Comparisons of technique success by peritoneal dialysis (PD) modality have typically excluded the initial 90 days of therapy. We analyzed a database of 51,469 new PD starts from 2004 to 2008 in the United States. The analysis concentrated on the initial 90 days of therapy to determine technique success and the impact of the continuous ambulatory PD (CAPD) and automated PD (APD) modalities.

Overall, 13.3% of patients stopped PD within 90 days. Of patients starting directly on APD, 14.3% stopped PD within 90 days. Of patients starting on CAPD, 12.6% stopped PD within 90 days, and 63.4% changed to APD within 90 days. Only 3.3% of the latter patients failed to reach 90 days of therapy. By comparison, technique failure occurred in 28.8% of those initiating with and remaining on CAPD.

We conclude that initial training to perform CAPD, with timely transfer to APD within the first 3 months, was associated with the greatest technique success at 90 days. The reasons for that success are unclear, and further research should be directed to determining factors responsible. It is possible that patients trained initially to CAPD but converted to APD have a greater understanding of the total therapy, which improves confidence. Those converted to APD may be more appreciative of the lifestyle benefits of APD, which translates into improved compliance; alternatively, technical factors associated with APD may be responsible. Those technical factors may include improved catheter function in the recumbent position during APD or the reduced infection risk associated with just 2 connect/disconnect procedures in APD compared with 8 in CAPD.

Key words
Continuous ambulatory peritoneal dialysis, CAPD, automated peritoneal dialysis, APD, technique success, 90 days

Introduction
The economic imperatives encouraging the most-cost effective use of dialysis services combined with recent changes in Medicare reimbursement to dialysis providers have resulted in renewed interest in peritoneal dialysis (PD) and an increase in the penetration of that modality in the United States (1,2; Baxter Healthcare Corporation. Data on file). Inherent in this environment of greater utilization of PD is the desire to improve technique success and to reduce complications that may contribute to a transfer to hemodialysis (HD).

Studies have shown that the initial 6 months of PD therapy is a period of vulnerability associated with a higher rate of technique failure (3). That observation is not surprising given that the early initiation of PD is likely associated with the discovery of new catheter complications, psychosocial adjustments to home therapy, and the discovery of training or patient education lapses that lead to higher initial infectious complications. The foregoing factors suggest that the patient new to PD might require increased vigilance and follow-up in those early months to ensure longer-term success.

No outcome studies comparing PD modalities have examined the first 90 days of therapy. We sought to better understand technique success in the first 90 days of PD therapy and the impact of both the initial dialysis modality and any switch in modality occurring within that period.

Methods
The present analysis is based on U.S. patients who started PD in the years 2004 through 2008. Information about such patients is held in the Baxter Healthcare Corporation, McGaw Park, Illinois, U.S.A.
Healthcare Corporation On-Call System, which tracks PD patient information in an approach compliant with the U.S. Health Insurance Portability and Accountability Act. The information is gathered as a component of the home delivery system of dialysis supplies and hence has the distinct advantage of reflecting actual rather than reported conditions. All events within the system are dated; therefore potential trends of interest can be examined and time windows of event occurrence can be determined.

For the present analysis (Figure 1), the product-limit method (Kaplan–Meier) was used to compute the probability of remaining on Baxter PD. Only data for the first 90 days after the start of PD were used.

**Results**

In the analysis of new PD starts from 2004 to 2008 (Table I), the database contained information on 51,469 PD patients. Patients initiating PD with continuous ambulatory PD (CAPD) accounted for more than half of the new starts \( (n = 30,840) \) compared with patients starting with automated PD \( \text{APD} \; (n = 20,629) \).

Overall, 13.3% of patients stopped PD within 90 days. Of patients starting with APD, 2941 \( (14.3\%) \) stopped PD within 90 days; of those starting with CAPD, 3890 \( (12.6\%) \) stopped PD within 90 days. Of patients starting with CAPD, 63.4% changed to APD within 90 days. Only 3.3% of the latter patients failed to reach 90 days \( (n = 641) \). That percentage compares with a 28.8% technique failure rate in patients initiating with and remaining on CAPD.

**Discussion**

In the literature, no reports have specifically addressed outcomes by PD modality in the initial 90 days of therapy. Most reports exclude the initial 90 days because of concerns that early patient outcomes are predominantly the result of initial health status rather than the dialysis modality itself.

Comparisons of outcomes in patients treated with CAPD or APD beyond 90 days have produced varying results. In two analyses using a Baxter Healthcare database and in a recent report from 21 clinical centers in the United States, APD appeared to have greater long-term technique success (3–5). In contrast, reports from a separate large U.S. dataset and from the NECOSAD (Netherlands Cooperative Study on the Adequacy of Dialysis) and Australian registries showed similar long-term outcomes for both modalities (6–8).

Several reports have noted a higher risk of PD technique failure in the first 6 months of PD therapy (3,4). Guo and Mujais observed that the rate of transfer to HD was highest in the first 6 months of PD and suggested that the period was of particular risk for technique failure (3). Those authors noted that transfer to HD within the initial 6 months was higher for patients started on CAPD. The authors reported that, in the initial year of therapy, technique failure was a result of infection (5.1%), catheter-related problems

![Kaplan–Meier curves for technique success within patient groups determined by modality at peritoneal dialysis (PD) start and modality at 90 days of follow-up. APD = automated peritoneal dialysis; CAPD = continuous ambulatory peritoneal dialysis.](image)

**Table I**

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<th>Modality at initiation and at 90 days of follow-up in patients newly started on peritoneal dialysis (PD) a</th>
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a Group comparisons demonstrated statistically significant differences \( (p < 0.001) \).

APD = automated PD; CAPD = continuous ambulatory PD.
PD Technique Success in the Initial 90 Days

(4.2%), adequacy (3.9%), other medical problems (2.3%), and psychosocial problems (2.6%).

A recent report by Kolesnyk and colleagues (9) raised concern that the initial 90 days of PD therapy represented a period of higher risk of treatment failure and suggested that interventions aimed at improving early outcomes could have a significant impact on the total time on therapy. Those authors reported on outcomes in patients participating in the NECOSAD. In their analysis, the authors compared technique success on PD during 4 periods of follow-up: the first 3 months of treatment, 3 – 12 months, 12 – 24 months, and 24 – 36 months. The highest rate of PD technique failure occurred during the first 3 months; it declined in all time periods afterward. Within the first 3 months, the risk of transfer to HD was higher in older patients, female patients, and patients with a higher comorbidity score. Incidence rates for the reasons for early technique failure were grouped as psychosocial or unknown problems (52%), catheter failure (40%), and infections (35%). The authors suggested that overall technique success could be improved by addressing the major reasons for early drop-out, such as catheter problems, infection control, and psychosocial factors that may affect proper patient selection.

Similarly Descoeudres and colleagues (10) reported on 279 Swiss PD patients, noting that the most frequent reasons for technique failure within 90 days of PD initiation were peritonitis (38%) and psychosocial problems (23%). Those authors did not describe the impact of PD modality on early technique success.

As mentioned, all reports examining the effect of initial modality and subsequent switches have excluded patients followed for fewer than 90 days on therapy. We sought to better understand modality outcomes in these critical early months after dialysis initiation. Narrowing the period of the analysis to the first 90 days may help to more clearly delineate this period of highest risk after initiation of PD. Our results show that patients initiating with CAPD but transitioning to APD during the first 90 days demonstrated the lowest risk of technique failure and that patients initiating with CAPD and remaining on CAPD had higher rates of early failure.

In this cohort of new patients starting PD during 2004 – 2008, discontinuation of PD within 90 days occurred in 13.3% of patients. The greatest initial technique success was seen in patients who initiated with CAPD and then switched to APD within 90 days. The lowest initial technique success was seen in the group who initiated with CAPD and remained on CAPD during the initial 90 days. Our report now adds additional information to this early period of vulnerability, because our database analysis reveals that 13.3% of patients initiating PD discontinued the therapy within the first 90 days. Outcomes studies that exclude the first 90 days may therefore underreport actual technique failure.

Initiating with CAPD and then making a timely transfer to APD is associated with the highest technique success, and yet we are not able to explain the factors responsible for that observation. Several factors might be speculated to explain this observation. Patients training initially on CAPD and then switching to APD may have a broader understanding of the modality and therefore more confidence in the therapy. Patients converting to APD after initial therapy with CAPD may be appreciative of the lifestyle enhancements of APD, resulting in increased compliance. Patients initiating on CAPD and then converting to APD may be a more independent population with fewer medical comorbidities. Switching from CAPD to APD reduces the number of connections required and may lower the risk of peritonitis. Alternatively, initiating dialysis with CAPD to restore metabolic and fluid balance before converting to APD may have a favorable impact on residual kidney function. Those—and possibly other—factors may explain our observation. Clearly, further research is needed to understand the impact of initial PD modality on early technique success.

Several additional factors may be responsible for the greater technique success in patients initiating on CAPD but transitioning to APD. Given that psychosocial factors have been demonstrated to be a significant reason for early PD failure, the lifestyle benefits afforded by APD might potentially mitigate some of the psychosocial impact. Alternatively, fewer catheter complications might occur in the supine position during APD compared with the upright posture during CAPD exchanges. Future studies may provide more clarity with respect to any effect of modality on the reasons for early technique success or failure.

This study has several limitations. Our analysis is limited to reporting on rates of technique success or failure; it does not allow for further analysis of the reasons for technique failure. Technique failure
was defined as stopping PD for any reason. The exact reason for stopping PD (death, peritonitis, and so on) was unknown.

Conclusions
In this large U.S. dataset from Baxter Healthcare of new starts on PD therapy, 13.3% of patients discontinued therapy in the first 90 days. Highest technique success at 90 days was associated with initiating on CAPD and then converting to APD. The initial months of PD therapy carry a higher risk to technique success, and we suggest that increased monitoring or other support may have particular benefit during this early time period.

Disclosures
All authors are employees of Baxter Healthcare Corporation.

References

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