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# A Renal Policy and Financing Framework to Understand Which Factors Favour Home Treatments Such as Peritoneal Dialysis

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## 1. Introduction

Dialysis services are expensive. Typically, a country spends 1 to 2% of its healthcare budget treating less than 0.1% of its population that requires dialysis (De Vecchi et al, 1999). In western countries, 90% of the patients are treated with haemodialysis in a dialysis centre attached or affiliated to a hospital.

The literature shows that when given the choice, up to 50% of dialysis patients will prefer to perform the procedure at home (Jager et al, 2004, Goovaerts et al, 2005). Performing dialysis at home can generate significant cost savings to high income country healthcare systems and societies while improving survival, reducing morbidity (i.e., dialysis-related complications, hospital acquired infection, etc.) and increasing patient's quality of life. Furthermore, patients' satisfaction with care is higher with home modalities (Fadem SZ, 2011). Home dialysis therefore represents an opportunity for healthcare systems to improve health gains in their population while reducing the cost per case of a dialysis patient.

In a survey of 6595 nephrology healthcare professionals, 56% mentioned home/self-care modalities as the preferred long-term dialysis modalities (Ledebro & Ronco, 2008). Yet, in western countries only 10% of the patients are treated at home with either peritoneal dialysis or home haemodialysis. Canada, the Netherlands, the UK and the Scandinavian countries have a much higher (20-30%) usage of home modalities.

Reimbursement and organization of renal care have often been cited as being responsible for the differences observed between countries. This chapter will review the organization and financing of dialysis in 14 countries and suggests a 4-pillar framework to explain the differences observed between countries. Correcting or addressing each of these 4 pillars will be essential for home modalities such as peritoneal dialysis to benefit a significant number of patients in a country. This chapter will propose a few avenues for this.

## 2. The framework

A 4-pillar framework (Figure 1) was postulated as an explanation of the extent to which home dialysis modalities are used. The 4 pillars can be described as follows:

Pillar 1 - Home target: the presence of a peritoneal dialysis or home dialysis target, i.e., a specific proportion of dialysis patients that should be treated at home, ideally within a specified time frame.

Pillar 2 - Organization of renal services: with a particular focus on the absence of undesired financial imbalance favouring one modality over the other (i.e., provider-driven demand rather than based on patient's needs), the availability of a well-structured pre-dialysis education program for stage 4 patients, the availability of home assistance for elderly patients, and the presence of a renal replacement therapy career or "home first" guideline/policy.

Pillar 3 - Incentives: either financially or quality-based for home dialysis.

Pillar 4 - Tracking: a renal registry or some other form of tracking system to monitor dialysis quality and/or clinical outcomes such as survival, hospitalizations, complications, etc. and to plan future dialysis needs.

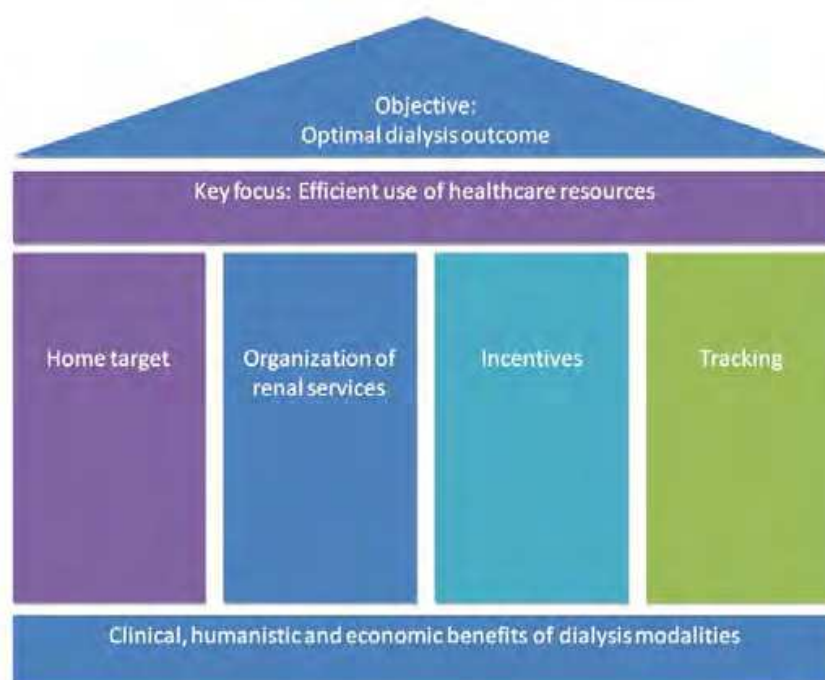


Fig. 1. Framework for renal policy and reimbursement

### 3. The analysis

Publicly available information on the organization of dialysis care in 14 target countries was reviewed and scored using a semi-quantitative scoring algorithm based on the 4-pillar framework (Table 1). The relationship between the score and the percent of patients performing dialysis at home (as per the latest information available, i.e., 2008 data from the European Renal Association-European Dialysis and Transplant Association renal registry, the United States Renal Data System, the Canadian Organ Replacement Register, the MNC Medical Netcare report for Germany and a publication by Gloor, 2010 for Switzerland) was explored with a regression analysis. An analysis of variance was performed to identify which factors of the 4-pillar framework were more associated with a higher usage of home modalities. The evolution of home dialysis usage during the a 5-year period (2004 to 2008) in

countries where the data was available was plotted on a graph to identify trends and try to relate them to changes in the respective local healthcare system.

Pillar	Score	Description
<b>1 Home target</b>	+1	per 15% target
<b>2 Organization of renal services</b>		
<b>Provider-driven demand</b>	-2	Provider “profit” largely favouring in-centre modalities
	-1	Important in-centre haemodialysis over capacity or tariffs too low to cover all costs
	0	No significant provider profit imbalance between modalities
<b>Pre-dialysis education</b>	-1	Presence of information bias due to prescriber being also provider of dialysis services
	0	No well organized pre-dialysis education
	+1	Pre-dialysis education in usage in most of the centres. Could be secured in a guideline or other official document.
<b>Assisted dialysis</b>	-1	Significant hurdles to supply and/or finance
	0	Per case basis
	+1	Official tariff
<b>Payment flow</b>	-1	Payment for home modalities via a different channel than in-centre modalities
	+1	Payment for all modalities going through hospital
<b>RRT career/home guideline/policy</b>	0	Absence of guideline/ policy recommending home modalities
	+1	Presence of a guideline or other official recommendation/ document favouring home modalities
<b>3 Incentive</b>	0	No incentive for home modalities
	+1	Presence of an incentive (e.g., key performance indicator, bonus scheme) favouring home
<b>4 Tracking</b>	0	No registry or other means of tracking the epidemiology and survival of dialysis patients
	+1	Existence of a registry recording/reporting incidence and prevalence with or without survival
	+2	Existence of a registry recording/reporting in addition some intermediate quality indicators with or without recommendations for changes
	+3	Existence of a registry recording/reporting final quality indicators such as evolution of survival with time, infections and hospitalizations rates

Table 1. Scoring criteria

## 4. Results

### 4.1 Pillar 1 - Home target

Some countries (Figure 2) have set a target for dialysis patients to be treated at home. This target is either for peritoneal dialysis as in Norway (30%), for home haemodialysis as in the UK (10-15%) or for home dialysis (i.e., peritoneal dialysis and home haemodialysis) as in Denmark (45%). The issuing body could be a government body or a government-appointed committee like in the UK or Denmark or an independent group of experts like Sweden or the nephrologist association like in Finland. In only a few instances (Austria, Denmark, Stockholm County) was this target accompanied by a timeline. Evidence of an implementation plan could not be found in any of the countries surveyed, except maybe in Ontario, one of the Canadian provinces (Provincial Peritoneal Dialysis Coordinating Committee, 2006).

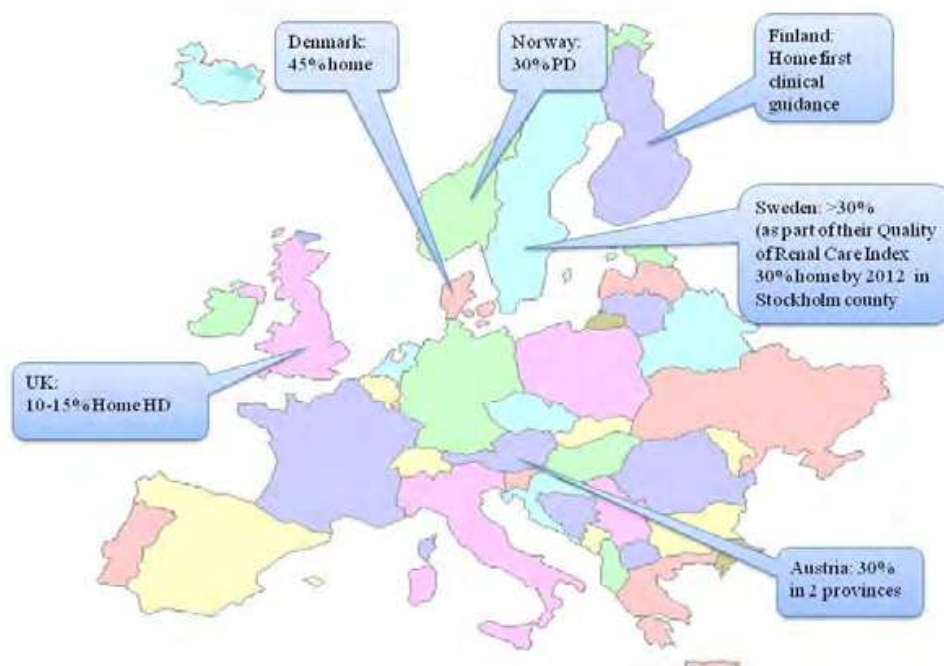


Fig. 2. Home targets

### 4.2 Pillar 2 – organization of renal services

Except for the USA, all countries have a public healthcare system. However, even in the USA, most dialysis patients are covered under the public system, Medicare (Mendelssohn DC, 2009). Dialysis providers are financed through either an overall department budget (e.g., Finland, some parts of Austria) or via a retrospective fee-for-service or prospective payment system like disease related groups. Transport costs and expensive medications such as erythropoietin stimulating agents or phosphate binders are paid through a different channel, increasing the difficulty for an exact comparison of costs between in-centre and home modalities. Medical monitoring is most of the time included within the tariff. In-centre haemodialysis has often the highest tariff and chronic ambulatory peritoneal dialysis the lowest. In some countries like Italy, the tariffs are more than 10 years old. In others like in the UK, France and the Nordic countries, a good tracking system of costs is in place and tariffs are updated on a yearly basis. In France, Austria, Denmark and Switzerland the



payment for home modalities is made via a different channel than in-centre modalities, therefore not contributing to the revenues of the dialysis centre where the prescriber of dialysis sits.

Healthcare tariffs are commonly set as closely as possible to the real costs. This is done in order to avoid creating an imbalance in “profitability” between services that would lead to an increased usage of one service over the others based on the “profits” it generates to the provider rather than based on the benefits it can bring to patients. In healthcare financing, this is called provider-driven demand. Most healthcare system would track healthcare costs (i.e., using paid tariffs) per type of provider, but provider costs are not publicly available. Therefore, the real costs of dialysis were not available for most countries and we could not estimate if there was a major difference in provider’s “profit” between home and in-centre modalities. However, based on the most recent analysis performed in Belgium (Cleemput et al, 2010) where automated peritoneal dialysis with more biocompatible and/or non glucose-based solutions is used in about 60% of the peritoneal dialysis patients, it can be seen that peritoneal dialysis costs to a dialysis provider (i.e., excluding transport and medications in the case of Belgium) are slightly lower than in-centre haemodialysis and in the same range as limited-care haemodialysis (Figure 3).

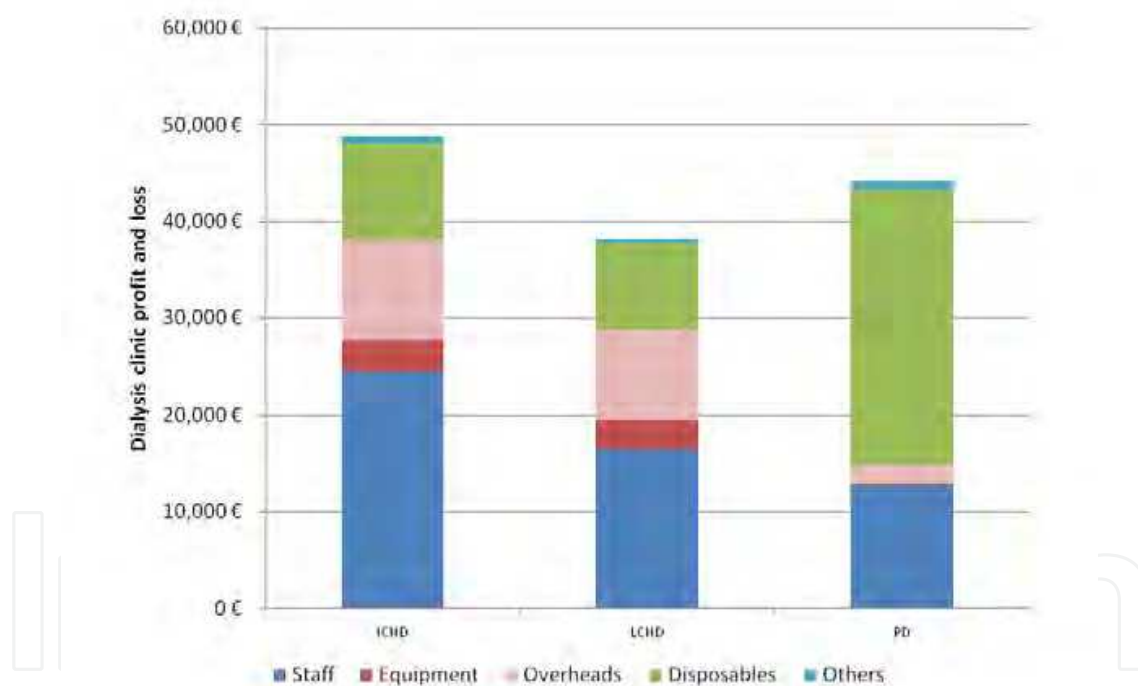


Fig. 3. 2006 costs of PD and HD to Belgium dialysis providers (Cleemput et al, 2010)

Therefore, the peritoneal dialysis and in-centre haemodialysis tariffs should not be too wide apart, otherwise it is likely to create a disproportionate “profit” in favour of in-centre haemodialysis. A large difference in tariffs in favour of in-centre modalities was found in most countries. In the USA, however, the recent changes in the tariffs are creating the reverse effect, i.e., disproportionate profit in favour of peritoneal dialysis. This was done on purpose, recognizing the overall lower healthcare costs associated with peritoneal dialysis (Berger et al, 2009; Cleemput et al, 2010; Figure 4) and changing the tariff setting method from cost-based to value-based.

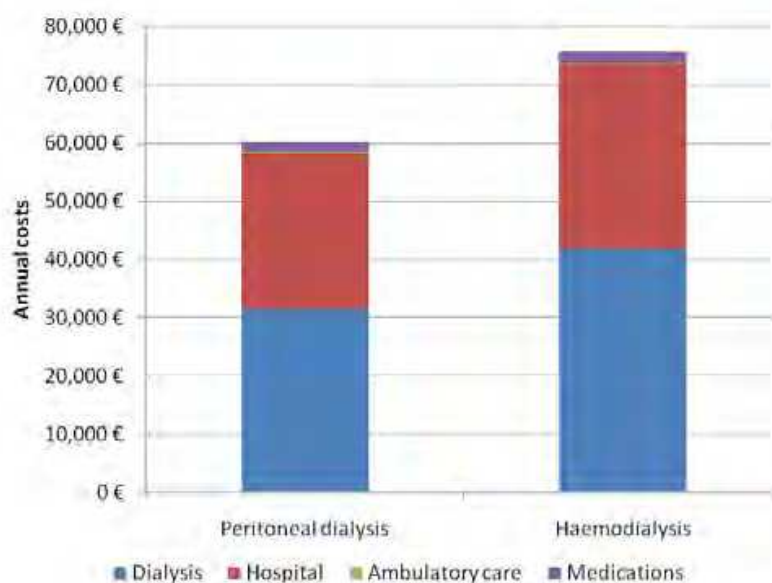


Fig. 4. 2006 Belgian total healthcare costs for dialysis patients (excluding transport; n=7230; Cleemput et al, 2010)

Well structured pre-dialysis education programs (where chronic kidney disease stage 4 patients are walked through the complications of the disease, the various renal replacement therapy modalities and the prevention measures to be taken to delay further decline in their renal function) exist mainly in Nordic countries. The USA has just implemented its new chronic kidney disease education program in 2010 and they are the only country so far with a payment attached to it (Medicare, 2010; Young et al, 2011).

Nursing assistance at home is available in some countries, but sometimes the financing is obscure and it is left to the nephrologist to organize.

Although most countries have some kind of guidelines on haemodialysis, peritoneal dialysis, or the management of anaemia, etc., none of them have a holistic guideline that sees end stage renal disease patients as cycling between various renal replacement therapies, therefore requiring focusing on the “big picture” rather than on each decision point separately (Braun Curtin et al, 2003). Finland, however, has a “home first” approach. It was originally developed by the Helsinki hospital (Honkanen & Rauta, 2008) but is followed throughout the country and is further supported by the nephrologist and patient associations’ quality of renal care criteria (Kidney and Transplant Patients Association, 2006). The British National Institute for Health and Clinical Excellence is currently preparing a clinical guideline for peritoneal dialysis. The draft that has been circulated for consultation (National Institute for Health and Clinical Excellence, 2011) mentioned the need to have patient-centred care where the patients’ needs and preferences are taken into account and where patients are enabled to make informed decisions on their options. The draft guidance also refers to the renal replacement therapy career concept. How this guideline will be implemented remains unclear at this moment.

### 4.3 Pillar 3 – incentives

In 2001, Belgium implemented a bonus scheme to favour the treatment of patients outside of the hospital premises (Royal Decree, 2006), and although PD benefited from it at the

beginning, limited care HD was the great winner of this bonus scheme. The USA is currently starting its Quality Incentive Program focusing on indicators such as anaemia and urea reduction ratio (Medicare, 2011). This is in fact a penalty scheme where payment is reduced by up to 2% if the dialysis provider fails to reach the quality standards. The UK has also recently published its quality standards for chronic kidney disease, but no intention to link them to payment has been announced yet (National Institute for Health and Clinical Excellence, 2010). In the Netherlands, the Hans Mak Institute is qualifying dialysis centres (including an on-site inspection and a patients' survey every 3 years); the standards as well as the results of the qualification are publicly available for patients to consult on their website (Hans Mak Institute, 2011).

#### 4.4 Pillar 4 – tracking

Renal registries exist in many countries. The data recorded are often only limited to the number of incident and prevalent patients as well as mortality. Morbidity indicators such as infections or hospitalizations are rarely recorded. Registries are not often used for planning purposes.

#### 4.5 Scores

Scores varied from -2 in Germany to +5 in Denmark, Sweden, Canada and Netherlands. All Nordic countries scored 4 or 5. The total score of each country is displayed in Figure 5 and a detailed description of the scoring results is given in Table 2.

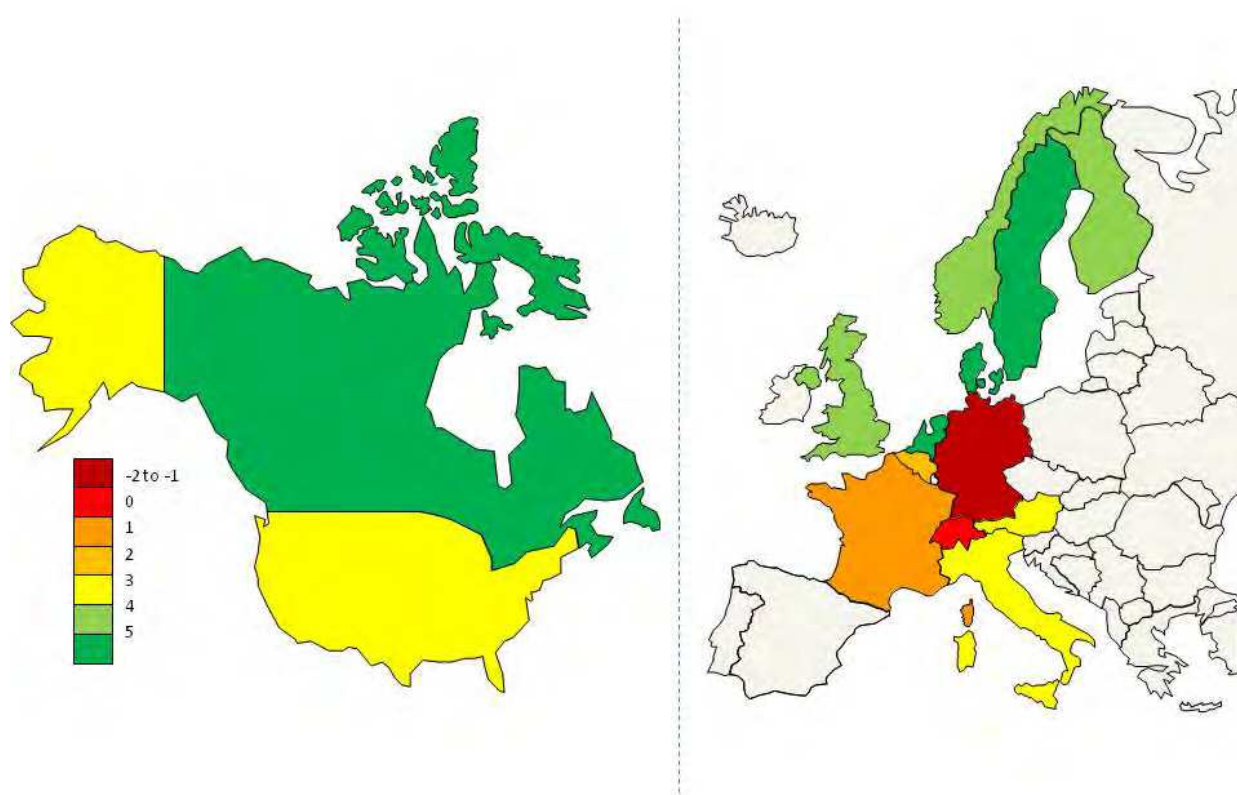


Fig. 5. 4-pillar framework total score



Country	Target	Provider-driven demand	Pre-dialysis education	Assisted dialysis	Payment flow	Clinical guidelines favouring RRT career/home modalities	Incentive	Tracking	Over-all rating	Home dialysis usage (2008)
<b>Denmark</b>	+3 home dialysis in 10 years (National Board of Health, 2006)	See under payment flow	+1 Implemented in most centres with some state of the art, but no mandatory requirement or tariff	-1 Financing is to be organized by nephrologist with municipalities	-1 No DRG earned by hospital for home modalities (corrected in 2011)	+1 Health technology assessment report supporting home modalities		+2 Tracking quality indicators. Link possible with national healthcare database to track hospitalizations	5	27.9%
<b>Sweden</b>	30% home by 2012 in largest county >20% PD (Renal Care Index, 2007)		+1 Documented in 2007 renal guidelines	Possible on a per case basis	+1	+1 Quality of renal care index Renal guidelines 2007	Quality of renal care index	+2 Tracking quality indicators and practice (cross-sectional report)	5	26.5%
<b>Finland</b>			+1 Secured in good renal patient management criteria from the kidney and liver patient association	On a per case basis	+1 Financing via hospital budget (i.e., based on real costs)	+1 Home first guidance followed throughout the country and secured in local policies and good renal patient management criteria from the nephrologist and patient associations		+1	4	25.5%

Table 2. Continued

Country	Target	Provider-driven demand	Pre-dialysis education	Assisted dialysis	Payment flow	Clinical guidelines favouring RRT career/home modalities	Incentive	Tracking	Over-all rating	Home dialysis usage (2008)
Netherlands		-1 Important in-centre HD over capacity	+1 Necosad guidance on pre-dialysis information	+1 Tariff for home HD and PD with nursing assistance	+1	+1 HansMak Institute guidelines		+2 HansMak Institute quality standards	5	22.4%
Canada	30% PD by 2010 in the largest province (Ontario)		+1	+1	+1	+1 Canadian Society of Nephrology favouring home dialysis		+1	5	21.7%
UK	+1 2002/2005 NICE guidance recommending 10-15% HHD	HHD tariff only indicative in 2011/2012 and requires negotiation between provider and NHS trust	+1	-1 No specific tariff, costs have to be assumed by dialysis centre or additional payment needs to be negotiated with NHS trust	+1	2011 NICE guidance on PD 2011 NICE chronic kidney disease quality standards recommending home dialysis	2011/2012 incentive for arterio-venous permanent access will increase the "profit" gap between HD and PD	+2	4	19.1%
Norway	+2 30% PD	-1 The use of HHD is slowed by several administrative hurdles to secure payment	+1	-1 Service available but no formal tariff, i.e., costs assumed by service provider	+1			+2 2009 report foresee lack of capacity in the future and the need to increase usage of home modalities	4	16.6%
Italy	General intent to treat more patients at home	-1 All tariffs not completely covering provider costs. Over in-centre HD capacity.		See incentive	+1	+1 Home first (in certain provinces)	+1 Some incentives to patients in Piemonte and Puglia	+1	3	11.4%

Table 2. Continued

Country	Target	Provider-driven demand	Pre-dialysis education	Assisted dialysis	Payment flow	Clinical guidelines favouring RRT career/home modalities	Incentive	Tracking	Over-all rating	Home dialysis usage (2008)
<b>Belgium</b>	See Incentive	-2 Large provider profit imbalance favouring ICHD	Recognized as an area that needs improvement in 2010 health technology agency report	+1 Tariff for PD and HHD	+1		+1 Bonus scheme favouring "out-of-hospital" modalities	+1	2	9.8%
<b>Austria</b>	+1 30% PD or home (in 2 provinces)	-1 No tariff for HHD. Only PD solutions reimbursed in some provinces.		+1 In some provinces as of 2009	-1 Home treatments funded via sickness funds (i.e., outside hospital budget). No tariff for HHD.		+1 Important lack of dialysis capacity in centres	+2 Tracking of dialysis quality indicators and patients' quality of life	3	8.8%
<b>Switzerland</b>	+1 Swiss dialysis contract with providers overall supports home modalities first	-1 In-centre HD overcapacity. Smaller provider profit with PD, no provider profit with HHD.	-1 Conflict of interest (prescriber is also the provider)	+1 Small payment to helping relative	+1			-1	0	8.6%
<b>France</b>	General intent to use the modality which is most appropriate to the patient	-1 MD honorarium penalizing home therapies Some regional authorities have recently set home dialysis targets		+1	-1 Payment flow penalizing home therapies			+2 Started in 2002 and covering most of the country now	1	8.4%

Table 2. Continued

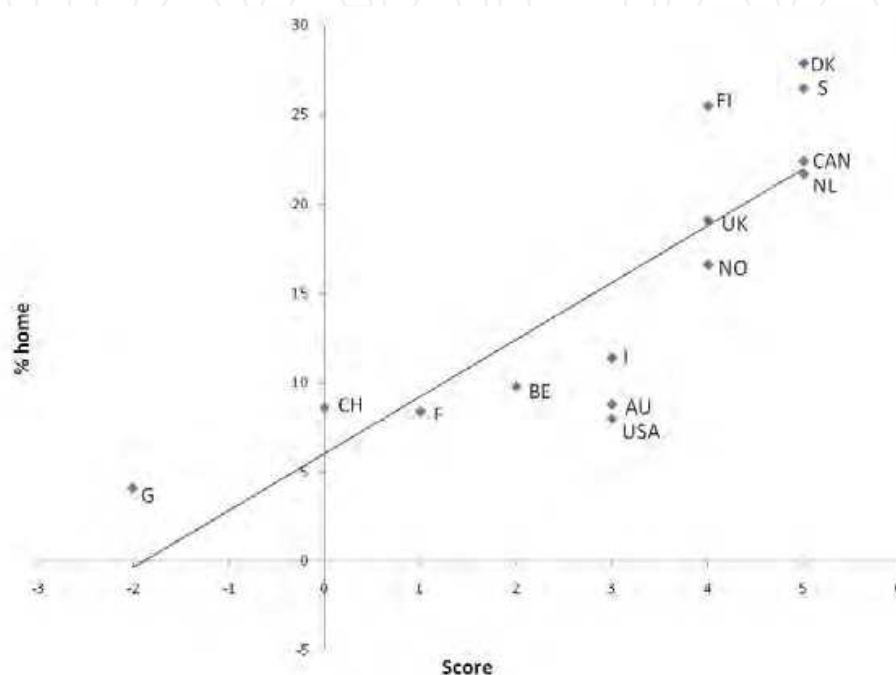
Country	Target	Provider-driven demand	Pre-dialysis education	Assisted dialysis	Payment flow	Clinical guidelines favouring RRT career/home modalities	Incentive	Tracking	Over-all rating	Home dialysis usage (2008)
USA (Medicare)		Provider profit favouring in-centre modalities. New payment favouring home therapies as of 2010	New pre-dialysis education tariff as of 2010	-1	+1		New quality incentive performance scheme to be in place in 2010/2011	+3	3	8.0%
Germany	Promotion of HHD by 2 large providers (KfH and PHV)	-2 Large in-centre HD over capacity. Low tariff overall forcing high efficiency of provider and therefore favouring in-centre modalities despite better margins for PD and limitations in number of HD patients per nephrologist	-1 Conflict of interest (prescriber is also the provider)	-1 Nursing assistance has to be assumed by providers	+1			+1 Via Quality Assurance in Dialysis program of Medical Netcare GmbH (commissioned by G-BA) since 2007	-2	4.5%

Table 2. Scoring

## 5. Analysis

### 5.1 Regression analysis

The regression analysis reveals a significant ( $p < 0.001$ ) correlation between the total score and the use of home dialysis. In countries like Denmark or Sweden where the score was 5, 26-27 % of their dialysis patients are treated at home. At the opposite end of the spectrum, Germany, which obtained a score of -2 is using home dialysis in only 4.2% of its dialysis population (Figure 5).



$r^2=0.694$ ;  $p < 0.001$ . AU: Austria; BE: Belgium; CAN: Canada; CH: Switzerland; DK: Denmark; F: France; FI: Finland; G: Germany; I: Italy; NL: the Netherlands; NO: Norway; S: Sweden; UK: United Kingdom; USA: United States of America

Fig. 6. Correlation between framework score and percent use of home dialysis

### 5.2 Analysis of variance

The analysis of variance showed that 3 factors were significantly predictive of home usage. These were pre-dialysis education ( $p < 0.001$ ), clinical guidelines/policies favouring home modalities ( $p = 0.002$ ) and (the absence of) provider-driven demand ( $p = 0.035$ ).

### 5.3 Time trends

The usage of home modalities over the 2004-2008 period was plotted on a graph to identify trends (Figure 6). Three different trends were observed. Small (3-5%) upward trends were observed in Denmark, Finland, Sweden and Canada, countries that already have a large proportion of their dialysis patients at home. A larger upward trend was observed in Austria (14%), but as the home usage was small to start with, this increase does not result in a significant absolute increase in home usage. The second trend was observed in countries like Belgium the USA, and Germany. These countries have a low usage of home modalities and there is no indication that this is changing. The third trend is seen in the Netherlands and in the UK, where home dialysis usage has markedly dropped over the 2004-2008 period,



from 27.7% to 22.4% in the Netherlands and from 25.9% to 19.1% in the UK, a 19% drop in the Netherlands and a 26% drop in the UK. It is interesting to note that these two countries implemented healthcare reforms during that time that had an overall objective of increasing competition among providers (that led to the opening of private dialysis centres) in the hope of decreasing healthcare costs.

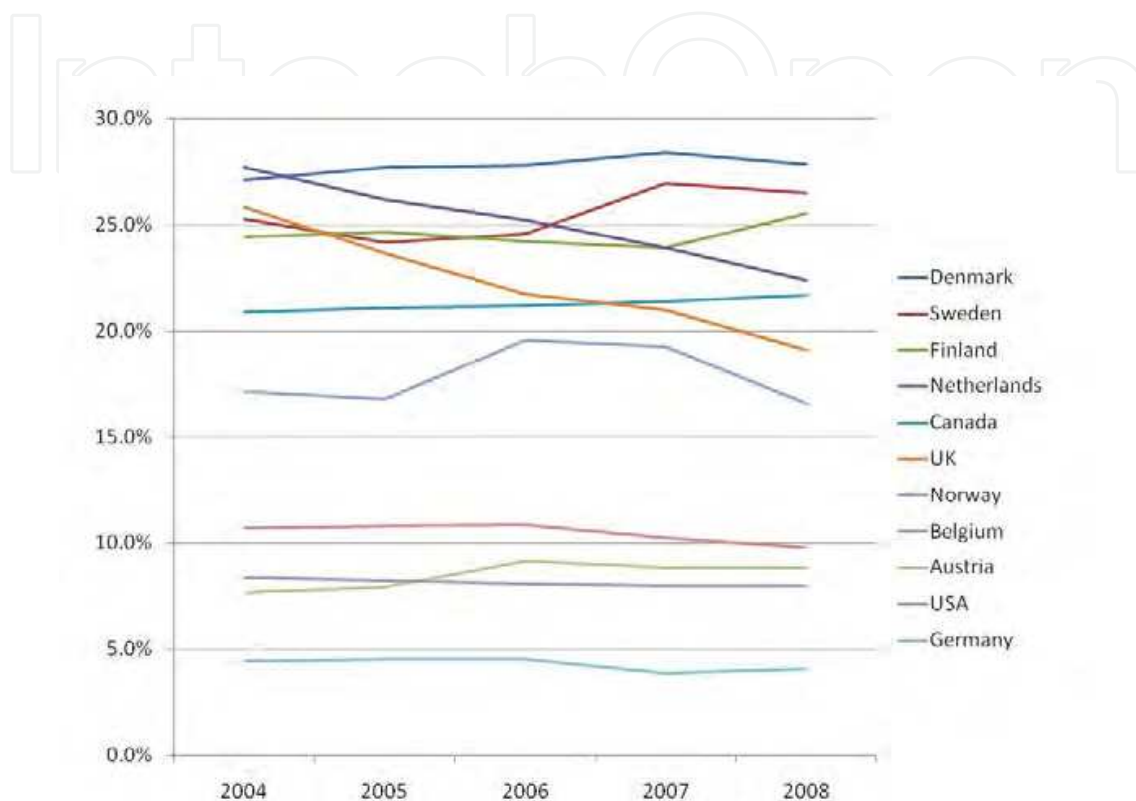


Fig. 7. Evolution of home dialysis usage over the 2004-2008 period

## 6. The recommendations

The 14 systems analyzed provide a series of possible avenues for change in local renal policy and reimbursement in order to create an environment that promotes home therapies such as peritoneal dialysis.

### 6.1 Pillar 1 – home target

Considering that 70% of patients are eligible for peritoneal dialysis and that when offered, 50% of them would choose peritoneal dialysis (Jager et al, 2004), a 35% target for peritoneal dialysis appears reasonable. For home haemodialysis, the literature cites approximately 10-15%. Therefore, ultimately, the goal should be to have around 45-50% of patients treated at home (35% peritoneal dialysis, 10-15% home haemodialysis). This target should be accompanied with an implementation plan to ensure better results. This implementation plan has been lacking in most countries that have such a target so far.

**Recommendation 1:** Set a reasonable proportion of patients (e.g., 10 to 15% over the current level up to 35% for peritoneal dialysis and 15% home haemodialysis) that should be treated at home within a set time frame (e.g., 5 years).

### 6.2 Pillar 2 – organization of renal services

The financing of dialysis in most countries with a high usage of home modalities is characterized by limited financial imbalance between modalities so that provider-driven demand (i.e., when the demand for a service is based on the benefits to the provider rather than the benefits to the patient) is avoided. This was a significant factor in the analysis of variance. Furthermore, in these countries, all payments are made via the same entity, i.e., the dialysis clinic.

**Recommendation 2:** Correct provider-driven demand by adjusting reimbursement levels to real costs or healthcare system value and use similar payment flow for in-centre and home modalities. Make healthcare costs more transparent by tracking provider costs and making them available to public.

Pre-dialysis education is well structured and organized in most countries with a high usage of home modalities. As mentioned earlier, when patients are informed of the various modalities, 50% of them will choose a home based therapy. The proportion is only slightly lower (35%) in the case of unplanned urgent start (Rioux et al, 2011). Pre-dialysis education, if performed in an unbiased way, should lead to a large increase in the use of home modalities. This factor was also significant in the analysis of variance.

**Recommendation 3:** Drive the development of high quality, unbiased, and ideally independent pre-dialysis education programs by providing adequate reimbursement for this activity.

Assisted dialysis is seldom available but is seen as a means to support home treatment. Assistance is not recommended for all patients but should be available for patients in some situations. For example, it can be useful while being trained for peritoneal dialysis or home haemodialysis; for patients who have had an urgent and unplanned start on dialysis to enable them to be discharged home before training starts; for patients or carers approaching burnout; for frail elderly patients who may not be able to manage all of their dialysis themselves; or for patients with particular mobility or dexterity problems who require assistance to enable dialysis at home.

**Recommendation 4:** Facilitate and actively encourage the adoption of home dialysis through the provision and reimbursement of assisted home dialysis.

Guidelines/policies on home dialysis were found in all countries with a high usage of home modalities. This was a significant factor in the analysis of variance.

**Recommendation 5:** Establish a holistic approach of dialysis care in an overall dialysis care guideline/policy integrating the patient “renal replacement therapy career” or “home first” concepts.

### 6.3 Pillar 3 - incentive

The Belgian financial incentive was effective in moving patients from in-centre haemodialysis to modalities where patients take more responsibility for their own therapy. This is the only example of a financial incentive available at the country level in the 14-country sample. The Italian incentive is only available in two provinces, while in Austria the incentive is the lack of resources rather than a financial incentive. These may not be sufficient to counteract the payment flow issue in Austria and the provider-driven demand

in both countries. However, limited care haemodialysis performed in a hospital environment should be excluded of such a financial incentive as it defeats the purpose of home, i.e., no impact on hospital acquired infections, lower impact on patient’s schedule and quality of life.

Penalties or incentives on outcomes have only been recently implemented in dialysis and their impact is yet to be measured. However, there are examples in other fields of medicine, e.g., the Centers for Medicare and Medicaid Services and Premier Hospitals Quality Incentive Demonstration program on 34 key performance indicators for 5 target diseases where a bonus or penalty is given to hospital lying outside of the norm (top and last 2 deciles); UK Quality Outcomes Framework to increase delivery of chronic care; Centers for Medicare and Medicaid Services non-payment for iatrogenic conditions, nosocomial infections and other similar complications; UK fine program on methicilin-resistant *Staphylococcus aureus* and *Clostridium difficile* infections. In their recent paper, Finkelstein et al, 2011, suggested a series of 12 quality improvement domains adapted from the Kidney Disease Outcomes Quality Initiative recommendations that could represent good targets for a dialysis related quality incentive.

**Recommendation 6:** Implement a financial incentive (that could be temporary until the target is reached) that will reward centres achieving a certain proportion of patients treated at home.

**Recommendation 7:** Implement a penalty for poor outcomes such as survival or hospitalizations/complications and/or for failing to meet set centre home dialysis targets.

#### 6.4 Pillar 4 – tracking

With the exception of the US (great quality registry but low usage of home) and Canada (low quality of registry but high usage of home), countries with a high usage of home modalities have good renal registries that track not only incidence, prevalence and mortality, but also quality indicators, morbidities (such as complications or hospitalizations) and changes in survival over time.

**Recommendation 8:** Establish a renal registry that will track morbidity (e.g., hospitalizations, days in hospitals, infections, complications, etc.) and changes in survival over time and use the data to assess impact of renal care policies and to plan future needs for renal services and healthcare professional training.

The recommendations are summarized in Table 4.

Framework pillar	Recommendation number	Recommendation
Home target	1	Set a reasonable proportion of patients (e.g., 10 to 15% over the current level up to 35% for PD and 15% home HD) that should be treated at home within a set time frame (e.g., 5 years).
Organization of renal services	2	Correct provider-driven demand by adjusting reimbursement levels to real costs or healthcare system value and use similar payment flow for in-centre and home modalities. Make healthcare costs more transparent by tracking provider costs and making them available to public.

Framework pillar	Recommendation number	Recommendation
	3	Drive the development of high quality, unbiased, and ideally independent pre-dialysis education programs by providing adequate reimbursement for this activity.
	4	Facilitate and actively encourage the adoption of home dialysis through the provision and reimbursement of assisted home dialysis
	5	Establish a holistic approach of dialysis care in an overall dialysis care guideline/policy integrating the patient "RRT career" concept.
<b>Incentives</b>	6	Implement a financial incentive (that could be temporary until the target is reached) that will reward centres achieving a certain proportion of patients treated at home.
	7	Implement a penalty for poor outcomes such as survival or hospitalizations/complications and/or for failing to meet set centre home dialysis targets.
<b>Tracking</b>	8	Establish a renal registry that will track morbidity (e.g., hospitalizations, days in hospitals, infections, complications, etc.) and changes in survival over time and use the data to plan future needs for renal services and healthcare professional training.

Table 4. Recommendation for change in renal services

## 7. Discussion

The cross-sectional nature of the analysis prevents the identification of a causal relationship between the score on the 4-pillar framework and the use of home modalities. The recent changes in the US and in the UK will be kept on the radar screen for their impact on home modalities. Small (3-5%) upward trends in the usage of home modalities were observed in most Nordic countries and Canada from 2004 to 2008, all countries that scored highly on the framework. The common themes between these 4 countries are the lack of provider-driven demand, well structured pre-dialysis education programs, and clinical guidelines/policies favouring home modalities, i.e., the 3 factors identified as significant in the analysis of variance. On the other hand, the remarkable decrease in usage of home modalities observed in the UK and the Netherlands while these countries are trying to let the market forces play a more active role seems to be detrimental to therapies such as home dialysis that generate savings outside of the budget scope of the dialysis providers. Provider efficiency may not always be compatible with overall healthcare system efficiency.

With lower income countries such as Hong-Kong, Mexico and Latin America having a high usage of peritoneal dialysis and higher income countries having a high usage of haemodialysis, it is tempting to conclude that peritoneal dialysis might be an inferior good, i.e., one for which the usage is decreasing as income increases (like cheap cars or inter-city bus transport). However, our analysis showed that countries such as the Nordics, that have an elevated gross domestic product, also have a high usage of home modalities. This is not supporting an inferior good status for peritoneal dialysis.

It is likely that no single factor is the secret weapon and that any change in the usage of home modalities will be the result of the inter-relation of the various factors described by the 4-pillar framework and maybe other factors not taken into consideration in this analysis (Chaudhary et al, 2011, Finkelstein FO et al, 2011). Nevertheless, it is reasonable to think that improving the score on the 4-pillar framework, and especially on the 3 factors identified by the analysis of variance (i.e., absence of provider-driven demand, well structured pre-dialysis education programs, clinical guidelines favouring home) would impact on the usage of home modalities.

## 8. Conclusions

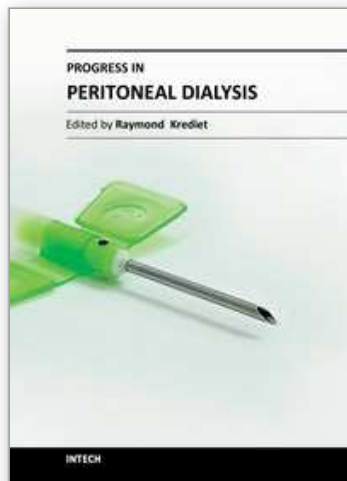
The analysis of the organization of dialysis services in 14 countries allowed the identification of several factors organized in a 4-pillar framework that favour the use of home modalities. Furthermore, several avenues for improvement were identified in the course of the analysis and have been used to suggest a series of 8 recommendations for change in renal policy and reimbursement. Some of these recommendations are in the process of being implemented (although secondary to a process totally independent from this analysis) in some countries. It will be interesting to assess the impact of the USA quality incentive program, the pre-dialysis education program and the new reimbursement tariffs on the usage of home dialysis in the years to come.

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