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"Does Implementation of Contact Precautions For All Patients Decrease the Risk of Infections with Multidrug-Resistant Organisms in the Medical Intensive Care Unit at Milstein Hospital?: A Natural Experiment of MICU-A and MICU-B"

A. Study Purpose and Rationale

The prevalence of multidrug-resistant organisms (MDROs) is increasing in hospitals and the Medical Intensive Care Units (MICUs). MDROs include methicillin-resistant *Staphylococcus Aureus* (MRSA), vancomycin-resistant *enterococci* (VRE), and multidrug-resistant (MDR) gram-negative rods, such as *Escherichia coli, Klebsiella pneumoniae,* (including extended-spectrum beta-lactamase [ESBL]-producing organisms of these two species), *Pseudomonas aeruginosa,* and *Acinetobacter spp.* Patients who have severe disease, are immunocompromised, have had recent surgery, and who have indwelling medical devices, such as central venous catheters, urinary tract catheters, and endotracheal tubes, are more susceptible to infection or colonization with these organisms (1,2). The majority of the patients in the MICU have at least one of these risk factors, and so becomes an important site to study the transmission of MDROs given the increased mortality and cost associated with them.

Epidemiologic studies have shown that the spread of MDROs is via the hands of healthcare workers (3-6)**.** Therefore, in order to curb the spread of MDROs among patients in the hospital, the CDC has released guidelines for the management of MDROs in healthcare settings (7). Infection control procedures currently include: education of healthcare workers about MDROs, implementation of Standard Precautions (hand hygiene and the use of appropriate barriers when in contact with mucous membranes, wounds, bodily fluids) and Contact Precautions (isolation or cohorting of patients, use of gowns and gloves when in contact with the patient or the patient's environment) [CP], appropriate environmental cleaning/disinfection/sterilization, MDRO surveillance, and judicious use of antibiotics. The implementation of these interventions have been shown to reduce the cases of MDROs in hospitals and intensive care units and have even led to eradication of some of the organisms in certain sites (7).

In the MICU, each patient is already in an isolated room, so CP would entail use of gowns and gloves when in contact with the patient and his/her environment. There have been three studies evaluating the use of gloves alone versus gloves with gowns in preventing the spread of VRE in the ICU. Two studies showed a decrease in transmission, and the third showed no difference (8-10). There has never been a direct comparison of Standard Precautions alone versus CP in addition to Standard Precautions, but they have both been evaluated in other studies where several strategies were being used and were found to be effective in reducing transmission of MDROs, and so are recommended.

Milstein Hospital has two Medical Intensive Care Units: MICU-A and MICU-B. MICU-B opened in June 2007, and is staffed by nurse practitioners and physician assistants as compared to medical residents in MICU-A. MICU-B has a lower admission rate (40-45 patients/month) than MICU-A (60-65 patients/month), and the patients in MICU-B, on average, have longer lengths of stay. Additionally, and relevant to this study, CP is implemented for all patients admitted to MICU-B. This began because, within the first few weeks of opening, there were a large number of patients admitted to MICU-B with MDR *Klebsiella pneumoniae*, so the policy was employed and has continued. MICU-A, on the other hand, implements CP only if the patient has a known infection or colonization with MDRO(s). Other infection control strategies that are employed by both MICUs include Standard Precautions, and surveillance. Given the difference in the CP policy between the two MICUs, it allows for an assessment of the effectiveness of implementation of universal CP to prevent transmission of MDROs in the MICU setting. A potential benefit to implementing CP for all patients in the MICU is that it eliminates the lag time to implement the infection control strategy and, in effect, reduce transmission that may occur during that lag time (for example, in waiting for surveillance culture data). Reduced transmission, in turn, leads to less morbidity and decreased length of stay, less antibiotic use, and less development of more resistant organisms (by way of decreased antibiotic exposure). There is increased direct cost, however, in the need for more gowns and gloves. Additionally, there have been studies that show that patients under CP are evaluated less by physicians (11, 12), and so there may be indirect costs as well, if these patients have complications that could have been prevented by evaluation by a physician. Therefore, this study can elucidate whether the use of universal Contact Precautions in the MICU is effective in reducing transmission and can eventually lead to a cost-benefit analysis of the strategy.

B. Study Design and Statistical Analysis

This will be a retrospective analysis of patients in the Medical Intensive Care Units (MICU-A and MICU-B). All patients admitted to MICU-A and MICU-B from July 2007 through January 2009 will be included. Infection rates with MDROs in MICU-B, where empiric contact isolation of all patients is enforced, will be compared to those in MICU-A, where contact isolation is implemented only in patients with known infection or colonization with one or more MDROs. This will be approximately 1100 subjects from MICU-A and 800 subjects from MICU-B.

The data that will be collected includes the following: history of infection with MDROs prior to admission to the MICU, surveillance culture data for VRE and MRSA on admission to the MICU, positive blood and urine cultures during the MICU course and the dates of these positive cultures, length of stay in the MICU

Culture data on all subjects will be collected via Webcis and with the assistance of the Department of Epidemiology.

Kaplan Meier analysis will be used, with time to infection as the outcome measure. Assuming a 10% infection rate with MDRO in MICU-A, this sample size is adequate to detect a 5% difference in outcome using chi-square analysis.

C. Study Procedure
Since this is a retrospective study, there will be no procedures performed upon patients. All surveillance cultures were obtained on admission to the MICU.

D. Study Drugs
No drugs will be used in this study.

E. Medical Device
No medical devices will be used in this study

F. Study Questionnaires
No questionnaires will be distributed in this study

G. Study Subjects
All patients who were admitted to MICU-A and MICU-B from July 2007 through January 2009 will be included.
Patients who do not have admission surveillance culture data will be excluded.

H. Recruitment of Subjects
Potential subjects will be identified through the MICU admission log books with the permission of Dr. Phillip Factor, the ICU Director.

I. Confidentiality of Study Data
Personal Health Information will not be collected.
Patient identity will not be linked with the data gathered for the study.
The data will be stored on a secured computer with log-in password.

J. Potential Conflict of Interest
There is no conflict of interest in this sudy.

K. Location of the Study
The study will be conducted only at CUMC.

L. Potential Risks
There are no potential risks to subjects in this study.

M. Potential Benefits
The results of this study could further guide infection control procedures in the MICUs of Milstein Hospital. Furthermore, it could provide some information to determine the cost-effectiveness of universal contact isolation.

N. Alternative Therapies
No thereapies are being provided in this study.

O. Compensation to Subjects
There will be no compensation.

P. Costs to Subjects
Subjects will incur no costs in this study.

Q. Minors as Research Subjects
No minors will be included in this study

R. Radiation or Radioactive Substances
No radiation or radioactive substances will be used in this study.

References

1. Lautenbach, E., Patel, J. B., Bilker, W. B., Edelstein, P. H., & Fishman, N. O. Extended-spectrum beta-lactamase-producing Escherichia coli and Klebsiella pneumonia: risk factors for infection and impact of resistance on outcomes. *Clin Infect Dis* 2001; 32: 1162-1171.
2. Goetz, A. M., Rihs, J. D., Wagener, M. M., & Muder, R. R. Infection and colonization with vancomycin-resistant Enterococcus faecium in an acute care Veterans Affairs Medical Center: a 2-year survey. *Am J Infect Control* 1998; 26: 558-562.
3. Centers for Disease Control. *Morbidity and Mortality Weekly Report* 2002; 51(16): 1-44.
4. Muto, C. A., Jernigan, J. A., Ostrowsky, B. E., Richet, H. M., Jarvis, W. R., Boyce, J. M., & Farr, B. M. SHEA guideline for preventing nosocomial transmission of multidrug-resistant strains of Staphylococcus aureus and enterococcus. *Infect Control Hosp Epidemiol* 2003; 24: 362-386.
5. Almuneef, M. A., Baltimore, R. S., Farrel, P. A., Reagan-Cirincione, P., & Dembry, L. M. Molecular typing demonstrating transmission of gram-negative rods in a neonatal intensive care unit in the absence of a recognized epidemic. *Clin Infect Dis* 2001; 32, 220-227.
6. Duckro, A. N., Blom, D. W., Lyle, E. A., Weinstein, R. A., & Hayden, M. K. Transfer of vancomycin-resistant enterococci via health care worker hands. *Arch Intern Med* 2005**;** 165: 302-307.
7. Centers for Disease Control. Management of Multidrug-Resistant Organisms in Healthcare Settings, 2006
http://www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf
8. Puzniak, L. A., Leet, T., Mayfield, J., Kollef, M., & Mundy, L. M. To gown or not to gown: the effect on acquisition of vancomycin-resistant enterococci. *Clin Infect Dis* 2001; 35: 18-25.
9. Srinivasan, A., Dick, J. D., & Perl, T. M. Vancomycin resistance in staphylococci. *Clin Microbiol Rev* 2002; 15: 430-438.
10. Slaughter, S., Hayden, M. K., Nathan, C., Hu, T. C., Rice, T., Van Voorhis, J., Matushek, M., Franklin, C., & Weinstein, R. A. A comparison of the effect of universal use of gloves and gowns with that of glove use alone on acquisition of vancomycin-resistant enterococci in a medical intensive care unit. *Ann Intern Med* 1996; 125: 448-456.
11. Kirkland, KB, Weinstein JM. Adverse effects of contact isolation. *Lancet* 1999; 354:1177-8.
12. Saint S, Higgins LA, Nallamothu BK, Chenoweth C. Do physicians examine patients in contact isolation less? A brief report. *Am J Infect Control* 2003 Oct; 31(6): 354-6.