ABSTRACTS

204. Mucosal Cytokine Profiles in Children with COVID-19

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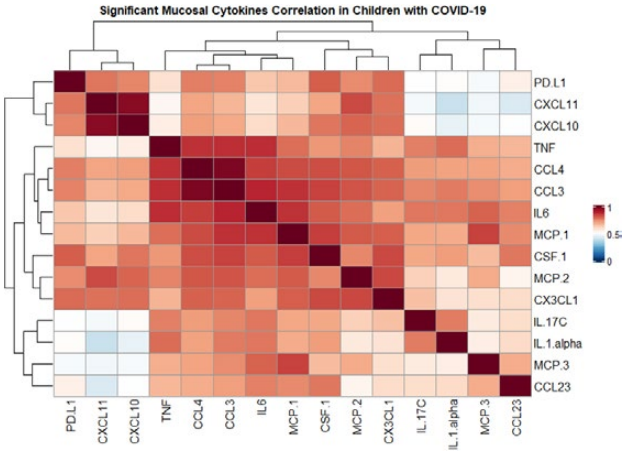
n/a

Session: 122. Caroline B. Hall Lecture
Saturday, October 2, 2021: 10:00 AM

Background. The mechanisms associated with COVID-19 in children are not well understood. We sought to define the differences in nasopharyngeal (NP) cytokine profiles according to clinical presentation in children with COVID-19.

Methods. Single-center, prospective study in 137 children and adolescents < 21 years of age hospitalized with COVID-19, and 35 age, sex and race matched pre-pandemic (2016-2019) healthy controls. Children with COVID-19 were categorized according to their clinical presentation in: COVID-19-symptomatic; COVID-19-screening, and multisystem inflammatory syndrome (MIS-C). NP swabs were obtained within 24 hours of admission to measure SARS-CoV-2 loads by rt-PCR, and a 92-cytokine panel. Unsupervised and supervised analysis adjusted for multiple comparisons were performed.

Results. From 3/2020 to 1/2021, we enrolled 76 COVID-19-symptomatic children (3.5 [0.2-15.75] years); 45 COVID-19-screening (11.1 [4.2-16.1] years), and 16 MIS-C (11.2 [5.9-14.6] years). Median NP SARS-CoV-2 loads were higher in COVID-19-symptomatic *versus* screening and MIS-C (6.8 vs 3.5 vs 2.82 $\log_{10}$ copies/mL; p< 0.001). Statistical group comparisons identified 15 cytokines that consistently differed between groups and were clustered in three functional categories: (1) antiviral/regulatory, (2) pro-inflammatory/chemotactic, and (3) a combination of (1) and (2); (**Fig 1**). All 15 cytokines were higher in COVID-19-symptomatic *versus* controls (p< 0.05). Similarly, and except for TNF, CCL3, CCL4 and CCL23, which were comparable in COVID-19-symptomatic and screening patients, the remaining cytokines were higher in symptomatic children (p< 0.05). PDL-1 (p=0.01) and CCL3 (p=0.03) were the only cytokines significantly decreased in children with MIS-C *versus* symptomatic COVID-19 children.



The 15 cytokines identified by multiple comparisons were correlated using Person's in R software. Red reflects a positive correlation and blue a negative correlation with the intensity of the color indicating the strength of the association.

Conclusion. Children with symptomatic COVID-19 demonstrated higher viral loads and greater mucosal cytokines concentrations than those identified via screening, whereas in MIS-C concentrations of regulatory cytokines were decreased. Simultaneous evaluation of viral loads and mucosal immune responses using non-invasive sampling could aid with the stratification of children and adolescents with COVID-19 in the clinical setting.

Disclosures. Octavio Ramilo, MD, Adagio (Consultant)Bill & Melinda Gates Foundation (Grant/Research Support)Janssen (Grant/Research Support)Lilly (Consultant)Merck (Consultant, Grant/Research Support)NIH (Grant/Research Support)Pfizer (Consultant)SANOFI (Board Member) Asuncion Mejias, MD, PhD, MsCS, Janssen (Grant/Research Support, Advisor or Review Panel member)Merck (Grant/Research Support, Advisor or Review Panel member)Roche (Advisor or Review Panel member)Sanofi (Advisor or Review Panel member).

1. The Relationship Between Chlorhexidine Skin Concentration and Multidrug-Resistant Organism (MDRO) Colonization in ICU Patients

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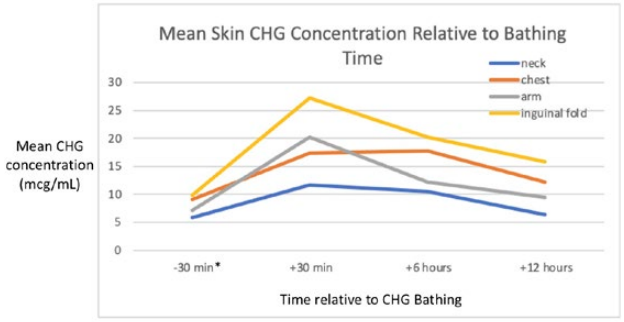
Session: O-01. Addressing MDRO Colonization and Infection

Background. Daily bathing of ICU patients with chlorhexidine gluconate (CHG) is an important method for healthcare-associated infection prevention. We set out to understand the relationship between CHG concentrations and MDRO colonization

Methods. In our trauma/surgical ICU at a large urban medical center, we performed CHG concentrations 2 days/week at 4 times points relative to CHG bathing (Medline, Northfiled, IL) application: 30 min. prior, and 30 min., 6 hrs., and 12 hrs. after application. CHG testing was done at 4 body sites: lateral neck, anterior chest, arm, and inguinal fold. On the contralateral side we tested the presence of the following 4 MDROs: methicillin resistant *S. aureus* (MRSA), and 3 enteric bacteria--extended spectrum beta-lactamase (ESBL)+ gram-negative rods, vancomycin resistant enterococcus (VRE), and carbapenem resistant enterobacteriaceae (CRE).

Results. We performed testing for 256 patient-days total, of which 42 were swabbed 1 time, 38 swabbed twice, 79 swabbed 3 times, and 97 swabbed 4 times (patient movement for tests, ICU transfer were limitations). Mean CHG skin concentrations were above the MICs of pathogens at all post-CHG application time points at all body sites at all times points (Figure) and decreased during the time points after bathing. In a logistic regression model controlling for patient characteristics, MRSA detection was inversely associated with CHG concentration with an 18% increase in odds of recovery for each 2-fold decrease in CHG concentration, as well as presence of a GI device and lack of ability to sit and roll. In a logistic regression model controlling for patient characteristics, resistant enteric bacteria detection was inversely associated with CHG concentration with an 11% increase in odds of recovery for each 2-fold decrease in CHG concentration, as well as mechanical ventilation, GI device, central line, and ICU duration.



*detectable CHG concentration prior to application occurred in patients with ICU stay ≥1 day

Conclusion. In our large study of CHG use and its association with MDRO detection, CHG concentrations decreased during the 24 hours after application, but were typically above concentrations considered adequate to kill MDROs. CHG concentration were inversely associated with the presence of MRSA and resistant enterics, suggesting that CHG application quality is a key component of the CHG bathing process.

Disclosures. **Loren G. Miller, MD, MPH**, **Medline** (Grant/Research Support, Other Financial or Material Support, Contributed product) **Stryker** (Other Financial or Material Support, Contributed product) **Xttrium** (Other Financial or Material Support, Contributed product) **James A. McKinnell, MD**, **Medline** (Grant/Research Support)

2. Space Time Trends of Community Onset *Staphylococcus aureus* Infections in Children Living in Southeastern United States: 2002-2016

Lilly Immergluck, MD, MS, FAAP[1]; Ruijin geng, MPH[1]; Chaohua Li, MPH[1]; Mike Edelson, MS[2]; Lance Waller, PhD[3]; George Rust, PhD[4]; Junjun Xu, MPH[5]; Fatima Ali, MPH[1]; Peter Baltrus, PhD[1]; Traci Leong, PhD[3]; [1]Morehouse School of Medicine, Atlanta, GA 30310, Georgia; [2]InterDev Inc., Roswell, Georgia; [3]Emory University, Atlanta, Georgia; [4]FLORIDA STATE UNIVERSITY, Atlanta, Georgia; [5]Ningbo Consulting Inc, Dunwoody, Georgia

Session: O-01. Addressing MDRO Colonization and Infection

Background. Staphylococcus aureus (*S. aureus*) remains a serious cause of infections in the United States and worldwide. Methicillin susceptible *S. aureus* (MSSA) is the cause of half of all health care–associated staphylococcal infections, and Methicillin Resistant *S. aureus* (MRSA) is the leading cause of community onset skin and soft tissue infections in the US. This study looks at a 15-year trend of community onset (CO)-MRSA and MSSA infections

We identified distinct groups of CO-MRSA and MSSA infection rate trajectories by grouping census tracts of the 20 county Atlanta Metropolitan Statistical Area (MSA) between 2002 to 2016 with similar temporal trajectories.

Methods. This is a retrospective study from 2002-2016, using electronic health records of children living in Atlanta, Georgia with *S. aureus* infections and relevant US census data (at the census tract level). A group based trajectory model was applied to generate community onset *S. aureus* trajectory infection groups (low, high, very high) by census tract and were mapped using ArcGIS.

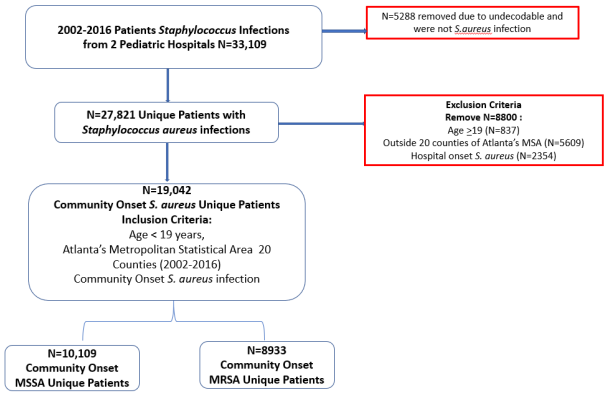
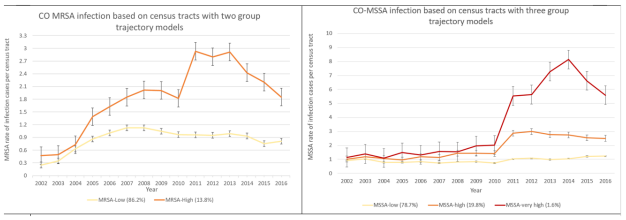


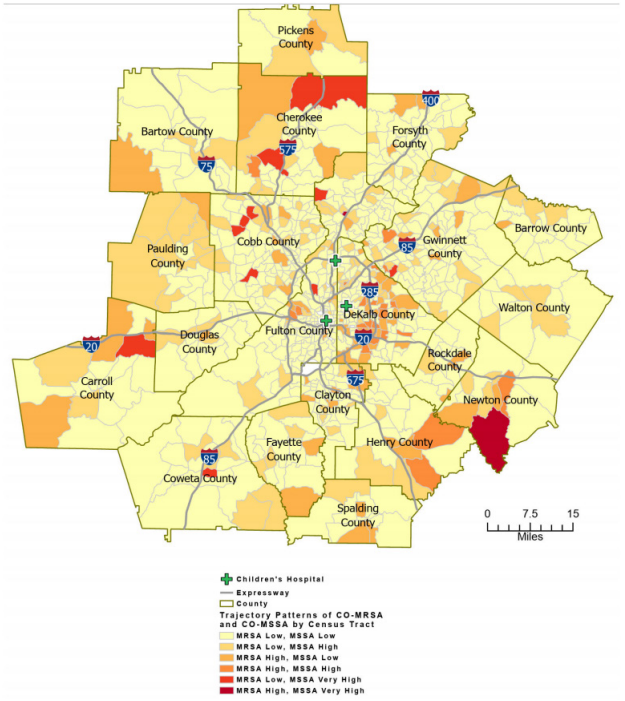
Figure 1. Enrollment Scheme –Unique Patients with CO- MRSA and MSSA Infections

Results. Three CO-MSSA infection groups (low, high, very high) and two CO-MRSA infection groups (low, high) were detected among 909 census tracts in the 20 counties. We found ~74% of all the census tracts with *S.aureus* occurrence during this time period belonged to low infection rate groups for both MRSA and MSSA, with a higher proportion occurring in the less densely populated counties. Census tracts in DeKalb County, one of Atlanta's most densely populated areas, had the highest proportion of the worst infection trend patterns (CO-MRSA high or very high, CO-MSSA high or very high).

Trends of Community-Onset MRSA and MSSA Infection Rates Based on Group-based Trajectory Models



Spatial patterns for CO-MRSA and CO-MSSA Trajectory Trends in the Atlanta Metropolitan Area Between 2002 to 2016



Conclusion. Trends of *S. aureus* infection patterns, stratified by antibiotic resistance over geographic areas and time, identify communities with higher risks for MRSA infection compared to MSSA infection. Further investigation of the determinants of the trajectory groupings and the geographic outliers identified by this study may be a way to target prevention strategies aimed to prevent *S. aureus* infections.

Disclosures. **All Authors**: No reported disclosures

3. Stopping Hospital Infections with Environmental Services (SHINE): A Cluster-Randomized Trial of Intensive Monitoring Methods for Terminal Room Cleaning on Rates of Multidrug-Resistant Organisms (MDROs) in the Intensive Care Unit (ICU)

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for the CDC Prevention Epicenters Program

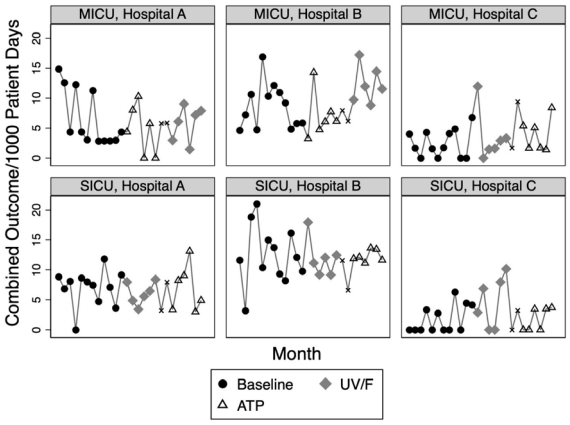
Session: O-01. Addressing MDRO Colonization and Infection

Background. MDROs frequently contaminate hospital environments. We performed a multicenter cluster-randomized, crossover trial of two methods for intensive monitoring of terminal cleaning effectiveness at reducing infection and colonization with MDROs within ICUs.

Methods. Six medical and surgical ICUs at three medical centers received both intensive monitoring interventions sequentially, in a randomized order. The intervention included surveying a minimum of 10 surfaces each in 5 rooms weekly, after terminal cleaning, with adenosine triphosphate (ATP) monitoring or an ultraviolet fluorescent marker (UV/F). Results were delivered to environmental services (EVS) staff in real-time, with failing surfaces recleaned. The primary study outcome was the monthly rate of infection or colonization with MDROs, including methicillin-resistant *Staphylococcus aureus*, *Clostridioides difficile*, vancomycin-resistant Enterococcus, and multidrug-resistant gram-negative bacilli (MDR-GNB), assessed during a 12-month baseline comparison period and sequential 6-month intervention periods, separated by a 2-month washout. Outcomes during each intervention period were compared to the combined baseline period plus the alternative intervention period using mixed-effects Poisson regression, with study hospital as a random effect.

Results. The primary outcome rate varied by hospital and ICU (Figure 1). The ATP method was associated with a relative reduction in the incidence rate of infection or colonization with MDROs (incidence rate ratio (IRR) 0.887, 95% confidence-interval (CI) 0.811–0.969, P=0.008) (Table 1), infection with MDROs (IRR 0.924, 95% CI 0.855–0.998, P=0.04), and infection or colonization limited to multidrug-resistant MDR-GNB (IRR 0.856, 95% CI 0.825–0.887, P< 0.001). The UV/F intervention was not associated with a statistically significant impact on these outcomes. Room turnaround time was increased by a median of one minute with the ATP intervention and 4.5 minutes with the UV/F intervention compared to baseline.

Figure 1. MDRO infection or colonization per 1000 patient days by study month



NOTE. MDRO, multi-drug resistant organism; MICU, medical intensive care unit; SICU, surgical intensive care unit; UV/F, ultraviolet fluorescent marker; ATP, adenosine triphosphate