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Quantitative Analysis Methicillin-Resistant Staphylococcus aureus (MRSA) in Clinical Nasal Swab Samples Collected From US Patient Populations

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Background:

Infections due to community and healthcare associated MRSA are an international problem.

Objectives:

The purpose of the present study is to better understand the likelihood of nasal MRSA carriage in various US patient populations and to quantify MRSA isolated from nasal swab specimens.

Methods:

Clinical nasal swab samples of MRSA were collected in a prospective, multi-center US clinical study. Nasal swab samples were obtained using a sterilized rayon swab from patients at 11 enrollment facilities. At 2 facilities, samples were collected from inpatients who were identified to be MRSA-positive as part of their active surveillance program. In addition, samples were collected from various risk groups as follows: inpatients (1 facility) and outpatients (2 facilities) requiring hemodialysis, inpatients (1 facility) and outpatients (1 facility) with known HIV infection, cardiac surgical pre-op patients (1 facility), and long-term elder care (5 facilities). Some facilities screened >1 risk group. Samples were analyzed using CHROMagar MRSA media and TSB with 6% NaCl enrichment broth. Samples growing MRSA were quantified.

Results:

Between January 23, 2006 and January 25, 2007, 21% (352 of 1706) nares swab specimens have yielded MRSA. Quantitation has been completed on the 352 MRSA samples, resulting in a mean of 1000 CFU/swab (range of 2 to 15 million). The mean quantity of MRSA colonizing the nares of patients identified by active surveillance (2500 CFU/swab) was greater ($p < 0.05$) than either the mean quantity in patients cultured because they were receiving hemodialysis (640 CFU/swab), had HIV infection (250 CFU/swab), or were in an elder care setting (200 CFU/swab). At facilities without active surveillance, MRSA prevalence was 18% (16 of 90) in long-term elder care patients, 17% (61 of 354) in HIV-infected outpatients, 14% (83 of 578) among inpatients receiving hemodialysis, 13% (18 of 135) in outpatients receiving hemodialysis, 3% (5 of 161) in HIV-infected inpatients, and 3% (6 of 198) in cardiac pre-operative inpatients.

Conclusions:

Nasal swab specimens with MRSA had an average of 1000 CFUs/swab specimen. We

found great diversity in the quantity of MRSA at this body site. The quantity of MRSA in the nares was greatest in patients identified by active surveillance. We have identified two outpatient populations that appear to be high-risk groups for MRSA carriage: long-term elder care patients and HIV-infected outpatients

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Rates and Plans for MRSA Prevention Initiative Nationwide: Methicillin/Oxacillin-resistant *Staphylococcus aureus* (MRSA) in U.S. Department of Veterans Affairs (VA) Medical Centers

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Background:

Infections with MRSA are increasing in the U.S.A. MRSA infection is of significant concern to VA, which, as the largest managed healthcare system in the U.S.A., provided care to over 5.4 million veterans in 2006 with over 565,000 discharges from inpatient care.

Objective:

To assess MRSA rates for VA medical centers (VAMCs) nationwide and address efforts to reduce MRSA infection systemwide.

Methods:

For rate determination over time, two national administrative data sources for VHA were used: 1) the Emerging Pathogens Initiative (EPI) which contains nationwide, laboratory-based culture results for all *S. aureus* (SA), as well as MRSA isolates, and 2) the Patient Treatment Files (PTF), which contain national data for all inpatient discharges, including ICD-9-CM-coded evidence of all staphylococcal infections, and the subset of MRSA. To reduce MRSA infections, a demonstration project was undertaken at one VAMC, with assistance from CDC, along with application of CDC HICPAC recommendations concerning multi-drug resistant organisms (MDROs, 2006) to VA from a national system perspective.

Results:

From 2001 through 2006, the overall percent of SA that are MRSA in VHA increased from a median of 46.9% to 58.3% ($p < 0.001$); the inpatient only subset increased from 59.1% to 67.0% ($p = 0.0007$) and the bloodstream only subset of inpatients was unchanged ranging from 50.0% to 60.0% ($p = 0.16$). PTF data revealed overall rate of persons/1000 discharged annually with staphylococcal disease increased 13% from 26.53 in FY 2000 to 30.00 in FY 2006 ($p = 0.003$), while rate of those coded with SA increased 19% from 16.28 to 19.37 ($p = 0.002$) and rate of those coded with MRSA increased 101% from 5.59 to 11.26 ($p = 0.001$).

The demonstration project revealed dramatic reductions in MRSA infections initially in intensive care units, but also on general medical units when program expanded to those

areas. The data from the demonstration site (VA Pittsburgh) will be presented in a separate abstract at SHEA.

Conclusions:

Despite many diligent, local efforts to reduce MRSA and even a national directive for hand hygiene for 2005, national MRSA rates have not decreased. Successful demonstration project and expansion of the prevention program to 17 beta sites, has led to implementation on January 12, 2007 of a nationwide directive to all VAMCs. The plan is to employ a bundle system approach toward prevention of MRSA, which includes active surveillance, hand hygiene, contact precautions, and cultural transformation using positive deviance. This is consistent with CDC HICPAC guidelines for MDROs when evaluating VHA nationwide as an entire system. This systemwide implementation is not without controversy, but VA leadership is taking decisive action to reduce MRSA infections.

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Naso-Pharyngeal Carriage of Common and Emerging Respiratory Viruses in Health Care Workers

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Background:

Pediatric emergency department (ED) health care workers (HCW) have increased exposures to patients with viral respiratory illnesses in the winter season. This presents an environment where respiratory virus (RV) transmission may occur from patients resulting in carriage of those viruses in HCW.

Objective:

Determine if naso-pharyngeal carriage of RV can be detected in pediatric ED HCW.

Methods: A pilot study was performed in the ED of Primary Children's Medical Center, Salt Lake City, Utah. After informed consent, a random sampling of HCW answered a short survey and underwent naso-pharyngeal (NP) wash for viral culture and multiplex PCR for 15 common and emerging respiratory viruses. Patient-HCW interactions in the ED were observed.

Results:

100 samples were obtained from 72 HCW between January 18 and February 12, 2007 during the viral respiratory season in Salt Lake City. Twenty-two HCW were sampled twice and 6 were sampled thrice. The majority of the samples (80%) were from female HCW, 61% were in the age range 25-44 and 51% were nurses. Overall, 55% of the samples were from asymptomatic HCW. Of the 45 with symptoms, the most common were runny nose (33%), cough (15%) or sore-throat (12%). Culture and multiplex PCR

revealed 16 positive samples (16%) from 16 unique HCW. Recovered pathogens included rhinovirus (6, 38%); non-SARS coronavirus 229E (3), adenovirus (2), respiratory syncytial virus, (RSV, 2), and one each of influenza A and B and non-SARS coronavirus NL63. Dual infections were detected in two samples (influenza A & rhinovirus, RSV & rhinovirus). Twenty-two percent of samples from symptomatic HCW were positive compared to 11% of samples from asymptomatic HCW ($p=0.13$). Among symptomatic HCW, nasal congestion and sore-throat predicted viral carriage (OR 4.4, $p=0.009$, 95% CI 1.5 - 13.5; OR 5, $p=0.02$, 95% CI 1.4 - 18.5, respectively). Five HCW showed viral acquisition by serial sampling and 3 showed a loss. The detection of virus was not associated with category of HCW, recall of ill contacts outside of work, presence of children at home or the number of shifts worked in the ED in the past week. Ninety percent of the HCW reported current influenza vaccination, including the two detected with influenza. During 19 hours of observations of multiple HCW interactions with 4 patients with respiratory illness, all patients were symptomatic, all interactions were within the 3 feet cough zone and neither the patients nor HCW routinely wore masks.

Conclusions:

This pilot study demonstrates that NP sampling of HCW can be reliably performed in a busy pediatric ED. A diverse viral carriage was detected in both symptomatic and asymptomatic HCW. The use of barrier methods to prevent transmission of RV was low. In the setting of emerging infectious threats, further studies are needed to confirm occupational transmission of viruses between patients and HCW and improve countermeasures to protect both groups.

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DOES A NATIONAL BEHAVIOUR CHANGE CAMPAIGN WORK FOR HANDHYGIENE? INITIAL ENGLISH and WELSH RESULTS

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Background:

The National Health Service (NHS) funded a national “cleanyourhands campaign” (CYHC) to change health care workers’ (HCW) behaviour in the United Kingdom (UK). The campaign was rolled out to all 185 acute hospital trusts Dec 2004-Jun 2005. It consisted of “near patient alcohol handrub (AHR)”, “talking walls” (posters) on each ward, & “patient empowerment” (materials telling patients to ask HCWs to clean their hands). An optional component was 6 monthly audit & feedback of hand-hygiene. A prospective independent study is evaluating the campaign 2004-8.

Objective:

To report changes in soap & AHR use & common Health Care Associated Infection rates in the baseline & roll out phases (Jul 2004-Jun 2005) & implementation of CYHC components at 6 & 12 months post roll out (Nov 2005 & Jun 2006).

Methods:

6-monthly questionnaires were sent to 185 acute hospitals. The first (Q1) & second (Q2) questionnaires measured CYHC implementation in Nov 2005 & Jun 2006, and requested monthly & quarterly HCAI rates. Final reminders, data collection & cleaning completed end Dec 2006.

NHS Logistics & Hospital Episode Statistics provided monthly data for each hospital on soap & AHR use in mls/patient bed-day *pre-campaign* (Jul-Dec 2004) & throughout the *roll out phase* (Jan-Jun 2005). Trends in soap/AHR use were assessed by a median regression model, and in HCAI rates by random effects Poisson regression. Analysis complete Feb 2007.

Thematic analysis of CYHC launch & preparation materials.

Results:

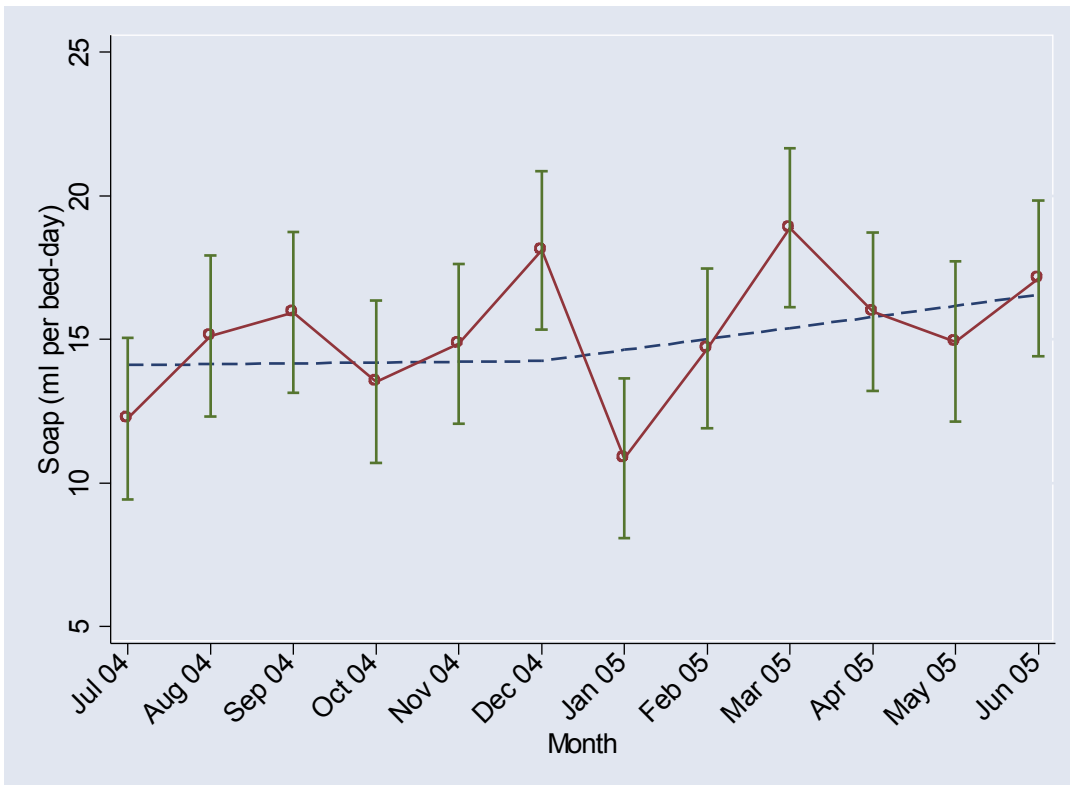
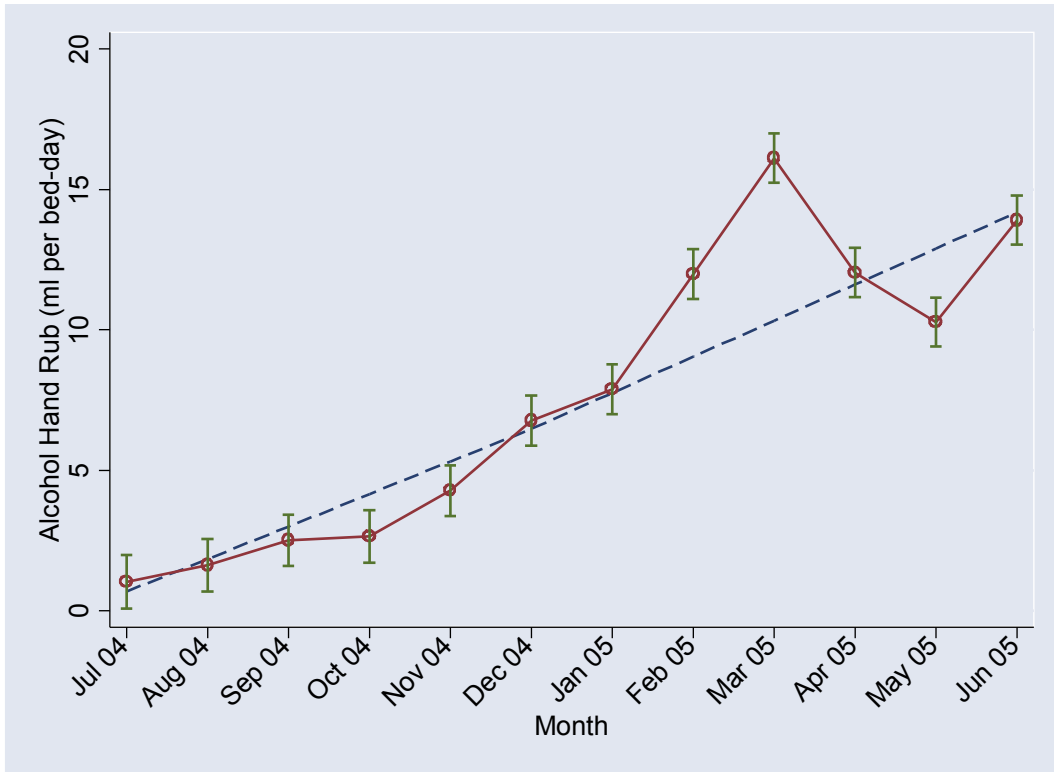
Response rates were 72% (Q1) 66% (Q2).

- By June 2006 (Q2) **AHR** was present at end of bed in >75% wards in 54% all acute hospitals & at bedside locker/wall in >75% of wards in 35%.
- **Talking wall posters** were in >75% of wards in 81% hospitals & in all wards in 61% .
- **Patient Empowerment** materials were perceived to reach patients in 48% hospitals (66% Q1) & to have changed their behaviour in 41% (47% Q1).
- **Audit & Feedback** occurred in >75% of wards in 52% of hospitals with 30% doing very little audit.
- *Soap & AHR use:* AHR use rose significantly ($p<0.001$) during the baseline and roll out phases, with median use rising from 1.0 to 13.9 mls/patient-bed day. Soap use was constant during baseline with a non-significant rise during roll out. Median combined soap & AHR use rose from 13.2 to 31 mls/patient bed-day. However, confounding by change in soap/AHR provider is possible.
- *HCAI rates:* there were seasonal rises in Clostridium difficile & Norovirus, but no change in MRSA, MSSA, GRE bacteraemias, or in new MRSA, ESBL or resistant Acinetobacter rates.
- *Thematic analysis:* only 5 of 78 hand-hygiene & consumable references in CYHC documents referred to handwashing or soap.

Conclusions:

Although possible confounders need to be explored, a national campaign targeting use of AHR, appears to have been effective in changing many aspects of hand-hygiene behaviour, increasing AHR use in particular, across the acute sector of the NHS in the

UK, without reducing soap usage.



An Outbreak of Multidrug-Resistant Acinetobacter: The Effectiveness of a Multifaceted Approach to Control

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Background:

In September 2006, we observed an increase in clinical cases of multidrug-resistant Acinetobacter (MDR-ACB) from an average of 2 cases/month to 11 cases/month. Despite routine infection control (IC) measures, the number of new clinical cases persisted through October, 2006.

Objectives:

To evaluate mechanisms of transmission within the hospital and implement control measures.

Methods:

A case-patient was defined as a patient with a bacterial culture growing Acinetobacter resistant to all but two classes of antibiotics. The quality of routine environmental cleaning was evaluated with an environmental marker, Glo Germ™. Glo Germ was applied to high touch areas of patient rooms, and those areas were assessed daily to determine if the marker had been removed. Intensive care units (ICU) were closed for 2-step cleaning with 10% bleach followed by a quaternary ammonium germicidal agent. Environmental cultures from patient rooms and nursing stations in these units were collected after disinfection. Environmental isolates of MDR-ACB were compared to patient isolates by pulsed-field gel electrophoresis (PFGE). Healthcare workers' (HCW) compliance with IC recommendations was assessed by observing hand hygiene practice and adherence to isolation protocols.

Results:

From September 1, 2006 to January 31, 2007 there were 38 case-patients with MDR-ACB; 34 (89%) received care in the ICU; and 14 (37%) were on surgical Team A. Occupancy in the same ICU at the same time as another patient with MDR-ACB or receiving care by a team caring for another MDR-ACB elsewhere were risk factors for acquisition. The Glo Germ assessment of daily disinfection showed ineffective cleaning at 68% (85/125) of the high touch sites. Environmental cultures after the 2-step disinfection showed MDR-ACB persisted in 22.1% (62/280) of sites cultured. The PFGE patterns for 29/38 patients and 33/34 environmental isolates were indistinguishable. Observations in 4 ICUs showed that compliance with isolation precautions was 75% (21/28). Hand hygiene compliance by Team A was 40% (17/43). To control the outbreak, environmental and equipment disinfection protocols were standardized with housekeeping leadership; HCWs were retrained in IC practices and compliance was monitored by administrative leadership. In addition, we performed admission and weekly surveillance cultures and daily Chlorhexidine baths of all ICU patients. After peaking at 11 cases/month in September and October, 2006, the number decreased to the baseline of 2 cases/month by January, 2007.

Conclusions:

Our findings underscore the importance of environmental contamination in outbreaks of *Acinetobacter* and the challenges of environmental disinfection. Our multi-faceted approach, which included strong reinforcement of IC practices as well as standardizing environmental disinfection protocols, was essential in controlling this outbreak.