The author replies.

We agree with Dr. Macías that the frequency and microbiology of infusion-related infections vary according to nursing and medical practice in various hospitals and countries. *Klebsiella* infections are not a common cause of infusion-related bacteremia at our institution or in the United States of America in general.

As we concluded in our study, "larger trials are required to determine whether delaying replacement of intravenous administrations sets up to 7 days is safe." Dr. Macías should test this observation in his medical setting before concluding that it is safer to adhere to the "traditional way."

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Frequency of Intravenous Administration Set Changes and Bacteremia: Defining the Risk

To the Editor:

I would like to respond to a comment made by Dr. Robert R. Muder in his editorial, "Frequency of Intravenous Administration Set Changes and Bacteremia: Defining the Risk."[1]

Dr. Muder stated, "The impetus for increasing the interval (of intravenous tubing changes) is, of course, cost, which includes acquisition cost of the set and nursing time required for routine changes."

It seems to me that one of the goals of intravenous fluid administration should be to maintain a closed system, thereby preventing contamination of the infusate; therefore, it is difficult to separate the issue of when to change the tubing from the issue of when to rotate the site. Several studies have indicated that routine site changes are not necessary at 72 hours.[2-4] Having two different time frames for site and tubing creates the situation where the system would have to be opened at the catheter hub, creating a portal of infection for the patient and potentially exposing staff to blood. Research to determine whether extended hang time for fluid and tubing is safe is a natural extension of the research to determine whether extended dwell times for peripheral catheters is safe. Both issues relate to patient comfort and safety.

As an infection control practitioner, my primary goal is always for the safety and comfort of the patients and the staff. If slaying the sacred cow contributes to this, I am satisfied that I have accomplished that goal. If, by slaying the sacred cow, institutions are able to decrease cost, we all benefit.

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The author replies.

I agree with Ms. Graeber that the primary goal of infection control is to promote the safety and well-being of the patient. There is ample evidence in the published literature to indicate that reducing nosocomial infections and other complications is eminently cost-effective, so patient safety and cost reduction need not be in conflict. The study by Raad and colleagues evaluated tubing changes in central intravenous lines.[1] Note that these lines are not usually changed at predetermined intervals but are left in place until they are not needed, they malfunction, or a complication develops; thus, the question of coordinating tubing changes with site rotation is not an issue, nor is patient comfort. However, there is undoubtedly a risk of bacterial contamination associated with breaking the system for a tubing change, which must be balanced with risks posed by prolonged use of the infusion set.

With regard to peripheral intravenous lines, there is, as Ms. Graeber notes, evidence to suggest that routine site changes at 72 hours may not be needed. Site rotation has been a standard of care for many years, but it has some drawbacks. One of the most important of these is the discomfort associated with a new placement. I think Ms. Graeber's suggestion that future studies evaluate the catheter and tubing as a unit is a very reasonable one. If a well-conducted randomized trial demonstrates that extending the duration of catheter and tubing use is safe, it would lead to improved patient comfort at a lower cost.

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The Identification and Investigation of Clustered Bacterial Isolates on Nursing Home Units

To the Editor:

Infection control reporting in nursing homes usually lists clinical syndromes (eg, respiratory tract or urinary tract infection), room number, and date.[1] Unfortunately, such listings do not provide much evidence of transmission, since the various infection syndromes may be caused by different organisms and a common strain may produce more than one syndrome (eg, methicillin-resistant *Staphylococcus aureas* may cause pneumonia and wound infection).[2] Finally, there may be a time lag between transmission of low-virulence pathogens and a second event, such as aspiration or skin abrasion, that allows the colonizer to produce infection detected by culture. We present a technique that lists bacterial isolates of identical species and antibiotic sensitivity for each nursing unit. Clusters with a possible common source are identified, followed by clinical assessment. This technique provides staff with specific circumstances to review secretion precautions.

The Wisconsin Veterans Home is a 721-bed skilled facility with four buildings and 14 nursing units (50-60 beds). Annual mortality is 17.4%. The home has an on-site bacteriology laboratory open 45 hours per week. The laboratory has strict policies for plating specimens. Approximately 650 clinical cultures are performed each year. All cultures are entered into a database. Every month, culture isolates from the previous 2 months are displayed for each of the 14 nursing units, stacked by bacterial species and date, with antibiotic sensitivity. This printout is examined by the medical director to identify clusters of identical bacterial species and sensitivity. Although this process is based only on reasonable judgments and may identify clusters that are not genetically related, the purpose of reporting a cluster is to initiate an investigation of possible transmission. Common-source transmission was thought to be more likely when rooms on the same 13- to 17-bed wing were involved or if the organism was unusual. An expected 2-month isolation rate per nursing unit was calculated from 12-month facilitywide (14 nursing units) rates to help gauge the possibility of chance occurrence (ie, N isolates in facility over 12 months ÷ by 14 nursing units ÷ by 6, as there are six 2-month periods/12 months). Between February 1999 and October 2000, 12 clusters were identified. We referred five clusters of only two organisms for investigation because they were unusual organisms and occurred on the same 13- to 17-bed wing, although perhaps a cluster of at least three isolates should be required to improve specificity at the expense of sensitivity. Three clusters were unique because the residents shared two organisms, an observation that strengthens the likelihood of a common source. All clusters included residents who shared living space and caregivers with isolates within 2 months. Transmission could occur between nursing units (within a wider space) or require a longer time span to appear (ie, the time between colonization and culture of infected secretions may be longer than 2 months). Full validation of our technique would require genetic analysis of isolates and more precise epidemiological investigations.

We present three clusters involving *Pseudomonas aeruginosa*. Cluster 1 involved three individuals, two with Foley catheters. A number of investigators have noted clustering of gram-negative bacterial species from urinary catheters in nursing homes.[3] Cluster 2 involved the only two ciprofloxacin-resistant *Pseudomonas* strains isolated that year in the entire 721-bed facility. The residents socialized directly and lived on the same 15-bed wing. Cluster 3 included three individuals who shared two organisms, *P aeruginosa* and β-hemolytic *Streptococcus* (not group A).

The clusters were referred to the director of nursing on a preprinted form that asked:

1. Do the residents have direct contact (on the nursing unit, socializing, activities, meals, etc)?
2. How much staff assistance in the activities of daily living do the patients require?
3. At what level do the residents share staff: registered nurse, licensed practical nurse, nursing assistant, therapists, volunteers?
4. How high is the likelihood of transmission directly between residents or via staff members?

The nursing supervisors believed that the inquiries were helpful, impressed caregivers with the importance of good technique, and led to improved secretion containment when resident-to-resident transmission seemed likely.

The technique presented does not replace tracking infection syndromes. Stevenson stated, "The variability of . . . LTCF-acquired infection (syndrome) rates can be confusing and may offer little value to an individual facility attempting to understand the significance of its infection rates."[1] It is our impression that substantial effort is expended on this type of reporting, often with little payoff. However, tracking infection syndromes is critical to the identification of explosive outbreaks (ie, viral respiratory or enteric infections). Rates of infection syndromes reflect transmission, as well as the burden of resident disability (eg, aspiration, malnutrition, immobility). There is a place for interventions to prevent transmission, as well as interventions to prevent the individual from becoming infected with endogenous flora. Increasing or outlier rates of pneumonia (not readily explained by case mix) could direct a facility toward quality improvement in areas such as vaccination, respiratory therapy, swallowing interventions, and dental care, or in the case of increased rates of urinary tract infections, toward portable bladder ultrasound determinations and increasing fluid intake.

In the vast majority of cases, it is easy to get away with poor technique. The identification of clustered bacterial isolates in time (over 2 months) and space (on a 50- to 60-bed nursing unit or 13- to 17-bed wing) provides a strong and specific reminder to staff that bacterial pathogens may be transmitted between individuals. This prompts staff members to review their secretion techniques, as well as basic hygiene maintenance by and for residents in public areas (ie, assisted hand washing and extra environmental cleaning). These simple techniques are within the resources of many nursing homes and deserve further study.

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Incidence and Mortality of Proven Invasive *Candida* Infections in Pediatric Intensive Care Patients

To the Editor:

Invasive *Candida* infections represent a clinical challenge in critically ill patients, with a growing incidence over recent years[1]; huge increases have been reported in preterm infants[2]. These infections carry a significant morbidity and mortality,[1,3] as well as an increasing cost and length of intensive care unit and hospital stay.[4] In children, epidemiological studies on candidiasis have focused