ampicillin (n = 153, 21.4%) and metronidazole (n = 135, 20%). **Conclusions:** This study shows high use of antibiotics among hospitalized patients in Haitian hospitals, especially in children aged <1 year. Almost all the antibiotics were prescribed as either empiric or prophylaxis therapy, with very few microbiology samples collected. These results suggest limited laboratory corroboration across hospitals to inform antibiotic use. Implementation of antimicrobial stewardship interventions is recommended to optimize antibiotic therapy and to mitigate antimicrobial resistance in hospital care settings, but adaptation of the methodology should be done in settings with limited laboratory capacity.

Funding: None
Disclosures: None
Doi:10.1017/ice.2020.495

Presentation Type:
Oral Presentation

An Outbreak of New Delhi Metallo–Lactamase-5 (blaNDM-5)–Producing *Escherichia coli* in Companion Animals in the United States

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Background: The emergence of carbapenem-resistant *Enterobacteriaceae* (CRE) in companion animals will be a game changer for infection prevention and control strategies in veterinary and human healthcare facilities. CRE have emerged as an important cause of human healthcare-associated infections and are a major clinical and public health problem. Although reports of CRE from animals are still very rare, they have been documented in China, Europe, and the United States. **Methods:** In April 2019, a passive veterinary surveillance system identified the $bla_{\text{NDM-5}}$ gene in an *E. coli* isolated from a dog in Philadelphia in July 2018. CRE are reportable to the Philadelphia Department of Public Health (PDPH), and in May 2019, the Matthew J. Ryan Veterinary Hospital at the University of Pennsylvania (MJRVH) reported a cluster of carbapenem-resistant *E. coli* (CR-*E. coli*) isolated from 14 animals to the PDHP. This cluster of 17 isolates, that all contained a blaNDM-5 gene, was the first report of a CR-*E. coli* outbreak at a US veterinary facility. The first isolate, *E. coli* 24213-18, was sequenced on the Pacific Biosciences (PacBio) Sequel Sequencer and has been uploaded to GenBank. Whole genome sequencing was performed on all 17 isolates using the Illumina MiSeq platform. Antimicrobial resistance genes were identified from the National Center for Biotechnology Information Pathogen Detection Isolates Browser using AMRFinder. **Results:** PacBio sequencing confirmed *E. coli* ST167 and identified a circular IncFII plasmid of 139,547 bp that contained the $bla_{\text{NDM-5}}$ gene, along with many additional resistance genes. In June 2019, a retrospective review of hospital records was completed and showed that, from July 2018, 17 CR- *E. coli* were isolated from 14 animals. **Conclusions:** Control of CRE infections in human healthcare settings is challenging because the organisms colonize the gastrointestinal tract and can go undetected. The same issue is to be expected with companion animals. Healthcare-associated spread of CRE *E. coli* in a veterinary facility emphasizes the importance of rapidly identifying and characterizing carbapenem-resistant isolates from animals. Methods to control the spread of CRE in veterinary medical settings have not yet been studied, and related investigations will be critically important to limit the transmission of these pathogens in animal populations. The risk of transmission of CRE from animals to people is currently poorly understood. CRE will be a major challenge across all health fields as these organisms become more prevalent in the community. It is likely that a 'One Health' approach to surveillance, infection prevention, and antimicrobial stewardship will be required to limit the spread and potential global dominance of CRE.

Funding: None
Disclosures: None
Doi:10.1017/ice.2020.496

Presentation Type:
Oral Presentation

Appropriateness of Orthopedic Surgical Antimicrobial Prophylaxis Prescribing in Australia: Meaningful Metrics for Surgeons

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Background: Orthopedic procedures are performed at high volumes in Australia. Thus, they are a commonly audited procedure group when measuring surgical antimicrobial prophylaxis (SAP) appropriateness and compliance in Australia and internationally. Recent analysis of the Surgical National Antimicrobial Prescribing Survey (Surgical NAPS) revealed high rates of inappropriateness, both procedurally (39.5%) and postprocedurally (53.0%). Inappropriate use can lead to patient harm and further increases the risk of antimicrobial resistance (AMR). Identification of factors associated with inappropriate orthopedic SAP prescribing may support the development of antimicrobial stewardship (AMS) interventions that are tailored to the orthopedic surgical setting to improve SAP. **Methods:** Surgical NAPS has been available to all Australian hospitals to complete from 2016; it supports the assessment of SAP appropriateness. Appropriateness is a composite measure based on antibiotic choice, timing of administration, dose and duration, applying the standardized *Surgical NAPS Appropriateness Assessment Guide*. Logistic regression was used to identify hospital, patient, and surgical factors associated with appropriateness. Adjusted appropriateness (AA) was calculated by generating marginal means from the multivariable model and averaging across all available covariates. Significance for multivariable analysis was determined as $P < .05$. Additional subanalyses were conducted on smaller subsets to calculate the AA for specific orthopedic procedures. **Results:** In total, 140 facilities contributed to orthopedic audits in the Surgical NAPS from January 1, 2016, to April 15, 2019, including 4,032 orthopedic surgical episodes and 6,709 prescribed doses. Overall appropriateness for prescribed procedural doses (n = 3,978) was 64.7% and was lower for prescribed postprocedural doses (n = 2,731, 48.3%). When antimicrobials were not prescribed, appropriateness was higher procedurally (n = 350, 89.7%) and postprocedurally (n = 1,127, 97.8%). When SAP was indicated, the most common reasons for inappropriateness, when prophylaxis was indicated, were timing for procedural doses (50.9%) and duration for postprocedural prescriptions (49.8%). The AA of each orthopedic procedure group was low for procedural SAP, ranging from 54.1% for knee surgery to 74.1% for total knee joint replacement. The adjusted appropriateness of postprocedural prescriptions was also low, ranging from 40.7% for hand surgery to 68.7% for closed reduction fractures. **Conclusions:** Orthopedic surgical specialties demonstrated differences across procedural and postprocedural appropriateness.

The metric of appropriateness is meaningful for both orthopedic surgeons and AMS programs. Targeted quality improvement projects are needed for orthopedic surgical procedures and to study the engagement between orthopedic surgeons, AMS, and guideline developers to support optimization of antimicrobial use in the surgical setting.
Funding: None
Disclosures: None
Doi:10.1017/ice.2020.497

Presentation Type:
Oral Presentation

Bloodstream Infections with Typical Probiotic Organisms

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Background: Probiotics are protective against *Clostridioides difficile* infection and antibiotic-associated diarrhea, and they may decrease risk of infections following complex abdominal surgeries. Infectious risks associated with probiotic use are not well described in the literature. We describe probiotic use among patients with bloodstream infections (BSIs) due to organisms typically found in probiotics. **Methods:** Patients with positive blood cultures with *Lactobacillus* spp, *Saccharomyces* spp, and *Bifidobacterium* spp at our large academic hospital from October 2016 through October 2019 were identified using Theradoc, a clinical surveillance tool. Clinical data and orders for probiotics, including probiotic capsules, probiotic yogurt, and kefir, were extracted from the electronic medical record. Cases were considered distinct if the cultures were collected 7 or more days apart. True infections were defined as positive cultures which were treated with antimicrobials and had provider documentation outlining clinical relevance of culture data. **Results:** Among 26 distinct episodes of BSI, 16 (62%) were considered true infections. The remaining 10 cases were interpreted as contaminants or of unclear significance. Of the 16 cases representing true infection in 14 patients, 6 (38%) had received probiotics in the hospital in the preceding month. Among these patients, 5 had *Lactobacillus* bacteremia and had received *Lactobacillus* capsules, probiotic yogurt, and/or kefir. One patient had *Saccharomyces* fungemia following receipt of probiotic yogurt and kefir. All 6 patients with BSI possibly related to probiotic use had an antecedent gastrointestinal procedure or surgery within a month of the BSI, and 2 had intra-abdominal abscesses from which the same organism was cultured. Of the 16 true BSIs, 9 occurred in immunocompromised hosts, but antecedent probiotic use was confirmed in only 1 of these cases. Two episodes caused by different organisms occurred within the same month; all other episodes were >60 days apart. **Conclusions:** In our retrospective review of BSIs with organisms typically found in probiotics over a 3-year period at a large academic hospital, more than one-third of those with clinically relevant BSIs had antecedent probiotic use within the hospital. All patients with infections possibly related to probiotic use had recent gastrointestinal procedures or surgery, raising concern for probiotic use following interventions that increase the risk for gastrointestinal tract leakage or translocation. Further research is necessary to assess the risk of bloodstream infection in postoperative patients treated with probiotics.
Funding: None
Disclosures: None
Doi:10.1017/ice.2020.498

Presentation Type:
Oral Presentation

Bright STAR Collaborative Consensus Guidelines for Blood Culture Use in Critically Ill Children

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Background: Blood cultures are essential diagnostic tools used to identify bloodstream infections and to guide antimicrobial therapy. However, collecting cultures without clear indications or that do not inform management can lead to false-positive results and unnecessary use of antibiotics. Blood culture practices vary significantly in critically ill children. Our objective was to create a consensus guideline focusing on when to safely avoid blood cultures in pediatric intensive care unit (PICU) patients. **Methods:** A panel of multidisciplinary experts, many participating in the Blood Culture Improvement Guidelines and Diagnostic Stewardship for Antibiotic Reduction in Critically Ill Children (Bright STAR) Collaborative, engaged in a 2-part modified Delphi process. Round 1 consisted of a preparatory literature summary and an electronic survey sent to subject matter experts (SMEs). In the survey, SMEs rated a series of recommendations about when to avoid blood cultures on a 5-point Likert scale, 1 being the lowest score and 5 being the highest score. Consensus was achieved for each recommendation if 75% of respondents chose a score of 4 or 5, and these were included in the final guideline. Any recommendations that did not meet these a priori criteria for consensus were set aside for discussion during the in-person expert panel review (round 2). An outside expert in consensus methodology facilitated round 2. After a review of the survey results and comments from round 1 and group discussion, the SMEs voted on these recommendations in real time. Voting was blinded. Participants included Bright STAR site leads, national content experts, and representatives from relevant national societies. **Results:** We received 29 completed surveys from 34 invited participants for an 85% response rate. Of the 27 round 1 recommendations, 18 met predetermined criteria for consensus. Round 2 included 26 in-person voting participants who (1) discussed and modified the 9 recommendations that had not met round 1 consensus, and (2) modified for clarity or condensed from multiple into single recommendations the 18 recommendations that had met the round 1 consensus. The final document contains 19 recommendations that provide guidance on how to safely improve blood culture use in PICU patients (Table 1). Also, 8 recommendations discussed did not reach consensus for inclusion. **Conclusions:** Using a modified Delphi process, we created consensus recommendations on when to avoid blood cultures and prevent overuse in critically ill children. These guidelines are a critical step in disseminating diagnostic stewardship and reducing unnecessary testing on a wider scale.
Funding: Agency for Healthcare Research and Quality, R18 HS025642-01, 9/2017 – 9/2020 (Aaron Milstone, PI)
Disclosures: None
Doi:10.1017/ice.2020.499