How to Cite this article: Arshia Ghaffari and Jorge Doria Medina Sanchez, Peritoneal Dialysis Should Be Considered the First Option for Patients Requiring Urgent Start Dialysis: PRO, Kidney360, Publish Ahead of Print, 10.34067/KID.0007782021

Article Type: Debates in Nephrology

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DOI: 10.34067/KID.0007782021

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Key Points:

Abstract:

Disclosures: A. Ghaffari reports the following: Consultancy: DaVita; Honoraria: 1) Baxter; 2) DaVita; Advisory or Leadership Role: Davita; and Speakers Bureau: Peritoneal Dialysis services - Baxter Healthcare. The remaining author has nothing to disclose.

Funding:

Author Contributions: Arshia Ghaffari: Writing - original draft; Writing - review and editing Jorge Doria Medina Sanchez: Writing - original draft

Data Sharing Statement:

Clinical Trials Registration:

Registration Number:

Registration Date:

The information on this cover page is based on the most recent submission data from the authors. It may vary from the final published article. Any fields remaining blank are not applicable for this manuscript.

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Peritoneal Dialysis Should Be Considered the First Option for Patients Requiring Urgent Start Dialysis: PRO

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Defining the Problem

Of all patients initiated on dialysis in the United States in 2018, 87.6% started in-center hemodialysis (HD) while only 10.6% started peritoneal dialysis (PD) (1). This is despite studies that demonstrate PD has an early survival advantage, higher quality of life measures, better outcomes at transplantation and lower overall cost of care (2). Studies evaluating PD candidacy have demonstrated that as much as 76% of patients are medically eligible to perform PD in the United States. Moreover, places with a PD-first governmental policy, such as Hong Kong, have demonstrated that with the right incentives and infrastructure, greater than 80% of patients can be managed on PD (2). So why does a such a drastic discrepancy exist between expected and actual incident PD patients in the United States?

While this discrepancy is multifactorial, a large driving factor is that 60% of patients present to end-stage kidney disease (ESKD) in need of dialysis without established dialysis access or plan for dialysis modality (1). Due to established pathways and ease of HD initiation, as well as financial disincentives for PD, the default pathway in patients that “crash” into dialysis is to initiate HD utilizing a tunneled central venous catheter (CVC).

Unfortunately, there are multiple problems with the default model of care. CVCs are fraught with complications such as infection, clotting, bleeding, and venous stenosis (3). Starting HD with a CVC is independently associated with increased mortality risk, infection and hospitalizations compared to other types of dialysis access (4,5). Per the CHOICE study annual mortality rates were up to 47% higher amongst patients with a CVC (6).

PD has less commonly been considered or offered to patients that present to dialysis unplanned as it requires 1) Confirming patient is a PD candidate; 2) Establishing peritoneal access, 3) Waiting 2-4 weeks to allow for healing of access surgical sites; 4) Providing patients with training before home PD initiation. However, if a patient urgently needs dialysis, the traditional model of care does not allow for PD initiation. Moreover, many practitioners incorrectly judge patients that present to dialysis unplanned as not being PD candidates. In the following sections, we will demonstrate how urgent-start PD solves many of the problems with the traditional model of care and should be considered as an initial option for CKD patients in need of urgent dialysis.

Solving the Problem: Urgent-Start PD

Urgent-start PD allows patients that present to dialysis unplanned the option of directly being initiated on PD (Figure 1). To do so, urgent-start programs require: 1) Having a mechanism to quickly evaluate patients for PD candidacy; 2) Be able to establish rapid PD access; and 3) Secure adequate staffing for nurse-assisted PD before the traditional 2-week PD catheter rest period. Utilizing low volume, supine exchanges to minimize risk of peri-catheter leaks, PD can be started within 24-48 hours after PD catheter placement either in the inpatient or outpatient setting. If patients are too ill and cannot wait 24-48 hours for PD initiation, temporary HD can
be instituted until stabilization, at which point PD can be considered and offered before patient discharge from the inpatient setting. If patient candidacy is unclear, and patient is later deemed not a PD candidate, urgent-start PD can serve as a bridge to permanent HD access and thus avoiding CVCs. Urgent-start PD is usually continued until the patients are trained on PD and ready to transition home.

Clinical Outcomes
Per the most recent USRDS data, while adjusted all-cause mortality has decreased in patients receiving both HD and PD between 2009 and 2018, patients on PD had an even greater decrease in mortality (164.2 to 131.5 per thousand patient-years in PD; 192.9 to 164.6 per thousand patient-years in HD) (1). When specifically evaluating outcomes in urgent-start PD, although no large trials exist, multiple observational studies demonstrate that mortality with urgent-start PD is similar to urgent-start HD (table 1). In a recent propensity-matched multicenter study of 717 urgent-start PD and HD patients with a mean followup of 1.2 ± 0.6 years, the use of urgent-start PD was associated with a significantly lower rate of hospitalization (1.21 versus 1.51 patient-years; adjusted HR 0.76; CI 0.65 – 0.88) and a trend toward lower mortality (8). Morbidity also appears to be significantly less in urgent-start PD as compared to urgent-start HD with multiple studies showing less hospitalizations, infections, and number of dialysis-related procedures in urgent-start PD as compared to HD with a CVC (9,10).

Other Advantages of Urgent-Start PD
Utilization of urgent-start PD allows for use of an access that serves as both a temporary as well as permanent dialysis access. This is a significant advantage to urgent-start HD that often requires multiple temporary or tunneled accesses by the time a permanent access is established. Moreover, PD as an initial therapy preserves vessels for future vascular access for HD and potentiates a longer dialysis lifespan. Some have argued that in the urgent setting HD can be started and patients later transitioned to PD. However, real-life experience and data from large cohorts demonstrate once patients start on HD, likelihood of transition to PD is unlikely (11).

As compared with HD, patients on PD have slower decline of their residual kidney function. Preservation of residual kidney function allows for decreased volume of PD exchanges, therefore leading to less peritoneal membrane dextrose exposure minimizing weight gain and optimizing the lifespan of the peritoneal membrane (2). The preservation of residual kidney function has been postulated to be a reason PD has an early survival advantage as well as explaining why PD patients require less erythropoietin-stimulating agents, less phosphate binders, better volume control and resultant better cardiovascular morbidity and mortality (2).

Other Considerations in Urgent-Start PD
In studies that have looked at urgent-start PD outcomes as compared to other modalities of dialysis, the general finding has been urgent-start PD is a safe and viable approach for patients
requiring urgent-start to dialysis (12,13). Technique failure rates are similar at 1-year as compared to traditional-start PD (14). It appears that once the early urgent-start period is passed, long-term complications are quite low. A long-term retrospective study that evaluated 2059 urgent-start PD patients for up to 10-years found high rates of catheter patency and technique survival, and low incidences of catheter-related complications (15). Furthermore, data from a 2020 Cochrane review of nearly 3000 patients, comparing urgent-start PD with conventional PD, except for possible increased risk of peri-catheter leak, there were no demonstrated differences in the risk of catheter blockage, malposition, PD dialysate flow problems, infectious complications, exit-site bleeding, technique survival or patient survival (17).

More importantly, in studies comparing urgent-start PD and HD with a CVC, during the first 30 days after initiation of dialysis, the incidence of dialysis related complications, specifically bacteremia, is significantly higher amongst HD patients (10). Likewise, a retrospective cohort study with up to 2 years of followup demonstrated that urgent-start PD was associated with fewer invasive procedures when compared to urgent-start HD (9).

**Healthcare System Cost**

The total medical expenditure per patient in Medicare terms is approximately $15,000 higher annually for HD patients as compared to PD patients (1). When looking specifically at cost of urgent dialysis initiation, Liu et al. demonstrated that urgent-start PD offers cost savings of approximately $3000 during the first 90 days of dialysis as compared to urgent-start HD (7). It was demonstrated that even the dual procedure approach, whereby patients started on HD via a CVC due to emergent need for dialysis followed by transition to urgent-start PD, had a similar cost to those starting HD with a CVC alone and transitioning to long-term HD. These calculated cost analyses do not account for unmeasured long-term costs such as HD patients challenge in maintaining employment or costs associated with transportation to the dialysis unit for HD patients as compared to PD patients.

**Summary**

When considering all the shortcomings of starting patients on HD with a CVC (higher rate of infections, hospitalizations, early mortality) and all the potential advantages of urgent PD initiation (lower cost, less hospitalizations, better quality of life), it behooves nephrologists to advocate for urgent-start PD in potential PD candidates. With the high percentage of patients that start dialysis in an unplanned manner, offering PD to all candidates would allow for significantly increased uptake of PD. This would translate to benefits for patients, payors, and providers. Moreover, it provides patients with the option of choosing PD as opposed to being defaulted to a treatment pathway that has poorer outcomes and less flexibility. With patient-centric approach to patient care, urgent-start PD should be recommended to all CKD patients in need of urgent dialysis who are deemed PD candidates.
Disclosures

A. Ghaffari reports the following: Consultancy: DaVita; Honoraria: 1) Baxter; 2) DaVita; Advisory or Leadership Role: Davita; and Speakers Bureau: Peritoneal Dialysis services - Baxter Healthcare. The remaining author has nothing to disclose.

Funding

None

Acknowledgements

The content of this article reflects the personal experience and views of the author(s) and should not be considered medical advice or recommendation. The content does not reflect the views or opinions of the American Society of Nephrology (ASN) or Kidney360. Responsibility for the information and views expressed herein lies entirely with the author(s).

Author Contributions

Arshia Ghaffari: Writing - original draft; Writing - review and editing. Jorge Doria Medina Sanchez: Writing - original draft.
References


Table 1: Studies comparing urgent-start PD with urgent-start HD.

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Study Groups</th>
<th>Endpoints</th>
<th>Followup</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koch</td>
<td>Single-center retrospective</td>
<td>Group 1 (n=57): Urgent-start HD</td>
<td>1. Infections</td>
<td>Up to 6-months</td>
<td>1. Bacteremia: HD 21.1%; PD 3.0%, p &lt; 0.01</td>
</tr>
<tr>
<td>2011</td>
<td>observational</td>
<td>Group 2: (n=66): Urgent-start PD</td>
<td>2. Mortality</td>
<td>(mean 4.7 months)</td>
<td>84% lower risk of bacteremia for PD group</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>3. Hospitalization</td>
<td></td>
<td>Peritonitis occurred only in 1 patient in each group</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>2. Mortality: No significant difference between 2 groups</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>group 1, 42.1%; group 2, 30.3% (p = NS)</td>
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<td>3. Hospitalizations: No difference (p = NS)</td>
</tr>
<tr>
<td>Jin</td>
<td>Single-center retrospective</td>
<td>Group 1 (n=96): Urgent-start PD</td>
<td>1. Dialysis-related complications</td>
<td>Up to 1 year</td>
<td>1. Overall complications: PD 5.2%; HD 24.4% (p&lt;0.01)</td>
</tr>
<tr>
<td>2016</td>
<td>observational</td>
<td>Group 2 (n=82): Urgent-start HD</td>
<td>2. Infections</td>
<td>(minimum 30 days)</td>
<td>2. Infectious complications: PD 2.1%; HD 11% (p=0.014)</td>
</tr>
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<td></td>
<td></td>
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<td>3. Actuarial survival</td>
<td></td>
<td>Bacteremia: PD 3.1%; HD 11% (p&lt;0.011)</td>
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<tr>
<td></td>
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<td></td>
<td>3. Actuarial survival at 90 days: PD 97.9%; HD 98.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Actuarial survival at 1 year: PD 92.1%; HD 93%</td>
</tr>
<tr>
<td>Karpinski</td>
<td>Multi-center retrospective</td>
<td>Group 1 (n=717): Urgent-start PD</td>
<td>1. Mortality</td>
<td>1.2 ± 0.6 yrs</td>
<td>1. Mortality: Urgent-Start PD 0.08 deaths/pt-yr</td>
</tr>
<tr>
<td>2020</td>
<td>propensity-matched</td>
<td>Group 2 (n=717): Urgent-start HD</td>
<td>2. Hospitalizations (mean both groups)</td>
<td></td>
<td>Urgent-Start HD 0.11 deaths/pt-yr (adjusted HR 0.84, 95% CI 0.62 - 1.15)</td>
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<tr>
<td></td>
<td>observational</td>
<td>(HD-CVC)</td>
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<td>Urgent-Start PD 1.21 admissions/pt-yr</td>
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<td>Urgent-Start HD 1.51 admissions/pt-yr</td>
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<td>(adjusted IRR 0.76, 95% CI 0.65 - 0.88)</td>
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Abbreviations: PD, peritoneal dialysis; NS, nonsignificant; HD-CVC, hemodialysis with central venous catheter; HR, hazard ratio; IRR, incident rate ratio; pt-yr, patient-year
Figure 1: Urgent-Start Peritoneal Dialysis Pathway

1. **Patient Presents with ESRD without a Plan for Dialysis**
   - Evaluate Patient for PD Candidacy
   - Recommend Urgent-Start PD

2. **Rapid PD Catheter Placement**
   - (within 24-48 hours)

3. **Initiate Low-Volume Recumbent Nurse-Assisted PD**
   - Start PD Training
   - Transition to Home Once Trained