

Editorial

The Expanding Role of Healthcare Epidemiology— Home and Long-Term Care

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During the last decade, there have been major shifts in the delivery of health care in the United States. Mergers of hospitals, movement to outpatient and ambulatory-care services, managed care, and reform of the US healthcare system have resulted in a dramatic relocation of patient care from hospitals to outpatient and out-of-hospital settings, including the home. This change, which has been motivated largely by the continuing increase in hospital healthcare costs and the search for cost-effective alternatives to hospital-based treatments, has led to a heightened interest in providing care in the home setting. Reflecting this interest, the Health Care Finance Administration has predicted that expenditures for the provision of home health care will increase from approximately \$2 billion in 1988 to nearly \$25 billion in 1999.¹ Advantages of home health care include decreased duration of hospitalization, cost savings, decreased psychosocial impact through avoidance of hospitalization, and the provision of care in a familiar surrounding with supportive family members.^{2,3} For many patients, home health care meets their medical needs without compromising the efficacy and safety present in the hospital setting.

The type of service delivered by different home healthcare agencies ranges from assigning nursing personnel to each patient to providing all the care received at home to agencies that merely deliver the needed supplies while the patient or family members

provide the home care. Undoubtedly, market forces will continue to propel the healthcare industry to increase quality while decreasing costs. The 1995 Joint Commission on Accreditation of Healthcare Organization's *Accreditation Manual for Home Care* states that performance expectations for home health care will begin to rise progressively in 1996 and in the years to follow.⁴ In many areas of the home care industry, technology is being introduced in new settings without the benefit of either an infection control infrastructure or, in some instances, appropriate infection control recommendations. Therefore, hospital epidemiologists and others in infection control need to provide input into efforts to monitor the adequacy of such care, measure outcomes, and compare the quality of the care provided by different home-healthcare agencies. The question remains, what are the benefits and risks associated with our cost-containment efforts?

Concomitant with the expansion in nonhospital-based healthcare delivery systems has been concern over the occupational risk to healthcare workers of infectious diseases. Healthcare-worker concerns about the risk of occupational acquisition of blood-borne pathogens has resulted in expanded infection control recommendations, the Occupational Safety and Health Administration's Bloodborne Pathogen Standard, and the emergence of many technological advances to reduce the risk of healthcare-worker

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96-ED-165. Garrett DO, Jarvis WR. The expanding role of healthcare epidemiology—home and long-term care. Infect Control Hosp Epidemiol 1996;17:714-717.

injury. One of the most common healthcare-worker injuries has been that associated with needles. To reduce the risk of such injuries, needle-protected and needleless devices have been developed, and their use is encouraged by federal and nonfederal agencies and infection control personnel. Needleless devices allow for the access of intravenous lines without the use of a needle, thereby reducing the risk of needlestick injury among healthcare workers.^{5,6} As a result, this new technology also has been introduced in home-care settings.

An expanding and increasingly popular component of home health care is home infusion therapy (HIT). Home infusion therapy allows patients to receive a variety of infusates, including hydration, hyperalimentation, clotting factors, and antimicrobial, chemotherapy, or analgesic agents at decreased cost in the comfort of their own home, providing the opportunity for a greater level of participation by patient and caregiver in the treatment plan. Home infusion therapy exemplifies the convergence of rapid advances in home care, introduction of new medical devices such as needleless devices, and absent or inadequate infection control recommendations. Several recent investigations have shown the potential for adverse patient outcomes associated with HIT when these conditions exist.

At one home-healthcare agency, where nursing personnel provided the patient care, a 10-fold increase in bloodstream infections (BSIs) associated with HIT was observed from July through December 1993.⁷ An investigation revealed that the increased BSI rate was associated with the introduction of a needleless device (device A), the receipt of hyperalimentation, and changing of the needleless device endcap at 7-day intervals. In another investigation, the BSI rate in a pediatric oncology population receiving HIT provided by several home-care companies increased significantly over a 2-year period from 0.8 per 1,000 central venous catheter (CVC)-days in 1992 to 1.2 per 1,000 CVC-days in 1994.⁸ In this instance, the home-healthcare agency provided the supplies, but the family members provided the home care. An epidemiologic investigation revealed that the increase in the BSI rate was associated with the introduction of a needleless device (device B) and with ethnicity—which may have been a measure of family member understanding of HIT instructions. In 1995, Do et al⁹ investigated a BSI outbreak in a large HIT population in which care was provided by nursing personnel. The HIT company had used three different needleless devices (devices C, B, and A) sequentially. An investigation revealed that BSI risk varied with the needleless device, but was reduced signifi-

cantly when the device endcap was changed at 2- to 3-day versus 7-day intervals.⁹ In addition, there was an increased BSI risk associated with externalized versus internalized CVCs and with tap water exposure through showering.

In each of these outbreaks, there has been a high frequency of hydrophilic gram-negative bacteria causing the BSIs, suggesting that patient-catheter exposure to tap water may be an important risk factor for BSI. These outbreaks highlight the association between the occurrence of complications in HIT and inadequate infection control measures. Although these data suggest that more frequent needleless-device endcap changes reduce the risk of BSI, further studies urgently are needed to provide the basis for infection control recommendations for this setting. Complete adoption of the recently released Centers for Disease Control and Prevention intravascular-device-related infections prevention guideline may not be practical, appropriate, or realistic for the home setting.¹⁰

Two studies by Lobato et al published in this issue of *Infection Control and Hospital Epidemiology* are important first steps in addressing the adequacy of current infection control practices and education in one type of home setting.^{11,12} In an investigation evaluating the households of human immunodeficiency virus-infected patients with hemophilia undergoing HIT, the authors documented the occurrence of serious shortcomings in infection control practices, including improper disposal of potentially infectious waste, inconsistent use of gloves during both the infusion and the cleaning-up of infusion equipment and waste, recapping of used needles, and improper storage of sharps containers.¹¹ These data indicate that more rigorous infection control education of patients and their family members and improved practices are necessary if health care is to be provided by family members in the home setting. Unfortunately, the authors do not provide data on race or socioeconomic status of the population studied. This information may be important, because, in one previous study, socioeconomic factors and ethnicity were identified as risk factors for BSI in home infusion patients.⁸ It is possible that culture or language barriers influence the understanding of the infection control education provided and result in the inadequate infection control practices reported by this study. Further exploration of the factors leading to these practices is necessary if prevention interventions are to be designed and implemented.

A second article by the same authors examined the teaching practices of the nurses who provide infection control education to patients and families involved

in home-care treatment.¹² This study showed a significant discrepancy in the teaching of infection control topics. While some measures were stressed, others were underemphasized. Furthermore, even practices that are stressed, such as the use of gloves during infusions and the proper disposal of sharp instruments and containers, were found not to be common in home settings. As this study so well demonstrates, adequate education and training of home-care patients and caregivers is a critical element in any HIT population. The nursing staff plays an essential role in the accomplishment of this task. Besides the burden of teaching complicated skills to patients and family members, the nurses also share the responsibility of carefully determining which are the initial skills necessary for the safety of the patient and caregivers. While some patients and family members are willing to accept the use of HIT and to cooperate in the training program, some may be overwhelmed and unwilling to care for themselves or to become caregivers to their loved ones. This poses a hindrance to the learning and training process.

Another increasingly important area in which health care is being provided is the long-term-care setting. Few guidelines exist for these settings, and implementation of current infection control guidelines, which were designed primarily for acute-care facilities, often is difficult, impractical, or inappropriate. As the proportion of the US population >65 years of age expands and a larger proportion of our population resides in long-term-care facilities, the cost-containment efforts focused on acute-care facilities increasingly will be focused on long-term-care facilities. The study by Graham et al¹³ published in this issue shows that we must be ever vigilant for opportunities to reduce healthcare costs, regardless of the setting, when they benefit the patient.

Percutaneous feeding tubes commonly are used to provide adequate nutritional support to select patients.¹³ Feeding in this manner is common in long-term care and increasingly is being used in home care. Similar to the issue of the optimal frequency for changing needleless device endcaps, few data exist on the frequency for changing percutaneous feeding tubes. Although relatively small (n=26), this study shows that changing such tubes on an as-needed basis, rather than routinely each month, was not associated with increased patient morbidity.

Home and long-term-care facilities have become accepted locations for the delivery of health care for a growing number of ill patients. Many of these patients have physical and psychological disabilities or devastating chronic and debilitating diseases. These patients may lack support systems or have substan-

dard or unsafe households. Infection control departments may be understaffed or nonexistent in long-term-care facilities or home-care agencies. Although long-term-care facilities may be functionally more like the acute-care setting, the patient population and infection control problems faced are very different. The home setting is removed even further from the traditional healthcare setting. Consequently, the shift of healthcare delivery from hospitals to the patient's home may be followed by an increase in the number of complications, as have been seen with HIT. So, as home- and long-term care continue expanding as alternative healthcare delivery settings, adequate measures to protect patients from adverse outcomes need to be addressed. Who will take the lead for developing these infection control programs?

When complications occur in home or long-term-care patients, the patients often are admitted to an acute-care facility. Few have evaluated the hidden cost of long-term or home health care. Home infusion therapy has been documented to reduce billed charges.^{14,15} However, when the cost of complications associated with home-care-related infections are included in such estimates, the cost savings may be reduced substantially. In a recent study in which the financial impact was estimated for catheter-related infections associated with outpatient and HIT patients, 33% of hospital charges for these infections, or nearly \$520,000, was not reimbursed and probably represented a financial loss to the hospital.¹⁶ This study further demonstrates the importance of the investment of more resources in infection control and preventive strategies to reduce HIT-related infections.

Home health care largely is self-monitored and self-regulated. The consumer's caretaker (usually the hospital or managed-care organization), rather than the patient, often determines which home-healthcare agency will provide the care. Decisions on which agency will be contracted are based more on services provided and cost rather than comparative data on adverse events. We have found in our HIT studies that often neither the numerator nor appropriate denominator data are collected routinely, and it takes weeks of intensive work either to obtain or estimate them. Few home-healthcare agencies have active infection control departments. Furthermore, there are no agreed-on comparative outcome data (or systems to collect such data) available to facilitate selection of the best provider. Thus, there is a critical need for the development of home-healthcare-associated infection definitions and the establishment of surveillance systems to monitor adverse events in this setting. Such a system would facilitate determination of baseline rates, detect emerging problems, and permit

interagency and intraagency comparisons. Who will design and conduct such surveillance systems? Currently, because the infections occur outside of the hospital setting, many infection control programs do not track such infections. Similarly, because the HIT patient who develops a BSI often is admitted to an acute-care facility, they are not tracked by the home-healthcare agency.

Alternative healthcare delivery settings, including home health and long-term care, need to be incorporated into our healthcare epidemiology programs. We need to extend to alternative healthcare delivery settings the same rigorous standards we have applied to the hospital setting in order to develop definitions of adverse events and care-associated infection, to design and conduct surveillance, to develop and conduct healthcare-setting-directed infection control education programs, and to conduct outcomes research. The documented efficacy of infection control programs in acute-care settings now must be extended. The accomplishment of these tasks will require the combined efforts of hospital epidemiologists, infection control practitioners, and home-healthcare and long-term-care personnel, including physicians, pharmacists, and nurses, all striving to ensure safe practices for the patients receiving healthcare therapy in nonacute-care settings. We have the expertise in epidemiology and infection control. We are challenged to extend our efforts to these alternative settings. The time to act is now.

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