

590. Reduction of Endotracheal Colonization by Gram-Negative Bacilli in a Neonatal Intensive Care Unit Through Use of a Novel Drain Cover

Melissa Buck, MD¹; Michael Antunes, MD²; Brewster Kingham³; Shawn W. Polson, PhD³ and Stephen C. Eppes, MD²; ¹Sidney Kimmel Medical College at Thomas Jefferson University, Wilmington, Delaware; ²Christiana Care Health System, Newark, Delaware; ³University of Delaware, Newark, Delaware

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Background. Splash and aerosolization from sink drains are a source of contamination, particularly by Gram-negative bacilli (GNB), in healthcare facilities. Neonatal Intensive Care Unit (NICU) outbreaks of infection due to GNB have been attributed to NICU sinks. Recent studies found that a dome-shaped drain cover placed in sinks in an adult ICU prevented dispersal of sink drain bacteria to the environment and hands of healthcare providers. Our NICU routinely performs weekly surveillance cultures of all endotracheal tubes (ETT) and has previously reported a correlation of ETT colonizing organisms with bacteria isolated from blood in late onset sepsis. Our objective was to determine whether the use of a drain cover in every sink in a level III 72 bed NICU could lead to a decrease in the isolation of GNB in the ETTs of hospitalized infants.

Methods. All 34 sink drains and basins in an open layout NICU were cultured. Drain covers were then installed and replaced on a routine basis. Weekly endotracheal tube cultures were performed for all intubated infants.

Results. Prior to implementation of drain covers, the most common GNBs cultured from ETTs were, in order, *E. cloacae*, *Klebsiella* spp., *Acinetobacter* spp., and *S. maltophilia*. The most common organisms isolated from sinks were, in order, *P. aeruginosa*, *Acinetobacter* spp. and *S. maltophilia*. An unusual species, *Acinetobacter ursingii*, was common in both sinks and endotracheal tubes. Before and after the implementation of drain covers, the median time to first isolation of a GNB was 14 and 17 days, respectively. Prior to draining cover implementation, there were 31 new GNB isolates during 700 ventilator days (rate of 44.3/1000 ventilator days) among infants with any positive ETT cultures. Post drain cover there were 26 new GNB isolates during 900 ventilator days (rate of 28.9/1000 ventilator days). There was a shift in microbial species isolated from ETTs with *Klebsiella* spp. and *S. marcescens* predominating after implementation of drain covers.

Conclusion. The use of a novel drain cover in the sinks in a NICU can reduce the frequency of GNB colonizing the ETTs of patients and can lengthen the time to first positivity. Mitigating sinks as a reservoir for GNB may reduce the likelihood of these bacteria infecting a vulnerable population.

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591. Mupirocin and Chlorhexidine Resistance in *Staphylococcus aureus* Isolated from Children in South Korea

Bi Na Kim, MD¹; Hyun Mi Kang, MD¹; Sun Hee Park, MD, PhD²; Joonhong Park, MD, PhD¹; Jin Han Kang, MD, PhD¹ and Jong-Hyun Kim, MD, PhD¹; ¹College of Medicine, The Catholic University of Korea, Daejeon, Taejeon-jikhalsi, Republic of Korea; ²Division of Infectious Diseases, Department of Internal Medicine, College of Medicine, The Catholic University of Korea, Seoul, Korea, Daejeon, Taejeon-jikhalsi, Republic of Korea

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Background. Increasing prevalence of mupirocin-resistant *Staphylococcus aureus* have been reported, and chlorhexidine resistance has become an issue. This study aimed to investigate the prevalence of mupirocin and chlorhexidine resistance in both colonized and infection causing *Staphylococcus aureus* in children, and find factors associated with increased virulence.

Methods. *Staphylococcus aureus*, isolated from children <18 years old admitted at a single center, were collected prospectively from August 2017 to July 2018. The isolates underwent multilocus sequence typing and were screened for genes causing chlorhexidine resistance (*qac A/B*), quaternary ammonium resistance (*smr*), mupirocin resistance (*ileS* mutation, *Mup A*, *MupB*), and Pantone Valentine Leucocidin (*pvl*) toxin.

Results. During the study period, a total of 49 non-duplicate isolates were included, of which 69.4% ($n = 34$) were Methicillin-resistant *Staphylococcus aureus* (MRSA). Of the colonizers ($n = 25$), the most common sequence type was ST 72 (68.0%), whereas among pathogens ($n = 24$), ST 72 (29.2%) and ST 89 (29.2%) were most prevalent. Pathogens in this study caused abscess formation ($n = 3$), sepsis ($n = 4$), and skin infections such as cellulitis and omphalitis ($n = 17$). Mupirocin resistance was found in 16.0% among colonizers vs. 45.8% among pathogens ($P = 0.023$). High-level mupirocin resistance was more common ($n = 3/25$, 12.0%) than low-level mupirocin resistance ($n = 1/25$, 4.0%) in colonizers, whereas, pathogens had similar rates of low-level (25.0%) and high-level ($n = 20.8\%$) mupirocin resistance. PVL toxin gene was more frequently found in colonizers than pathogens (64.0% vs. 33.3%, $P = 0.032$), and all isolates had quaternary ammonium resistance genes. Chlorhexidine resistance gene was found in only 3 MRSA isolates colonized in the nares of preterm infants. All were SCCmec type 4, however, two were ST 72, spa type t1054, which had high -level mupirocin resistance and PVL toxin gene.

Conclusion. A PVL toxin gene-positive MRSA which had genes causing mupirocin and chlorhexidine resistance were found in the nasal carriage of preterm infants. These stains may cause failure of MRSA eradication in hospital settings, using conventional methods of nasal mupirocin application and chlorhexidine bathing.

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592. Assessment of Time Spent in the Room by Nurses and Nursing Assistants on a Pediatric Ward by Patient Isolation Status and Demographics

Kari Simonsen, MD¹; Robin High, MBA, MA¹; Mary Fortini, MD¹; Lindsay Hegemann, RN²; Susan Beedle, RN² and Amber Phipps, DBA²; ¹University of Nebraska Medical Center, Omaha, Nebraska; ²Children's Hospital and Medical Center, Omaha, Nebraska

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Background. Published reports have raised concern that RNs spend less time in hospital rooms of patients requiring isolation precautions. Other patient-related factors including race/ethnicity, primary language, and socio-economic factors reportedly influence the mean time spent in the room by RNs and certified nursing assistants (CNAs). At a children's hospital the automated hand hygiene monitoring system (AHHMS) has motion sensors that detect patient room entry and exit and sensors that detect hand hygiene events. Time spent in patient rooms by RNs and CNAs was examined using AHHMS data captured for patients on a 24-bed pediatric hospital ward for multiple patient characteristics to evaluate factors influencing the duration of visits.

Methods. RNs and CNAs routinely wore badges with infrared signal technology to monitor hand hygiene compliance, generating time-stamped data for room entries and exits, identified by user job category. Over a 30 day period, April 2016, RN and CNA time in the room was compared by patient characteristics including: length of stay, white yes/no, Hispanic yes/no, interpreter needed yes/no, and isolation status of contact-droplet, contact, or none. Mean minutes spent in the room for RNs and CNAs were evaluated with a random-effects linear model and gamma distribution.

Results. Admissions for 220 patients occurred in the 24 rooms during the evaluation period; 88 RNs and 28 CNAs completed 18,641 time-stamped room entries and exits. The natural log of patient length of stay (hours) was significantly associated with increased RN and CNA minutes spent in the room ($P < 0.001$). Interpreter required was not associated with time in the room ($P = 0.72$), nor was race ($P = 0.60$), nor was Hispanic ethnicity ($P = 0.81$). There were no significant differences in time spent in the room for contact, contact-droplet, and no isolation ($P = 0.92$).

Conclusion. Data derived from infrared signal AHHMS badges can provide insight into RN and CNA care patterns. Isolation status and patient demographics were unrelated to mean RN and CNA time in the room. Patient length of stay was the only predictor of increased nursing time spent providing direct patient care. These results contrast with previous reports demonstrating fewer nursing interactions based on patient demographics or isolation.

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593. Burden of Healthcare-Associated Infections among Hospitalized Infants within Community Hospitals

Ibukunoluwa C. Akinboyo, MD¹; Rebecca R. Young, MS, MS²; Michael J. Smith, MD, MSCE²; Becky A. Smith, MD²; Sarah S. Lewis, MD³ and Deverick J. Anderson, MD, MPH⁴; ¹Duke University, Durham, North Carolina; ²Duke University Medical Center, Durham, North Carolina; ³Duke University Hospital, Durham, North Carolina; ⁴Duke Center for Antimicrobial Stewardship and Infection Prevention, Durham, North Carolina

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Background. Healthcare-associated infections (HAI) remain the leading cause of morbidity and mortality among hospitalized children. Within community hospitals with targeted infection prevention efforts, participation in an infection control network has led to significant decreases in device or procedure-related infections among adult patients. The impact of these interventions has not been assessed in pediatric patients admitted to community hospitals.

Methods. We conducted a retrospective cohort study to describe the burden of HAI among hospitalized infants (< 1 year old) within 53 community hospitals participating in the Duke Infection Control Outreach Network (DICON) from 2013–2018. We determined the frequency of device-related HAI, central line-associated bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI) and hospital-associated pneumonia or ventilator-associated events (HAP/VAE) using National Healthcare Safety Network (NHSN) definitions; and the burden of HAIs among neonatal intensive care units (NICU) and non-NICU centers. The trend of HAI was analyzed with Spearman's correlation.

Results. Thirty hospitals reported 150 HAI among 141 infants over the 6-year period. Median (IQR) time to infection was 10 (4, 20) days after admission. Hospitals with a NICU (15) reported more HAI (median 5, (IQR: 3, 12)) than hospitals without a NICU (median 2 (IQR: 1, 2)) ($P = 0.031$). CLABSI represented 35% of HAI, HAP/VAE were 23% and CAUTI were 12%. The most frequently isolated primary organism for all HAI was *Escherichia coli* (22 HAI, 15%) which was also isolated in 39% of CAUTI. Methicillin-resistant and methicillin-susceptible *Staphylococcus aureus* (*S. aureus*) were the most commonly isolated organisms among CLABSI (17%) and HAP/VAE (33%). Nine centers with ≥ 4 years of NICU and Central line (CL) use data reported a median (IQR) rate of 1.2 (0, 2.4) CLABSIs/1,000 central line days. There was no change in median CLABSI rate over time ($P = 0.47$), Figure 1.

Conclusion. CLABSI, most commonly caused by *S. aureus*, represented the majority of HAI reported from hospitalized infants within community hospitals participating in an infection control network. Further research into device utilization practices may inform future interventions to reduce HAI.