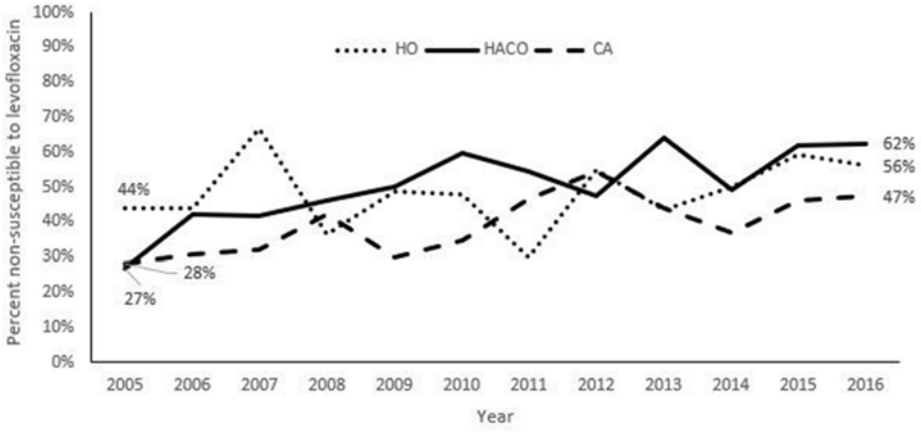

Figure. Percent levofloxacin non-susceptibility among invasive MRSA USA300 isolates by epidemiologic classification and year.

Fig. 1.

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Background: Incidence of community-associated (CA) and healthcare-associated, community-onset (HACO) USA300 methicillin-resistant *Staphylococcus aureus* (MRSA) bloodstream infections has remained unchanged in recent years. Traditionally considered a CA strain, USA300 is increasingly associated with healthcare settings. We examined whether antimicrobial nonsusceptibility among USA300 strains could distinguish epidemiologic class (community vs hospital), and whether divergences in susceptibility were occurring over time. **Methods:** We used data on invasive MRSA infections from active, population, and laboratory-based surveillance during 2005–2016 from 11 counties in 3 states. Invasive cases were defined as MRSA isolation from a normally sterile site in a surveillance area resident. Cases were considered hospital-onset (HO) if the culture was obtained >3 days after hospitalization and HACO if ≥1 of the following risk factors was present: hospitalization, surgery, dialysis, or residence in a long-term care facility in the past year; or central vascular catheter ≤2 days before culture. Otherwise, cases were considered CA. Sites submitted a convenience sample of clinical MRSA isolates for molecular typing and antimicrobial susceptibility testing. Molecular typing was performed by pulsed-field gel electrophoresis until 2008, when typing was inferred using a validated algorithm based on molecular characteristics. Reference broth microdilution was performed for 8 antimicrobials and interpreted based on CLSI interpretive criteria. We compared USA300 nonsusceptibility for HO and CA isolates. For antimicrobials with >5% nonsusceptibility and for which HO isolates had greater nonsusceptibility than CA isolates, we compared nonsusceptibility for HACO and CA and analyzed annual trends in nonsusceptibility within each epidemiologic class (ie, CA, HACO, and HO) using linear regression. **Results:** Of 17,947 MRSA cases during 2005–2016, isolates were available for 6,685 (37%), and 2,120 were USA300 (34% CA, 52% HACO, 14% HO). HO isolates had more nonsusceptibility than CA isolates to gentamicin (2.2% vs 0.6%; $P = .03$), levofloxacin (47.8% vs 39.7%; $P = .02$), rifampin (3.7 vs 1.1%; $P = .01$), and trimethoprim-sulfamethoxazole (3.4% vs 0.6%; $P = .04$). HACO isolates also had more nonsusceptibility than CA isolates to levofloxacin (50.9% vs 39.7%; $P < .01$). Levofloxacin nonsusceptibility increased during 2005–2016 for HACO and CA isolates ($P < .01$), but not among HO isolates ($P = .36$) (Fig. 1). **Conclusions:** Overall, nonsusceptibility across drugs cannot distinguish USA300 isolates causing HO versus CA disease. Although HO isolates had higher levofloxacin nonsusceptibility than CA and HACO isolates early on, USA300 MRSA HACO isolates now have levofloxacin nonsusceptibility most similar to that of HO isolates. Further study could help to explore whether increases in fluoroquinolone nonsusceptibility among CA and HACO cases may be contributing to the persistence of USA300 strains.

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Antimicrobial Resistance and Biofilm Formation by *Staphylococcus aureus* Isolated From Ocular Infections

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Background: Untreated staphylococcal ocular infections may cause injuries in the ocular structure and lead to visual impairments, lesions in the anatomical ocular surface, and blindness. The aim of the study was to describe the characteristic of 90 *Staphylococcus aureus* (SA) strains from hospital and community treated ocular infections with a special emphasis on ability of biofilm formation and drug resistance. The biofilm formation was carried out using the Congo red agar (CRA) method applying Congo red dye. Studies have demonstrated that the CRA method is simple, fast, and repeatable and that modifications of some components

can easily increase its accuracy. **Methods:** Biofilm formation was examined by the method with CRA test. On CRA, slime-producing strains formed black colonies, whereas nonproducing strains developed red colonies in 6 kinds of colors, from very red to very black: very red, red, burgundy, almost black, black, and very black. Antimicrobial susceptibility testing was performed by disc diffusion or the E-test method according to the current guidelines of the EUCAST. The MRSA, and MLSB phenotypes were detected. Polymerase chain reaction (PCR) was used to detect the *mec*A, and *mup*A genes. Erythromycin resistance genes (*erm*A, *erm*B, *erm*C, and msr) were detected by multiplex PCR. **Results:** A positive result of the CRA test was accomplished in 66.2% cases; significantly more often in hospital strains (73.4% vs 45.4%; OR, 3.3; 55% CI, 1.2–9.3). Moreover, 73.4% isolates were fully susceptible. In hospitalized patients, the level of resistance to at least 1 antimicrobial category has been identified as 40.9%, and this rate was 27.2% in outpatients. Among the tested strains, 5 (6.0%) had the resistance phenotype MRSA and 22 (26.5%) the resistance phenotype MLSB; 4 strains manifested both mechanisms; erythromycin resistance was 25.3% in those resistant to fluoroquinolones. Resistance to fluoroquinolones was 5 times more often found in ambulatory patients. All of the tested isolates were vancomycin sensitive. **Conclusions:** Biofilm formation is an important risk factor for developmental staphylococcal hospital-acquired ocular infections. Our results prove that hospital strains have demonstrated much greater biofilm-forming ability than nonhospital strains. Studies indicate the high efficacy of chloramphenicol and fluoroquinolones treatments, as well as the need to implement new solutions due to the aforementioned bacteria's high resistance to neomycin and anatomic barriers difficulties.

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Antimicrobial-Resistant Organism Outbreak in a Skilled Nursing Facility in Pennsylvania, 2019

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Background: In April 2019, the Montgomery County Office of Public Health (MCOPH) was notified by the Pennsylvania Department of Health (PADOH) of a tier 2 carbapenemase mechanism in a resident of a Pennsylvania skilled nursing facility that was detected through targeted surveillance. Production of the New Delhi metallo-β-lactamase (NDM) carbapenemase was detected using polymerase chain reaction (PCR). The initial follow-up revealed that the patient resided at a 148-bed skilled nursing facility that specializes in spinal cord injury, neurological diseases, ventilator dependence, and pulmonary diseases. MCOPH and PADOH initiated an investigation to identify additional cases and prevent transmission. **Methods:** Over a series of 9 point-prevalence surveys, we collected 518 specimens for colonization screening. Screening was conducted on the wing of the index case and was later expanded to include the entire unit (n = 90), after evidence of transmission was noted. Perirectal swabs were submitted to the regional antibiotic resistance laboratory for testing using the Cepheid GeneXpert Carba-R assay. Together with screening, MCOPH and PADOH conducted a series of on-site visits involving the completion of the CDC infection control assessment and response (ICAR) tool and direct care observations, including 409 hand hygiene observations. **Results:** In addition to NDM, *Klebsiella pneumoniae* carbapenemase (KPC) and Verona integron-encoded metallo-β-lactamase (VIM) were also detected. ICAR results and direct care observations revealed numerous deficiencies in the domains of hand hygiene, personal protective equipment, and environmental cleaning. In addition to 2 cases of carbapenemase-producing organisms (CPO) being detected through clinical specimens, an additional 27 CPO cases were identified through screening coordinated by public health. This large, multimechanism outbreak is attributed to a combination of intrafacility transmission and imported cases. Based on these findings, recommendations for infection prevention and control were provided on site and in writing. Our continued work with this facility lead to improvements in infection control, including a HH success rate improvement of 53%. **Conclusions:** Novel or targeted multidrug-resistant organisms are effectively contained when healthcare facilities and state and local public health work together to reduce transmission to baseline and to improve infection control practices.

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Antimicrobial Stewardship Approach: Strategy to Enhance Antimicrobial Stewardship Programs in Arizona Long-Term Care

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Background: Implementing robust antimicrobial stewardship programs within long-term care facilities (LTCFs) presents unique challenges not typically seen in other healthcare settings. These facilities tend to care for older adults, rely on limited on-site clinician availability and experience higher-than-normal staff turnover. Many LTCFs lack the resources and expertise to track and analyze antibiotics usage. Through a collaborative effort between the Arizona Department of Health Services and the University of Arizona College of Pharmacy, support for carrying out stewardship activities was provided to these healthcare facilities. Our objective was to assess the viability of using pharmacy prescribing data to evaluate antibiotics usage among LTCFs throughout Arizona to assist in development of antimicrobial stewardship interventions. **Methods:** We invited interested LTCFs to participate in the development and enhancement of antimicrobial stewardship programs. We analyzed antibiotic prescribing data from November 2017 through November 2018 to assess the types and quantities of antibiotics prescribed. We worked with pharmacies to obtain a deidentified dataset that included unique patient identifiers, transaction (start) date, agent name, directions for use, route of administration, quantity dispensed, and stop dates. We estimated duration of treatment by assessing antibiotic starts using the number of transaction dates and unique patient identifiers for repeat prescriptions. Each agent was evaluated individually and assigned to an antibiotic category to better assess cumulative prescribing. **Results:** Through assistance from our community