

Peritoneal Dialysis in the elderly: challenge accepted

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Received for publication: Jan 14, 2018

Accepted in revised form: Apr 12, 2018

ABSTRACT

At present, mostly in Western countries, age is no longer an absolute limitation for renal replacement therapy (RRT); however, some elderly patients are still not considered for peritoneal dialysis (PD), mainly due to late referral, social isolation, low functional capacity or lower life expectancy. In this review, we address the challenges posed by older patients on PD programs, focusing on a SWOT (strengths, weaknesses, opportunities and threats) analysis and illustrate how PD may have successful outcomes in this population, worldwide and in Portugal. Finally, we will enumerate strategies to overcome the barriers to this technique. From January to December 2017, we conducted a systematic review of the literature using MEDLINE, the Cochrane Library and Web of Knowledge. Studies on PD and HD were included. All searches were limited to English and Portuguese and were augmented by review of bibliographic references from the studies included. Findings concerning modality superiority and better outcome in older people are still scarce and controversial, however according to several well-established PD programs worldwide, including assisted PD, elderly patients presented similar technique survival, hospitalization rates and frequency of peritonitis as compared to younger PD patients and HD patients. As expected, older patients had higher mortality though, especially in patients with more comorbidities. On the other hand, PD was associated with less cognitive loss and showed benefit in perceived quality of life. In Portugal, the low utilization of PD and the patients' age discrepancy between both modalities explains the limited literature and the discrepant results (some studies show lower peritonitis rate, superior technique and patient survival and others present higher hospitalization episodes and mortality rates); however, it appears to be a good (cost-effective) option for elderly patients. Overall, PD is an equally suitable modality for elderly patients in the long term.

Keywords: (assisted) peritoneal dialysis; barriers; chronic kidney failure; elderly; quality of life

INTRODUCTION

Over the past 40 years, the world's population has been aging at a rapid pace as a result of dramatic improvements in life expectancy, especially in developed areas. With patients reaching older age groups, the increasing incidence and prevalence of chronic diseases such as chronic kidney disease (CKD) pose new challenges to health professionals.

CKD represents a significant international public health burden with rising economic cost, morbidity and

mortality¹. Overall, its prevalence is estimated to be 8–16% (mean 11%) particularly high in developed areas such as Europe, the USA, Canada and Australia^{2,3} but it frequently affects mostly the elderly, with age *per se* a risk factor for CKD. In people over 70 years of age, the prevalence of CKD stages 3–5 is 25%, and 30% in those over 80 years old⁴. In 2015, there were 901 million people worldwide aged 60 years or over and 125 million older than 80^{5,6}.

Similar trends apply to Portugal, which during the last few decades has faced a steep decline in birth rates

and a rapid growth of the aging population, resulting in a marked increase in the number of elderly and very elderly people (>80 years old). In 2015, 20.5% of our population was over 65 years old and increasing⁵. According to the ERA-EDTA Registry Annual Report, in 2015, 81 373 individuals commenced renal replacement therapy (RRT) for end stage renal disease (ESRD) equating to an overall unadjusted incidence rate of 119 per million population (pmp). By the end of 2015, 546 783 individuals were receiving RRT, corresponding to an unadjusted prevalence of 801 pmp. Portugal ranked second regarding incidence (227 pmp) and, first regarding prevalence of RRT (1824 pmp) in Europe and was among the highest in the world⁷. Additionally, the Report Registry Office of the Portuguese Society of Nephrology (PSN) revealed that by the end of 2015, 18 928 patients were on RRT; 61% (n= 11514) were on hemodialysis (HD); 35% (n= 6663) were transplanted and only 4% (n=751) were on peritoneal dialysis (PD) (2.5% patients above 65 years)^{8,9}.

This scenario calls for innovative approaches of health services, in order to guarantee quality and accessibility, allowing a more tailored prescription. But the question is not just quantitative – why aren't more elderly patients on PD?. The question is primarily qualitative – are elderly patients receiving the treatment they aim for? Yet another matter remains – are the most tailored prescription costs sustainable?

Despite domiciliary renal replacement regimens being increasingly advocated to overcome the economic burden of treating chronic diseases, there are many barriers to such a strategy. HD programs have grown exponentially with an unprecedented number of patients receiving dialysis, mainly in facility-based centers where healthcare professionals provide all the treatment.

On the other hand, PD has remained an underused modality in all age groups^{10,11}, mostly in older people who represent the fastest-growing group initiating dialysis^{12,13} and despite PD being available worldwide and offering similar or even better overall survival when compared to HD¹⁴. Average PD penetration is reported to be 11–13% according to references, although considerable variation exists among countries^{15–17}. Despite only 4% of the Portuguese ESRD population being on PD in 2015, a tremendous growth in PD utilization was documented from 1997 to 2015 as a result of growing awareness among health professionals¹⁸. However, as opposed to its overall increase over the last decade, it is declining in developed countries¹⁵. Some reasons may

explain the preference for HD over PD regardless of the good outcomes in older individuals, such as the lack of enthusiasm for PD and the absence of political investment which almost devalue its effectiveness. While there are limited studies in the elderly, it has recently been shown that PD is an equally suitable modality for elderly patients in the long-term^{18–20}. With this in mind, it seems that overcoming the barriers to self-care PD in an aging population is a very important factor²¹.

Countries such as France and Hong Kong have shown that PD programs, especially assisted PD (asPD) may succeed in the elderly with minimal risk to overall health. Other countries such as Denmark, Canada, Italy, Brazil, Belgium, the UK, the Netherlands and China have also developed strategies to implement asPD (both continuous ambulatory PD and automated PD) as clinical outcomes have been shown to be promising in this age group²². However, this is only possible due to healthcare insurance and/or public healthcare systems which fully cover these programs. Worldwide governments should therefore develop health policies in order to accommodate the needs of this particular group.

■ SPECIAL CONSIDERATIONS IN THE ELDERLY

The elderly population has a unique profile of medical and social needs that must be addressed carefully with tailored risk and benefit calculations. Older individuals often have a higher incidence of comorbidities, prior surgery and geriatric syndromes such as frailty (weight loss, slow gait, fatigue, muscle weakness and functional impairment) impaired vision, deafness and cognitive dysfunction that predispose to increased morbidity and mortality. All these clinical conditions are associated with isolation, poor accommodation and financial problems¹³. However, these should not be interpreted as absolute contraindications to PD as nearly two-thirds of patients above age 65 are still capable of performing PD independently²³. Being 65 years old nowadays is completely different from a century ago, when medical services were scarce and even less available to a population which suffered severe illness and experienced premature death. It is important to notice that at the present time, most people of this age still work on a regular basis and fully enjoy their independence. Even in older age groups, patients' preference for independence and quality of life (QoL) spending more time at home with family and friends and practicing their regular hobbies could be more important than living some extra

amount of time on RRT. To fit treatments to patient expectations should be a major objective, particularly in the elderly.

■ DIALYSIS MODALITY CHOICE FOR ELDERLY: A SWOT ANALYSIS

Both HD and PD are suitable techniques for older populations, although there is a large disparity in the results of studies evaluating outcomes of PD vs HD. Globally, clinical results in PD are similar or better, not worse. Here, we focus on the benefits and challenges of PD for end-stage renal disease (ESRD) elderly patients, especially asPD, which is intended for those who cannot perform home self-dialysis but might benefit from it. Table 1 summarizes the dialysis modality choices for the elderly based on SWOT analysis.

■ Strengths

PD is widely accessible, even in the most remote and rural areas, including in the developing world, refuting the myth that strict home conditions are mandatory. Moreover, indications and contraindications for PD in the elderly are similar to those existing in their younger

counterparts, which makes it an accessible modality for this population. Additionally, some studies have demonstrated similar outcomes regarding mortality, morbidity and QoL in elderly people on PD and HD^{24,25,26}. Others report a better sense of well-being and QoL, especially regarding patients' mental states, which is directly related to the possibility of a more active social life with less treatment-schedule life intrusion, allowing them to better enjoy their free time with their family and friends^{23,25,27}. Furthermore, it was documented that the elderly may suffer less cognitive loss under PD than HD²⁸. Patients on PD benefit from better cardiovascular stability (fewer arrhythmias and hypotensive events, less variation in volume status and electrolyte shifts), better preservation of residual renal function, lower risk of gastrointestinal bleeding (no anticoagulation) and often less restricted diet^{29,30,31}. Further, a native vascular access is often problematic in older patients, who are more likely to experience vascular access complications and the burden of vascular procedures, so that the decision to place a central venous catheter must be counterbalanced with the viability of PD.

Moreover, this group of patients tend to begin dialysis with higher residual renal function and diuresis which can be protected longer in contemporary PD incremental regimens.

Table 1

A SWOT analysis focused on Peritoneal Dialysis modality choice for the elderly: clinical and management issues

<p>Strengths</p> <ul style="list-style-type: none"> • Home-based treatment • Better hemodynamic tolerance • Lower risk of GI bleeding • Longer renal function preservation • Less restricted potassium diet • Lower treatment intrusion in life • Lower risk of cognitive loss • No need for vascular access • No need for iterative angioplasties /surgeries • Fewer transport requirements • Cheaper than center HD in some business models 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Physical barriers • Cognitive barriers • Psychological and social barriers • Nephrologists' lower experience with this modality • Clinicians' biased perceptions related with elderly and with PD • Lack of job opportunities in PD • Lack of reimbursement incentives to PD • Lack of integrated dialysis Units
<p>Opportunities</p> <ul style="list-style-type: none"> • Quality of life • Flexibility and freedom • Incremental PD • Assisted PD • Integrated dialysis care • Telemedicine • End-of-life comfort promotion • Cost efficiency in dialysis access management • Cost-efficiency in transfer policies among modalities 	<p>Threats</p> <ul style="list-style-type: none"> • Isolation • Technique failure • Infections • Minimal nurse training • Caregiver burnout • Conflict of interests within HD/PD Units • Inadequate business model making modality costlier than HD

Finally, when considering economical aspects, PD appears to be cheaper than HD when transportation cost to the HD center is allocated¹⁴. Depending on the business model, the cost of regular assistance by trained personnel (asPD) might be mitigated²².

■ Weaknesses

Most patients are eligible for PD but still nowadays, many nephrologists have little experience dealing with this type of RRT and neglect its advantages or indications. The great majority still feel uncomfortable with PD prescription and prefer a corporative HD work in clinics with appropriate therapy algorithms and high accessibility. Equally relevant is the fact that most of them tend to forget about this technique, due to both the absence of implemented structures to perform asPD safely and also the absence of allocated reimbursement, which definitely plays a negative role¹³.

A successful PD program with fewer complications is only possible if healthcare professionals and those who provide assistance to patients while they are performing PD have adequate training, knowledge and reimbursement. Clinicians should be prepared to identify and overcome obstacles such as physical, cognitive, psychological or social barriers. Physical barriers such as decreased vision, strength, manual dexterity or mobility as well as cognitive barriers such as dementia, psychiatric conditions, learning disabilities or language barriers and finally, psychological barriers such as fear of lack of supervision, fear of isolation at home or feeling overwhelmed by the possibility of performing home dialysis will all impact on the allocation to PD¹³.

Indeed, some elderly experience loneliness and social isolation being more likely to decline and die faster in a way that going to an HD center on a regular basis might be an opportunity to socialize with others.

Therefore, both patients and medical professionals should be aware that dialysis may be burdensome and not always confer survival benefit (although this applies whichever the modality). It requires a thoughtful and individualized evaluation before starting RRT.

■ Opportunities

To fully respect ethical recommendations, PD should be presented to all candidates to RRT so they can

choose freely which modality suits them better²¹. However, we must anticipate that some patients will require personal assistance. Hence, asPD can be provided by family members, friends, home caregivers, healthcare professionals or skilled nurses/facilities. This approach has increased PD utilization mostly in developed countries such as Belgium, Canada, Denmark and France who have developed asPD programs to allow more patients to receive home dialysis with a gradual better quality of life, flexibility and freedom³². Patient empowerment as well as family and social support often overcomes barriers perceived by the clinicians. Assisted PD is often needed in the short period after PD induction or hospital admission as a temporary support that is soon dispensed with as the patient gains self-confidence and recovers.

The authors believe that telemedicine, a tool already applied in contemporary PD clinics, could provide clinical supervision while mitigating patients' and families' sense of isolation. It should however be evaluated by the health business model to improve efficacy without threatening quality.

Additionally, contrary to the present policies, it might be opportune to include the PD unit in an integrated dialysis clinic (with HD and PD, home and center modalities) that would allow a better and more cost-efficient flux of patients among modalities in case of certain events such as indication to transfer, helper or patient burn-out, to provide guidance to familiar staff in access management and change of modality these would be easier and potentially less costly. This would allow the elderly to profit from the chosen home modality, giving him more confidence and support in his often limited living expectancy. Further, comfort-adjusted PD regimens are feasible and appropriate for patients facing end-of-life complications, avoiding the clinical and financial burden of vascular accesses and intermittent extracorporeal sessions in clinics.

■ Threats

Like any other type of RRT, PD may have potential problems, particularly in older patients who present more socio-economic barriers to self-care, fear of isolation and of being unable to perform the technique, and risk of peritonitis³³. Despite several studies showing infection rates to be similar in elderly vs non-elderly PD patients, peritoneal infections are associated with greater mortality in this age-group^{12,23,31,33}. For this reason, it is very important to provide adequate training

to healthcare technicians, community nurses or family members who will be the patients' caregiver to avoid these complications.

Additionally, assisted PD may be associated with the risk of helper burn-out if adequate support is not given.

Considering organizational variables, even within integrated dialysis units, some conflict of interest may occur, threatening an unbiased allocation of patients to the modality. Finally, an economically successful business model in HD is a major competitive barrier to innovative models.

■ IS THERE EVIDENCE OF WORSE OUTCOMES WITH PD IN THE ELDERLY? NO

Findings on modality superiority in older people are still scarce, heterogeneous and controversial, showing rather discordant conclusions. These probably result from the lack of a standard definition of "elderly patient", from numerous methodological issues not taking into account competing events' risk analysis (death and access to kidney transplantation) and mostly from research centre effect³⁴.

Despite the heavy burden of comorbidities such as diabetes *mellitus*, arterial hypertension, dyslipidemia and neoplasia, data from more recent reports appear to be encouraging in this subgroup of patients²⁸. As a matter of fact, it seems possible that elderly can attain favorable survival and quality of life similar to their younger counterparts³⁵. Nonetheless, a very important factor to consider regarding long-term outcome is the hospitalization rate which is a significant marker of morbidity³³.

According to several reports from asPD programs from various world-centers, the number of hospital admissions was higher during the first year of treatment and more frequent in asPD compared to autonomous PD patients (35 vs 19 hospital days/patients.years) presumably related to the morbidity of assisted patients^{22,6}.

Two other studies from Oliver *et al.* and Quinn *et al.* compared PD to In-Centre HD and demonstrated similar rates of all-cause hospitalization^{37,38}. On the contrary, one study in United States showed that patients on domiciliary HD spend fewer days in the hospital than

do PD patients³⁹. However, these studies were all in younger patients. Regarding technique survival, a study in China found no difference between the younger and elderly patient groups³⁵.

In South Korea, a prospective observational nationwide study was conducted to compare the outcome of elderly PD patients with elderly HD patients and younger PD Patients. The overall outcomes were similar between elderly PD and HD patients. PD showed benefit in QoL in the elderly. Additionally, the technical survival rate of elderly PD patients was similar to that of younger PD patients. Taken together, PD may be a comparable modality for elderly ESRD patients⁴⁰.

Another study compared the outcome of older non-diabetic patients (>70 y) with younger diabetic patients (40-60y) on continuous ambulatory PD (CAPD); survival rate at 2 years was significantly lower in the older group (68 vs 82%, $p \leq 0.001$) but the technique survival was similar (86 vs 88%) despite the higher peritonitis rate in the former group (0.52 vs 0.37 patient-year, $p < 0.002$)⁴¹.

In United Kingdom, Brown *et al.* found that in her own practice in 2002, 1-year and 4-year survivals for patients over 65 years old on CAPD and automated peritoneal dialysis (APD) were 94% and 63%¹³. At the same time, data from the UK Renal Registry report for 2003 showed survival for all patients over 65 on dialysis (HD and PD) of 69% at 1 year and 33% at 4 years⁴². In contrast, the North Thames Dialysis Study (NTDS) reported a 1-year survival rate of 71% for patients aged >70 and mortality was significantly associated with age 80 and older⁴³.

Kadambi *et al.* compared the outcomes of three groups of patients of different ages (<50 years, 50-64 years and >65 years); 90% were on APD; patients over 65 years of age had higher mortality rate but the rate of technique failure and overall peritonitis were not different from the younger individuals. Not surprisingly, patient survival on PD was affected by the comorbidities assessed by the Charlson Comorbidity Index^{28,40}.

Infectious complications and cardiovascular disease were the most common causes of hospitalization and of death³³. Regarding peritonitis, it is usually responsible for 20% of PD technique failure and results in an overall mortality rate of 2-6%, but these vary widely according to the Centre policies and experience^{44,45}. There is a wide variation in global PD peritonitis rate ranging from 0.06 episodes/year in Taiwan to 1.66 episodes/year in Israel^{46,47}.

In some reports, peritonitis rate was lower in asPD patients than in self-PD patients (1/28 vs 1/25 patient-months) whereas in some others it was found to be the other way round (1/25 vs 1/30 patients/months)²². In the self-care PD patients the rate of peritonitis was 1/24.9 patient months and in the assisted group, 1/28.2 patient months⁴⁸.

A study from France, where asPD is well implanted, mentioned that the probability of being peritonitis-free was higher in patients assisted by their family members compared to nurse-assisted PD patients²². However, these results were inverted when fully trained nurses from dialysis centers were providing the home visits.

Despite the previously described barriers related with aging, a recent study from the French Peritoneal Dialysis Registry concluded that there was no association between ages greater than 75 and increased risk of peritonitis. Moreover, 1-year and 4-year patient survivals of 94% and 63%, respectively have been reported for patients over 65 years old in Hammersmith Hospital, UK, along with data from Hong Kong which shows survival of 88% and 56% at 2 and 5 years^{13,49}.

Overall, it appears that regarding technique and elderly patient survival, PD is not inferior to HD. Home-based dialysis seems to be associated with more satisfaction than center-dialysis^{13,29}. However, it is difficult to draw conclusions based on these data due to the absence of a comparable group of similar age and comorbidities.

■ ARE SUCH OUTCOMES DIFFERENT IN PORTUGAL? NO

Data for 2015 from the 2016 Annual Report of the PSN Registry showed that from 2007 to 2015 there was a 45.3% increase in PD utilization vs 27.4% in HD. Generally, PD patients are younger (mean age: 54.5 years) than the overall ESRD population (mean age: 67 years). This age discrepancy is more pronounced between 65–80 years old (HD: 40.8% vs PD: 25.3%) and even more over 80 (HD: 20.6% vs PD: 3.3%)⁸. Mortality (non-adjusted) in HD corresponded to 13.3% vs 5.3% in PD.

This may justify the paucity of Portuguese PD studies in elderly patients; the majority addressing outcomes in the global treated population.

A study from Hospital Geral Santo António in Porto described their 20-year PD experience with 312 patients,

but only 27% were >60 years¹⁹. Rodrigues *et al.* showed a cumulative survival of 91, 74 and 55% at one, three and five years, respectively, similar to larger reports conducted in Europe and the US. Of note, it was highlighted in this paper that the good survival rates could be associated with a positive selection of the population, mainly because auto-dialysis capacity was a major prerequisite for PD initiation. The rate of peritonitis was 1/30 patient.months and hospital admission was 4.8 days/patient.year. Regarding peritonitis, Teixeira *et al.*, documented that the probability of experiencing a first episode was higher in older patients and in females⁵⁰.

The Coimbra Hospital and University analyzed data from 184 PD patients over a 20-year period (19% of patients were ≥65 years old)¹⁸. Over the follow-up period, of the 76 PD patients who switched from HD due to vascular access failure, 65.8% died, 13.2% received a kidney transplant (KT), and 9.2% returned to HD. These patients were significantly older (mean age 58.4 ± 14.9 years) than those who chose PD as the first RRT (mean age 41.8 ± 14.7 years, p = 0.001), possibly explaining the difference in the outcome. A total of 91 episodes (1.2 episodes/patient) of peritonitis occurred with an overall rate of 0.31 episodes/patient.year. During the observation period, 34.2% died while on PD. The leading cause of death was cardiovascular disease (46.0%). Infections not related to the PD technique were the cause of death in 17.5% patients and peritonitis in 4.5%. Using univariate Cox regression analysis, diabetes mellitus, older age, and prior HD were associated with lower survival.

Data from a Portuguese study conducted in 2013 that enrolled 851 patients of all ages from 17 hospital units showed a global drop-out rate of 25% (n=216) due to transfer to HD (55.2%), kidney transplant (30.3%), death (14%) and finally renal function recovery (0.5%). Causes for HD transference were technical failure (33%), catheter-related infections (29%), non-compliance (9%) and mechanical problems (9%). Mortality was secondary to cardiovascular events (56.7%), infectious complications (15.6%) and malnutrition (15.6%)⁵¹.

More recently and with focus on the elderly, Campos *et al.* evaluated the rate of PD dropout in different age and era cohorts of 525 patients (15% were ≥65 years old)²⁰. Results showed that PD was the first option for older people in 48%; <15% of them were using asPD (with a family helper) and the incidence of transfer to HD in these patients occurred at a rate of 11 episodes/100 patients-year. However, increasing age was not responsible for a higher rate of dropout. Except for

disability to self-dialysis, all other causes of technique failure were less common in the elderly such as access-related infection (46.4%), ultrafiltration failure (17.9%) and mechanical complications (10.7%).

An additional 10-year study from Hospital de Santa Cruz in Lisbon regarding the clinical outcomes of 17 patients under asPD were examined⁵². Assisted patients had lower peritonitis rate (0.4 vs 0.59 episodes/patient.year), higher hospitalization episodes (0.67 versus 0.45 episodes/patient.year, $p=NS$), superior technique survival (92.3%, 92.3%, 83.1%, 72.7% vs 91.9%, 81.7%, 72.1%, 68.3%, at 1, 2, 3, and 4 years, respectively, $p=NS$) and similar patient survival (93.3%, 93.3%, 93.3%, 74.7% vs 95.9% 93.7%, 89%, 82% at 1, 2, 3, and 4 years, respectively, $p=NS$). Based on these results, the authors concluded that asPD offers an opportune, reliable, and effective homecare alternative for patients with no other RRT options.

Lastly, Coentrão *et al.* analysed the cost of HD and PD access in incident dialysis patients, suggesting that those who initiate PD require fewer resources to establish and maintain a dialysis access during the first year of treatment, emphasizing that PD is a cost-effective option⁵³.

Along with these results, the majority of hospital PD units from North to South have progressively started to promote asPD to patients who are suitable for home-based PD but unable for self-care, as an alternative to HD. However, home visits from healthcare professionals are still not covered by the public healthcare system, so assistance is provided by family members or close relatives. Public hospital policies and corporate dialysis facilities lack investment in home therapy in this particularly demanding but predominant group of elderly CKD patients. Reimbursement policies have not yet

integrated assisted dialysis as a tool to promote home dialysis instead of center HD dialysis. Health business models along with the public health mission to provide quality treatments should be complementary in order to suit patient demands while avoiding clinical and cost burden. It is therefore time for a change.

■ STRATEGIC PLANS

Dialytic treatment, whether HD or PD should be able to promote the best QoL possible in the limited expected life-time of this group of elder patients, regardless of their age, beliefs and economic and social status. However, we should keep in mind that dialysis is not an appropriate option for every patient if it does not provide minimal survival benefit with comfort. Individualized shared decisions must be made against one-fits-all allocations.

New policies (Table 2) should be promoted to solve the proposed issues: 1) quantitatively – more elderly patients should benefit from PD advantages, mitigating the enormous discrepancy in modality allocation that occurs independently of age,; 2) qualitatively – elderly patients ideally should be receiving the treatment they aim for and not the compulsory allocation to HD due to system (not technique) limitation,; 3) health ministry investment should be put on adequate business models to accommodate tailored dialysis, either in public or private facilities.

Indeed, PD has been demonstrated to be an excellent alternative to HD for any age group, and specifically in older patients. Assisted PD has changed the paradigm by exploring new options for dependent frail individuals: nurse dialysis unit staff can assist a pool of PD

Table 2

Strategic recommendation to promote PD

<p>Government policies and economic factors</p> <ul style="list-style-type: none"> • Reimbursement incentives to healthcare provider/helper • Initiatives to promote care within residential and nursing home settings • Encourage of local manufacturing or production of PD solutions • Creative business plans 	<p>Healthcare professionals' education</p> <ul style="list-style-type: none"> • Training of fellows, nephrologists, nurses and dialysis staff on <ul style="list-style-type: none"> – the different dialysis modalities – management of pain, depression, renal-specific symptoms and care at the end of life
<p>Modality-related factors</p> <ul style="list-style-type: none"> • Shared decision making • Updated access complications prevention • Updated use of PD regimens • Optimized patient flux among modalities 	<p>Patient-related factors</p> <ul style="list-style-type: none"> • Pre-dialysis education • Creation of facilities that provide PD, patient-centered clubs, social activities • Society commitment to aging groups

patients sparing vascular access complications/procedures, and transportation. The cost of PD solutions would follow the same scale economy advantages observed with HD variables. A PD-first program, or a PD-before vascular access in patients with reasonable life expectancy must be addressed: government policies and economic factors, modality and patient-related factors must be leveled and a business plan not neglecting patient-first must be developed. Further, healthcare professional, patient or care provider education is the mainstay of this modality, playing a critical role in its success. In Hong Kong, Thailand and China, this was overcome by continuous education to fellows in training, nurses and dialysis staff, with massive public investment in PD which turned out to be clinically and financially attractive. In Portugal, all nephrologists in training have contact with PD for at least 3 to 6 months during their fellowship but then lose touch with this modality because jobs are offered mostly in HD clinics. This context is beyond the medical advantages of home therapies. Continuous registry of results, quality control and clinical investigation must be followed in dialysis units with straight link with economy experts to detail fields of improvement. Society must be also implied in policies: awareness, literacy and civil commitment to allow sustainability, equity and quality in health treatment.

Conflicts of interest: none to declare

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