Can peritoneal dialysis be applied for unplanned initiation of chronic dialysis?

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**ABSTRACT**

Late referral of patients with chronic kidney disease (CKD) and unforeseeable deterioration of residual renal function in known CKD patients remain a major problem leading to the need of unplanned start on chronic dialysis without a mature access for dialysis. In most centres worldwide, these patients are started on haemodialysis (HD) using a temporary tunnelled central venous catheter (CVC) for access. However, during the last decade, increasing clinical experience with unplanned start on peritoneal dialysis (PD) right after PD catheter implantation has been published. Key studies are reviewed in the present paper, and the results seem to indicate that compared with patients starting PD in a planned setting with peritoneal resting...
after PD catheter implantation, patients starting unplanned PD have an increased risk of mechanical complications but apparently no increased risk of infectious complications. In contrast, patients starting unplanned HD using a temporary CVC have an increased risk of both mechanical and infectious complications when compared with patients starting planned HD using an arterio-venous fistula or a permanent CVC. Regarding clinical outcome in terms of survival, unplanned PD seems to be at least as safe as unplanned HD. Combining the unplanned PD programme with a nurse-assisted PD programme is crucial in order to offer the patient a real opportunity to choose a home-based dialysis option. In conclusion, unplanned start on PD seems to be a feasible, safe and efficient alternative to unplanned start on HD for the late referred patient with end-stage renal disease and urgent need for dialysis.

**Keywords:** infections, mortality, peritoneal dialysis, unplanned

### INTRODUCTION

Can peritoneal dialysis (PD) be applied for unplanned initiation of chronic dialysis? Yes, it can, with respect for the individual patient. Dialysis initiation using a temporary haemodialysis (HD) catheter or a PD catheter without peritoneal rest before start of dialysis is called unplanned start. There is no general consensus on the optimal number of days that has to pass from the placement of the PD catheter to initiation of dialysis before it is planned dialysis initiation. Everything between 7 and 14 days has been used in the literature. In the unplanned setting, while the PD catheter is resting, some centres use a break-in period with HD. Recently, the term sub-optimal dialysis initiation to more precisely characterize unplanned dialysis start has been suggested by Mendelssohn et al. [1]. Sub-optimal dialysis includes patients who initiate dialysis during admission to hospital using a temporary central venous catheter and patients who do not start dialysis on their modality of choice. The overlap between unplanned and sub-optimal initiation of dialysis is obvious.

Today, most unplanned patients are started on HD using a temporary CVC, which is associated with an increased 90 day mortality [2–4]. Data on unplanned initiation of PD are scarce, but indicate that mortality is the same or even better than for unplanned initiation of HD and the number of infectious complications including bacteraemia seems less. For unplanned initiation of PD, peritonitis rates are the same as in planned initiation of PD leaving the apparently increased number of mechanical complications as the only drawback.

### MORTALITY

**Epidemiology**

Since 2008, The Danish Nephrology Registry has recorded whether initiation of chronic dialysis was planned or unplanned. Planned initiation of HD was defined as the first dialysis performed on an arterio-venous fistula or a permanent tunnelled CVC for HD while unplanned initiation of HD was defined as first dialysis performed on a temporary CVC (tunnelled or untunnelled). Unplanned PD was defined as first use of the PD catheter ≤ 6 days after implantation. During 2008 through 2011, ~50% of all incident dialysis patients started unplanned. Only 5–10% of patients needing unplanned initiation of dialysis were started on PD, while 50% of the patients with planned initiation of dialysis were started on PD. The patients starting unplanned PD were on average 10 years younger and had a lower Charlson Co-morbidity Index than those starting unplanned HD. Five per cent of patients with type II diabetes mellitus started unplanned PD, while it was 15% for patients with glomerulonephritis, adult polycystic kidney disease or unknown kidney disease. Whether this difference between diagnoses is real or more a consequence of difference in age and co-morbidity is unclear. Importantly, when adjusting for differences in age, renal diagnosis and co-morbidity, no difference in mortality was seen between patients starting unplanned PD, planned PD and HD (Figure 1) but patients starting unplanned HD on a CVC had a higher mortality than patients starting planned HD [5].

Data from the Australian and New Zealand Dialysis and Transplantation Register showed that in incident dialysis patients >75 years, the hazard ratio for mortality was the same for unplanned PD [1.73 95%CI (1.26–2.36)] and unplanned HD [1.65 (1.40–1.95)] and both were significantly higher than for prepared HD [6]. This emphasizes the importance of late referral and lack of established access on mortality and that it might be more important than the choice of dialysis modality.

Recently, Lobbezoo et al. [7] used data from the French Language Peritoneal Dialysis Registry to compare patients with planned start on PD with those with a sub-optimal start on PD. Included in the study were all incident PD patients with functioning PD for >2 days. Unplanned PD patients had been on HD for <30 days, which the authors assumed to represent patients starting unplanned dialysis. They identified 7931 planned starters and 568 sub-optimal starters. No difference in mortality was found between the two groups using bivariate analysis.

![Figure 1: Mortality in relation to dialysis access at first dialysis from the Danish Nephrology Registry. The odds ratio for mortality, planned HD on an arterio-venous fistula is reference population. The analysis is adjusted for age, renal diagnosis and Charlson Co-morbidity Index [5].](image-url)
RISK OF INFECTIONS

The populations starting unplanned and planned PD are a priori different. The unplanned population is made up of previously referred patients and the known patients with an unexpected deterioration of residual renal function and an unplanned start on chronic dialysis with PD seems to be at least as safe as unplanned HD.

Unplanned versus planned PD

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Unplanned versus planned HD

In the study by Koch et al. [9], two-thirds of the patients started on HD used a non-tunnelled CVC resulting in a bacteraemia incidence of 0.72 per patient years compared with started on unplanned PD. This incidence is higher than reported elsewhere for HD patients [14]. In this study, there was no difference between groups in co-morbidity or number of diabetics. HD patients started on HD had a mortality rate of approximately one-third after 6 months. This re

Table 1. Studies investigating the effect of unplanned PD on outcome

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Design</th>
<th>Modality</th>
<th>Population</th>
<th>Sample size</th>
<th>Time to PD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liu et al. [16]</td>
<td>Jan 2001–Dec 2010</td>
<td>Retrospective</td>
<td>CAPD incremental</td>
<td>CAPD</td>
<td>344</td>
<td>&lt;7 days</td>
</tr>
<tr>
<td>Koch et al. [9]</td>
<td>Jan 2004–Dec 2006</td>
<td>Prospective</td>
<td>APD or breaking with HD</td>
<td>HD on CVC Tunnelled: 88%</td>
<td>34</td>
<td>Median: 4 days</td>
</tr>
<tr>
<td>Liu et al. [16]</td>
<td>Jan 2001–Dec 2010</td>
<td>Retrospective</td>
<td>CAPD incremental</td>
<td>CAPD</td>
<td>344</td>
<td>&lt;7 days</td>
</tr>
</tbody>
</table>

APD, automated peritoneal dialysis; CAPD, continuous ambulatory peritoneal dialysis; CVC, central venous catheter.

*Some patients included in both studies.
with bacteraemia/septicaemia have twice the mortality compared with those without, emphasizing the crucial importance of avoiding bacteraemia/septicaemia due to the CVCs [15]. This may explain why the Danish Nephrology Registry reported that mortality was lower in unplanned PD patients compared with unplanned HD patients starting dialysis on a CVC.

None of the studies comparing unplanned versus planned PD could show any difference in the number of peritonitis episodes and peritonitis free survival in Chinese [16] and European patients [10]. In our hands, the bacterial agents were the same in both groups with 10% of peritonitis episodes being culture-negative, while one-third was due to Gram negative and two-thirds were due to Gram positive bacteria. The peritonitis rate was 1 in every 24 months. Even though no statistically significant difference in time to first peritonitis was observed, the duration was 147 days (median) in unplanned PD and 281 days in planned PD. Diabetes and co-morbidity were independent risk factors increasing the risk for peritonitis. In a Cox proportional hazard model, the trend in the planned group toward shorter time to peritonitis was not present when including age, diabetes and co-morbidity in the model. Thus, in contrast to unplanned initiation of HD, unplanned initiation of PD does not seem to increase the risk of infectious complications.

HOSPITALIZATION

No difference in rate of readmissions and number of days spent at hospital between unplanned PD and unplanned HD has been reported so far. In the study by Lobbedez et al., the initial hospitalization duration was the same in the two groups and with a wide span from 0 to 120 days. The number of days spent in hospital to initiate dialysis might be a factor involved in the decision whether to choose unplanned HD or PD for the patients. This is solved in the study by Koch where they used intermittent centre PD three times weekly as initiation, and has recently been successfully used by Gharra et al. [12] too.

In our experience, the actuarial survival free of re-hospitalization did not differ between the unplanned and planned PD groups (26% versus 21%) [10], which is in the same range as described by Lobbedez et al. [8]. The number of days at hospital was significantly higher for the unplanned group with 38 days per patient year compared with 23 days per patient year for planned patients. Not surprisingly, the median time to re-hospitalization was 85 days versus 145 days for the unplanned and planned patients, respectively.

THE PD CATHETER

The European Best Practice guidelines recommend that PD is first initiated 2 weeks after PD catheter implantation [17]. The rationale is an expected reduction in the risk of leakage of PD fluid along the catheter. It has even been suggested to wait 2–4 weeks in order to increase wound healing [18, 19]. If these recommendations are kept rigidly, the consequence for the patients with urgent need for dialysis are that they all have to start on HD. The dogma of 2 weeks of peritoneal rest after PD catheter implantation has been challenged by several small studies without control groups. They showed that the number of leakages and catheter migrations were in the expected range compared with what is seen with standard initiation of PD [20, 21]. Two recent retrospective single-centre studies on continuous ambulatory peritoneal dialysis (CAPD) with incremental increase in volume of dialysate showed difference in results (Table 2). The study by Yang et al. [22] showed no difference in short- and long-term PD catheter complication rates or survival. In a recent single-centre retrospective study including 657 PD patients during a 10-year period, Liu et al. [16] showed that a short catheter break-in period had no influence on long-term survival, but more patients in the unplanned initiation group had mechanical catheter related problems and more patients were transferred to HD. In a logistic regression analysis, unplanned initiation was an independent risk factor for PD catheter dysfunction and decreased technique survival, but technique survival was extremely high in both groups. This observation is confirmed with our own experience, as we have observed more mechanical PD catheter related complications among unplanned patients, but no difference in long-term technique survival.

In sub-optimal PD, an increased risk for transfer to HD has been shown [7], which partly reflects a catheter related problem. However, in patients on assisted PD, either by a nurse or a family member, this risk was not present.

In our experience, the number of mechanical PD catheter complications is relatively small and is potentially easy to manage either with conservative treatment or with placement of a new catheter.

ELIGIBILITY AND EDUCATION FOR UNPLANNED PD

In our opinion, only very few contraindications exist against unplanned start on PD in patients with CKD 5: we regard S-potassium >6.5 mmol/L, severe hypertension with a diastolic blood pressure >120 mmHg, severe overhydration with pulmonary oedema and signs of uraemic pericarditis or colitis [10] as relative contraindications, which fits well with the studies by Lobbedez and Koch, who used unplanned PD in unselected patients with urgent need for dialysis, despite severe heart failure, malignancy or diabetes mellitus. For patients with contraindication against unplanned start on PD a break-in period with HD should be used to stabilize the patient simultaneously with placement of the PD catheter and start on PD within a few days. Obviously, the absolute contraindication against PD such as lack of suitable peritoneal membrane, inability of the abdominal cavity to sustain the mechanics or an unacceptable risk of infection is still to be respected [23]. It is of utmost importance to remember that age, reduced vision or motor skills are not a contraindication against PD, but merely demand a more extensive programme eventually including assisted PD to establish the patients at home [24].
For the late referred patient with urgent need for dialysis, the free individual choice of dialysis modality is in reality rather limited. Most of these patients have decreased ability to acquire new knowledge and make important decisions regarding treatment modality because of the uraemic state. In practice, it is the options and practices available at the individual centres that will decide the choice of modality. Independent of the unplanned modality chosen, it is important to have an educational programme to give the patients a real possibility to choose the modality later on, that fits best to their lifestyle. The demands to an educational programme in the unplanned setting is different from the educational programme offered to known predialysis patients as described by Porter et al. [25]. It seems that an effort with a dedicated nurse may increase the number of patients choosing a home-based modality after individual guidance [26, 27]. When in-centre HD is the primary modality for unplanned start, patients are more likely to continue on that modality than patients who have carried through a predialysis educational programme [27, 28]. We strongly believe that use of a home-based modality for unplanned start on dialysis gives the patient more free choice when they have to decide between PD, home HD and in-centre HD, as it is expected to be easier to change from home based to in-centre treatment if the modality fails than vice versa. By combining our programme for unplanned start on dialysis with a programme for assisted PD, the number of even frail elderly patients who can be offered a real choice of a home-based modality increases dramatically. It is well known that a predialysis educational programme increases the number of patients choosing home-based dialysis [29, 30]. In a recent study, it was shown that out of 124 patients wishing PD only 52% actually started on PD. Of the remaining 59 patients, 57% started on unplanned HD and only eight of these patients was transferred to PD at Day 90. However, from the study, it was not clear why patients wanting PD were not transferred to PD after the unplanned start on HD [31]. Probably, both patient related, social, staff related and economic factors were involved. In a European study, a higher degree of concordance was seen between the wanted and the final modality [32]. Important factors for patients making their choice of dialysis are independence and the feeling of confidence [33]. Unplanned start on dialysis may induce insecurity and lack of confidence in the patients. Therefore, extra effort from the staff is necessary at unplanned initiation of dialysis start to make the patient confident with a home-based dialysis modality.

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Modality</th>
<th>Number</th>
<th>PD-catheter placement technique</th>
<th>Follow-up (months)</th>
<th>Time to PD start (days)</th>
<th>Technique survival (overall)</th>
<th>Technique survival (PD-catheter dysfunction)</th>
<th>Catheter dysfunction (overall)</th>
<th>Catheter dysfunction</th>
<th>Leakage</th>
<th>Migration/ malposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yang et al. [22]</td>
<td>Retrospective</td>
<td>CAPD</td>
<td>310</td>
<td>Surgical Tenckhoff Straight</td>
<td>6</td>
<td>&lt;14</td>
<td>85.4%</td>
<td>86.9%</td>
<td>9.2%</td>
<td>10.8%</td>
<td>2.2%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Povlsen and Ivarsen [10]</td>
<td>Retrospective</td>
<td>APD</td>
<td>140</td>
<td>Surgical Tenckhoff</td>
<td>3</td>
<td>&lt;12</td>
<td>86.7%</td>
<td>86.7%</td>
<td>15.4%</td>
<td>15.4%</td>
<td>3.8%</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

In all studies, the volume of dialysate was incremental increased over a 2 week period.

A study randomizing unplanned patients to either PD or HD will probably never be performed, so we have to rely on clinical experience from dedicated centres and on registry data. Unplanned PD is an option with at least as good an outcome as unplanned HD and should be offered in an unbiased way to all patients without contraindications to PD starting unplanned dialysis. For the early referred patient, who has already chosen PD, but has to start dialysis in an unplanned way, unplanned start on PD is the obvious choice. Combining the programme
for unplanned start on PD with a programme for nurse-assisted PD dramatically increases the number of patients that can be given a real choice of a home-based dialysis modality.

**CONFLICT OF INTEREST STATEMENT**

None declared.

**REFERENCES**

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**FULL REVIEW**


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