Antimicrobial Stewardship News

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IDWeek 2021: Highlighted DCASIP Research and Abstracts

We wanted to highlight some of the research coming out of the Duke Center for Antimicrobial Stewardship and Infection Prevention in this newsletter by summarizing the IDWeek 2021 abstracts presented. Overall there were 3 oral presentations and 13 poster presentations. None of these projects could have been possible without the collaboration and partnership of many of you.

Platform Presentations

Effects of an Opt-Out Protocol for Antibiotic De-escalation among Selected Patients with Suspected Sepsis: The DETOURS Trial

Rebekah W. Moehring, Michael Yarrington, Bobby G. Warren, III, Yuliya Lokhnygina, Erica Atkinson, Allison Bankston, Julia Coluccio, Michael Z. David, Angelina Davis, Janice Davis, Brandon Dionne, April Dyer, Travis Jones, Michael Klompas, David W. Kubiak, John Marsalis, Jacqueline Omorogbe, Patricia Orajaka, Alice Parish, Todd Parker, Jeffrey C. Pearson, Tonya Pearson, Christina Sarubbi, Christian Shaw, Justin Spivey, Robert Wolf, Rebekah Wrenn, Elizabeth Dodds Ashley, Deverick Anderson

The De-escalation: OpTing-Out of Rx in Selected patients with Suspected sepsis (DETOURS) Trial included 767 non-ICU adults on broad-spectrum antibiotics with negative blood cultures, who were randomized to receive either standard of care or proceed through an opt-out protocol for antibiotic de-escalation. Patients with ongoing signs of symptoms of infection, concerning or inadequate microbiology data, or high-risk conditions were excluded. For intervention patients, study teams approached the treatment team to ask if the treatment team wanted to opt out of antibiotic discontinuation, and then performed a guided de-escalation discussion if the provider determined antibiotics should be continued. Intervention patients had 32% lower odds of antibiotic continuation (79% vs. 84%, OR 0.68, 95% confidence interval [0.47, 0.98]). Days of therapy distributions among those who continued antibiotics were similar (ratio of means 1.06 [0.88-1.26]), as were multiple safety outcomes.

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Early Recognition and Response to Increases in Surgical Site Infections (SSI) Using Optimized Statistical Process Control (SPC) Charts – the Early 2RIS Trial: A Multicenter Stepped Wedge Cluster Randomized Controlled Trial (RCT)

Arthur Baker, Iulian Ilieş, James Benneyan, Yuliya Lokhnygina, Katherine R. Foy, Sarah Lewis, Brittain A. Wood, Esther Baker, Linda Crane, Kathryn L. Crawford, Andrea Cromer, Polly W. Padgette, Linda Roach, Linda Adcock, Nicole Nehls, Joseph Salem, Dale Bratzler, Patch Dellinger, Linda R. Greene, Susan Huang, Christopher Mantyh, Deverick Anderson

We conducted a prospective multicenter stepped wedge cluster RCT to evaluate the performance of SSI surveillance and feedback performed with optimized SPC plus traditional surveillance methods compared to traditional surveillance alone. SPC methods more frequently detected important SSI rate increases associated with deficiencies in SSI prevention best practices than traditional surveillance; however, feedback of this information did not lead to SSI rate reductions. Further study is indicated to determine the best application of SPC methods to improve adherence to SSI quality measures and prevent SSIs.

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Impact of COVID-19 Pandemic on Healthcare-Associated Infections (HAIs) in a Large Network of Hospitals
Sonali Advani, Emily Sickbert-Bennett, Elizabeth Dodds Ashley, Andrea L. Cromer, Yuliya Lokhnygina, Alicia Nelson, Ibukunoluwa C. Kalu, Lauren DiBiase, David J. Weber, Deverick J. Anderson

This retrospective review sought to evaluate the impact of the COVID-19 pandemic on the incidence of hospital-acquired infections. Monthly incidence rates of central-line-associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), C. difficile infections (CDI), and ventilator-associated events (VAE) were collected from 51 hospitals from 2018 to 2021. Segmented regression analysis was performed to estimate changes in monthly incidence rates of HAIs in the baseline period (01/2018 – 02/2020) and the pandemic period (03/2020 – 03/2021). Compared to the baseline period, CLABSI and VAE incidence substantially increased during the pandemic period (by 50% and 700% respectively), as did the overall trend of CDI incidence upon segmental regression analysis; no change in CAUTI incidence was observed. These variations in trends of different HAIs are likely due, in part, to unique characteristics of the underlying infection, resource shortages, staffing concerns, increased device use, changes in testing practices, and the limitations of surveillance definitions.
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Poster Presentations

Pandemic Pinch: The Impact of COVID Response on Antimicrobial Stewardship Program (ASP) Resource Allocation
Elizabeth Dodds Ashley, April Dyer, Travis Jones, Melissa D. Johnson, Angelina Davis, Katherine R. Foy, Alicia Nelson, Sonali Advani, Andrea L. Cromer, Danielle Doughman, Ibukunoluwa C. Kalu, Emily Sickbert-Bennett, Rebekah W. Moehring, Deverick J. Anderson, Steven S. Spires

We performed a cross-sectional electronic survey of stewardship pharmacy and physician leaders in 37 hospitals within the Duke Antimicrobial Stewardship Outreach Network (DASON) (community) and Duke/UNC Health systems (academic) in April-May 2021. We had a 78% response rate and found pharmacy personnel was reduced in 59% of facilities and 44% also reallocated ASP personnel to non-stewardship duties. Despite these staff reductions, pharmacists often served as primary contact for remdesivir approvals and other COVID-19 therapeutic and drug shortage decisions. The pandemic response heavily diverted routine ASP work and it has not yet returned to baseline.
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Effect of Automated Identification of Antimicrobial Stewardship Opportunities for Urinary Tract Infections
Connor Deri, Rebekah Wrenn, Justin Spivey, Rebekah Moehring, Michael Yarrington

A best practice alert (BPA), which identified inpatients with a new antibiotic order associated with a genitourinary indication and a preceding urinalysis with 0 to 5 WBC/hpf, was created and reviewed by antimicrobial stewardship (AS) pharmacists to identify possible asymptomatic bacteriuria. Three hundred twenty-seven total antibiotic orders met BPA criteria within the study period and were analyzed: 245 and 82 in the pre- and post-BPA group, respectively. The pre-BPA group had a slower median time to intervention (28 hrs vs 13.5 hrs, p = 0.03) and lower rate of UTI-related interventions (11.0% vs 20.7%, p = 0.04). The use of clinical decision support may aid in efficiency of AS review and syndrome-targeted AS impact.
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Vancomycin AUC Dosing: Is One Concentration in the Hand Worth Two in the Bush?
Justin Spivey, Jenny Shroba, Connor Deri, Cara Nys, Rebekah Wrenn, Michael Yarrington

Recent guidelines recommend a transition from trough-based to area-under the curve-based (AUC) vancomycin monitoring for serious invasive methicillin-resistant Staphylococcus aureus infections. Due to the challenges of performing AUC monitoring in clinical practice, this study sought to compare the accuracy of an AUC calculated by trapezoidal calculations utilizing peak and trough (P/T) concentrations to a single steady-state trough combined with volume of distribution. The single-trough method performed similarly to the more laborious P/T method. No patient would have received a dose adjustment based on the two different AUC estimation methods. The single-trough method may represent a resource-conscious AUC estimation method for patients meeting population assumptions.
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Outpatient Prescribing During the COVID-19 Pandemic
Ganga Moorthy, Congwen Zhao, Michael Smith

We assessed pre- and post-COVID-19 pandemic outpatient prescribing data for upper respiratory tract infections (URI) in children from January 2019 to February 2021. Of the 62,447 study participants, 29% received an antibiotic, among which amoxicillin was the most commonly prescribed (64.4%). White race, private insurance, visits with nurse practitioners and with non-pediatric providers were associated with higher likelihood of antibiotic prescribing. Despite a large decrease in the number of outpatient visits during the pandemic, rates of prescribing for URI decreased only minimally. A better understanding of factors associated with antibiotic prescribing during the pandemic may identify priority targets for outpatient stewardship interventions.
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Determination of Plasma Protein Binding of Dalbavancin
Nicholas A. Turner, Allan Xu, Smitha Zaharoff, Thomas L. Holland, and Thomas P. Lodise on behalf of the Anti-bacterial Resistance Leadership Group

Complementary to an ongoing clinical trial of dalbavancin for the treatment of Staphylococcus aureus bacteremia, we investigated the plasma binding properties of dalbavancin. Accurate assessment of protein-bound vs free drug can be important for clinical outcomes, since free drug is sometimes the more relevant predictor of clinical activity and tissue penetration. We found that dalbavancin is highly protein bound at ~99%. Comparing clinical outcomes to free drug concentrations will be an important consideration in ongoing clinical trials.
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Hesitancy in Uptake and Recommendation of COVID-19 Vaccines by US Healthcare Workers
Steven S. Spires, Rebecca Rayburn-Reeves, Elizabeth Dodds Ashley, Jenna Clark, Avani P. Desai, Jan Lindemans

We worked with the Duke Center for Advanced Hindsight behavioral scientists in surveying many healthcare workers (HCWs) within DASON to better understand their beliefs regarding the COVID-19 vaccine. Since we know that HCWs play a key role in vaccine confidence, we also sought to understand the decision-making process behind recommending the vaccine to others. Remarkably, we found that in contrast to the type of risk comparison messaging that appealed most to the HCWs in accepting the vaccine themselves, they preferred a more generic message emphasizing safety and efficacy when recommending the vaccine to others. This finding emphasized the desire for HCWs to educate others using a familiar messaging theme in the setting of the introduction of a new health technology.
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Impact of the COVID-19 Pandemic on Surgical Volume and Surgical Site Infections (SSI) in a Large Network of Community Hospitals
Erin Gettler, Jessica Seidelman, Becky A. Smith, Deverick Anderson for the CDC Prevention Epicenters

We performed a retrospective cohort study analyzing data on SSIs from 45 community hospitals in the southeastern United States from 1/2018 to 12/2020. We defined the pre-pandemic time period from 1/1/18 to 2/29/20 and the pandemic period from 3/1/20 to 12/31/20. We compared monthly and quarterly median procedure totals and SSI prevalence rates (PR) between the pre-pandemic and pandemic periods. In our community hospital network, the pandemic did not significantly impact overall and procedure-specific SSI prevalence rates. There was a decline in surgical cases beginning in March 2020, reaching a nadir in April, followed by a return to pre-pandemic volume by June. While the decline in surgical procedure volume was transient, during this decline there was a trend toward increased SSIs that did not reach statistical significance. This finding could be due, in part, to deferred elective cases relative to urgent and emergent surgeries, or due to a shift in infection prevention efforts to outbreak management.
Link to Poster

Descriptive Analysis of SARS-CoV-2 Infections Among Health System and University Employees
Jessica Seidelman, Ibukunoluwa Kalu, Maya Rinehart, Matthew Stiegel, Kristen Said, Carol Epling, Sarah Lewis, Becky Smith

COVID-19 infections were prospectively tracked and traced across Duke University and the Duke University Health System from 3/2020 to 4/2021. Each employee with a confirmed positive test and presumed positive cases were interviewed with a standard contact tracing template that included descriptive variables such as high-risk behaviors and contacts, dates worked while infectious, and initial symptoms. During the study period, 3,140 COVID-19 infections in 3,119 employees were identified out of a total of 34,562 employees (9.0%). Severe disease among employees was significantly less frequent compared to patients in the health system (15.3% vs 2.2%, $p< 0.01$). The majority of COVID-19 infections (52%) were linked to acquisition in the community by adjudication criteria, while few were attributed to workplace exposures (9.8%). Employees with unknown sources of COVID-19 participated in higher-risk activities at approximately the same frequency as employees with community sources of COVID-19. Despite a comprehensive testing and benefit program, a large proportion of COVID-positive employees worked with symptoms, highlighting ongoing challenges with presenteeism in healthcare.
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Low Frequency of Healthcare Worker (HCW) Infections Following Occupational Exposures to COVID-19
Jessica Seidelman, Ibukunoluwa Kalu, Kristen Said, Carol Epling, Maya Rinehart, Matthew Stiegel, Rebekah Moehring, Deverick J. Anderson, Sarah S. Lewis, Becky A. Smith

Data on occupational acquisition of COVID-19 in healthcare settings are limited. Prospective data were collected on healthcare worker (HCW) exposures to COVID-19 in the Duke University Health System; employees were monitored for development of symptomatic and asymptomatic infection after documented high-, medium-, and low-risk exposures based on CDC guidance as assessed by contact tracing and interviews of the exposed HCW. From March 2020 to May 2021, 6,606 occupational exposures (0.5 exposures/HCW) were identified, with highest incidence occurring among respiratory therapists, nursing assistants, and physicians. A total of 260 (2%) HCW had positive tests/conversions; 28 (10.8%) were asymptomatic at the time of testing. High-risk exposures had a significantly greater number of post-exposure infections compared to medium- and low-risk exposures (12.5% vs. 4.2%, vs. 0.4%; $p < 0.001$). This work shows conversion following exposure to COVID-19 in the healthcare setting with appropriate protective equipment was low, and limiting contact tracing to only high- or medium- risk exposures may best utilize limited personnel resources.
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Carbapenem-resistant Enterobacteriaceae (CRE) Contamination of In-room Sinks in a New Bed Tower Disinfection/Sterilization & Environmental Infection Prevention
Bobby G. Warren, III, Bechtler S. Addison, Alicia Nelson, Aaron Barrett, Amanda M. Graves, Sarah S. Lewis, Becky Smith, Deverick J. Anderson

The amount of time from opening of a new bed tower to CRE contamination of patient room hospital sinks is poorly understood. We observed transient colonization of sink drains with potentially important pathogens during a short observation period and note persistence of a KPC-positive *Klebsiella pneumoniae* following the housing of the unit's first CRE patient. Observation over longer time is required to determine transient versus persistent colonization and risk factors for persistent drain colonization. Given the ease at which CRE colonizes sinks, new strategies are needed to prevent CRE sink colonization.
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SARS-CoV-2 Surveillance Testing Patterns Among Hospitalized Pediatric Patients in a Single Academic Medical Center
Areej Bukhari, Jessica Seidelman, Becky A. Smith, Sarah S. Lewis, Michael J. Smith, Rebekah Moehring, Deverick Anderson, Ibukunoluwa C. Kalu for the CDC Prevention Epicenters

Children infected with SARS-CoV-2 often have mild or no symptoms, making symptom screening an ineffective tool for determining isolation precautions. This retrospective cohort study reviewed demographic data, positivity rates, and repeat testing trends among admitted pediatric patients undergoing universal pre-procedural or pre-admission COVID-19 screening at Duke Children's Hospital. The positivity rate was low among this inpatient cohort, with 4.3% of patients testing returning positive (45 patients out of 1,027 pediatrics inpatients). Of 654 children with repeated tests, only 7 converted to a positive result from a prior negative result. Tests repeated < 3 days from a negative result were especially low yield, suggesting limited utility of this practice. Diagnostic testing stewardship in certain populations may be useful, especially as community infection rates decline.
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SARS-CoV-2 Environmental Contamination in Hospitalized COVID-19 Patients' Rooms
Bobby G. Warren, III, Alicia Nelson, Aaron Barrett, Bechtler S. Addison, Amanda M. Graves, Sarah S. Lewis, Becky Smith, David J. Weber, Emily Sickbert-Bennett, Deverick J. Anderson

The correlation between SARS-CoV-2 RNA and infectious viral contamination of the hospital environment is not clear. We cultured inpatient rooms housing COVID-19 patients to assess environmental contamination of SARS-CoV-2. Overall, the amount of environmental contamination of SARS-CoV-2 RNA was low and viable SARS-CoV-2 virus was lower. Thus, the discovery of genetic material in the environment is not an indicator of contamination with live infectious virus.
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The Impact of COVID-19 Response on Infection Prevention Programs and Practices in Southeastern United States
Sonali Advani, Andrea L. Cromer, Brittain Wood, Esther Baker, Kathryn L. Crawford, Linda S. Crane, Linda Roach, Polly Padgette, Elizabeth Dodds Ashley, Ibukunoluwa C. Kalu, David J. Weber, Emily Sickbert-Bennett, Deverick J. Anderson

In April and May 2021, electronic surveys were sent to infection preventionists in 58 hospitals within the Duke Infection Control Outreach Network and Duke/UNC Health systems. This served as a follow-up to an initial survey from April 2020 and included questions relating to resource availability, changes to personal protective equipment (PPE) and testing, staffing challenges, and crisis capacity strategies. With a response rate of 93% (54 responses), the follow-up survey revealed overall improvement in resource availability (including significantly fewer PPE and resource shortages), evolution of PPE guidance, increase in testing capacity, and burdensome staffing changes. The serial surveys suggest increasing uniformity in infection prevention policies, but also highlight the increase in staff turnover and infection prevention staffing shortages.
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