Microbiologic Surveillance Using Nasal Cultures Alone Is Sufficient for Detection of Methicillin-Resistant Staphylococcus aureus Isolates in Neonates

Kamaljit Singh,1,2 Patrick J. Gavin,2,3 Thomas Vescio,2,3 Richard B. Thomson, Jr.,2,3 Ruth B. Deddish,1,2 Adrienne Fisher,3 Gary A. Noskin,1,2 and Lance R. Peterson2,3*

Northwestern Memorial Hospital,1 and Feinberg School of Medicine of Northwestern University,2 Chicago, Illinois 60611, and Evanston Northwestern Healthcare, Evanston, Illinois 602013

Received 24 October 2002/Returned for modification 16 December 2002/Accepted 2 February 2003

During an outbreak of methicillin-resistant Staphylococcus aureus (MRSA) in the neonatal intensive care units at two hospitals, we assessed several sites for detection of MRSA colonization. Nasal cultures found 32 of 33 MRSA-colonized patients (97%). Rectal cultures detected 29% of 24 MRSA-colonized patients identified by paired rectal and nasal samples and axillary samples found 22% of 9 MRSA-colonized patients identified by axillary samples paired with nasal swabs. There were no positive umbilical samples.

Methicillin-resistant Staphylococcus aureus (MRSA) has emerged as a cause of epidemics in the neonatal intensive care unit (NICU) (4, 9, 13). High rates of colonization (30 to 70%) may occur before clinical infections indicate a problem (14, 17). However, there are few data on the appropriate body site(s) for microbiologic surveillance of MRSA among neonates. As a result, there are widely differing practices for the detection of MRSA that involve culturing multiple sites, including the anterior nares, umbilicus, pharynx, catheter sites, rectum, groin, and axilla, as well as any open wounds (1, 6, 18). During a recent outbreak of MRSA in the NICUs at two hospitals, we compared (i) nasal versus rectal cultures and (ii) nasal versus axillary plus (where available) umbilical cultures for the detection of MRSA carriage.

Northwestern Memorial Hospital is a 720-bed teaching hospital with a 46-bed NICU that admits approximately 700 infants each year. An outbreak of MRSA here was first recognized in October 2001 after MRSA was recovered from the endotracheal tube and blood of a neonate. Weekly surveillance cultures for the detection of MRSA were obtained from the anterior nares and rectum from all neonates in the NICU. In December 2001, following an interim comparison between paired nasal and rectal swabs, it was decided to discontinue rectal cultures. Continued comparisons were performed between paired nasal and axillary cultures plus (where present) umbilical stump cultures. All cultures were plated directly onto Columbia—colistin—nalidixic acid–5% sheep blood agar plates (Remel, Inc., Lenexa, Kans.) and incubated at 35°C for 48 h. Isolates that were catalase- and coagulase-positive and demonstrated growth on a 6-μg/ml oxacillin salt agar screening plate were identified as MRSA.

An analysis of the laboratory cost of our surveillance testing was performed, which included the actual cost of bacteriologic media, reagents, and laboratory technologist time. Recovery of MRSA from different culture sites was compared using a two-sided exact McNemar’s test. A P value of ≤0.05 was considered significant. The Institutional Review Board of Evanston Northwestern Healthcare approved the analysis of this testing method comparison.

The outbreak in the two NICUs involved a total of 38 neonates. The mean gestational age of the colonized and infected infants was 30 weeks (range, 24 to 40 weeks), there was an equal number of boys and girls, and the average birth weight was 1,243 g (range, 555 to 3,356 g). Thirty-three of the 38 neonates were colonized with MRSA, and 5 had clinical infections.

Overall, 373 paired nasal and rectal cultures and 185 paired nasal and axillary cultures (53 of these also included umbilical cultures) were collected. Of these, 51% were from Northwestern Memorial Hospital and 49% from Evanston Northwestern Healthcare. Of 24 positive infants who had paired nasal and rectal cultures, both cultures were positive in 6 infants, only the
The ecological niche of *S. aureus* is the anterior nares, from where the organism can spread to other parts of the body (8). Importantly, as nasal colonization with *S. aureus* appears to antedate bacteremic as well as nonbacteremic infection (16), detection of nasal carriage may be of great clinical relevance. Additionally, treatment of the anterior nares to eliminate nasal carriage also results in the disappearance of the organism from other areas in most cases (10, 12).

Karchmer and colleagues recently estimated that well over U.S. $10 in reduced health care cost is realized for each U.S. $1 spent on active surveillance cultures by comparing a MRSA outbreak in two NICUs (7), only one of which performed weekly active surveillance. However, limiting expenditures to what is necessary is always prudent. We found that the use of nasal surveillance cultures alone during both outbreaks would have resulted in an overall cost saving of U.S. $7,637.50 and detected 97% of MRSA-colonized infants.

Our findings indicate that nasal surveillance cultures alone are sufficiently sensitive and cost-effective for the detection of MRSA in neonates.

Kamaljit Singh was funded by The National Medical Research Council of Singapore as a Medical Microbiology fellow.

### REFERENCES

15. Tenover, F. C., R. D. Arbeit, R. V. Goering, P. A. Mickelsen, B. E. Murray,

