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## Surviving the First Year of Peritoneal Dialysis: Enduring Hard Times



### Related Article, p. 761

Currently, more than half a million patients with kidney failure are treated by dialysis and transplantation in the United States. More than 100,000 Americans initiate dialysis therapy every year, and until recently, only 6% to 7% of these patients either initiated treatment with peritoneal dialysis (PD) or switched to PD in their first year of dialysis therapy.<sup>1</sup> During the last 3 decades, many studies have examined the comparative survival of patients treated with in-center hemodialysis (HD) versus PD, most of which have shown a lower risk of death in patients treated with PD in the period soon after initiating dialysis therapy.<sup>2-5</sup> Despite some concern regarding long-term survival of PD patients, more recent studies suggest that improvement in survival of patients treated with PD has outpaced that of patients treated with in-center HD: most studies with contemporary cohorts demonstrate equivalent survival between these dialysis modalities (Fig 1).<sup>4,6-10</sup> Although the precise reason for this differential change in patient outcomes is unknown, potential explanations for these improved PD outcomes include the application of principles of continuous quality improvement, individualization of PD prescriptions, and reduction in risk of PD-related peritonitis (Box 1). For many reasons, including the emerging evidence of equivalent survival of HD and PD patients and changing financial incentives, the prevalent PD population in the United States now is growing at twice the rate of those treated with in-center HD.<sup>1</sup>

This issue of *AJKD* features an article by Pulliam et al<sup>11</sup> evaluating first year outcomes of 1,677 incident PD patients treated in US-based Fresenius dialysis units in 2009. This retrospective observational study examined patient survival, as well as incidence of and risk factors for hospitalization, peritonitis, and transfer to in-center HD therapy. The authors describe particularly high rates of peritonitis (27.6%), hospitalization (56%), and switching to HD therapy (20.9%) in the first 6 months of PD therapy. This experience builds on previous studies that have examined early outcomes in the PD population in the United States.<sup>6,12</sup> Episodes of peritonitis and higher probability of transfer to in-center HD therapy remain the Achilles' heel of PD and are 2 outcomes of particular interest for future quality improvement.

To our knowledge, the study by Pulliam et al<sup>11</sup> presents the first data for peritonitis rates from a

large dialysis organization in the United States, thus providing the first opportunity to benchmark against reports from either single centers of excellence or other audits of programs from different parts of the world. The reported peritonitis rate of 38 events per 100 patient-years is equivalent to one episode every 31.6 months. This is comparable to a 2006 North American survey that reported a peritonitis rate of 37 events per 100 patient-years among prevalent PD patients.<sup>13</sup> Additionally, the rate reported by Pulliam et al<sup>11</sup> compares favorably with audits of PD programs based in Canada, Scotland, and London, England, where peritonitis rates were considerably higher.<sup>14-16</sup> However, Pulliam et al<sup>11</sup> highlight opportunities for further prevention of infectious risk, particularly within the first 6 months of initiating PD therapy, especially because some of these peritonitis episodes result in discontinuation of PD therapy. Whereas most studies have evaluated microbiological data and fine-tuned clinical training protocols to decrease peritonitis risks in prevalent PD patients,<sup>17-20</sup> incident PD patients possibly are at higher risk for peritonitis. This is due to other medical comorbid conditions associated with recent initiation of dialysis therapy or surgical complications related to PD catheter placement, which subsequently may increase the risk of peritonitis.<sup>21,22</sup>

More studies are required to better understand the risk factors associated with early PD peritonitis. In patients treated with in-center HD, the first 6 months of dialysis therapy also are a period of higher risk, suggesting that uncontrolled complications of kidney failure or comorbid conditions may influence peritonitis development.<sup>1</sup> Patients also may experience other previously unrecognized psychosocial or economic stressors, making the transition to dialysis therapy particularly challenging.<sup>23</sup>

Another important finding in this study is the high rate (81%) of central venous catheter placement in patients during their transition from PD to HD therapy. In discussing this finding, the authors acknowledged that the current body of data does not support

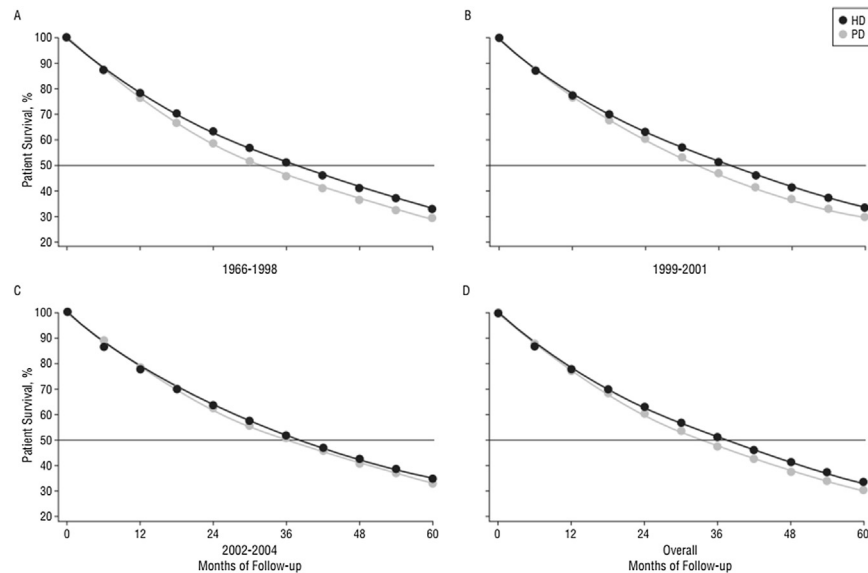
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**Figure 1.** Adjusted population survival curves comparing the outcome of incident peritoneal dialysis (PD) and hemodialysis (HD) patients in the United States stratified by cohort period. (A) The 1966-1998 cohort: adjusted median life expectancy, 37.2 months for HD patients and 31.7 months for PD patients; (B) 1999-2001 cohort: adjusted median life expectancy, 37.3 months for HD patients and 33.0 months for PD patients; (C) 2002-2004 cohort: adjusted median life expectancy, 38.4 months for HD patients and 36.6 months for PD patients; and (D) overall: adjusted median life expectancy, 37.6 months for HD patients and 33.7 months for PD patients. Adapted from Mehrotra et al<sup>4</sup> with permission of the American Medical Association.

the routine placement of arteriovenous (AV) accesses in all patients who start treatment with PD.<sup>24</sup> Preparing PD patients for transfer to in-center HD therapy is labor intensive, is expensive, and requires buy-in from patients.<sup>25</sup> It would be optimal if individuals with the highest likelihood of transfer to in-center HD therapy could be identified reliably and targeted for placement of AV access. However, the risks of placement, such as fistula-associated cardiovascular effects and a possible waste of resources, may outweigh its potential benefits. Further, it may be distracting for PD programs to use their personnel for identifying patients at risk for transfer to HD therapy rather than focusing on quality improvement to

reduce risk for transfer. Risk for transfer is inevitable in any PD program, and smaller PD facilities with limited physician and nursing resources are at the highest risk of transfer to in-center HD therapy.<sup>26</sup> Given finite resources, we suggest that implementing clinical training and quality improvement protocols to optimize patient outcomes should take priority in PD units. Appropriately identifying patients for whom PD therapy is failing and preparing them for transfer to HD therapy remains an art rather than a science and thus does not readily lend itself to algorithmic approaches.

In contrast, the delay in establishing a usable AV access in patients who have transferred to HD is an opportunity for quality improvement. According to the US Renal Data System (USRDS), >80% of incident dialysis patients have a central venous catheter during their first HD session, a rate that decreases to 52% by day 91.<sup>1</sup> In contrast, in patients transitioning from PD to HD therapy, Pulliam et al<sup>11</sup> noted no substantial change in AV access by 90 days after modality change. Transitions from PD to in-center HD therapy are periods of intense stress for patients, particularly when they are emergent, such as in the setting of episodes of peritonitis. It also is likely that patients and providers may hold out hope for eventual transition back to PD therapy, resulting in significant delays in planning for vascular access. Finally, some of these patients may have had previous difficulty establishing vascular access, which could influence their initial selection of a dialysis modality. In this context, it is important to note that almost one-half of patients who transfer to in-center HD will not be able to resume PD.<sup>27-29</sup> Better predicting which PD to HD transfers will be permanent, by evaluating both

**Box 1.** Possible Explanations for the Differential Improvement in Outcomes of Patients Treated With HD and PD in the United States

<b>Related to Dialysis Practices</b>	
<i>PD Related</i>	
<ul style="list-style-type: none"> <li>• Better and individualized PD prescription management over the years</li> <li>• Reduced risk of infectious complications</li> <li>• More widespread use of quality-improvement programs</li> <li>• More attention to maintenance of normal volume status</li> </ul>	
<i>HD Related</i>	
<ul style="list-style-type: none"> <li>• Greater and longer use of tunneled venous catheters</li> </ul>	
<b>Unmeasured Confounding</b>	
<ul style="list-style-type: none"> <li>• Residual confounding because patients starting PD are younger and healthier than in previous years</li> <li>• Longer waiting times for transplantation: healthier patients remain dialysis dependent for longer periods</li> <li>• Because PD patients have higher transplantation rates, outcomes of this cohort are more likely to be affected</li> </ul>	

Adapted from Chiu et al<sup>2</sup> with permission of Elsevier.  
Abbreviations: HD, hemodialysis; PD, peritoneal dialysis.

the microbiology of peritonitis and severity of the episode, could be a potential starting point for quality improvement efforts aiming to reduce the time to achieve AV access.

As in any observational study, the primary limitations of the report from Pulliam et al<sup>11</sup> are the inability to exclude patient selection bias, confounding by indication, and residual confounding.<sup>30</sup> For example, factors specific to patient selection and treatment choices, as well as PD unit size, nursing expertise, and treatment protocols, could not be analyzed in the study. Many of these variables tend to differ among dialysis facilities and can have a significant impact on patient outcomes.<sup>20,31,32</sup> Another limitation of this study is its lack of a comparison group. The study would demonstrate stronger generalizability if its incidence and outcomes were similar to another PD patient cohort or those found in theUSRDS database.

In conclusion, PD remains a valuable yet underused modality in the United States. Although patient survival on PD therapy has been improving, there remain opportunities for quality improvement, such as reducing the risk for peritonitis and transfer to in-center HD therapy, as well as reducing the delay in achieving a usable AV access for patients who transfer to HD therapy. More studies are required to determine the long-term consequences of early morbidity events and effectiveness of preventive measures in PD treatment.

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