Section 4

Healthcare-Associated Infections and Antimicrobrial Resistance

Section 4: HAIs and Antimicrobial Resistance

Health care-associated infections background

The Centers for Disease Control and Prevention (CDC) estimates that on any given day, 1 in 31 hospital patients has a Health Care-Associated Infection (HAI). Florida has a large system of health care facilities providing care to residents and visitors. There are **309** licensed inpatient hospitals with **213** having emergency departments. There are **481** ambulatory surgery centers, **704** nursing homes and **3150** licensed assisted living facilities in Florida. To assess a facility's capability to identify, isolate, inform, prepare for transport, and provide care for persons with highly infectious diseases, the CDC designed the Infection Control Assessment Response (ICAR). An ICAR program was started in Florida in 2017 to conduct non-regulatory infection control assessments in collaboration with all health care facilities. Assessments review infection control policies and conduct direct observations of infection prevention practices (e.g., hand hygiene, personal protective equipment, environmental cleaning, patient care, device reprocessing, etc.).

Antimicrobial resistance background

Antimicrobial resistance is the ability of a microorganism to evade antimicrobial treatment. One reason microorganisms have become resistant to antibiotics is that they are often inappropriately used to treat infections with the wrong dose, duration, or drug choice. Giving antibiotics to food animals can also foster resistance in bacteria. Infections caused by drug-resistant organisms are difficult to treat and often require extended hospital stays, treatment with more toxic drugs and increased medical costs. Surveillance data are used to identify occurrences of novel resistant organisms, analyze trends over time, target facilities for interventions to improve antibiotic prescribing and guide empiric therapy.

Antibiotic resistance is an urgent public health problem that is responsible for over 2.8 million infections and more than 35,000 deaths annually in the United States. The misuse of antibiotics has contributed to the growing problem of resistance and improving the use of antibiotics in healthcare to protect patients and reduce the threat of antibiotic resistance is a national priority. Because antibiotics are a shared resource, the potential for spread of resistant organisms means that the misuse of antibiotics can adversely impact the health of patients, even those who are not directly exposed to them. Further, like all medications, antibiotics can have unintended consequences, including adverse drug reactions and *Clostridioides difficile* infection (CDI).

Antibiotic stewardship refers to coordinated interventions designed to improve the use of antibiotics. Antibiotic stewardship programs have been shown to increase optimal prescribing for therapy and prophylaxis, improve the quality of patient care, reduce adverse events associated with antibiotic use such as CDI and resistance, and offer cost savings to hospitals. CDC recommends that antibiotic stewardship programs be implemented in all health care settings.

State and local health departments play critical roles as partner and convener across the health care continuum and are positioned to promote appropriate antibiotic use and prevention strategies to limit the development of antimicrobial resistance. Activities that our state and local health departments do to implement antibiotic stewardship include:

1. Incorporate stewardship activities into HAI program through identifying leaders to secure expertise knowledgeable on antibiotic stewardship activities and tools and identify staff available to evaluate antibiotic stewardship programs and antibiotic resistance patterns and trends
2. Conduct surveillance to understand current stewardship practices/needs across facilities
3. Coordinate and integrate stewardship activities with ongoing quality improvement efforts both within own agency and by reaching out to quality improvement organizations to synergize activities.
4. Provide and develop education and tools on appropriate antibiotic prescribing for facilities and healthcare professionals and community members
5. Enforce a communications plan to reach and maintain relationships with facilities and organizations with similar goals and guide partners to appropriate stewardship resources

Laboratory Testing

To further improve surveillance and awareness of *Candida auris (C.auris*), carbapenem-resistant *Acinetobacter baumannii* (CRAB), carbapenem-resistant *Pseudomonas aeruginosa* (CRPA), and carbapenem-resistant Enterobacterales (CRE), FDOH's BPHL expanded CRAB, CRPA, and CRE testing capabilities to identify types of resistance mechanisms used by these organisms. Carbapenemase-producing bacteria are pathogens of public health concern. Carbapenemases are enzymes that breaks down carbapenem antibiotics and can be transferred between organisms. A variety of carbapenemases have been reported in the U.S. and in Florida including *Klebsiella pneumoniae* carbapenemase (KPC), Verona integron-encoded metallo-β-lactamase (VIM), New Delhi metallo-β-lactamase (NDM) and oxacillinase (OXA)-48-like.

Section 4: HAIs and Antimicrobial Resistance

C. auris, on the other hand, is a fungal disease that is often multi-drug resistant and recent surveillance in other states have identified isolates resistant to all classes of antifungal medication. *C. auris* can be misidentified with standard laboratory methods requiring additional workup. Health care facilities with a suspected *Candida auris* isolate should work with the HAI Program to obtained confirmatory testing through the Antibiotic Resistance Laboratory Network (ARLN) in Tennessee for identification and antifungal susceptibility testing. The HAI Program is also working with health care laboratories across the state to leverage existing technology to improve identification and surveillance efforts for *C. auris*.

Electronic Laboratory Reporting (ELR) Surveillance

All laboratories participating in ELR must report antimicrobial resistance testing results for all *Acinetobacter baumannii*, *Citrobacter* species, *Enterococcus* species, *Enterobacter* species, *Escherichia coli*, *Klebsiella* species, *Pseudomonas aeruginosa*, *Serratia* species and *S. aureus* isolates from normally sterile sites. Resistance results are processed electronically in the state's reportable disease surveillance system.

Antimicrobial Resistance Key Points

Acinetobacter species in 2020

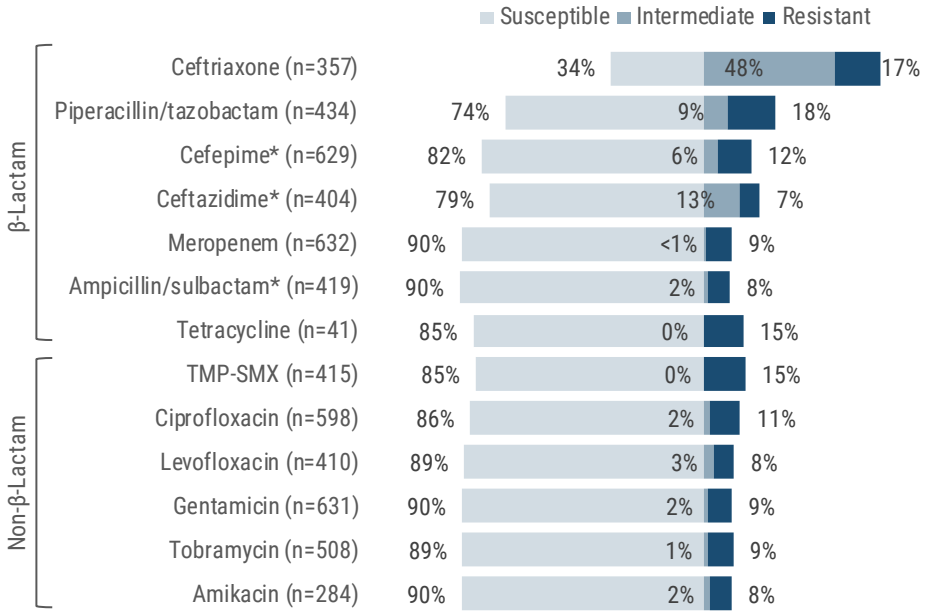
522 isolates reported

11% resistant to one or more carbapenems (doripenem, ertapenem, imipenem, meropenem)

10–13% resistant to recommended antibiotics (cefepime, ceftazidime, ampicillin/sulbactam)

Organism Facts

- Gram-negative bacteria, frequently found in soil and water; *A. baumannii* is most common species causing disease in humans
- Causes pneumonia, blood infections, meningitis, urinary tract infections, skin or wound infections
- Transmitted via direct contact



TMP-SMX=trimethoprim/sulfamethoxazole
* Recommended first-line antibiotics, according to *The Sanford Guide to Antimicrobial Therapy 2018*
Note: indeterminate results not included in this figure

Section 4: HAIs and Antimicrobial Resistance

Streptococcus pnuemoniae in 2020

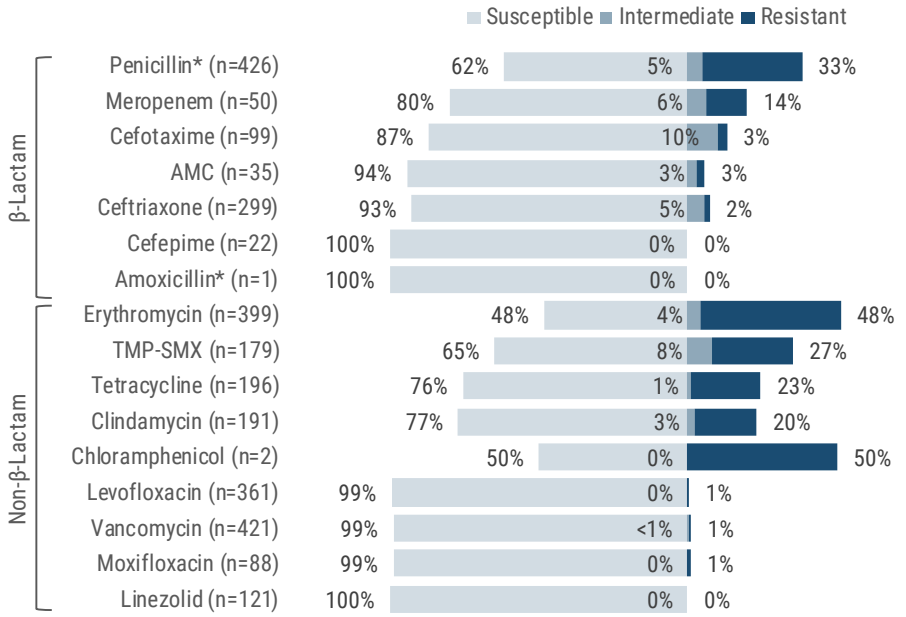
774 *S.* pneumoniae invasive disease cases reported

40% had isolates resistant to at least one antibiotic

20% resistant to penicillin and **0%** resistant to amoxicillin (recommended first-line antibiotics)

Organism Facts

- Gram-positive, facultative anaerobic bacterium
- Major cause of pneumonia and meningitis
- Transmitted via direct contact



AMC=amoxicillin/clavulanate
TMP-SMX=trimethoprim/sulfamethoxazole
* Recommended first-line antibiotics, according to *The Sanford Guide to Antimicrobial Therapy 2018*

Escherichia coli in 2020

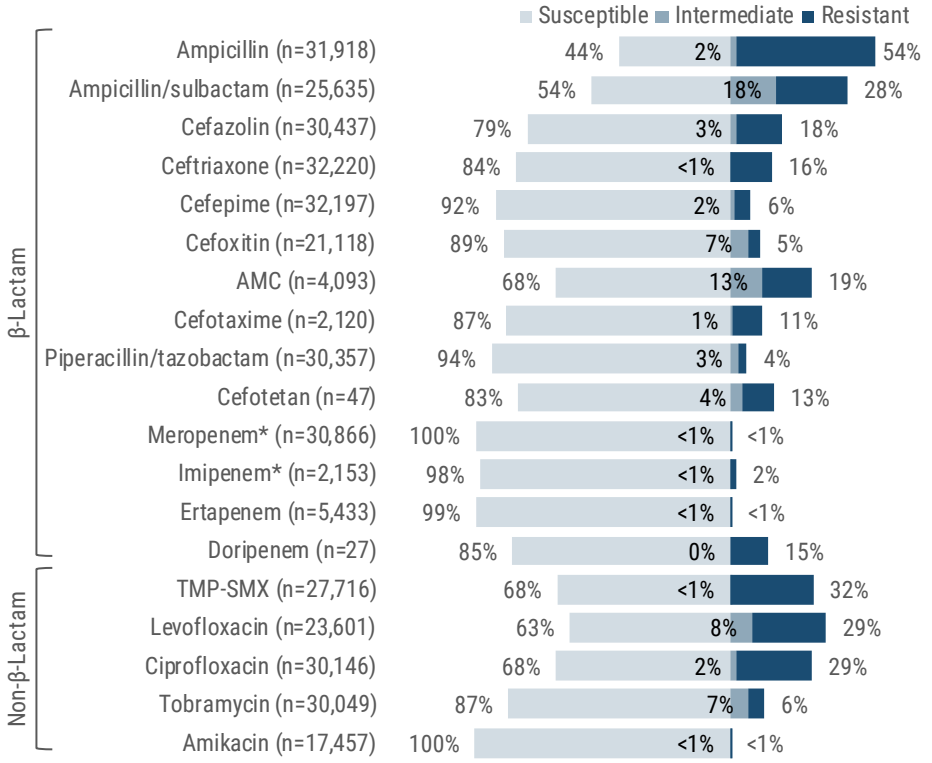
21,055 isolates reported

0.2% resistant to one or more carbapenems (i.e., CRE)

<1% resistant to imipenem or meropenem (recommended first-line antibiotics)

Organism Facts

- Gram-negative, facultative aerobic bacterium, frequently found in lower intestine
- Cause of food poisoning, pneumonia, breathing problems, and urinary tract infections
- Transmitted via fecal-oral route



AMC=amoxicillin/clavulanate
TMP-SMX=trimethoprim/sulfamethoxazole
* Recommended first-line antibiotics, according to *The Sanford Guide to Antimicrobial Therapy 2018*
Note: indeterminate results not included in this figure

Section 4: HAIs and Antimicrobial Resistance

Antimicrobial Resistance Key Points (Continued)

Klebsiella species in 2020

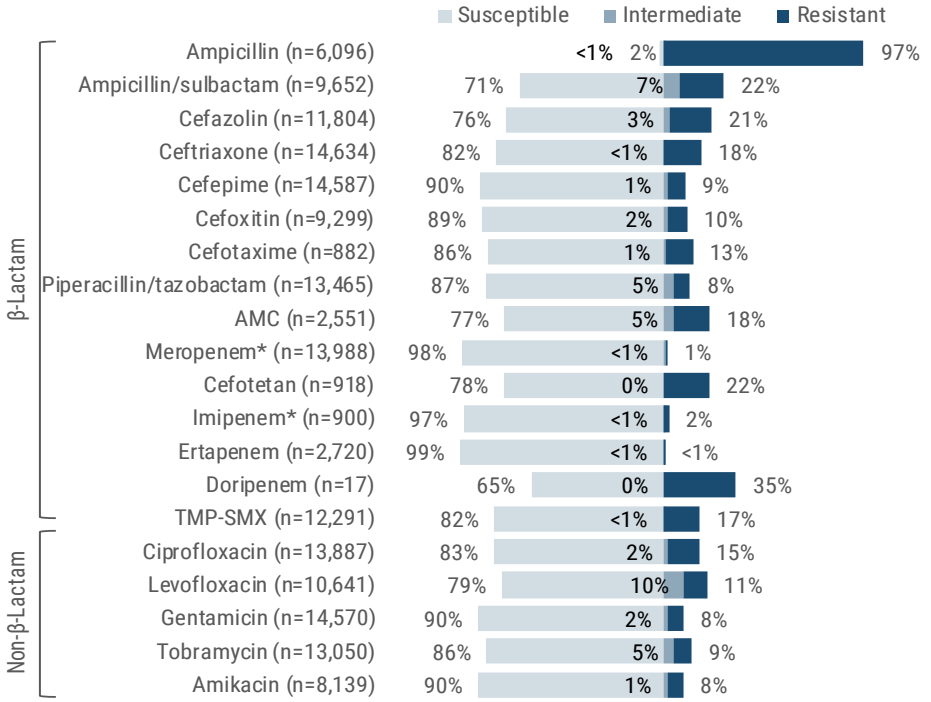
6,243 isolates reported

0.8% resistant to one or more carbapenems (i.e., CRE)

<1% resistant to imipenem or meropenem (recommended first-line antibiotics)

Organism Facts

- Ubiquitous, gram-negative bacteria; *K. oxytoca* and *K. pneumoniae* are most common species causing disease
- Causes food poisoning, pneumonia, breathing problems, urinary tract infections
- Transmitted via direct contact



AMC=amoxicillin/clavulanate

TMP-SMX=trimethoprim/sulfamethoxazole

* Recommended first-line antibiotics, according to *The Sanford Guide to Antimicrobial Therapy 2018* Note: indeterminate results not included in this figure

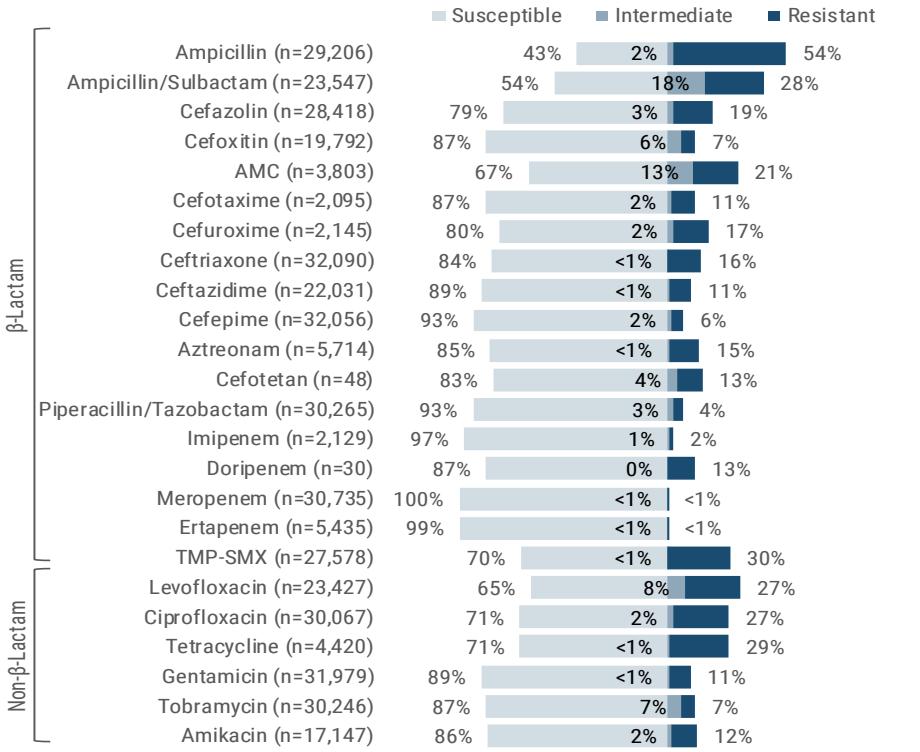
Enterobacteriaceae in 2020

30,122 isolates reported

0.6% resistant to carbapenem (i.e., CRE)

Organism Facts

- Family of bacteria that includes *Escherichia coli*, *Klebsiella pneumoniae*, *Salmonella* species and *Shigella* species
- Often occur in health care settings in patients who require devices or antibiotic therapy
- Transmission depends on organism



AMC=amoxicillin/clavulanate
TMP-SMX=trimethoprim/sulfamethoxazole
* Recommended first-line antibiotics, according to *The Sanford Guide to Antimicrobial Therapy 2018*
Note: indeterminate results not included in this figure

Section 4: HAIs and Antimicrobial Resistance

Antimicrobial Resistance Key Points (Continued)

Staphylococcus aureus in 2020

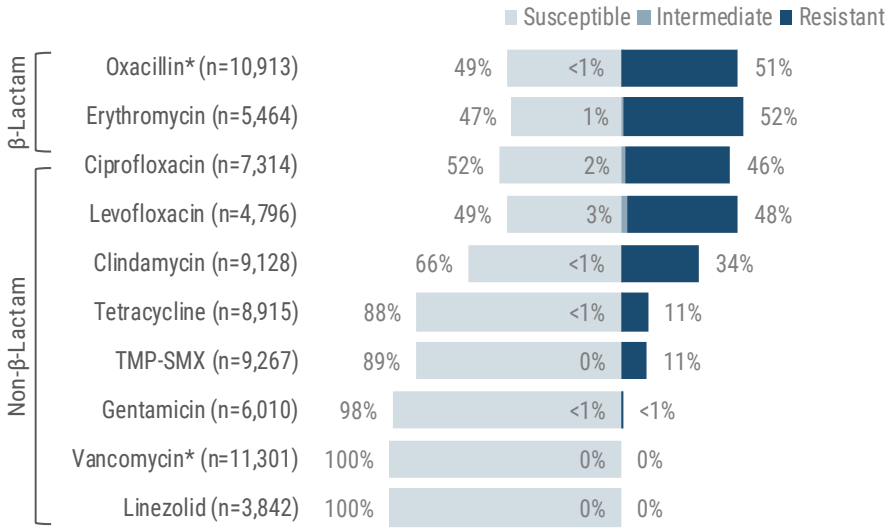
58,441 isolates reported

36% resistant to oxacillin (i.e., MRSA)
(susceptibility testing now done on oxacillin rather than methicillin)

0% resistant to vancomycin (recommended first-line antibiotic when resistant to oxacillin)

Organism Facts

- Gram-positive bacterium, often part of the body's normal flora, frequently found in nose, respiratory tract, and on skin
- Leading cause of skin and soft tissue infections
- Transmitted via direct contact



TMP-SMX=trimethoprim/sulfamethoxazole
* Recommended first-line antibiotics, according to *The Sanford Guide to Antimicrobial Therapy 2018*