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Assessing the potential for improved response to antimicrobial resistance in outpatient Staphylococcus aureus isolates using seasonal and spatial antibiograms

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Increasing bacterial resistance to multiple classes of antibiotics limits effective treatment options. Understanding spatial and temporal variation in resistance rates is important for informing empiric therapy, the prescribing of antimicrobials before lab-based susceptibility testing results are available to the provider. In particular, the use of cumulative susceptibility reports, also known as antibiograms, is recommended for improved empiric therapy and antibiotic stewardship. However, the predictive ability of antibiograms has not been well-studied nor has the potential for past seasonal or spatial variation in susceptibility been assessed as important in predicting likelihood of future susceptibility. Utilizing Staphylococcus aureus isolates obtained in outpatient settings from a nationwide provider of care, the Veterans Health Administration, and a local provider of care, the University of Iowa Hospitals and Clinics, standard, seasonal and spatial antibiograms were created for five commonly used antibiotic classes. A total of 338,681 S. aureus isolates obtained in VHA outpatient settings from 2010-2019 and 6,817 isolates obtained in UIHC outpatient settings from 2014-2019 were used to generate and test antibiograms. Logistic regression modeling determined the capacity of these antibiograms to predict isolate susceptibility to each antibiotic class. All models had low predictive capacity, with areas under the curve of < 0.7. Standard antibiograms are poor in predicting S. aureus susceptibility to antibiotics often chosen by clinicians, and seasonal and spatial antibiograms do not provide an improved tool in anticipating non-susceptibility. These findings suggest that further refinements to antibiograms may be necessary to improve their utility in informing choice of effective antibiotic therapy.

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