tectable by routine testing in the clinical laboratory.[5] Our speculation is that such strains may spread among patients and become recognized only when the patients receive fluoroquinolones, the most significant factor associated with CREC colonization. That we may have had such strains in our patients was suggested from in vitro studies of these CREC, in which a wide range of minimum inhibitory concentrations to ciprofloxacin was observed.[3] If low-level resistance occurred and was not detected by the clinical laboratory, these patients could have been colonized for longer periods than we had thought. It would appear that the epidemiology of ciprofloxacin resistance in *E coli* is complex, and further studies focusing on the nature of the resistance of the *E coli,* specific sites of acquisition, and colonization might be useful to determine exact reservoirs and mechanisms of spread of resistant strains.

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Patient Versus Healthcare Worker Risks in Needleless Infusion Systems

To the Editor:

In the August 1997 issue of *Infection Control and Hospital Epidemiology,* Voss, Verweij, L'Ecuyer, and Fraser[1] posed vital questions: Are needleless intravenous (IV) systems safe for patients? Needless? Efficient? Cost-effective?

At the Seventh Annual Meeting of the Society for Healthcare Epidemiology of America, McDonald et al[2] reported a comparison of central venous catheter-associated bloodstream infections (BSI) in patients in a hospital where the Baxter InterLink (Baxter Health Care Corp, Deerfield, IL) needleless IV system was changed to an intravenous access (IVAC; IVAC Medical Systems, San Diego, CA) needleless IV system. They found a threefold increase of BSI in patients infused via the IVAC system. In 1996, L'Ecuyer et al[3] reported that the use of needleless IV systems reduced, but did not entirely eliminate, accidental needlesticks in healthcare workers (HCWs). In 1995, Danzig et al[4] compared prior use of standard infusion systems with use of Baxter's InterLink needleless IV system in home healthcare settings wherein total parenteral nutrition was indicated. She reported a 10-fold increase in BSI in patients infused via the Baxter needleless IV system. She obtained cultures of bacteria from the infusion side of the slit latex infusion port cap and theorized that the slit in the cap provides a recess, albeit small, away from the mainstream wherein bacteria might proliferate between port injections via a blunt cannula. Cogent to these questions and reports, I observed the following:

1. The IVAC SmartSite (B. Braun Medical Inc, Bethlehem, PA) needleless IV system infuses ports via a blunt cannula or via the nozzle on a Luer-Lok syringe inserted into a recessed space containing a collapsing slit silicone port cap. The slit cap dribbles infusion fluid back into the recessed space each time the blunt cannula or nozzle is withdrawn from an infusion port more than 30 cm below the water level in the infusion source. Infusion fluid squirts through in a stream whenever more than 100 cm of hydrostatic pressure is exerted in the infusion system when the SmartSite cap is not screwed on. Fluid remains in the capped recess until the next blunt cannula or syringe nozzle is inserted.

2. The Braun SAFSITE-Y (B. Braun Medical Inc) needleless IV system depends on a line valve that opens with insertion of a standard syringe nozzle or a Tubex Blunt Pointe (Wyeth Laboratories Inc, Philadelphia PA) into a recess in the open side of an infusion access port. During the withdrawal of the nozzle, while the line valve is still partly open and hydrostatic pressure in the infusion system exceeds that in syringe or the cartridge used for injecting soluble fluid, fluid from the infusion leaks back into the recess and remains there or evaporates. With the next injection, some residual recessed fluid may enter the line.

3. Use of the CLAVE (McGaw Inc, Irvine, CA) system depends on a tapered needle with a compressible silicone cap, both located in a recess on the open side. The CLAVE has external threads for attachment of a Luer-Lok syringe. When the filled syringe is advanced and locked onto the CLAVE, the nozzle progressively presses against the silicone cap, which com-

presses like an accordion until the tapered tip of the needle passes through a flattened part of the silicone cap to rest within the bore of the syringe nozzle. This establishes in-line fluid continuity. When hydrostatic pressure in the infusion set exceeds that in the syringe nozzle during the process of withdrawal, some fluid in the set leaks back into the nozzle and drips off into the recess. This fluid remains there or evaporates until the next syringe nozzle is inserted. Owing to the relatively thin septum of flat silicone through which the tapered needle passes, some CLAVEs leak infusion fluid after repeated use and do so in proportion to the height of the water column above the port in a standing infusion set.

4. In the Baxter InterLink needleless IV system, the slit port caps are thick, do not leak with >100 cm of retrograde hydrostatic pressure, and present no obvious recesses. However, when a blunt cannula (outside diameter ±2.5 mm) is withdrawn, the slit closes first on the infusion side, trapping fluid within the port cap. The amount of fluid trapped, albeit small and mostly squeezed out, probably is distributed evenly on both surfaces of the slit by the force of capillary action. This fluid is likely to remain there until the next blunt cannula is pushed through. All cannulae inserted subsequently are obliged to pass through the same slit.

5. In all needleless IV systems, when the syringe or cartridge piston is not activated by manual control of the plunger, some fluid drips off the nozzle or blunt cannula into up-facing port recesses or slits. The volume dripping is proportional to the square of the radius of the leading bore.

6. Standard infusion sets with unslit infusion port caps are serviced by standard hollow-bore steel needles with sharp leading bevels and significantly smaller outside diameters, which seldom pass through the same track in the port cap; present no obvious recesses; seldom allow port cap leakage under more than 50 cm retrograde hydrostatic pressure; and are relatively efficient, because the same needle used to withdraw soluble medication from a vial is used to inject an infusion port. Needles currently are less costly than blunt cannulae, harpoons, and other paraphernalia essential to cannula use. Standard port caps require sharp needles, but the needle bores seldom are contaminated with blood or body fluids.

Thus, comparing needleless IV systems and standard infusion systems from a hydrodynamic point of view, it seems that standard systems are relatively safe, needed, efficient, and cost-effective for avoiding nosocomial BSI in patients. The added risk of standard systems for BSI from needlesticks in healthcare workers seems small in comparison. However, healthcare worker risks for BSI from sharp hollow-bore steel needles or needles used to insert catheters on the leading ends of needleless IV systems and standard infusion sets remain extreme.

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Anergy Testing and TB Preventive Therapy for HIV-Infected Persons

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The CDC recently revised their recommendations for anergy skin testing and tuberculosis (TB) preventive therapy for HIV-infected persons. The report emphasizes that isoniazid (INH) preventive therapy is effective in reducing the incidence of active TB among persons who have HIV infection and latent TB. Because of the complications associated with TB disease in HIV-infected persons, these persons must be screened for TB infection. The CDC recommends that HIV-infected persons who have positive reactions to skin testing with purified protein derivative (PPD) tuberculin be evaluated to exclude active TB and offered preventive therapy with INH, if indicated. However, HIV-infected persons may have compromised ability to react to tuberculin skin testing, because HIV infection is associated with an elevated risk for cutaneous anergy.

Anergy testing is a diagnostic procedure used to obtain information regarding the competence of the cellular immune response. For anergy testing, the CDC recommends the use of two US Food and Drug Administration-approved Mantoux-method tests (mumps and *Candida),* used together, with cut-off diameters of 5 mm of induration. Efforts to apply the results of anergy testing to preventive therapy decisions must be supplemented with information concerning the person's risk for infection with *Mycobacterium tuberculosis.*

Factors limiting the usefulness of anergy skin testing include problems with standardization and reproducibility, the low risk for TB associated with a diagnosis of anergy, and the lack of apparent benefit of preventive therapy for groups of anergic HIV-infected persons. Therefore, the use of anergy testing in conjunction with PPD testing is no longer recommended for screening programs for *M tuberculosis* infection conducted among HIV-infected persons in the United States.

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