

## COMMENTARY

### TRANSLATING AN UNDERSTANDING OF THE DETERMINANTS OF TECHNIQUE FAILURE TO MAXIMIZE PATIENT TIME ON PERITONEAL DIALYSIS?

Since the late 1990s, a significant reduction in the risk for death of patients undergoing peritoneal dialysis (PD) has occurred in many parts of the world (1). Studies from the United States, Canada, France, Taiwan, Australia, and New Zealand indicate that the reduction in death risk for patients undergoing PD in those countries has been of a significantly greater magnitude than the reduction observed for patients undergoing in-center hemodialysis (2–6). Consequently, in contemporary cohorts, the short- and long-term survival of PD patients is no different than that of in-center hemodialysis patients (3,5–8). This is the backdrop against which the use of PD is increasing in many countries such as the United States, Thailand, and China—an increase that is also driven, in some regions at least, by favorable changes in national reimbursement policies (9–11).

Despite improvements in the survival of PD patients, challenges remain. Patients treated with PD are more likely to transfer to in-center hemodialysis, and yet data about trends in PD technique survival over time are scarce. In the United States, a transfer to in-center hemodialysis was 38% less likely for patients who started PD during 2002 – 2004 than for those who started treatment during 1996 – 1998 (12). Those findings are similar to results reported from Canada, where technique survival was better for PD patients between 2000 and 2005 than for patients between 1995 and 2000 (13). However, the improvements were not sustained: technique survival for Canadian PD patients was not different during 2006 – 2009 than during 1995 – 2000 (13). Those data argue for the need to continue to monitor trends in technique survival, particularly in areas that are seeing rapid growth in the utilization of PD.

Given that each individual patient has only one peritoneal cavity, but multiple vascular access sites, it is not unexpected that technique survival with PD will be lower than that for in-center hemodialysis. Nevertheless, two lines of evidence suggest that high rates of PD

technique failure should not be considered inevitable. First, a strong center effect is known to exist, such that patients experience significantly higher technique survival when undergoing PD in facilities that provide care to a larger number of patients (12,14,15). Second, two of the most common reasons for a transfer from PD to hemodialysis—peritonitis and catheter-related problems—are to a large extent preventable (13). Furthermore, there is evidence that the gains from lowering infection rates in PD patients reported from single centers might not be as widespread and might represent an opportunity for quality improvement efforts (16,17).

It is in this context that readers should interpret the paper by Shen and colleagues published in this issue of *Peritoneal Dialysis International* (18). In an analysis of 1587 patients who started PD during 1996 – 1997 in the United States, the investigators identified a variety of sociodemographic predictors of the risk for transfer to in-center hemodialysis. Those predictors included male sex, black race, Medicaid insurance, retired or disabled status, and a systolic blood pressure of 140 – 160 mmHg (18). The constellation of many of those associations highlights the potential importance of two sociodemographic determinants that may possibly affect outcomes in PD patients and that are discussed here: socioeconomic status (SES) and social support.

There is considerable evidence that individual and neighborhood SES are both associated with the health status of individuals and with outcomes in a variety of disease states. Given the complexity of the determinants of social standing and economic imperatives in society, no single descriptor variable can reliably measure SES or its impact on an individual's health. An individual's SES can be described by measures such as the availability and nature of health insurance, educational attainment, family income, and housing. Neighborhood SES is at least as important—if not more so—in affecting health, because

neighborhood SES may also determine factors such as food choices and access to health care. Finally, there is a complex interplay between race and SES. In at least one study, the death risk of individuals with end-stage renal disease living in neighborhoods with 75% or more black residents was higher than it was in neighborhoods with less than 10% black residents (19). However, the magnitude of the increase in death risk with neighborhood segregation was greater for white than for black residents (19).

These issues are particularly relevant to patients with kidney diseases, because in most societies, chronic kidney disease and end-stage renal disease disproportionately affect people who are poor, less educated, and members of racial or ethnic minorities. Compared with individuals choosing in-center hemodialysis, those choosing PD therapy are required to assume a substantially greater responsibility for their own care. Thus, the question of whether individual or neighborhood SES or an individual's racial identification influences PD outcomes is highly relevant. In the report by Shen *et al.* (18), the risk for technique failure was higher in patients with Medicaid insurance, which raises the question of whether that association is mediated by low SES. In contrast to the association with Medicaid insurance, no demonstrable association between educational attainment and PD technique survival was found by the investigators (18). Furthermore, another large cohort study in the United States was unable to demonstrate any association between neighborhood SES and PD outcome (20). Finally, an analysis from the Brazilian PD registry demonstrated no significant association between family income and PD technique survival (21). Thus, the evidence to date does not seem to indicate that low SES adversely influences PD outcomes. Caution must be exercised because bias among health care providers may have *a priori* precluded PD from being offered to many patients with low SES, and this patient selection may preclude identification of an association with patient outcomes. Nevertheless, evidence to date seems to indicate that, provided a patient has a home and wants to perform PD, individual or neighborhood SES should not be expected to be a significant determinant of technique survival. Future studies need to further explore the reasons that potentially account for the association between Medicaid insurance and lower PD technique survival.

The study by Shen and co-workers also identified lower technique survival in black people, a finding that has been widely reported from previous studies in the United States (18). Even though that finding has previously been validated, there are large gaps in current knowledge concerning the association between race and patient outcomes. For example, it remains unclear

whether the association of race with lower PD technique survival reflects unmeasured confounding with SES. Datasets that are large enough to be adequately powered to examine outcomes, such as the one used by Shen, generally don't include a comprehensive assessment of individual or neighborhood SES to answer that question. Furthermore, such datasets don't capture the reasons underlying the high risk for technique failure in patient subgroups such as those of black race, precluding the development of preventive strategies to improve patient outcomes. Moving forward, it is imperative that the PD community bridge these gaps in our knowledge.

The demonstration of a higher risk of PD technique failure in individuals who are retired or disabled (or both) raises the question of whether enhancing social supports will reduce the probability of transfer to in-center hemodialysis. Indeed, to date, studies of PD patients suggest that greater social support is associated with fewer symptoms of depression and anxiety, greater satisfaction with care, better health-related quality of life, fewer hospitalizations, and higher PD technique survival (22–24). The literature also contains descriptions of successful programs of assisted PD in which the therapy is performed at home with the assistance of a family member or paid helper, generally a nurse (25–27). Indeed, in some countries such as France, visiting nurses support a substantial proportion of the country's PD patients. It seems logical, then, to argue for the expansion of assisted PD, not only to increase the proportion of patients selecting the therapy as a treatment option, but also to reduce technique failure. However, at least one study of assisted PD from France indicated that peritonitis rates were higher for individuals who received assistance from visiting nurses than for those who were assisted by family members (28). On the other hand, the technique survival of patients receiving assisted PD with the support of a community nurse in France is superior to that observed for patients performing self-care PD (29). Care must be exercised in attributing lower technique survival to the provision of support, given that Shen and colleagues also did not find any significant association between other surrogate measures such as marital status or living alone with PD technique survival. It is also important to acknowledge that psychosocial and emotional support provided by a well-functioning home dialysis program can potentially reduce the impact of a patient's living situation on outcome and should be considered independent of social support at home.

To summarize, the study by Shen *et al.* draws attention to the association of sociodemographic factors with outcomes of patients treated with PD. However, it remains unclear whether the associations demonstrated

in the study reflect the importance of SES or social support on outcomes in PD patients. Future studies need to examine whether some causes of PD technique failure are more prevalent in these high-risk sociodemographic groups and whether specific interventions can be implemented to maximize time on therapy for any individual patient.

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