Infections Requiring Hospitalization in Patients on Hemodialysis

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Although the past decade has witnessed significant improvements in survival for patients receiving hemodialysis (HD) (1), hospitalization rates, particularly for infection, have not improved commensurately. Notable lack of progress is evident regarding hospitalizations for bacteremia/sepsis and pulmonary infections, such as pneumonia and influenza (2). For bacteremia/sepsis, first-year (incident) admission rates showed a 39% relative increase between 2003 and 2010 from 12.9% to 18.0%. Similarly, admission rates for prevalent patients increased 36% from 8.6% to 11.6%. Pneumonia/influenza hospitalization rates also did not improve between 2003 and 2010; although first-year admission rates decreased slightly (from 10.2% to 9.0%), rates for prevalent patients increased from 8.3% to 9.0%.

In this issue of the Clinical Journal of the American Society of Nephrology, Dalrymple et al. (3) examine risk factors for infection-related hospitalization in patients on HD. Using US Renal Data System data for patients initiating in-center HD between 2005 and 2008, Dalrymple et al. (3) followed patients for infection-related hospitalizations through 2009 and assessed the association of patient and dialysis facility factors with infection-related hospitalization. Dalrymple et al. (3) found some expected nonmodifiable factors to be associated with increased risk: older age, chronic obstructive pulmonary disease as a comorbid condition, low serum albumin, inability to ambulate or transfer, and residence in a care facility. Among possibly modifiable factors, dialysis facility factors, such as total staffing and composition, showed little or no association with risk, but dialysis initiation with a catheter showed a strong association. Geographic differences were also found, with considerable variation in risk by ESRD network. This may suggest geographically variable patient factors not accounted for in the analysis or geographic differences in infection control practices.

Dialyzing with a catheter at initiation was the most important factor associated with hospitalizations for all-cause infections, bloodstream infections/sepsis, and dialysis access infections. Although not surprising, this reinforces a critical message about the importance of placing permanent accesses. Initiatives, such as Fistula First (4), have led to substantial improvement in the percentage of prevalent patients dialyzing with an arteriovenous fistula from 32.4% in 2001 (5) to >60% in 2013 (1); even if 100% is not a realistically obtainable goal, opportunity for improvement remains. However, a larger concern relates to dialysis initiation, where improvements have been almost nonexistent; 12.3% of patients initiated with a functioning arteriovenous fistula in 2005, and 16.6% of patients initiated with a functioning arteriovenous fistula in 2012 (1).

In addition to re-emphasizing the need to initiate more patients on HD with permanent accesses, what other guidance can this study provide (3)? Perhaps the nephrology community should consider the importance of measures aimed at reducing infections, such as vaccinations. Although Dalrymple et al. (3) did not examine vaccinations, improvements in vaccination rates may be possible. Optimal use of the pneumococcal vaccine, for example, is an evolving issue. Guidelines for pneumococcal vaccination in patients on dialysis currently recommend administering the newer pneumococcal conjugate vaccine 13 8 weeks before or 1 year after the more standard pneumovax (the 23-valent pneumococcal polysaccharide vaccine [PPSV23]), with repeat vaccination with PPSV23 every 5 years thereafter. Although some studies show stronger immunogenicity with pneumococcal conjugate vaccine 13 than with PPSV23 in immunocompromised individuals, duration of immune response is not known with certainty, and some studies have shown lower immune response to both vaccines than in individuals without immunocompromising conditions. Thus, the best pneumococcal pneumonia immunization strategy for patients on dialysis is uncertain.

Also of intense recent interest in the public health community are influenza and influenza-like illness (ILI). Improvements have been made in increasing influenza vaccination rates among patients on HD (1). However, numerous studies (6–10) have shown an inadequate initial and possibly quickly waning immune response, suggesting the need for high-dose vaccination and/or repeat vaccination during the influenza season. To complicate matters, other circulating viruses may contribute to morbidity, leading to hospitalization for infection. Strong circumstantial evidence for this exists in the form of a pronounced seasonal effect of increased hospitalization rates caused by noninfluenza infections (2). The ILI data compiled by the Centers for Disease Control and Prevention (CDC) on the basis of a sample of 2900 outpatient health care providers in all states,
representing >30 million patient visits each year, show wide variation in the timing and strength of each (presumed) influenza season. ILL, defined as “fever (temperature of 100°F [37.8°C] or greater) and a cough and/or a sore throat without a known cause other than influenza,” is a commonly encountered clinical entity (11–14). Although the CDC data provide weekly estimates of the percentage of all outpatient visits caused by ILL at a national level, some studies (11–14) suggest that considerably <50%, perhaps as low as 20%, of such clinical syndromes may be caused by true influenza. ILL, therefore, probably reflects a set of clinical symptoms that can be caused by a large number of viruses infecting the upper and lower respiratory tracts, including rhinovirus, adenovirus, respiratory syncytial virus, parainfluenza virus, and human metapneumovirus. This is a sobering warning that influenza vaccination alone could never be sufficient to curtail the seasonal increase in hospitalizations for infection.

The ILL data suggest that seasonality could play a key role in the patterns of infection in patients on dialysis. This concept has been appreciated for some time, given that dialysis access–related infections show a reverse seasonality, with higher rates during the summer months (2,15), presumably because of the effect of skin perspiration on bacterial growth. Thus, seasonally adjusted infection control measures may be required. Unfortunately, relatively little attention has been paid to developing evidence-based practices for infection control in the dialysis unit until recently. Gupta et al. (16) describe the process and resulting recommendations of a Department of Health and Human Services initiative that began in 2008 to decrease healthcare-associated infections. This effort included representatives from the CDC, Centers for Medicare and Medicaid Services, and the Agency for Healthcare Research and Quality to develop a national strategy for health care–associated infection prevention and resulted in the National Action Plan to Prevent Healthcare-Associated Infections. The plan includes a chapter on recommendations for dialysis facilities, with a focus on prevention of intravascular infections (reduced use of catheters), prevention of blood–borne pathogen transmission (hepatitis B and C virus control), prevention of influenza and pneumococcal disease (vaccination), prevention priority implementation bundles (for example, checklists), and education and training of dialysis facility staff. Need for improvement in adherence to some widely accepted infection control practices is considerable. Chenoweth et al. (17) evaluated adherence to 73 evidence–based infection control practices in 34 dialysis facilities representing four ESRD networks and a range of dialysis organization affiliations (large, small, and independent). Chenoweth et al. (17) found large variation in adherence and generally, far from optimal adherence across most of the practices assessed; overall adherence was about 68% across all facilities.

Infections remain a major source of morbidity and mortality in patients on dialysis, especially those initiating dialysis. The study by Dalrymple et al. (3) is, thus, an important contribution. Its strengths include the large population examined, leading to reasonable generalizability of results to all patients on HD, and the inclusion of both patient factors and some dialysis facility factors in the analyses. However, the study has some important limitations (3). Dalrymple et al. (3) began follow-up at day 91 of dialysis to ensure availability of claims. This necessary restriction misses the first 90 days, when hospitalizations for infection are highest (2). This may be because of the high prevalence of catheter use at initiation and may suggest presence of other factors associated with early versus later infection. Dalrymple et al. (3) also used vascular access as recorded on the Medical Evidence Report. Although this information is generally accurate (18), substantial change occurs during the first 90 days, and therefore, results related to vascular access may be subject to misclassification. Finally, use of comorbidity data from claims has known limitations, primarily because of undercoding (19), which may lead to residual confounding of results.

Despite these limitations, this study provides important insights into infections in patients on dialysis, especially regarding the critical need to place permanent accesses as early as possible (3). As survival continues to improve among patients receiving in-center HD, infection will remain an abiding clinical concern. Additional research should investigate the best strategies to place and maintain early accesses, optimal use of vaccinations, and optimal infection–control practices in the dialysis unit and beyond.

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Disclosures

None.

References


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See related article, “Risk Factors for Infection-Related Hospitalization in In-Center Hemodialysis,” on pages 2170–2180.