tab=antibiotic-resistance.

Phenotype Analytical Definitions

Key

(S) Susceptible

(I) Intermediate

(R) Resistant

(NS) Non-Susceptible

Phenotypes that have undergone definition changes are indicated by an asterisk (*). Refer to the Appendix for details regarding phenotype definition changes.

Enterococcus faecalis

Vancomycin-resistant (VRE)	Any isolate that tested (R) to vancomycin
Daptomycin-resistant*	Any isolate that tested (NS), (I), or (R) to daptomycin

Enterococcus faecium

Vancomycin-resistant (VRE)	Any isolate that tested (R) to vancomycin
Daptomycin-resistant*	Any isolate that tested (NS) or (R) to daptomycin

Coagulase-negative Staphylococci

Vancomycin-resistant	Any isolate that tested (I) or (R) to vancomycin

Staphylococcus aureus

Methicillin-resistant (MRSA)	Any isolate that tested (R) to at least 1 of these: methicillin, oxacillin, cefoxitin
Linezolid-resistant MRSA	MRSA that tested (R) to linezolid
Fluoroquinolone-resistant MRSA*	MRSA that tested (I) or (R) to at least 1 of these: ciprofloxacin, levofloxacin, moxifloxacin
Daptomycin-resistant MRSA	MRSA that tested (NS) to daptomycin

Acinetobacter

Carbapenem-resistant*	Any isolate that tested either (I) or (R) to at least 1 of these: imipenem, meropenem
Multidrug-resistant (MDR)*	Any isolate that tested either (I) or (R) to at least 1 drug in at least 3 of these categories: 1. Extended-spectrum cephalosporins (ceftazidime, cefepime, ceftolozane/tazobactam, ceftazidime/avibactam) 2. Fluoroquinolones (ciprofloxacin, levofloxacin) 3. Aminoglycosides (amikacin, gentamicin, tobramycin) 4. Carbapenems (imipenem, meropenem) 5. Piperacillin/tazobactam 6. Ampicillin/sulbactam

Enterobacterales

Includes *E. coli, Enterobacter, K. oxytoca, K. pneumoniae, K. aerogenes*, *K. granulomatis, K. singaporensis, K. variicola,* and unspecified Klebsiella spp.

Carbapenem-resistant (CRE)*	Any isolate that tested (R) to at least 1 of these: imipenem, meropenem, ertapenem, meropenem/vaborbactam, or imipenem/relebactam

Escherichia coli

Carbapenem-resistant (CRE)*	Any isolate that tested (R) to at least 1 of these: imipenem, meropenem, ertapenem, meropenem/vaborbactam, or imipenem/relebactam
Cephalosporin-resistant*	Any isolate that tested (I) or (R) to at least 1 of these: ceftriaxone, ceftazidime, cefepime, cefotaxime, ceftolozane/tazobactam, or ceftazidime/avibactam
Fluoroquinolone-resistant	Any isolate that tested (I) or (R) to at least 1 of these: ciprofloxacin, levofloxacin, moxifloxacin
Multidrug-resistant (MDR)*	Any isolate that tested either (I) or (R) to at least 1 drug in at least 3 of these categories: 1. Extended-spectrum cephalosporins (ceftriaxone, ceftazidime, cefepime, cefotaxime, ceftolozane/tazobactam, ceftazidime/avibactam) 2. Fluoroquinolones (ciprofloxacin, levofloxacin, moxifloxacin) 3. Aminoglycosides (amikacin, gentamicin, tobramycin) 4. Carbapenems (isolate must have tested (R) to imipenem, meropenem, ertapenem, meropenem/vaborbactam, or imipenem/relebactam) 5. Piperacillin/tazobactam

Klebsiella

Includes *K. oxytoca, K. pneumoniae, K. aerogenes* (unless otherwise specified), *K. granulomatis, K. singaporensis, K. variicola,* and unspecified Klebsiella spp.

Carbapenem-resistant (CRE)*	Any isolate that tested (R) to at least 1 of these: imipenem, meropenem, ertapenem, meropenem/vaborbactam, or imipenem/relebactam
Cephalosporin-resistant* (Excludes *K. aerogenes*)	Any isolate that tested (I) or (R) to at least 1 of these: ceftriaxone, ceftazidime, cefepime, cefotaxime
Multidrug-resistant (MDR)* (Excludes *K. aerogenes*)	Any isolate that tested either (I) or (R) to at least 1 drug in at least 3 of these categories: 1. Extended-spectrum cephalosporins (ceftriaxone, ceftazidime, cefepime, cefotaxime, ceftolozane/tazobactam, ceftazidime/avibactam)

	2. Fluoroquinolones (ciprofloxacin, levofloxacin, moxifloxacin) 3. Aminoglycosides (amikacin, gentamicin, tobramycin) 4. Carbapenems (isolate must have tested (R) to imipenem, meropenem, ertapenem, meropenem/vaborbactam, or imipenem/relebactam) 5. Piperacillin/tazobactam

Enterobacter

Carbapenem-resistant (CRE)*	Any isolate that tested (R) to at least 1 of these: imipenem, meropenem, ertapenem, meropenem/vaborbactam, or imipenem/relebactam
Cefepime-resistant	Any isolate that tested (I) or (R) to cefepime
Multidrug-resistant (MDR)*	Any isolate that tested either (I) or (R) to at least 1 drug in at least 3 of these categories: 1. Cefepime 2. Fluoroquinolones (ciprofloxacin, levofloxacin, moxifloxacin) 3. Aminoglycosides (amikacin, gentamicin, tobramycin) 4. Carbapenems (isolate must have tested (R) to imipenem, meropenem, ertapenem, meropenem/vaborbactam, or imipenem/relebactam) 5. Piperacillin/tazobactam

Pseudomonas aeruginosa

Carbapenem-resistant*	Any isolate that tested (I) or (R) to at least 1 of these: imipenem, meropenem
Cephalosporin-resistant*	Any isolate that tested (I) or (R) to at least 1 of these: ceftazidime, cefepime, ceftolozane/tazobactam, ceftazidime/avibactam
Fluoroquinolone-resistant	Any isolate that tested (I) or (R) to at least 1 of these: ciprofloxacin, levofloxacin
Aminoglycoside-resistant	Any isolate that tested (I) or (R) to at least 1 of these: amikacin, gentamicin, tobramycin
Piperacillin/Tazobactam-resistant*	Any isolate that tested (I) or (R) to piperacillin/tazobactam

Multidrug-resistant (MDR)*	Any isolate that tested either (I) or (R) to at least 1 drug in at least 3 of these categories: 1. Extended-spectrum cephalosporins (ceftazidime, cefepime, ceftolozane/tazobactam, ceftazidime/avibactam) 2. Fluoroquinolones (ciprofloxacin, levofloxacin) 3. Aminoglycosides (amikacin, gentamicin, tobramycin) 4. Carbapenems (imipenem, meropenem) 5. Piperacillin/tazobactam

Appendix: Phenotype Definition Change Log

- **Daptomycin-resistant *Enterococcus faecalis*:**
  - Starting with 2021 data, the option for a resistant (R) result for daptomycin was added into NHSN and incorporated into this phenotype definition.
  - Starting with 2022 data, the option for an intermediate (I) result for daptomycin was added into NHSN and incorporated into this phenotype definition.
- **Daptomycin-resistant *Enterococcus faecium*:**
  - Starting with 2021 data, the option for a resistant (R) result for daptomycin was added into NHSN and incorporated into this phenotype definition.
- **Fluoroquinolone-resistant MRSA:**
  - For data prior to 2021, moxifloxacin was not included in the phenotype definition.
- **Carbapenem-resistant *Acinetobacter*:**
  - Starting with 2025 data, doripenem was removed from the phenotype definition.
- **MDR *Acinetobacter*:**
  - For data prior to 2021:
    - Ceftolozane/tazobactam and ceftazidime/avibactam were not included in the phenotype definition.
    - Piperacillin was included in the phenotype definition.
  - Starting with 2025 data, doripenem was removed from the carbapenem resistance category.
- **Carbapenem-resistant Enterobacterales:**
  - For data prior to 2021, meropenem/vaborbactam and imipenem/relebactam were not included in the phenotype definition.
  - Starting with 2025 data:
    - *K. granulomatis, K. singaporensis, K. variicola,* and unspecified Klebsiella spp. were added to the phenotype definition.
    - Doripenem was removed from the phenotype definition.
- **Carbapenem-resistant *Escherichia coli*:**
  - For data prior to 2021, meropenem/vaborbactam and imipenem/relebactam were not included in the phenotype definition.
  - Starting with 2025 data, doripenem was removed from the phenotype definition.
- **Cephalosporin-resistant *Escherichia coli*:**

- For data prior to 2021, ceftolozane/tazobactam and ceftazidime/avibactam were not included in the phenotype definition.

- **MDR *Escherichia coli*:**
  - For data prior to 2021, the following antibiotics were not included in the phenotype definition:
    - Ceftolozane/tazobactam and ceftazidime/avibactam
    - Meropenem/vaborbactam and imipenem/relebactam
  - Starting with 2025 data, doripenem was removed from the carbapenem resistance category.
- **Carbapenem-resistant *Klebsiella*:**
  - Starting with 2020 data, *K. aerogenes* were added to the phenotype definition.
  - Starting with 2021 data, Meropenem/vaborbactam and imipenem/relebactam are included in the phenotype definition.
  - Starting with 2025 data:
    - Doripenem was removed from the phenotype definition.
    - *K. granulomatis, K. singaporensis, K. variicola,* and unspecified Klebsiella spp. were added to the phenotype definition.
- **Cephalosporin-resistant *Klebsiella*:**
  - Starting with 2025 data, *K. granulomatis, K. singaporensis, K. variicola,* and unspecified Klebsiella spp. were added to the phenotype definition.
- **MDR *Klebsiella*:**
  - For data prior to 2021, the following antibiotics were not included in the phenotype definition:
    - Ceftolozane/tazobactam and ceftazidime/avibactam
    - Meropenem/vaborbactam and imipenem/relebactam
  - Starting with 2025 data:
    - Doripenem was removed from the carbapenem resistance category.
    - *K. granulomatis, K. singaporensis, K. variicola,* and unspecified Klebsiella spp. were added to the phenotype definition.
- **Carbapenem-resistant *Enterobacter*:**
  - Starting with 2020 data, *E. aerogenes* was removed from the phenotype definition.
  - For data prior to 2021, meropenem/vaborbactam and imipenem/relebactam were not included in the phenotype definition.
  - Starting with 2025 data, doripenem was removed from the phenotype definition.
- **Cefepime-resistant *Enterobacter*:**
  - Starting with 2020 data, *E. aerogenes* was removed from the phenotype definition.
- **MDR *Enterobacter*:**
  - Starting with 2020 data, *E. aerogenes* was removed from the phenotype definition.
  - For data prior to 2021, meropenem/vaborbactam and imipenem/relebactam were not included in the phenotype definition.
  - Starting with 2025 data, doripenem was removed from the carbapenem resistance category.
- **Cephalosporin-resistant *Pseudomonas aeruginosa*:**
  - For data prior to 2021, ceftolozane/tazobactam and ceftazidime/avibactam were not included in the phenotype definition.
- **Piperacillin/Tazobactam-resistant *Pseudomonas aeruginosa*:**
  - For data prior to 2021, piperacillin was included in the phenotype definition.
- **Carbapenem-resistant *Pseudomonas aeruginosa*:**

- Starting with 2025 data, doripenem was removed from the phenotype definition.

- **MDR *Pseudomonas aeruginosa*:**
  - For data prior to 2021:
    - Ceftolozane/tazobactam and ceftazidime/avibactam were not included in the phenotype definition
    - Piperacillin was included in the phenotype definition
  - Starting with 2025 data, doripenem was removed from the carbapenem resistance category.