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Peritoneal Dialysis Is Facing Declining? An Unintended Consequence of Healthcare Reform in China



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All evidences show that peritoneal dialysis (PD) should be extensively applied in China. The overall prevalence of chronic kidney disease is 10.8%, becoming an important public health problem in China [1]. Our government must face the challenge of a disastrous burden of end stage renal disease (ESRD) in the following decade, as dialysis population doubled and medical expenditure achieving 80 Billion USD yearly [2]. Although PD is more cost-efficient modality with a similar outcome as compared to hemodialysis (HD) based on National Registry Data, the penetration rate of PD is consistently low, i.e. 13.1%~14.1% since 2011 [3].

It is not difficult to understand that the entity of economic deficit of PD treatment directly leads to its underutilization (Table 1). The Public hospital in China is profit-oriented healthcare organization. They have to face great pressures of patient services being priced by our government with a few financial subsidies [4]. HD treatment covered by medical insurance belongs to treatment category, half of which is gained as a major income for the hospital. By contrast, PD solution belonging to medicine category and make a few benefits for hospitals. Although payments on PD operation, training, family guidance were created in National Medical Service Price Project, 2012, they have not been initiated yet.

This situation is getting worse now. The Chinese government has been facing an increased financial burden since they proposed the ambitious goal of achieving national universal health insurance, 2009 [4]. In order to suppress the excessive growth in medical expenditures, Chinese government implements two absolutely heavyweight policies. The one is the limitation on drug proportion of hospital income (i.e. 35% or lower) to restrain over prescriptions. The other is drugs zero rate policy, which cancel the previously exploited 15% drug price markup. PD thoroughly lose profit opportunity thereafter! It comes naturally to restrict or even cease PD program in avoid of the economic deficit and unaffordable human investment. If so, the insufficient health-care provision of PD would be greatly aggravated in the near future.

Can we rescue the declining PD? Recently, Ministry of Human Resources and Social Security started to encourage health reform

on payment according to the disease or capital. As the expectation of placing payment and charge reform for ESRD care into priority, we also worry its efficacy. In the profit-oriented medical environment, healthcare reform for the purpose of controlling the expenditure must create new problems. Only if benefits of hospitals, medical personnel, patients, and governments are fully considered, there is a hope for improvements in quality of patient-oriented therapy in this country.

Table 1. Comparisons of cost, payment and profit for peritoneal dialysis and hemodialysis in Beijing

Per 100 patients, Monthly calculation, Beijing		PD	HD
Cost	Space of dialysis center (sq. feet)	540	4320
	Nurse	1	6
	Doctor	2	2
	Care worker	NA	2
	Engineer	NA	1
	Salary*	5,000	22,000
	Machine depreciation**	NA	75,000
	Dialysis***	60,000	60,667
	Others (etc. disinfection)	Not included	
Payment#	Medical service	833	833
	Dialysis treatment	NA	104,000
	Dialysis solution	60,000	NA
	Others (etc. medicine and biochemistry)	Not included	
	Profit for dialysis treatment	-4,167	9,833

*Salary for nurse, doctor, care worker and engineer is estimated as 1, 667, 3,333, 1,333 and 2,667 USD per month respectively

**Machine depreciation is estimated on 25 dialysis machines for 6 years, with 833 USD per one machine per month

***Dialysis fee is based on manual peritoneal dialysis with 120 bags (5 USD/bag), or 13 episodes of hemodialysis (46.7 USD/episode) for one patient per month

Payments of PD is only for the solution. Payments for HD are bundled as 480 USD for one episode

Taken together, PD technique in China is severely restricted due to current healthcare policies. Healthcare policy maker, medical institutions and nephrology community must take action to rescue this declining technique to face the challenge of high ESRD burden in this country.

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Centre-Specific Predictors of Peritonitis



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Peritonitis is the commonest complication occurring in peritoneal dialysis (PD) patients. Traditional patient-related peritonitis risk factors have been assessed in many studies, which identified age, race, body mass index (BMI), diabetes, cardiovascular disease and hypoalbuminemia as potential peritonitis predictors [1, 2]. Different strategies have been used to improve peritonitis rates over the years, including new connection techniques, topical antibiotic prophylaxis and fungal prophylaxis [3]. Notwithstanding the known risk factors and efforts aiming to decrease peritonitis, it remains high in many regions and, most importantly, several studies have reported a large 5- to 10-fold variability in peritonitis rates across different dialysis centres within individual countries [1, 4, 5]. Few studies have explored centre-related factors associated with peritonitis rate variability and they solely evaluated centre size and use of topical antibiotic prophylaxis as potential risk factors.

Considering the limited evidence regarding centre-related predictors of peritonitis, we recently assessed these centre-specific risk factors in a multi-centre registry study [6]. All adult Australian patients initiated on PD between 1st October 2003 and 31st December 2013 were included. Overall, 8913 patients receiving PD from 51 dialysis centers were analysed. The study included a majority of Caucasian (75%) and male (59%) patients with a median age of 61 (interquartile range [IQR] 49-71) years at renal replacement therapy (RRT) initiation. Diabetic nephropathy was the commonest cause of primary kidney disease (33%) and about two-third of the patients had PD as their first RRT modality (64%).

In total, there were 7667 peritonitis episodes among 3893 patients for an overall peritonitis rate of 0.51 episodes per patient-year with a variation from 0.17 episodes per patient-year to 1.74 episodes per patient-year in the centres with the lowest and highest peritonitis rates, respectively. We assessed predictors of peritonitis rate in a multivariable mixed effects negative binomial regression model, with adjustment for patient-level and centre-level characteristics.

On a patient-level, older age, Aboriginal and Torres Strait Islander race, diabetes and higher body mass index (BMI) were associated with increased peritonitis risk while Asian patients and those treated with PD as the first RRT modality had a lower peritonitis risk. Compared to the middle 50% of centres (second and third quartiles combined), centre-level characteristics associated with higher peritonitis risk included greater use of icodextrin in centres (incidence rate ratio [IRR] 1.24 95% confidence interval [CI] 1.10-1.39), lower automated PD (APD) centre exposure (IRR 1.24,

95%CI 1.10-1.39) and lower antifungal prophylaxis use (IRR 1.25, 95% CI 1.11-1.41). In contrast, smaller center size (IRR 0.78, 95% CI 0.69-0.90), higher proportion of PD in the dialysis centre (IRR 0.87, 95% CI 0.77-0.99), lower rates of performance of PET at PD start (IRR 0.78, 95% CI 0.66-0.93), and lower proportion of hospitalisation at time of peritonitis (IRR 0.85, 95% CI 0.75-0.96) were associated with lower peritonitis rates.

Importantly, the addition of center-related factors resulted in a significant attenuation in peritonitis variation between different centres ($p=0.02$). The absolute difference between IRR point estimates across centres decreased from 1.34 ± 0.34 in the unadjusted analysis to 1.29 ± 0.23 following adjustment for patient-level characteristics and then to 1.19 ± 0.24 following additional adjustment for center-level characteristics. (Figure 1)

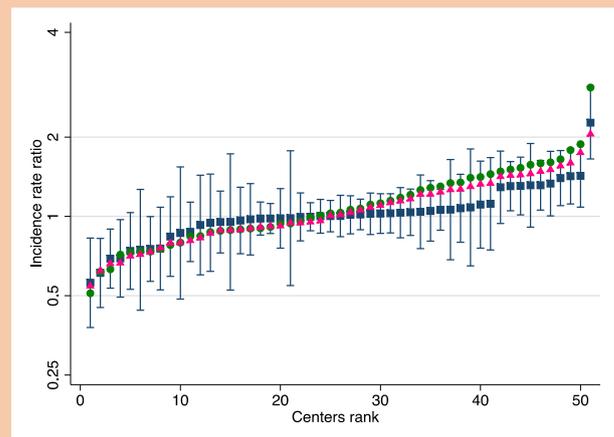


Figure 1. Variation of peritonitis IRR across 51 Australian PD dialysis centers in unadjusted (green circle), patient-level adjusted (pink triangle) and multilevel (patient and center) adjusted (blue square). Reproduced with permission from Nadeau-Fredette, A.C., et al., Center-Specific Factors Associated with Peritonitis Risk-A Multi-Center Registry Analysis. *Perit Dial Int*, 2016. 36: 509-18 [6].

We also assessed risk of first peritonitis in a survival model including 3893 peritonitis episodes. The crude peritonitis-free survival time was 1.93 (95% CI 1.86-2.01) years. In the multivariable analysis, centres with lower automated PD exposure were associated with higher risk of first peritonitis whereas smaller center size and lower or higher proportion of hospitalisation for peritonitis were identified as predictors of lower first peritonitis risk. Furthermore, the results were globally consistent in a competing risk model with transplantation as the competing event.

To our knowledge, our study is the first to evaluate several center-related characteristics associated with peritonitis risk in a large PD population with the concurrent inclusion of patient-related confounding. Centres with high proportions of dialysis patients treated with PD were associated with lower peritonitis rates, which is a similar finding to that reported in a Dutch study for the association with PD technique survival [7]. Unexpectedly, smaller PD centres (rather than larger as reported in another study[8]), were found to have lower peritonitis rates. This difference could be related to the multiple predictors included in our study (e.g. proportion of PD patients and centre size) and might indicate that centres' enthusiasm toward PD is more important than the actual PD program size. The protective association with lower hospitalizations at the time of peritonitis could reflect outpatient support in different centres, an essential component of home dialysis therapy [9]. Similarly, the association between low or high use of icodextrin and APD could be related to the lack of

individualization of PD prescription based on patient's special needs, thereby influencing peritonitis rates in centres with a more standardized practice pattern. Finally, the association between lower antifungal prophylaxis use and lower peritonitis rate could be a surrogate marker of an overall lower total peritonitis rate in these centres, despite the lack of compliance with international guidelines [10].

Overall, our study revealed that centre-related factors made a significant contribution to the variation of peritonitis rates observed across different dialysis centres. The main centre-specific peritonitis predictors were centre size, proportion of patients treated with PD and practice-related characteristics, such as proportion of patients treated with APD or icodextrin, and proportion of patients admitted at time of peritonitis. Globally, these findings are noteworthy as they represent a critical step toward peritonitis prevention. Indeed, identification of center-specific factors associated with lower or higher peritonitis rate may lead to the implementation of practice changes targeting modifiable centre characteristics.

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Editor's Note

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Evaluation of Long-Term Combination Therapy With Peritoneal Dialysis and Hemodialysis

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Peritoneal dialysis (PD) is a common renal replacement therapy for patients with end-stage kidney disease (ESKD), and the preservation of residual renal function (RRF) and high quality of life are advantages of PD treatment [1]. However, adequate solute and fluid removal are difficult to achieve with PD alone, and this develops during long periods of PD treatment. Thus, a therapy for those patients who cannot continue PD alone and who require an increasing dosage of PD is to switch to hemodialysis (HD) and renal transplantation or to start a combination therapy with PD and HD.

Combination therapy with PD and HD was first introduced in Japan [2, 3], and after a while has increased rapidly. The percentage of patients on this therapy has leveled in recent years. In 2014, approximately 1900 patients (about 20 % of all PD patients) were on this therapy in Japan [4]. A combination therapy is required as an alternative to increasing the dose of PD for other factors, such as a loss of RRF, peritoneal fibrosis and functional failure induced by a bioincompatible peritoneal dialysate [5]. In general, the regimen for this therapy is five or six days of PD combined with one HD session per week. According to some reports [6,7], potential indications for the combination therapy with PD and HD are peritoneal rest with an expectation of improved peritoneal function, postponement of membrane deterioration, and the potential for minimizing cardiovascular complications related to HD. On the other hand, Moriishi et al. [8] reported that improvement in peritoneal function for the combination therapy with PD and HD cannot be expected for patients in whom peritoneal function has already deteriorated. It is well known that long-term PD duration is a cause for encapsulating peritoneal sclerosis (EPS), some of which is observed after the cessation of PD [9]. However, there have been no reports that have examined the evaluation of long-term combination with PD and HD. Therefore, we hypothesized that a combination therapy with PD and HD might improve clinical status and prognosis in patients undergoing dialysis.

The objective of our study was to evaluate whether the therapy is useful for the likelihood of long-term peritoneal membrane and cardiac function. The therapy was 6 days of PD and 1 session of HD per week. Physical, biochemical, dialysate-to-plasma ratio of creatinine (D/P Cr), arteriovenous fistula (AVF) blood flow, and left ventricular mass index (LVMI) data were prospectively analyzed with measurements performed at 0 and 6 months, 12 or 18 months after initiation of the therapy.

The levels of hemoglobin (Hb) after the therapy were significantly higher than those at initiation of the therapy. The levels of LVMI and human atrial natriuretic peptide (hANP) after the therapy were significantly lower than those at initiation of the therapy, whereas AVF blood flow did not change significantly. D/P Cr levels at 6 months after the therapy were significantly lower than those at initiation of the therapy. D/P Cr levels at 12 or 18 months after the therapy were not aggravated. In our study, because of the adjusting body fluid status, this therapy could maintain and improve the levels of Hb and cardiac function over 1 year.

A combination therapy should be used in PD patients with fluid overload attributable to ultrafiltration failure, poor self-management of fluid balance, and severe heart failure. Our study shows that the combination therapy with PD and HD might be useful for the likelihood of long-term peritoneal membrane and cardiac function. However, the high level of plasma β 2-MG with the long-term combination therapy can influence the prognosis of the patient. Therefore, when needing a maintenance dialysis, PD should be begun for maintenance of RRF. Next, when RRF is decreasing a combination therapy with PD and HD should be begun for adjusting body fluid status, with a sufficient dialysis dose and peritoneal rest. Moreover, when the RRF falls to zero, and combination therapy becomes difficult, it's better not to force it and instead to shift to HD alone. Further studies are needed to evaluate peritoneal function for deciding when to stop PD therapy. Although combination therapy is useful from the lifestyle viewpoint of patients in the transitioned period of PD to HD with ESKD, the therapy should not be continued aimlessly [10].

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The Peritoneal Dialysis Society of India (PDSI) Annual Conference

The Peritoneal Dialysis Society of India (PDSI) Annual Conference was held at Thirupathy (Andhra Pradesh, India) 11, 12th August 2017. The speakers from India covered a wide range of topics including all aspects of Peritoneal Dialysis. The session included invited talks, symposium, debates, free paper presentation and quiz. The congress was attended by 250 delegates from across India. The New President of the PDSI Prof. Shiva Kumar along with Prof. Ram Raipur and the organizing committee did a admirable organization. The highlight of the conference was release of Peritoneal Dialysis Primer first edition by the chief guest Prof. Ravi Kumar director of Sri Venkateswara Institute of Medical Sciences. The Peritoneal Dialysis Primer has 62 chapters written by Authors who vast experience on Peritoneal Dialysis. The Primer was dedicated to late Prof. Dimitrios G.Oreopoulos. There was a separate sessions for nurses and technologist covering basic aspects of PD, training, follow up and nutritional aspects.

Figure 1. Inaugural ceremony with release of the Primer.



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Intensive Versus Minimal Standard Dosage For Peritoneal Dialysis In Acute Kidney Injury: A Randomized Pilot Study



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Peritoneal dialysis (PD) is one of the modes of renal replacement therapy in acute kidney injury (AKI), especially in resource-limited settings [1]. However, there is still some controversy about what constitutes the optimal dosage of PD in AKI. In 2014, the International Society for Peritoneal Dialysis (ISPD) adopted a guideline for PD in AKI. They recommended two dosage options. First, the optimal dosage suggested was Kt/V 3.5 weekly, which had a comparable outcome with daily hemodialysis. A weekly Kt/V of more than 3.5 did not provide additional benefit by reducing mortality. PD fluid prescribed for the optimal dose was 36 to 44 liters per day for cycler PD and around 18, 24, or 32 liters per day for manual PD, depending on the patient's body weight. Second, the minimal standard dosage should be weekly Kt/V 2.1 by prescribing around 12, 16, or 24 liters of PD fluid per day. However, these recommendations come from extrapolations of studies comparing PD with other modalities of dialysis in outcome and professional consensus [1-4]. So there are a few studies that direct comparison between two different dosages of PD in AKI.

We conducted a randomized controlled study in a single center in Thailand to compare an intensive dosage (> 30 L of PD volume per day) with a minimal standard dosage (< 20 L of PD volume per day) for PD in AKI. We enrolled AKI patients without hypercatabolic stage [5], severe hyperkalemia (>6.5 mEq/L), and midline abdominal surgical scar in our study. A flexible PD catheter was inserted at the patients' bedside, using the modified Seldinger technique. A 1.5-liter fill PD volume with one-hourly cycles (36 L of PD volume per day = 1 session) and 1.5 liters fill volume with two-hourly cycles (18 L of PD volume per day) were performed for the intensive and minimal standard dosage by manual exchange drainage. PD volume was fixed for the first two sessions, then adjusted based on the nephrologist's judgment. The baseline was similar between the two groups. Patients were around 60 years old, weighed 60 kg, and had an average BMI of 23-24. Most of the patients were critically ill (88% on a mechanical ventilator, 70% were on inotropic drugs and APACHEII score around 25-26). BUN and Cr were around 76 and 5 mg/dl, and the anion gap was 20 mEq/L at the start dialysis. Delivery Kt/V during the first two sessions was 0.61, 0.67 and 0.38, 0.36; weekly Kt/V was 3.3 and 2.26 in the intensive and minimal standard group, respectively. The in-hospital mortality rate over 30 days was 72%: 31 out of 39 patients (79%) in the intensive PD dosage group and 23 out of 36 patients (63%) in the minimal standard PD dosage group. There was no significant difference in 30-day in-hospital mortality between the intensive and standard PD dosage groups (relative risk [RR] 1.11, 95% confidence interval [CI] 0.80 – 1.51, p= 0.13). Moreover, metabolic control during the PD sessions, including BUN, potassium, blood glucose, bicarbonate, and serum albumin between the two groups was not significantly different during the

first two PD sessions. The PD peritonitis rate was higher in the intensive PD group than in the minimal standard PD dosage group but was not significantly different (15.3% vs. 8.3%, p= 0.34).

The optimal PD dosage in AKI should be a minimal dosage which had a comparable mortality with a higher dosage. Our study shows that 18 vs. 36 liters per day (weekly Kt/V 3.3 vs. 2.26) of PD had comparable outcomes. From Ponce et al. in 2011, we had already known that using a higher dosage of PD (40-48 L, weekly Kt/V 4.13) did not lower mortality or metabolic control compared with a lower dosage of PD (32-38 L, weekly Kt/V 3.0) in critical AKI patients [6]. However, to our knowledge, no study that compares 32-38 L per day with lower dosages of 16-20 L per day according to the ISPD guideline, so our study fills this gap of knowledge. In conclusion, we suggest that an optimal dosage of PD in AKI should be a weekly Kt/V around 2.2. Therefore, we used 18 liters per day, with 12 manual exchanges of 1.5 liters in the first two PD sessions then adjusted to 4-6 exchanges per session with a flexible PD catheter to achieve this weekly Kt/V. Please note that our patients' weight was around 60 kg. If patients' weight was higher than 60 kg, it need a higher PD volume; for example, 21 L if they weigh around 70 kg. Lastly, the outcomes of AKI patients who use PD with a minimal standard dosage (around 18 L per day, delivery of Kt/V of around 0.36 and 0.39 per session, and weekly Kt/V 2.26) compared with a standard dosage of intermittent hemodialysis or continuous venovenous hemodialysis in AKI are still uncertain. Studies in this area will strengthen the rationale for using the minimal standard dosage of PD in AKI.

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3-6 March 2018

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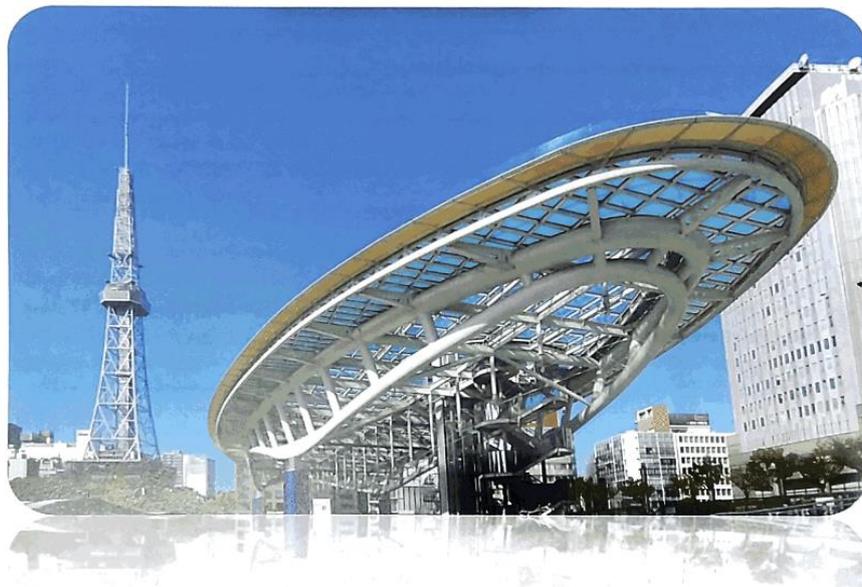
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