Organisatie en financiering van chronische dialyse in België

KCE reports 124A

Federaal Kenniscentrum voor de Gezondheidszorg
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Contact

Federaal Kenniscentrum voor de Gezondheidszorg (KCE)
Administratief Centrum Kruidtuin, Doorbuilding (10e verdieping)
Kruidtuinlaan 55
B-1000 Brussel
Belgium

Tel: +32 [0]2 287 33 88
Fax: +32 [0]2 287 33 85

Email: info@kce.fgov.be
Web: http://www.kce.fgov.be

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IRINA CLEEMPUT, CLAIRE BEGUIN, YOLANDE DE LA KETHULLE, SOPHIE GERKENS,
MICHEL JADOUL, GERT VERPOOTEN, CHRIS DE LAET

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Titel:	Organisatie en financiering van chronische dialyse in België
Auteurs:	Irina Cleemput (KCE), Claire Beguin (UCL), Yolande de la Kethulle (UCL), Sophie Gerkens (voorheen UCL, nu KCE), Michel Jadoul (UCL), Gert Verpooten (UA), Chris De Laet (KCE)
Reviewers:	Christian Léonard (KCE)
Externe experts:	Jean-Marie Billiouw (NBVN), Dirk Corens (UZ Brussel), Daniel Crabbe (RIZIV), Bart De Moor (NBVN), Luc Frimat (CHU Nancy, France), Norbert Lameire (UGent), Joëlle Nortier (GNFB), Jean-Michel Pochet (GNFB), Gauthier Saelens (Grand Hôpital de Charleroi), Koenraad Stas (Virga Jesse Ziekenhuis Hasselt), Robert Van den Oever (CM).
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Externe validatoren:	Willem Geerlings (MC Haaglanden, Nederland), Filip Roodhooft (KULeuven), Dirk Wouters (RIZIV)
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VOORWOORD

Eindstadium nierfalen is een chronische levensbedreigende aandoening die in principe op twee manieren kan worden behandeld: door middel van levenslange dialyse of door middel van niertransplantatie. De organisatie en financiering van dialyse is een punt dat blijft terugkeren op de agenda van het RIZIV. De kosten voor het RIZIV van dialysebehandelingen nemen elk jaar toe. Er worden verschillen vastgesteld tussen België en andere landen in de mate waarin wordt gekozen voor de veronderstelde "lagere kosten" dialysebehandelingen, met name peritoneale dialyse en hemodialyse in satellietcentra. Het Belgische financieringssysteem is ook vrij uniek in z'n soort.

Deze studie concentreert zich voornamelijk op de criteria voor de keuze tussen de verschillende dialysemodaliteiten: hemodialyse in het ziekenhuis, hemodialyse in een satellietcentrum of thuis, peritoneale dialyse. Daarnaast wordt ook gekeken naar de organisatie van chronische dialyse in België, de kosten van de verschillende alternatieve dialysemodaliteiten en de financiering van deze activiteiten. Hebben de inspanningen om de alternatieven naast de klassieke hemodialyse in het ziekenhuis te stimuleren hun doel bereikt of niet? Tenslotte stellen we ons ook de vraag in hoeverre de patiënt hierbij mag meepraten.

Met deze studie hoopt het KCE een aantal inzichten te verschaffen in de situatie van chronische dialysebehandeling in België die kunnen bijdragen tot de discussies en onderhandelingen in het kader van een mogelijke hervorming van de financiering van de chronische dialyse. Dit neemt niet weg dat er een aantal politieke keuzen zullen moeten worden gemaakt, waar deze studie geen pasklare oplossingen voor kan bieden.

Wij willen bij deze graag de ziekenhuizen en patiëntenverenigingen bedanken die bereid waren een bijdrage te leveren aan deze studie door aan onze bevragingen mee te werken. Zoals steeds is hun bijdrage essentiëel wanneer men ijvert voor een billijke, betaalbare en kwaliteitsvolle gezondheidszorg.

Jean-Pierre CLOSON
Adjunct Algemeen Directeur

Raf MERTENS
Algemeen Directeur

Samenvatting

ACHTERGROND

Nierfunctievervangende therapie (NVT) is een levensreddende en erg doeltreffende ondersteunende behandeling voor alle patiënten met eindstadium nierfalen, i.e. patiënten die om een of andere reden te maken krijgen met een falende nierfunctie. In wezen bestaan er twee types van NVT: dialyse en niertransplantatie. Niertransplantatie wordt beschouwd als de eerstekeuzebehandeling omdat het resultaat beter is en de kostprijs lager. Niet alle patiënten komen echter in aanmerking voor een niertransplantatie en de meeste in aanmerking komende patiënten moeten eerst wachten tot een geschikte nier beschikbaar komt. Deze patiënten worden behandeld met één of een opeenvolgende combinatie van dialysevormen:

- Hemodialyse in een ziekenhuisomgeving (ziekenhuis-HD): vorm van "hoge zorg" hemodialyse in een ziekenhuis of equivalent centrum waarbij alle zorg wordt vertrekt door het medisch en para-medisch personeel.
- Hemodialyse in a satellieteenheid (satelliet-HD): voornamelijk "lage zorg" hemodialyse (soms 'zelfzorg HD' genoemd) waarbij een deel van de noodzakelijke handelingen voor de dialyse door de patiënt worden uitgevoerd, met een beperktere aanwezigheid van nefrologen en verpleegkundig personeel. Satellietcentra voor HD kunnen ondergebracht zijn in een ziekenhuis of in een afzonderlijk gebouw. Een satellite-HD eenheid is altijd verbonden aan een erkend centrum voor ziekenuis-HD.
- Peritoneaaldialysis (PD): in tegenstelling tot HD maakt PD gebruik van het peritoneaal membraan als een semi-permeabel mebraan, in plaats van een kunstmatig membraan. De twee voornaamste categorieën van PD zijn continue ambulante peritoneaaldialyse (CAPD) en automatische peritoneaaldialyse (APD). CAPD maakt, in tegenstelling tot APD, geen gebruik van machines voor de toelevering en drainage van de dialysevloeistoffen.
- Thuis-hemodialyse (thuis-HD): haemodialysis bij de patient thuis, waarbij hoofdzakelijk de patiënt zelf alle noodzakelijke handelingen voor de dialyse uitvoert.

Satelliet HD, PD and home HD zijn allen 'lagere zorg' dialysevormen in vergelijking met ziekenhuis-HD. Zij worden samen de "alternatieve dialysevormen" genoemd doorheen dit rapport. Een ziekenhuis-HD centrum is verantwoordelijk voor de supervisie van alle patiënten die worden behandeld met één van de alternatieve dialysevormen.

Chronische dialyse heeft een zeer ingrijpende impact op het leven van een patiënt. Wegens de verschillen in het behandelingsschema en de plaats van behandeling tussen de verschillende dialysevormen –ziekenhuis-HD vindt bijvoorbeeld typisch plaats drie maal per week gedurende 4 uur in een ziekenhuis, terwijl PD dagelijks gebeurt bij de patiënt thuis- is mogelijks de (gepercipieerde) impact op het dagelijks leven van patiënten eveneens verschillend tussen de dialysevormen. Dialysevormen kunnen niet worden beschouwd als perfecte substituten voor elkaar vanuit het standpunt van de patiënt. Patiëntenvoorkeuren worden een belangrijk element in de keuze van een dialysevorm.

Dialyse is een betrekkelijk dure behandeling. De terugbetalingskosten voor het Rijksinstituut voor Ziekte- en Invaliditeitsverzekering (RIZIV) stijgen voortdurend (van €206 miljoen in 2000 tot bijna €336 miljoen in 2008). Dit wordt grotendeels veroorzaakt door het toenemende aantal patiënten op NVT (tussen 2002 en 2007 nam de populatie toe met 26%). Binnen de populatie met NVT, steeg de proportie van patiënten ouder dan 65 jaar het snelst (+40% tussen 2002 en 2007). De dialysekosten voor het RIZIV zullen waarschijnlijk nog verder stijgen door de veroudering van de bevolking. Daarom willen besluitvormers manieren vinden om de dialysekosten onder controle te houden terwijl echter ook de hoge kwaliteit van de zorgverlening behouden blijft. De hamvraag is of meer patiënten kunnen worden behandeld met alternatieve dialysevormen die waarschijnlijk goedkoper zijn in vergelijking met ziekenhuis-HD, en of de financiële stimulansen die tot nu toe werden gecreëerd geschikt zijn om een efficiëntie toewijzing van dialysemiddelen te garanderen.

DOELSTELLINGEN

De doelstellingen van dit rapport zijn:

- de verschillende behandelingsopties voor patiënten met eindstadium nierfalen te beschrijven, een literatuuroverzicht te maken van de beschikbare evidence over de klinische effectiviteit, kosten-effectiviteit en levenskwaliteit van patiënten in verschillende dialysevormen en een overzicht te geven van de selectiecriteria voor verschillende dialysevormen die in de literatuur worden beschreven (hoofdstuk 2):
- het relatieve gebruik van verschillende dialysemodaliteiten in België te beschrijven evenals het wettelijke kader voor de verstrekking en financiering van dialyse (hoofdstuk 3);
- de patiëntenpopulatie te beschrijven en de kosten en budgettaire impact voor het RIZIV en voor de patiënten in te schatten van verschillende de dialysevormen (hoofdstuk 4).
- de kosten van de verschillende dialysevormen te berekenen vanuit het standpunt van het ziekenhuis en de kosten en opbrengsten van een dialyseprogramma te vergelijken (hoofdstuk 5);
- de Belgische situatie te vergelijken met die in andere landen (hoofdstuk 6);
- de patiëntgerelateerde problematiek bij de verschillende dialysevormen te beschrijven (hoofdstuk 7) en
- conclusies te trekken over de organisatie en financiering van dialyse in België (hoofdstuk 8).

Deze studie concentreert zich voornamelijk op de dialysevormen die het meest in België worden gebruikt voor de behandeling van patiënten met eindstadium nierfalen. Niertransplantatie wordt niet ten gronde onderzocht, maar wel besproken indien aangewezen.

METHODEN

Voor de beschrijving van de klinische en economische evidence van chronische dialysebehandeling, alsook van de levenskwaliteit in geval van de verschillende dialysevormen en aspecten gerelateerd and pre-dialyse patiënteneducatie, werd een literatuuroverzicht gemaakt. De standaard KCE-procedures voor literatuuroverzicht werden gevolgd.

Om de epidemiologie van eindstadium nierfalen en dialysebehandelingen in België te beschrijven, werden twee gegevensbronnen gebruikt: (1) het meest recente gemeenschappelijk jaarverslag van de Belgische verenigingen voor nefrologie en (2) gegevens over de kenmerken van dialysepatiënten en behandelingsmodaliteiten uit de databank van het IMA (Intermutualistisch Agentschap) tussen 2003 en 2006.

Met de gegevens van het IMA konden ook de uitgaven van het RIZIV voor chronische dialysepatiënten en de eigen bijdragen van de patiënten worden geanalyseerd. 'Chronische dialyse' werd gedefinieerd als minstens 7 opeenvolgende weken (terugbetaalde) chronische dialysebehandeling, ongeacht het jaar. De patiënten werden in 8 profielen opgedeeld in functie van hun volledige voorgeschiedenis van dialysebehandeling tijdens de periode 2003-2006: ziekenhuis-HD, satelliet-HD, PD, HD en een aantal combinatieprofielen.

Een vragenlijst werd naar meer dan 50 dialysecentra in België gezonden om een inschatting te kunnen maken van de kosten van de verschillende dialysevormen voor het ziekenhuis. Slechts 8 centra stuurden uiteindelijk de vragenlijst terug. Deelname was anoniem en antwoorden werden verstuurd via een betrouwbare derde partij. In de analyse werd rekening gehouden met de variabiliteit van de gemelde volumes van gebruikte middelen en kosten per eenheid. Ondanks het beperkte responspercentage leken de resultaten consistent te zijn met de verwachte verhoudingen tussen kostenposten en behandelingsmodaliteiten. Zoals verwacht waren de personeelskosten bijvoorbeeld hoger voor ziekenhuis-HD dan voor satelliet-HD en hoger voor satelliet-HD dan voor thuis-HD. Een kosten-opbrengstenmodel werd ontwikkeld om het nettoresultaat (kosten – opbrengsten) te schatten voor een hypothetisch dialyseprogramma met 100 dialysepatiënten. Er werd rekening gehouden met het feit dat sommige kosten op korte of middellange termijn vast of semi-vast zijn. Kosten en opbrengsten werden uitgedrukt in waarden voor het jaar 2006.

Voor de internationale vergelijking werden de bevindingen van de "International Study of Health Care Organization and Financing (ISHCOF)" betreffende de financiering van ESRD in 12 hoog-inkomenslanden (Australië, België, Canada, Engeland en Wales, Frankrijk, Duitsland, Italië, Japan, Nieuw-Zeeland, Spanje, Zweden en de Verenigde Staten) samengevat.

De patiëntgerelateerde aspecten werden onderzocht door middel van een schriftelijke vragenlijst die naar enkele patiëntenorganisaties en patiënten werd gezonden via de Federatie van Belgische Verenigingen voor Nierinsufficiënten (Fenier). Hoewel verschillende praktische beperkingen de implementatie van een onderzoeksprotocol van hoge kwaliteit verhinderden, kwamen onze resultaten overeen met de bevindingen uit studies gepubliceerd in peer-reviewed literatuur.

RESULTATEN

KLINISCH EN ECONOMISCH BEWIJSMATERIAAL UIT DE LITERATUUR

Het valt op dat in de literatuur geen overtuigend bewijsmateriaal werd gevonden inzake verschillen in mortaliteit, morbiditeit of levenskwaliteit die te wijten zouden zijn aan de specifieke dialysevorm zelf. Met uitzondering van één enkele studie waren alle studies zuiver observationeel met slechts een beperkte mogelijkheid tot correctie voor vertekening ('confounding') en voornamelijk vertekening door indicatie ('confounding by indication'). De resultaten van sommige grote registers lijken te wijzen op een betere overleving voor patiënten met specifieke condities die in de beginperiode starten met PD en daarna overgaan naar HD. Deze registers hebben echter ook verschillende vertekeningen en 'confounding by indication'. Zeer weinig patiënten zijn bereid om willekeurig toegewezen te worden aan een dialysevorm. Gerandomiseerde gecontrolleerde studies over dialysevormen zijn daardoor vrijwel onmogelijk gebleken.

Volgens de literatuur is ziekenhuis-HD duurder dan satelliet-HD, thuis-HD en PD vanuit het standpunt van zowel de gezondheidszorgbetalers als de aanbieders van gezondheidszorg. Economische studies die thuis-HD vergelijken met satelliet HD spreken elkaar tegen. Beginnen met PD is volgens de literatuur minder duur en even of meer doeltreffend dan beginnen met HD .

SELECTIE CRITERIA VOOR DIALYSEVORMEN

Medische indicaties en contra-indicaties voor specifieke dialysevormen zijn voornamelijk gebaseerd op de opinies en consensus van deskundigen. Voor de meerderheid van de patiënten (64% volgens een grote Nederlandse cohorte studie in meerdere centra) zijn er geen medische indicaties en contra-indicaties voor specifieke dialysevormen. De keuze van dialysevorm wordt noch door de richtlijnen van American Nephrology, noch door de richtlijnen van de European Renal Association besproken. In Australië (2005) en Frankrijk (2008) werden dergelijke richtlijnen echter wel geproduceerd.

Bij gebrek aan specifieke indicaties of contra-indicaties zou volgens de literatuur de keuze van een dialysevorm voor de patiënt voornamelijk moeten worden bepaald door de persoonlijke voorkeur van een volledige geïnformeerde patiënt. Pre-dialyse vorming en voorbereiding van patiënten wordt als belangrijk beschouwd door deskundigen, patiënten en hun familieleden. De studie van strategieën voor een adequate pre-dialyse informatie en vorming van patiënten viel buiten het bereik van dit project.

ORGANISATIE EN GEBRUIK VAN DIALYSE IN BELGIE

Epidemiologie

In 2007 werden ongeveer 11 400 prevalente patiënten behandeld met NVT, waaronder ongeveer 6 700 dialysepatiënten en ongeveer 4 700 getransplanteerde patiënten. Vergeleken met 2002 betekende dit een stijging van de prevalentie van NVT met 26%. De proportie patiënten ouder dan 75 jaar in deze populatie van 11 000 patiënten op NVT steeg in die periode van 19% tot 27%. Van de dialysepopulatie alleen was twee derde van de patiënten 65 jaar of ouder en 41,5% was ouder dan 75 jaar in 2007. De stijging van het percentage oudere patiënten die dialyse ondergaan, heeft voornamelijk een invloed gehad op het gebruik van ziekenhuis-HD waar het aandeel van de oudere patiënten sneller steeg dan bij de andere dialysevormen.

De overleving van chronische dialysepatiënten ligt laag in vergelijking met de algemene bevolking. In onze overlevingsanalyse, gebaseerd op de IMA-gegevens van ongeveer 8 000 patiënten die startten op dialyse (i.e. incidente patiënten), bedroeg het overlevingspercentage vier jaar na de start op dialyse gemiddeld minder dan 40%. Dit overlevingspercentage was slechter voor ziekenhuis-HD en beter voor PD en satelliet-HD. Deze vaststelling is waarschijnlijk echter te wijten aan het feit dat patiënten met een hoog sterfterisico vaker met ziekenhuis-HD worden behandeld.

Vergeleken met andere landen (Nederland, Oostenrijk, Finland, Zweden en het VK) zijn patiënten op NVT in België gemiddeld 5 tot 9 jaar ouder. De gemiddelde leeftijd van incidente patiënten bedroeg bijna 69 jaar in 2007.

In 2007 was bij prevalente patiënten glomerulonefritis de voornaamste oorzaak voor eindstadium nierfalen (19%). Bij incidente patiënten zijn niervaatziekten en diabetische nefropathie echter belangrijker als oorzaak voor eindstadium nierfalen.

Behandelingsmodaliteiten

In 2007 werd ongeveer 66% van de chronische dialysepatiënten behandeld met ziekenhuis-HD. Satelliet-HD wordt door 24% en PD door 10 % van de chronische dialysepatiënten gebruikt. Er bestaat een zekere variabiliteit tussen de Belgische dialysecentra in de mate waarin zij alternatieve dialysevormen gebruiken. Centra in Vlaamse provincies hebben gemiddeld een hoger percentage van gebruik van satelliet-HD en PD dan centra in Waalse provincies, met uitzondering van de centra in Waals Brabant. Het gebruik van PD en satelliet-HD steeg tussen 2002 en 2007 van 28% tot 34%. De stijging was voornamelijk te wijten aan een toename van het gebruik van satelliet-HD.

In vergelijking met andere landen is in België het gebruik van PD beperkt. In Finland, Nederland en het Verenigd Koninkrijk, bijvoorbeeld, is de proportie van NVT patiënten (dialyse+transplantatie) die behandeld wordt met PD tussen de 8 en de 10%, terwijl dit in België ongeveer 5% is. De wachttijd voor niertransplantatie is in België echter korter (2 tot 2,5 jaar) dan in sommige andere landen.

Organisatie en financiering

De wet bepaalt de operationele en functionele criteria voor de erkenning van dialysecentra. Er worden voorwaarden opgelegd betreffende het aantal en de kwalificatie van medisch, verplegend en technisch personeel. Voor de verpleegkundigen wordt bepaald dat minstens 50% een speciale kwalificatie moet hebben in dialyseverpleegkunde. Een dergelijke kwalificatie bestaat echter officieel (nog) niet in België.

In 2007 bestonden er in België 53 hoofddialysecentra, waarvan er 49 één of meerdere satellietdialyse-eenheden hadden.

De financieringsmechanismen voor dialyse ondergingen over de jaren talrijke wijzigingen met als doel het gebruik van alternatieve dialysevormen te verhogen.

De huidige terugbetalingstarieven zijn weergegeven in Tabel 1.

Tabel 1: Terugbetaling van de verschillende dialysevormen in België (waarden op 1/1/2009)

Ziekenhuis-HD, per dialysesessie	
Basisforfait	€42.10
% van de ligdagprijs op 30 juni 2002	€20%
Bonus op forfait:	
als 5% ≤ percentage alternatieve dialyse < 10%	€31.41
als 10% ≤ percentage alternatieve dialyse < 25%	€76.96
als 25% ≤ percentage alternatieve dialyse < 35%	€100.43
als percentage alternative dialyse ≥ 25%	€105.95
minimumforfait	€119.27
Maximumforfait	€276.08
Honorarium	€199.74
ALTERNATIEVE DIALYSEVORMEN	
Thuis-HD:	
Met verpleegkundige assistentie	€309.96/sessie
Zonder verpleegkundige assistentie	€258.05/sessie
Peritoneaaldialyse:	
Met verpleegkundige assistentie	€927.43/week
Zonder verpleegkundige assistentie	€734.16/week
APD	€817.04/week
Onvolledige week peritoneaaldialyse :	
Met verpleegkundige assistentie	€132.49/dialysedag
Zonder verpleegkundige assistentie	€104.88/ dialysedag
APD	€116.72/ dialysedag

Ziekenhuis-HD wordt gefinancierd door een forfaitair bedrag en een medische vergoeding (honorarium) per sessie. Satelliet-HD en thuis-HD sessies worden terugbetaald aan het verantwoordelijke moedercentrum via een forfaitair bedrag per sessie. Voor thuisdialyse met ondersteuning van een verpleegkundige betaalt het RIZIV een hoger forfaitair bedrag. Het verantwoordelijke dialysecentrum moet het verschil tussen het forfaitair bedrag met en het forfaitair bedrag zonder verpleegkundige ondersteuning, betalen aan de thuisverzorgingsdienst die de ondersteuning biedt. Hoewel het bedrag voor ondersteuning door thuisverzorging vast is, variëren de betalingen die door de thuisverzorgingsdiensten ontvangen worden soms van het ene dialysecentrum t.o.v. het andere zonder duidelijke reden.

Openbaar vervoer van en naar het dialysecentrum wordt volledig terugbetaald aan de patiënten. Vervoer via andere middelen wordt sinds 1985 terugbetaald aan € 0,25 per km en is beperkt tot 30 km enkele reis. Sindsdien werd dit bedrag niet meer geïndexeerd. Sommige ziekenfondsen voorzien een bijkomende terugbetaling in het kader van de aanvullende verzekeringen.

RIZIV UITGAVEN

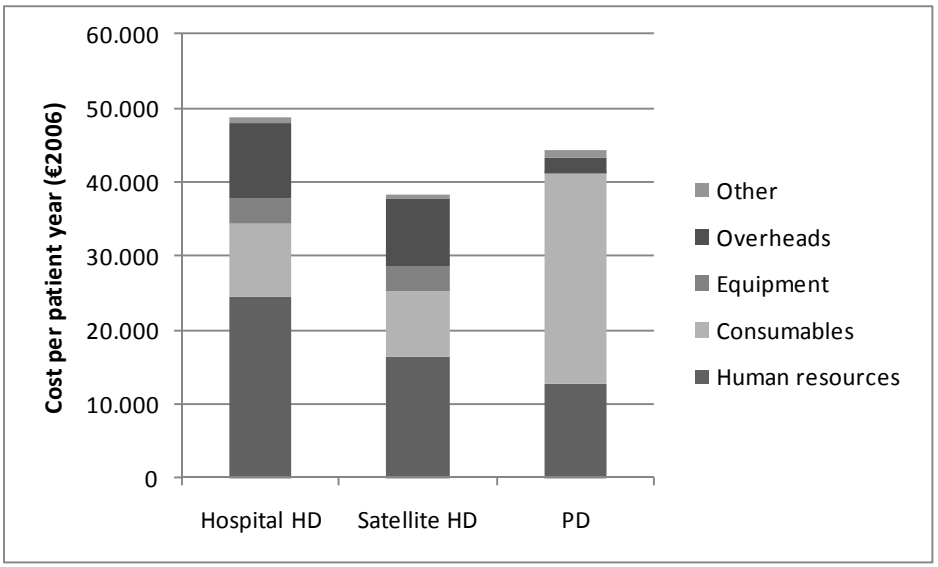
Zestig procent van de totale RIZIV uitgaven voor dialysepatiënten heeft betrekking op ambulante dialysebehandeling, gemiddeld €40 354 per patiënt in 2006. Eigen bijdragen van de patiënt zijn moeilijk te meten omdat ze worden beïnvloed door het inkomen, het verzekeringsstatuut en de bijkomende financiële voordelen die de ziekenfondsen bieden. Bovendien zijn de ligdagprijzen en sommige andere uitgaven, zoals zonder voorschrift verkrijgbare geneesmiddelen, niet opgenomen in de registratie van het IMA. Het totaal van de eigen bijdragen van de patiënt die samenhangen met gedeeltelijk terugbetaalde gezondheidszorgen, steeg van €6.1 miljoen in 2003 (n=6 804) tot €7.6 miljoen in 2006 (n=7 630).

Een longitudinale uitgavenanalyse, die begon 1 jaar voor het begin van de dialyse tot 4 jaar na de start van de dialyse, toonde dat de totale kosten voor terugbetaling van de gezondheidszorg beginnen te stijgen in de maanden die voorafgaan aan het begin van de dialyse, een piek bereiken tijdens de maanden na het begin van de dialyse en daarna geleidelijk beginnen af te nemen.

KOSTEN VAN DIALYSEVORMEN VANUIT HET STANDPUNT VAN HET ZIEKENHUIS

Voor een ziekenhuis wordt de jaarlijkse totale kostprijs van ziekenhuis-HD geraamd op €48 800 per patiënt (s.d. €3 266). Satelliet-HD kost ongeveer €38 300 per jaar per patiënt (s.d. 3 520) en PD zonder verpleegkundige ondersteuning ongeveer €44 200 per patiënt per jaar (s.d. 8 330). Figuur 1 toont het relatieve gewicht van elk van de kostenbestanddelen in de totale kosten voor elke behandelingsmodaliteit.

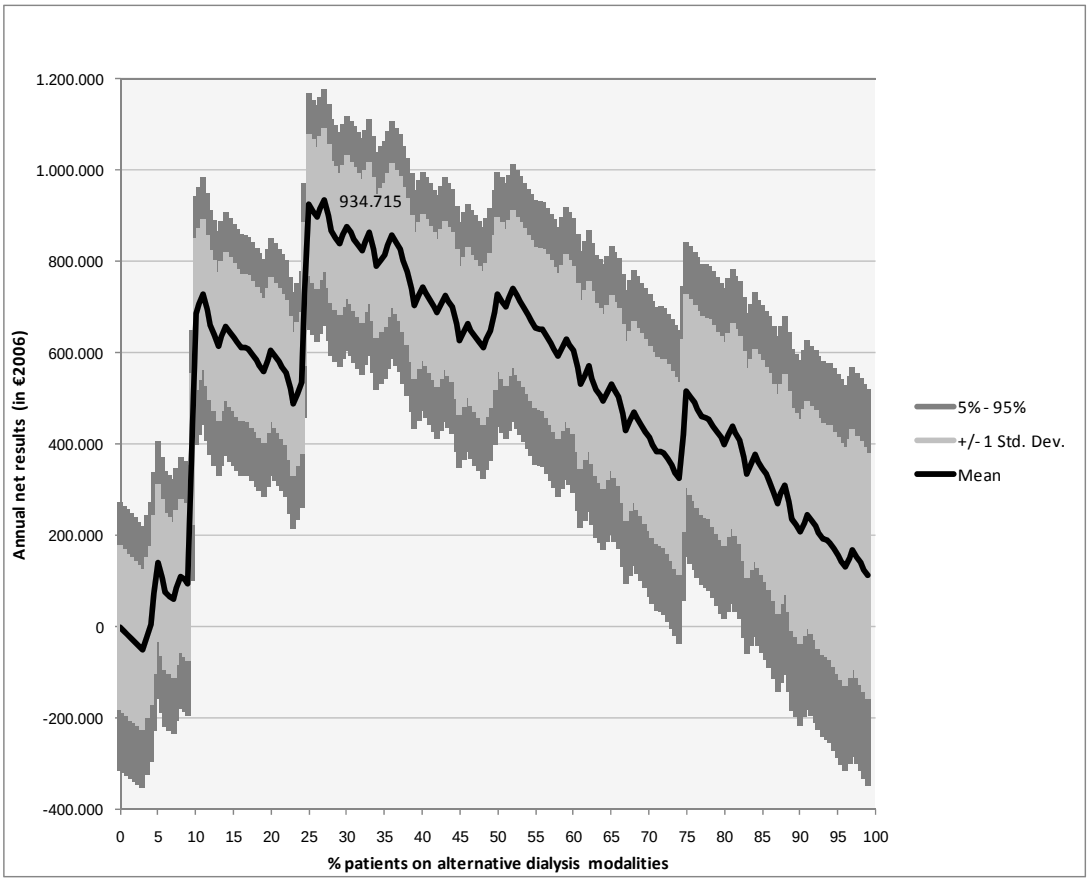
Figuur 1: Kosten van dialyse per patiënt per jaar vanuit het standpunt van het ziekenhuis (€2006)



Het is niet verwonderlijk dat personeelskosten het belangrijkste kostenbestanddeel vormen voor ziekenhuis-HD en satelliet-HD. De hogere kostprijs van PD in vergelijking met satelliet-HD wordt voornamelijk verklaard door de hoge kosten van consumptiegoederen voor PD, waarbij de kosten voor dialysevloeistoffen ongeveer 90% voor hun rekening nemen.

Volgens onze kosten-opbrengstensimulatie, en gegeven de huidige terugbetalingsmechanismen en -tarieven, zorgt een gemiddelde proportie patiënten op PD en/of satelliet HD van 28% voor maximalisering van de winst (figuur 2). De winst die met dit niveau van gebruik van alternatieve dialysevormen (exclusief thuis-HD) door een dialyseprogramma met 100 patiënten worden bekomen, bedraagt gemiddeld €934 715 per jaar. In 2006 bedroeg het gemiddelde percentage PD en/of satelliet HD in Belgische dialysecentra bijna 34%.

Figuur 2: Jaarlijkse winst van een dialyseprogramma met 100 patiënten afhankelijk van het percentage patiënten behandeld met alternatieve dialysevormen (PD en satelliet-HD) (€2006)



Waarschijnlijk worden de positieve financiële stimulansen die worden gegeven voor het gebruik van alternatieve dialysevormen tenietgedaan door de incrementele winst die wordt gegenereerd door ziekenhuis-HD. Dit geldt vooral voor PD. Volgens onze simulaties is het waarschijnlijk dat voor sommige ziekenhuizen in België de ontvangsten van PD zelfs onvoldoende zijn om de kosten van PD te dekken. Dit is minder het geval voor satelliet-HD. Ziekenhuizen zouden dus eerder geneigd kunnen zijn om het niveau van hun satelliet-HD te verhogen om een hogere forfaitaire bonus te krijgen voor ziekenhuis-HD, dan om het niveau van hun PD te verhogen.

INTERNATIONALE VERGELIJKING

Met betrekking tot het aantal patiënten per nefroloog staat België op de 5de plaats in de lijst van 12 landen die in de ISHCOF-studie werden opgenomen, met één nefroloog per 42 NVT-patiënten (waaronder dialyse- en transplantatiepatiënten). Dit aantal wordt grotendeels bepaald door de bij wet bepaalde personeelsnormen voor ziekenhuis-HD in België en de betrekkelijk hoge proportie ziekenhuis-HD patiënten in België vergeleken met andere landen. Het gemiddelde voor alle landen was één nefroloog per 56 NVT-patiënten.

In België kunnen patiënten, net zoals in de meeste landen, in theorie de dialysevorm kiezen die zij prefereren, tenzij er medische contra-indicaties zijn. In de praktijk zijn de keuzemogelijkheden echter vaak beperkt door een vroege of minder vroege verwijzing naar een nefroloog (patiënten opleiden voor PD neemt meer tijd in beslag dan patiënten voorbereiden voor ziekenhuis-HD), beperkte geografische toegankelijkheid van dialysefaciliteiten, planning van het aantal en de lokalisatie van de dialyse-eenheden door de overheid en bestaande klinische praktijkpatronen in een land of op lokaal niveau.

Financieringsmechanismen omvatten een vergoeding per prestatie (terugbetaling per dialysesessie of -week), een uniform forfaitair bedrag onafhankelijk van de dialysevorm maar afhankelijk van de patiëntkenmerken, financiering via Diagnosis Related Groups (DRG) en gemengde systemen die vergoedingen per prestatie combineren met een vergoeding en per patiënt.

Maatregelen voor kostenbeheersing in de sector van dialyse omvatten onder andere minder frequente prijsindexering van de terugbetalingstarieven, beperking van de terugbetaling van geneesmiddelen tot middelen met een bewezen (kosten-)effectiviteit, forfaitaire terugbetaling van geneesmiddelen, het geven van boeten voor overdreven voorschrijfgedrag van bepaalde geneesmiddelen en het beperken van het aantal dialysecentra.

PATIENTGERELATEERDE ASPECTEN

Voorkeuren van de patiënt zijn een belangrijke determinant voor de keuze van de dialysevorm wanneer er geen specifieke medisch indicaties zijn voor een welbepaalde vorm. Vormen van thuisdialyse worden voornamelijk gekozen omwille van de flexibiliteit en onafhankelijkheid, terwijl dialyse in een centrum wordt gekozen omwille van de meer beschermde omgeving waarin de dialyse plaatsvindt. Sociale ondersteuning door een partner of informele zorgverlener is een belangrijke maar onvoldoende voorwaarde voor het kiezen voor vormen van thuisdialyse. Een cruciale determinant bij het kiezen van een dialysevorm is het in stand houden van een normaal leven. Pre-dialyse vorming en patiëntenbegeleiding lijken cruciaal te zijn om patiënten en hun familieleden toe te laten een geïnformeerde beslissing te nemen over hun behandelingsvorm. Patiënten en patiëntenverenigingen die onze enquête beantwoordden vinden dat zij van hun nefroloog, de pre-dialyse teams en de patiëntenorganisaties adequate en voldoende informatie krijgen, hoewel patiëntenbegeleiding nadat de behandeling is gestart, nog steeds noodzakelijk wordt geacht.

Belgische patiënten ervaren de eigen bijdragen voor medische zorgen als een zware financiële last, vooral gezien de impact van de ziekte en de behandeling op hun vermogen om voltijds of zelfs deeltijds te blijven werken.

DISCUSSIE EN CONCLUSIES

De hoofdbekommernis bij het organiseren van dialysezorgen zou moeten zijn dat patiënten die dialyse nodig hebben de kans krijgen om een volledig geïnformeerd een beslissing te nemen over hun dialysevorm.

In België bestaan echter geen klinische richtlijnen voor het starten met dialyse bij patiënten met chronische nierziekte, de indicaties en contra-indicaties voor dialysevormen, de pre-dialyse vorming en counseling en het maken van een definitieve keuze tussen dialysevormen.

De huidige terugbetalingsmechanismen voor dialyse zijn geen goede weerspiegeling van de echte kosten voor het ziekenhuis en de patiënt. Winsten gegenereerd door de dialysedienst van een ziekenhuis worden momenteel vaak gebruikt door het ziekenhuismanagement om verlieslatende activiteiten van het ziekenhuis te subsidiëren. Door dergelijke structurele onevenwichtigheden worden de kosten van de gezondheidszorg voor het RIZIV echter minder transparant. Dergelijke vertekende kostencijfers met ingebouwde compensaties voor de tekorten van andere diensten kunnen bijgevolg leiden tot vertekening in de beslissingen voor de verdeling van middelen.

Het optimale financieringsmechanisme voor dialyse zou zo winstneutraal mogelijk moeten zijn voor de verstrekker om financiële incentieven ten gunste of ten nadele van een bepaalde dialysevorm te vermijden. Volgens ons kosten-opbrengstenmodel is dit op dit moment niet het geval. Er dient te worden opgemerkt dat voor deze studie een traditionele benadering voor kostprijsberekening werd gehanteerd. Deze benadering heeft een aantal duidelijke beperkingen, zoals het feit dat ze niet corrigeert voor mogelijk inefficiënt gebruik van middelen in de centra. Bovendien is de steekproef van dialysecentra die hebben deelgenomen aan onze kostenbevraging niet representatief voor alle Belgische dialysecentra, aangezien in 5 van de 8 deelnemende centra de artsen gesalarieerd waren en in veel ziekenhuizen in België artsen werken als zelfstandige.

Volgens onze kosten-opbrengstensimulaties zouden de bestaande financiële stimuleringsmechanismen voor alternatieve dialysevormen in feite ontmoedigend werken voor het gebruik van PD omdat geen onderscheid wordt gemaakt tussen satelliet-HD en PD. Het is meer winstgevend om patiënten van ziekenhuis-HD op satelliet-HD over te schakelen omdat dit voor het ziekenhuis een goedkoper alternatief is dan PD, maar gezien de huidige terugbetaling van PD en satelliet-HD, een duurder alternatief voor het RIZIV. Hoewel het stimuleringsmechanisme een duidelijk effect had op het gebruik van satelliet-HD, is het effect ervan op PD gering gebleven. Om het huidige stimuleringsmechanisme voor alternatieve dialysevormen te verfijnen, moet een onderscheid worden gemaakt tussen PD en satelliet-HD. Hiervoor moet echter een drempel worden gedefinieerd voor het percentage PD in alle alternatieve dialysevormen. Er bestaat geen wetenschappelijke basis voor een dergelijke drempel aangezien de keuze van dialysevorm niet alleen wordt gebaseerd op de patiëntenprofielen maar ook op de voorkeuren van de patiënten. Daardoor zal verfijning van het systeem met de forfaitaire bonussen waarschijnlijk moeilijk zijn.

De hoge kosten van PD in vergelijking met andere dialysevormen is voornamelijk te wijten aan de hoge kosten van de consumptiegoederen. Dit kan worden verklaard door de virtuele monopoliepositie van één enkele grote leverancier van dialysevloeistoffen voor PD. De prijs die wordt betaald voor dialysevloeistoffen door een specifiek ziekenhuis is het resultaat van onderhandelingen tussen het bedrijf en het ziekenhuis. Het is moeilijk om de resultaten van deze onderhandelingen te isoleren van de andere producten die aan het ziekenhuis worden verkocht. Bijgevolg zullen niet alle ziekenhuizen dezelfde prijs betalen voor de dialysevloeistoffen.

Een volledig kostenneutraal financieringsmechanisme zou elke dialysemodaliteit terugbetalen aan de echte kostprijs. In de praktijk wordt vaak gebruik gemaakt van de gemiddelde kosten voor de diensten. Er wordt beweerd dat de kosten voor dialysebehandeling hoger zijn voor specifieke categorieën van patiënten, bijv. diabetici, patiënten met verschillende co-morbiditeiten, bejaarden. De geldigheid van deze bewering kon door ons niet worden nagegaan aangezien in België geen gegevens voorhanden zijn met betrekking tot de profielen van dialysepatiënten in termen van kostenbepalende kenmerken. Indien het inderdaad zo zou zijn dat de kosten tussen de patiëntencategorieën verschillen, zou het de moeite waard zijn om te onderzoeken hoe gegevens inzake kostenbepalende patiëntkenmerken zouden kunnen worden verzameld en hoe de financiering van de dialysevormen van deze kenmerken afhankelijk zou kunnen worden gemaakt.

De financiering van ziekenhuis-HD via forfaitaire bedragen en medische honoraria, waarbij ervan wordt uitgegaan dat de medische honoraria zowel de kosten van de intellectuele handelingen van de arts als van de consumptiegoederen dekken, staat in contrast met de financiering van satelliet-HD, PD en thuis-HD via forfaits alleen die worden verondersteld alle kosten te dekken. In zijn huidige vorm was het systeem een financiële stimulans voor de ziekenhuizen om eerder satelliet-HD te ontwikkelen in plaats van PD, terwijl voor de nefrologen de per prestatie vergoeding voor ziekenhuis-HD financieel het meest aantrekkelijk bleef.

AANBEVELINGEN

RICHTLIJNEN

- In België zouden klinische richtlijnen moeten worden ontwikkeld om de besluitvorming, inclusief het betrekken van de patiënt in het proces, te verbeteren omtrent:
  - het starten met een dialysebehandeling,
  - de identificatie van indicaties en contra-indicaties voor specifieke dialysevormen,
  - pre-dialyse vorming en counseling van de patiënt en
  - de uiteindelijk keuze van dialysevorm.

PATIENTENBEGELEIDING

- Elke patiënt die start met chronische dialyse zou tijdig, volledig en objectief geïnformeerd moeten worden over de verschillende dialysevormen, conform de wet op de patiëntenrechten..
- Een dergelijke patiëntenbegeleiding zou opgenomen moeten worden als een vereiste voor alle pre-dialyse patiënten in het bestaande Zorgtraject Chronische Nierinsufficiëntie van het RIZIV.
- De Belgische verenigingen voor nefrologie zouden in hun bestaand protocol voor gegevensregistratie een instrument moeten voorzien om het effect van de introductie van de patiëntenbegeleidingsdiensten in de dialysecentra te evalueren.

FINANCIERING

- De terugbetaling van dialysebehandelingen zou de werkelijke kosten van deze behandelingen voor het ziekenhuis en de patiënt beter moeten weerspiegelen en de terugbetaling van dialyse zou niet mogen worden verantwoord op basis van een compensatie voor andere, ondergefinancierde, ziekenhuisdiensten.
- De koppeling van de vergoeding voor de intellectuele act van de nefroloog en de kosten van consumptiegoederen in de vergoeding per prestatie in de huidige financiering van ziekenhuis-HD zou moeten worden stopgezet.
- Financiering via een forfait *en* een medisch honorarium voor ziekenhuis-HD enerzijds en via een forfait alleen voor alternatieve dialysevormen anderzijds, moet worden herzien.
- Een betaling per ziekenhuis HD-sessie, per satelliet HD sessie en per PD week die de echte kosten van elke behandelingsmodaliteit beter benadert moet worden overwogen. Een correctie voor co-morbiditeiten die een duidelijke relatie hebben met de kosten van de ambulante dialysebehandeling kan worden overwogen. De relatie met de historische ligdagprijs en het systeem van forfaitaire bonussen voor ziekenhuis-HD kan binnen deze totale herziening van de financieringsmechanismen voor dialyse worden afgeschaft.
- De terugbetaling van vervoer van en naar het dialysecentrum met privémiddelen moet worden herzien zodat de werkelijke vervoerskosten voor de patiënten beter worden weerspiegeld. Indien privévervoer door patiënten wordt gedeeld, zou slechts eenmaal terugbetaling van het RIZIV mogen worden gevorderd.
- Er moet verder worden onderzocht waarom en in welke mate de bedragen die aan organisaties voor thuisverpleging worden betaald verschillen tussen ziekenhuizen.

Scientific summary

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ABBREVIATIONS

ABC	Activity Based Costing
ADL	Activities of Daily Living
APD	Automated Peritoneal Dialysis (=CCPD)
AV-fistula	Arterio-Venous fistula
BFM-BMF	Budget Financiële middelen / Budget des moyen financiers
BMI	Body Mass Index
CAPD	Continuous Ambulatory Peritoneal Dialysis
CCPD	Continuous Cycling Peritoneal Dialysis (=APD)
CCTR	Cochrane Controlled Trial Register
CDC	Centers for Disease Control and Prevention
CEA	Cost-Effectiveness Analysis
CHD	Coronary Heart Disease
CHF	Congestive Heart Failure
CHMP	Committee for Medicinal Products for Human Use
CI	Confidence Interval
CKD	Chronic Kidney Disease
CKD5D	Chronic Kidney Disease Stage V D (see ESRF and ESRD)
CRT	Cardiac Resynchronisation Therapy
CUA	Cost-Utility Analysis
CVD	Cardiovascular Disease
DDD	Defined Daily Dose
DOPPS	Dialysis Outcomes and Practice Patterns Study
DRG	Diagnosis Related Group
EAC	Equivalent Annual Cost
EBPG	European Best Practice Guidelines
EMEA	European Medicines Agency (EU Agency)
EQ-5D	EuroQoL 5 dimensions
ERA	European Renal Association
ESRD	End-Stage Renal Disease (see ESRF and CKD5D)
ESRF	End-Stage Renal Failure (see ESRD and CKD5D)
EU	European Union
EuroQol-5D	European Quality of Life scale – 5 dimensions
E-W	England and Wales
FDA	Food and Drug Administration
FFS	Fee for Service
FPS	Federal Public Service (Federale Overheidsdienst/Service Public Fédéral)
FTE	Full Time Equivalent
FU	Follow-up
GFR	Glomerular Filtration Rate
GNFB	Groupement des Néphrologues Francophones de Belgique
HAS	Haute Authorité de Santé (France)
HCHD	High-Care Haemodialysis
HD	Haemodialysis
HDD	HD Domestic
HDH	HD in Hospital
HDS	HD in Satellite

HG/UH	Hospital Use Only (Belgium: Hospitaal Gebruik / Utilisation Hospitalière)
HRQOL	Health Related Quality of Life
HUI	Health Utilities Index
ICER	Incremental Cost-Effectiveness Ratio
IMA - AIM	Intermutualistisch agenschap - Agence intermutualiste
IPD	Intermittent Peritoneal Dialysis
IR	Incidence Rate
ISHCOF	International Study of Health Care Organization and Financing
ITT	Intention-To-Treat (population)
KCE	Kennis Centrum – Centre d'Expertise (Belgian Health Care Knowledge Centre)
KDIGO	Kidney Disease Improving Global Outcomes
KDOQI	Kidney Disease Outcomes Quality Initiative
KDQOL	Kidney Disease Quality of Life
LCHD	Low-Care Haemodialysis
LE	Life Expectancy
LY	Life Year
LYG	Life Year Gained
MDS	Minimal Data Set
MeSH	Medical Subject Heading
MS	Member State (EU)
MVD	Multi Vessel Disease (more than 1 coronary vessel affected)
NBVN	Nederlandstalige Belgische Vereniging voor Nefrologie
NCA	National Competent Authority (EU)
NECOSAD	Nederlandse Coöperatieve Studie naar de Adequaatheid van Dialyse
NHHD	Nocturnal Home Haemodialysis
NIHDI	National Institute for Health and Disability Insurance (RIZIV/INAMI – Belgium)
NIPD	Nightly Intermittent Peritoneal Dialysis
NKF	National Kidney Foundation
NZ	New Zealand
ONT	National Transplant Organization
ORPADT	ORganisatie van het PAramedisch personeel der Dialyse en Transpalantie Centra
OTC	Over-the-counter drugs
PC	Peritoneal Cavity
PD	Peritoneal Dialysis
PET	Peritoneal Equilibration Test
PP	Per-protocol (population)
PPS	Prospective Price System
PY	Person Years
QALY	Quality Adjusted Life Year
QOL	Quality of Life
RCT	Randomized Controlled Trial
RKF	Residual Kidney Function (=RRF)
RRF	Residual Renal Function (=RKF)
RRT	Renal Replacement Therapy
RTX	Renal Transplantation
SF-36	Medical Outcome Study Short Form 36-Item Health Survey
SG	Standard Gamble
TPD	Tidal Peritoneal Dialysis
TTO	Time Trade-Off

TTP	Trusted Third Party
USA	United States of America
USRDS	United States Renal Data System
VAS	Visual Analogue Scale (for measuring HRQOL)
VAT	Value Added Tax
WHO	World Health Organisation

1 INTRODUCTION

1.1 BACKGROUND

With ageing, renal function declines, as has been documented in longitudinal studies.[1] In patients with chronic renal disease, this decline can be much more outspoken, leading to a situation where residual kidney function is insufficient. At that stage Renal Replacement Therapy (RRT) may become necessary. Several classifications have been used to quantify the stages of chronic renal disease. The most severe state may be called end-stage renal disease (ESRD), end-stage renal failure (ESRF) or chronic kidney disease stage VD (CKD5D) as described in more detail in chapter 2 on the literature review. Throughout this review, and for consistency reasons, we will use the term *'end-stage renal disease'* (ESRD).

As in other industrialised countries the prevalence of end-stage renal disease (ESRD) treatment in Belgium is increasing. In Belgium, the annual growth rate in the number of patients treated for ESRD was about 5.2% between 2002 and 2007.[a] The incidence of ESRD treatment remained relatively stable over this period. There are large differences in the growth rates of ESRD treatment prevalence between age groups. The highest growth rate is observed in patients older than 65 years of age.

There are different treatment options for patients needing RRT. The patients can be dialysed, either with haemodialysis (HD) or with peritoneal dialysis (PD). In both cases patients can also receive a kidney transplant, either from a deceased or a living donor. Ultimately, kidney transplantation is considered to be the most preferable option, whenever possible.

1.2 TECHNOLOGY OVERVIEW

1.2.1 Dialysis

During the disease process ultimately leading to ESRD, therapy for kidney failure (dialysis) may become necessary while waiting for the, if at all possible, preferable therapy of kidney transplantation. Dialysis, or *'renal replacement therapy'* (RRT) refers to the process by which fluids and solutes are removed from, or added to the patient's blood.[2] During this process, the blood from the patient undergoes exchanges with a dialysate either in a dialyzer outside the body ('extracorporeal circuit') through an artificial semi permeable membrane and is then returned to the patient (such as in haemodialysis) or through a natural membrane provided by the peritoneum (such as in peritoneal dialysis). A full description of techniques and dialysis schedules is outside the scope of this report and can be found in appropriate reference manuals.

1.2.2 Haemodialysis

Haemodialysis (HD) removes or adds solutes by diffusion between blood and dialysate across a semi-permeable membrane. The haemodialysis machine incorporates many features, such as a pump to deliver blood to the dialyzer at a constant rate, monitors to ensure that the pressures inside extracorporeal circuit are not excessive, a detector for leakage of red blood cells from the blood compartment into the dialysate compartment, an air detector and shut-off system to prevent air embolism, a pump to deliver dialysate, a proportioning system for proper dilution of the dialysate concentrates, a heater to warm the dialysate to body temperature, an ultra filtration controller for precise regulation of fluid removal, and conductivity monitors to check the total ion strength in the dialysate.[2] These devices ensure the proper, safe, and reliable delivery of blood and dialysate to the membrane, where exchange of water and solutes takes place.

[a] Source: at the moment of writing unpublished common report of the NBVN-GNFB 2008.

For chronic haemodialysis, the maintenance of vascular access is a major challenge. Adequate vascular access should deliver blood flow to the dialyzer of 0.2 up to 0.5 l/min, depending upon body size. Long-term vascular access for haemodialysis is preferably established by the creation of an AV fistula in an upper extremity (usually the forearm), although a lower extremity vessel is sometimes used.[2] Those fistulae are established by connecting an artery to a nearby vein through a surgical anastomosis of the native vessels. Sometimes, the anastomosis has to rely on a synthetic graft. In general, native fistulae are preferred over synthetic grafts because of the relative longevity (approximately 80 % vs. 50 % over 3 years), and a lower susceptibility to infection.[2]

Although haemodialysis is a relatively safe procedure, several complications may arise. Some are inherent to side effects of the extracorporeal circuit, some derive from technical errors, and some from specific reactions of patients. Hypotension during dialysis is common, attributed to volume depletions and shifting of fluid from extra- to intracellular space. Furthermore, impaired sympathetic activity, vasodilatation, sequestration of blood in the muscles, and splanchnic pooling of blood while eating during dialysis are commonly reported.[2] Many of these complications can be prevented by adequate counselling. The most common post-haemodialysis symptom is asthenia, a generalized 'washed-out' sensation, attributed to the rapid changes in fluids and serum chemistry.[2] It usually lasts for a few hours and disappears spontaneously.

Chronic haemodialysis typically is performed three times weekly and can be delivered in various settings: in the hospital in a classical full-care haemodialysis unit, in a low-care setting (further in this report called a satellite dialysis centre), or less commonly at the home of the patient. Also the frequency of dialysis can differ, depending on remaining renal function (RRF) and patient preferences, including longer dialysis times, more frequent dialyses and during daytime or at night

1.2.3 Peritoneal dialysis

In the 1960's peritoneal dialysis (PD) was mainly used to manage patients with acute renal failure, while patients with ESRD were treated almost exclusively by haemodialysis, or occasionally by intermittent PD (IPD). In the 1970's, continuous ambulatory peritoneal dialysis (CAPD) was introduced leading to an increase in the use of chronic PD.[2]

In contrast to HD, instead of an artificial membrane the peritoneal membrane is used as a semi-permeable membrane in PD. Standard PD fluid contains a high concentration of glucose or of a polysaccharide as osmotic agent, making the dialysate hyperosmolar as compared with serum and causing fluid removal through ultra filtration. The important physiological constraints of PD are, therefore, the peritoneal blood flow and peritoneal membrane, as well as dialysate volume, duration of exchange and number of exchanges per day.[2] The patient-dependent physiological aspects are monitored through a peritoneal equilibration test (PET), during which a series of peritoneal transport capabilities are measured. This test allows for an optimal design of the treatment regimen with PD. The access for PD is a surgically inserted catheter into the abdominal cavity. As a general advantage, PD is claimed to better preserve RRF in patients than HD.[2] Therefore it is believed that PD might be preferable as the initial treatment option for ESRD, if possible. There are, however, possible complications, the most important of which is peritonitis. Peritonitis accounts for an important proportion of the hospital admissions for these patients and it is the major cause of technique failure resulting to a transfer from PD to HD. Because of the daily manipulations, entry of bacteria into the catheter during exchanges is common. Treatment of peritonitis is initially empiric and based on antibiotics, but sometimes catheter removal and switching to other dialysis modalities can be necessary. Other frequent complications include catheter infections at the entry or in the tunnel, catheter malfunctions, hernias and fluid leaks. A long-term complication is due to the fact that the peritoneum undergoes changes in response to the new environment, leading to thickening of the peritoneal interstitium and basement membrane reduplication in both mesothelium and in the capillaries, usually after about 4 to 5 years of PD,[2] leading to decreased PD efficiency, and sometimes encapsulating (sclerosing) peritonitis.

Survival of patients on PD appears to be similar to those on HD, although most of these studies are observational and therefore influenced by underlying co-morbidity (see chapter 2). Ultimately, many patients transfer from PD to HD for various reasons, but often because of peritonitis or catheter infections. Other reasons are catheter malfunction, inability to perform the procedures, or an inadequate clearance, especially in the presence of decreasing RRF.

There are two main categories of PD, Continuous Ambulatory Peritoneal Dialysis (CAPD) and Automated Peritoneal Dialysis (APD).

Continuous Ambulatory Peritoneal Dialysis (CAPD)

CAPD does not require specific machinery and uses the smallest volume of dialysate to prevent uremia, usually a daily volume of around 8 to 10 litres of dialysate. CAPD involves a series of daily exchanges (three to five daily), with dialysis occurring continuously. Treatment regimens depend on patient size, peritoneal transport capabilities and residual renal function (RRF).

The dialysis fluid is instilled by gravity into the peritoneal cavity (PC) and drained out after a dwell period of several hours.[2] The CAPD system consists of a plastic bag containing the PD fluid, a transfer tubing set, and a permanent, indwelling implanted catheter. The connection between bag and transfer set is manipulated a few times daily, a procedure which must be done using strict, semi sterile, no-touch techniques.

Automated Peritoneal Dialysis (APD)

Automated PD (APD) is a rather broad term that is used for different forms of PD requiring a mechanical device, a *'cycler'* to assist in the delivery and drainage of the dialysis fluid.[2] APD variants include Continuous Cycling PD (CCPD) involving exchanges during both day and night, but also other variants such as Intermittent PD (IPD), Nightly Intermittent PD (NIPD) or Tidal PD (TPD).

APD regimens usually include an increased number of short-dwell exchanges with the 'cycler' delivering a preset number of exchanges. The major advantage of APD is that it eliminates the need for frequent manual interventions, with most of the dialysis occurring at night during sleep.[2] Normally, APD needs only two procedures daily, the initial connection of the catheter to the machine and the disconnection at the end of dialysis.

1.3 THE ISSUE

Substitution of the more expensive haemodialysis in hospital by the less expensive alternatives such as low-care haemodialysis in satellite centres and peritoneal dialysis has been slower in Belgium than in many other countries. This is thought to be partly due to the financing mechanisms for dialysis. Since 1995 the Belgian government has modified the financing system a couple of times, with the explicit goal of introducing incentives for substitution.

In this study we investigate the current situation of dialysis in Belgium. We examine the clinical, economical, organisational or patient-related reasons for the observed distribution between dialysis modalities.

The clinical reasons are related to patient characteristics. Clearly not all patients are eligible for low-care haemodialysis in satellite centres or for peritoneal dialysis. Indications for the different types of dialysis need to be carefully reviewed.

Economic reasons relate to the real cost of the different types of dialysis and the financing of these services. Therefore, the real costs of the different forms of dialysis for hospitals need to be calculated and compared with the corresponding reimbursement.

Organisational reasons relate to the legal requirements for different types of dialysis. Legal requirements are imposed on the logistics, qualification and availability of personnel, numbers of patients treated annually, agreements with a transplantation centre etc.

Finally, patient-related factors, such as patient preferences or socio-economic situation, may explain the choice of type of dialysis.

A thorough analysis of all these elements is currently lacking. In this HTA, we will try to fill this gap.

1.4 OBJECTIVES

The primary objectives of this HTA are:

- To describe the different treatment options for patients with ESRD and give an overview of the selection criteria for different types of dialysis described in literature (chapter 2);
- To describe the relative use of different dialysis modalities in Belgium as well as the legal framework for dialysis provision and financing (chapter 3);
- To describe the patient population and to assess the costs and budget impact for the National Institute for Health and Disability Insurance (NIHDI) and for the patients of the different dialysis modalities (chapter 4);
- To calculate the costs of the different dialysis modalities from the hospital's point of view and compare the costs of a dialysis programme with its revenues (chapter 5);
- To compare the Belgian situation with other countries (chapter 6);
- To describe patient-related issues in different dialysis modalities (chapter 7) and
- To draw conclusions for the organization and financing of dialysis in Belgium (chapter 8).

The focus of this HTA lies on the different types of dialysis used in Belgium for adult patients with chronic end stage renal failure who need chronic dialysis: high-care haemodialysis (hospital HD) in a hospital setting, low-care haemodialysis in a satellite centre (satellite HD), home haemodialysis and peritoneal dialysis (PD). The phrase "alternative dialysis modalities" is used throughout the text to cover PD, home HD and HD in a satellite centre.

Acute dialysis and paediatric dialysis is not considered in this study. Specific aspects for renal transplantation are not examined in depth, but discussed whenever appropriate.

2 LITERATURE REVIEW OF CLINICAL AND ECONOMIC ASPECTS OF CHRONIC DIALYSIS

2.1 INTRODUCTION

The optimal treatment of 'end-stage renal disease (ESRD), also called 'end-stage renal failure' (ESRF) and currently officially labelled as chronic kidney disease stage V D (CKD5D, see Table 1), is clearly a successful kidney transplantation. However, and not surprisingly, not a single randomized controlled trial of kidney transplantation versus any kind of dialysis has ever been performed and such a trial is very unlikely ever to be performed. Still, large observational studies strongly suggest that kidney transplantation is associated with both a better quality of life and a better survival than long-term dialysis. For instance, Wolfe et al.[3] compared the survival of patients enlisted in the US for a kidney transplant (but not transplanted) with those enlisted and transplanted between 1991 and 1997. After adjustment for many potential confounders, middle and long-term survival was shown to be substantially better in those who were transplanted than in those who did not have the chance to be transplanted.[3] The discussion of the reasons for this better survival with kidney transplantation are beyond the scope of this review of the clinical and economic aspects of chronic dialysis and probably include both a better correction (even suboptimal with most kidney transplants) of the uremic syndrome and avoidance of the potential complications of chronic dialysis.

As mentioned in the introduction we will use, throughout this review, the term *'end-stage renal disease'* (ESRD) for simplicity and for consistency reasons. We also assume that kidney transplantation is, in principle, the treatment of choice for ESRD for reasons explained above. However, several stages of chronic renal disease have been defined by international consensus, all requiring different approaches as summarized in the position statement of the Kidney Disease Outcomes Quality Initiative (KDOQI) and modified and endorsed by the 'Kidney Disease: Improving Global Outcomes' Foundation (KDIGO).[4, 5] The only modification recommended at this 2004 conference was the addition of a suffix for treatment: ***'T'*** for all kidney transplant recipients at any level of GFR, and ***'D'*** to indicate dialysis for CKD stage 5 patients treated by dialysis (see Table 1).[5]

Table 1: Stages of CKD (chronic kidney disease) as defined by KDOQI and modified and endorsed by the 2004 KDIGO Controversies Conference on 'Definition and Classification of Chronic Kidney Disease'[4, 5]

Stage	Description	GFR (ml/min/1.73m2)	ICD-9 CM code	Treatment classification
1	Kidney damage with normal or ↑ GFR	≥90	585.1	**T** (for transplant) if kidney transplant recipient
2	Kidney damage with mild ↓ GFR	60–89	585.2	**T** if kidney transplant recipient
3	Moderate ↓ GFR	30–59	585.3	**T** if kidney transplant recipient
4	Severe ↓ GFR	15–29	585.4	**T** if kidney transplant recipient
5	Kidney failure	<15 (or dialysis)	585.5*	**T** if kidney transplant recipient **D** (for dialysis) if dialysis (HD or PD)**

CKD, chronic kidney disease; GFR, glomerular filtration rate; ↑, increased; ↓, decreased.
*585.6 (if ESRD) V codes for dialysis or transplantation
** In this report labelled as ESRD

The indications for kidney transplantation have increased over the last twenty years, with a growing number of older patients and/or diabetics and/or patients with severe co-morbidities successfully transplanted. However, the limited availability of organs to be transplanted remains a major barrier to the extension of the benefits of kidney transplantation to many high risk recipients. Therefore, we will concentrate this review on the comparison of the indications and results in terms of quality of life and survival of the different modalities of dialysis. The review will also be restricted to adult patients, treated in developed countries.

Since dialysis became available in the 1960's, it proved to be (and remains) a life-saving treatment when the indication to starting dialysis is clearly established. Therefore, not a single randomized controlled trial comparing dialysis to no dialysis has ever been performed, for obvious ethical reasons.

More complicated, however, is the question whether starting any kind of dialysis in elderly (>75 years) patients with co-morbidities such as extensive peripheral vascular disease, ischemic heart disease or congestive heart failure prolongs life and/or improves quality of life. As mentioned above, no RCT has ever been performed. A few observational studies have attempted to answer this question by analyzing the impact on survival of starting haemodialysis (HD) or not (conservative medical treatment), after multivariate adjustment for pre-existing co-morbidities. For instance, Murtagh et al. showed,[6] in a retrospective analysis, that overall one and two year survival was significantly better in elderly (>75 years) patients started on HD than treated conservatively (84 and 76% versus 68 and 47% respectively) but the survival advantage was lost in patients with high co-morbidity scores , especially with ischemic heart disease. As in any observational study, the risk of a bias by indication of starting HD (versus conservative treatment) remains a potential source of confounding, the direction of which is difficult to predict with certainty in the absence of randomisation. Moreover, it has been argued that, since GFR naturally declines with age in both men and women, the interpretation of the absolute value of GFR as used in Table 1 and its implication on the benefit of starting RRT in those patients remains difficult especially in older age groups.[1]

2.2 METHODS

2.2.1 Literature search criteria

We conducted a systematic search strategy. At first, the literature was searched for meta-analyses and systematic reviews on specific subjects. Then, individual studies published later than the publication date of the most recent reference in the reviews, were identified using the same keywords. The initial search was performed at the end of 2007 and an update search was performed end of October 2009. Additional references were identified based on the reference lists of previous articles and on specific searches on follow-up articles of published studies.

Since the focus of this report is on the basic organisation and location of RRT, we excluded articles that dealt specifically with the effect of technical matters such as the differences between convective dialytic techniques compared to diffusive techniques, the frequency of dialysis and the controversies surrounding high- versus low-flux HD.[7, 8] RCTs are ongoing to sort out the comparative efficacy of those different HD techniques, but those are outside the scope of this report.

More details on the search strategy and on the inclusion and exclusion criteria can be found in the appendix.

2.2.2 Main MeSH terms and definitions

Over the years, several MeSH terms and definitions have been created for indexing dialysis and renal failure. Although some definitions may seem to have become slightly outdated by current definitions, they are mentioned here with their official definition as used by the US National Library of Medicine.

- Renal Dialysis: Therapy for the insufficient cleansing of the BLOOD by the kidneys based on dialysis and including hemodialysis, PERITONEAL DIALYSIS, and HEMODIAFILTRATION.
  Year introduced: 2001(1967)
- Kidney Failure, Chronic: The end-stage of CHRONIC RENAL INSUFFICIENCY. It is characterized by the severe irreversible kidney damage (as measured by the level of PROTEINURIA) and the reduction in GLOMERULAR FILTRATION RATE to less than 15 ml per min (Kidney Foundation: Kidney Disease Outcome Quality Initiative, 2002). These patients generally require HEMODIALYSIS or KIDNEY TRANSPLANTATION.
  Year introduced: 1967(1966)
- Renal Replacement Therapy: Procedures which temporarily or permanently remedy insufficient cleansing of body fluids by the kidneys.
  Year introduced: 1994

While, for practical and dissemination purposes, the US literature and the NKF prefer to use the word *'kidney'*, we will try to use *'renal'* consistently throughout this report, whenever we are referring to the generic term rather than to a proprietary name, such as an organisation.

2.2.3 Selected literature

Four systematic reviews were identified and three relevant for this report will be discussed in more detail.[9-11] Observational studies were only included if they met all of the following criteria: sample size >500, multivariate adjustment for potential confounders such as age, gender, co-morbidities and published after 1996.

For quality of life, twelve reviews were found of which three were relevant for this report and retained for more detailed discussion together with a few specific studies.

For costs and cost-effectiveness five relevant literature reviews were found.[9, 12-15] Six additional primary costs studies,[16-21] and five additional primary cost-effectiveness studies[13, 22-29] of different dialysis modalities were found.

In addition to this literature, we used the position statement from KDOQI and KDIGO,[5] and the Australian and French guidelines on the indications and contra-indications for choice of dialysis modality.[30-32]

2.2.4 Terminology

Terms used in international literature vary and are sometimes slightly different. According to expert opinion, the situation in Belgium can also be very different from one centre to another while there appears to be a shift in patient profiles with an increasing number of high-care patients being treated in so called 'low-care' settings. The mortality data presented in chapter 4, however, seem to indicate that on average the patient profile of patients treated in different facilities is still very different.

For the sake of consistency we will use the following terms throughout this report:

- Hospital HD: full-care (high-care) haemodialysis in a hospital or equivalent centre (can also be done in satellite centres), with full assistance by nephrologists and nursing personnel; in international literature this type of HD is often called in-centre HD,
- Satellite HD: mainly low-care haemodialysis (sometimes called self-care haemodialysis) where part of the necessary manipulations are done by the patient, with a lower attendance of nephrologists and nursing personnel. Satellites centre for HD can be embedded in a hospital or in a separate building. Also full-care (high-care) HD is possible in some of the satellite centres and according to expert opinion the proportion of patients treated in that way is increasing.
- Home HD: haemodialysis at the home of the patient, with the patient mainly in charge of necessary manipulations, without attendance of nephrologists and with limited, if any, nursing personnel,
- CAPD: Continuous Ambulatory Peritoneal Dialysis, see description in chapter 1,
- APD: Automated Peritoneal Dialysis, see description in chapter 1.

Satellite HD, home HD, CAPD and APD are collectively referred to as "alternative dialysis modalities" throughout this report. As home HD is only used by a small proportion of patients in Belgium (0.55% in 2006 according to the NIHDI Dialysis survey 2006), most of the analyses of alternative dialysis modalities focus on PD and satellite HD.

2.3 MORTALITY AND MORBIDITY

2.3.1 Hospital HD versus satellite HD versus home HD

2.3.1.1 Mortality

A systematic review of studies comparing the medical effectiveness of these various HD modalities was published in full in 2003, and in summary form in 2004.[9, 33] This review included a total of 27 studies of variable quality: 4 systematic reviews, 1 randomized cross-over trial and 22 comparative observational studies, and outcomes included quality of life and survival. There were, however, major concerns about potential patient selection biases due to confounding by indication. Eight primary studies and one systematic review included in this review provided information on survival for people undergoing home HD compared with hospital or satellite HD. Only 6 studies used a Cox proportional hazards model to try and correct for baseline characteristics.

Overall, the mortality risk for patients undergoing home HD was lower than for patients undergoing hospital or satellite unit HD. The single exception was a study by Price and colleagues dating back from the late seventies and including patients dialyzed between 1964 and 1976.[34] Therefore, this comparison appears irrelevant for obtaining valid conclusions on current dialysis technologies and practice. Of the 2 studies using the Cox model and comparing home with satellite HD, one reported a significantly better survival in home HD,[35] whereas the other reported similar survival with home and satellite HD.[36]

Overall, Mowatt et al. concluded that patients on home HD are in most studies a highly selected group, generally younger and with less co-morbidities than those who are dialyzed in hospital.[9, 33]

In addition, home dialysis provides an opportunity to dialyze more frequently and for longer period than would be possible in most hospital or satellite units. It is therefore difficult to disentangle the true benefits of home HD from the effects of socio-demographic and co-morbidity factors and the opportunity provided by home HD for greater duration and/or frequency of dialysis sessions.

2.3.1.2 Morbidity

Only two studies reviewed by Mowatt et al. provided information on hospitalization rates.[9, 33] In one of them,[37] the average yearly hospitalization rate was 13.4 days/patient for home HD, compared with 11.5 days for satellite HD and 15.1 days for hospital HD. In a review comparing short daily or nocturnal HD with hospital HD 3 times/week, Mohr and colleagues found an average reduction of 43 % (weighted CI 23-63 %) in hospital days associated with daily or nocturnal HD.[21] Again, this benefit may result from various factors: patient selection bias, potential benefits of home HD by itself or higher dialysis dose related to the home setting and thus opportunity to dialyze for longer sessions and or more frequently.

2.3.2 Continuous ambulatory peritoneal dialysis (CAPD) versus automated peritoneal dialysis (APD/CCPD)

2.3.2.1 Mortality

A Cochrane review analyzed RCTs comparing CAPD with APD in patients with ESRD and this was published as a full review but also as a summary paper.[10, 38] The authors were able to include only 3 trials (139 patients). APD did not statistically significantly differ from CAPD with respect to mortality endpoints (relative risk 1.49, 95 % confidence intervals 0.51 to 4.37).

2.3.2.2 Morbidity

In the same review, [10, 38] APD did not differ from CAPD with respect to the risk of peritonitis (relative risk 0.75, 95 % CI 0.50 to 1.11), switching from original PD modality to a different dialysis modality (RR 0.50, 95 % CI 0.25 to 1.02) hernias (RR 1.26; 95 % CI 0.32 to 5.01), PD fluid leaks (RR 1.06, 95 % CI 0.11 to 9.83), PD catheter removal (RR 0.64, 95 % CI 0.27 to 1.48) or hospital admissions (RR 0.96, 95 % CI, 0.43 to 2.17). The evolution of residual renal function was also similar between groups (mean difference – 0.17, 95 % CI, -1.66 to +1.32). In 1 study, the peritonitis and hospitalization rate was significantly lower in patients on APD (expressed as episodes per patient year.[39]

Overall, the authors of this review conclude that APD has not been shown to have significant advantages over CAPD in terms of important clinical outcomes, but that APD may be considered advantageous in younger PD patients or those in employment or education due to psychosocial advantages.[10] Additional RCTs, however; are recommended to provide more evidence on the relative benefits of both treatments.

2.3.3 PD versus HD

A Cochrane review presented a systematic review of RCTs and quasi RCTs comparing CAPD to hospital or home HD for adults with ESRD.[11] The reviewers identified only one small trial. This trial was performed within the context of a large Dutch multicentre cohort study (NECOSAD) on patients with ESRD that started on RRT. The original cohort study ran from 1997 and included 1983 patients by August 2005.[40]

For the trial, new dialysis patients from 38 dialysis centres, without obvious contra-indication to either PD or HD were further invited to participate in a trial and were randomly assigned to start with HD or PD. Inclusion period was between January 1997 and August 2000. Ultimately, only 38 patients could be randomized: 18 patients to HD and 20 to PD. There was no statistical difference between PD and HD patients over 2 years of follow-up in death or quality of life years.[41]

After 5 years of follow-up, 9 HD and 5 PD patients had died, a borderline significant crude hazard ratio of death of 3.8 for HD compared to PD (95 % CI 1.1 to 12.6). After adjustment for age, co-morbidities and primary kidney disease, the hazard ratio declined and was no longer statistical significant: 3.6 (0.8 to 15.4). However, it should be stressed that in this trial 4 of the initial 20 patients randomized to PD were switched to HD whereas only 1 of the initial 18 patients randomized to HD switched to PD. It should also be stressed that quality of life was the primary outcome of this trial, while survival was only a secondary endpoint. Finally, the 7 years average age difference between the HD (62 y) and PD (55 y) group casts serious doubt on the allocation concealment, although this might also be due to spurious randomisation variation due to the small number of patients included.

This single RCT comparing HD with PD in 38 Dutch dialysis centres clearly illustrates the major difficulties of such an undertaking. The authors commented that although their study was underpowered, their results may suggest that the treatment strategy starting with PD leads to better survival compared to a strategy starting with HD. The authors suggest that the difference in survival rate between modalities, although not significant after adjustment for various confounding factors, may potentially be due to the better preservation of residual renal function in PD than HD.

Early observational studies comparing PD and HD had multiple methodological problems related to their observational and retrospective nature and presented design flaws as well as important case-mix differences.

Some more recent and better-designed observational studies suggest that after correction for base-line co-morbidities, there may be an early survival benefit with PD (first 1 to 2 years) with a tendency toward improved outcomes with HD in later years. Additional large-sized observational studies based on data from the US Renal Data System (USRDS) have suggested that patients starting dialysis with known atherosclerotic heart disease or congestive heart failure have a greater relative risk of death on PD than with HD at 2 years (see Table 2).

Overall, the existing data show that the apparent benefits for one modality over the others are modest compared with the influence of other more important prognostic factors such as age, diabetes and heart disease.

Table 2: Observational studies comparing survival between PD and HD

Country	Study design	N of patients	Hazard Ratio of death and comments
USA[42]	Registry Billing data	398 940	PD = HD Except Diabetics > 65 y (in which PD < HD)
USA[43]	Registry Billing data	107 922	Congestive heart failure PD < HD
USA[44]	Cohort	1041	year PD = HD 1 - 2 years PD < HD
USA[45]	Registry	107 922	PD < HD in patients with coronary disease
Netherlands[46]	Cohort	1222	< 2 y PD = HD > 2 y PD < HD in elderly
USA[47]	Cohort of candidates for TP only	12 568	PD = HD except BMI > 26 where PD < HD
Canada[48]	Cohort	822	PD = HD
Denmark[49]	Registry	4921	PD > HD during first 2 years
Netherlands[50]	Registry	16 643	PD > HD within first 15 months PD < HD after 15 months in > 70 y old diabetics No adjustment for co-morbidity, only for primary renal disease

2.4 QUALITY OF LIFE

2.4.1 Background

As renal function declines, patients may experience symptoms that severely affect their health related quality of life (HRQOL). When the phase of end-stage renal disease is reached, the impact of the illness on functioning and HRQOL is considerable.

Especially in chronic diseases, the assessment of HRQOL is important as an outcome measure. This also applies to the evaluation of various renal replacement therapies because of the improved survival among patients with ESRD.

HRQOL can be assessed using both generic and disease specific instruments. The advantage of generic instruments is that it allows for the comparison of different diseases. The generic instruments are either preference-based instruments or health-profile measures. Disease specific instruments do not allow for comparison of different diseases, but can have a value for example in trials comparing two treatments for the same disease.

Preference-based methods assign a quantitative value to a person's preference for a specific health status. Examples of techniques to solicit these preferences include time-trade off (TTO), standard gamble (SG) and visual analogue scale (VAS) methods.

The most widely used health-profile measure is the Medical Outcome Study Short Form 36-Item Health Survey (SF-36).[51] The SF-36 instrument includes 36 items assessing eight dimensions of functioning and well-being.

Disease-specific quality of life questionnaires for ESRD have been developed, such as the Kidney Quality of Life (KDQOL).[52, 53]

Several studies assessed health-related quality of life in patients with ESRD and compared the quality of life of different dialysis modalities and we also retrieved a few meta-analyses of these.

2.4.2 Results

A meta-analysis compared quality of life measurements using the SF-36 instrument among HD, PD and renal transplant patients.[54] Fifty-two studies were identified that included 44 HD groups (30 372 patients), 20 PD groups (3 262 patients), and 28 transplant groups (2 948 patients). SF-36 scores were significantly lower for dialysis patients compared with transplant patients except for the '*Mental Health*' dimension for which PD patient scores were not different from transplantation patient scores. Scores of HD compared with PD were not different. Correction for age and the presence of diabetes decreased the differences between dialysis and transplantation. The authors concluded that, except for the *Mental Health* dimension, HRQOL was higher among renal transplant patients than among dialysis patients.

In a later meta-analysis, the same authors also assessed preference-based quality of life indicators, identifying studies from literature that reported VAS, time trade-off (TTO), SG, EuroQol 5D, and health utilities index (HUI) values in ESRD patients.[55] They identified 27 articles that met preset criteria. They concluded that transplant patients tended to have a higher utility than dialysis patients (although not statistically significant for all measurement instruments), but no evidence for a statistically significant difference in utility could be found between HD and PD patients.

In the Cochrane review comparing CAPD and APD,[10, 38] (see 2.3.2) one out of the three RCTs reported on quality of life measurements using the Karnofsky scores. There was no difference between CAPD and APD. Another study, using a self-developed '*Patient Satisfaction with Treatment* score', reported that patients on APD had significantly more time for work, family, and social activities compared to CAPD patients.

The small RCT within the NECOSAD study comparing CAPD to HD (also see 2.3.3) measured HRQOL using the EuroQol Visual Analogue Scale (VAS). Quality of life was measured at start of dialysis and at regular intervals thereafter.[41] There was no significant difference in quality of life (measured as mean EuroQoL score) at 2 years between the two types of treatment, but due to the small numbers there were insufficient data to draw any conclusion.

Data comparing HRQOL of hospital HD with satellite HD or home HD are lacking, but data from a Danish focus group study shows that compared to HD, eligible patients that are on PD mention as advantages the absence of transport needs, the greater flexibility, a better social life, the possibility to work and also the possibility to take equipment on holiday (see chapter 7 for more details on this study).[56]

Finally, an important component of HRQOL is the functional status and dependence of patients. Recently, Tamura et al. published a large registry study including 3 702 US nursing home residents.[57] Functional dependence, as measured with the Minimum Data Set-Activities of Daily Living scale (MDS-ADL) showed that among nursing home residents with ESRD, the initiation of dialysis is associated with a substantial and sustained decline in functional status. However, this study does not compare different dialysis modalities, but is important when considering whether or not to start dialysis.

In conclusion, HRQOL in ESRD patients has been extensively studied, often with the purpose to compare renal transplantation with dialysis. These studies mainly tend to confirm the consensus among health-care professionals and patients that quality of life is better after renal transplantation compared to dialysis. Complete uncertainty remains, however, about the differences in HRQOL between HD and PD patients, since observed differences are small, and since studies were based on observational data that did not allow adequate correction for confounding. Therefore, selection bias and confounding introduced by unmeasured covariates cannot be excluded.

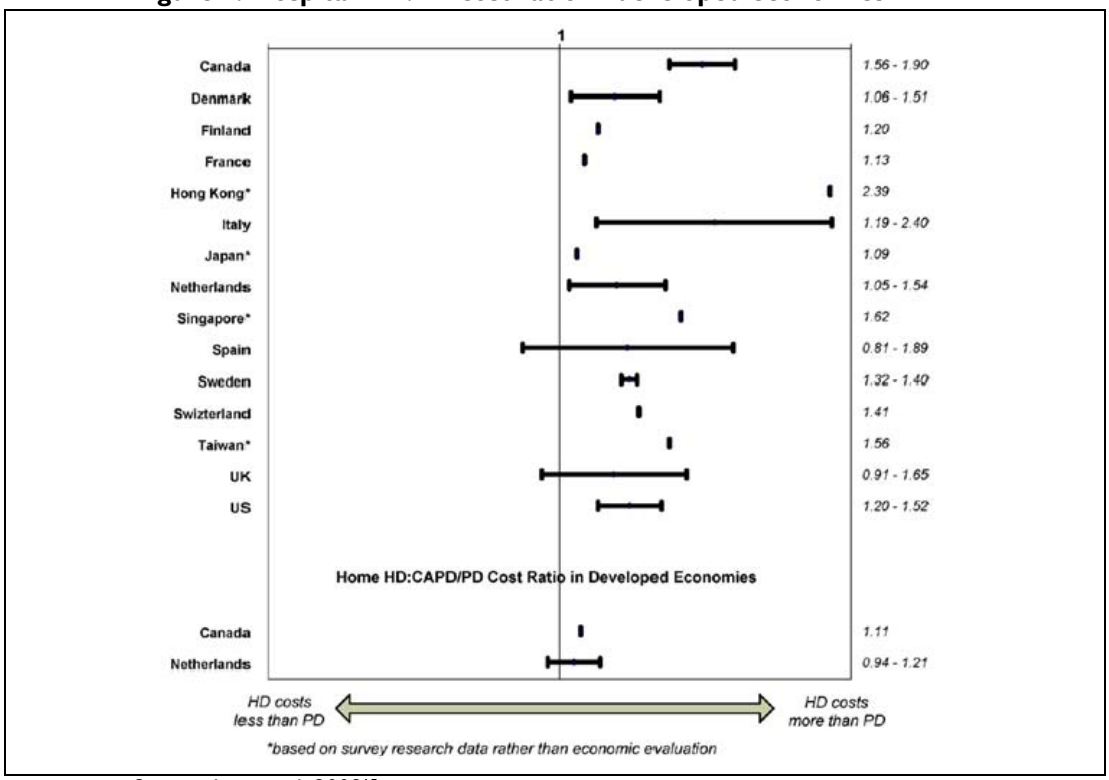
2.5 COSTS AND COST-EFFECTIVENESS OF DIALYSIS MODALITIES

Details on the methodology and a more extensive description the studies included in the economic literature review and their weaknesses can be found in the appendix to Chapter 2. The evidence tables in this appendix only include studies identified before the update search. The relevant articles identified during the update search are included in the narrative summary of findings below.

2.5.1 Costs of dialysis modalities

Comparisons of cost data from different studies are difficult because of the methodological and transparency differences between studies, such as differences in the perspective of the cost analysis or the methods used for allocating costs and overhead expenses to dialysis modalities. To draw meaningful conclusions about the relative cost differences between PD and HD, a recent systematic literature review calculated the HD:PD cost ratios found in different studies.[15] These ratios are less sensitive to methodological differences between studies. The study concluded that in developed countries PD usually costs less to the health care payer than HD.[15] The HD:PD cost ratios as calculated and presented by Just et al.[15], are shown in Figure 1.

Figure 1: Hospital HD:PD cost ratio in developed economies[15]



Source: Just, et al. 2008[15]

If data on resource use are collected prospectively over a specific period of time, they should be analyzed on an intention to treat basis. This implies that the costs of PD may also include costs of hospital HD, namely for those patients who started on PD and switched to hospital HD in the course of time. Moreover, resource use data should be corrected for age and co-morbidities as these factors may impact on the costs of treatment. Several –though not all- studies included in the review and more recent ones applied this principle.[19, 27, 58, 59]

More results from the same review show hospital HD to be more expensive than home or satellite HD and APD to be more expensive than CAPD.[15] A French study not included in this review found that, from a health insurers point of view, there were no important differences between the costs of the three home dialysis modalities (home HD, CAPD and APD), while hospital HD is more expensive than PD.[17] It should be noted that costs in this study are actually charges. The health insurance costs of hospital HD were almost 40% higher than the costs of PD. The cost difference is mainly explained by the higher reimbursement of hospital HD sessions and the costs of medications not covered by the lump sum reimbursement for dialysis. The costs of transport for hospital HD are almost equal to the costs of nursing support and treatment of complications for PD.

Regarding the costs of different dialysis modalities over time, it is found that during the first 6 months of dialysis treatment the incremental cost of hospital HD compared to PD is larger than during the following 6 months. This is mainly explained by the higher hospitalisation costs for hospital HD in this period. During the next 6 months, the cost gap becomes smaller because the cost of hospitalisation goes down for the HD patients. In the following years of treatment the hospitalisation and medication costs for PD rise compared to the previous years while the cost for the hospital HD treatment remains relatively stable, thereby reducing the cost difference between the modalities.[17, 59]

With respect to different HD modalities, the cost of hospital HD is found to be highest.[16, 18-21]. Mowatt et al. concluded from their literature review that satellite HD seems to cost more than home HD but that results vary depending on the staffing intensity and the ability to maximize use of HD machines.

It is thought that the new generation of home HD equipment, with lower complication rates and less need for caregiver involvement might reduce the costs of home HD.[9] Lee et al[19] found hospital HD to be about 18% more costly than satellite HD and about 42% more costly than home HD. Four studies concluded that both hospital HD or satellite HD are more costly than home HD.[16, 20, 21, 24]

Most cost studies adopt a payer or provider perspective, including only direct costs in the analyses. Indirect costs (productivity losses) were rarely included. This may introduce a bias against home dialysis modalities for which productivity losses might be less than for hospital HD.

2.5.2 Cost-effectiveness of dialysis modalities

A general comment with respect to the cost-effectiveness of dialysis modalities raised by many authors of cost-effectiveness analyses is that the comparison of dialysis modalities is hampered by selection bias in observational data. Dialysis modalities are in most cases no perfect substitutes -the choice between them being inspired mainly by the medical condition and preferences of the patient and, for transplantations, also the availability of organs. Moreover, investigating the relative cost-effectiveness of different dialysis modalities is seriously hampered by the absence of effectiveness data from RCTs. Many authors limit themselves, therefore, to a discussion of the costs on the one hand and the effects on the other hand. Some, however, have attempted to calculate an incremental cost-effectiveness ratio (ICER). These ICERs should be interpreted with caution, as they are, by nature, unstable. If patients currently treated with modality A are being moved to modality B because B is found to be more cost-effective (a lower ICER), the ICER of B risks to increase, because A might have been the most cost-effective treatment for some of these patients. Moving them to B reduces B's effectiveness and increases B's costs.

2.5.2.1 HD modalities comparison

Mowatt *et al* [9] examined the cost-effectiveness of home HD versus satellite and hospital HD, based on a review of 6 studies. They concluded that home HD has lower costs and better outcomes than hospital HD. At the start of dialysis treatment the costs of home HD are higher than the costs of hospital HD. The payback period was estimated to be around 14 months. Satellite HD generates lower costs and better outcomes than hospital HD.[9]

Findings with respect to the relative costs and effects of home HD compared to satellite HD are conflicting. Two primary cost-utility analyses [9, 22] found home HD to be more costly and more effective than satellite HD. Costs of transportation and productivity losses were not included in this study, which may bias the results against home HD. A cost-utility study from Finland that did include costs of transportation (though not productivity losses) found neither significant difference in health-related quality of life (HRQOL) nor total healthcare related costs differences between home HD nor satellite HD. The study compared costs and HRQOL between home HD and satellite HD patients that were originally suitable for either modality using a cross-sectional design. Higher direct medical costs of dialysis and hospital treatment in case of home HD were compensated by lower travel costs.[24]

Two studies compared hospital HD and home nocturnal HD.[25, 26] In a cross sectional study, home nocturnal HD was found to be a dominant strategy, i.e. more effective and less costly.[25] A second study compared hospital HD to a strategy of starting on hospital HD and moving to home nocturnal HD after 5 years.[26] The authors concluded that starting on hospital HD and being transferred to home nocturnal HD was a dominant strategy compared to staying on hospital HD lifelong.

2.5.2.2 *PD compared to HD*

Winkelmayer *et al* assessed the average cost-effectiveness ratios of HD, PD, and renal transplantation based on a literature review. The average cost-effectiveness ratio of hospital HD was found to be the highest, followed by home HD, PD and finally renal transplantation.[14]

Another literature review based on seven economic evaluations suggested that CAPD was more efficient than hospital HD because of its lower average cost per life year saved.[60] A Greek economic evaluation not yet included in the literature review also reached this conclusion based on the finding that PD was as effective as hospital HD in terms of QALYs and less costly.[23] This conclusion was based on lifelong extrapolations of observational data.

In a Markov model comparing HD to PD and taking into account switches between PD and HD, multiple scenarios were assessed with respect to transition probabilities, survival rates and discount rates.[13] In half of these scenarios, starting on HD was a dominant (more effective and less costly) strategy compared to starting on PD and in the other cases, starting on HD was more effective but also more costly than starting on PD.[13]

A study that used, besides other observational designs, a case-control study design with 68 CAPD-HD pairs matched on age and co-morbidities, found that CAPD is a dominant strategy compared to HD over the first three years of treatment. The analysis was performed on an intention-to-treat basis.[27] Other primary economic evaluations also concluded that starting on PD is a dominant strategy or a more cost-effective strategy (i.e. has lower average cost-effectiveness ratio) compared to starting on HD.[28, 29]

In conclusion, PD is generally found to be less costly and more or equally effective as hospital HD in economic models, especially in the first 6 months of treatment. A difference remains afterwards but becomes smaller as the complication rates of PD increase. Results of economic evaluations comparing home HD with hospital or satellite HD are conflicting. Comparisons between studies are difficult because much depends on the costs of resources and the resource use in the country.

2.6 CHOICE OF A SPECIFIC DIALYSIS MODALITY IN INDIVIDUAL PATIENTS

2.6.1 Medical indications and contra-indications for specific dialysis modalities

The formulation of indications and contra-indications for the different dialysis modalities is difficult and the evidence is largely restricted to expert opinion.

The choice of dialysis modality is discussed neither by the American Nephrology guidelines (KDOQI),[61] nor by the European guidelines from ERA (EBPG).[62]

2.6.1.1 *Australian guidelines*

In Australia, a specific guideline on the 'mode of dialysis at initiation' was produced by CARI (Caring for Australians with Renal Impairment) in 2005, based on a systematic literature overview,[30] but all suggestions for choice of dialysis modality are based on level III or IV evidence only. These guidelines suggest that the mode of initial dialysis should take into account the preferences of a fully informed patient, the absence of medical and surgical contra-indications (see below), and resource availability, although this part of the guideline is based on level IV evidence only. The following relative and absolute medical and surgical contraindications to PD or HD are mentioned :[30]

For PD:

- previous abdominal surgery with adhesions
- unrepaired hernia
- pleuro-peritoneal communication
- bowel problems (e.g. chronic constipation, diverticulitis)

- severe respiratory insufficiency
- ileal conduit or colostomy
- abdominal obesity
- large muscle mass

For HD:

- vasculature unsuitable for AV fistula
- cardiovascular instability
- needle phobia

These guidelines also suggest that when there are no specific patient preferences, no contraindications or no resource constraints, the use of CAPD should be considered (not APD) in preference to HD, in order to better preserve residual renal function (RRF) and to allow for a graded introduction of dialysis.[30] This last statement is based on level III evidence, and also supported by Greenberg et al. [2]

An additional absolute contra-indication to self-care peritoneal dialysis is blindness (in the absence of a third party helping for exchanges) and an additional relative contraindication is a history of non-compliance with medical treatment and follow-up. In addition, there are social contra-indications to peritoneal dialysis, especially the inability to perform PD exchange safely oneself for other reasons than blindness. Absolute contra-indications to haemodialysis are few and usually not known before actually starting HD. These include very severe congestive heart failure (CHF) with the inability to tolerate ultra filtration, or extensive thrombosis of most or all of the major central veins, precluding the creation of a suitable vascular access.

2.6.1.2 French guidelines

In 2008 the French *'Haute Authorité de Santé'* (HAS) released consensus based guidelines on indications and contra-indications for PD versus HD.[31] These guidelines concern not only the criteria for the initial choice of dialysis modality, but also criteria for the transfer from PD to HD and vice versa, the choice of PD or HD before a planned kidney transplant and the choice of dialysis modality after graft failure. For the initial choice it is recommended that several factors are taken into account: residual renal function (RRF), body mass index (BMI), psychosocial factors that might influence the capability of the patient to strictly adhere to the treatment, the initial cause of renal disease and co-morbidities.

For new dialysis patients the French guidelines recommend PD more than HD for cirrhotic patients with ascites, for patients with kidney failure due to cholesterol embolism or with difficulties for HD vascular access. PD is not recommended in patients with morbid obesity (BMI>45 kg/m^2) or with irreparable abdominal hernias.[31, 32]

2.6.2 Patient choices

2.6.2.1 Reported choice

It is obvious that many non-medical factors, more related to patient preferences, are important in the choice of a specific dialysis modality.

Patient choice in the absence of medical contra-indications has been described in the Dutch NECOSAD study that started in 1997 (see also 2.3.3).[40, 63] All ESRD patients included in NECOSAD were new on dialysis treatment. The majority (64%) of all ESRD patients had indeed no medical contra-indications to either HD or PD. Of these patients, 52% preferred HD over PD.[40] Older patients, women, and patients living alone were more likely to choose HD, and these latter findings largely correspond to the Belgian observations as reported in chapter 4. Patients who received predialysis care were two times more likely to choose PD instead of HD,[63]. In younger patients, employment status and the ability to work were most likely taken into account in the choice of treatment modality.

Mehrotra et al. reported that in the USA, chronic peritoneal dialysis declined from 11% in 1996-1997 to 7% in 2002-2003 ($p<0.001$) despite the fact that the outcomes associated with PD improved significantly over the same period.[64] This trend of a PD decline could not be explained by increasing age, co-morbidity and body size of incident ESRD patients.

An Italian multi-centre study among 9773 incident chronic dialysis patients starting RRT in 2004, found an average of 15.9% of PD as initial therapy but also large variations ranging from 0.4%to 19.3% depending on type of centre and geography. [65]

2.6.2.2 *Factors influencing choice*

A recent systematic review analysed the factors influencing decision-making in adults with ESRD.[66] This review included studies and decision support tools since 1998. Forty studies that focused on patient decisions for RRT were appraised, and also the provision of information from health care professionals was analysed. The conclusion from this systematic review was that decision making is extremely complex from a patients' point of view, both for choice of a specific RRT modality as for the choice whether or not to start dialysis therapy. Little is known about interventions to support patients with ESRD in making informed decisions on RRT choices. The authors conclude that it would be beneficial to develop specific clinical practice guidelines and decision support tools.

In Denmark, the patient's views regarding the choice of dialysis modality were investigated through a method of focus groups. The participants (patients and relevant others) considered that each dialysis modality has its advantages and disadvantages. Flexibility, independence and feelings of security were key factors for the choice.[56] This study will be described in more detail in chapter 7.

2.7 PREDIALYSIS PATIENT EDUCATION

Only a few randomized controlled trials and cohort studies have been performed on this highly relevant clinical issue.

Devins et al. randomised 297 patients with progressive CKD expected to require RRT within 6 to 18 months to an interactive 1-on-1 slide-supported educational session and booklet and supportive telephone calls or usual care.[67] The intervention delayed the time to dialysis by an average of 2.8 months ($p<0.032$).

Manns et al. randomized 70 patients with CKD to either a two-phase patient-centred educational intervention (booklets, a video on self-care dialysis, and a small group educational session on self-care dialysis) or ongoing standard care.[68] Significantly more patients in the intervention group than the standard group intended to start dialysis with a self-care modality (82.1% versus 50%, $p=0.015$). However, the authors only studied the tentative decision of the patient to choose one or another modality; the study did not provide information on the actual modality chosen by the patients included in this study.

The few observational studies concur to conclude that, when detailed information on the various dialysis modalities is provided early, more patients are likely to start with a self-care modality such as PD or home HD.[69, 70]

The European Best Practice Guidelines recommend (quote): "Patients whose GFR is <30 mL/min and declining despite therapy should be under the care of a nephrologist and be prepared for the onset of end-stage renal failure. This preparation includes choosing the most appropriate location (e.g. home or hospital) and the form of treatment (e.g. HD, CAPD, pre-emptive transplantation or conservative treatment). This choice will involve discussion between patients, their families and nephrology staff. This process may need support from specialist renal counsellors and social workers".[62]

In Belgium the system of so called 'ambulatory care pathways' also called 'shared care' (Zorgtrajecten/Trajets de soins, see http://www.zorgtraject.be) became applicable for chronic kidney disease patients on June 1st 2009. Within those Care Pathways the management, treatment and follow-up of patients with a chronic disease are streamlined. This trajectory is based on a close cooperation between patient, general practitioner and specialist doctor. The main aim of this system is to enhance collaboration between all parties and ultimately enhance patient care. Moreover, it offers financial and other benefits to both patients and treating physicians. Since the system is new, it is too early to be evaluated at this moment.

2.8 CONCLUSION

Overall, this overview of the literature is disappointing as there is limited evidence about the comparative intrinsic value of different dialysis modalities. Only one single RCT has ever tried to compare HD and PD but unfortunately that study failed to recruit sufficient patients and the small size of the included cohort and methodological problems preclude any reliable conclusion.

The evidence on different dialysis modalities is limited to results from observational studies that were not designed to adequately deal with underlying confounders. The recommendation of the Australian guidelines to initiate dialysis with PD when there are no contra-indications and when acceptable to the patient is plausible but unproven. The recent French guidelines are more reserved on this topic.

Key points

- **There is no evidence for a difference in survival due to different dialysis modalities per se.**
- **Differences in survival were observed for different dialysis modalities but almost all studies were observational and therefore subject to several biases and especially confounding by indication.**
- **Some large registry data suggest a better survival for patient starting on PD in the initial period and a better survival with HD later on for patients with specific conditions but also those registries are characterised by several biases and especially confounding by indication**
- **There is no evidence for a difference in morbidity due to different dialysis modalities per se for similar reasons as mentioned above.**
- **There is no evidence for a difference in quality of life due to different dialysis modalities per se.**
- **According to the literature hospital HD seems to be more costly than satellite HD, home HD and PD both from the health care payer's and provider's point of view.**
- **Economic evidence about home HD and satellite HD seems to be conflicting and does not allow conclusions about their relative cost(-effectiveness). Starting on PD, however, seems more cost-effective and sometimes even dominant (more effective and less costly) compared to starting on HD.**
- **Medical indications and contra-indications for the choice of specific dialysis modalities are mainly based on expert opinion and consensus.**
- **For the majority of patients there are no absolute medical indications or contra-indication for specific dialysis modalities.**
- **According to the literature, patients' choice should be mainly determined by personal preferences of a fully informed patient, if there are no specific indications or contra-indications.**
- **Pre-dialysis patient education and preparation is considered important by experts. The study of strategies for pre-dialysis patient information and education fell outside the scope of this report.**

3 BELGIAN SITUATION

3.1 EPIDEMIOLOGY

3.1.1 The patient population

Data on the prevalence and incidence of renal replacement therapy for Belgium are available from the two professional organisations of nephrologists in Belgium, the NBVN [b] (Nederlandstalig Belgische Vereniging voor Nefrologie/Dutch Speaking Nephrology Association) and the GNFB [c] (Groupement des Néphrologues Francophones de Belgique/French Speaking Nephrology Association). All dialysis centres, including those located in the Brussels region, are associated with one community, either the French speaking community or the Dutch speaking community. The NBVN and GNFB publish a common report on their activities. The most recent common report for the year 2008, reporting on the activities up to 2007 was not yet published on the organisations' websites at the time of the final edition of this report, However, we received a draft version of the common report from the presidents of the organisations which allowed us to present the most up-to-date statistics about prevalence, incidence according to age, major causes of ESRD and transplantation activities. The data from the GNFB and NBVN are also reported in the annual reports of the European Renal Association (ERA)[d], although small differences exist between the figures presented in the ERA Annual Reports and the common reports of the NBVN/GNFB. In this chapter the common reports of the NBVN/GNFB are the main source of information, unless specified otherwise.

3.1.1.1 Incidence and Prevalence

Table 3 presents the evolution of the number of patients on renal replacement therapy (RRT, including all dialysis modalities and renal transplantation) between 2002 and 2007.

Table 3: Number of patients on RRT in Belgium (dialysis and renal transplant patients)

	2002	2003	2004	2005	2006	2007
Prevalence	9027	9438	9967	10422	10948	11396
Prevalence pmp*	875.6	911.4	958.7	997.7	1041.5	1076.7
Incidence	1783	1751	1909	1885	1999	1957
Incidence pmp*	172.9	169.1	183.6	180.5	190.2	184.9

*pmp: per million of the populatione
Source: Common report NBVN-GNFB, 2008.

In five years time, the number of prevalent patients on RRT has increased with 26%, going from 9 000 patients in 2002 to almost 11 400 patients in 2007. The population on RRT has been growing annually at a rate of about 5% between 2002 and 2007.

The number of new patients grew at an annual rate of about 2% between 2002 and 2007. This can partly be explained by the relatively large proportion of older patients and the aging population in Belgium. The age distribution of prevalent patients is shown in Table 4.

[b] http://www.nbvn.be
[c] http://www.gnfb.be
[d] Available from http://www.era-edta-reg.org/index.jsp?p=annrep, last accessed November 10, 2009.

Table 4: Number and percentage of prevalent RRT patients according to age (both dialysis and renal transplant patients)

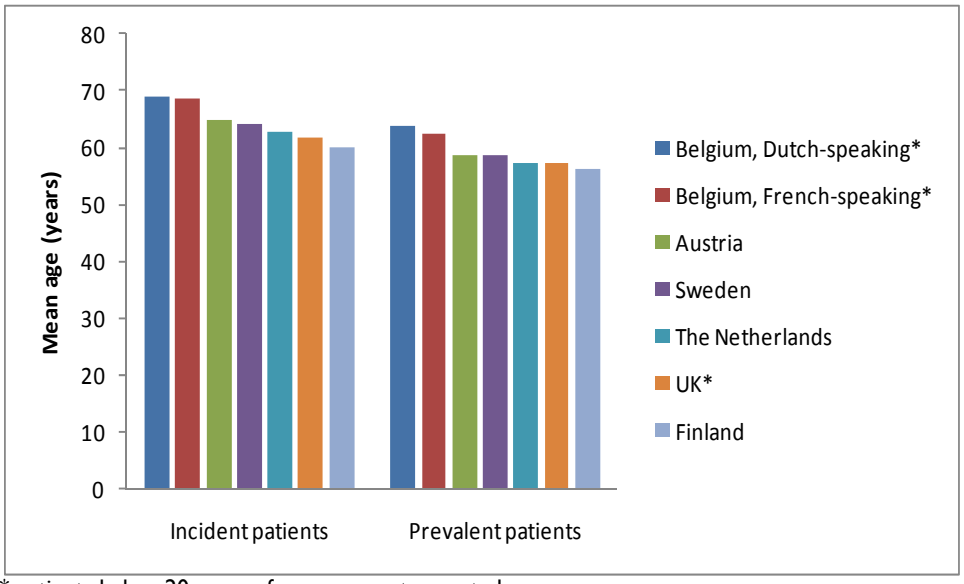
	2002		2003		2004		2005		2006		2007	
Age	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
0-24	149	*2*	144	*2*	159	*2*	159	*2*	153	*1*	159	*1*
25-34	455	*5*	469	*5*	459	*5*	459	*4*	464	*4*	445	*4*
35-44	916	*10*	909	*10*	942	*9*	942	*9*	965	*9*	978	*9*
45-54	1597	*18*	1624	*17*	1669	*17*	1720	*17*	1727	*16*	1759	*15*
55-64	1909	*21*	1971	*21*	2080	*21*	2218	*21*	2361	*22*	2460	*22*
65-74	2214	*25*	2319	*25*	2436	*24*	2465	*24*	2506	*23*	2583	*23*
75-84	1564	*17*	1756	*19*	1944	*20*	2125	*20*	2348	*21*	2495	*22*
≥85	223	*2*	246	*3*	278	*3*	334	*3*	424	*4*	517	*5*
Total	**9027**		**9438**		**9967**		**10422**		**10948**		**11396**	

Source: Common report of the NBVN and GNFB, 2008.

The largest age group is the group of patients between 65 and 74 years of age, although the older age group (75-84 years of age) seems to gain in importance in the last two years. In 2002 about 19% of the patients on ESRD treatment were 75 years of age or above. In 2007, already 27% of the ESRD patients were older than 75 years of age (see also Figure 3). This is more than could be expected by ageing of the population alone and seems to indicate a paradigm shift in therapeutic choices by nephrologists.

Compared to other countries, the mean age of the incident and prevalent patients on renal replacement therapy is high (Figure 2 and Table 5). The ERA-EDTA annual report does not contain data for the entire Belgian territory. Data are presented for the Dutch-speaking part of Belgium and the French-speaking part separately, based on the data from the NBVN and the GNFB respectively.

Figure 2: Mean age of incident and prevalent ESRD patients on renal replacement therapy in 6 countries(dialysis and renal transplant patients)



* patients below 20 years of age were not reported.
Source: ERA-EDTA Annual Report 2007

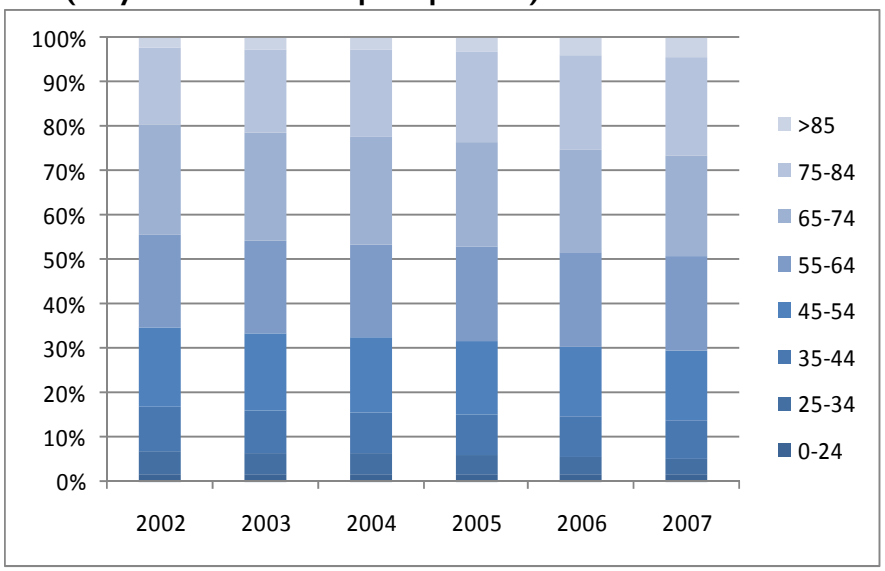
Table 5: Mean and median age of incident and prevalent ESRD patients on renal replacement therapy in 4 countries (2007) (dialysis and renal transplant patients)

	Incident patients		Prevalent patients	
	Mean age (years)	Median age (years)	Mean age (years)	Median age (years)
Belgium, Dutch-speaking*	69.0	72.8	63.8	65.6
Belgium, French-speaking*	68.5	71.6	62.4	63.5
Austria	64.7	67.6	58.7	60.1
The Netherlands	62.8	66.0	57.2	58.9
Finland	60.0	62.2	56.4	58.1
Sweden	64.3	67.6	58.6	60.3
UK*	61.6	64.0	57.2	57.9

* patients below 20 years of age were not reported.
Source: ERA-EDTA Annual Report 2007

The proportion of patients younger than 35 years is stable over time, while the group of people younger than 25 years is small (less than 2% of the population).

Figure 3: Evolution of the prevalent ESRD population by age from 2002 to 2007 (dialysis and renal transplant patients)



Source: Common report of the GNFB and NBVN, 2008

The age and gender distribution of new, i.e. incident, patients receiving chronic renal replacement therapy registered in 2007 is shown in Table 6.[e] In 2007, 1 973 new patients with chronic renal failure were reported: 1 219 men and 754 women. About 60% of the population were thus males. More than one third of the new patients treated for the disease is 75 years old or older and among those new patients.

[e] These data were derived from the ERA Annual Report 2007, as they were not presented in the draft common report of the GNFB/NBVN.

Table 6: Number and percentage of incident ESRD patients on RRT according to age and sex in 2007.

Age	Men	%	Women	%	Total	%
20-44	81	7%	51	7%	132	7%
45-65	338	28%	181	24%	519	26%
65-74	341	28%	195	26%	536	27%
>75	459	38%	327	43%	786	40%
All	1219	100%	754	100%	1973	100%

Source: ERA-EDTA Registry Annual Report 2007[71], based on data derived from NBVN and GNFB Databases, though not presented in the common report 2008.

The main causes of ESRD in Belgium are glomerulonephritis, renal vascular disease and diabetic nephropathy (Table 7).

Table 7: Major causes of ESRD in prevalent patients in 2007

	N	%
Glomerulonephritis	2 141	19
Pyelonephritis	1 083	10
Tubulo interstitial disease	665	6
Congenital disease	1 547	14
Renal vascular disease	2 025	18
Diabetic nephropathy	1 966	17
Secondary nephropathy	884	8
Other	248	2
Unknown	837	7

Source: Common report NBVN-GNFB, 2008

In terms of the evolution over time of the main causes of ESRD, it is observed that renal vascular disease has become more important over the last 5 years. The number of patients in whom renal vascular disease was the cause of ESRD has increased with 52.1% between 2002 and 2007, while the total population has increased with 26.2% in the same period. The number of patients with ESRD due to diabetic nephropathy increased with 39.7% between 2002 and 2007. While in 2002 diabetic nephropathy was still a more important cause of ESRD (16% of all patients) than renal vascular disease (15%), renal vascular disease has now become more important than diabetic nephropathy. While glomerulonephritis remains the most important cause of ESRD in prevalent dialysis patients (mainly due to a longer life expectancy), renal vascular disease and diabetic nephropathy are the most important major causes of ESRD in new (incident) cases.

3.1.2 Renal Transplants

In Belgium, renal transplant activities are regulated by the law of June 13th, 1986, based on an "opting-out system" or "dissent solution", according to which the potential donor has to explicitly disagree with donation during his lifetime.[f] This means that the organ donation system is based on the principle of active "no": a subject is considered to be a potential donor except if he has refused officially and explicitly to be an organ donor. Parallel to the opting-out system, a registration procedure exists for people who want to actively consent with organ donation. Strictly, this has no legal basis, as in principle organs can be harvested irrespective of an active consent. In daily practice, however, the family is almost always consulted for permission. An active registration as organ donor will therefore mainly help the decision of the family, who is faced with a difficult choice at an emotional moment.

f Law of 13 June 1986 on the prelevation and transplantation of organs. B.S./M.B 14/02/1987, operational since 24/02/1987.

The eight Belgian renal transplant centres[g] are collaborating with Eurotransplant. The Eurotransplant International Foundation is responsible for the mediation and allocation of organ donation procedures in Austria, Belgium, Germany, Luxemburg, the Netherlands, Slovenia and Croatia. Eurotransplant has an allocation system of kidneys based on 5 factors: HLA matching, frequency of HLA type, waiting time, geographical distance between place of kidney removal and transplantation and balance between the number of kidneys offered and received at the national level. Organs can also be allocated on the basis of medical urgency.

Given that renal transplantation is generally believed to offer a better quality of life to ESRD patients, the possibility of renal transplantation should at least be considered in all ESRD patients. The number of patients on the transplant waiting list for a kidney only or combined kidney-liver, kidney-heart, kidney-lung or kidney-pancreas transplantation in 4 countries is presented in Table 8. The proportion of dialysis patients on the renal transplant waiting list is comparable to that in the Netherlands, but lower than in Austria.

Table 8: Active kidney transplant waiting list as per December 31st, 2007

Type of transplant	Austria	Belgium	Germany	Netherlands
kidney	820	796	7 916	916
kidney+heart	3	3	18	0
kidney+liver	4	9	50	1
kidney+lung	0	0	3	0
kidney+pancreas	25	32	220	20
Total	852	840	8 207	937
(% of dialysis patients)	(18.97%)	(12.54%)*		(12.78%)

Source for the number of patients on the transplant waiting list: Annual Report of the Eurotransplant International Foundation 2007 (http://www.eurotransplant.nl/files/annual_report/AR2007_def.pdf).
Percentages of dialysis patients on the transplant waiting list calculated based on the prevalence figures of RRT presented in the ERA-EDTA Registry Annual Report 2007 for Austria and the Netherlands, no data were available for Germany in this registry.
* based on the total prevalence figures of RRT and renal transplantation presented in the NBVN-GNFB Common report, 2008.

g AN Universitair Ziekenhuis Antwerpen,
BJ Academisch Ziekenhuis der Vrije Universiteit,
BR ULB, Hôpital Erasme, Bruxelles
GE Universitair Ziekenhuis, Gent
LA Cliniques Universitaires St. Luc, Bruxelles
LE Kinderdialyse Universitair Ziekenhuis Gasthuisberg, Leuven R.
LG Centre Hospitalier Universitaire, Liège
LM Universitair Ziekenhuis Gasthuisberg, Leuven

The number of transplantations in 2007 in the same countries is presented in Table 9.

Table 9: Kidney transplants from deceased donor (2007)

Type of transplant	Austria	Belgium	Germany	Netherlands
kidney only	306	410	2157	433
kidney en bloc	1	8	10	4
kidney + pancreas	20	16	116	25
kidney + heart	1	4	8	0
kidney en bloc + whole liver	0	0	1	0
Kidney + split liver	0	0	4	0
Kidney + whole liver	8	11	42	2
Kindney + pancreas + whole liver	0	0	1	0
Kidney + lung	0	0	1	0
Total	**336**	**449**	**2340**	**464**

Source: Annual Report of the Eurotransplant International Foundation 2007 (http://www.eurotransplant.nl/files/annual_report/AR2007_def.pdf).[72]

The kidney, like lung and partial liver is an organ that can also be donated by living donors Almost a third of all kidney organs registered in Eurotransplant come from living donors, possessing bilateral renal function and not having other systemic diseases. Over 2/3 of kidney allografts, however, come from deceased donors. According to the Eurotransplant statistics for the year 2008, 413 "kidney only"-transplants in Belgium were from deceased donors and 45 from living donors (33 from related and 12 from non-related donors). This means that about 10% of the kidneys transplanted in Belgium are from living donors. The option of living-related and particularly living-unrelated donation is used infrequently in Belgium. Other countries, especially the Netherlands, use this option more often (Table 10).

Table 10: Deceased versus living donor kidney transplantation (kidney only) in a selection of countries associated with Eurotransplant (2008)

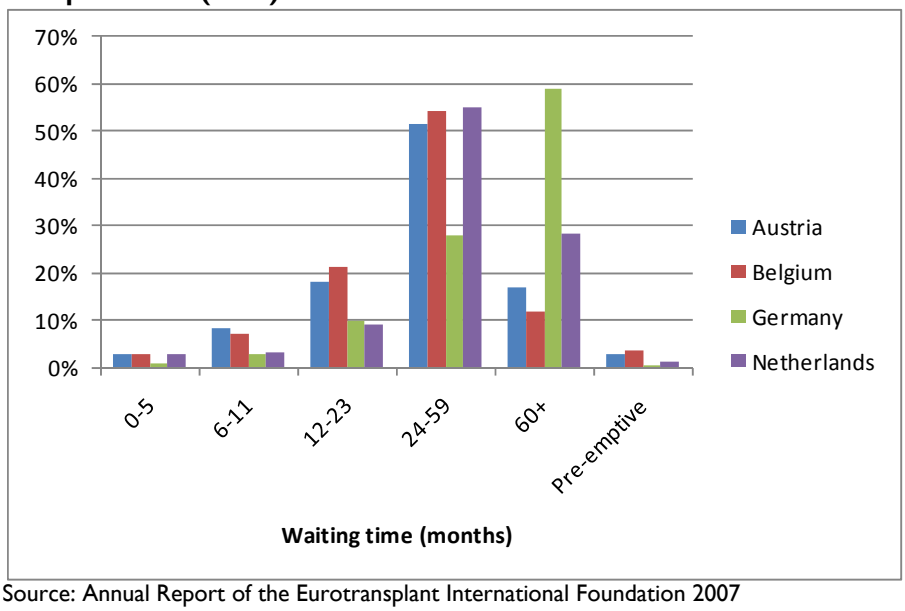
	Deceased donor	Living donor	% living donor	Total
Belgium	413	45	10%	458
Austria	263	57	18%	320
Germany	2005	565	22%	2570
The Netherlands	336	411	55%	747

Source: Annual Report of the Eurotransplant International Foundation.[73]

A persistent issue relating to organ transplantation is the scarcity of organ donors relative to the number of potential recipients on organ transplantation waiting lists. The average waiting time for renal transplant candidates is 2 to 2.5 years.

Compared to Germany and the Netherlands, patients have to wait less long for a kidney transplant in Belgium (Figure 4). Also the proportion of patients transplanted pre-emptively is relatively large in Belgium, compared to other countries (almost 3.6% compared to 0.23% in Germany and 1.37 in the Netherlands). According to the experts, both differences may partly explain the lower use of living donors in Belgium.

Figure 4: Time on the transplant waiting list for kidney (only) transplantation (2007)

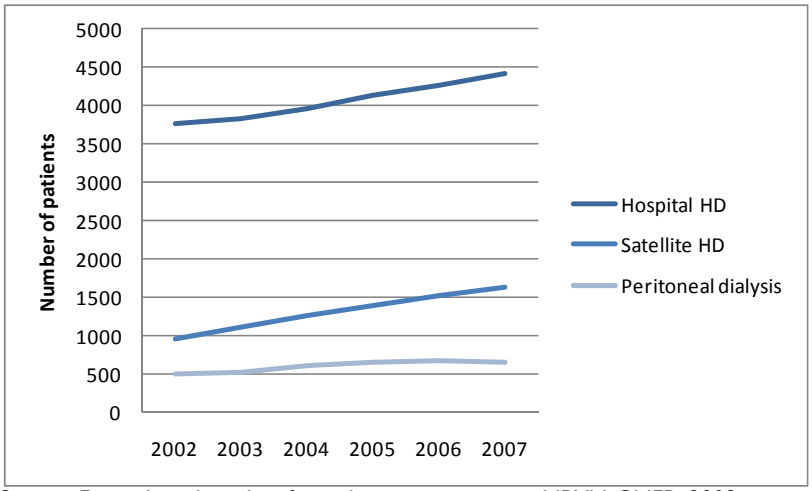


Source: Annual Report of the Eurotransplant International Foundation 2007 (http://www.eurotransplant.nl/files/annual_report/AR2007_def.pdf).[72]

3.1.3 Use of different dialysis modalities for ESRD in Belgium

The total number of patients on all dialysis modalities has increased between 2002 and 2007 (Figure 5). In 2007 approximately 6 700 patients were on chronic dialysis therapy in Belgium. The annual growth rates show different patterns between dialysis modalities. The number of peritoneal dialysis patients has grown less rapidly than the number of patients on hospital HD or satellite HD. In 2007 even a small decrease in the number of prevalent patients on PD was observed as compared to 2006 (from 671 to 654).

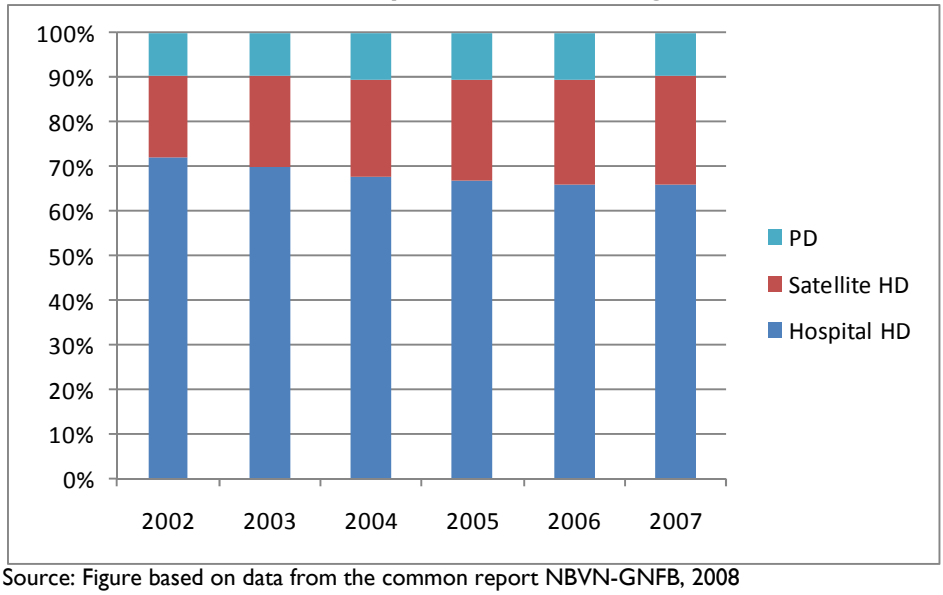
Figure 5: Evolution of the numbers of patients in different dialysis modalities between 2002 and 2007



Source: Figure based on data from the common report NBVN-GNFB, 2008

In relative terms, the percentage of patients on alternative dialysis treatments (PD and satellite HD) has grown from 28% in 2002 to 34% in 2007 (Figure 6). The growth in the proportion of satellite HD patients has had the largest contribution to this increase. The vast majority of chronic dialysis patients is treated with hospital HD (almost 66%). Satellite HD is used by approximately 24% of the patients in 2007 and PD by approximately 10% of the dialysis patients.

Figure 6: Evolution of the percentage of prevalent dialysis patients treated with different modalities of dialysis treatment in Belgium



Source: Figure based on data from the common report NBVN-GNFB, 2008

The evolution of the age distribution of prevalent patients in PD and satellite HD between 2002 and 2007 is presented in Figure 7. The figures show several observations:

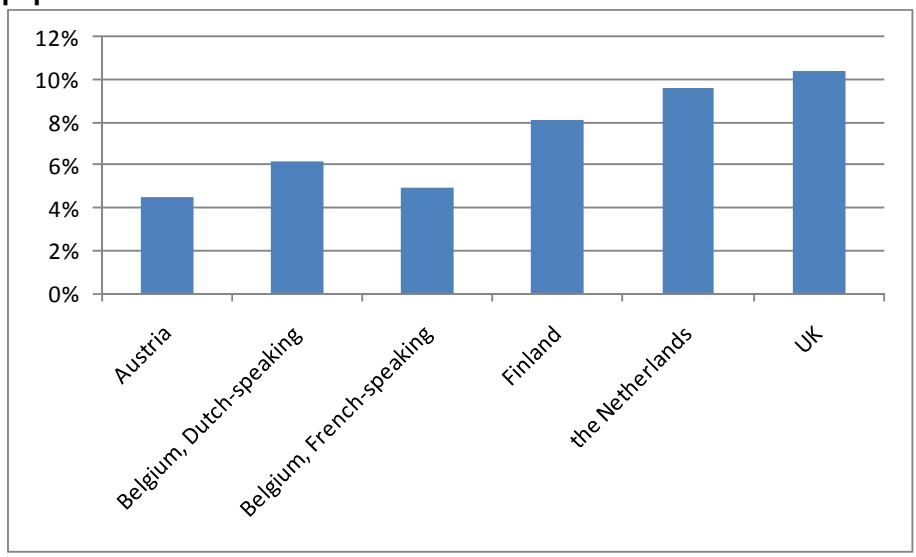
- The number of prevalent patients on RRT has been increasing throughout these six years. An uneven growth has been observed between treatment modalities, with satellite HD showing the most important increase in the number of patients (+69.5%).
- Older patients are more often treated by means of hospital HD than younger patients. Eight in 10 patients younger than 55 years were treated by means of satellite HD, home HD, PD or transplantation in 2007.
- Over the years, the proportion of older patients on any of the dialysis modalities is increasing, although in 2007 the proportion of patients ≥75 years treated with PD declined slightly. In 2007 the proportion of all dialysis patients (excluding transplanted patients) older than 75 years of age was 41%.
- Besides the decline in the number of elderly patients on PD also the number of patients younger than 55 years of age on PD declined between 2005 and 2007, suggesting that the decline in the relative use of PD cannot only be attributed to an age-effect.

Figure 7: Age distribution of prevalent patients in different RRT modalities between 2002 and 2007 (in relative terms in the left column and in absolute numbers in the right column)

Source: Common report of the NBVN and GNFB, 2008.

The proportion of prevalent RRT patients (including transplantation) treated with PD is in Belgium relatively low compared to other countries (Figure 8). There might be different explanations for this observation. Firstly, the population on RRT in Belgium is on average older than in other countries and patients on PD or living with a renal graft are generally younger than patients on hospital HD (as shown in Figure 7). Secondly, Belgium has a shorter waiting time for transplantation. As there might be relatively more PD patients on the waiting list, the shorter waiting time might explain why relatively less patients are on PD in Belgium. We did not have data on the dialysis modality of patients who are on the waiting list for transplantation, however. Therefore, we could not verify this hypothesis.

Figure 8: Proportion of prevalent PD patients in total prevalent patient population on RRT in 5 countries*



* Data from Belgium and the UK do not include dialysis modality use of patients younger than 20 years of age.
Source: ERA-EDTA Registry Annual Report 2007[71]

Key points

- **In Belgium, approximately 11 000 patients are on renal replacement therapy (dialysis or transplantation) at any given moment. The population with ESRD has been growing annually at a rate of about 5% during the last five years.**
- **According to the Belgian ESRD registries approximately 6 700 patients were on chronic dialysis therapy in 2007. The vast majority of chronic dialysis patients is treated with hospital HD (almost 66%). Satellite HD was used by 24% and PD by 10% of the dialysis patients.**
- **The proportion of older people treated for ESRD grows. While in 2002 about 19% of the patients on renal replacement therapy were older than 75 years of age this proportion was 27% in 2007. This includes patients living with a renal transplant. In 2007 the proportion of dialysis patients older than 75 years of age was 41% according to the registries of the two Belgian professional organisations NBVN and GNFB.**
- **The main causes of ESRD in prevalent RRT patients in Belgium are glomerulonephritis, renal vascular disease and diabetic nephropathy. The relative importance of renal vascular disease as a cause of ESRD has increased during the last five years because it became a major cause of ESRD in incident patients.**
- **Belgium has an opting-out system for organ donation. Nevertheless the need for kidneys for transplantation still exceeds the availability.**
- **In Belgium patients wait less long for a kidney transplantation than in the Netherlands and Germany.**
- **Less than 10% of the kidneys transplanted in Belgium are from living donors. Some other countries use this option more often.**
- **Over a period of 6 years (2002-2007), the proportion of patients on alternative dialysis therapies has increased from 28 to 34%. The growth can be largely attributed to the increase in the use of satellite HD.**

- **The proportion of older patients on renal replacement therapy has been increasing between 2002 and 2007, though unequally across treatment modalities. The proportion of prevalent elderly patients (≥75 years of age) on PD has remained stable between 2005 and 2007, while the proportion of prevalent elderly patients on hospital HD has increased rapidly.**
- **The proportion of ESRD patients on PD treatment is lower in Belgium than in other countries. This might be explained by the higher average age of patients on renal replacement therapy in Belgium and the shorter waiting time for transplantation compared to other countries.**

3.2 CLINICAL CHARACTERISTICS OF DIALYSIS PATIENTS

As explained in chapter 2, the clinical characteristics of patients are one of the factors that determine the appropriateness of giving the choice to patients about their dialysis treatment modality. Therefore, it is important to have an idea of the Belgian patient characteristics, to put the findings in this and the following two chapters on health care expenditures and provider costs into the right perspective. The professional organizations in Flanders and Wallonia (NBVN and GNFB) register medical patient characteristics to some extent, but not exactly in the same way. For example, the GNFB database contains data on the Charlson co-morbidity score of incident patients, while the NVBN database does not contain these data. The data do therefore not allow drawing firm conclusions about the patient profiles in the whole of Belgium.

In 2009-2010, the NBVN and GNFB will perform a large survey on the dependency of dialysis patients. The questionnaire contains questions about, for instance, the patients' mobility, living situation and professional activities. The results are expected to be presented at the end of 2010.

3.3 PLANNING, ORGANISATION AND REGULATION

3.3.1 Legal aspects

In Belgium, the programming of dialysis centres is regulated by the Royal Decree of 27 November 1996.[h]

In the regulation, a centre for the treatment of chronic renal failure is defined as a medico-technical service, functionally and operationally embedded in a hospital, where a chronic renal failure patient can receive the most appropriate renal replacement therapy, such as

- Chronic haemodialysis, either the classic haemodialysis in a hospital setting (hospital haemodialysis) or collective haemodialysis in an appropriate environment (satellite haemodialysis) or home haemodialysis
- Chronic peritoneal dialysis (PD) at home
- Renal transplantation

3.3.1.1 Hospital haemodialysis units

With regard to the haemodialysis unit in a hospital setting, the law stipulates the requirements the hospital service must fulfil. The dialysis unit must be located in an acute hospital with at least a laboratory for clinical biology with a continuous surveillance, a department of medical imaging and an approved emergency service. The dialysis centre must treat at least 40 ESRD patients each year with one of the four treatment possibilities: hospital HD, satellite HD, PD or renal transplantation. Renal transplant patients being followed-up in the hospital after transplantation are counted as one patient. Also patients treated in satellite centres are included in this patient count.

[h] Royal Decree of 27 November 1996 on the enactment of the norms with which centres for the treatment of chronic renal failure should comply to be approved as medical-technical service in the sense of art 44 of the Law on Hospitals, coordinated on 7 August 1987; B.S./M.B. 18/02/1997.

For each patient, a medical and a medical-technical patient file is required. The data to be included in the medical file include: actual duration of dialysis, blood flow, dialysis efficiency, biological and technical examinations, drug treatment, etc. Data to be included in the medical-technical file relate to the methods used for blood purification, re-use of the artificial kidney, sterilisation methods used for materials and equipment and registration of the results of the control mechanisms for the composition of the water and dialyzer.

The activities are under supervision of a qualified nephrologist or specialist in internal medicine who works full-time (at least 8/10 of the normal professional activity) in the hospital. Besides the supervising specialist, an additional specialist in internal medicine has to be available for the first 4000 dialysis sessions performed in the centre. The hospital must employ an additional nephrologist for each additional 4000 dialysis sessions performed in the centre. At least one specialist (nephrologist or specialist in internal medicine) must be present in the unit for the full duration of the dialysis sessions.

The number of nurses and renal technicians required is related to the number of dialysis sessions performed yearly by the unit. The number of nurses and renal technicians is fixed at one full-time equivalent per 500 dialysis sessions (or one full time equivalent for 3.2 patients). The law stipulates that at least 50% of this staff should be a qualified dialysis nurse. However, such a qualification does not officially exist in Belgium. The ORPADT has some form of recognition for dialysis nurses, but this has strictly speaking no legal value. This requirement hence remains unfulfilled in practice. Consequently, the only *real* requirement with respect to nursing and technical staff is that at least 50% is a qualified nurse.

Each dialysis centre must have a formal collaboration agreement with at least one renal transplant centre.

The wards, rooms and space of the dialysis centre must be well-adapted to the number of patients and to the dialysis material used. The dialysis unit must have the possibility to isolate patients with Hepatitis B Virus, Hepatitis C Virus and Human Immune deficiency Virus (HIV). Additionally, the dialysis centre must organise a permanent "on call" service for urgent treatment at every time of day and night. Finally, the centre must commit itself to a programme for the evaluation of medical practice, established to ensure that each and every patient receives the most appropriate form of renal replacement therapy. Moreover, centres are obliged to develop initiatives to allow for internal audit of their activities.

3.3.1.2 Home haemodialysis and peritoneal dialysis

The specialist responsible for the dialysis centre decides, on a case by case basis and by mutual agreement with the patient, which patients are eligible for home dialysis (home HD, PD).

The supervision of the dialysis is done by the physicians of the dialysis centre. They are supported in their activities by a team of qualified personnel (nurse, technician, logistic personnel). According to law, at least one of them should be a nurse with a special qualification in dialysis but, as explained before, as this qualification does not exist in Belgium, the requirement cannot be applied in practice.

Prior to the start of the home HD and PD, the dialysis centre must educate the patient and if necessary a second person who supports the patient in order to ensure that the patient can correctly perform his dialysis. In case of calls from a patient dialysed at home by HD or PD –be it for an emergency or not- the responsible nephrologist of the centre or a delegated doctor, needs to be immediately available for advice. If necessary, a qualified person is sent to the patients' home. No formal legal requirements for the number of staff members are imposed.

The dialysis centre must provide the dialysis equipment (machines), materials and some dialysis-related medication. The centre also performs the necessary in-house adaptation works such as electricity, water supply, telephone connections for home dialysis. Moreover, the dialysis centre installs and maintains the equipment.

As for hospital HD patients, the centre keeps a medical-technical patient file for every home dialysis patient and supervises the dialysis journal completed by the patients.

3.3.1.3 Satellite haemodialysis

The specialist responsible for the dialysis centre decides, on a case by case basis and by mutual agreement with the patient, which patients are eligible for satellite HD.

The dialysis centre should educate the patient in order to enable him to correctly perform his dialysis treatment. The physicians of the dialysis centre are responsible for the supervision of the satellite dialysis. They cannot delegate this responsibility to another physician and are supported by a team of nursing, technical and logistic personnel. At least one nurse should have a special qualification or experience in dialysis techniques.

In case of a call from the satellite unit, the hospital dialysis centre should always be available to give instructions, send a qualified person and, in case of an emergency, take the patient back for treatment at the hospital unit. The hospital dialysis unit chooses the appropriate premises for the organisation of the collective satellite HD unit and is responsible for the operation of the services. It also provides the necessary consumables, medicines and materials.

A satellite HD unit should never be located nearer to another hospital HD unit than the one it is associated with. A satellite unit can be embedded in the acute hospital premises or be established outside the acute hospital.

3.3.2 Dialysis facilities in Belgium

Belgium counts 53 ESRD treatment centres. Of these, 49 have one or more satellite HD units located inside or outside the main hospital. Currently, five centres have a paediatric dialysis programme and a sixth is being developed.[i]

3.3.3 Real-world relevance of norms and rules for hospital and satellite HD units

According to some of the experts consulted in the context of this study, the norms established for satellite HD units are outdated. They have the strong impression that satellite centres are increasingly treating "high-care" patients (i.e. patients that would normally get their HD treatment in hospital). Strictly speaking this violates the spirit of the law, being that patients treated in satellite centres should be able to take a certain responsibility for their own treatment and do not require the continuous presence of a nephrologist. They should be "low-cost" dialysis patients, which justifies the lower reimbursement of patients treated in these centres compared to patients treated in a hospital HD centre.

The experts presume, however, that treating high-care patients in a satellite dialysis centre does not jeopardize the safety of the treatment for patients, as more personnel will be engaged in the satellite centres if more high-care patients are being treated there and the nephrologist will visit the centre whenever needed. The reimbursement of the dialysis sessions provided in the satellite centres, which were intended to be "low-cost setting", then becomes insufficient to cover the costs of the treatment of the "high-cost patients".

If the difference between the profiles of patients treated in satellite HD centres and patients treated in hospital HD centres is indeed decreasing, we should be able to observe this in the data from the NBVN/GNFB and the IMA/AIM. Figure 7 showed that the proportion of patients older than 75 years of age has been increasing in the last 5 years. Over 30% of the patients on satellite HD were over 75 years of age in 2008. Mortality, however, is still significantly different between the two groups (see chapter 4), with patients on satellite HD treatment having a better life expectancy than patients on hospital HD. Unfortunately, no data have been collected over time about the profile of patients in both settings in terms of dependency, preferences and co-morbidities.

[i] U.Z. Leuven, U.Z. Antwerpen, U.Z. Gent, C.H.U. Liège, Hôpital Universitaire des Enfants Reine Fabiola (HUDERF). Paediatric programme is currently being developed at the Cliniques Universitaires Saint Luc.

Consequently, firm conclusions about the evolution of patient profiles and the potential reduction of the difference between hospital HD centres and satellite HD centres cannot be drawn.

Key points

In 2007, there were 52 main dialysis centres in Belgium, 49 of which also have a satellite dialysis unit located inside or outside the main hospital building.

By law:

- **A centre for the treatment of chronic renal failure is considered as a medico-technical service, functionally and operationally embedded in a hospital.**
- **A dialysis centre must treat at least 40 ESRD patients per year with any type of dialysis or renal transplantation.**
- **A nephrologist or specialist in internal medicine working full-time in the hospital must supervise the activities of the dialysis centre.**
- **Besides the supervising physician, a nephrologist or specialist in internal medicine must be available for the first 4000 hospital HD sessions and an additional one for every additional 4000 hospital HD sessions performed in the centre.**
- **One full-time equivalent nurse or technician is required per 500 hospital HD sessions, with at least half of this staff being qualified dialysis nurses. As no officially recognized qualification in dialysis nursing exists in Belgium, the only practical implication of this requirement is that at least 50% of the nursing and technical staff should be a qualified nurse.**
- **The supervision of home HD and PD is done by the physicians of the dialysis centre, supported by a team of qualified nurses, technicians and logistic personnel. The dialysis centre must provide the dialysis equipment, materials and medication, perform the necessary in-house adaptation works and install and maintains the equipment.**
- **In case of satellite HD, the dialysis centre must educate the patient to enable the patient to correctly perform his/her dialysis treatment. The physicians of the dialysis centre are responsible for the supervision of the satellite dialysis.**

Some experts believe the norms and rules imposed on satellite HD and hospital HD centres are no longer relevant, as the profiles of patients treated in hospital centres and patients in satellite centres are becoming increasingly similar. There are, however, no data available to support this perception.

3.4 FINANCING OF CHRONIC RENAL FAILURE MANAGEMENT

3.4.1 General Principles

The costs related to the treatment of chronic renal failure are mainly supported by the public health insurance. The costs for transport of the patients to the dialysis unit are also covered (mainly or partly) by the NIHDI.

The financing of dialysis depends on the treatment modality. Two financing mechanisms co-exist:

- the system of lump sums for hospital HD, Home HD and PD: the dialysis centre receives a lump sum per dialysis session (in case of HD or incomplete PD weeks) or per dialysis week (in case of PD) to cover the costs of material, equipment, salaries of nurses and technical personnel;
- the system of "fees for services" on top of the lump sum for hospital HD: the nephrologists receives a honorarium per dialysis session for his activities during the session. Part of this honorarium can flow back to the hospital, according to internal policy rules.

Financing mechanisms for dialysis have been defined for HD first in 1995 and have been modified several times since then. The current financing mechanisms for dialysis activities are stipulated in the Royal Decree of June 23rd, 2003 and came into effect on July 1st 2003.[j] A brief overview of the changes in the financing mechanisms between 1995 and 2003 is given in the paragraph 3.4.2.

3.4.2 Historical evolution of dialysis financing mechanisms

3.4.2.1 Hospital HD

Until the 1st of January 1996, the lump sum for hospital HD was strongly related to the hospital's per diem price. Hospitals received a lump sum of 75% of their per diem price per dialysis session, with a minimum of BEF4 500 (~€111.55). The lump sum was increased with 15% if 25% or more of the dialysis patients were treated by means of dialysis modalities outside the hospital (CAPD, satellite HD or home HD).

In January 1996, the lump sum for hospital HD was re-defined. The strictly linear relationship between the per diem price and the baseline lump sum was abandoned, but a categorical relationship was maintained (see Table 11 for the lump sum as a % of the per diem price categories). Dialysis centres' still received a 'bonus' of 15% if more than 25% of the ESRD patients were treated with alternative dialysis modalities. Due to the strong relationship between the lump sum and the hospital per diem price, also the lump sum 'bonus' was variable across hospitals. The minimum lump sum was fixed at BEF4 500.

Table 11: Lump sums for hospital HD between 1/1/1996 and 1/11/1996

Per diem price	Lump sum for hospital HD as a % of the hospital's per diem price
< BEF7000 (~€173.52)	75%
>= BEF7000 and < BEF8000 (~€198.31)	73%
>= BEF8000 and < BEF9000 (~€223.10)	71%
>= BEF9000	69%

j Royal Decree of 23 June 2003 for the execution of article 71bis, §§1 and 2 of the law concerning the compulsory insurance of health care and reimbursements, coordinated on 14 July 1994. B.S./M.B. 1/07/2003.

In the Royal Decree of 28 October 1996 (B.S./M.B. of November 9th, 1996), the relationship between the per diem price and the lump sum for hospital HD was reduced further. A baseline lump sum for hospital HD was fixed at BEF2 000 (~€49.58) for all dialysis centres. On top of this baseline lump sum, dialysis centres also received 40% of the per diem price per hospital HD dialysis session. A lump sum bonus of BEF500 (~12.39) was allocated if at least 15% but less than 25% of the ESRD patients followed an alternative dialysis therapy. The lump sum bonus for treating more than 25% of the ESRD patients with alternative dialysis types was fixed at BEF1,000 (~€24.79) per session. The minimum lump sum was kept at BEF4 500 (~€111.55).

In July 2001, the baseline lump sum of BEF2 000 was reduced to BEF1 500 (~€37.18) per hospital HD session, still 40% of the hospital's per diem price was added to this lump sum and a positive incentive was given to alternative ESRD treatment modalities by giving a lump sum bonus in function of the proportion of patients treated with alternative treatment modalities (see Table 12). The minimum lump sum remained fixed at BEF4 500 (~€111.55) and the maximum was set at BEF10 000 (~€247.89).

Table 12: Lump sum bonus for hospital HD between 1/07/2001 and 30/06/2003 in function of the % of patients on alternative dialysis modalities

% of patients on alternative dialysis modalities	Lump sum bonus	Baseline lump sum
≥10% and <25%	BEF900 (~€22.31)	BEF1 500 (~€37.18) + 40%*per diem price
≥25% and <35%	BEF1 750 (~€43.38)	
≥35%	BEF1 950 (~€48.34)	

On the 1st of October 2001 all lump sums were reduced by 15%, as a general saving measure.

The Royal Decree of June 23, 2003 (coming into effect on July 1st, 2003) redefined the categories for the lump sum bonus. The change was largest for dialysis centres that treated more than 10% of their ESRD patients with alternative treatment modalities (Table 13). The minimum lump sum was set at €111.55 and the maximum at €247.89.

Table 13: Lump sum bonus and baseline lump sum for hospital HD between 1/07/2003 and 30/06/2005 in function of the % of patients on alternative dialysis modalities

% of patients on alternative dialysis modalities	Lump sum bonus	Baseline lump sum
<5%	0	€37.80 + 25%*per diem price
5-10%	€18.59	
10-25%	€59.49	
25-35%	€80.56	
>35%	€85.52	

* Since July 2002, the 'budget of financial means' (Budget Financiële Middelen/Budget des Moyens Financiers) of Belgian hospitals is no longer calculated based on per diem prices. The system of per diem prices has been abandoned. The per diem prices used for the calculations of the lump sums are therefore based on the per diem prices as of 30/06/2002

Reimbursement prices are revised on the 1st of July of every year per hospital, in function of the percentage of alternative dialysis modalities used. Indexation is performed on the 1st of January of every year if the health index of the previous year exceeded the so-called 'spill index' (trigger index). Dialysis reimbursement tariffs are coupled to the trigger index used for the payment of social services (e.g. pensions) at that date. This trigger index is based on the health index.[k] The adaptation factor for the reimbursement tariffs is equal to the health index/trigger index. The tariffs defined in the Royal Decree of June 23, 2003 are multiplied by the adaptation factor to determine the reimbursement values for that year. In practice, the reimbursement tariffs increase by about 2% each year.

Table 14 gives an overview of the changes that have taken place in the financing mechanisms for hospital HD between 2003 and 2009, with the references to the Royal Decrees. The amounts presented in the table are indexed amounts. In March 2006 the trigger index was increased from 109.45 to 111.64 as a saving measure for the government. The implication was that the actual reimbursement tariffs decreased because the adaptation factor for the tariffs defined in 2003 decreased from 1.061 (health index/trigger index=116.15/109.45) to 1.04 (=116.15/111.64).

In 2009 the trigger index was increased from 111.64 to 112.89. The implication of this was that the reimbursement tariffs did not increase by 4.04% compared to the previous year but by 2.89%.

The current financing mechanisms for hospital haemodialysis are described in more detail in paragraph 3.4.3.1.

k The health index differs from the consumer price index. The health index is calculated by excluding a number of products from the basket used for the calculation of the consumer price index, more specifically alcoholic drinks (bought in a store or consumed in a bar), tobacco products, motor fuels (excluding LPG). Indexation is done when the average health index of the last 4 months exceeds the trigger index. If the trigger index has been exceeded, a new trigger index is set by multiplying the previous trigger index by 1.02.

Table 14: Overview of the historical evolution in hospital HD lump sums in Belgium

Royal Decree	**23/06/2003**			**17/02/2005**	**3/06/2005**		**24/03/2006**			
Application date	**1/07/2003**	**1/01/2004**	**1/01/2005**	**25/02/2005**	**1/07/2005**	**1/01/2006**	**28/03/2006**	**1/01/2007**	**1/01/2008**	**1/01/2009**
Baseline lump sum	37,80	38,56	39,33	38,54	39,33	40,11	39,33	40,11	40,92	42,10
% of the per diem price*	25%	25%	25%	25%	20%	20%	20%	20%	20%	20%
Lump sum bonus if % alternative dialysis modalities is:										
<5%	0	0	0	0	0	0	0	0	0	0
≥5 and <10%	18,59	18,96	19,34	18,95	29,34	29,93	29,34	29,93	30,52	31,41
≥10 and <25%	59,49	60,68	61,89	60,65	71,89	73,33	71,89	73,33	74,79	76,96
≥25 and <35%	80,56	82,17	83,81	82,13	93,81	95,69	93,81	95,69	97,60	100,43
≥35%	85,52	87,23	88,97	87,19	98,97	100,95	98,97	100,95	102,97	105,95
Minimum lump sum	111,55	113,78	116,05	113,73	111,41	113,65	111,42	113,64	115,92	119,27
Maximum lump sum	247,89	252,85	257,90	252,74	257,90	263,06	257,90	263,06	268,32	276,08

* Per diem prices as of 30/06/2002.

3.4.2.2 *Satellite HD, home HD and PD*

Up until June 30, 2001, a lump sum of €222.34 per session (maximum 6 times per 2 weeks) and €217.82 per session (maximum 3 times per week) was paid for respectively satellite HD and home HD. This was intended to cover the costs of medical and paramedical personnel, equipment, materials and consumables. For PD, this lump sum was determined at €619.73 per week.

A separate reimbursement for APD as well as for home HD and PD *with nursing support* was introduced on July, 1st, 2001. APD was reimbursed at €694.10 per week, home HD with nursing support at €264.43 per session and PD with nursing support at €793.26 per week.

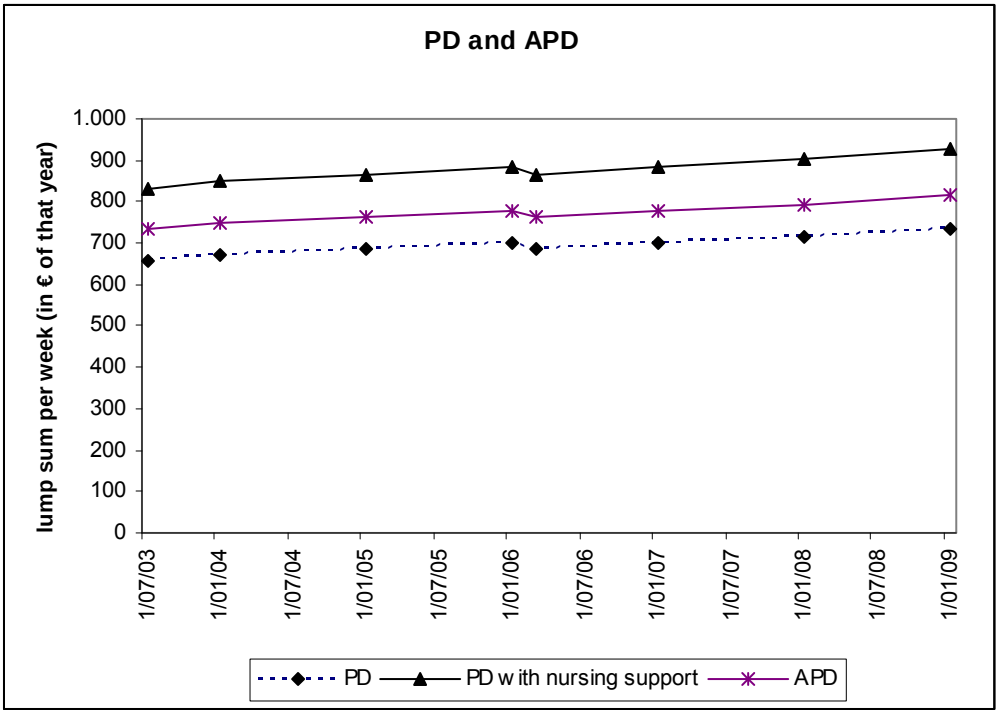
In July 2003, along with the major changes made to the lump sums for hospital HD, the lump sums for alternative dialysis modalities were increased. Table 15 compares the lump sums as from July 1st, 2003 with the lump sums applied between July 2001 and June 30th, 2003.

Table 15: Lump sums for alternative dialysis modalities in 2001 and 2003

Dialysis modality	NIHDI code	2001 until June 30, 2003	From July 1st, 2003 onwards
Satellite HD, per session	*761515*	222.34	236.50
Home HD, per session	*761493*	217.82	231.70
Home HD with nursing support, per session	*761456*	264.43	278.31
CAPD, per week	*761552*	619.73	659.21
APD, per week	*761530*	694.10	733.58
PD with nursing support, per week	*761471*	793.26	832.74

Figure 9 shows how lump sums for alternative dialysis modalities have changed since 2003. The kink in 2006 is due to the increase in the trigger index in March 2006, as a consequence of which the lump sums declined in March 2006.

Figure 9: Evolution of lump sums for alternative dialysis modalities since July 2003



3.4.2.3 Transport

Public transport from the patient's home to and from the dialysis centre is fully reimbursed to the patients. Transport by other means is since 1985 reimbursed at €0.25 per km and limited to 30 km per one way journey. If there is no dialysis centre within a range of 30 km from the patient's home, the real distance is reimbursed at the same amount of €0.25 per km.[l] Travel costs of patients following home dialysis treatment related to consultations and/or surveillance of their dialysis treatment have been reimbursed much more under the same conditions as for patients on hospital HD treatment.[m] This amount has not been indexed since 1985 and is currently still €0.25 per km.

Besides the NIHDI reimbursement of €0.25 per km in case of private transport, some sickness funds provide an additional reimbursement in the context of the complementary insurance package. Different formulas exist, such as a lump sum out-of-pocket payment per treatment day or an additional reimbursement per kilometre.

3.4.3 Current financing of hospital haemodialysis

As mentioned before, the current financing mechanisms are basically as determined in 2003.

All figures presented in this paragraph are indexed amounts for 2009 unless specified otherwise. The index applied for the calculation of the tariffs in 2009 is 125.73 (1996=100); the trigger index is 112.89, meaning that the amounts mentioned in the Royal Decree of 23 June 2003 have to be multiplied by 125.73/112.89 to obtain the tariffs applicable in 2009. The original figures in the Royal Decree of were coupled to the trigger price index of 109.45 (1996=100).

3.4.3.1 Lump sums for hospital haemodialysis

Since July, 1st 2005, a dialysis centre receives a lump sum of €42.10 per haemodialysis session (2009 reimbursement rate), plus 20% of the hospital's per diem price.[n] The lump sum is increased with a variable amount, depending on the proportion of ESRD patients treated with alternative dialysis modalities, i.e. home HD, PD or satellite HD. The incremental indexed lump sums are presented in Table 16.

Table 16: Incremental lump sums according to the percentage of ESRD patients of a hospital receiving alternative types of dialysis (all amounts in € 2009)

Percentage of patients receiving alternative dialysis treatments	Incremental lump sum (indexed)	Baseline lump sum
5-10%	€31.41	€42.10 + 20%*per diem price
10-25%	€76.96	
25-35%	€100.43	
>35%	€105.95	

* Per diem prices as of 30/06/2002

The minimum lump sum per hospital HD session is set at €119.27 and the maximum is €276.08.

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l Ministerial Decree of 21 January 2001 - Ministerieel besluit tot wijziging van het ministerieel besluit van 24 januari 1985 tot vaststelling van de tegemoetkoming van de verplichte verzekering voor geneeskundige verzorging en uitkeringen in de reiskosten van de gedialyseerde rechthebbenden, B.S./M.B. 19-02-2002.

m Ministerial Decree of 8 December 1999 - Ministerieel besluit tot wijziging van het ministerieel besluit van 24 januari 1985 tot vaststelling van de tegemoetkoming van de verplichte verzekering voor geneeskundige verzorging en uitkeringen in de reiskosten van de gedialyseerde rechthebbenden, B.S./M.B. 28-01-2000.

n Royal Decree of 3 June 2005. - Koninklijk besluit tot wijziging van het koninklijk besluit van 23 juni 2003 tot uitvoering van artikel 71bis, §§ 1 en 2 van de wet betreffende de verplichte verzekering voor geneeskundige verzorging en uitkeringen, gecoördineerd op 14 juli 1994, B.S./M.B. 20-06-2005.

The percentage of alternative dialysis treatments is calculated as:

$$\frac{\frac{A}{156}+\frac{B}{52}+\frac{C}{\text{days in year}}}{\frac{A}{156}+\frac{B}{52}+\frac{C}{\text{days in year}}+\frac{D}{156}}$$

Where

A = number of lump sums charged for home HD and satellite HD per year (the maximum number of lump sums per year is 156, i.e. three lump sums per week for 52 weeks/year)

B= number of lump sums charged for PD per year (maximum number of lump sums per year is 52; i.e. one lump sum per week x 52 weeks/year)

C= number of lump sums charged for fractionated PD at home (i.e. in case of incomplete PD weeks, a lump sum per day is charged to the RIZIV/INAMI. The denominator is the total number of days in the year, i.e. 365 or 366)

D= number of lump sums charged for hospital HD patients per year (the maximum number of lump sums per year is 156; i.e. three lump sums per week for 52 weeks/year)

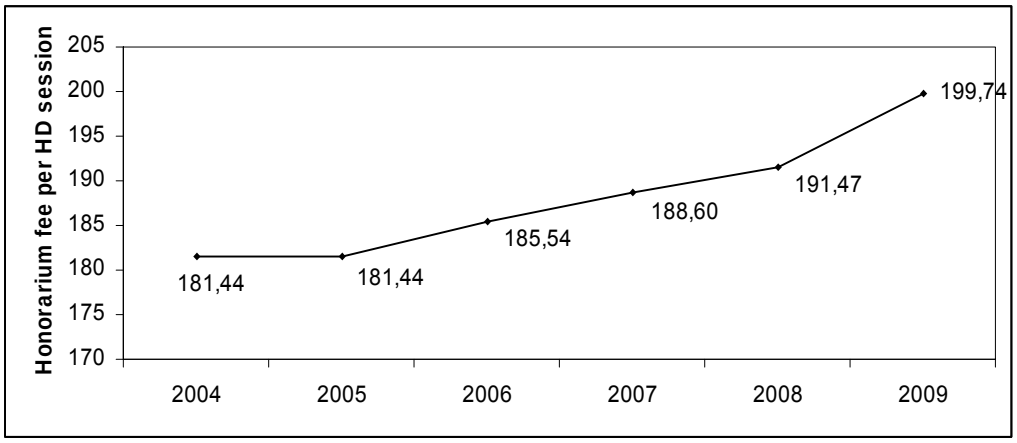
For hospitalized patients, the dialysis centre receives 50% of the reimbursement for hospital HD, with a minimum of €92.76. If a patient is hospitalized in a hospital that is not a legally recognized dialysis centre, the hospital HD dialysis lump sum (100%) is paid to the centre that provides the HD treatment.

3.4.3.2 Fee for service for hospital haemodialysis

Per hospital HD session the nephrologists can charge an honorarium fee of €199.74 (code 470470 – 470481). This honorarium covers the intellectual act of the physician supervising the patient treated with haemodialysis or intermittent haemofiltration, including the costs for the haemofiltration and haemodialysis material, the individual appliances of the artificial kidney and the tubes needed for dialysis.[o] It also covers the costs of dialysis fluid.[p]

The evolution of the honorarium fees over time is presented in Figure 10. The figure shows that no indexation was applied to the honorarium fees in 2005, i.e. the fee remained at the same level as in 2004.[q]

Figure 10: Honorarium fees for hospital HD since 2003 (per session)



[o] Royal Decree of 29 April 1999. - Koninklijk besluit tot wijziging van het koninklijk besluit van 14 september 1984 tot vaststelling van de nomenclatuur van de geneeskundige verstrekkingen inzake verplichte verzekering voor geneeskundige verzorging en uitkeringen. B.S./M.B. of 27-05-1999.

[p] Interpretatieregels betreffende de nomenclatuur van de geneeskundige verstrekkingen, B.S./M.B. 13/03/2002

[q] No indexation was applied in 2003 either, data not shown in the figure.

3.4.4 Current financing of satellite HD, home HD and PD

The financing of satellite HD, home HD and PD consists of a lump sum only. This means that for ambulatory low-care and home HD and for PD the nephrologist does not receive a specific honorarium. During the education of a PD patient, however, be it ambulatory or in hospital, the nephrologist can charge an honorarium fee per day, for a maximum period of 3 consecutive weeks (codes 470433-470444). Also in case of hospitalisation of a PD patient for installation of the dialysis catheter (codes 470400 and 470422) or for another reason (codes 470374-470385), specific honorarium fees can be charged (limited to 6 weeks in case of hospitalisation for installation of the dialysis catheter). The fees-for-service charged to the NIHDI for supervision during the education of a patient (470433-470444) or during hospitalisation for another reason (470374-470385) cover all costs associated with PD, including the dialysis fluids and leads needed for the dialysis treatment.[r]

The lump sum paid to the centre is due per treatment session for haemodialysis at home (limited to 3 lump sums a week) and satellite HD (limited to 6 lump sums per two weeks). Peritoneal dialysis is reimbursed per week, except if the treatment has been interrupted during the week. In that case PD is reimbursed per treatment day.

The lump sum is intended to cover all the costs borne by the dialysis centre (depreciations, wages and social security contributions for personnel, overhead costs, administration, materials and consumables and other direct costs) as well as the costs borne by the patients for home dialysis (increased electricity and water use and telephone costs). The dialysis centre has to reimburse the patient for his additional expenses due to dialysis from this lump sum at a rate of €5.19 per session for home HD patients or €3.84 per week for PD patients.

For home HD and PD, different tariffs apply depending on whether support is required from a nurse at home. The cost of nursing support is included in the lump sum and hence the nurses providing the support are supposed to charge the dialysis centre for their services. Nursing support can only be charged to the centre if it was prescribed by the nephrologist of the supervising dialysis centre.

For PD different tariffs apply for CAPD and APD. An overview of the lump sums for each type of dialysis treatment with their respective sub-categories is presented in Table 17.

Table 17: Lump sums for home HD, satellite HD and PD (2009 prices)

	Lump sum
Home haemodialysis	
With nursing assistance at home	€309.96/session
Without assistance	€258.05/session
Peritoneal dialysis	
With nursing assistance at home	€927.43/week
Without assistance	€734.16/week
APD	€817.04/week
Incomplete peritoneal dialysis week	
With nursing assistance at home	€132.49/dialysis day
Without assistance	€104.88/dialysis day
APD	€116.72/dialysis day
Satellite HD	€263.40/session

The lump sum per week or per day for nursing support is in principle equal to the difference in lump sums between PD or home HD with and PD or home HD without nursing support; i.e. €193.27 per week PD, €51.91 per home HD session, €110,39 per week APD and €27,61 per day for incomplete weeks of PD. However, a survey conducted in 2006 by the Wit-Gele Kruis, a Flemish home nursing organisation, revealed that the amount reimbursed to the nursing organisation for nursing support differs across dialysis centres.

[r] K.B. 29.4.1999" (operational 1.7.1999) +,"K.B. 27.3.2003" [operational 1.4.2003 ("K.B. 22.4.2003" + Erratum B.S. 29.4.2003)]

Moreover, according to a time-and-motion study in 24 patients performed by the same organisation, these amounts are insufficient to cover the real costs of nursing assistance at home.[74] The total time investment of home nurses was registered for 9 APD patients, 14 CAPD patients and one home HD patient. This included dialysis interventions as well as other home nursing interventions that are not directly related to the dialysis therapy and are reimbursed by the NIHDI through the nursing fee-for-service system. 'Other' interventions included giving injections, washing and dressing patients, wound care etc. In two CAPD patients and the home HD patient, no dialysis-specific interventions were performed but only 'other' interventions. Interventions specific for the dialysis treatment included priming of dialysate, connecting and disconnecting dialysate bags, changing dialysis bags, registration of in- and outflow rate, determination of the liquid balance, parameter control and some small other activities such as motivating the patients and taking lab samples.

In five of the nine APD patients, a nurse visited the patient twice on one day. Two patients were visited once and two patients three times. The average duration of each visit was 35 minutes. The weighted average duration of nursing care for dialysis related activities was 1 hour per day.

For CAPD, there was a large variation in the number of visits per day, ranging from 2 visits (1 patient) to 8 visits (1 patient). The majority of the patients, 6 out of 12, were visited four times a day. The average duration per visit was 33 minutes. The weighted average duration of nursing care for dialysis related activities was 1h55 per day.

The reimbursement obtained by the home nurses from the dialysis centres ranged from €14.83 to €15.76 per day for APD (4 observations, mean €15.07) and from €15.76 to €27.61 per day for CAPD (13 observations, mean €23.11).[s] In terms of reimbursement per hour for dialysis related nursing care at home, this means €15.07 per hour for APD and €12.06 for CAPD. With the implied legal tariff for home nursing support, the reimbursement per hour of dialysis related activities would be €15.77 for APD and €14.40 for CAPD, assuming that the data presented are representative for a day of nursing support of dialysis activities and can be extrapolated to the entire week, including week-ends.

3.4.5 Summary of financing mechanisms for the different types of dialysis

On the basis of the different financing systems for dialysis described above and the mean lump sums paid to dialysis centres per hospital HD session in 2007 derived from the NIHDI dialysis survey (inflated to € for 2009), we estimated the average reimbursement per patient per dialysis. Table 18 presents the calculations.

Table 18: Summary of the different financing systems for dialysis in Belgium (2009 prices)

	Hospital HD	Home HD		Satellite HD	Peritoneal dialysis		
		Without support	With support		Without support	With support	APD
Fees for service paid to the nephrologist per session	199,74						
Lump sum per session	195,82	258,05	309,96	263,4			
Lump sum per week					734,16	927,43	817,04
Lump sum per day					104,88	132,49	116,72
Estimated reimbursement per patient year	61.708	40.256	48.354	41.090	38.176	48.226	42.486

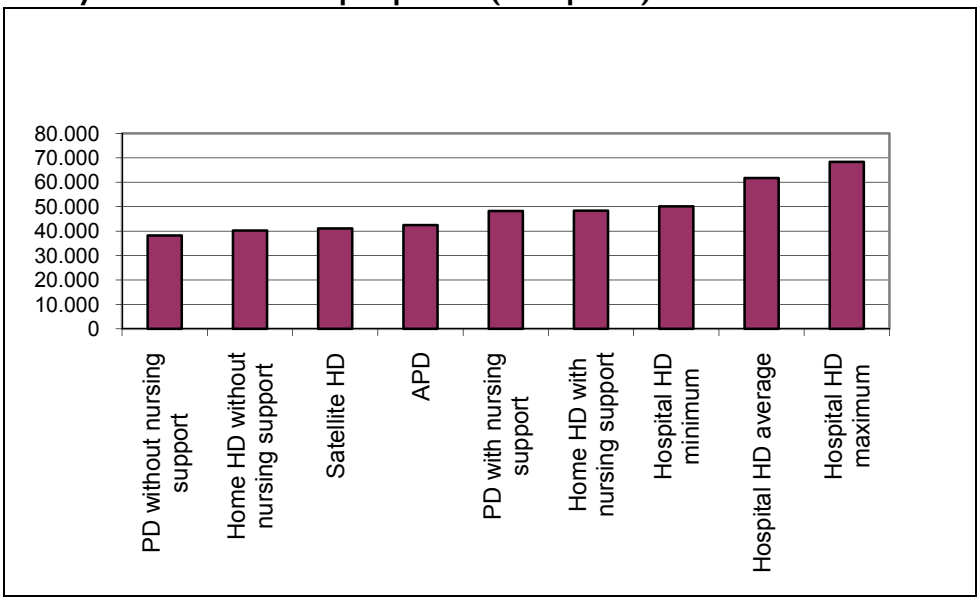
[s] In the report by the Wit-Gele Kruis, the data were presented in prices for 2006. In order to remain consistent with the figures in the remainder of this chapter, the reimbursement fees presented in the study report were multiplied by the price index of 1.049 to obtain the figures in 2009 reimbursement prices (the trigger index was increased to 111.64 in 2006 to 112.89 in 2009, as a consequence of which the reimbursement prices increased less than the health index between 2006 and 2009.)

The average lump sum per hospital HD session paid by the NIHDI to the dialysis centres is €195.82 (range €115.92 - €221.66) in 2009 prices, based on the average lump sum paid per hospital in 2007. According to projections of the NIHDI for 2009, the average lump sum paid by the NIHDI in 2009 will be €184.45, taking into account the fact that a centre receives only 50% of the hospital HD lump sum for patients who are hospitalised in the hospital where the dialysis centre is located.

The lump sum is specific to the dialysis centre as it depends on (1) the hospital's per diem price on 30/06/2002 and (2) the percentage of alternative dialysis treatment types under the supervision of the centre: more alternative treatments are directly linked to a higher lump sum and vice versa. Everything included one hospital HD session costs on average €395.56 (range €321.40 - €437.87) to the health care budget.

The estimated theoretical total reimbursement per patient per year is based on 156 dialysis sessions per year for hospital, satellite and home HD and 52 weeks per year for PD. The real reimbursement per patient year might differ, as in practice patients might die or be transplanted and hence not complete a full year of dialysis treatment or they may be hospitalized (the financing of dialysis during hospitalization is different from the financing of ambulatory dialysis treatment). It should therefore be considered as a theoretical estimate of the maximum total ambulatory dialysis cost for the NIHDI for a complete year of treatment of a prevalent patient surviving the whole year without any hospital admission during that year. Figure 11 presents this theoretical annual cost per patient per type of dialysis for the NIHDI. For hospital HD three scenarios are presented: one for the minimum, one for the average and one for the maximum lump sum per dialysis session.

Figure 11: Estimated theoretical cost per patient per year for different types of dialysis from the NIHDI perspective (2009 prices)



The cheapest forms of dialysis for the NIHDI are realised either at home (without home nursing support) or in a satellite dialysis centre. In case of a hospital characterised by a low rate of alternative treatments, and hence a lower lump sum per hospital HD session, the annual expenditures to treat a patient with hospital HD are only slightly higher than the expenditures related to the treatments realised at home with nursing support. Centres with a high rate of alternative dialysis treatment receive a higher lump sum per hospital HD session. The NIHDI expenditures of one year of hospital HD treatment are therefore highest in these centres.

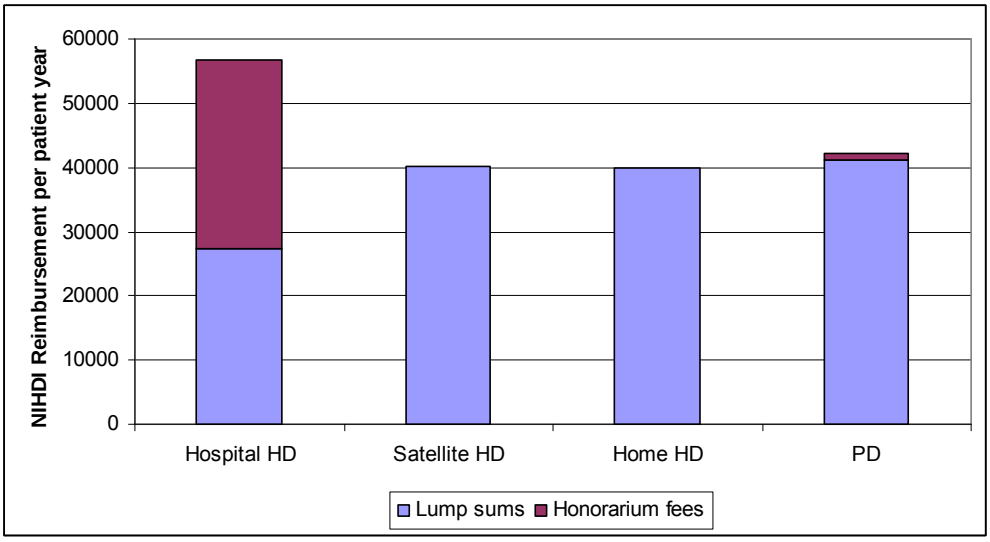
Figure 12 shows the mean *actual* reimbursement per patient year for each type of dialysis, taking together all types of PD, both types of home HD (with or without nursing support) and including reimbursement for education of home HD and PD patients and surveillance in case of hospitalization.

The reimbursement per patient year is obtained by dividing the total NIHDI reimbursement by the total number of patient years in the respective treatment modalities. The number of patient years in PD is obtained by dividing the total number of lump sums paid for PD by the 52 (as there are 52 weeks in a year and PD lump sums are paid per week) *plus* the number of fractioned PD lump sums divided by 365 (as lump sums for fractionated PD are paid per day). The number of patient years in hospital HD is obtained by dividing the total number of lump sums for hospital HD by 156, corresponding to 3 sessions per week in each of the 52 weeks of the year. Similarly, the number of patient years for home HD and satellite HD was calculated.

The mean actual reimbursement per patient year of hospital HD treatment was lower than the theoretical estimate of the reimbursement per year of hospital HD treatment presented in Figure 11. The reason is twofold. First, there is a price effect. Figure 11 uses prices of 2009, while Figure 12 expresses reimbursement in terms of prices of 2008 for the honorarium fees and PD and satellite HD lump sums and of 2007 for the hospital HD lump sums. Second, the real NIHDI expenditures per patient year include the effect of the lump sum for hospitalized HD patients being 50% of the normal lump sum for an ambulatory hospital HD session if the patient is hospitalized in a hospital with a recognized dialysis centre. The theoretical estimate in Figure 11 assumes a full year of treatment without hospitalizations.

The similarity between the theoretical reimbursement per year for home HD in Figure 11 and the actual reimbursement per patient year in Figure 12 reflects the fact that the majority of patients are treated with home HD without nursing support (32 patient years without nursing support compared to 3 patient years with nursing support). The average expenditure for PD reflects a mixture of patients treated with and patients treated without nursing support (91 patient years with nursing support versus 140 without nursing support).

Figure 12: Mean actual NIHDI reimbursement per patient year, based on the number of cases in 2007 and reimbursement tariffs of 2008



Source: NIHDI dialysis questionnaire 2007

Key points

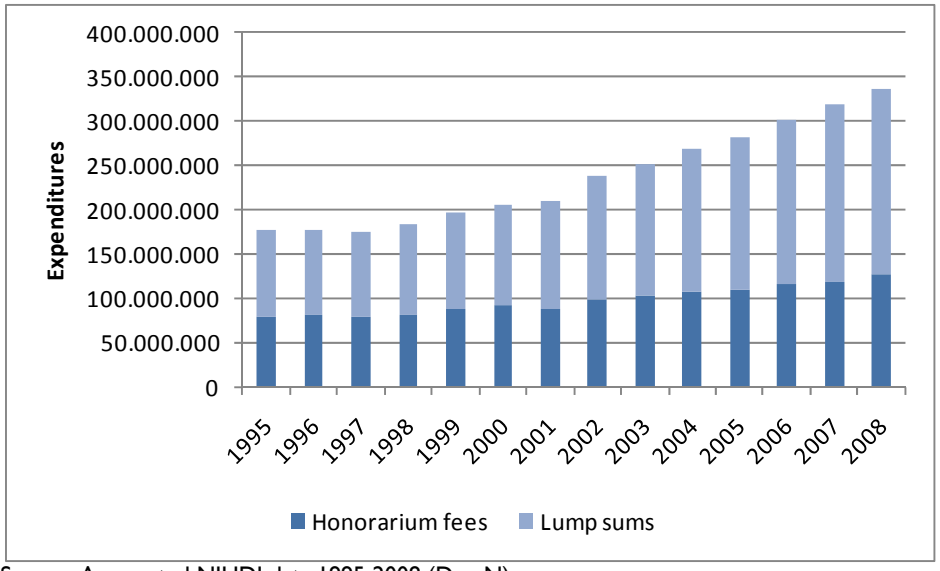
- **The financing mechanisms of the different dialysis modalities have undergone many changes throughout recent years. The objective of all major changes was to reduce the strong relationship between dialysis reimbursement and the hospital per diem price established in 1995 and to give stronger (financial) incentives to increase the use of alternative dialysis modalities (PD and satellite HD).**
- **Currently, hospital HD is financed through a lump sum and a fee (honorarium) per session. The baseline amount of the lump sum depends for 20% on the hospital's historical per diem price. A lump sum bonus is granted depending on the proportion of patients treated with alternative dialysis modalities. The bonus increases up to the point where 35% of the dialysis treatments are through alternative dialysis modalities and remains constant afterwards.**
- **Satellite HD is reimbursed through a lump sum per session. A maximum of 6 lump sums are paid per 14 days of satellite HD treatment.**
- **Home HD is reimbursed through a lump sum per session, with a maximum of 3 sessions per week. A higher lump sum is paid for home HD with nursing support.**
- **PD is reimbursed through a lump sum per week. A higher lump sum is paid for PD with nursing support.**
- **The dialysis centre receives the lump sums. In case of home dialysis with nursing support, the dialysis centre has to pay home nursing service €51.91 per session for home HD, €193,27 per week for CAPD and €110,39 per week for APD. According to a study of the *Wit-Gele Kruis*, however, the reimbursement received by the home nursing services differs across centres.**
- **The average total NIHDI expenditures for ambulatory dialysis per patient year were in 2008 €56 817 for hospital HD, €41 167 for PD, €40 224 for satellite HD and €39 870 for home HD and (prices of 2008 applied to cases of 2007).**

3.4.6 National expenditures for dialysis between 2002 and 2008

The total NIHDI expenditures for chronic dialysis-related services were more than €336 Million in 2008. This represents 1.57% of the national budget allocated for health care in 2008.

Figure 13 shows the evolution of the total NIHDI expenditures for dialysis between 1995 and 2005, including paediatric dialysis, and the relative contribution of the honoraria and the lump sums to the total expenditures. The honoraria include all honoraria related to all types of chronic dialysis treatment, i.e. not only the hospital HD honoraria but also the honoraria for supervision of peritoneal dialysis during the education of a patient in-hospital or during hospitalizations of patients on peritoneal dialysis for other causes.

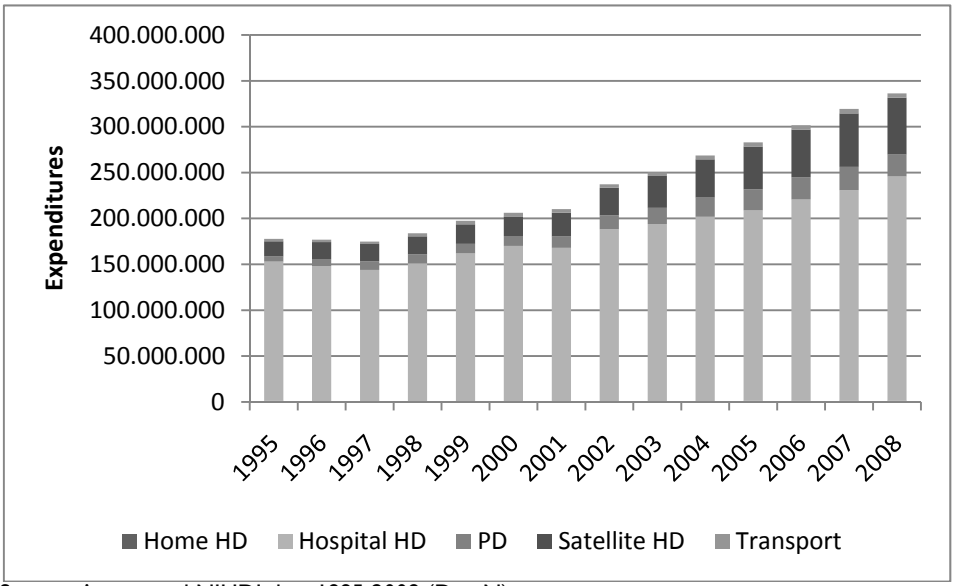
Figure 13: Evolution of NIHDI expenditures for chronic dialysis-related activities from 1995 to 2008



Source: Aggregated NIHDI data 1995-2008 (Doc N)

Figure 14 shows the expenditures per dialysis type. The totals include the lump sums as well as the honorarium fees. As in Figure 13, the amounts in Figure 14 include the expenditures for ambulatory dialysis as well as for dialysis during hospitalization, travel costs, surveillance during education of PD patient in hospital and costs of dialysis in children. Expenditures for acute dialysis, however, are excluded. Note that in 2001, the year of the financial reforms for the dialysis sector, expenditures for all types of dialysis started to rise more rapidly than in the earlier years.

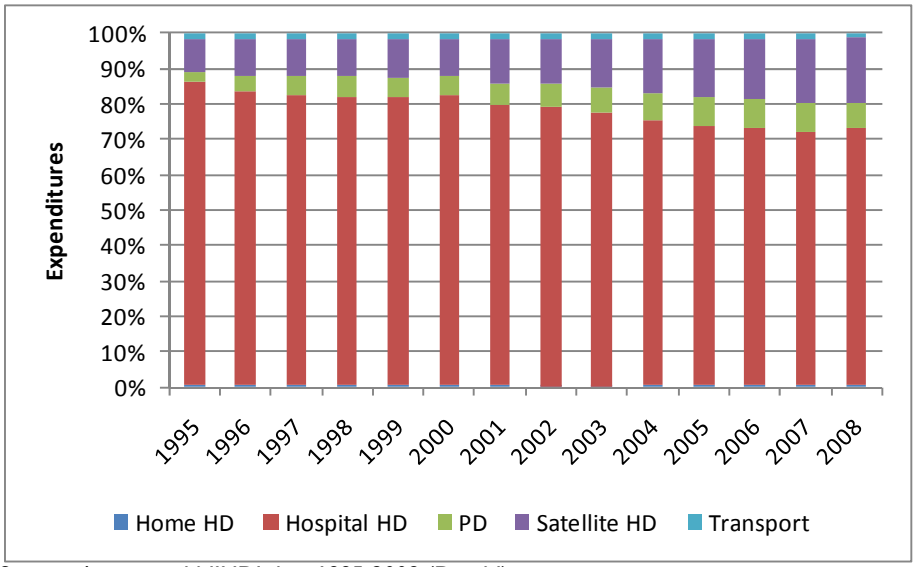
Figure 14: Evolution of expenditures for hospital HD, satellite HD, PD and home haemodialysis from 1995 to 2008



Source: Aggregated NIHDI data 1995-2008 (Doc N)

An increase in the relative expenditures on presumed "low-cost" dialysis modalities (satellite HD, PD and home HD) has been observed between 2000 and 2006 (Figure 15). This might be seen as an immediate result of the financial reforms in 2001. While in 2000 only 16% of the expenditures were for alternative forms of dialysis, this increased to 27% in 2006. Since 2006 the relative expenditures on alternative dialysis modalities seem to be stable at slightly less than 30% of total expenditures on dialysis-related activities, including lumps sums and medical surveillance fees for ambulatory dialysis or dialysis during hospitalization and transportation.[t]

Figure 15: Evolution of the relative expenditures on different dialysis modalities



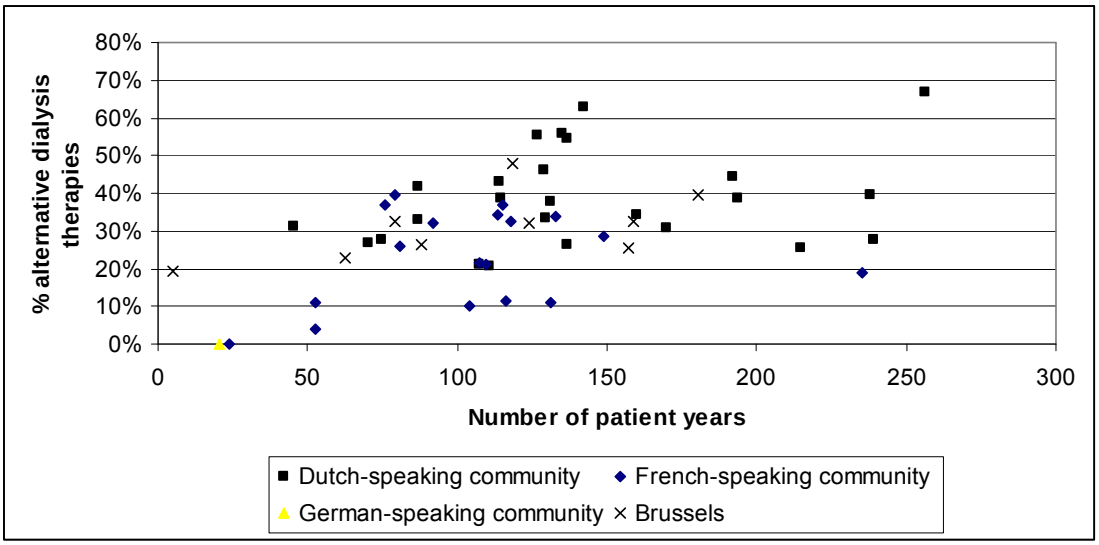
Source: Aggregated NIHDI data 1995-2008 (Doc N)

3.4.7 Differences in use of alternative dialysis modalities between centres and between regions

There is quite some variability in the use of alternative dialysis modalities across the Belgian territory. Figure 16 illustrates the overall variability in the use of alternative dialysis types of all Belgian dialysis centres in function of the theoretical number of patients (or "patient years") of the centre in 2007 and in function of the geographical region where the centre is located. The number of patient years of a centre in 2007 is obtained by dividing the number of lump sums charged to the NIHDI for each dialysis modality by the maximum possible number of lump sums per year (i.e. 156 for HD, 52 for PD and 365 for fractionated PD). This is a theoretical number of patients, as not all patients will be treated for a full year. Patients can die, be transplanted or start dialysis in the middle of the year. Nevertheless, the theoretical number of patients gives an indication of the scale of the dialysis centre. The higher the theoretical number of patients is, the larger the centre.

[t] More specifically, dialysis-related activities encompass the dialysis treatment itself either ambulatory or during hospitalization, medical surveillance during ambulatory dialysis treatment or during hospitalization of PD or HD patients, surveillance during training of PD patients, paediatric hospital HD and transportation to and from the dialysis centre.

Figure 16: Percentage use of alternative dialysis types per centre in function of the theoretical number of patients treated in 2007 and in function of the community



Source: NIHDI Dialysis Survey, 2007

Two small centres do not treat patients with alternative dialysis modalities at all. The centre with the highest use of alternative dialysis types (67%) is also the largest centre, treating on average 256 patients per year.

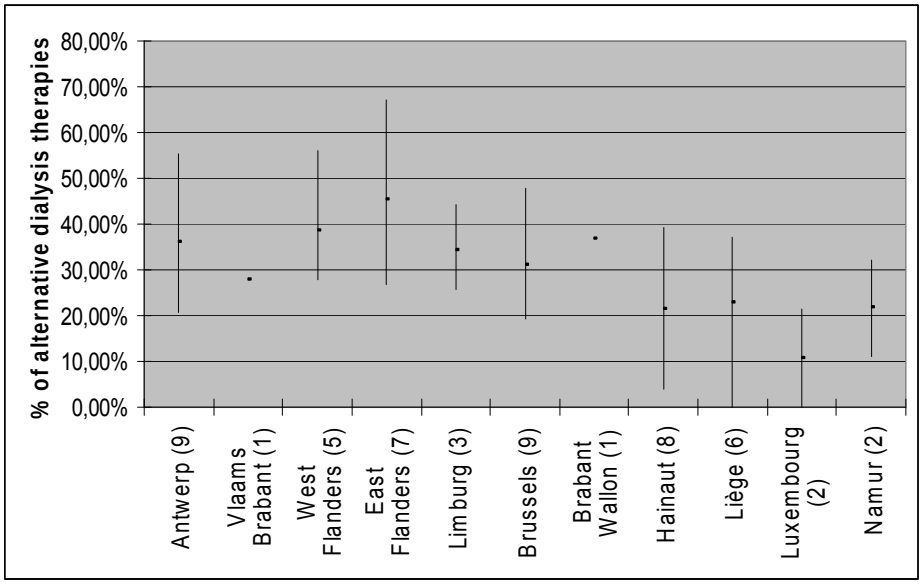
For centres with 50 or more "full-year" dialysis patients, the relationship between the scale of the centre and the percentage of alternative dialysis use is not clear.

The distribution of small versus large centres is similar for Brussels and the Dutch-speaking community (Figure 16). 33% of the Brussels' and Flemish centres treated more than 150 patients in 2007. This percentage is lower in the French-speaking community: one centre treated more than 150 dialysis patients. In the French-speaking community there are more smaller dialysis centres than in the Dutch-speaking community or in Brussels.

Figure 17 shows the variation in the use of alternative dialysis modalities according to the province of the dialysis centres in Belgium. For each province, the mean percentage of alternative dialysis use in the centres of that province is shown, as well as the minimum and maximum percentage observed in the centres located in that province.

The mean percentage of alternative dialysis types per unit is higher in the Dutch-speaking provinces than in the French-speaking provinces, with the exception of *'Brabant Wallon'*. The proportion of alternative dialysis types per unit in Brussels is comparable to the proportions observed in the Dutch-speaking provinces. A large variability between centres can be observed within the provinces (Figure 17).

Figure 17: Mean, minimum and maximum percentage of use of alternative dialysis types according to province (number of centres) in 2007



3.4.8 Income from dialysis for hospitals

The honoraria and lump sums for hospital HD are an important source of revenues for dialysis centres. Because both are paid per hospital HD session, they are purely variable financing mechanisms. Ideally, variable financing mechanisms should be used to reimburse variable costs. In the case of hospital HD, however, the corresponding costs are often fixed or semi-fixed, at least in the short run. For instance, the costs of the equipment and personnel (nurses, technicians, dieticians and nephrologists) do not increase proportionally to the number of patients. One dialysis machine can be used to treat up to 5 hospital HD patients if dialysis is also performed on Saturdays and at night. With the current financing system, treating 40 hospital HD patients generates twice as many revenues as treating 20 hospital HD patients. The costs of treating 40 patients is, however, likely to be less than twice the costs of treating 20 patients because of the presence of fixed and semi-fixed costs. Such a discrepancy between the cost structure and the reimbursement mechanisms for hospital HD might give financial incentives in favour of or against a specific dialysis modality, if medically a choice is possible.

In chapter 5 the costs and revenues of a dialysis programme, from the perspective of a hospital, in function of the relative use of alternative dialysis modalities is simulated in order to study the financial incentives for the use of more or less alternative dialysis treatment types.

Key points

- **Total NIHDI expenditures for chronic dialysis have risen sharply between 1995 and 2008, with a marked increase in the growth rate from 2001 onwards. Since 2006 the average relative share of alternative dialysis modalities in total expenditures on dialysis has stabilized at slightly less than 30%.**
- **There is variability between Belgian dialysis centres in the extent to which they use alternative dialysis treatment modalities. Centres in the Dutch speaking provinces have on average a higher proportion of alternative dialysis treatment use than centres located in the French speaking provinces, with the exception of *'Brabant Wallon'*,**
- **The honorarium fees and lump sums for hospital HD are a purely variable financing mechanism, while some costs of hospital HD are fixed or semi-fixed. This might create financial incentives for or against the use of hospital HD if medically a choice is possible.**

4 PATIENT CHARACTERISTICS, PUBLIC REIMBURSEMENT AND OUT-OF-POCKET EXPENSES

4.1 INTRODUCTION AND OBJECTIVES

This chapter analyses reimbursement and out-of-pocket data that were routinely collected between 2003 and 2006 for patients in Belgium with registered chronic dialysis during at least 7 consecutive weeks. Apart from patient characteristics such as age and gender, these data include the dialysis modality, the NIHDI cost of dialysis, NIHDI cost of hospital stays, medical consultation fees and ambulatory drug prescriptions of all affiliates of the Belgian sickness funds during those years.

The objective of this chapter is to describe patient characteristics and costs by dialysis modality.

4.2 METHOD

4.2.1 Financing of dialysis

The mechanisms for the financing of haemodialysis (HD) have been described in the chapter 3. The main characteristics are that for hospital haemodialysis (HD) the reimbursement consists of 2 parts, a fee for the nephrologist and a lump sum for the hospital, while for satellite HD, home HD and for peritoneal dialysis (PD), only a lump sum can be asked. In all cases of haemodialysis, the lump sum is due for each session (with a maximum number of sessions in case of satellite and home HD). In case of peritoneal dialysis, the lump sum is intended to cover a week of treatment or a fraction of a week (per day). For routine satellite or home HD sessions and for routine PD treatment at home, nephrologists do not receive an honorarium fee.

In case of hospitalisation of a PD patient for the insertion of his treatment catheter, his treatment education or any other reason, an honorarium fee can be charged by the nephrologist per day, with limits on the number of days in case of catheter insertion (6 weeks) and education (3 weeks). In the nomenclature a distinction is made between satellite HD delivered to a hospitalized patient and satellite HD delivered to an ambulatory patient. The reimbursement amounts are identical. If a hospital HD patient is hospitalized in a centre with an accredited hospital HD dialysis unit, the hospital receives 50% of the lump sum of an ambulatory hospital HD session. The hospital performing the dialysis receives the full lump sum for hospital HD if the patient is hospitalized in another hospital without an accredited dialysis unit.

4.2.2 Inclusion criteria

Patients were included when they had an episode of chronic dialysis occurring during any of 4 consecutive years (2003 until 2006). For the purpose of this analysis *'chronic dialysis'* was defined as reimbursement corresponding to 7 consecutive weeks of chronic dialysis treatment regardless of the year, defined according to the reimbursement codes associated with chronic dialysis as registered in the IMA - AIM database (see appendix to chapter 4). The specific NIHDI nomenclature codes used can be found in the appendix to this chapter. Only patients aged 18 years and older were included in this analysis.

4.2.3 Working definitions

The first episode of 7 consecutive weeks of chronic dialysis during 2003-2006 marked the start of follow-up. Those patients were considered as incident chronic dialysis patients for that specific year, while being considered prevalent for the next years if still on dialysis (labelled as ongoing). For the first year this rule was slightly different: when there was chronic dialysis reimbursement between January 1st and January 7th 2003, these patients were considered as 'prevalent' for 2003.

In the database the data are presented by year of billing. Therefore, the definition of incident and prevalent patients was made for each year separately, and the same patient might be in the database for several years. Patients treated during more than one year are 'incident' the first year and 'prevalent' the next years.

Kidney transplant, death of the patient, or the absence of further data were considered as indicating the end of dialysis treatment (labelled further in this chapter as transplant, death and stop). Patients with dialysis reimbursement during the last week of 2006 were considered as having ongoing dialysis treatment after the study period.

4.2.4 Patient profiles

For the analysis, patients were categorised into 8 profiles as a function of the whole dialysis treatment they received during the period 2003-2006. These profiles were defined as follows:

- Hospital HD: at least 80% of the dialysis duration during the complete period of the dialysis treatment in hospital HD
- Satellite HD: at least 80% of the dialysis duration during the complete period of the dialysis treatment in satellite haemodialysis
- Home HD: at least 80% of the dialysis duration during the complete period of the dialysis treatment in home haemodialysis
- PD: at least 80% of the dialysis duration during the complete period of the dialysis treatment in peritoneal dialysis (CAPD or APD)
- HD: at least 80% of the dialysis duration during the complete period of the treatment in either Hospital or Satellite HD (when the patient would not apply for either the Hospital HD or Satellite HD category)
- PD-Hospital HD: at least 80% of the dialysis duration during the complete period of the treatment in either PD or Hospital HD
- PD-Satellite HD: at least 80% of the dialysis duration during the complete period of the treatment in either PD or Satellite HD
- Rest: all other combinations.

During the remainder of this chapter, those 8 categories will be referred to as the ***'dialysis modality'***.

4.2.5 Data analysis and presentation of results

Data are analysed separately from a third payer perspective (sections 4.4 and 4.6) and from a patient perspective (out-of-pocket payments in section 4.4.6). Data are mainly presented by calendar year except for sections 4.3.1 were numbers of individual patients are described and in section 4.6 were a longitudinal analysis of incident patients is presented.

Whenever relevant, results are described for prevalent and incident patients separately. All expenses are presented in € without correction for inflation. Between 2003 and 2006 dialysis reimbursement increased by approximately 6% over the four years.

In the section on hospitalisation, all hospital stays in acute and non acute beds were included and the hospitalisation year was defined as the year of discharge. This means, for example, that if a patient was transplanted during a specific year, the cost for this hospital stay was included in that year. If a patient was transferred from an acute to a non acute bed, the complete hospital stay was taken into account.

For the average cost per patient the analysis is limited to prevalent patients only, for reasons explained later.

4.3 PATIENT CHARACTERISTICS

4.3.1 Number of individuals receiving chronic dialysis treatment

Table 19 provides an overview of the number of individual patients included in this study. A total of 12 742 individuals (7309 men) received chronic dialysis treatment between 2003 and 2006. Of these, 4807 (2556 men, 53%) were prevalent patients in 2003. The remaining 7935 patients (4753 men, 60%) became incident chronic dialysis patients during one of the four years of follow-up.

During the four years of follow-up approximately 40% of those patients died.

Table 19: Number of individual patients by treatment year and dialysis modality

	Prevalent 2003	Incident 2003	Incident 2004	Incident 2005	Incident 2006	Total
Hospital HD	3224	1324	1458	1405	1251	8662
Satellite HD	762	242	243	252	183	1682
Home HD	19	5	3	1	.	28
PD	341	189	212	182	173	1097
HD	331	158	148	126	113	876
PD-Hospital HD	62	45	42	44	40	233
PD-Satellite HD	1			1	2	4
Rest	67	34	23	25	11	160
Total	**4807**	**1997**	**2129**	**2036**	**1773**	**12 742**
Males	2556	1191	1273	1213	1076	7309
Prop. Male	53%	60%	60%	60%	61%	57%

For ease of presentation, and because of a better data granularity, the remainder of the results will be presented by year of dialysis, keeping in mind that some patients appear in this administrative database for more than one year. Patient characteristics will mainly be shown overall, for all years combined, since they have changed little over those four years. Where appropriate, time trends will be addressed.

4.3.2 Number of patients by year of treatment and dialysis modality

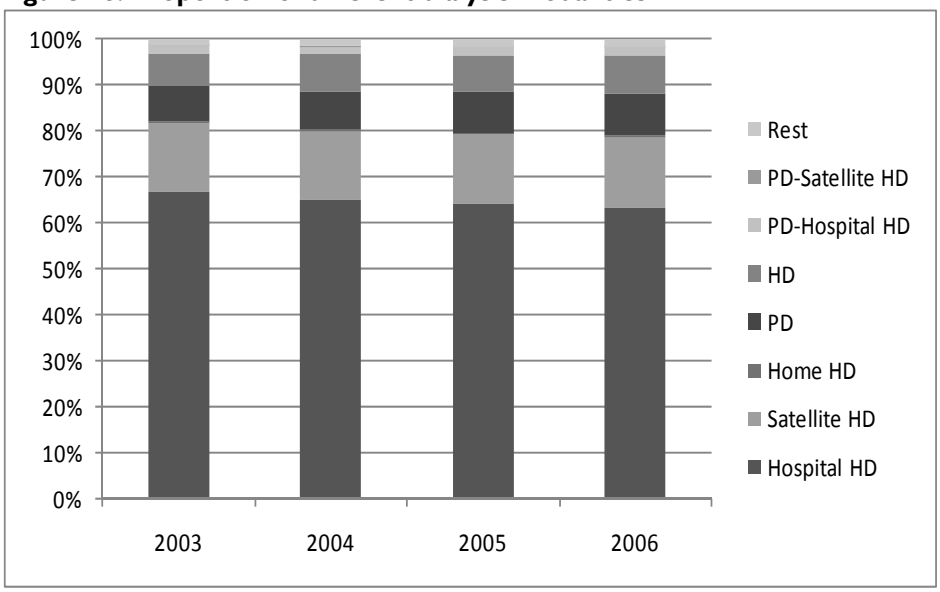
Table 20 shows the number of patients (both prevalent and incident) for each treatment year by dialysis modality. For most dialysis modalities there is a steady increase in the absolute numbers during the four years studied, although the numbers for some of the dialysis modes are too low to draw firm conclusions, especially for home HD and for the group of PD mixed with satellite HD.

However, as shown in Figure 18, the distribution of the different dialysis modalities barely changed during the four years studied.

Table 20: Number of patients by treatment year and dialysis modality

	2003	2004	2005	2006	Increase
Hospital HD	4548	4814	4894	4838	6,4%
Satellite HD	1004	1090	1172	1162	15,7%
Home HD	24	22	18	15	-37,5%
PD	530	618	677	704	32,8%
HD	489	583	610	640	30,9%
PD-Hospital HD	107	125	139	143	33,6%
PD-Satellite HD	1	1	2	4	300,0%
Rest	101	118	131	124	22,8%
Total	**6804**	**7371**	**7643**	**7630**	**12,1%**

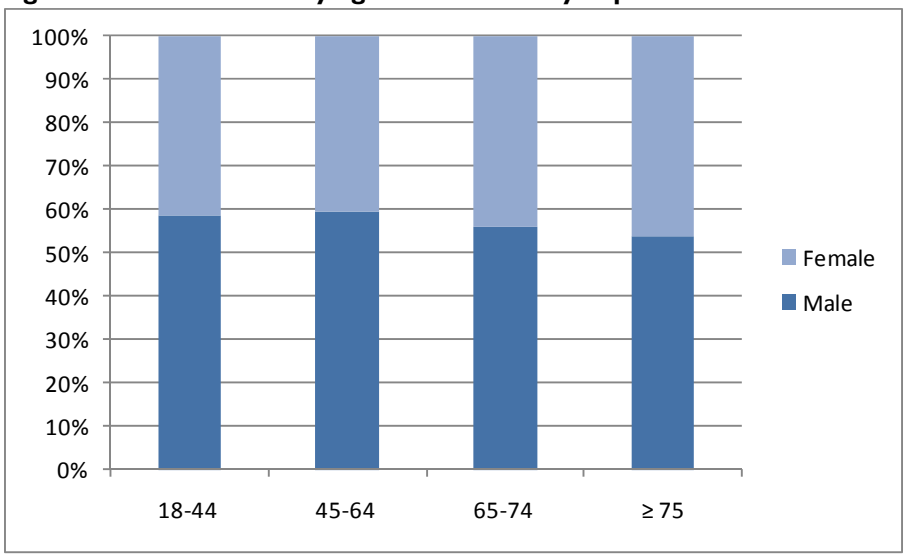
Figure 18: Proportion of different dialysis modalities



4.3.3 Age and gender

Overall the proportion of males in the chronic dialysis is 56%, and this proportion slightly increased from 55% in 2003 to around 57% in 2006, an increase observed in all major dialysis modality categories. The proportion of males is higher (around 60%) in the incident cases and lower (around 54%) in the prevalent cases, which might partly be reflecting a higher mortality in men. The mortality effect is also apparent in the gender ratio by age as can be seen in Figure 19, showing that with increasing age the proportion of women slightly increases.

Figure 19: Gender ratio by age in chronic dialysis patients



However, there do not appear to be major gender effects. Therefore, the distribution of age categories is shown in Figure 20 for men and women combined, illustrating that two third of the population is aged 65 and above, and that almost 40% are 75 and above. Over the four years of study there appears to be an evolution towards treating even more elderly patients as illustrated in Figure 21, where the proportion of chronic dialysis patients aged 75 and above increased from 35% to 41% between 2003 and 2006.

Figure 20: Age distribution in chronic dialysis patients (both genders)

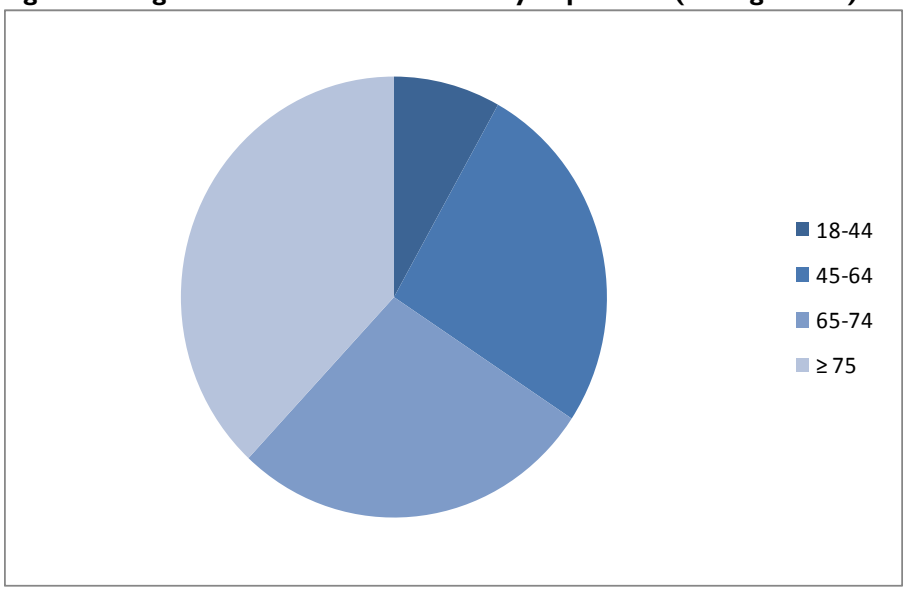
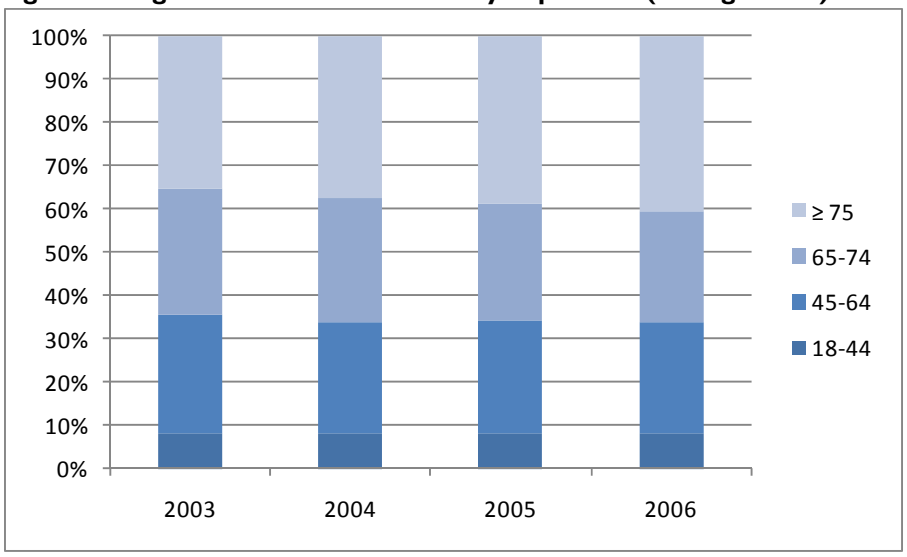


Figure 21: Age evolution in chronic dialysis patients (both genders)



In Figure 22 and Figure 23 the choice of (main) dialysis modality is shown by gender and age. Although there appear to be some differences between modalities, it should be kept in mind that for some of these categories (especially home HD, and mixed PD-satellite HD, but also for the groups of PD-Hospital HD and for the rest group) the numbers are small. From the figure it could be hypothesised that men tend to prefer peripheral HD and PD, whereas women seem to rely somewhat more on hospital HD. Age, however, also appears to have an important influence on the choice of dialysis modality as can be seen from Figure 23. Over 70% of hospital HD patients are aged 65 and over, but less than 50% of PD patients. The satellite HD and the mixed HD group have an intermediate age distribution.

Figure 22: Gender distribution by dialysis modality

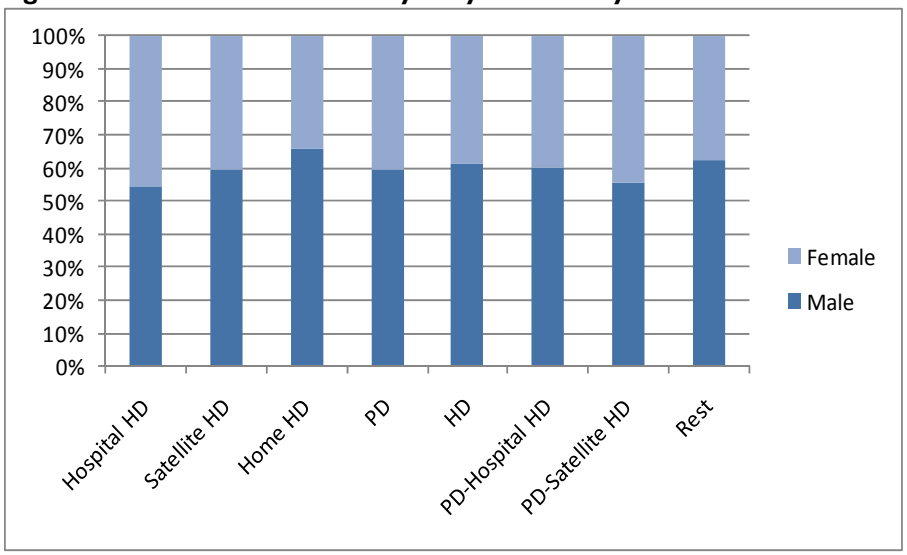
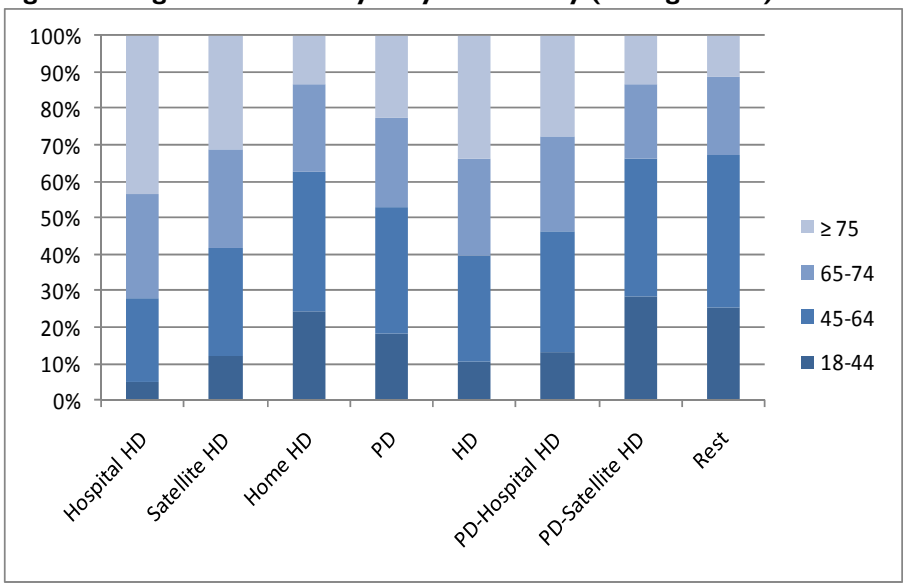


Figure 23: Age distribution by dialysis modality (both genders)



4.3.4 Starting, continuing and stopping dialysis

Patients start with chronic dialysis because of end-stage renal disease (ESRD). Therefore, therapy is either for life or until successful renal transplantation. Figure 24 shows, by dialysis modality, the start/stop status. The most important categories are the patients that either start during the year (the incident patients) or continue from previous year (prevalent patients). According to the data, each year approximately 4% of chronic dialysis patients in the study (mainly prevalent patients) received a renal transplantation, and an additional 20% stopped dialysis, mainly because they died.

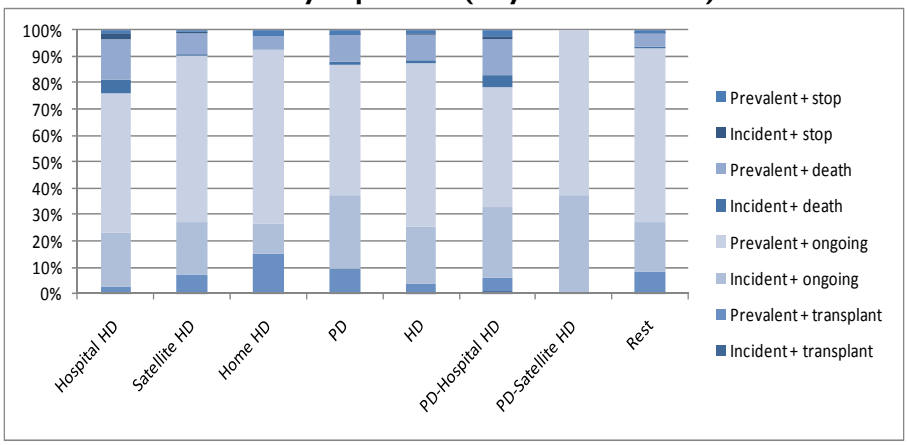
The overall transplantation rate corresponds to approximately 80% of the total number of transplantations in Belgium reported by Eurotransplant (www.eurotransplant.nl), except in the first year 2003 where it is lower. There are several reasons for this discrepancy. In 2003 some patients who received a kidney transplant were not included in our study because they did not fulfill the chronic dialysis inclusion criteria for our study (at least 7 weeks of chronic dialysis in the study period). Other reasons for this discrepancy applying to all study years include pre-emptive transplantations, patients being on dialysis for a short period of time before transplantation, paediatric transplants and possibly other reasons.

The stop reasons differ markedly by dialysis modality, which is undoubtedly caused by important ***'confounding by indication'***. It should be remembered that the data we present are observational and that patients on different dialysis modalities have very different average patient profiles. Therefore, the associations should not be interpreted causally.

It can for instance be seen from Figure 24 that patients on home HD, on PD and to a lesser extent on satellite HD have a higher probability of receiving a renal transplant, whereas individuals on hospital HD and on HD in general are more likely to die.

Over the four year study period those results remained relatively stable across dialysis modalities. Therefore, results have been presented for all years together in one figure.

Figure 24: Continuation rates and reasons for stopping per year in prevalent and incident chronic dialysis patients (all years combined)



4.3.5 Mortality

4.3.5.1 Cross-sectional analysis

As mentioned in 4.3.1, approximately 40% of individual patients included in this study died during the four-year study period. However, those patients were a mixture of prevalent patients and incident patients that were followed-up for different periods of time. The high mortality, obviously, is influenced by the relatively high and increasing age of patients that receive chronic dialysis therapy in Belgium.

The mortality of dialysis patients who died during the same calendar year was on average 17% (only slightly higher in men than in women). In incident patients this mortality during the same year was 15% while in prevalent patients it was 18%. But, the mortality during the same calendar year is very much age dependent: 4% at ages 18-44, 10% at ages 45-64, 18% at ages 65-74 and 24% at age 75 and above.

4.3.5.2 Longitudinal Survival Analysis

To avoid the interpretational problems of the mix of prevalent and incident patients we also conducted a longitudinal survival analysis for the whole study period on incident patients only, i.e. patients that did not have chronic dialysis in the first week of 2003, as defined previously.

Overall mortality for both genders is presented in Figure 25, showing that the four-year survival for incident chronic dialysis patients is less than 40%. As expected, the four-year survival is extremely age dependent and is somewhat lower in men as anticipated (see Figure 26 and survival curves in appendix).

Figure 25: Survival for incident chronic dialysis patients (all ages and both genders)

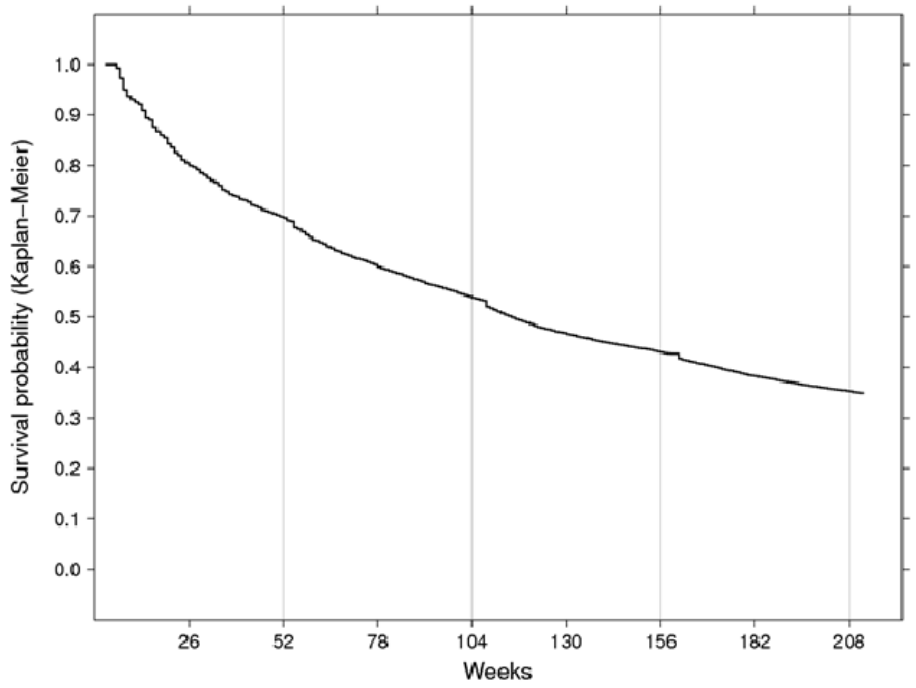
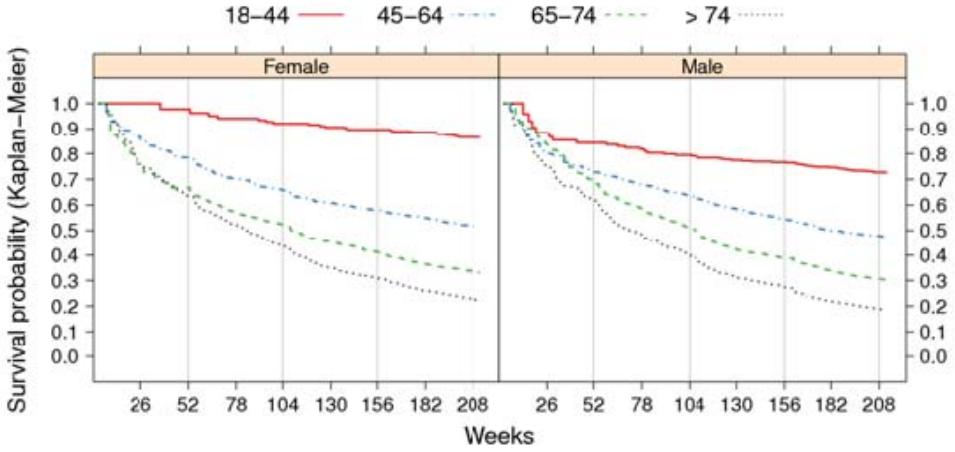


Figure 26: Survival for incident chronic dialysis patients by gender and age

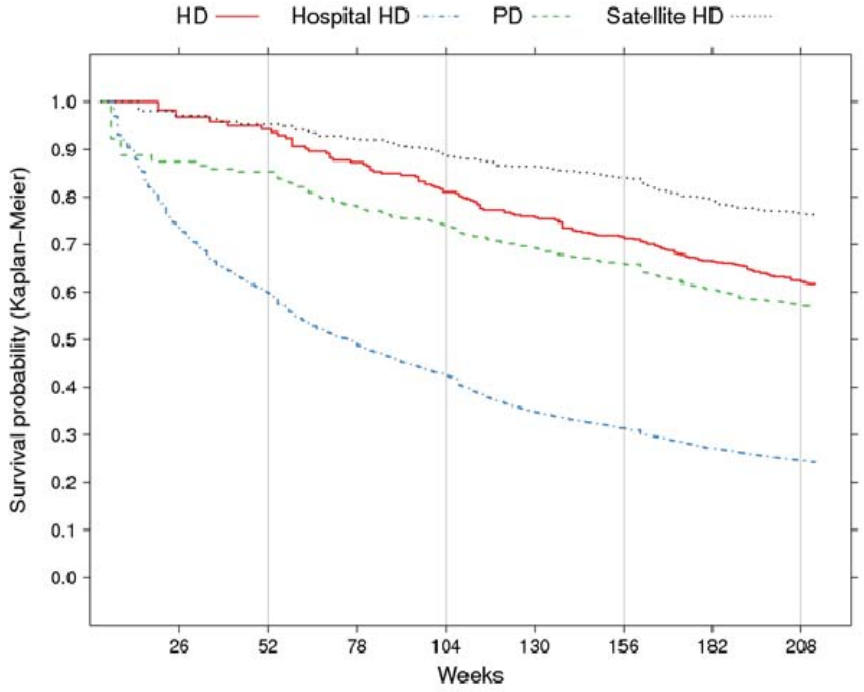


For the mortality by dialysis modality, we limited the analysis to those modalities with a least 500 incident patients over the 4 year period, i.e. the hospital HD, satellite HD, PD and mixed HD groups. There is a marked observed difference between dialysis modalities, as shown in Figure 27. Where patients categorised in the hospital HD group have a four-year survival of slightly more than 20%, the survival in de PD group, the mixed HD group and especially in the satellite HD group is much better.

Obviously, those results should be interpreted with much caution, since these results are heavily biased by several confounders, the most important of which is the confounding by indication as mentioned previously. The patient profile, age, co-morbidities and case severity are very different for those different categories and are in themselves reasons to select a specific dialysis modality. Therefore, these results should certainly not be interpreted as being causally linked to the use of specific dialysis modalities but should be interpreted as descriptive data only.

Other survival analyses are shown in the appendix to chapter 4.

Figure 27: Survival for incident chronic dialysis patients by dialysis modality (both genders)



4.4 PUBLIC REIMBURSEMENTS FOR CHRONIC DIALYSIS PATIENTS: CROSS-SECTIONAL ANALYSIS PER YEAR

In this section specific reimbursed expenses will be analysed and described. For the overall costs, all patients will be included. For the average cost per patient, we will only use cost and numbers of the ***'prevalent'*** patients, since ***'incident'*** patients will, on average, only have started chronic dialysis therapy in the middle of the year. Including incident patients in the cost per patient analyses would artificially lower the estimates. An analysis of cost before and after initiation of therapy is presented in 4.6

It should also be remembered that also prevalent patients will, on average, not receive dialysis therapy for a full year since some of them stopped chronic dialysis during the year for various reasons, as described in 4.3.4. On average, across dialysis modalities and over the four years, approximately 25% of patients stop dialysis for various reasons (transplant, death or unknown). Assuming those patients stop on average in the middle of the year, we can assume that on average prevalent patients will have dialysis for 87.5% of the year. Therefore, the data for the average reimbursement per patient will be underestimated by about 14% (the reciprocal of 87.5% minus 1). Moreover, prevalent patients spend on average more than 60 days per year in hospital (see section 4.4.3), leading to an lower average cost for ambulatory dialysis, consultations and ambulatory medication.

On the other hand, expenses are likely to be higher for patients that are starting on chronic dialysis, because very often there will be an acute episode that will frequently require a hospital admission. Therefore, an additional longitudinal analysis for incident patients will be presented in section 4.6, detailing the costs for the same cost items in relations to the time to and since start of dialysis.

4.4.1 NIHDI reimbursements

4.4.1.1 Overall reimbursements

In Figure 28 the total reimbursements for all medical costs for dialysis patients are shown. The total reimbursement for those patients (patients as defined in Table 20) increased from €386 million in 2003 to €450 million in 2006. Total reimbursement is obviously associated with the dialysis modality but is rather unrelated to age as shown in Figure 28 and Figure 29. These reimbursements only consider direct reimbursements by the NIHDI, but do not include the per diem cost for hospital care, which is paid out of the budget of financial means (BFM/BMF). These expenses are estimated to amount to approximately an additional € 170 million per year as detailed in 4.4.3.

Figure 28: Total reimbursements for chronic dialysis patients by year for different dialysis modality categories

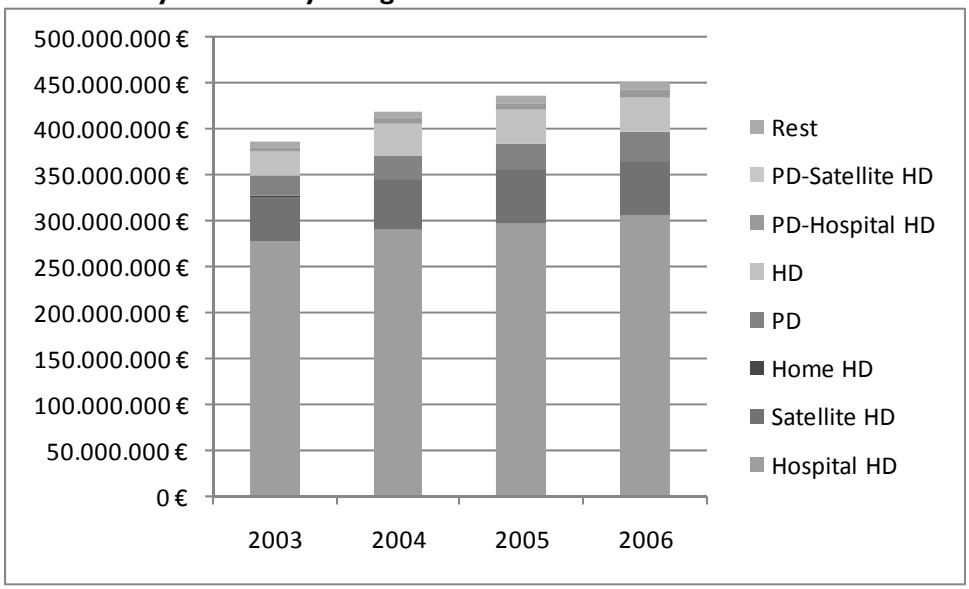
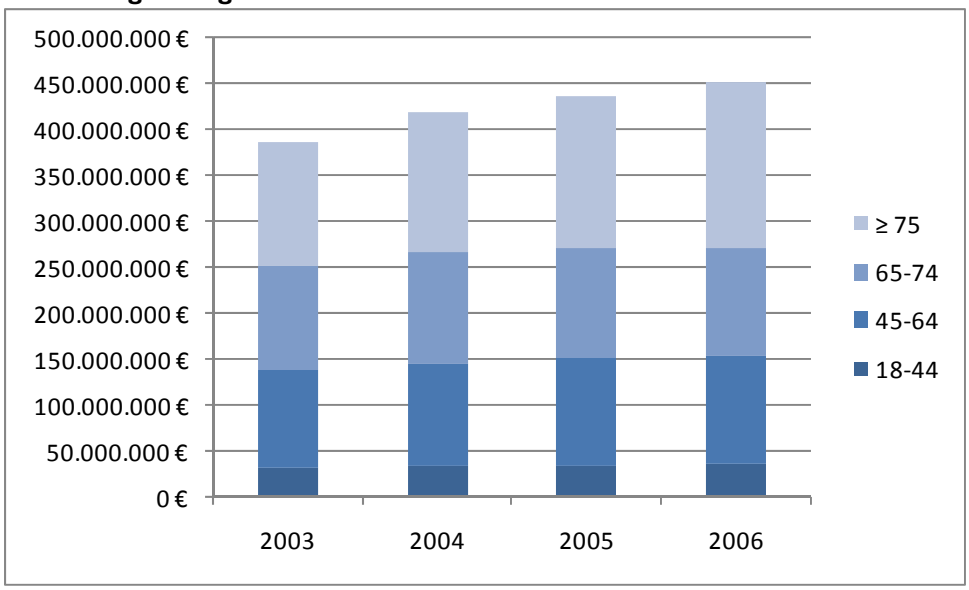


Figure 29 shows the same data but by age. The distribution of reimbursements by age category closely resembles the age distribution as shown in Figure 20, indicating that the underlying pathology is the main driver for total medical expenses.

Figure 29: Total reimbursements for chronic dialysis patients by year for different age categories



4.4.1.2 Average reimbursement per patient (prevalent only)

Using the above data, but limiting those to prevalent patients only, Table 21 gives the average total reimbursement per year by dialysis modality, while Table 22 shows the same data by age. The average reimbursements are relatively stable over the four years studied, and the growth in total expenses is mainly associated with the growing numbers of chronic dialysis patients. Patients on alternative dialysis modalities have markedly less overall medical expenses that patients on hospital HD.

Also in those prevalent patients, the age appears to have a minor influence on the average reimbursement of medical expenses.

Table 21: Average total reimbursement for prevalent patients by dialysis modality

Dialysis Modality	2003	2004	2005	2006
Hospital HD	67.469 €	65.980 €	65.707 €	67.385 €
Satellite HD	52.304 €	53.423 €	53.098 €	53.207 €
Home HD	50.042 €	49.402 €	46.154 €	49.301 €
PD	45.117 €	46.501 €	47.104 €	48.458 €
HD	61.727 €	62.261 €	63.065 €	60.632 €
PD-Hospital HD	55.235 €	57.802 €	58.453 €	61.844 €
PD-Satellite HD	45.122 €	56.043 €	55.933 €	55.141 €
Rest	55.236 €	61.951 €	60.914 €	62.583 €
Overall	62.682 €	61.868 €	61.492 €	62.451 €

Table 22: Average total reimbursement for prevalent patients by age

Age Category	2003	2004	2005	2006
18-44	61.041 €	61.274 €	59.037 €	60.351 €
45-64	63.370 €	63.360 €	63.500 €	63.620 €
65-74	63.187 €	62.139 €	62.023 €	63.948 €
≥ 75	62.118 €	60.744 €	60.293 €	61.221 €
Total	62.682 €	61.868 €	61.492 €	62.451 €

4.4.2 Ambulatory dialysis

4.4.2.1 Overall reimbursements

The reimbursement data for dialysis include the medical fees (honoraria), the lump sums ("forfait"), and the transport costs. Total reimbursement for dialysis was €227.7 million in 2003 and increased to €272.1 million in 2006, an increase of 20%. As shown in Figure 30, the majority of these reimbursements (approximately 60%) come through the lump sum for dialysis. Medical fees account for almost 40% of the cost, while transport reimbursement accounts for only around 2% of the reimbursements. These proportions remained relatively stable over the four years studied although there is a slight increase in the proportion of the lump sum (59 to 62%), and a slight decrease in the proportion of the medical fees (40 to 37%), which can be explained by the increase in the proportion of dialysis patients treated with alternative dialysis modalities, which are only reimbursed through a lump sum.

Figure 30: Reimbursements for ambulatory dialysis by year for different reimbursement categories

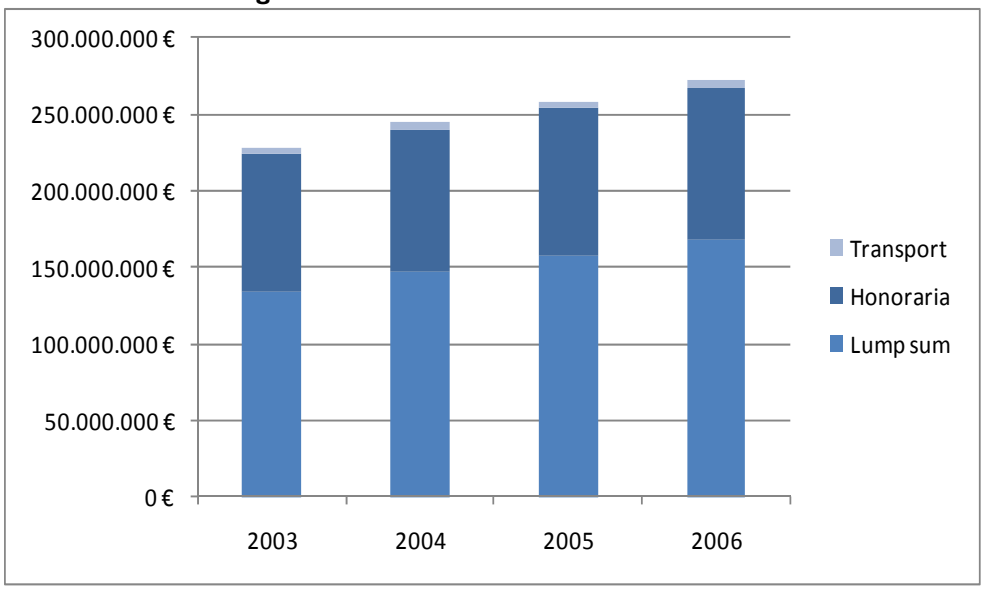
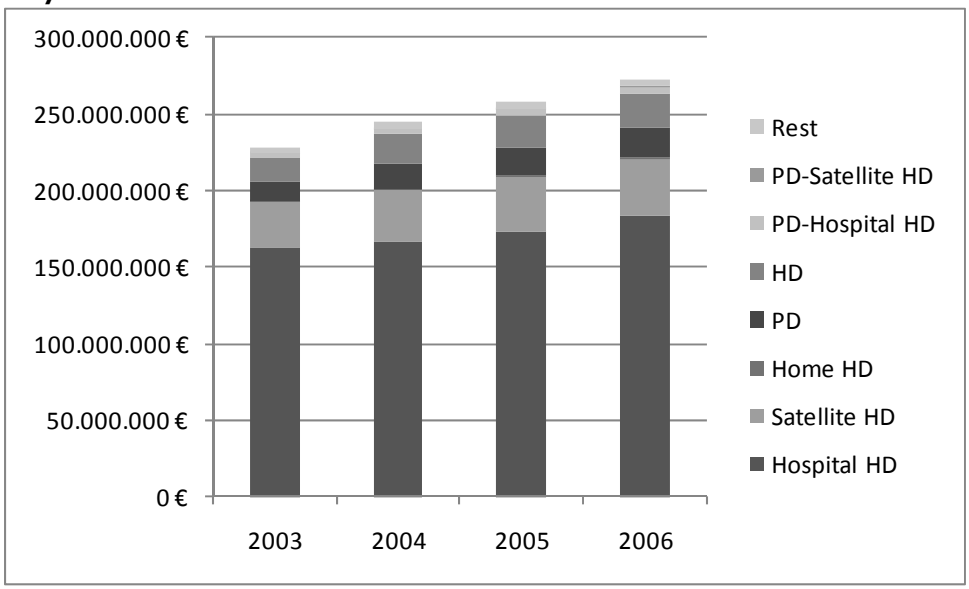


Figure 31 shows the same data but now by the dialysis modality. Not surprisingly the categories with most patients account for the highest reimbursement costs. Therefore, in the next section, the average cost per patient in each category is given.

The proportion of medical fees is higher in the Hospital HD group, approximately 50% compared to the 40% overall.

Figure 31: Reimbursements for ambulatory dialysis by year for different dialysis modalities



4.4.2.2 *Average reimbursement per patient (prevalent only)*

Table 23 gives the average reimbursement for ambulatory dialysis per year for prevalent patients only. Overall, hospital HD is the most expensive with a cost ranging from approximately €42 500 to 44 000 per year. Satellite HD is cheaper with average reimbursements around €33 000. PD average cost per patient ranges from €29 000 to €31 000. Other categories are smaller, and results more difficult to interpret.

It should be stressed that the average reimbursement cost for dialysis per patient in Table 23 is underestimated for reasons explained in the introduction of this section 4.4. At first by 14% because not all patients continue a full year on dialysis because they stop for various reasons, and secondly because prevalent patients spend, on average, more than 60 days in hospital (see 4.4.3) where they still receive dialysis therapy but those data are not included in the ambulatory dialysis reimbursements. As shown in 4.4.3.2 the dialysis during hospital stays amounts for all patients combined to almost €20 million each year.

The increase of the average dialysis expenses for patients from the PD group are related to an improved reimbursement for PD during the study period, as described in chapter 3.

Table 23: Average reimbursement for ambulatory dialysis per year for prevalent patients

	2003	2004	2005	2006
Hospital HD	44.098 €	42.472 €	42.686 €	44.320 €
Satellite HD	32.966 €	33.912 €	33.707 €	33.560 €
Home HD	33.611 €	32.788 €	32.663 €	34.002 €
PD	29.131 €	31.339 €	31.612 €	31.501 €
HD	39.257 €	38.513 €	38.689 €	37.506 €
PD-Hospital HD	33.454 €	31.876 €	33.751 €	33.977 €
PD-Satellite HD	42.400 €	44.411 €	39.220 €	39.923 €
Rest	36.407 €	36.351 €	38.412 €	34.886 €
Average	40.652 €	39.584 €	39.627 €	40.354 €

4.4.3 Hospital stays and one-day clinic

The hospital stays and one-day clinic admissions in this section concern all hospitalisations, both in acute and non-acute beds of the patients included in the sample. The year of hospitalisation was defined as the year of discharge. As a result, if for example a patient is transplanted during a given year that hospital stay will be included. If a patient is transferred from an acute to a non-acute bed, the complete hospital stay is taken into account. If should be emphasised that the one-day clinic admissions associated with dialysis are not included in those data. For those the data are presented in 4.4.2. Dialysis costs during a normal hospital stay, however, are included in those data.

This analysis only takes into account the specific reimbursements for medical acts drugs and implants. The so-called 'per diem prices for hospital stays (ligdagprijs/prix de journée) are not taken into account since these have assumed different forms throughout the years, and are now based, since July 1st 2002, on estimates and a forecast-based provisional rate,[75] through the so-called budget of financial means (BFM/BMF, see also chapter 5). In 2006 the average 'per diem cost' for the dialysis centres was € 269.44 (source: dialysis questionnaire RIZIV/INAMI, www.riziv.be, also see chapter 5). Therefore, the approximately 600 000 hospital days yearly (see further) correspond to an additional yearly budgetary reimbursement impact of approximately € 170 million. In the calculations we have included this cost as the 'estimated per-diem' cost. For the one-day clinic admissions, the day prices ('forfaits') were included in the reimbursement analysis.

4.4.3.1 Resource use

Every year there were around 15 000 hospital admissions in these chronic dialysis patients, increasing from 14 260 in 2003 to 15 173 in 2006. Combined with a total number of hospital days of approximately 600 000 per year this leads to an average hospital length of stay of dialysis patients of around 40 days for each individual stay.

Many patients on chronic dialysis need a hospital admission as shown in Table 24. Almost all incident patients are admitted at least once to a hospital during the year they become incident. Hospital admissions in prevalent (ongoing) patients are less frequent. The same phenomenon, but to a lesser extend happens for one-day clinic admissions.

Table 24: Proportion of chronic dialysis patients with at least 1 hospital admission or one-day clinic admission during each year

	2003	2004	2005	2006
Hospital admissions				
Incident	94%	94%	94%	94%
Prevalent	72%	72%	72%	72%
Overall	78%	78%	77%	77%
One-day clinic				
Incident	39%	32%	32%	33%
Prevalent	40%	26%	24%	26%
Overall	40%	28%	26%	27%

In all years studied, the average number of separate hospital admissions per year is higher in incident patients (around 2.8 overall) than it is in prevalent patients (around 1.8 overall) (detailed data not shown). The average for both groups combine is around 2.0 (see also Table 25).

Table 25 shows, moreover, for incident and prevalent patients combined, the yearly number of hospital admissions by dialysis modality. For all main groups, this number is higher for incident than for prevalent patients, but there are important differences between the groups. In the group hospital HD the number of admission in the incident group is lower than for the PD group (2.8 v.s. 3.0) while in the prevalent group it is higher (1.9 v.s. 1.6).

Table 25: Yearly number of hospital admissions by dialysis modality (all patients, including those with and without hospital admissions)

All patients	2003	2004	2005	2006
Hospital HD	2,2	2,1	2,1	2,0
Satellite HD	1,5	1,5	1,5	1,5
Home HD	1,0	0,9	0,4	0,4
PD	2,2	2,1	1,9	2,1
HD	2,1	2,1	2,0	2,1
PD-Hospital HD	3,1	3,3	3,1	3,6
PD-Satellite HD	0,0	1,0	1,0	4,0
Rest	2,6	2,6	2,6	2,6
Average	2,1	2,0	2,0	2,0

In the four years studied, chronic dialysis patients accounted for slightly more than 600 000 hospital days per year, and the total number of days in hospital during one year for incident patients was on average longer than for prevalent patients, 137 days per year versus 64 days respectively (detailed data not shown).

Table 26 shows the total number of days in hospital for a full year by dialysis modality for all patients combined.

Table 26: Total number of days in hospital during a complete year by dialysis modality (all patients, including those with and without hospital admissions)

All patients	2003	2004	2005	2006
Hospital HD	104	95	90	90
Satellite HD	37	34	38	41
Home HD	26	16	7	7
PD	67	62	59	64
HD	87	88	77	76
PD-Hospital HD	195	171	151	203
PD-Satellite HD	0	50	16	490*
Rest	88	109	75	94
Average	91	84	79	81

*this specific total length of stay is clearly a data artefact: this category concerns only 4 patients and included one hospital stay that extended over several years. As mentioned in section 4.2.5, the year of discharge was taken as the year of analysis causing this artefact.

For one-day clinic admissions (excluding the so-called 'mini-forfait), we observed an increase in absolute numbers from approximately 16 400 to 23 900 over the study period. In contrast to the hospital admissions shown previously, the number of one-day clinic admissions is higher in prevalent patients than in incident patients, as shown in Table 27. The increase in absolute number is not only due to an increasing number of patients but also due to an increase of the average number of one-day admissions, shown in the same table.

Table 27: Yearly number of one-day clinic admissions per patient

	2003	2004	2005	2006
Incident	2,0	1,7	1,6	4,6
Prevalent	2,6	2,9	2,9	2,7
Overall	2,4	2,6	2,5	3,1

Table 28 shows, for all patients combined the yearly frequency of one-day clinic admissions by dialysis modality. The low rate of one-day clinic admissions in hospital HD category compared to the satellite HD category is probably explained by the fact that often medical problems will be discussed and treated during one of the patient's regular visits to the hospital for ambulatory dialysis treatment.

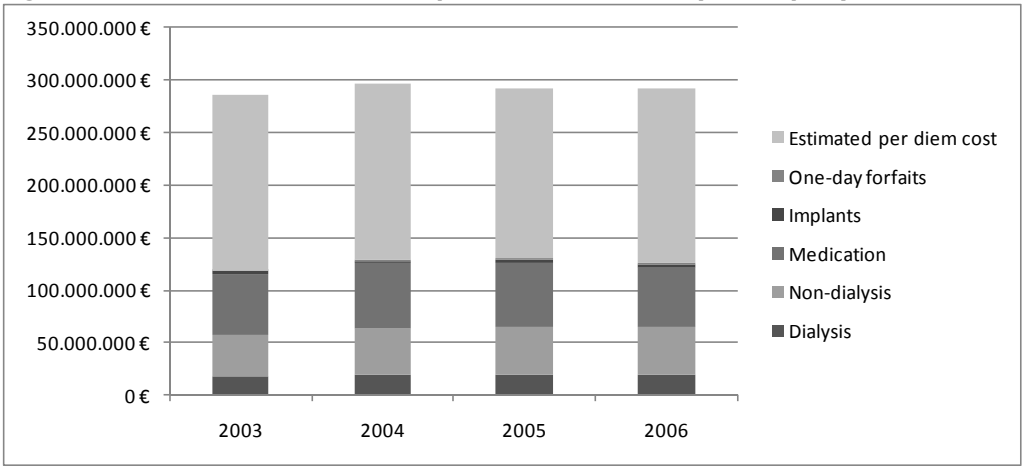
Table 28: Yearly number of one-day clinic admissions by dialysis modality and per patient (all patients)

	2003	2004	2005	2006
Hospital HD	0,5	0,5	0,5	0,5
Satellite HD	12,7	12,9	13,2	12,5
Home HD	0,3	0,9	0,1	0,1
PD	0,8	0,9	0,7	5,5
HD	1,7	1,8	1,0	1,0
PD-Hospital HD	0,9	0,9	1,1	12,7
PD-Satellite HD	0,0	2,0	54,5	85,0
Rest	1,9	3,0	3,1	2,4
Average	2,4	2,6	2,5	3,1

4.4.3.2 *Overall reimbursements*

Figure 32 shows the public imbursement for hospital and one-day care, with an estimated 'per diem costs' for inpatient care (see above). Every year, almost €20 million is reimbursed for dialysis during hospital stays in addition to the ambulatory dialysis reimbursements presented in 4.4.2.

Figure 32: Reimbursements for hospital care and one-day clinic per year



4.4.3.3 *Average reimbursement per patient (prevalent only)*

As shown in Table 29 the prevalent patients in the peripheral dialysis modalities have less expensive hospital and one-day clinic stays than those in the hospital HD dialysis modality category or in mixed categories, probably indicating that the latter indeed correspond to older, frailer and more ill patients. It should be emphasised that the numbers in this table include an estimated per diem hospital cost which was not included in the original reimbursement data.

Table 29: Yearly average reimbursement for hospital care and one-day clinic per year by dialysis modality for prevalent patients (including the estimated per diem cost)

	2003	2004	2005	2006
Hospital HD	39.581 €	36.294 €	34.609 €	33.545 €
Satellite HD	22.112 €	22.297 €	23.492 €	23.441 €
Home HD	17.176 €	17.543 €	11.922 €	12.734 €
PD	22.939 €	22.366 €	21.553 €	26.697 €
HD	35.097 €	40.063 €	37.424 €	33.800 €
PD-Hospital HD	51.548 €	61.291 €	51.226 €	66.287 €
PD-Satellite HD	1.365 €	21.308 €	21.920 €	229.641 €
Rest	32.846 €	49.629 €	37.414 €	47.239 €
Average	35.287 €	33.833 €	32.139 €	32.112 €

4.4.4 Ambulatory consultations

The consultations included in this section include all types of medical consultation, with the exclusion of specific dialysis sessions (section 4.4.2) and hospital admissions (section 4.4.3). Overall, about 100 000 ambulatory consultations occurred each year for chronic dialysis patients, slightly increasing from 99 122 in 2003 to 105 961 in 2006.

4.4.4.1 *Resource use*

More than 90% of chronic dialysis patients had ambulatory consultations reimbursements, and this proportion was rather similar for incident and prevalent patients (detailed data not shown).

As shown in Table 30, incident patients consult more often than prevalent patients. Overall, the highest frequency for ambulatory consultations per patient are performed for the PD group, as shown in Table 31.

Table 30: Yearly number of ambulatory consultations per patient

	2003	2004	2005	2006
Incident	19,4	19,4	18,7	18,0
Prevalent	12,6	13,0	13,0	12,6
Overall	14,6	14,8	14,5	13,9

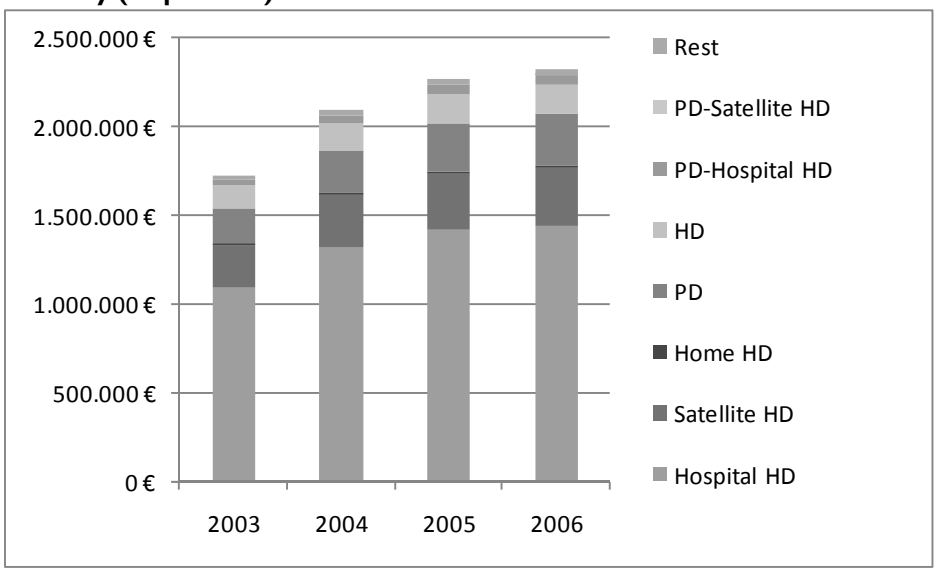
Table 31: Yearly number of ambulatory consultations by dialysis modality and per patient (all patients)

	2003	2004	2005	2006
Hospital HD	13,7	14,2	14,0	13,4
Satellite HD	14,2	14,5	13,7	13,2
Home HD	13,9	12,5	12,2	13,1
PD	21,3	20,8	20,0	19,3
HD	15,1	13,9	13,8	12,7
PD-Hospital HD	18,2	18,5	17,7	14,9
PD-Satellite HD	0,0	0,0	0,0	11,3
Rest	15,2	14,2	14,3	15,0
Average	14,6	14,8	14,5	13,9

4.4.4.2 *Overall reimbursements*

Figure 33 shows a steady increase of the reimbursements for ambulatory consultations in all patients, from €1.7 million in 2003 to €2.3 million in 2006. This increase is observed for all major categories of dialysis modalities.

Figure 33: Reimbursements for ambulatory consultations by dialysis modality (all patients)



4.4.4.3 *Average reimbursement per patient (prevalent only)*

Table 32 indicates that the increase of reimbursements is not only due to the slight increase in the number of consultations, but mainly to higher reimbursements per (prevalent) patient.

Table 32: Yearly average reimbursement of ambulatory consultations per patient by dialysis modality

	2003	2004	2005	2006
Hospital HD	203 €	233 €	255 €	265 €
Satellite HD	215 €	251 €	248 €	265 €
Home HD	253 €	231 €	259 €	282 €
PD	373 €	396 €	396 €	405 €
HD	219 €	227 €	251 €	251 €
PD-Hospital HD	291 €	307 €	323 €	322 €
PD-Satellite HD	0 €	0 €	0 €	11 €
Rest	252 €	250 €	244 €	323 €
Average	220 €	250 €	267 €	279 €

4.4.5 Ambulatory medication

Ambulatory medication costs were collected as described in the appendix to this chapter. Reimbursements are described as in previous sections, overall and by prevalent patient and include the deliveries done by public pharmacies in the classes A, B, C, Cs and Cx. Reimbursed dietary products, ambulatory oxygen, contraceptives, diagnostic products and vaccines were excluded.

4.4.5.1 Overall reimbursements

Table 33 shows the yearly reimbursement for ambulatory medication by type of patient, while Table 34 gives the same information by dialysis modality. The yearly reimbursement for ambulatory medication appears to be relatively stable over the study period.

Table 33: Yearly reimbursement for ambulatory medication by type of patient

	2003	2004	2005	2006
Incident patients	2.466.031 €	2.174.620 €	2.031.131 €	1.852.168 €
Prevalent patients	5.727.504 €	5.379.873 €	5.619.123 €	6.813.815 €
All patients	8.193.535 €	7.554.493 €	7.650.254 €	8.665.983 €

Table 34: Yearly reimbursement for ambulatory medication by dialysis modality (all patients)

	2003	2004	2005	2006
Hospital HD	5.251.205 €	4.577.586 €	4.603.663 €	5.207.473 €
Satellite HD	1.372.944 €	1.258.520 €	1.198.423 €	1.366.477 €
Home HD	26.289 €	17.260 €	13.468 €	22.957 €
PD	818.344 €	876.610 €	941.927 €	1.062.937 €
HD	459.635 €	550.869 €	586.764 €	656.154 €
PD-Hospital HD	149.238 €	140.391 €	181.485 €	181.040 €
PD-Satellite HD	0 €	0 €	1.081 €	1.935 €
Rest	115.879 €	133.257 €	123.444 €	167.010 €
Total	8.193.535 €	7.554.493 €	7.650.254 €	8.665.983 €

4.4.5.2 Average reimbursement per patient (prevalent only)

Table 35 shows the ambulatory drug reimbursement costs in prevalent chronic dialysis for the different dialysis modality groups.

Table 35: Yearly average reimbursement for ambulatory medication by dialysis modality for prevalent patients

	2003	2004	2005	2006
Hospital HD	1.088 €	930 €	931 €	1.084 €
Satellite HD	1.443 €	1.193 €	1.059 €	1.215 €
Home HD	1.323 €	786 €	792 €	1.530 €
PD	1.763 €	1.590 €	1.485 €	1.630 €
HD	942 €	882 €	935 €	1.050 €
PD-Hospital HD	1.580 €	1.151 €	1.200 €	1.321 €
PD-Satellite HD	0 €	0 €	0 €	369 €
Rest	1.267 €	1.140 €	775 €	1.397 €
Total	1.191 €	1.026 €	1.002 €	1.163 €

4.4.6 Venofer® (intravenous iron)

A special case of medication in chronic dialysis is Venofer® (iron sacharose), an iron preparation used for iron supplementation through intravenous delivery, frequently needed in dialysis patients and intended for hospital use only (category HG/UH.).

4.4.6.1 Overall reimbursements

Table 36 shows that use and reimbursement for Venofer mainly occurs in prevalent patients and that over the study period there is overall a modest increase of reimbursements.

Table 36: Yearly reimbursement for Venofer by type of patient

	2003	2004	2005	2006
Incident patients	293.562 €	337.076 €	311.894 €	293.996 €
Prevalent patients	1.272.740 €	1.305.424 €	1.378.283 €	1.446.116 €
All patients	1.566.302 €	1.642.499 €	1.690.178 €	1.740.113 €

4.4.6.2 Average reimbursement per patient (prevalent only)

Table 37 indicates that Venofer is mainly used for the HD patients, and almost not in the PD dialysis modality category (defined as 80% of total time in PD). Venofer was indeed not indicated and not reimbursed for PD patients during PD at the time of study, although nowadays it is reimbursed for PD patients as well.

Table 37: Yearly average reimbursement for Venofer by dialysis modality for prevalent patients

	2003	2004	2005	2006
Hospital HD	294 €	269 €	270 €	271 €
Satellite HD	271 €	288 €	273 €	283 €
Home HD	213 €	115 €	181 €	103 €
PD	15 €	13 €	10 €	16 €
HD	279 €	285 €	276 €	271 €
PD-Hospital HD	113 €	111 €	178 €	183 €
PD-Satellite HD	0 €	0 €	14 €	11 €
Rest	137 €	202 €	247 €	227 €
Total	265 €	249 €	246 €	247 €

4.5 OUT-OF-POCKET EXPENSES FOR CHRONIC DIALYSIS PATIENTS: CROSS-SECTIONAL ANALYSIS PER YEAR

Compared to reimbursements the official out-of-pocket payments for the patients themselves are relatively small. For the analyses of the global out-of-pocket payments in this section we will combine patients' co-payments (remgeld/ticket modérateur) and co-insurance with the supplements that can be asked in specific cases.[u] The same cost categories as in section 4.4 will be used. For the calculation of the out-of-pocket expenses co-payments, co-insurance and supplements were combined.

Overall resource use has been described in section 4.4; therefore, in this section only overall costs and cost per patient will be detailed.

In interpreting these results, however, it should be kept in mind that a number of those patients have special statutes (MAF, OMNIO) that lower the impact of these out-of-pocket payments and also that sickness funds often offer additional financial benefits for those patients. However, it should also kept in mind that the costs listed in this section only include the registered out-of-pocket health care costs related to health care services that are partly reimbursed, and that, because they are not essential for the reimbursement itself, the extent to which these registrations are complete might be heterogeneous. Non-reimbursed items such as over the counter drugs (OTC), supplies, waste disposal etc. are not included in these out-of-pocket costs. Another important cost item not included in this registered expenses are the personal per-diem hospital costs.

4.5.1 Total out-of-pocket expenses for reimbursed health care items

4.5.1.1 Overall expenses

Total out-of-pocket expenses for chronic dialysis patients have increased from €6.1 million in 2003 to €7.6 million in 2006. Figure 34 and Figure 35 show those expenses by dialysis modality category and by age category. Similar to what was shown for reimbursements in Figure 29, the cost by age category closely matches the age distribution.

[u] Both co-payments and co-insurance are cost-sharing arrangements which require the individual covered to pay part of the cost of care. A co-payment is a fixed fee (flat rate) per item or service; in case of co-insurance the patient pays a fixed proportion of the total cost. In addition to co-payments and co-insurance, patients also pay supplements. Supplements are distinct from co-payments and co-insurance. Supplements can be defined as the difference between the total payments and the convention tariff.

Figure 34: Total out-of-pocket expenses for reimbursed care by year for different for different dialysis modality categories

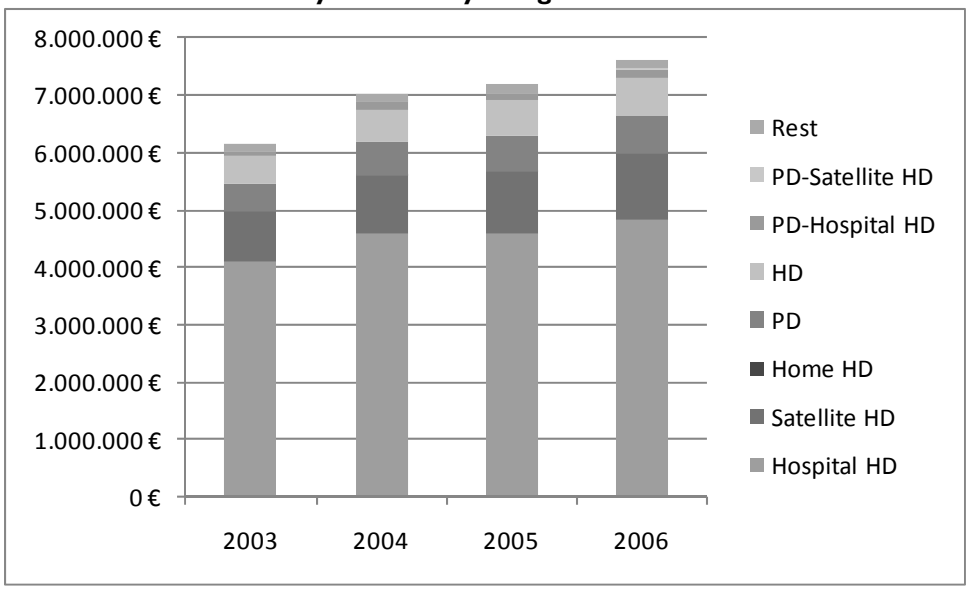
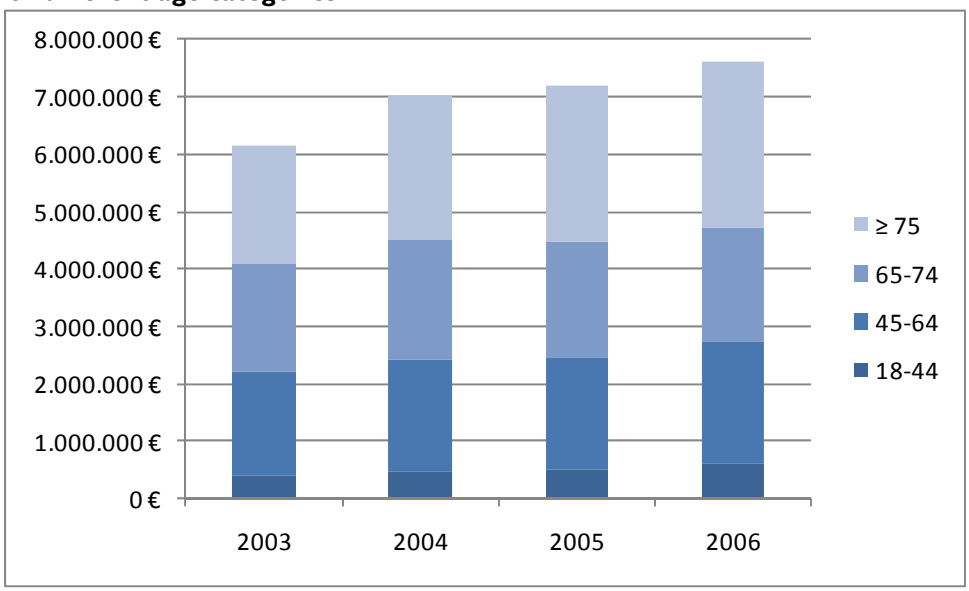


Figure 35: Total out-of-pocket expenses for chronic dialysis patients by year for different age categories



4.5.1.2 *Average expenses per patient (prevalent only)*

With the above data but limiting them to prevalent patients only the average total out-of-pocket cost was calculated. Results are shown in Table 38. No large and consistent differences were observed between the dialysis modalities. In the analysis by age shown in Table 39, the group of prevalent patients aged 45 to 64, consistently had higher out-of-pocket expenses than the other age groups.

Table 38: Yearly total average out-of-pocket expenses per year for prevalent patients by dialysis modality

Dialysis Modality	2003	2004	2005	2006
Hospital HD	868 €	877 €	859 €	904 €
Satellite HD	810 €	878 €	864 €	955 €
Home HD	833 €	921 €	634 €	698 €
PD	885 €	842 €	855 €	897 €

HD	927 €	890 €	964 €	979 €
PD-Hospital HD	835 €	1.066 €	902 €	982 €
PD-Satellite HD	296 €	1.794 €	851 €	1.629 €
Rest	932 €	1.094 €	1.114 €	1.258 €
Overall	864 €	883 €	874 €	927 €

Table 39: Yearly total average out-of-pocket expenses per year for prevalent patients by age

Age Category	2003	2004	2005	2006
18-44	692 €	751 €	762 €	820 €
45-64	940 €	948 €	943 €	1.040 €
65-74	894 €	917 €	889 €	946 €
≥ 75	821 €	838 €	839 €	865 €
Total	864 €	883 €	874 €	927 €

4.5.2 Ambulatory dialysis

4.5.2.1 Overall expenses

Figure 36 shows the total out-of-pocket payments for ambulatory dialysis per year. In contrast to Figure 30, it can be seen that for the patients themselves transport represents the highest cost for dialysis. The strange peak in out-of-pocket payments for honoraria in 2004 is entirely caused by supplements for medical acts in the hospital HD category patients and remains unexplained. Except for the year 2004, the overall out-of-pocket costs for chronic dialysis decreased from 2003 to 2006.

Figure 36: Out-of-pocket payments for ambulatory dialysis by year for different reimbursement categories

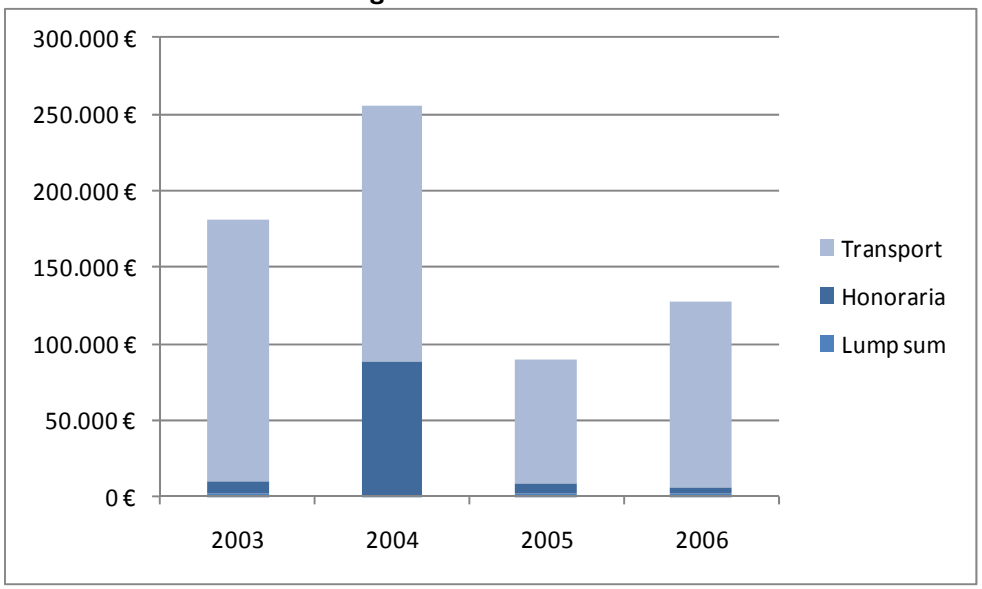
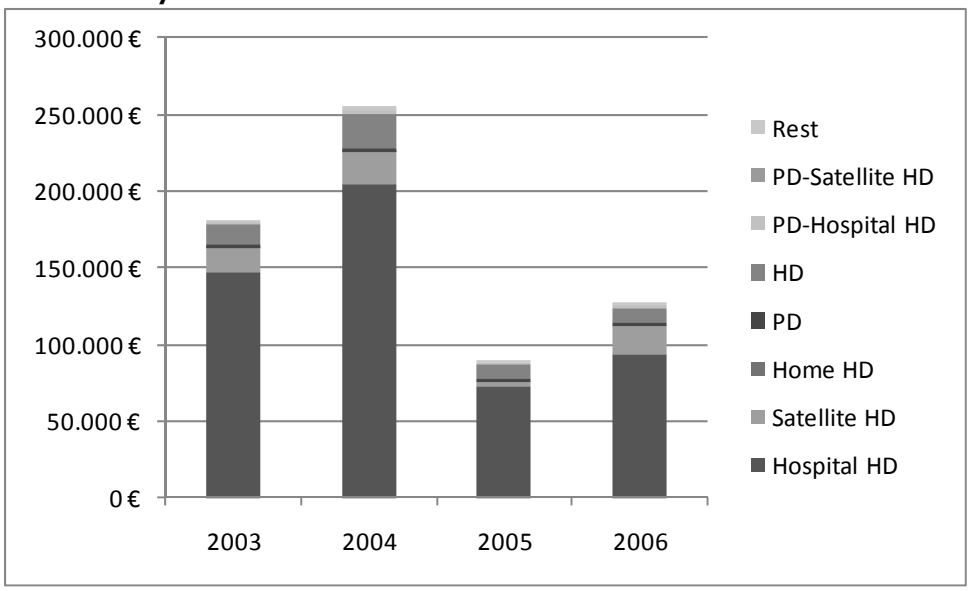


Figure 37 shows the same data but now by dialysis modality, largely showing similar patterns as Figure 31 with the largest overall out-of-pocket payments for patients in the hospital HD category.

Figure 37: Out-of-pocket payments for ambulatory dialysis by year for different dialysis modalities



4.5.2.2 *Average expenses per patient (prevalent only)*

Table 40 shows the average out-of-pocket payments by dialysis modality. Obviously, the hospital HD and the mixed HD categories cause most out-of-pocket expenses, due to the relative importance of the transportation cost for the patient.

Table 40: Yearly average out-of-pocket payments for ambulatory dialysis per year for prevalent patients

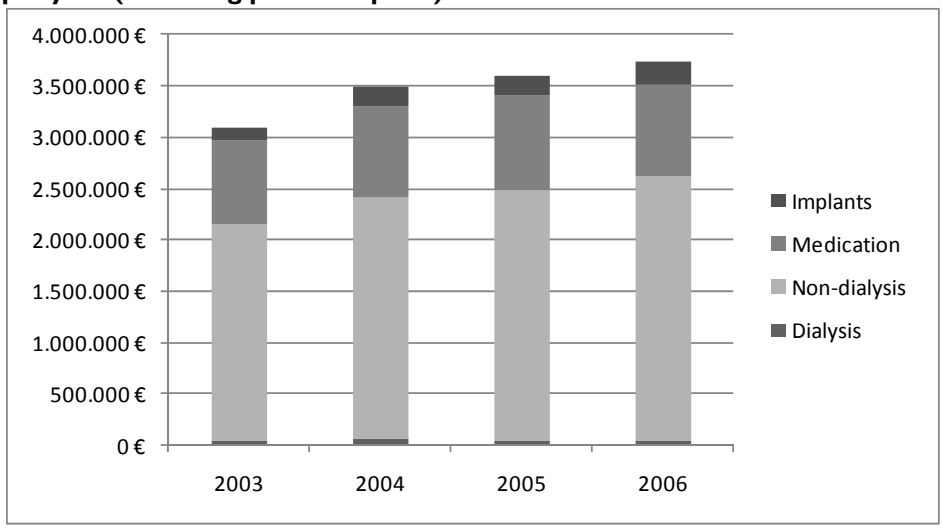
	2003	2004	2005	2006
Hospital HD	41 €	54 €	19 €	21 €
Satellite HD	16 €	20 €	4 €	16 €
Home HD	11 €	13 €	0 €	0 €
PD	7 €	4 €	3 €	1 €
HD	26 €	48 €	13 €	19 €
PD-Hospital HD	20 €	21 €	18 €	16 €
PD-Satellite HD	0 €	0 €	0 €	0 €
Rest	14 €	22 €	12 €	7 €
Average	33 €	43 €	14 €	18 €

4.5.3 Hospital stays and one-day clinic

4.5.3.1 *Overall expenses*

Figure 38 shows the overall out-of-pocket expenses for hospital care and one-day clinic admissions. In contrast to Figure 32 for reimbursements, the bulk of out-of-pocket expenses goes to non-dialysis related expenses and medication. One-day clinic lump sums are not applicable to these out-of-pocket expenses. The personal share for the per-diem price is not included since this personal share is depending on the social and familial status of the patient, data that were not included in the data collection. Anyway, this personal share out-of-pocket cost can be estimated to be a substantial out-of-pocket payment and, depending on the socio-economic mix of the patients, in the total range of €3 to 9 million, or between approximately €400 and €1200 per chronic dialysis patient.

Figure 38: Out-of-pocket payments for hospital care and one-day clinic care per year (excluding per-diem price)



4.5.3.2 Average expenses per patient (prevalent only)

The figures in Table 41 do not include, as described above, the out-of-pocket payments for the personal share in hospital stays. Except for these costs, the yearly average out-of-pocket payments for hospital care and one-day clinic care per patient appear rather homogeneous for the most important dialysis modality categories. Out-of-pocket expenses for the PD group, however, appear to be consistently lower than for the other groups. For satellite HD, this is less clear and not consistent over the studies years.

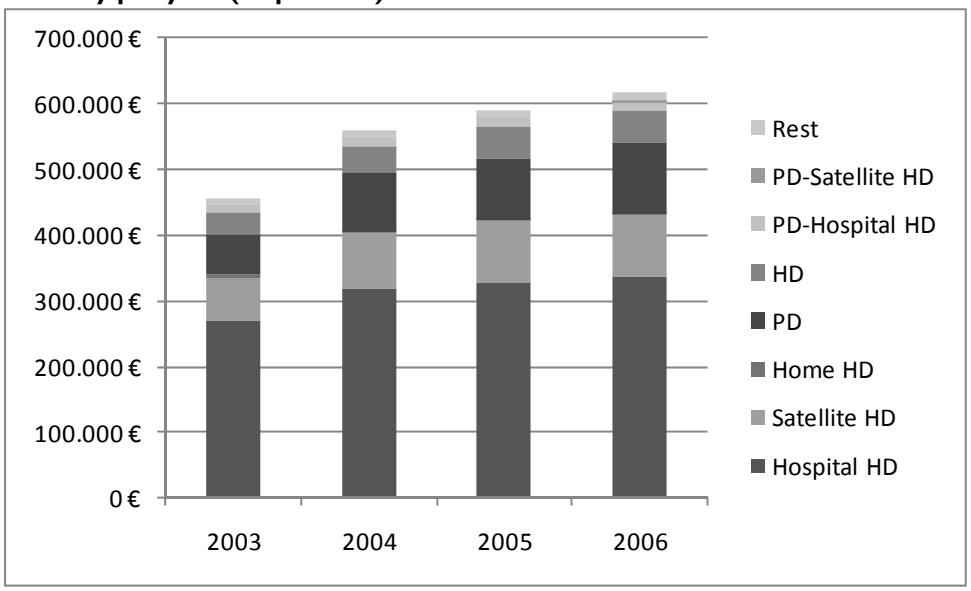
Table 41: Yearly average out-of-pocket payments for hospital care and one-day clinic for prevalent patients (excluding 'per diem' payments)

	2003	2004	2005	2006
Hospital HD	449 €	429 €	431 €	445 €
Satellite HD	429 €	456 €	449 €	499 €
Home HD	331 €	531 €	280 €	286 €
PD	400 €	333 €	358 €	352 €
HD	514 €	445 €	523 €	510 €
PD-Hospital HD	354 €	522 €	403 €	487 €
PD-Satellite HD	296 €	1.736 €	764 €	806 €
Rest	528 €	680 €	673 €	756 €
Average	446 €	434 €	439 €	458 €

4.5.4 Ambulatory consultations

4.5.4.1 Overall expenses

Figure 39: Out-of-pocket payments for ambulatory consultations by dialysis modality per year (all patients)



4.5.4.2 Average expenses per patient (prevalent only)

Table 42: Yearly average out-of-pocket payments for ambulatory consultations for prevalent patients

	2003	2004	2005	2006
Hospital HD	49 €	53 €	56 €	58 €
Satellite HD	56 €	71 €	71 €	76 €
Home HD	137 €	117 €	94 €	146 €
PD	120 €	143 €	143 €	154 €
HD	60 €	61 €	71 €	67 €
PD-Hospital HD	86 €	110 €	91 €	87 €
PD-Satellite HD	0 €	0 €	0 €	0 €
Rest	81 €	73 €	80 €	104 €
Total	57 €	65 €	69 €	72 €

4.5.5 Ambulatory medication

4.5.5.1 Overall expenses

Table 43: Yearly out-of-pocket payments for ambulatory medication

	2003	2004	2005	2006
Incident patients	349.995 €	391.427 €	377.755 €	341.895 €
Prevalent Patients	797.675 €	919.422 €	1.026.314 €	1.199.874 €
All patients	1.147.670 €	1.310.849 €	1.404.068 €	1.541.769 €

Table 44: Yearly out-of-pocket payments for ambulatory medication by dialysis modality (all patients)

	2003	2004	2005	2006
Hospital HD	754.657 €	837.718 €	881.654 €	950.504 €
Satellite HD	169.418 €	199.597 €	223.354 €	245.087 €
Home HD	3.497 €	3.871 €	3.293 €	3.337 €
PD	104.919 €	126.379 €	136.291 €	159.457 €
HD	79.399 €	98.942 €	111.248 €	131.048 €
PD-Hospital HD	18.275 €	26.039 €	27.562 €	29.368 €
PD-Satellite HD	0 €	0 €	262 €	538 €
Rest	17.505 €	18.303 €	20.405 €	22.431 €
Total	1.147.670 €	1.310.849 €	1.404.068 €	1.541.769 €

4.5.5.2 *Average expenses per patient (prevalent only)*

Table 45: Yearly out-of-pocket payments for ambulatory medication by dialysis modality for prevalent patients

	2003	2004	2005	2006
Hospital HD	163 €	171 €	178 €	199 €
Satellite HD	167 €	181 €	195 €	215 €
Home HD	164 €	191 €	194 €	222 €
PD	192 €	209 €	201 €	225 €
HD	166 €	165 €	179 €	205 €
PD-Hospital HD	174 €	207 €	204 €	214 €
PD-Satellite HD	0 €	0 €	0 €	82 €
Rest	182 €	158 €	164 €	182 €
Total	166 €	175 €	183 €	205 €

4.6 PUBLIC REIMBURSEMENTS FOR CHRONIC DIALYSIS PATIENTS: LONGITUDINAL ANALYSIS FOR INCIDENT PATIENTS

The objective of this last section is to illustrate the evolution of expenses in six-month periods before and after starting dialysis. In this analysis, all the incident patients since 2003 and until the end of 2006 are included (see Table 19). Expenses incurred up to a year before dialysis' start were taken into account.

As shown in section 4.3.1, the number of incident patients over the 4 years was 7935. However, we do not have information on all of these patients for the whole duration of the follow-up period. Table 46 shows the number of patients by age and period of available reimbursement data (for a full or partial period of 6 months) for analysis

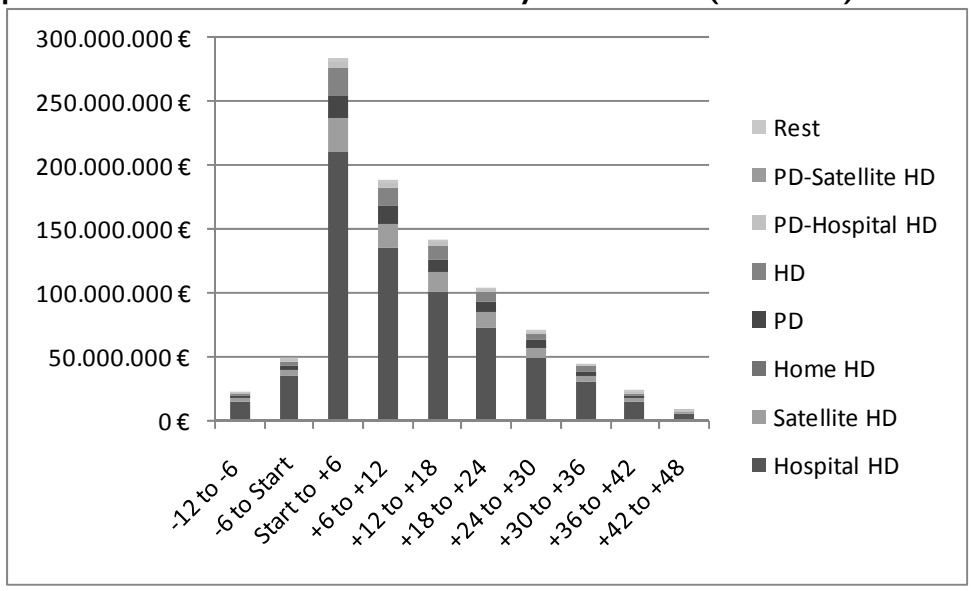
Table 46: Number of patients by age and period (months) of available reimbursement data for analysis

Age category	-12 to -6	-6 to Start	Start to +6	+6 to +12	+12 to +18	+18 to +24	+24 to +30	+30 to +36	+36 to +42	+42 to +48
18-44	612	667	700	549	423	323	232	158	83	48
45-64	1943	2048	2107	1547	1173	895	650	431	241	111
65-74	2107	2184	2207	1547	1183	904	645	448	253	114
≥ 75	2849	2905	2921	1949	1411	1015	679	436	231	97
Total	7511	7804	**7935**	5592	4190	3137	2206	1473	808	370

4.6.1 Overall reimbursements

The same reimbursement categories have been included as in section 4.4: ambulatory dialysis, hospital stays and one-day clinic but excluding the per diem cost (ligdagprijs/prix de journée), ambulatory consultations and ambulatory medication. Figure 40 shows the total reimbursements for those categories in relation to the start of chronic dialysis. Reimbursements are for six-month periods to improve the granularity of the results. It should be noted however, that this figure only concerns total reimbursements for all surviving patients on dialysis. Therefore, the apparent important decrease in the consecutive six-month periods after the onset of dialysis is artificial since many patients either died or were censored during the study. For more relevant information on the average expenses per patient see Figure 41.

Figure 40: Six-monthly total reimbursements for incident and surviving patients in relation to start of chronic dialysis treatment (in months)



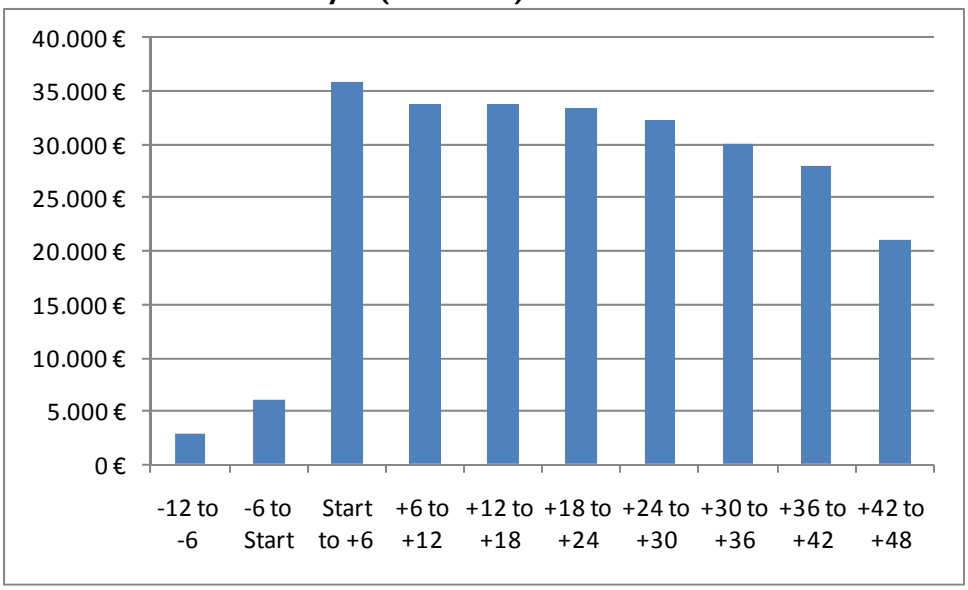
4.6.2 Average reimbursement per patient

Table 47 shows the six-monthly average reimbursement for incident patients in relation to the start of dialysis. As expected, a sharp peak is seen at the beginning of dialysis. The reimbursement cost for patients on chronic Hospital HD show a less outspoken peak with a more steady reimbursement profile afterwards. This could be related to the relatively old age and high mortality in those patients and who, because of death, spend considerably less than 6 months on average on chronic dialysis. For a better visual presentation the overall data are also presented in Figure 41.

Table 47: Six-monthly average reimbursements for incident patients in relation to the start of dialysis (in months)

	-12 to -6	-6 to Start	Start to +6	+6 to +12	+12 to +18	+18 to +24	+24 to +30	+30 to +36	+36 to +42	+42 to +48
Hospital HD	2.962 €	6.664 €	38.779 €	39.838 €	40.188 €	40.043 €	38.511 €	36.659 €	34.332 €	26.137 €
Satellite HD	2.512 €	4.766 €	27.944 €	23.169 €	23.223 €	22.436 €	22.864 €	20.589 €	18.934 €	13.858 €
Home HD	2.186 €	3.261 €	29.924 €	22.114 €	22.490 €	25.414 €	20.098 €	23.333 €	18.270 €	17.995 €
PD	2.652 €	4.603 €	23.466 €	19.970 €	20.691 €	20.505 €	20.243 €	16.801 €	17.359 €	12.248 €
HD	2.543 €	5.245 €	38.786 €	31.283 €	29.260 €	28.631 €	28.981 €	28.007 €	24.199 €	16.466 €
PD-Hospital HD	3.078 €	5.408 €	28.405 €	25.504 €	27.519 €	30.839 €	32.965 €	28.598 €	25.345 €	16.920 €
PD-Satellite HD	1.591 €	6.306 €	30.665 €	31.003 €	26.594 €	25.057 €				
Rest	2.762 €	6.230 €	32.450 €	26.913 €	26.784 €	27.922 €	26.879 €	26.130 €	25.014 €	14.561 €
Total	2.850 €	6.112 €	35.754 €	33.702 €	33.734 €	33.326 €	32.348 €	30.099 €	28.051 €	21.018 €

Figure 41: Six-monthly average reimbursements for incident patients in relation to the start of dialysis (in months)



4.7 OVERVIEW AND CONCLUSIONS

For this analysis of the daily practice of chronic dialysis in Belgium over the years 2003 till 2006, we divided ESRD patients on chronic dialysis in eight *'dialysis modality categories'* based on an arbitrary threshold of 80% of the use of specific dialysis modality during the full study period. Therefore, in all the groups, patients sometimes switched from one dialysis mode to another. However, this 80% of a specific modality was seen as a form of 'intention to treat' analysis, because it can be supposed that patients having 80% of their dialysis with a specific modality were indeed intended to use that modality as the main method for chronic dialysis.

We have presented the data in detail for the eight categories but we decided to focus the description and also the discussion on the four largest groups since the other groups were often too small for meaningful interpretation. Those four groups are the hospital HD, satellite HD, the general HD group (mixed hospital and satellite HD but neither of them more than 80% of the total period) and the PD group. As shown in Table 1 the four other groups are relatively small.

4.7.1 Patients

At the start of the year 2003, 4 807 patients were on chronic dialysis treatment. During the four subsequent years another 7 935 patients started chronic dialysis treatment. The proportion of males in those incident cases was higher (around 60%) than in the prevalent cases (53%).

The vast majority of patients were on hospital HD (68%), while 13% were on satellite HD and 9% on PD. An additional 7% were also for more than 80% on HD, but partly in hospital and partly in satellite (the 'HD group').

Patients on chronic dialysis in Belgium are relatively old in comparison with some other countries. Two third of the dialysis population is aged 65 and above, and almost 40% are aged 75 and over. During the four years of study the proportion of patients aged 75 and above increased from 35% to 41%.

The choice of the main dialysis modality appears to be influenced by age and gender, with younger patients relying more on PD and women more on hospital HD.

Each year, approximately 4% of dialysis patients in this study (mainly prevalent patients) received a kidney transplant, while about 20% stopped dialysis for other reasons, mainly death. As explained in 4.3.4 the transplant rate appears to be slightly underestimated in those data.

The transplant and mortality rates are very different across main dialysis modalities with more people on PD receiving a kidney transplant and more people on hospital HD dying. However, this observation cannot be interpreted as causal, but is mainly due to an important confounding by indication: patients start on a specific dialysis modality not only because of choice, but also dependent on their physical condition.

Approximately 60% of patients included in this study survived beyond the end of 2006, but these patients were a mix of prevalent patients at baseline and incident patients that started dialysis at some moment during the four years. The four-year survival in patients that became incident during the study was on average less than 40%. Further survival analyses showed that survival was very much age dependent and to a lesser extent gender dependent, but most importantly depended on main dialysis modality. Patients on hospital HD had a four-year survival of slightly more than 20% while the survival in the PD, the mixed HD and especially in the satellite HD group was markedly better. Again, this should not be seen as a causal relationship, since the available observational data did not allow for an adequate control for confounders. The most plausible explanation is again confounding by indication leading the more elderly and most severe patients to hospital HD.

4.7.2 Expenses for the public payer (NIHDI)

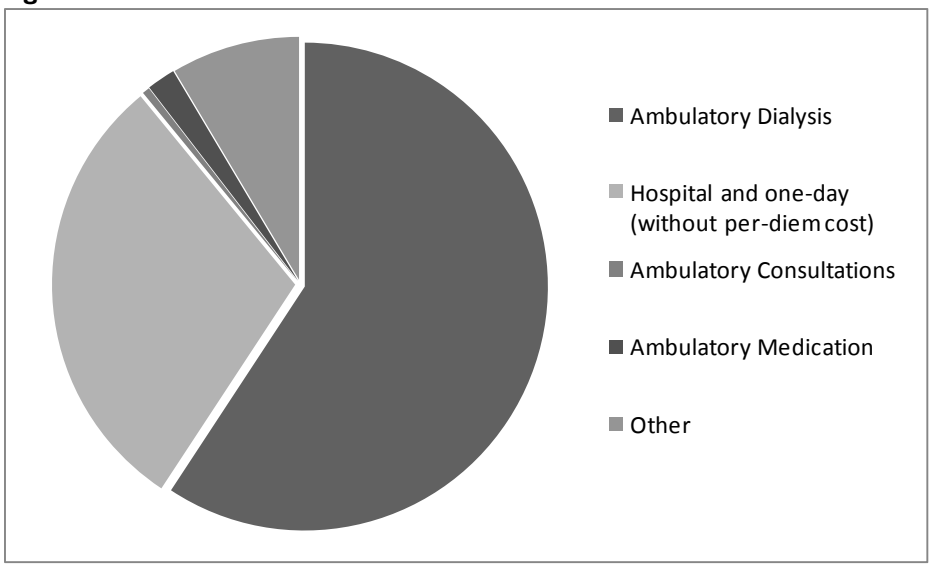
A similar situation of confounding by indication is found in the cost data. We detailed both the overall expenses and the expenses per patient by calendar year. For the expenses per patients we only used those patients who were prevalent during that same calendar year because incident patients actually started therapy, on average, in the middle of the year only, making overall averages meaningless and incomparable.

The total NIHDI reimbursements for patients in this study on chronic dialysis went from €386 million in 2003 to more than €450 million in 2006. Looking at the average reimbursement per patient (an analysis done for prevalent patients only for reasons explained before) it appears that hospital HD is overall the most expensive dialysis modality from the perspective of the NIHDI, while patients on alternative dialysis modalities such as satellite HD or PD but also home HD costs less on total patient reimbursements. Again, interpretation of these data is limited by the observational nature of the registry without much possibility to control for confounders.

We also studied the detailed medical expenses in four mutually exclusive domains: ambulatory dialysis expenses, expenses for hospital care and one-day clinic, ambulatory consultations and ambulatory medication. Obviously, those patients also incur other medical expenses grouped in a rest category. In Figure 42 the distribution of those different expense domains is given. Pure NIHDI reimbursements for the therapy itself, ambulatory dialysis, is the largest part with almost 60% of expenses. However, hospital and one-day clinic expenses come second (30%), but this is without the inclusion of the former per-diem price of hospital stays since those are not paid through NIHDI resources but through the Budget of Financial Means (BFM/BMF) directly from the Federal Public Service (FPS) of Health. Inclusion of those expenses would add an additional 40% to the total cost.

Other expenses, ambulatory consultations and ambulatory medication are rather marginal, and an additional 9% is spent on other health care domains.

Figure 42: Distribution of NIHDI reimbursements



4.7.3 Out-of-pocket expenses for the patient

For the analyses of the global out-of-pocket payments in this section we combined the co-payments (remgeld/ticket modérateur) with the supplements that can be demanded in specific cases. The same cost categories as before were used.

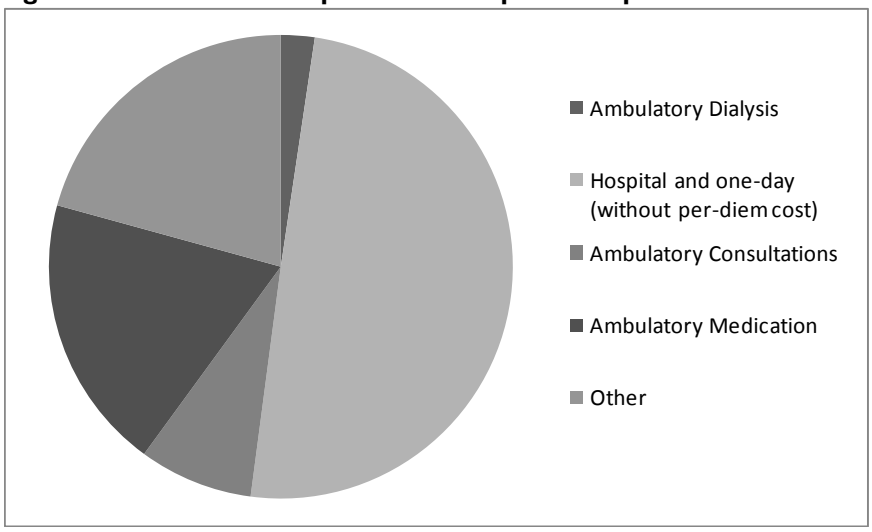
Compared to reimbursements from the public payer, the expenses for the patient appear at first glance to be small. However, we should bear in mind that many of their real expenses are not included, mainly the personal *'hotel'* cost for hospital stays and the over-the-counter (OTC) medication. It should also be remembered that the costs listed in this section only included out-of-pocket costs that are partly reimbursed by NIHDI. Non-reimbursed items such as some supplies, waste disposal etc. are not included in these out-of-pocket costs.

On the other hand, the different statutes for patients such as MAF and OMNIO, which in practice lower the impact of these out-of-pocket payments, and also sickness funds that often offer additional financial benefits for their members could not be taken into account in this analysis.

Given these limitations, the registered out-of-pocket expenses for patients overall rose from €6.1 million in 2003 to €7.6 million in 2006. Considering cost per (prevalent) patient no large and consistent differences were observed between the different dialysis modalities. However, the group of prevalent patients aged 45 to 64, consistently had higher out-of-pocket expenses than the other age groups.

The distribution of these expenses, for the same cost domains as before are given in Figure 43. This distribution is markedly different from the distribution of the reimbursement expenses shown in Figure 42. For the patient, half of the out-of-pocket expenses are for hospital care and one-day clinic care, even disregarding the personal contribution for the per-diem hospital cost. Ambulatory medication (19%) and other medical costs (21%) come next. The ambulatory dialysis itself is almost cost-free for the patient as the main burden is paid for by the public payer.

Figure 43: Distribution of patient out-of-pocket expenses



4.7.4 Expenses before and after starting dialysis

We analysed the reimbursement expenses before and after starting dialysis in all 7 935 incident patients since 2003 and until the end of 2006.

The six-monthly reimbursements show an increase in the six months before starting dialysis, with a high peak during the 6 months following the initiation of dialysis and gradual decline thereafter (see Table 47). There were some marked differences between the average costs for patient in the different dialysis modality groups but, again, proving a causal relation is impossible with the observational registry data.

Key points

- **Survival of chronic dialysis patients is low. In our study, the four-year survival was on average less than 40%. This survival was worse for hospital HD and better for PD and satellite HD. However, this observation is most likely due to inverse causation.**
- **Between 2003 and 2006, total NIHDI reimbursements for all health care for those patients rose from €386 million to more than €450 million (without per-diem hospital costs).**
- **Considering these total NIHDI reimbursements, hospital HD is overall the most expensive dialysis modality. Total reimbursements for patients on peripheral dialysis modalities such as satellite or home HD and PD are markedly lower.**
- **For the pure NIHDI reimbursements, ambulatory dialysis is responsible for 60% of expenses. Hospital and one-day clinics come second with 30%. However, inclusion of the per-diem price would add an additional 40% on the total reimbursement expenses.**
- **Patient out-of-pocket expenses are difficult to estimate with precision since they are influenced by income, statute, and additional financial benefits from sickness funds. Moreover, per-diem hospital prices and some other expenses such as over the counter drugs are not included in the registration. However, the patient's out-of-pocket expenses directly linked to partly reimbursed health care rose from €6.1 million in 2003 to €7.6 million in 2006.**
- **For the patient out-of-pocket expenses no important or consistent differences between dialysis modalities were observed. However, the patients aged 45-64 consistently incurred higher out-of-pocket expenses.**
- **Overall health care reimbursement expenses start to rise in the months preceding the onset of dialysis, reach a peak during the months after dialysis initiation and show a slow decrease afterwards.**

5 THE COSTS AND REVENUES OF DIFFERENT DIALYSIS MODALITIES IN BELGIUM FROM THE HOSPITAL PERSPECTIVE

5.1 INTRODUCTION

To assess the extent to which the revenues generated by different dialysis modalities fit the costs from the perspective of the hospital, the costs of the different dialysis modalities need to be calculated.

This chapter contains two types of analysis:

- an analysis of the costs of hospital haemodialysis (hospital HD), satellite HD and peritoneal dialysis (PD) from the perspective of the hospital;
- a simulation of the costs and revenues for a hospital of an 'average' dialysis programme with 100 patients, as a function of the proportion of use of 'alternative' dialysis modalities (PD and satellite HD).[v]

Both analyses are performed from a purely financial perspective. As each of the other chapters in this report, this chapter contributes only some pieces to the complex dialysis policy puzzle. It should therefore not be read on its own, ignoring the other pieces presented in this report.

5.2 COSTS OF HOSPITAL HD, SATELLITE HD AND PD

5.2.1 Methods

The following cost components were included in the analysis: human resources (medical, paramedical and technical staff), medical equipment, consumables, overhead costs and other costs such as maintenance contracts. Where relevant, a distinction is made between satellite HD, hospital HD and PD.

A traditional costing approach was used, whereby costs that could be directly attributed to dialysis modalities were allocated directly and indirect costs were allocated by means of appropriate cost drivers. An appropriate cost driver for the indirect cost "personnel administration", for instance, is the number of full-time equivalents (FTEs) needed for an activity. The personnel administration cost per FTE (cost per unit) is obtained by dividing the total cost of personnel administration in a hospital by the total number of FTEs in that hospital. To allocate the costs of personnel administration to HD dialysis *sessions* or PD dialysis *weeks*, the number of FTEs needed per HD dialysis session or per PD week is multiplied by the personnel administration cost per FTE.

For each cost component, the volume of resource use and the unit cost of the resource was estimated. Different sources were used: data from a hospital survey performed by KCE for this specific purpose, results from other published surveys such as the ORPADT[w] survey and data from the NIHDI dialysis survey 2004. The NIHDI dialysis survey 2004 contains, in contrast to the later surveys, data on dialysis centres' human resource use. More specifically, this survey collected information on the number of FTEs nephrologists, specialists internal medicine, nurses and technicians.

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[v] The number of patients in the programme was chosen to facilitate the interpretation of the results; i.e. the number of patients on an alternative dialysis modality equals the proportion of patients in the total programme if the total number of patients is 100. Home HD is a very small proportion in the total dialysis population. Because of insufficient data on the costs of home HD (see infra), home HD is ignored in this analysis.

[w] ORPADT is the organisation of paramedical personnel of the dialysis and transplantation centres (*Organisatie van het Paramedisch Personeel der Dialyse- en Transplantatiecentra*).

The total cost per HD session and per PD week was obtained by first calculating the total cost per resource item (volume X unit cost) per session or per week and then adding up all these costs. For PD, the costs of continuous ambulatory peritoneal dialysis (CAPD) and automated peritoneal dialysis (APD) as reported by the dialysis centres in the hospital survey were added and divided by the total number of dialysis weeks to obtain a cost per week of PD. The resource use data were not questioned separately for the two PD types. It was therefore not possible to calculate the difference in costs between CAPD and APD.

Based on the cost per HD session or per PD week, the cost per patient year could be calculated by multiplying the cost per HD session with 156 (52 weeks X 3 sessions per week[x]) and the cost per week of PD by 52.

It is important to note that this traditional costing approach has some important limitations. First, this approach does not correct for potential inefficiencies in resource use. It assumes that the resources are currently used efficiently, i.e. without excess capacity or waste of resources. Validation of this hypothesis was impossible within the time constraints of this study. Second, for the application of this costing approach we had to rely on the responses of hospital accountants to our cost survey, which had to work in collaboration with the nephrologists of their hospital for some parts of the survey. The data provided are, after some checks and clarifications asked, assumed to be reliable and correct. Experts in cost analysis believe, however, that responses to surveys are rarely completely reliable and comparable between respondents because respondents are not always completely sure about which data are asked in particular. Because of the anonymous nature of the survey –on request of the dialysis centres- we could not invite respondents for a common discussion about the data. Third, the dialysis centres responding to the survey were not necessarily representative for all dialysis centres in Belgium, as in more than half of the centres physicians are paid a salary, while in most Belgian dialysis centres physicians are working privately.

Alternative cost calculation methods, such as Activity Based Costing and time driven costing, would give more accurate cost estimates. Each of these systems gives more details on the cost structure and on the actual time and resource use. Their application in health care is difficult –though probably not impossible- for a number of reasons. First, these cost calculation methods require a high level of openness from the hospital management and the providers to share information on prices paid by the hospitals for pharmaceutical products, equipment and devices. This has been proven difficult in the Belgian health care sector. Second, the success of the application of these cost calculation methods depends on the willingness of the hospital management and providers to allow researchers to collect resource use data on the floor during clinical activities.

5.2.1.1 Hospital survey

A cost survey was sent to the medical directors and the head of the nephrology department of all hospitals in Belgium with a dialysis centre. The questionnaires were sent by regular mail and by e-mail on 16/10/2008. The initial deadline for returning the questionnaires was 7/11/2009. On the request of several centres the deadline was extended with two weeks. Centres were informed about the deadline extension on 24/10/2008. The centres were asked to send their responses to a trusted third party, external to the KCE. The trusted third party (TTP) delivered the anonymized individual responses to the KCE. Respondents received a cost compensation of €200 for their participation. The full questionnaire is presented in the appendix to chapter 5.

The main source of information was the hospital accountancy of 2006. Data were obtained for human resources costs, equipment costs, costs of consumables, transportation costs and overhead costs. Where possible, the aggregated results of the survey were cross-checked with other sources, such as the NIHDI dialysis survey and the ORPADT survey.

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[x] HD treatment consists typically of 3 session of approximately 4 hours per week.

If national data, or data based on more observations than obtained from our hospital survey, existed on specific cost items (e.g. on the number of nurse FTEs per patient), these data were used in the cost analysis. All cost components and within these the different resource items and the sources for their unit costs and volumes are presented in a table in the appendix to chapter 5. This table also presents the mean value, standard deviation and, where applicable, the probability distribution of all input variables used in the cost simulations. These input variables are further described in paragraphs 5.2.1.3 to 0.

Eight questionnaires were returned to the trusted third party, containing data from the complete dialysis programmes in 6 hospitals (with data for hospital HD, satellite HD and PD), one satellite HD centre (with data for satellite HD only) and one PD programme. Five of the six hospitals with data on all dialysis types reported to have a remote satellite dialysis unit. Three of them also provide satellite HD in hospital. In 3 of the 8 responding centres doctors work privately, in the 5 remaining centres doctors receive a salary. The costs of home HD are not calculated in this chapter because insufficient data were obtained from the survey on this dialysis modality.

5.2.1.2 Accounting for variability and uncertainty in the cost analysis

Due to the low response rate the results on all variables show relatively large variability. Performing a cost analysis using only the mean observed data would not provide reliable results. To account for uncertainty and variability in unit costs and volumes of resource use between dialysis centres, each variable in the cost analysis for which more than 3 observations (responses) were available was re-defined by a probability distribution. For variables in the cost analysis for which only 2 or 3 observations were available, the average of the reported figures was used because in case of so few observations, any fitted probability distribution becomes unreliable. If only one hospital reported a specific cost item under equipment, consumables or overhead costs, this cost was added to that hospital's "other costs".

A complete overview of the cost items included in the analysis, their mean unit cost and volume, distributions and parameters of the distributions is provided in a table in the appendix to chapter 5.

Using the distributions of each of the variables in the cost analysis, the expected distribution of the total costs per HD session or per PD week could be simulated. For this simulation 5000 Monte Carlo simulations were performed using @Risk software. @Risk is an add-in for Microsoft® Excel used for economic modelling and decision-making under uncertainty.[y] The Monte Carlo simulation procedure implies random draws from each of the distributions included in the analysis and a re-calculation at each draw of the total cost per HD session or per PD week. At the same time, the Monte Carlo simulation can also calculate at each draw the costs of each of the cost components (human resources, equipment, consumables, overhead costs and other costs). The result is 5000 estimates of the total costs and each of the cost components per HD session and per PD week. Based on these estimates the distribution of the total costs estimates, as well as of different cost components can be defined.

5.2.1.3 Human resources

Human resources costs for dialysis include the costs of medical, nursing, technical and administrative staff and dieticians. For the calculation of human resources costs per dialysis session or week, information is needed for each staff category working for the ambulatory dialysis programme on the number of FTEs, the division of time between different dialysis modalities and the cost per FTE. Combined with information on the number of dialysis sessions or weeks provided in the dialysis programme, the staff cost per HD session or PD week can be calculated.

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y http://www.palisade.com/risk/default.asp

Medical staff

Data on the time devoted to each dialysis modality by the medical staff and the cost per FTE was derived from the hospital survey. Respondents were asked to fill out a time sheet for each nephrologist, stating the number of working hours devoted to each of the following activities: the ambulatory dialysis programme, other patient care unrelated to ambulatory dialysis, education, research and management activities. For the ambulatory dialysis programme, it was moreover asked to specify how much of the time was devoted to hospital HD, to satellite HD, to PD and to home HD.

Nephrologists in the responding hospitals devoted on average 59.2% of their working time on the ambulatory dialysis programme. Of this 59.2%, on average 60.4% of their time is allocated to hospital HD, 28.5% to satellite HD, 10.5% to PD and 0.6% to home HD related activities.

Because the cost of nephrologists' time devoted to other activities such as education, research and management, are supposed to benefit the ambulatory dialysis programme as well to some extent, a proportion of this time (and thus cost) is added to the time devoted for ambulatory dialysis programme. This latter proportion is set equal to:

$$T_{education}^{dialysis} = T_{dialysis} \times T_{education}$$

Where $T_{education}^{dialysis}$ represents the proportion of medical staff time devoted to education, research and management attributed to the ambulatory dialysis programme, $T_{dialysis}$ the proportion of medical staff time only devoted to the ambulatory dialysis programme and $T_{education}$ the proportion of medical staff time devoted to education, research and management activities.[z] Thus, the total proportion of medical staff time devoted to the ambulatory dialysis programme is calculated as

$$T_{dialysistotal} = T_{dialysis} x(1 + T_{education}^{dialysis}))$$

To allocate medical staff costs to the different dialysis modalities, the time devoted to each of the dialysis modalities needs to be calculated. This is done by multiplying $T_{dialysis\ modality}$ by $T_{dialysistotal}$, where $T_{dialysis\ modality\ X}$ refers to the proportion of the total time devoted to the dialysis programme spent on modality X. The total time devoted to the dialysis programme is on average 59.2% according to the survey. Also according to the survey, $T_{hospitalHD}$ is 60.4%, $\%T_{PD}$ is 10.5% and $\%T_{satellite\ HD}$ is 28.5%. The remainder of the time spent on the ambulatory dialysis programme is devoted to spent on home HD (0.6%) and is, due to insufficient cost data, disregarded in this study. The medical staff cost for hospital HD is then equal to

$$C_{medicalstaff}^{hospitalHD} = C_{medicalstaff} \times \%T_{hospitalHD}$$

where $C_{medicalstaff}$ equals the average total cost of a full-time nephrologist as derived from the hospital survey.

Combined with data on the number of patients treated with each of the dialysis modalities, the number of PD patients and the number of HD sessions per full-time 'dialysis nephrologist' could be calculated. A full-time 'dialysis nephrologist' is defined as a nephrologist working 100% for the dialysis programme (including some education, research and management). In practice, a nephrologist will almost always spent some of his time on other activities (e.g. patient care unrelated to the dialysis programme). For the calculation of the costs of nephrologists' time for each dialysis modality, account has to be taken of the time actually spent on the dialysis modality, rather than the time working at the hospital. To illustrate the difference between the number of FTE nephrologists working for the dialysis programme (the costs of whom should be attributed to dialysis activities) and the number of FTEs working at the dialysis centre, we can refer to the results of the NIHDI dialysis survey 2004.

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z For example, if a nephrologist spends 51% of his time working for the ambulatory dialysis programme, and 10% of his time on education, research and management, we allocate 0.51*0.1 = 5.1% of this time spent on education, research and management activities to the dialysis programme.

According to the data collected in this survey, a dialysis programme with 100 dialysis patients, with 69.87% patients on hospital HD, 20% on satellite HD, 9.45% on PD and 0.54% on home HD (i.e. the average proportions of patients on different modalities in 2004), employs on average 4.34 FTE nephrologists. These nephrologists devote on average 59.2% of their time to the ambulatory dialysis programme and 6.5% on education, research and management (data from hospital survey). From these data, we can conclude that a cost of 2.74 FTE (4.34*0.592*(1+0.065)) nephrologists should be allocated to this dialysis programme.

The number of PD patients and the number of hospital HD sessions per FTE dialysis nephrologist are presented in Table 48. The figures in this table represent the number of patients one FTE nephrologist can follow-up if he would spend all of his time on only one dialysis modality. For example, one FTE dialysis nephrologist that would only follow-up PD patients and no other patients would be able to follow-up on average 40 PD patients. Similarly, one FTE dialysis nephrologist would be able to supervise on average 8 203 hospital HD sessions per year, corresponding to 52 patients following hospital HD for a full year.

Table 48: Number of hospital HD and satellite HD sessions and number of PD patients per FTE nephrologist as derived from the responses to the hospital survey*

	Mean	s.d.	Median	Min	Max
PD patients per FTE	40	15	49	16	52
Hospital HD sessions per FTE	8.203	2.731	8.369	4.705	11.973
Satellite HD sessions per FTE	9.273	4.233	7.674	4.980	18.218

* number of FTEs corrected for time not devoted to the ambulatory dialysis programme but taking into account a proportion of the activities related to education, research and management.

The means do not show any surprising results: the number of hospital HD sessions per FTE nephrologist is lower than the number of satellite HD sessions. However, the standard deviation is large, due to large differences between centres. The observed distribution is moreover skewed, as shown by the strange result for the medians. The median number of hospital HD sessions managed per FTE nephrologist according to our survey is higher than the median number of satellite HD sessions managed by one FTE nephrologist. This is unexpected, as no permanent presence of a nephrologist is required for satellite HD units and hence one would expect a higher number of satellite HD sessions per FTE nephrologist than hospital HD sessions. In the cost analysis, a gamma distribution was fitted on the variables, setting the mean correctly at the observed mean. As such, the impact of the observed inconsistency might be somewhat reduced.

Taking the total actual number of FTE nephrologists, not corrected for time devoted to dialysis but counting the number of full-time people, results for all centres in a ratio of 1 or 2 nephrologists per 4000 HD sessions. This is consistent with the regulatory requirements.

Obtaining the cost per FTE of medical doctors in Belgium is known to be difficult. In Belgium, physicians are generally paid on a fee-for-service basis, except at some hospitals where physicians receive a salary and sometimes additional bonuses. However, even those salaries are paid by the hospitals out of the fees-for-service they receive from the NIHDI for the activities performed by their physicians. There is only one fee-for-service system: the NIHDI pays the same fee for acts performed by physicians whether or not they receive a salary. To estimate the physician costs, respondents were asked to report data as booked on specific entries in the hospital accounting system. The entries are referred to as "Finhosta entries" because the accounting data of hospitals are put in a database called Finhosta. Finhosta is used for the calculation of the "Budget van Financiële Middelen/Budget des Moyens Financiers" of Belgian hospitals. The Belgian Federal Public Service for Health collects the data on a yearly basis. Data collection and transmission is mandatory for all hospitals. Entries are split according to cost centres. The dialysis unit is one specific cost centre in Finhosta.

Finhosta entries 6200x; 6210x, 6220x, 6230x, 6240x, 62500x, 62510x, 6170x encompass all the costs for the hospital related to the employed medical personnel, including salaries, social security costs, employer contributions and other medical personnel-related costs. Respondents were asked to report the sum of these entries for medical staff receiving a salary. For medical staff not receiving a salary, respondents were asked to report the amount booked under Finhosta entry 6190x.

The cost per FTE is obtained by dividing the total personnel cost of the dialysis unit by the number of FTEs working at the unit. The reported costs per FTE nephrologist showed a large variability across responding centres (Table 50).

Nursing, technical and other staff

It was asked whether nurses were shared between the hospital haemodialysis programme and the satellite dialysis programme in order to be able to allocate nursing costs to the right modality. In three centres, nurses at the satellite unit worked exclusively for the satellite unit and were not involved in dialysis at the hospital. All other hospitals with a satellite unit shared nurses between the hospital unit and the satellite unit. For these, it was important to know how nurses' time is allocated between the different dialysis modalities to calculate the number of FTEs nurses required for each modality. The proportion of total working time devoted to each dialysis modality was therefore asked, both for nurses, dieticians, technical and administrative staff (see questionnaire in the appendix to chapter 5). The cost of nursing support at home provided by home nurses in case of PD is not included in this cost analysis. From a hospital point of view, these are not costs, as the hospital receives a fixed lump sum from the NIHDI for nursing support at home which it has to transfer fully to the home nursing services, independent of whether or not this lump sum covers the total real costs of home nursing services.[aa]

The number of HD sessions or PD patients per FTE nurse, technician, administrative staff or dietician could be calculated similarly to the calculations for the number of hospital and satellite HD sessions and the number of PD patients per FTE nephrologist. The results are presented in Table 49.

Table 49: Number of hospital HD and satellite HD sessions and number of PD patients per FTE nurse, technician, secretary and dietician as derived from the responses to the hospital survey

	Mean	s.d.	Median	Min	Max
Nurses					
PD patients	8	5	6	3	16
Hospital HD sessions	472	93	489	293	569
Satellite HD sessions	876	628	791	300	2.030
Technicians					
PD patients	14		14	14	14
Hospital HD sessions	17.231	10.494	11.150	8.700	29.343
Satellite HD sessions	20.511	12.357	25.060	2.581	29.343
Administrative staff					
PD patients	114		114	114	114
Hospital HD sessions	15.659	11.438	14.816	4.061	28.942
Satellite HD sessions	4.797	3.163	4.797	2.561	7.033
Dieticians					
PD patients	239		239	239	239
Hospital HD sessions	37.421	6.447	33.944	33.460	44.860
Satellite HD sessions	18.436		18.436	18.436	18.436

One respondent failed to provide any data on costs or FTE for nursing or other non-medical staff.

[aa] See chapter 3 for the calculation of the reimbursement per hour of nursing support implied by the lump sum reimbursement.

Costs per FTE nurse, technician, administrative staff and dietician are presented in Table 50. The mean annual wage cost for medical staff and its large variability may be explained by the overrepresentation of hospitals paying their physicians a salary. The actual wage cost of physicians working privately is often unknown and not available as such in the hospital accounting system. The figures presented might hence underestimate the actual wage cost of the medical staff.

Table 50: Costs per FTE per year reported by respondents to the hospital survey for different categories of staff (in €2006)

Cost/FTE	Mean	s.d.	Median	Min.	Max.	n
Medical staff	269.490	129.010	278.010	121.439	479.489	8
Nursing staff	54.313	3.437	54.508	49.863	58.490	6
Technical staff	62.106	4.773	62.943	54.991	66.777	6
Administrative staff	49.603	8.527	47.713	41.451	61.535	4
Dietician	57.098	15.903	57.540	40.979	72.776	3

5.2.1.4 Equipment

Equipment used for HD includes the dialysis machine, the seat, the weighing device, a tensiometer and a water purification machine. For PD a dialysis machine is needed in case of APD, as well as a heating plate, a weighing device, a tensiometer, a table, a serum standard and buckets. This equipment has to be provided by the dialysis centre following-up the PD patient. The cost for equipment per patient per year is obtained by calculating first the equivalent annual cost (EAC) of the machine, and then dividing this EAC by the number of patients that can be treated with the machine per year. This approach assumes that the equipment is financed through loan capital, while in practice it could also be financed through equity capital.

The EAC calculates the cost of equipment per year, taking into account the financial costs of the investment. It equals the amount that needs to be repaid yearly (including capital and interest repayments) when the full investment is borrowed at a rate r% and repaid over a period of t years. The EAC is calculated by dividing the initial investment cost by an annuity factor. The annuity factor depends on the lifetime of the equipment (t) and the interest rate (r) and is calculated as $(1-1/(1+r)^t)/r$.[bb] An annual interest rate used for these calculations depends on the lifetime of the equipment. The lifetime of each type of equipment was derived from the hospital survey.

The interest rate used for the calculation of the EAC equals the average interest rate in 2006 on a long term obligation (Obligation Linéaire - Lineaire Obligatie), increased with 0.15 percent points to account for the bank margin.[cc] The 5, 7 and 10 year average OLO's were in 2006 respectively 3.6%, 3.73% and 3.81%.[dd]. Including the 0.15 percent points bank margin, this leads to the following interest rates used for equipment that is used for respectively 5, 7 and 10 years: 3.75%, 3.88% and 3.95%. These interest rates are assumed to cover the financial costs of investment.

The lifetime of the dialysis and water purification machines, heating plates and buckets is assumed to be 7 years. Seats, weighing devices, serum standards, beds and tables are assumed to have a lifetime of 10 years. Smaller medical equipment such as tensiometers and vascular access monitoring devices are assumed to have a lifetime of 5 years.

The number of HD sessions or PD weeks per unit of equipment per year are presented in Table 51. As shown in the table, only few or none of the respondents reported the use of some types of equipment. The estimated number of HD sessions or PD weeks for these units per year does not allow estimating a reliable distribution (see paragraph 5.2.1.2 for how variables with few observations are dealt with in the cost analysis).

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bb This formula assumes payments are made at the end of the year.

cc The bank margin assumed is consistent with the bank margin assumed in previous KCE reports (see, for example, KCE-report 106). Data on interest margins are available at http://www.nbb.be/

dd http://www.nbb.be/belgostat/PresentationLinker?TableId=420000033&Lang=N

Table 51: Number of HD sessions and number of PD weeks per unit of equipment per year as derived from the responses to the hospital survey

	Mean	s.d.	Median	Min	Max	n
Haemodialysis						
Dialysis machines	373	120	361	249	612	7
Seats	692	342	744	249	1.128	7
Weighing devices	2.067	1.562	1.494	817	4.591	5
Tensiometer	959	152	961	806	1.109	3
Water purification machine	6.771	4.682	5.869	1.494	16.334	7
Vascular access monitoring device	16.334		16.334	16.334	16.334	1
Beds	835		835	835	835	1
Peritoneal dialysis						
Dialysis machine (in case of APD)	39	14,34	42,33	23,35	51,45	3
Heating plate	62	40,70	43	34	109	3
Weighing devices	236	365,61	58	43	784	4
Tensiometer	198	181,86	154	43	398	3
Serum standards	398		398	398	398	1
Buckets	103		103	103	103	1
Tables	398		398	398	398	1
Beds	784		784	784	784	1

The distributions are large for many of the equipment items. The data were taken as reported by the respondents to the survey. The fact that the number of PD weeks per APD dialysis machine is lower than 52 (corresponding to one year) might be explained by the method used for counting the number of APD weeks. When asked how many APD weeks the hospital provided in 2006, the respondents counted the number of lump sums for APD charged to the NIHDI in 2006. However, this number is likely to be smaller than 52 per APD patient, as the lump sum for APD cannot be charged by the hospital if the APD patient is hospitalized or during the training of CAPD patients. During hospitalization APD is financed through honorarium fees and not through the ambulatory lump sum for APD. The number of APD weeks reported by the respondents is therefore smaller than 52 times the number of APD patients and consequently the number of APD weeks per APD machine is smaller than 52.

Respondents were asked to report the catalogue unit price of the equipment including VAT, in order to get a full cost estimate of the different dialysis modalities. However, some hospitals in Belgium receive their (home) HD equipment at a reduced price or lease the equipment from the supplier. According to the experts we consulted, companies compensate price reductions on equipment through the prices for consumables. As consumables like dialyzers produced by one company cannot be used on equipment produced by another company, hospitals' negotiating power decreases once the equipment is installed. According to the experts, therefore, hospitals have to make a trade-off between paying a higher price for the equipment and thus a lower price for the consumables and paying a lower price for the equipment and thus higher prices for the consumables.[ee]

Two in 8 dialysis centres responding to the hospital survey declared not paying or leasing the HD equipment. As we asked to report the catalogue unit price of the equipment, the estimated average cost of equipment might be higher than the cost actually paid.

The unit costs of the different types of equipment, as derived from the hospital survey are presented in Table 52.

[ee] With dialysis fluids for PD being subject to a value added tax (VAT) of 6% and equipment to a VAT of 21%, the option of lower prices for equipment and higher prices for consumables might be more attractive from the hospital's point of view, at least if the same company delivers the equipment for HD and APD and the dialysis fluids for PD.

Table 52: Cost per unit of dialysis equipment as derived from the hospital survey (in €2006)

	Mean	s.d.	Median	Min	Max	n
Haemodialysis						
Dialysis machines	3.931	677	3.747	3.039	4.929	6
Seats	416	101	445	230	511	6
Weighing devices	839	719	644	238	1.635	3
Tensiometer	200	270	200	9	390	2
Water purification machine	32.711	11.744	28.862	19.127	49.761	5
Peritoneal dialysis						
Dialysis machine (in case of AP)	n.a.		n.a.	n.a.	n.a.	0
Heating plate	26,03		26,03	26,03	26,03	1
Weighing devices	23,09	21,53	19,31	3,69	46,26	3
Tensiometer	18,88	5,01	19,85	13,46	23,34	3

n.a.: no data available

The difference in costs between the weighing devices and tensiometers used for PD (at the patients' home) and the ones used at the hospital may be explained by the more intensive use of the hospital weighing devices and tensiometers and the usually more sophisticated nature of professional equipment. Professional equipment is more expensive than equipment for private use by one or a few people.

5.2.1.5 Consumables

Consumables used for HD and PD are presented in Table 53. Respondents were asked to give the total cost of consumables booked on cost places 560 to 569 in the Finhosta accounting system.

Table 53: Consumables used for HD and PD

Haemodialysis	Peritoneal dialysis
Medication	Dialysate
Artificial kidney	Desinfectant fluids
Blood lines	Clips
Bicarbonate	Connector/deconnector
Acid concentrate	Nursing kits
Heparine	Tape
Saline solution	Belts
Needles	Needles
Connector/deconnector	Micropore
Desinfectant	Waste basket
Dustbin	Other: ….
Syringes	
Perfusion sets	
Other: ….	

The cost of consumables varied largely between the responding hospitals for PD. The mean and median total costs of consumables per dialysis modality are presented in Table 54.

Table 54: Total costs of consumables per satellite and hospital HD session and per week of PD (in €2006)

	Mean	s.d.	Median	Min	Max	n
Hospital HD, per session	63,66	11,21	59,67	54,15	83,97	6
Satellite HD, per session	57,27	11,63	58,56	41,14	69,31	7
PD, per week	547,04	131,72	573,09	312,69	664,77	6

5.2.1.6 Overhead costs

Overhead costs include costs of buildings, laundry, meals, administration, accommodation etc. that cannot be allocated directly to the dialysis programme. The problem with allocating overhead costs to dialysis based on hospital accounting data is that the accounting practices for this type of costs varies between hospitals. As such, one and the same cost item can be booked as a direct cost in one hospital, while it is included in the overhead costs in other hospitals. Nevertheless, the definition of what is included in the cost per m², per FTE or per FTE nurses seems to be highly comparable between the respondents. Depreciation, general costs, maintenance and heating costs are allocated by m²; administration and accommodation costs are allocated by FTE and nursing management and hospital hygiene costs by FTE nurses. KCE is not in a position though to examine whether the costs booked under each of these heading actually belong there. Therefore, it is assumed all overhead costs reported are correctly reported.

The allocation mechanism for overhead costs works as follows: overhead costs that are strongly correlated with the number of m² (e.g. cleaning) are allocated by means of the number of m² used by a service or product (in this case the product is a dialysis session). The total costs of all overhead cost items included in this category are divided by the total number of m² of the hospital to obtain a cost per unit of the allocation basis (cost per m²). This unit cost is then multiplied by the total number of m² needed for a dialysis session to obtain the cost of heating and cleaning (and all other costs allocated per m²) per dialysis session. Similarly, general administrative costs are allocated based on the number of FTE, because there is a strong positive relationship between general administration costs and the number of FTEs needed to produce a service or product. Overhead costs per unit of FTE, and cost per dialysis session are obtained in the same way as for the overhead costs per m². The unit costs per FTE hence do not relate to the wage costs of personnel but are solely used to allocate general (overhead) costs of the hospital to the different activities of the hospital.

The allocation of the overhead costs to different dialysis modalities is based on the cost per unit of each allocation basis (m², FTE, FTE nursing, meal) and the number of units of each allocation basis needed for hospital HD, satellite HD or PD. The unit cost per unit of the allocation basis as well as the number of m², FTE (including FTEs of all medical, paramedical and other personnel) and FTE nursing of the dialysis unit(s) was reported by 5 respondents (of the 6 that stated that they used fixed allocation bases). The cost per unit of the allocation basis is fixed at the mean of the unit costs reported by these 5 centres to flatten out the effect of accounting differences between centres. It was moreover assumed that the number of m² required for a satellite HD session does not differ from the number of m² required for a hospital HD session. Both hospital HD and satellite HD patients are assumed to receive a meal. This is current practice in most hospitals in Belgium.

The total overhead cost per HD session and per PD week is calculated as follows:

Overhead cost per HD session = HD m² per session * cost per m² + HD FTE per session * Cost per FTE + HD FTE nursing per session * Cost per FTE nurse + Cost per meal

Overhead cost per PD week = PD FTEs per week * Cost per FTE + PD FTE nursing per week * Cost per FTE nurse

No data have been collected in the survey on the number of m² in case of PD, although hospital premises are also used for PD, e.g. for keeping a stock of PD dialysis fluids, surveillance of PD patients and consultations. The underestimation of the real overhead costs of PD caused by this lack of data is likely to be relatively small, as the overhead costs per m² are small in general and the volume of m² used per year per PD patient is also likely to be small.

The calculations of the overhead costs per hospital HD session and per satellite HD session are similar, only the number of medical and other FTEs will differ between the modalities. Therefore, the actual overhead cost figures will differ between the two modalities.

Table 55 presents the *volume* of overhead cost drivers used by each dialysis modality as derived from the responses to the hospital survey. The number of m² used for one HD session, for instance, is obtained by dividing the total number of m² of the hospital and satellite dialysis units by the total number of HD sessions performed at these units. The figure thus obtained reflects how much of the overhead cost per m² should be allocated to one HD session. The overhead costs allocated on the basis of the number of FTEs refer to the number of FTEs of all personnel categories *except* medical personnel. It includes nursing, dieticians, administrative staff and technical staff.

Table 55: Volume of the overhead cost drivers by type of dialysis as reported in the hospital survey

	Mean	s.d.	Median	Min	Max	n
m² per HD session*	0,10480	0,03	0,11	0,06	0,14	5
Number of FTEs**						
- hospital HD, per session	0,00251	0,0006	0,0024	0,0019	0,0036	6
- satellite HD, per session	0,00198	0,0010	0,0019	0,0006	0,0035	6
- PD, per week	0,00344	0,0016	0,0031	0,0021	0,0065	6
Number of FTE nurses						
- hospital HD, per session	0,00222	0,0006	0,0020	0,0018	0,0034	6
- satellite HD, per session	0,00169	0,0011	0,0013	0,0005	0,0033	6
- PD, per week	0,00311	0,0019	0,0032	0,0012	0,0061	5
Meals per HD session	1					

* calculated as the total number of m² of the dialysis unit divided by the total number of HD sessions.
** includes the number of FTEs of all personnel categories except for the medical personnel.

The costs per unit of the allocation basis as reported by the five respondents are presented in Table 56. The standard deviation, median, minimum and maximum figures are only for illustrative purposes, as the cost analysis will use a fixed cost per m², FTE (including all personnel categories except medical personnel), FTE nurse and meal equal to the mean of the reported unit costs. These unit costs need to be multiplied by the volume of overhead resource use per year for each of the dialysis modalities. This volume per year is obtained by multiplying the volumes per HD session by 156 (3 sessions a week for 52 weeks per year), and the volumes per PD week by 52.

Table 56: Unit costs per year of the overhead allocation bases as derived from the responses to the hospital survey (in €2006)

	Mean	s.d.	Median	Min	Max	n
Overhead cost per m²	167,47	64,62	169,05	69,46	228,06	5
Overhead cost per FTE	10.766	3.760	11.852	6.550	14.569	5
Overhead cost per FTE nurse	1.404	309	1.252	1.120	1.796	5
Cost per meal	19,20	4,16	19,20	16,26	22,14	2

5.2.1.7 Other direct costs

Respondents to the survey also reported other direct costs related to dialysis, for instance maintenance contracts for dialysis machines, transport for technicians, study costs, 'administration' costs (including subscriptions to scientific journals, conferences etc.), safety control, etc. Items mentioned by only one dialysis centre under the heading of equipment or overhead costs were also included under the heading of other costs for this centre. Examples of such cost items are the vascular access monitoring device, special beds, serum standards and special weighing devices. Respondents were asked to specify the items they included under the heading "other costs" and give a cost per item. This allowed moving the costs of elements to for instance equipment or consumables if this increased the consistency of the categorisation between respondents. For the remaining items, a total cost was calculated for each centre and divided by the total number of HD sessions or PD weeks to obtain an "other direct costs" estimate for each dialysis modality (Table 57).

Table 57: Other direct costs per hospital or satellite HD session or per week of PD as derived from the hospital survey (in €2006)

	Mean	s.d.	Median	Min	Max	n
Hospital HD	4,85	1,98	3,95	3,49	7,13	3
Satellite HD	2,72	0,62	2,72	2,29	3,16	2
Peritoneal dialysis	17,00	21,01	9,81	0,52	40,66	3

5.2.2 Results

First, the estimated costs of each of the cost components are presented with their distributional parameters (5.2.2.1 to 5.2.2.5). Second, the total costs for each of the dialysis modalities are presented, per HD session or PD week as well as per patient year (5.2.2.6).

5.2.2.1 Human resources

The results of the simulated costs of human resources per HD session or PD week and per patient year, with their distributional parameters, are presented in Table 58.

Table 58: Simulated human resources costs per HD session, per PD week and per patient year for all dialysis modalities

	Mean	s.d.	Median	Q1	Q3
Hospital HD, per session	157,13	13,36	155,51	138,25	181,51
Satellite HD, per session	105,02	11,85	103,62	88,20	126,61
PD, per week	245,75	90,27	228,86	131,61	417,40
Hospital HD, per patient year	24.512	2.085	24.259	21.567	28.315
Satellite HD, per patient year	16.384	1.848	16.165	13.759	19.751
PD, per patient year	12.779	4.694	11.900	6.844	21.705

Hospital HD is the most expensive dialysis modality in terms of human resources costs for the hospital, followed by satellite HD and by PD. The human resources costs of hospital HD per patient year are about twice the human resources cost of PD (excluding nursing support at home in case of PD).

The relative contribution of each of the personnel categories in the total human resources costs (per session or per week for HD and PD respectively) is presented in Table 59.

Table 59: Relative contribution of each category of personnel in total costs of the dialysis modalities: mean cost in €2006 (% in total mean human resources cost of the modality)

	Medical personnel	Nursing	Other
Hospital HD, per session	36.44 (23,19%)	108.63 (69,13%)	12.06 (7,68%)
Satellite HD, per session	33.22 (31,63%)	59.74 (56,89%)	12.06 (11,49%-
PD, per week	157.74 (64,19%)	81.47 (33,15%)	6.55 (2,66%)

5.2.2.2 Equipment

The results of the simulated costs of equipment per HD session or PD week and per patient year, with their distributional parameters, are presented in Table 60.

Table 60: Simulated equipment costs per HD session, per PD week and per patient year for all dialysis modalities

	Mean	s.d.	Median	Q1	Q3
Hospital HD, per session	20,61	8,45	18,72	10,59	36,89
Satellite HD, per session	20,61	8,45	18,72	10,59	36,89
PD, per week	1,08	n/a	1,08	1,08	1,08
Hospital HD, per patient year	3.215	1.318	2.920	1.652	5.754
Satellite HD, per patient year	3.215	1.318	2.920	1.652	5.754
PD, per patient year	56	n/a	56	56	56

The equipment needed for hospital HD and satellite HD is assumed to be equal, therefore the costs are equal. Dialysis machines account for more than 55% of the total equipment costs of hospital and satellite HD. PD requires only limited equipment, explaining the low cost for PD on this cost component. Costs of equipment for APD could not be estimated due to the absence of data on this cost item. None of the respondents to the hospital survey provided a cost estimate for the APD equipment. A possible explanation might be that the equipment is provided without charge by the company that provides the dialysis fluids and that the company is compensated through the price paid for the dialysis fluids. This hypothesis, expressed by the external experts working at dialysis centres, could not be verified with the limited data available to us.

5.2.2.3 Consumables

The results of the simulated costs of consumables per HD session or PD week and per patient year, with their distributional parameters, are presented in Table 61.

Table 61: Simulated consumables costs per HD session, per PD week and per patient year for all dialysis modalities

	Mean	s.d.	Median	Q1	Q3
Hospital HD, per session	63,66	11,22	63,00	46,40	83,15
Satellite HD, per session	57,27	11,63	56,49	39,56	77,64
PD, per week	547,04	131,74	536,44	349,67	779,86
Hospital HD, per patient year	9.931	1.751	9.828	7.239	12.972
Satellite HD, per patient year	8.935	1.814	8.812	6.172	12.111
PD, per patient year	28.446	6.850	27.895	18.183	40.553

PD induces the highest consumables costs of the three modalities, followed by hospital HD and satellite HD. Ninety percent of the consumables costs of PD are related to the dialysis fluids. These are delivered directly at the patients' home.

5.2.2.4 Overhead costs

The results of the simulated overhead costs per HD session or PD week and per patient year are presented in Table 62. As noted before, the overhead costs of PD will be slightly underestimated as costs per m² were not included.

Table 62: Simulated overhead costs per HD session, per PD week and per patient year for all dialysis modalities

	Mean	s.d.	Median	Q1	Q3
Hospital HD, per session	66,53	8,36	66,10	53,58	81,11
Satellite HD, per session	59,62	12,34	58,00	42,66	82,64
PD, per week	39,15	17,60	36,41	15,66	71,98
Hospital HD, per patient year	10.379	1.303	10.311	8.358	12.654
Satellite HD, per patient year	9.300	1.924	9.049	6.654	12.892
PD, per patient year	2.036	915	1.893	814	3.743

5.2.2.5 Other direct costs

The results of the simulated other direct costs per HD session or PD week and per patient year are presented in Table 63. All input data for the other direct costs were based on 2 or 3 observations only. As a consequence the mean observed value was used as input value for the cost analysis and there is no variability in the results of the simulations on this variable.

Table 63: Simulated other direct costs per HD session, per PD week and per patient year for all dialysis modalities

	Mean
Hospital HD, per session	5,01
Satellite HD, per session	2,96
PD, per week	17,02
Hospital HD, per patient year	782
Satellite HD, per patient year	462
PD, per patient year	885

PD has the largest average "other" cost of the three modalities. The other costs of PD include serum standards, tables, furniture etc provided by the hospital to the patient. It concerns items of other cost components (e.g. equipment) reported by only one or two hospitals that were transferred to the "other costs" category.

5.2.2.6 Total costs

Table 64 summarizes the total costs per patient year of the different dialysis modalities. Concerning the different HD modalities our results show that hospital HD is more costly for the hospital than satellite HD. PD is found to be more costly than satellite HD, but less costly than hospital HD. This finding contrasts with most studies in literature, where PD is usually found to be the least costly dialysis modality.

Table 64: Simulated total costs per patient year for hospital HD, satellite HD and PD

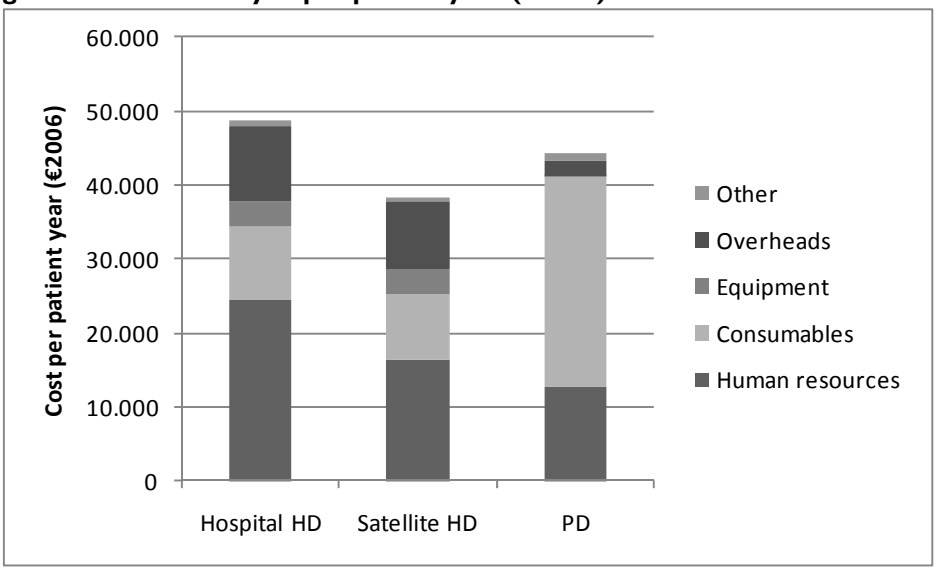
	Mean	s.d.	Median	Q1	Q3
Hospital HD, per patient year	48.819	3.266	48.688	43.769	54.340
Satellite HD, per patient year	38.296	3.520	38.099	32.911	44.256
PD, per patient year	44.202	8.330	43.670	31.652	59.012

Figure 44 shows the relative importance of each of the cost components in the total costs of the different dialysis modalities. Clearly, human resources is the most important cost component for hospital and satellite HD. The costs of consumables for PD are high compared to the other cost components of PD and compared to any of the cost components of the other dialysis modalities. The importance of the consumables costs makes PD a relatively more expensive dialysis modality than satellite HD from the hospitals' point of view. As mentioned before, the largest share of the total consumables costs for PD is taken by the cost of the dialysis fluid (about 90%). A possible explanation of the high consumables costs for PD might be that they reflect partly the compensation for providing equipment at a reduced price or free of charge through the prices of the consumables for PD. The proportion of APD in total PD was almost 50% in 2006 (NIHDI dialysis survey 2007).

Only one dialysis centre provided a cost estimate for the lending of APD equipment in our survey, although five out of eight centres did report APD activities. This may indicate that compensation through the prices of consumables is common.

The cost of equipment for hospital HD is relatively small compared to the other cost components. An explanation for this might be the different value added tax (VAT) applicable to equipment (21%) and dialyzers and blood lines (both 6%). It is not uncommon for companies to give a discount on the price of equipment. This implies, however, that the hospital has to buy the dialyzers and blood lines at the same company, as the dialyzers most often only fit the dialysis machine of the same company. For the hospital this is nevertheless an interesting deal because it has to pay less VAT on the consumables than on the equipment.

Figure 44: Cost of dialysis per patient year (€2006)



Key points

- **The yearly total cost for a hospital of hospital HD is estimated at €48 800 per patient. Satellite HD costs about €38 300 per year per patient and PD without nursing support about €44 200 per patient per year. These figures correspond to €313 per hospital HD session, €245 per satellite HD session and €850 per week PD without nursing support. These estimates encompass costs of medical and paramedical personnel, equipment, consumables, overheads and other hospital costs. Costs of nursing home care or patient transportation are not included, as they represent no direct cost to the hospital.**
- **Human resources are the most important cost component for hospital HD and satellite HD.**
- **The higher cost of PD compared to satellite HD is explained mainly by the relatively high cost of consumables for PD, the largest part of which are the dialysis fluids. PD dialysis fluids cost more per patient per year than personnel in case of hospital HD.**

5.3 COSTS AND REVENUES OF A DIALYSIS PROGRAMME FROM A HOSPITAL'S PERSPECTIVE

Based on the cost estimates presented above and the current financing mechanisms for the different dialysis modalities, a simulation was made of the total costs and revenues for a hypothetical dialysis programme with 100 patients from the perspective of the hospital. Because of the trapped financing system for hospital HD (an incremental lump sum is granted depending on the proportion of patients following alternative dialysis treatments), there is no single fixed reimbursement fee for hospital HD which can be compared to the costs of hospital HD. The proportion of patients on alternative dialysis treatments (PD or satellite HD) will determine the balance between costs and revenues of a dialysis programme for the hospital. Therefore, the costs and revenues of a dialysis programme are simulated in function of the proportion of patients on alternative dialysis modalities. Costs and revenues were calculated from the perspective of the hospital. Costs include all elements described in paragraph 5.2, revenues include lump sums and fees for service (honoraria) for hospital HD and lump sums for satellite HD and PD.

In the short term some costs are fixed or semi-fixed. In the long term all costs are in principle variable. Assuming that all costs are variable is highly theoretical, because even in the (very) long run a hospital dialysis unit will always be confronted with semi-fixed costs of staffing and equipment. The number of transplantations, for instance, is highly unpredictable. If a patient is transplanted, inefficiencies may arise in the resource use of a dialysis unit if the free space for a dialysis patient is not filled in immediately. One dialysis machine has the capacity to treat 4 to 5 patients if used from Monday until Saturday and at night. "Losing" a patient induces inefficiencies in the use of equipment (and personnel). It is often not possible for a hospital to adapt resources (staff, equipment) to the level required for treating the number of patients at a specific moment in time. We present a scenario that is situated between the short run and the long run scenario, i.e. we assume that the equipment and personnel can be adapted to a certain extent to the number of patients, though not infinitesimal. For example, the number of dialysis machines increases per 4 additional patients treated with HD and the number of nephrologists increases per 25 hospital HD patients treated.

5.3.1 Methods

For the simulation of the costs and revenues of a hypothetical dialysis programme with 100 patients, a number of assumptions had to be made.

5.3.1.1 Revenues

The total revenues of a dialysis programme with 100 patients are estimated starting from the financing mechanisms described in chapter 3. In order to simulate the revenues for an 'average' Belgian dialysis centre, national averages were used where possible. This is the case for the per diem price, the proportion of satellite HD in total alternative dialysis modalities and the proportion of APD in total PD. The average per diem price of the dialysis centres in 2006 was €269.44 (median €250.95; st.dev. €61.88, Q1 €230, Q2 €280.25, as derived from the NIHDI dialysis survey 2006). This implies a lump sum per hospital HD session for the 'average dialysis centre' of €40.11+0.2*€269.44=€94 (i.e. the baseline lump sum of €40.11 plus 20% of the per diem price. This amount equals a centre's lump sum per hospital HD session, see chapter 3). The incremental lump sums according to the percentage of alternative dialysis treatments are as in Table 65. They reflect the reimbursement tariffs between January 1st, 2006 and March 30th, 2006. As from April 1st, 2003 reimbursement tariffs were reduced. This was not taken into account in the calculations. On January 1st 2007, the tariffs were again at the same level as during the first three months of 2006 due to indexation.

Table 65: Input data for the simulation of the revenues of a hypothetical dialysis programme as a function of the proportion of patients treated with alternative dialysis modalities

% alternative dialysis	Incremental lump sum for hospital HD
5-10%	29,95
10-25%	73,33
25-35%	95,69
>35%	100,95
Input variables	
Per diem price (national average in 2006)	269,44
Baseline lump sum hospital HD	94
Minimum lump sum hospital HD	113,64
Maximum lump sum hospital HD	263,06
Fee for service Hospital HD	188,6
Lump sum PD without nursing support	699,51
Lump sum APD	778,54
Lump sum for Satellite HD	250,98
Reimbursement to patients from PD lump sum, per week	3.45
% PD in all alternative dialysis treatments	32.08%
% satellite HD in all alternative dialysis treatments	67.92%
% APD in total PD	49.88%

The calculation of the revenues for CAPD was based on the lump sum for PD without nursing support to remain consistent with the cost estimates for PD. For the calculation of the costs of CAPD, payments made to the home nursing services were not included as real costs, as they actually are (or should be[ff]) a zero-operation for the hospital. The hospital acts as the intermediary between the NIHDI and the home nursing services. These payments are neither a cost nor a revenue for the hospital.

In the calculations of the revenues, only the relative use of two broad categories of dialysis are varied: hospital HD and alternative dialysis. This is done to make the simulations manageable. Moreover, this simplification allows presentation of the results on a two dimensional graph. It implies, however, that the composition of "alternative dialysis" needs to be specified in the model. We used the national averages on the relative use of satellite HD, APD and CAPD to define this composition. In 2006 about 67.92% of all the alternative dialysis treatments were satellite HD treatments, 16% was APD (i.e. 49.88% of 32.08%) and 16.08% was CAPD (source: NIHDI Dialysis survey 2006[gg]). This is accounted for in the calculations, by assuming at each level of alternative dialysis treatments, a lump sum for satellite HD is received for 67.92% of the patients on alternative dialysis therapy, a lump sum for APD for 16% of the patients and a lump sum for CAPD (without nursing support) for 16.08% of the patients.

ff As described in chapter 3, there appears to be some variability between the payments received by the home nursing services from different dialysis centres.

gg The proportion alternative dialysis use in Belgian centres derived from the NIHDI Dialysis survey is based on the concept of patient years, obtained by dividing the number of dialysis sessions or weeks by 156 or 52 respectively. The proportion differs from the figures presented in the NBVN-GNFB Common report 2007 (and in Chapter 3) because the latter are based on actual patients rather than on the theoretical number of patient years. The figures derived from the NIHDI Dialysis survey are presented here as they are more consistent with the concept of a patient in the costs-revenues model.

5.3.1.2 Costs

For the calculation of the short term costs for the hospital, a distinction is made between fixed, semi-fixed and variable costs. Fixed costs do not change with the number of patients treated, semi-fixed costs increase stepwise and variable costs increase directly with the number of patients treated. Table 66 gives an overview of the fixed, semi-fixed and variable cost categories for each type of dialysis.

Table 66: Fixed, semi-fixed and variable cost categories for each dialysis modality

	Hospital HD	Satellite HD	PD
Fixed cost	1 nephrologist for the entire dialysis programme		
Fixed cost	Equipment Building space Cleaning Energy	Equipment Building space Cleaning Energy	
Semi-fixed costs	Nephrologists Nurses Technicians	Nephrologists Nurses Technicians	Nephrologists Nurses
Variable costs	Consumables Meals	Consumables Meals	Consumables Patients' expenses

For the simulation of short term costs, the legal requirements for medical personnel were imputed, the national average number of patients per FTE nurse as obtained from ORPADT was used, and results from the hospital survey were used for input data for which no national averages were available.

The law requires that for a dialysis programme of 40 patients, at least one full-time nephrologist should be available, defined as a nephrologist working at least 8/10 of normal professional activities at the hospital. Additional staff requirements are stipulated in the law for hospital HD. For the first 4000 and each additional 4000 hospital HD sessions an additional specialist must be present. It is not specified how much of his time this additional nephrologist should work for the dialysis programme. According to the results of the hospital survey, this additional nephrologist would spent about 63% of his time on these 4000 hospital HD dialysis sessions.[hh] Four thousand HD sessions corresponds to 25.6 patients. It is therefore assumed that, besides the one FTE nephrologist required for the supervision of the entire dialysis programme, an additional 0.63 FTE nephrologist is needed per 25 hospital HD patients.

For the costs-revenues model, this implies that if less than 25 of the 100 patients are treated with hospital HD and hence more than 75 patients with alternative dialysis treatments, 1.63 FTE nephrologist would be needed for the follow-up of the patients. Table 67 shows the number of FTE nephrologists modelled at different levels of hospital HD and alternative dialysis use in our hypothetical dialysis programme with 100 patients. The distribution of patients between alternative dialysis modalities is fixed at 16% on APD, 16.08% on CAPD and 67.92% on satellite HD. The cost of this number of FTE nephrologists is assigned to the simulated dialysis programme. The cost of one FTE is allocated as a general cost for the entire programme, also being to the benefit of the PD and satellite HD patients, while the remainder is attributed exclusively for the hospital HD activities. Note that this may slightly overestimate the costs of hospital HD, as in practice these other physician FTEs will also be used for the follow-up of PD and satellite HD patients.

[hh] This 63% includes a provision for time devoted to education, management and research.

Table 67: Number of nephrologists in function of the number of hospital HD patients included in the costs-revenues model

Number of hospital HD patients	Number of nephrologists
0-25	1.63
26-50	2.25
51-75	2.88
76-100	3.50

To verify the validity of our assumptions with respect to the number of FTEs at any specific level of alternative dialysis use, we cross-checked our assumptions with the data from the NIHDI dialysis questionnaire 2004. These data reflect the actual number of FTEs nephrologists and specialists internal medicine in Belgian dialysis centres at that time. According to these observations, a dialysis centre with 100 patients, of which 70 are on hospital HD, 20 on satellite HD, 10 on PD (i.e. the national average proportions on each of the modalities in 2004), employs 2.74 FTE. In our model, a dialysis programme with this distribution of patients between the different modalities employs 2.88 FTE.

As for the nurses, the law imposes one FTE nurse per 3.2 hospital HD patients per year. For satellite HD, no legal requirements are imposed on the number of nurses. We assume 5.5 satellite HD patients per FTE nurse per year, corresponding to the results for Flanders from the ORPADT survey in 2006.[ii] We further assume, based on the results of the hospital survey, that one FTE technician, one FTE secretary and 0.5 FTE dietician would be needed for the entire dialysis programme.

The total costs for alternative dialysis treatments are assumed to be composed in the same way as the revenues; i.e. 67.92% of the alternative dialysis treatments are satellite HD, 32.08% PD.

5.3.2 Results

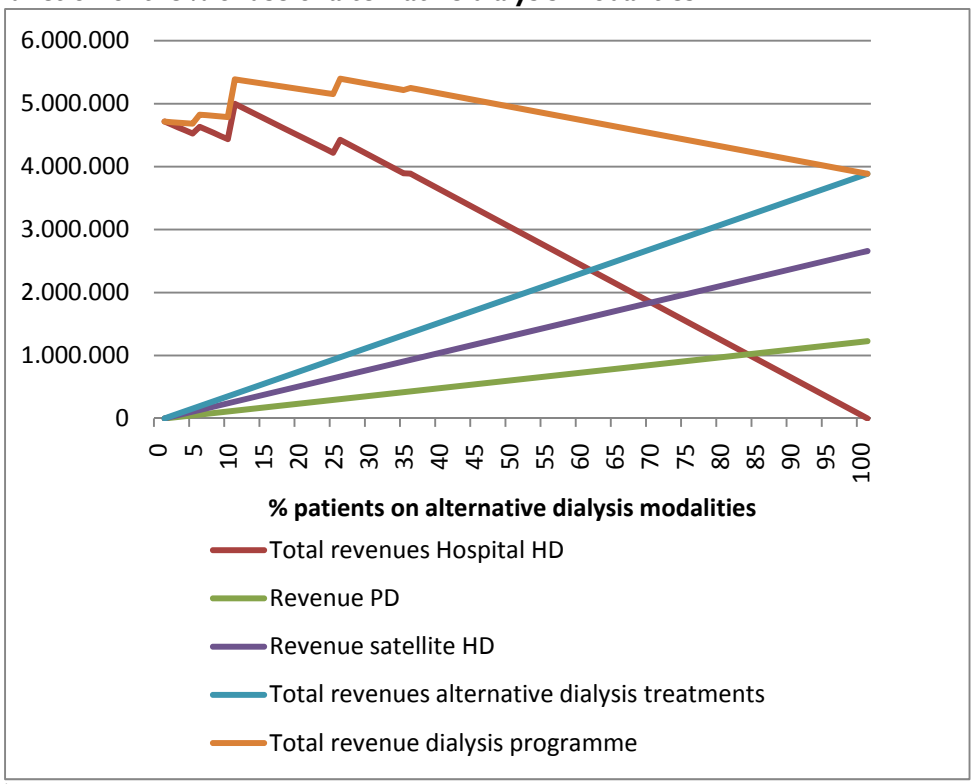
5.3.2.1 Revenues

Total revenues for each of the dialysis modalities, in function of the proportion of patients on alternative dialysis modalities (X-axis), are presented in Figure 45. Regardless of the number of patients on alternative dialysis modalities, it is assumed that always 16% of these patients follow CAPD treatment, 16.08% APD treatment and 67.92% satellite HD treatment, as found in the Belgian data of 2006 (cfr. 5.3.1). Revenues per patient on each of the modalities are presented in Figure 46.

The revenues for PD and for satellite HD increase linearly with the number of patients following these treatments. This is due to the lump sum reimbursement per PD week or per satellite HD session. The existence of 'bonuses' for the lump sums of hospital HD related to the proportion of patients treated with alternative dialysis modalities, introduces a non-linear relationship between the revenues for hospital HD and the number of patients on alternative dialysis modalities. Due to this stepwise increase in lump sums for hospital HD with the increase in the proportion of patients treated with alternative dialysis types, the *total* revenues of the dialysis programme initially increase stepwise but then decrease again. From the point where total revenues start a linear decline (i.e. at 35% of the patients treated with alternative dialysis modalities) the hospital earns less with each additional patient on an alternative dialysis treatment (essentially this is because from that point onwards the reimbursement per patient remains constant, as shown in Figure 46). With current reimbursement rules and values, total revenues are maximized at the point where 25% of the patients are treated with an alternative dialysis modality (assuming that the proportion of patients being treated with satellite HD versus PD equals the national average: 67.92% for satellite HD, 16% for CAPD and 16.08% for APD).

[ii] http://www.orpadt.be/documenten/EPDResultsFlandersWallonia2007.pdf

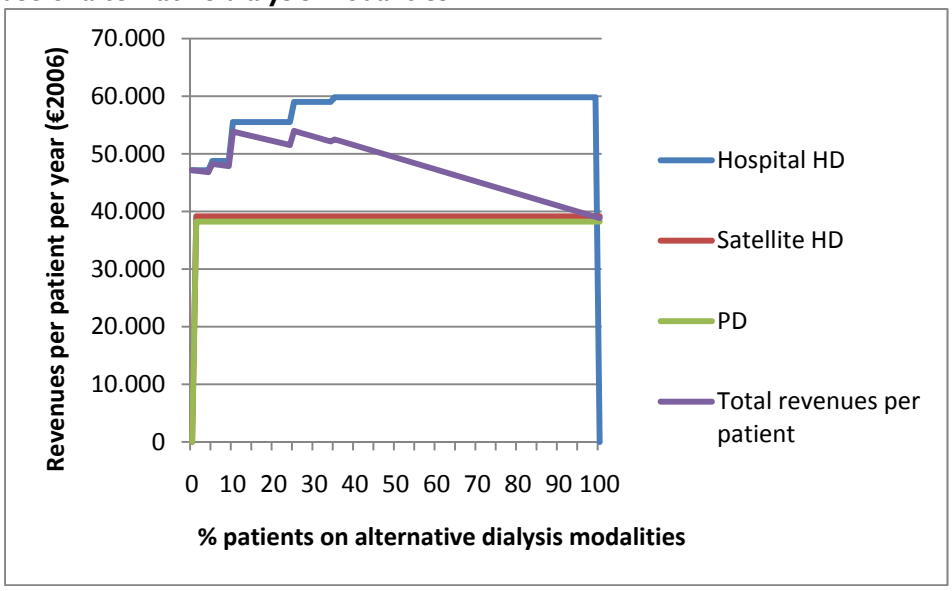
Figure 45: Total revenues for a dialysis programme of 100 patients in function of the % of use of alternative dialysis modalities*



* alternative dialysis modalities are composed of 67.92% satellite HD, 16.08% APD and 16.00% CAPD at each value on the X-axis.

Figure 46 shows the revenues per patient per dialysis modality and total revenues per dialysis patient in this programme. Given the fixed financing system for PD and satellite HD, revenues per patient for these modalities remain fixed at all levels of alternative dialysis treatment use. Revenues per hospital HD patient increase up to the point where 35% of the patients are treated with alternative dialysis modalities and remain constant thereafter. Obviously, the linearly declining revenue per dialysis patient after the point where 35% of the patients is on an alternative dialysis modality is due to the fixed reimbursement for all modalities from that point onwards and the reimbursement of alternative dialysis modalities being lower than the reimbursement for hospital HD.

Figure 46: Revenues per patient per dialysis modality in function of the % of use of alternative dialysis modalities

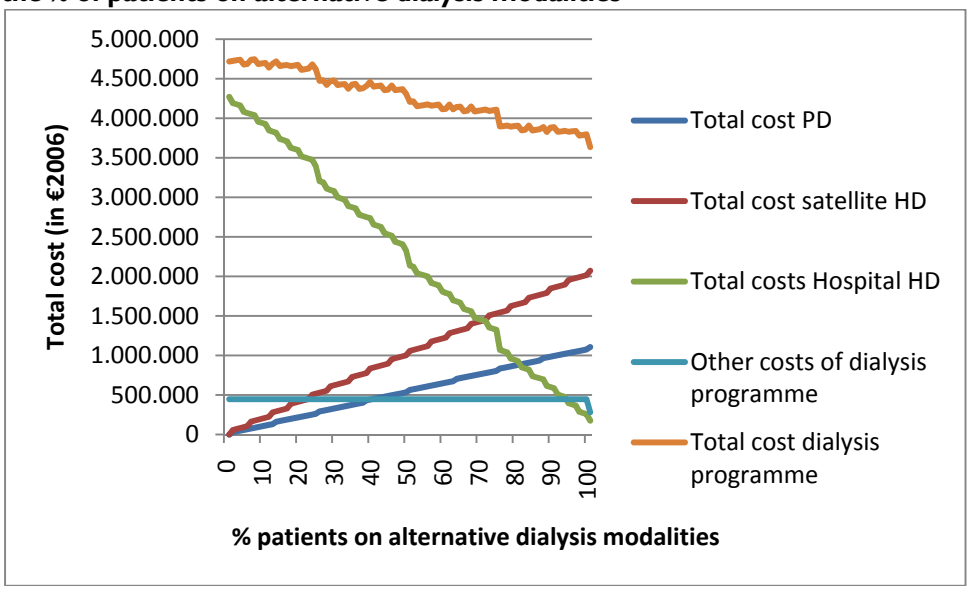


The figures relating to the revenues for PD per patient are lower in this simulation than the corresponding NIHDI expenditures presented in chapter 4. The reason for this apparent discrepancy is that this simulation assumes that all patients are on PD *without nursing support*, in order to allow meaningful comparisons with the estimated costs of PD. The costs estimated in paragraph 5.2 also excluded the costs of nursing support. The estimates in chapter 4 include the NIHDI costs of PD with as well as without nursing support.

5.3.2.2 *Costs*

The average total costs for a dialysis programme of 100 patients are presented in Figure 47.

Figure 47: Average costs of a dialysis programme of 100 patients, related to the % of patients on alternative dialysis modalities

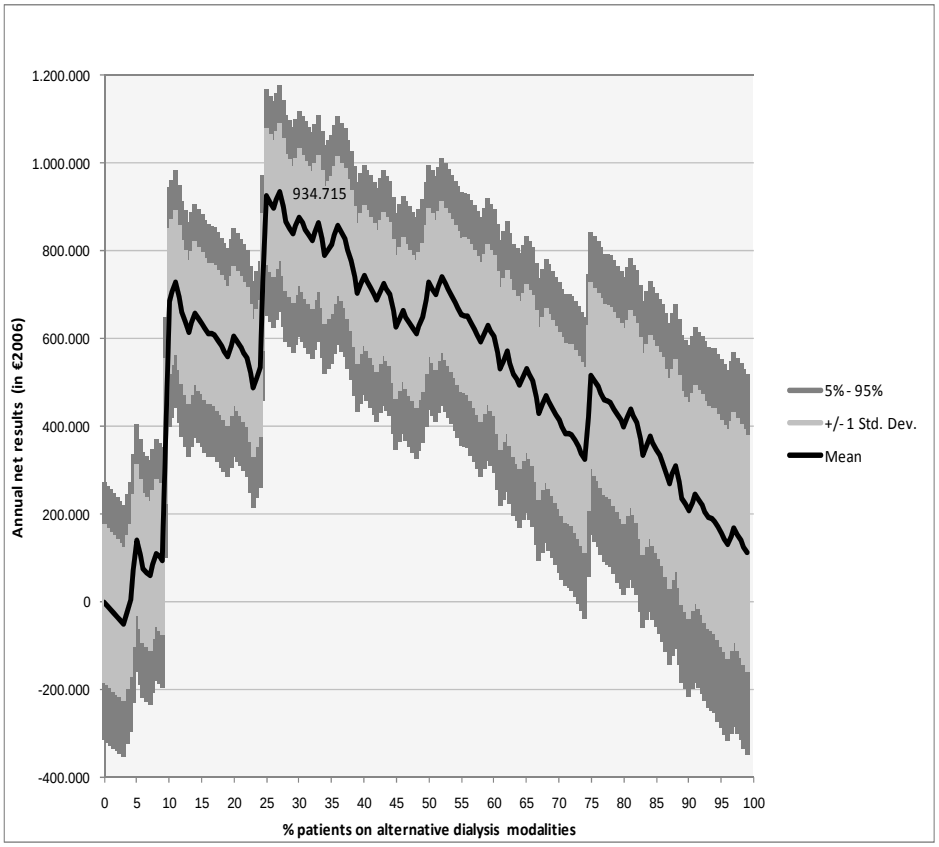


A decreasing total cost with an increasing percentage of patients on alternative dialysis modalities is found. Due to the presence of semi-fixed costs the total cost decreases stepwise. The observed kinks in the total cost of hospital HD-curve are mainly due to there being one additional nephrologist needed per 25 additional patients on hospital HD.

5.3.2.3 Revenues and costs balance

Figure 48 shows the balance between the revenues and costs, with its area of uncertainty. With the current information on costs, and for a dialysis centre with a per diem price of €269.44, the average revenues equal the average costs if about 5% of the patients are treated with alternative dialysis modalities. Below this 5% average revenues are lower than average costs, implying a deficit to the hospital; above this 5% the hospital makes on average a profit. The grey zone around the black mean cost curve represents the variability (± 1 standard deviation) in costs across hospitals, resulting from the Monte Carlo simulations on costs. It shows that some hospitals might make profits at or even below 5% alternative dialysis modalities, while some will make losses even up to 10% of alternative modality use.

Figure 48: Short term revenues-cost balance of a dialysis programme with 100 patients related to the proportion of patients on alternative dialysis modalities



According to our simulations, mean profits are maximised if 28% of patients are treated with an alternative dialysis modality under current reimbursement rules and values. Total profits amount to approximately €934 700 per year for a dialysis programme with 100 patients (in €2006). In 2006, the average proportion of PD+satellite HD in total dialysis (excluding home HD) was 33.72% in Belgian dialysis centres (source: Dialysevragenlijst RIZIV 2006).

Figure 49 and Figure 50 show the costs and revenues for respectively the alternative dialysis modalities and hospital HD related to the proportion of patients on alternative dialysis modalities. Fixed costs related to the dialysis programme (independent from the distribution of patients between modalities) are not included in these figures because they cannot be attributed to one specific modality. This explains why the figures do not show the same deficits as Figure 48 for levels of alternative dialysis use below 5%. The sum of the profits generated by hospital HD and the profits generated by the alternative dialysis modalities *MINUS* the general fixed costs correspond to the profits (and losses) presented in Figure 48.

For the alternative dialysis modalities, the difference between revenues and costs increases with an increasing proportion of patients treated with alternative dialysis modalities. This should give an incentive to using alternative dialysis modalities. However, the profits generated by hospital HD per patient are higher than those generated by alternative dialysis modalities.

Figure 49: Costs and revenues of alternative dialysis modalities, related to the proportion of patients on alternative dialysis treatment modalities

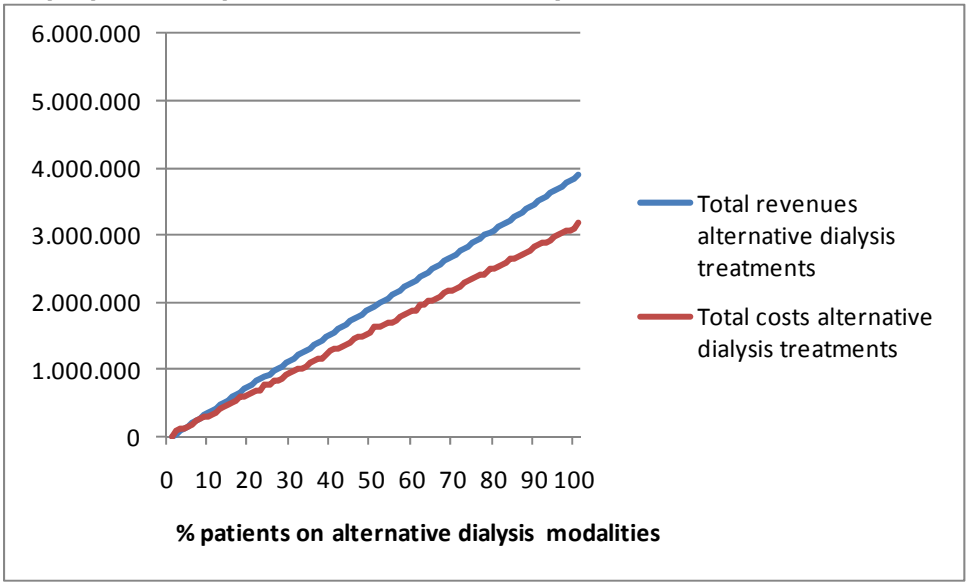
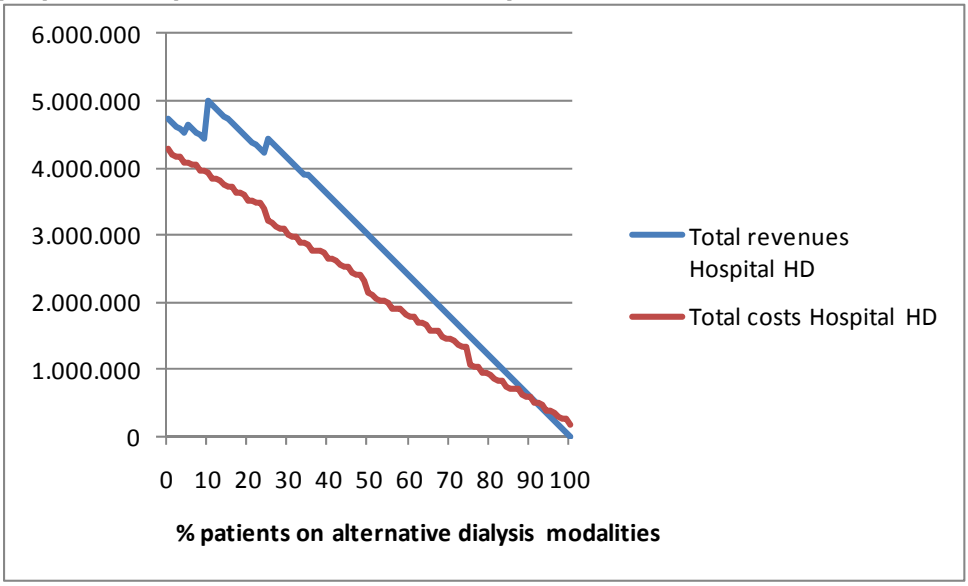


Figure 50: Short term costs and revenues of hospital HD, related to the proportion of patients on alternative dialysis treatment modalities

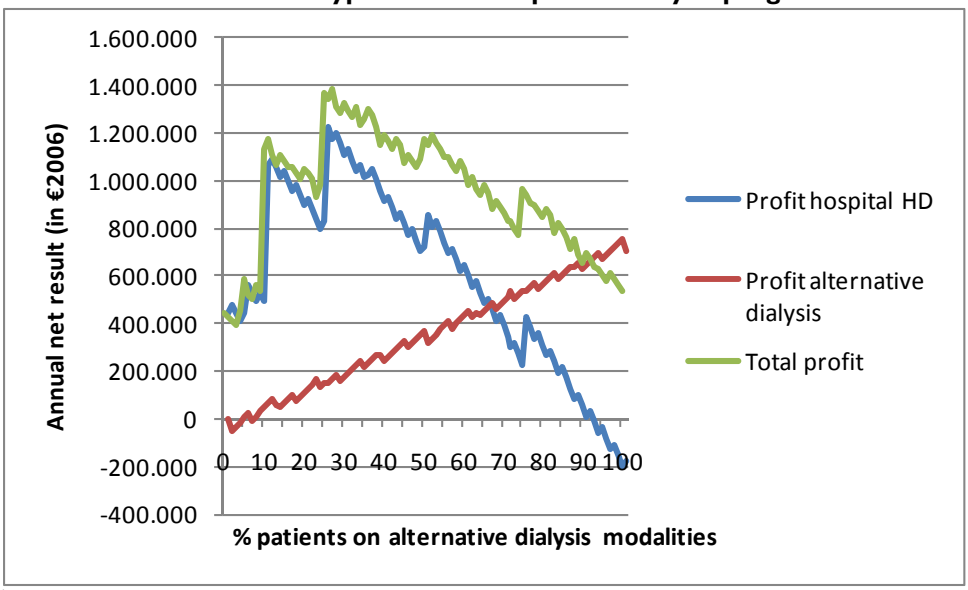


In the current reimbursement system for dialysis, lump sums for hospital HD increase stepwise depending on the proportion of alternative dialysis, while the reimbursement of the alternative dialysis modalities is fixed per patient. The profits of hospital HD are presented in Figure 51. Up to the point where 28% of the patients are treated with alternative dialysis modalities, the profit lines decline stepwise and steps are relatively large. Afterwards, profits generally decline due to there being less patients treated with hospital HD (less patients on hospital HD implies less profits).

The profits of alternative dialysis modalities show a smoother increase with the number of patients on alternative dialysis. This is because of the fixed reimbursement rate for alternative dialysis modalities and the preponderance of variable costs in total costs of these modalities. Variable costs as well as reimbursement increase linearly with the number of patients on alternative dialysis modalities. Therefore the total profits increase the more patients are treated with these modalities.

Figure 51[jj] also shows that treating 65 patients out of 100 with alternative dialysis modalities (of which 44 on satellite HD, 11 on CAPD and 10 on APD) generates the same profit as treating 35 patients out of 100 with hospital HD (represented by the intersection between the "profit alternative dialysis"-line and the "profit hospital HD"-line). As a consequence, the presumed positive financial incentive created for alternative dialysis modalities turns out to be a financial disincentive for the use of alternative dialysis modalities because beyond the point where 28% of the patients are treated with alternative dialysis modalities the marginal profit from a further increase in alternative dialysis is negative (meaning that profits diminish).

Figure 51: Contribution of hospital HD and alternative dialysis modalities to the annual net result of a hypothetical 100-patient dialysis programme*



* General fixed costs related to the dialysis programme *in se* are not taken into account in this figure. These costs cannot be attributed to a specific modality. The sum of the profits generated by hospital HD and the profits generated by the alternative dialysis modalities *MINUS* the general fixed costs correspond to the profits (and losses) presented in Figure 48.

Key points

- **In the simulated average Belgian dialysis programme, short run profits are maximized if on average 28% of the patients are on alternative dialysis treatments (PD or satellite HD). In 2006 the average proportion of PD and satellite HD in total dialysis (excluding home HD) was 33.72% in the Belgian dialysis centres.**
- **A dialysis programme with average costs (including fixed costs) makes a deficit if less than 5% of the patients are on alternative dialysis.**
- **The presumed financial incentives for alternative dialysis treatments in practice turn out to be financial disincentives.**

[jj] Note that this figure includes only variable and semi-fixed costs. Fixed costs do not change with the number of patients on alternative dialysis modalities and hence would be disregarded for –purely hypothetical- short term decisions on the "optimal" level of alternative dialysis use. We emphasize this is purely hypothetical as decisions about dialysis modalities are of course in first instance inspired by other considerations than financial profits.

5.4 DISCUSSION

5.4.1 Cost analysis

The analysis of the costs of different dialysis modalities was mainly based on data obtained through a hospital survey. All dialysis centres in Belgium were contacted to participate in the survey, but only 8 centres actually participated. Despite the low response rate, the data provided by the hospitals were fairly complete and it was clear that the people filling out the questionnaires had put much effort in it. Additional questions were asked to each of the respondents, through the intermediary of the trusted third party, if the researchers were not sure about the interpretation of specific data. Nevertheless, the low response rate limits the generalizability of the results. This issue was partly dealt with by putting probability distributions on the variables included in the cost analysis and verifying the assumptions with a panel of external experts. However, this does not solve the entire problem of the limited response rate. Some non-responders informed KCE about the reasons for not participating, mainly lack of time, some informed KCE that they simply were not willing to participate but the majority just remained silent.

The results of the cost analysis showed that satellite HD is the least costly dialysis modality from the hospital's perspective, followed by PD and hospital HD (see Figure 44). The unexpected high cost of PD is mainly due to the cost of the consumables, 90% of which are dialysis fluids.

There might be different explanations for this observation. First, the relatively high cost of the consumables might be due to companies charging higher prices for consumables to compensate the revenues foregone from providing dialysis equipment free of charge or at a reduced price. Secondly, some experts believe this might be related to the virtual mono- or oligopoly situation of the suppliers of dialysis fluids in Belgium. No official data sources on the market shares of the different suppliers on the Belgian market were found to verify this statement, but the following economic reasoning may apply here. The company with the largest market share in dialysis fluids may benefit from both economies of scale and economies of scope.

Economies of scale imply lower production costs because of a large market share, since production costs decrease with higher production volumes. Economies of scope are realised if a company experiences decreasing costs because it produces more than one product. For example, a company producing many hospital products (e.g. dialysis fluids, glucose solutions for intravenous administration, etc…) may benefit from economies of scope. The additional advantage of producing many hospital products and producing high volumes is that the company may sell its products at a lower price as compared to its competitors. Competitors with a smaller market share and no or fewer other hospital products, have less margin to reduce prices. As such, a virtual monopoly is created because of the higher production efficiency of the largest company. Finally, a combination of these factors may apply. For instance, a large hospital buying many different products from one company might have a stronger bargaining power and hence obtain better conditions for its equipment than smaller hospitals buying smaller volumes. The smaller hospitals may have to pay the market price or the price set by the virtual mono- or oligopolists for its consumables (or negotiates a slightly lower price). Hospitals on the other hand of the spectrum, with much less bargaining power, might have to buy their equipment at less interesting conditions and at the same time still have to pay the market (or oligopolists') price for its consumables.

The relatively high cost of dialysis fluids for PD might hamper the move towards PD as dialysis fluids are the most important cost component for PD. Consumables for PD cost 2.5 times more than consumables for hospital HD (see Figure 44) and 16% more than the costs of human resources associated with hospital HD. Hospital HD is the most human resource intensive dialysis modality. Human resources costs make up 50% of the total costs of hospital HD. It is remarkable that the costs of consumables for PD are higher than this important cost component of hospital HD.

The cost analysis presented in this chapter is performed from the perspective of the hospital. Its results underestimate the true total cost of dialysis from a societal point of view. A number of important cost items are not included, such as nursing support at home in case of PD, patient transportation costs, PD patients' medication costs, out-of-pocket expenses of patients and their caregiver and caregiver's time investment. Some of these costs, however, are dealt with in chapter 4 of this report, and a summary of the analysis on home nursing costs for dialysis patients performed by the "Wit-Gele Kruis" has been presented in chapter 3.

Patient's transport is reimbursed by the NIHDI. The patients receive the reimbursement directly from their sickness fund. In addition to the legal reimbursement provided by the NIHDI, patients can receive additional reimbursement from their sickness fund as part of the complementary insurance package. Large differences exist, however, between sickness funds. The standard NIHDI reimbursement is €0.25 per kilometre, with a maximum of 30 km single journey or to the nearest dialysis centre. Patients can use different means of transportation. As shown in Table 68 most patients go to the dialysis centre by taxi. This can be a taxi shared with other patients. Some sickness funds and dialysis centres organise shared transport to the hospital for dialysis patients for which they make an agreement with private taxi companies. The cost of patient transport for the NIHDI was described in chapter 4.

Table 68: Means of transportation used by HD patients

Ambulance, lying	4%
Ambulance, sitting	14%
Taxi	54%
Public transport	5%
Private transport	23%

Source: ORPADT survey 2006

5.4.2 Simulation of revenues and costs

A short term revenues/cost scenario was presented for a hypothetical "average" dialysis programme with 100 patients. Revenues and costs were estimated in function of the proportion of patients on alternative dialysis modalities. The balance shows that dialysis programmes are on average profitable for a hospital, especially at a proportion of patients on alternative dialysis modalities superior to 10%. In reality, a hospital's balance may deviate from the estimated average, mainly due to differences in the cost structure, case mix or efficiency.

The simulations described in this chapter are performed from a purely financial point of view and look at a dialysis programme as an isolated hospital activity of a hospital. In practice, however, the hospital management is concerned with the full set of activities at the hospital rather than each of the activities separately. In that sense, the profits generated by the dialysis activities of a hospital might be used to cover the deficits incurred by other hospital services. This does not mean that from a financial point of view large imbalances between costs and revenues are desirable. Such imbalances reduce transparency.

For the calculation of the balance between revenues and costs, no distinction was made between the character of the revenues of hospital HD and the character of the revenues for alternative dialysis modalities. The revenues of hospital HD consist of a lump sum and a medical fee (honorarium), while the revenues of PD consist of a lump sum only. The presumption was that the total revenues of hospital HD, including lump sums and honoraria, should compensate the total costs of hospital HD (including, besides other components, medical personnel). This distinction between lump sums and honoraria was therefore irrelevant for the specific cost-benefit analysis presented here, but for medical professionals this will not be perceived as such. Honoraria are perceived as a direct remuneration of the work of medical doctors (and hence belonging to them), while a lump sum is considered a reimbursement of operational costs like nursing personnel, buildings, equipment and material belonging to the hospital.

In case of dialysis, however, honorarium fees are supposed to cover part of the consumables associated with hospital HD. The precise proportion is not specified by law. As a result, the income from the nephrologist is the result of a negotiation between the hospital management and the nephrologists.

In the hypothetical dialysis programme with 100 patients, about 48% of the total revenues for hospital HD are honoraria. For the alternative dialysis modalities the revenues consist entirely and exclusively of lump sums. Therefore, because physicians are not remunerated for PD in the same way as for hospital HD, i.e. by means of a honorarium fee, physicians might feel less inclined to guide a patient who has different treatment options and who is indifferent or asks for decision support, towards alternative dialysis treatments. The incremental lump sum mechanism creates, from this point of view, only in theory a positive incentive for the hospital management. This is only in theory because, as demonstrated by the revenues-cost analysis, also from a hospital's financial point of view the incentive stops if 28% of the patients are on alternative dialysis modalities.

Finally, this revenues-cost simulation does not take any medical considerations into account. The objective was limited to the evaluation of the financial consequences and built-in incentives of the current financing mechanisms for dialysis, given the costs from the hospitals' point of view resulting from the cost analysis. This analysis should not be read in isolation from the other parts of this study, and medical criteria for choosing between dialysis preferences and patient preferences are described in other chapters.

Key points

Cost analysis

- **The analysis of the costs of different dialysis modalities in Belgium from the perspective of the hospital was hampered by a low response rate on the cost survey but variability in cost estimates was taken into account and results appeared consistent.**
- **Costs from the hospitals' perspective underestimate the costs of dialysis from a societal point of view.**

Revenues – cost simulation

- **According to the simulation, the optimal proportion of patients on alternative dialysis modalities (from a purely financial point of view from the hospitals' perspective) is approximately 28%.**
- **Presumed positive financial incentives for the use of alternative dialysis modalities might be neutralized by the profits generated by hospital HD.**
- **Because alternative dialysis modalities are reimbursed by means of lump sums only and hospital HD by lump sums and a honorarium fee, physicians might not be given the right financial incentives to promote alternative dialysis modalities.**

6 INTERNATIONAL COMPARISON

6.1 INTRODUCTION

In 2007, the International Study of Health Care Organization and Financing (ISHCOF) conducted a comparative review of financing ESRD in 12 high income countries: Australia, Belgium, Canada, England and Wales (E-W), France, Germany, Italy, Japan, New Zealand (NZ), Spain, Sweden and United States.[76] The comparisons focused on ESRD financing, incentives and their consequences on patients' outcomes.

The ISHCOF is a sub-study of the Dialysis Outcomes and Practice Patterns Study (DOPPS) which is an international study focusing on the treatment and outcomes of HD patients where the main goal is to identify practice patterns that improve patient outcomes. DOPPS is supported by scientific grants from Amgen and Kirin without restrictions on publications. The data of each country have been reviewed by specialists from the country concerned.

The paper of Dor et al.[76] is the main reference we will use to compare the Belgian situation with other countries. But we confirmed and completed our information with specific inquiries on each of the 12 countries. The comparison takes into account different aspects such as the number of ESRD patients, the different treatment modalities and the financing of dialysis or renal transplantation in the countries involved.

6.2 ORGANISATION OF CARE FOR ESRD PATIENTS

6.2.1 Incidence and prevalence

As shown in Table 69, ESRD incidence and prevalence rates varied widely across the countries in 2002.[76] Prevalence ranged from 626 cases per million population (pmp) in E-W to 1 801 in Japan. Incidence rates range from 97 per million population in Australia to 340 in the USA. Belgian prevalence and incidence rates are in the lower half of the distribution.

Table 69: Prevalence rates, incidence rates, and average annual percentage change in rates of ESRD in 2002[76]

Country	Prevalence per million people	Average annual % change*	Incidence per million people	Average annual % change*
Belgium	**835**	**4.69**	**156**	**5.69**
France	866	2.67	123	5.36
Spain	895	4.07	131	1.59
Italy	864	2.39	142	2.72
Sweden	756	3.30	125	-0.20
E-W	626	3.81	101	1.81
Germany	918	4.70	174	4.13
USA	1 446	3.71	340	3.31
Canada	927	6.86	158	2.89
Australia	658	4.25	97	3.05
NZ	685	6.08	119	5.24
Japan	1 801	5.17	260	2.94

* The average is calculated over a 5-year interval (1998-2002), except for France (prevalence: 2003-2004; incidence: 1997-2001) and for Japan (incidence: 2000-2004)

Between 1998 and 2002, the average annual increase in the incidence rate for Belgium is nearly 6%, the highest average increase of all countries included.

6.2.2 Number of nephrologists

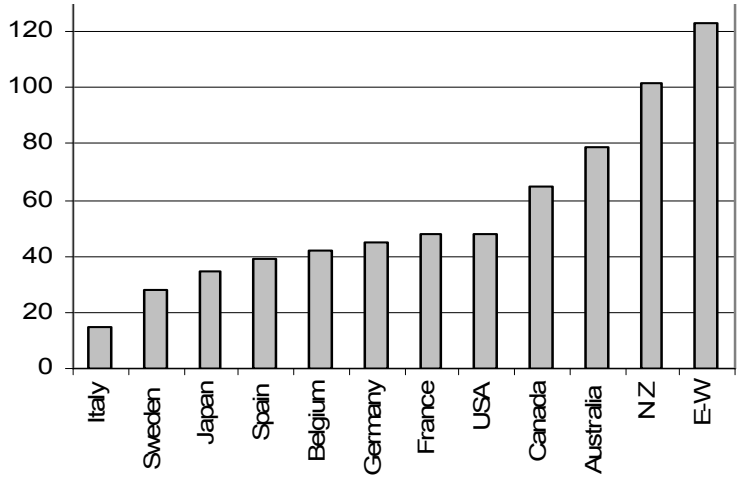
Table 70 and Figure 52 show the average number of patients treated per nephrologist. There are important differences between ISHCOF countries concerning the average number of patients per nephrologist. The ratio ranges between one nephrologist for 15 patients in Italy to one for 123 patients in England and Wales. It is however unclear whether for all countries the renal transplant patients were included in the patient numbers per nephrologist. The ratios may therefore not be completely comparable between the countries. The average for the 12 ISHCOF countries is one nephrologist for 56 patients. The value observed for Belgium is around the median value of the sample.

Table 70: Nephrologist/patients ratio

	Nephrologists/patients	Rank
Belgium	**1 / 42**	**5**
France	1 / 48	7
Spain	1 / 39	4
Italy	1 / 15	1
Sweden	1 / 28	2
England and Wales	1 / 123	11
Germany	1 / 45	6
USA	1 / 48	7
Canada	1 / 65	8
Australia	1 / 79	9
New Zealand	1 / 102	10
Japan	1 / 35	3

Data of 2001 for Australia; 2002 for Canada; 2003 for E-W and USA; 2004 for France and New Zealand; 2005 for Belgium; 2006 for Spain; when it is not specified in the article, we assume it corresponds to the time window of the studies: 2002-2003 for Sweden and 2004-2005 for Italy, Germany and Japan

Figure 52: Patients/Nephrologist ratio



In Sweden, the territory is divided into several counties and the number of primary care physicians and nephrologists is limited by each county. Moreover, the historic lack of physicians in several disciplines has forced the development of very skilled nurses.[77]

In Germany, the number of physicians involved in the care of ESRD patients is linked to the number of patients treated at each centre. Kleophas and Reichel precise that to ensure treatment quality this number must be limited to a maximum of 50 patients per nephrologist.[78]

6.2.3 Geographical access to dialysis facilities

The ISHCOF study does not provide detailed information about rules or criteria for the geographical location of dialysis units in the countries. In Italy, the satellite units are located mostly in the northern part of the country. The regions with a higher prevalence of "private" centres also have a larger number of dialysis centres per million people and a low prevalence of peritoneal dialysis.[79] In the USA, most dialysis facilities are located in urban rather than rural areas. However to promote access to care in rural areas, Medicare provides higher payment rates to some rural facilities deemed to be essential or sole providers of dialysis services.[80] In Canada, the units tend to be geographically dispersed; there is therefore little competition among them.[81] According to Nicholson and Roderick there is probably an insufficient dialysis capacity in E-W for patients who might benefit from this therapy.[82] This is likely to affect predominantly the elderly with co-morbidity.

6.2.4 Distribution of patients between treatment modalities

6.2.4.1 Proportions of patients in each ESRD treatment modality

Table 71 shows the distribution of prevalent ESRD patients between the different ESRD treatment modalities: hospital HD, satellite HD, home HD, CAPD, APD and renal transplantation (RTX) for the 12 ISHCOF countries. Belgium ranks fifth for transplantation and for HD in satellite units and 7th low for PD.

Table 71: Proportion of ESRD patients per treatment modality

	% of HD	% of PD	% of RTX	average treatment time
Belgium	**40% hospital HD 13% satellite HD**	**6% PD**	**41%**	**240 min**
France	53.9%	5.1% CAPD	41%	240 min
Spain	48% HD < 0.5% home HD	5% CAPD	47%	220 min
Italy	53% hospital 14% satellites 0.4% home	7% CAPD 3% APD	22.6%	220 min
Sweden	1% inpatients 34% outpatients 1% home	12% CAPD	52%	240 min
E - W	22 % hospital 18 % satellites 2% home	13% CAPD	45%	-
Germany	61.6% hospital 8.3% satellites 0.6% home	3.6% CAPD	25.9%	240 min
USA	64% hospital and satellites 0.8% home	7.2% CAPD	28%	Between 189 and 270 min
Canada	46% hospital and satellites 1% home	6% CAPD 6% APD	41%	240 min
Australia	14.5% hospital 23.5% satellites 6% home	7% CAPD 5% APD	44%	-
New Zealand	14.9% hospital 9,6% satellites 8.4% home	21.5% CAPD 5.4% APD	40.3%	270 min
Japan	96.1% hospital (17.2% evening; 0.04% home)	3.7% CAPD	less than 0.5%	244 min

Data of 2002 for USA and Canada; 2003 for France and Sweden; 2004 for Belgium (not presented in original articles but included here based on data from NBVN/GNFB common report 2008), E-W, Germany, Australia and New Zealand; for Spain, Italy, and Japan it is not specified in the article, so, we assume it corresponds to the time window of the studies: 2004-2005

6.2.4.2 *Average number of patients per centre*

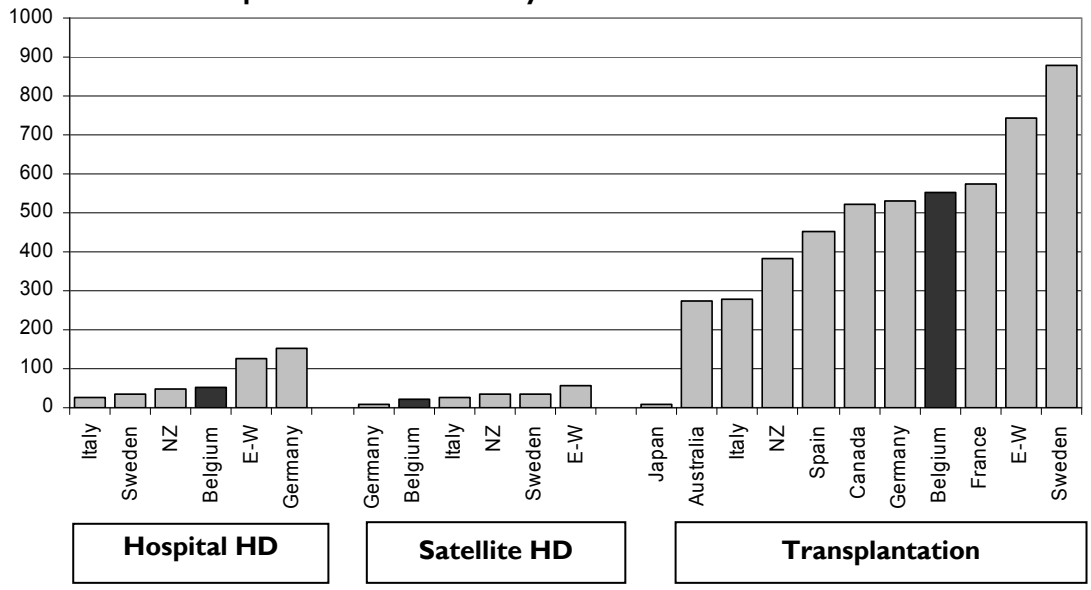
In Table 72 we calculated for each country for which data were available the average number of patients per hospital or satellite HD unit and per hospital doing transplantation. Our calculations are based on information given in **Error! Reference source not found.** and Table 71. For some countries (France, Spain, Sweden, Canada, Australia and Japan) only the number of transplanted patients per hospital are given.

Table 72: Average number of ESRD patients per treatment centre and per modality

	Patients per hospital HD unit	Patients per satellite HD unit	Transplanted patients per hospital
Belgium	**54**	**21**	**551**
France			576
Spain			453
Italy	28	25	277
Sweden			879
E - W	127	56	742
Germany	152	8	530
Canada			520
Australia			272
New Zealand	47	34	382
Japan			7

Figure 53 positions Belgium within the entire group of ISHCOF countries for the 3 treatment modalities concerned.

Figure 53: Average number of ESRD patients per dialysis or transplantation unit and per treatment modality



6.2.5 Incentives and criteria influencing the choice of the treatment

6.2.5.1 Comparison of incentives for transplantation

Renal transplantation is considered the optimal treatment strategy for ESRD. But all ISHCOF countries have a waiting list for transplantation due to a lack of donors. To increase the donation rate each country attempts to develop incentives for donation. For instance, the French Ministry of Health has provided human and financial resources to launch a national donation campaign and the age limit for donors was increased to 70 years.[83] The government of New Zealand gives compensations to living kidney donors toward loss of income and has set up a national organ donor registry in 2005.[84] In the last decade, Spain has had a continuous increase of cadaveric organ donation. This success may have resulted in part from the creation in 1989 of the National Transplant Organization. This agency manages the transplant waiting list, assists hospital transplant coordinators and coordinates the distribution of organs. Each transplant hospital has a transplant coordinator team that must be available 24 hours a day. Moreover, a financial incentive is given to nephrologists per transplantation. This sum represents 10%-25% of their salary.[85] An "old-for-old" program is established in Germany: transplant candidates over 65 may only receive organs from donors in their same age cohort.[76] In Japan, where there is widespread believe that removing organs from a donor after brain death is equivalent to murder, the government does not promote transplantation from brain death donors. As a result, the absolute number of kidney transplantations is low and most of them are from living donors who are related to the patient.[86]

6.2.5.2 Characteristics of patients eligible for transplantation

As there are not enough grafts for all potentially eligible patients criteria are applied to give priority for transplantation to specific patients. In the USA, patients eligible for transplantation are healthier than the average ESRD patients.[87] In France, priority is given to hyper-immunized patients, followed by candidates from the same region, children, patients awaiting a pancreas-kidney graft, and patients with the longest waiting time.[83] In New Zealand, to be eligible for the transplant waiting list, patients are generally required to have a more than 80% chance of two-year survival from all causes of mortality. Other waiting list criteria incorporate the extent and impact of co-morbidities such as cancer and cardiovascular disease.[84] In England and Wales, children and patients regarded as difficult to match are favoured for transplantation.[82] In Japan, children receive the highest priority. Patients who are positive for hepatitis C virus are matched with kidneys that are positive for the same virus. Priority is then given to recipients who are in the same region as the donor or who have been waiting a long time for a kidney.[86]

6.2.5.3 Criteria for dialysis facilities

In Belgium, ESRD patients on the transplant waiting list or patients not eligible for transplantation can choose among different dialysis modalities. In some other countries patients have no or a constrained choice. Reasons for a constrained choice might be related to geographical access to dialysis centres, governmental planning of dialysis facilities or established clinical practice patterns in the country.

Geographical access

In the E-W patients in general have no choice due to the shortage of dialysis units in E-W. Even in the larger urban areas, such as Greater London and Manchester, renal services have been consolidated in a few main centres.[82]

In Sweden, patients living in rural areas most often have to travel long distances to reach a dialysis unit. To avoid this burdensome transport patients may prefer PD.[77]

Governmental planning

All French dialysis centres have an occupancy rate close to 100%. This is the result of state-managed, regional planning, which determines the number of facilities required to treat the population of ESRD patients. The government authorizes centres to provide care accordingly. This system results in very little competition between the centres because they are guaranteed to have their beds filled.[83]

In Spain, the Health Authority of each autonomous community determines the number of authorized units needed to cover dialysis and transplantation needs in function of the ESRD prevalence in each area and quality criteria fixed by the Health regulation. It assigns patients to units in function of their home address.[85]

Clinical practice pattern

The decreasing incidence rate of ESRD in Sweden suggests that there is a decreasing tendency to initiate ESRD treatment in very old patients.[77] In Germany, hospital-based dialysis facilities are supposed to treat ESRD patients with more co-morbidities than patients in other settings.[78] In the past, patients in New Zealand have been rejected for treatment because of older age or the presence of diabetes mellitus. These criteria have now been abandoned in clinical practice.[84]

New Zealand has the highest prevalence of home-based and self-care dialysis in the world. This practice pattern and dialysis infrastructure has evolved in part from a philosophical position among nephrologists that this form of dialysis is better. Based on observational data nephrologists in New Zealand perceive PD and HD to generate equivalent outcomes and that home HD generates generally better outcomes than satellite or hospital HD. Home-based therapies have also been perpetuated by the need to minimize costs. However, it might limit access to dialysis for less capable or medically more unstable patients who are treated palliatively for ESRD without dialysis.[84]

6.3 ESRD FUNDING

6.3.1 Introduction

In this section, we present for each country the budget linked to ESRD treatment compared to the budget of health care, the financing rules used for payment of physicians and dialysis units, the proportion of out-of-pocket payments made by the patient and the incentives used to contain costs.

6.3.2 National budget for ESRD patients

Table 73 and Figure 54 show the proportion of the Gross Domestic Product (GDP) allocated to health care and the proportion of the total health care budget allocated to ESRD treatment for each of the 12 ISCHOF countries.

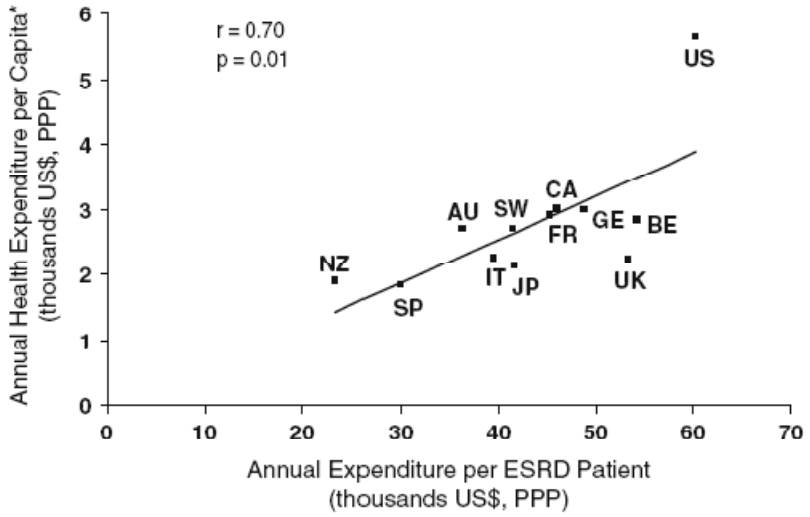
Table 73: ESRD expenditures as a proportion of total health care expenditures

	Health care expenditures as a % of GDP	ESRD expenditures as a % of total health care expenditures
Belgium	**9**	**1.8**
France	10.5	1.3
Spain	7.7	1.5
Italy	8.3	1.8
Sweden	9.2	-
England and Wales	8.7	1.5
Germany	11	-
USA	14.6	1.8
Canada	9.3	1.2
Australia	-	-
New Zealand	8.5	0.91
Japan	7.9	3.7

Data of 2001 for Belgium and Italy; 2002 for Sweden, USA, Canada, N Z and Japan; 2003 for Spain and Germany; 2004 for France and E-W

Figure 54 shows a positive correlation between the annual health expenditures per capita and the annual expenditures per ESRD patient.

Figure 54: Annual expenditure per ESRD patient and general population health expenditure per capita, 2003[76]



ESRD expenditures data have been inflated at 3% per year to estimate the year 2003

The figure suggests at first glance that higher annual health care expenditures per capita are associated with higher annual expenditures per ESRD patient. However, excluding the US from the regression analysis would flatten the linear relationship considerably.

According to Wikström et al.[77], the cost of a functioning kidney transplantation is about one-fifth of the cost of treating a HD patient for one year, except for the year of the transplantation where it is about one-half.

6.3.3 Financing of dialysis physicians

Table 74 summarises the financing modalities for physicians and dialysis units.

In Italy, Spain and Sweden, ESRD physicians are employed by the hospitals and are salaried. Most physicians from Belgium working in a university hospital are also salaried; while the others are paid on a fee-for-service basis. The hospital-based physicians of Japan and E-W and those working in public hospitals of France and Australia receive a salary. The office-based physicians of France, Japan and New-Zealand and those working in private hospitals (France and Australia) are paid a fee for service. The non-hospital-based physicians of E-W and New Zealand are paid through a capitation payment. Finally, in the USA, physicians receive a fixed monthly capitation payment for outpatient services and a fee-for-service for hospitalized patients.

Table 74: Payment rules[76]

	Dialysis units	Physicians
Belgium	**FFS**	**Salary, FFS**
France	Mix	Salary, FFS
Spain	FFS	Salary
Italy	FFS	Salary
Sweden	Global budget	Salary
England and Wales	Mix	Salary, Capitation
Germany	Outpatient dialysis: fixed lump sum Inpatient dialysis: FFS	FFS
USA	Mix	Capitation, FFS
Canada	Global budget	FFS
Australia	Mix	Salary, FFS
New Zealand	Global budget	Capitation, FFS
Japan	Mix	Salary, FFS

FFS= fee-for-service or fee-per-treatment session

6.3.4 Financing of dialysis units

Health care systems in the ISCHOF countries are clearly different. However, treatment for ERSD is primarily funded through social insurance, with relatively low levels of patients' co-payments.

In several countries the organization and financing of ESRD services is fully integrated into the main national health care system. In others, they are governed by the regional health care authorities. This is the case, for example, in Australia, New Zealand and some Canadian provinces where regional health authorities administer specific ESRD programs.

There are large differences between the payment systems of countries. Three types of models tend to dominate the financing mechanisms of dialysis units. Table 74 summarises for each ISHCOF country the financing mechanisms for both the dialysis units and the physicians.

6.3.4.1 Fee for service or fee-per-session

In Italy each centre is reimbursed according to the outpatient services performed. The amount of the fees depends on the type and location of the dialysis unit. In Spain, the public insurance system pays facilities for each individual session on a fee-for-service basis. In Germany, a distinction is made between the reimbursement of dialysis services for inpatient dialysis treatments and ambulatory dialysis services. Inpatient dialysis services are reimbursed per dialysis procedure, while ambulatory dialysis services are paid by means of a lump sum per week. The reimbursement for ambulatory dialysis treatments is a weekly flat rate independent of the mode of dialysis procedure and the frequency of dialysis treatment.

6.3.4.2 Global budget

In Canada and New Zealand, regional ESRD authorities receive overall budgets, which they allocate to various providers (province or territory). This system confers flexibility in allocating resources among centres based on needs and patient flows. In Sweden, the annual budget is the result of a negotiation between the government and the physicians in function of their expected patients load for the following year.

6.3.4.3 Mix

Australia, USA, Japan and England and Wales have a mixed system. In Australia, public facilities receive an annual grant based on the annual number of dialysis patients. There has been a movement towards a two parts payment system, consisting of a capitation payment designed to cover fixed costs and a case payment to cover variable costs.[88] The specific annual capitation grant is payable to the parent centre, while the case payment per dialysis session is made directly to the providers of in-centre and satellite services. In the United States, payment for HD and related services for ESRD is a mix of a fee-for-service and a prospective payment. Dialysis facilities are reimbursed by a single "composite rate" payment per dialysis treatment which covers the basic services. In Japan, the reimbursement system for ambulatory dialysis has both a prospective price system (PPS) component and a fee-for-service component. The fee-for-service covers the dialyzers, drugs, special examinations (such as diagnostic imaging) and clinical biology. The PPS component covers the other costs of treatment, such as personnel costs, dialysis fluid and anti-coagulants. On average, 79% of the reimbursement is PPS and 21% is fee-for-service.

The Payment by Results system, introduced recently in England and Wales, has tariffs based on the average national reference cost of Healthcare Resource Groups. This system is similar to the DRG system. For renal services, the idea was to introduce this system from April 2008 onwards, but due to problems with the data that should form the basis for the calculation of the national tariffs for dialysis the introduction has been postponed until November 2010. At this moment, contracts between commissioners and dialysis providers tend to incorporate a global budget through prospective payments (depending on the planned activity) or fee-for-service (per outpatient HD treatment and transplant).

In Belgium, PD is reimbursed per patient per week[89], while satellite and home HD are reimbursed per session, three times a week (see chapter 3). Hospital HD is reimbursed per session with no limit on the number of sessions per week.

6.3.5 Patients' co-payments

In most countries, the national health care insurance bears most of the ESRD treatment costs. In France as well as in Italy, the social security covers 100% of all medical expenditures of ESRD patients.[79, 83] In Spain, the public health system covers nearly all costs of ESRD, including all medication, erythropoietin (EPO) and transportation. In addition it pays a disability pension for ESRD patients. The amount of this disability pension granted to patients depends on the degree of disability. A commission of sanitary inspectors or referees estimates the degree of disability on an individual basis.[85]

In Canada, New Zealand, E-W, Japan, Sweden and Germany, patients must pay a part of their treatment costs, generally related to medication.

In Canada, policies concerning prescription drugs and coverage differ between provinces. In British Columbia (BC), for instance, all ESRD patients registered with the BC Renal Agency are eligible to receive "renal" medication from a restricted pharmacopeia free of charge. For all other provinces, the ministry of health contracts with an independent pharmaceutical insurance plan to provide government-sponsored drug insurance which is paid for out of general taxation dollars and by prorated, income-based, insurance premiums. Pharmaceutical coverage is provided by such government-sponsored drug insurance plans for citizens aged 65 years and older and must be available to all Canadian citizens who pay an annual insurance premium. Generally, only drugs that have been shown to be clinically effective and cost-effective are available through government-sponsored formularies.[81] Some ESRD drugs are provided to patients without the requirement for third-party or government-sponsored insurance. This is the case for anti-rejection drugs, which are free to all Canadian transplant patients.

The out-of-pocket payments for primary care in New Zealand are high. Most citizens do not hold private insurance and there is evidence that the co-payments deter some people from accessing General Practitioners services. Therefore it may represent a barrier to early detection and treatment of ESRD. Concerning medication, any pharmaceutical prescribed and directly dispensed from a hospital pharmacy to a hospitalised patient or an ambulatory treated patient at the hospital are fully subsidized by the government.[84] In other words, drugs that are listed are completely reimbursed; this is not the case for those that are not listed.

In England and Wales, patients pay only 2% of their health care expenditures out of pocket.[82] In Japan, co-payments of 10%-30% are usual but are limited to approximately US$600 per month. Above this sum health insurance fully reimburses patients.[86] The Swedish Health Care system covers all costs related to ESRD treatment, including dialysis, medications, lost wages and other sickness benefits. However limited co-payments do exist for medical care, prescription drugs, travel and extra supplies (such as home dialysis machines).[77]

In Germany, night dialysis is not covered by medical insurance (public or private). It is mostly a costly dialysis alternative mainly due to nurse salaries and dialysis centres are largely unwilling to pay for night HD. This situation can discourage patient to choose this modality.[78] Concerning transportation costs in Germany, different insurance providers are now introducing systems to manage patient transportation so that 2 to 3 patients can share one car to the dialysis centre and back home.[78]

6.3.6 Cost containment measures

In the USA, since the current composite rate system for dialysis units was implemented in 1983, there have been only 4 payment updates, resulting in a substantial real (inflation-adjusted) decline in the payment for services covered by the composite rate. This process has stimulated providers to adopt productivity-improving measures and to minimize costs for whatever they do. This financial pressure encouraged the limitation of dialysis units and improve the efficiency of current dialysis practices, such as reuse of dialyzer and reduction of staffing.[80]

Reuse of dialyzers has passed into disuse in Belgium. The dialyzer label of the FX class Capillary Dialyzer of Fresenius Medical Care, for instance, explicitly mentions that the dialyzers are for single use. The manufacturer renounces any liability in case of reuse of the dialyzers and states that reuse may be hazardous to both patients and operators. Another reason why reuse has passed into disuse might be economical: reuse requires a nurse preparing the dialyzer for reuse. As human resources are relatively more expensive than the dialyzers themselves, it is more efficient not to reuse dialyzers.

In Canada, generally, only drugs that have been shown to be clinically effective and cost-effective are available through government-sponsored formularies.[81]

Japan revises its national fee schedule every two years. In the revision of April 2006, the government imposed price and policy changes to achieve a target reduction of 4% in overall HD expenditures. To achieve this target, payment for the use of EPO was changed from a dose-based payment per patient to a fixed-amount payment per session, regardless of dosage.[86]

In Germany, a number of measures to contain costs have been introduced. Firstly there has been a change from a reimbursement per treatment to a weekly flat rate independent of the dialysis modality and the frequency of dialysis treatments. This flat rate has been progressively reduced: from €580 in 2002 to €550 in 2003 and to €520 in 2004. The reimbursement rate differs however for patient younger than 60 years, patient 60 years and older and diabetic ESRD patients. Another action was the regulation and limitation of the number of dialysis units. The expectation is that this will increase the volume of dialysis treatments per centre and, thus, spread fixed costs among more patients, resulting in better economic efficiency. In Germany, as in all other countries, physicians are free to prescribe pharmaceuticals. However, if the average spending on drugs prescribed compared to other dialysis facilities and nephrological practices is grossly exceeded, the physicians responsible are held liable and forced to pay the additional costs.[78]

Key points

Based on the results of the ISHCOF study, comparing the organisation and financing of ESRD treatments in 12 high income countries, the following conclusions can be drawn:

In terms of the number of patients per nephrologist, Belgium ranks 5th in the list of 12 countries, with one nephrologist per 42 ESRD patients (including dialysis and transplant patients). This results from the staffing norms imposed by the Belgian law for hospital HD and the relatively high proportion of patients on hospital HD in Belgium as compared to other countries. The average across all countries was one nephrologist per 56 ESRD patients. These ratios need to be interpreted with caution, however, as they might not be completely comparable between countries.

In most countries, home HD is not frequently used (less than 1% of ESRD patients are on this treatment modality). The technique is more frequently used, however, in New Zealand (8%), Australia (6%) and England and Wales (2%). The high prevalence of home-based and self-care dialysis in New Zealand may be explained by the large distances between dialysis centres and patients' homes.

In most countries, patients can in theory chose between dialysis modalities if medically appropriate. In practice, however, choices can be constrained by late referral to the nephrologist, limited geographical access to dialysis facilities (England and Wales and Sweden), governmental planning of the number and location of dialysis units (France and Spain) or established clinical practice patterns in a country (Sweden, Germany, New Zealand).

Different financing mechanisms for dialysis facilities exist in the countries examined:

- **Fee for service (e.g. Belgium): fixed fee per treatment session or per treatment week**
- **Flat rate lump sum independent of the type of dialysis modality used (e.g. Germany)**
- **DRG financing (e.g. UK): reimbursement according to the average national cost of the diagnosis related group**
- **Mixed financing mechanisms (e.g. Japan, USA), combining capitation payments (budget per patient per year, usually to cover fixed costs) with fee-for-service (to cover variable costs)**

Ambulatory ESRD treatment is almost fully reimbursed in most countries. Consequently, patient co-payments are usually low and mostly limited to the costs of some medications.

Cost containment measures implemented by the countries studied include:

- **Introduction of a flat rate lump sum reimbursement per treatment week independent of the dialysis modality but dependent on age and co-morbidity**
- **Less frequent indexing of reimbursement fees**
- **Limitation of the reimbursement of medications to medications with proven effectiveness and cost-effectiveness**
- **Moving from dose-based reimbursement to lump sum reimbursement of medications**
- **Limitation of the number of dialysis centres**
- **Penalties in case of excessive medication prescription**

7 PATIENT PERSPECTIVE IN CHRONIC DIALYSIS

7.1 INTRODUCTION

End-stage renal disease (ESRD) is a chronic condition requiring chronic treatment. If transplantation is no option or patients are waiting for transplantation, patients have to make a choice between the different dialysis treatment modalities. Besides medical criteria, patient characteristics and preferences are important for the choice of the most appropriate dialysis modality.

In this report we briefly touched upon the medical aspects of dialysis choice, but we mainly focused on the organisational and financial aspects of chronic dialysis treatment. In this chapter, we look at the issue of chronic dialysis treatment from the patients' perspective.

7.2 OBJECTIVES

The objective of this part of the study was to describe the experiences and perceptions of patients with respect to the following elements:

- the information received before the start of dialysis treatment;
- the determinants of choice between dialysis modalities;
- the advantages and disadvantages of different dialysis modalities;
- the social support and support from hospital/home nursing facilities in case of dialysis treatments at home;
- the out-of-pocket costs directly or indirectly related to the disease and to the treatment.

The focus was on chronic dialysis patients under PD therapy, hospital HD, satellite HD, home HD or nocturnal HD as well as on patients who switched between different dialysis modalities. We were interested in the experiences of both patients in the early stages of their treatment and patients who were already on dialysis for a longer time.

7.3 METHODS

For this part of the study a sequential approach of data collection was used, consisting of an exploratory phase and a phase intended to collect more in-depth information.

In January 2007, VlaVeNier[kk] (Vlaamse Vereniging voor Nierpatiënten vzw) and Fenier-Fabir[ll] (Federatie van Belgische Verenigingen voor Nierinsufficiënten/Fédération des Associations Belges d'Insuffisants Rénaux) were invited for an exploratory discussion at KCE.

- VlaVeNier was a Flemish association for patients with ESRD. The association ceased its activities in July 2009. Three people of VlaVeNier attended the exploratory meeting at KCE.
- Fenier-Fabir is an umbrella organization of ESRD patient associations in Belgium (Flanders and Wallonia). All Belgian associations of ESRD patients, except for VlaVeNier, are member of Fenier-Fabir. In 2007 the representative of Fenier-Fabir was unable to come to Brussels for the exploratory meeting.

The exploratory meeting gave a first general impression about the elements that are important for patients on each of the different dialysis treatment modalities.

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kk http://www.nierpatient.be/

ll http://www.fenier-fabir.net/

In September 2009, we contacted Fenier-Fabir again to discuss options to obtain more in depth information on patient-related issues.

Many practical constraints and the discussion with the representative have had an impact on the data collection methods used.

A first option discussed was to organize a focus group or Delphi panel discussion. However, both of these approached seemed unfeasible for several (mainly practical) reasons.

- Sampling issues: we needed the perspective of so many categories of patients that it would be impossible to find a way to gather all of them in the same place at the same time (older and younger, recently started with dialysis or on dialysis for a longer time, all dialysis modalities, with social support or without social support, etc…).
- Condition of patients: the treatment regimen of ESRD patients is very strict and is performed for different patients at different moments of the day, which leads to practical problems when one wants to gather those patients in one place at the same time for about two hours.
- Mobility: transportation for the Delphi panel or focus group discussion may be a problem for patients.
- Language: a French and a Dutch speaking focus group or Delphi panel would have to be organized with the patients coming from each of the categories mentioned earlier, which was not feasible within the time constraints imposed by the project.

A second option proposed to the president of Fenier-Fabir was to organize a group-interview with representatives of individual patient organizations (members of Fenier-Fabir). The proposal was made to have this meeting as part of the Board Meeting of Fenier-Fabir, held on September 17th, 2009.

KCE proposed two scenarios: a formal agenda point "discussion with KCE researchers" could be introduced as part of the Board meeting: The president was reluctant to work along the lines of this scenario, and preferred to discuss the questions raised internally without participation of an external party.

As an alternative scenario the KCE proposed to come to the location of the Board meeting, where KCE researchers would be available outside the meeting room during the discussions of the Board to answer potential additional queries about our questions.

A second alternative was finally chosen considering the conditions set by the president of Fenier-Fabir. The option was to let the president of Fenier-Fabir send out a questionnaire to a number of people, collect the answers and send the original answers to KCE.

The questionnaire and accompanying letter (see appendix to this chapter) for the participants was developed by KCE. The letter explained the objectives and the reason for the survey and explained that the presidents of the organizations were expected to respond to the questions as representatives of their members and present the points of view of their individual members.

The questionnaire and letter were sent to the president of Fenier-Fabir in the first week of September to allow sufficient time for preparation of the discussion. The questionnaires were sent out by the president after the Board meeting took place. KCE asked in an accompanying mail to distribute the questionnaire to all members of the Board of Fenier-Fabir (see appendix to this chapter).

Even after asking the explicit question to the president of Fenier-Fabir, it still remains unclear to us to whom the questionnaire was eventually sent: whether it was sent to several patient organizations, only one patient organization, the members or one member of the Board of Fenier-Fabir and whether it was sent to president(s) of the patient organization(s) only that responded as representatives of the members of their organization or also to individual patients.

7.4 RESULTS

This section reports on the results of the survey. No other information sources have been used in this section.

7.4.1 Methodological problems

Twelve questionnaires were returned to KCE through the intermediary of the president of Fenier-Fabir. A number of major problems from a methodological point of view were noticed that jeopardized the usability and reliability of the responses:

- The lay-out of the questionnaire has apparently been changed. From the completed questionnaires received it appeared that the accompanying letter had been removed and a front page had been added. One questionnaire mentioned Fenier-Fabir as author of the questionnaire, where the other questionnaires mentioned "KCE".
- It appeared that the questionnaires were not filled out independently from each other. There were sets of questionnaires with very similar responses to all of the questions: identical word choice, structure of sentences etc. Two "sets" could be identified: one set with 4 questionnaires and one with 5 questionnaires. The remaining 3 questionnaires seem to have been completed independently by individual patients answering from their personal experience.
- Two questions (related to the advantages and disadvantages of each dialysis modality and the relative importance of each of these advantages and disadvantages for the choice between modalities) were only answered by 3 respondents, all three of them being respondents answering from their personal perspective as patients.

First, the fact that the accompanying letter appeared to have been removed before the questionnaire was sent out is a major problem from a methodological point of view, since crucial information on the aims and scope of the questions was removed.

Second, the interdependency between answers to the questionnaires made it impossible to apply standard techniques for the analysis of qualitative data. Because of the interdependency between the answers, serious questions can be raised about the validity and reliability of the responses.

7.4.2 Reported issues by patients

Taking into account all these methodological flaws we present the general viewpoints as reported in the questionnaires with the clear disclaimer, however, that we do not consider this part of the study as a reliable representation of patient-related issues as perceived by Belgian patients.

7.4.3 Information

Currently, information on different dialysis modalities is first provided by the nephrologist and the pre-dialysis team of the hospital. Patients sometimes also receive information from other patients (e.g. during visits to the dialysis centre) and patient associations. One patient, who was already on dialysis treatment for a long time, stated that when she started her chronic treatment, she received her information mainly from the nephrologist. The choices were much more limited at that time; the information was therefore limited to hospital HD and –to a much more limited extent- home HD.

The information provided by the nephrologist and the pre-dialysis team is in general considered accurate. It gives some idea of the impact of the treatment on daily life, although the real impact is only felt once the treatment has started.

The written information consists of an extensive education bundle containing information on all aspects of the dialysis treatment modalities, sample issues of the journal *Horizon*, published by Fenier-Fabir, and leaflets. Some hospitals also organize visits to the dialysis centre and some hospitals also provide a DVD with relevant information and testimonies of patients. Information and contact details addresses of patient organizations are provided. Patients can contact such organization if they want.

Patients consider the leaflets combined with the information given face-to-face by the physician and others, including other patients, to be very useful. Oral information gives them the opportunity to ask additional questions or clarifications. The information provided is considered accurate and sufficient by most patients. Some patients prefer to get additional information once they have started their treatment as well as regular updates of the information.

7.4.4 Choice between dialysis modalities

According to the responses received, patients can in most cases explicitly choose between dialysis modalities. A patient who is already on dialysis for a long time stated that at the time she started her treatment, the options were limited to hospital HD and home HD. Some reluctance from the nephrologist was felt by this patient to present home HD as a treatment option. If for medical reasons a choice between dialysis modalities is not possible, reasons are explained to the patient.

Most patients consider the time they have for making a decision about their treatment modality sufficient, although some patients note that time is always too short for this kind of important decisions.

Most but not all respondents considered the support provided by health care professionals for choosing between treatment modalities sufficient. People stating that the support was not sufficient gave no further explanation.

The choice of treatment seems to be mainly determined by on the one hand the expected flexibility (PD and home HD) and on the other hand the security it provides (hospital HD). According to the respondents, active, younger patients or students tend to chose initially for PD, home HD or evening or night HD. This is confirmed by the findings in chapter 4.

Professional arrangements are also an important determinant for the choice of the dialysis modality, e.g. whether patients can obtain a special working statute that allows them to perform their dialysis treatment at work or have a flexible working schedule. We should note that this may apply only to the professionally active patient population. Chapter 4 showed that only 1 in 3 patients on chronic dialysis treatment are younger than 65 years of age and thus could be part of this population.

The advantages and disadvantages of each dialysis modality are weighed to determine the final preference for one dialysis modality or another. This weighing is very patient specific and depends on the patient's character and attitude (e.g. ability to take responsibility for own treatment) and social status (e.g. living alone, with a partner or with adult children).

Frequent reasons for switching from PD to HD are peritonitis and the feeling of continuously being busy with the treatment and having no single day off. Switches from HD to PD are mentioned as being less frequent. They can occasionally occur if patients start on acute dialysis and can still make a choice at the moment dialysis becomes chronic. According to one respondent, a reason for switching from HD to PD could be the lack of privacy in the sometimes crowded dialysis centres.

7.4.5 Advantages and disadvantages of different dialysis modalities

The advantages and disadvantages of the different dialysis modalities, as reported in the questionnaires, are presented in Table 75.

Table 75: Reported advantages and disadvantages of different dialysis modalities from the patients' point of view

Advantages	Disadvantages
<u>Home dialysis modalities (PD, Home HD)</u> - Flexibility (adaptation of treatment schedule to professional activities, social life, family life, holidays) - Responsibility over own treatment - Autonomy - Leaving the hospital environment - Costs of installation of equipment and material costs borne by the dialysis centre - Hospital can be contacted in case of an emergency - No transportation - Less strict diet (PD)	- Less security - Not every patient is eligible - Availability of informal caregiver highly desirable - Disease and treatment are more prominently present in the home environment - Special premise for treatment required - Patient must be able to contact the dialysis centre in case of an emergency - Less social contacts - Extra out-of-pocket costs (e.g. electricity and water) - Difficult treatment procedure - No treatment free days (PD)
<u>Satellite HD</u> - Being in charge of own treatment - Secure environment with adequate professional support - Flexibility (flexible treatment hours) allows to maintain family, professional and social life - Contact with other patients	- Transportation to the satellite centre
<u>Hospital HD</u> - Surveillance by a competent team - No responsibility over own treatment - Reduction of risks related to treatment (treatment failure, contamination risk) - Treatment frequency limited to three times per week and duration to 4 hours, treatment free days in-between - Secure environment - Availability and accessibility of an entire care team (physician, nurses, social worker, dietician) - Easy access to other health care services (e.g. ergotherapy) - No hospital facilities needed at home (family not confronted with disease and treatment all the time) - Social contacts with other patients	- Transportation: time, effort and cost - Patient is less implicated in his treatment - Exposition to risk of nosocomial infections

7.4.6 Support in case of home dialysis treatments

Support to patients on home dialysis treatments can be provided by the informal caregiver, the home nursing services and the dialysis centre.

In general, respondents value the support of the informal caregiver (partner, adult children), although some respondents state that the support by an informal caregiver is useless, because the treatment is too complicated. In the answers we distinguished responses that were related to the technical support and responses related to the psychological support. Moreover, we made a distinction between PD and home HD. Informal caregivers seem most important for the psychological support and motivation of PD patients, although limited technical support is often also needed from the informal caregiver (e.g. emptying the heavy dialysis bags). For home HD informal caregiver support is thought to be indispensable both for the technical and for the psychological aspects. Providing support to the home dialysis treatment is thought to be burdensome for the informal caregiver.

Some but not all patients need professional support, provided by home nursing services.

7.4.7 Financial issues

Although the reimbursement system for dialysis covers many costs related to the dialysis treatment, patients report that they still have to bear important costs themselves. These costs may be directly related to the dialysis treatment but also to the treatment of co-morbidities.

Respondents report that the patients' out-of-pocket costs related to hospitalization can be high, especially for patients without hospitalization insurance. At the start of chronic dialysis treatment, all patients are hospitalized: hospital HD patients for the creation of the AV fistula, PD patients for the insertion of the PD catheter and for training. Once ambulatory dialysis has started, patients may require additional hospitalizations related to complications or co-morbidities (see also chapter 4). The out-of-pocket costs related to the treatment of co-morbidities (diabetes, cardiovascular diseases), which are common in dialysis patients, may be important.

In addition, patients report co-payments for some medications or costs for other pharmaceutical products (e.g. ointments, bandages, special nutrition), clinical biology (is reported to be relatively high for hospital HD), honorarium fees for ambulatory consultations or consultations in the hospital, physiotherapy etc. Other costs patients might have to bear are costs of prostheses that are not or only partially reimbursed. Although all of these individual cost items might have a relatively small cost per unit, the sum of them may become considerable compared to the patients' income.

Patient costs specifically related to PD are storage costs for PD fluids, home adaptation costs to prepare a room for the treatment, and waste management. The bags with the dialysis fluid create additional waste. The empty fluid bags can be put in the regular bin bags of the municipality but induces as such a cost of additional bin bags. Some patients can dispose of the empty dialysis fluid bags in their local container park.

Patient costs specifically for home HD include building adaptation costs (bathroom, bedroom and treatment room), electricity and water.

Patient costs specific for hospital or satellite HD include out-of-pocket payments for transportation to and from the dialysis centre. Several patients argue that the reimbursement for transportation is insufficient and has not followed the increasing prices of transportation. The results presented in chapter 4 confirm that the most important out-of-pocket costs for patients related to ambulatory dialysis are for transport to and from the dialysis centre.

Patients also report opportunity costs, i.e. the cost of not being able to keep a full time job and the problem of finding or keeping a job.

7.5 PSYCHOSOCIAL CONSIDERATIONS

Respondents had the opportunity to provide any additional information they considered important from a dialysis patient's point of view. Some psychosocial considerations were raised.

A general comment was that the disease and treatment are heavy to bear. It is hard to cope with the dietary restrictions and the constraints experienced every day. Dialysis patients do not always feel well understood by the general public. The general public is insufficiently aware of the disease and may therefore avoid ESRD patients. As a consequence patients risk becoming isolated. Moreover, simple social activities may become problematic, e.g. going to a restaurant with friends is difficult because of the complicated diet patients have to adhere to.

The professional caregivers perfectly master the treatment technically. However, the psychological aspects seem less well understood. Without a partner, the treatment seems even more difficult to bear. Patients feel that they live thanks to a machine. Dialysis not only impacts upon the life of the patient but also upon the life of their family members. They are hampered in their activities and bear part of the costs.

Some patients also struggle with the financial consequences of their treatment. Out-of-pocket costs might sometimes be high. Moreover, they often have to stop their professional activities or have to work part time, which reduces their level of income. Some respondents criticize the way in which invalidity is assessed and that it takes the limitations a patient on chronic dialysis experiences insufficiently into account. After HD, for instance, patients may experience headaches, loss of strength and dizziness and feel ill. Moreover, they have to be careful for bleedings and cannot perform heavy work. In these circumstances it may be difficult to work for some patients.

7.6 CONCLUSION

7.6.1 Our survey

Despite the problems encountered during the development of the methodology for this part of the study, a few conclusions can be drawn with respect to specific patient-related issues in chronic dialysis treatment.

ESRD and chronic dialysis treatment have a profound impact on patients' life. Consequences of the disease and treatment relate to the technical aspects of the treatment as well as psychosocial aspects.

Patients receive both oral and written information on the dialysis modalities before the start of their chronic dialysis treatment. They generally consider the information accurate but desire a regular update or refreshing of information after their treatment has started.

Patients are able to choose their dialysis modality if this is medically feasible. Home dialysis modalities are mainly chosen for the flexibility they offer, while hospital and satellite HD are mainly chosen for the security they provide. Having social support at home seems to be an important determinant for choosing home dialysis, but it is not a sufficient determinant. Even patients with social support at home might prefer hospital HD or satellite HD. The final choice of a patient depends heavily on his preferences. The weighing of the advantages and disadvantages of each dialysis modality is highly patient dependent.

The availability of an informal caregiver seems important for the psychological support of the patient, motivation and, to a limited extent, the technical aspects of the treatment procedure.

Patients report important out-of-pocket costs related to hospitalizations, clinical biology, transportation to the dialysis centre, medication and other pharmaceutical products, prostheses and honorarium fees for consultations.

Finally, ESRD and dialysis has an impact on the patients' psychosocial functioning: they sometimes feel isolated and not well understood by the general public and are constrained in their social activities. The activities of patient associations through which patients get in touch with other patients are highly valued by the respondents.

7.6.2 Previous studies

Relatively few studies have been performed on decision-making support for ESRD patients. A recent literature review, including 40 studies on factors influencing patient involvement in decisions about ESRD treatment, found that studies about decision-making needs of ESRD patients mainly focussed on the choice between dialysis modalities and health care professional's provision of information about the decision, and less on the decisional conflict and support of patients in the decision-making process.[66] While many patients want to participate in the decision about their dialysis modality, they may experience a decisional conflict when weighing the pros and cons of each of these options. There seems to be a gap in the knowledge about patient decision aids and implementation of shared decision-making in order to support ESRD patients in making a choice.

According to this literature review, factors influencing decisions related to ESRD treatment include interpersonal relationships (e.g. opinions of family and providers), trust in providers, preservation of current well-being, normality and quality of life (e.g. concerns about impact on daily living), need for control, being personally responsible. A Canadian study of 197 ESRD patients included in the review identified age-related differences in preferences for involvement in decision-making. Older participants in general preferred their health care team to make the decision for them. Younger patients preferred to be involved in the decision making process and therefore contact more often their nurses and other renal patients. Opinions of family members had a greater influence on the dialysis modality chosen by older patients than on the dialysis modality chosen by younger patients.[66]

The findings of our limited survey are in agreement with the findings of a Danish qualitative study on the patients' views regarding the advantages and disadvantages of dialysis modalities, problems experienced and patient involvement in the choice of modality. In contrast to our study, that study followed the standards for good qualitative research. The findings were, however, very similar to ours. Table 76 summarizes the findings of the study by Lee et al., including the findings from literature described by the same authors[56]

Table 76: Patients' views and literature findings regarding the advantages and disadvantages of different dialysis modalities*

	Focus group participants[56]		**Literature findings: advantages**
	Advantages	**Disadvantages**	
Hospital HD	Security (known professionals carrying out the treatment), freedom from illness at home and on dialysis-free days, socializing (mainly with staff)	Transport time, fixed time in dialysis (no flexibility in extent or time of dialysis), limitations to holidays	Dialysis-free days, having others do the dialysis while the patient sleeps, reads, etc. Good for patients who are uncertain about ability to dialyze without direct supervision or have limited space at home.
Satellite HD	No waiting time when starting a dialysis session, possible flexibility in extent and time of dialysis	Transport time, limited flexibility in extent and time of dialysis, limitations to holidays	Greater flexibility with respect to choice of day, time and frequency
Home HD	No transport, greater flexibility, better social life, possibility of work, dialysis at night means	Takes up space, technical problems and noise, limitations to holidays	Flexibility with respect to choice of time and frequency, less time consumption, no

	that days are free		transport, possibility for doing other things (watch TV, use PC, read, sleep, etc.) while on dialysis
CAPD	No transport, greater flexibility, better social life, possibility of work, possible to take equipment on holiday	PD bags are heavy and both full bags, used bags and other equipment takes up a lot of space	Flexibility, possibility of night treatment, greater self-care and autonomy, privacy, no transport, possibilities for work. Good for patients fearing needles but considerations related to body image
APD	As for CAPD plus dialysis at night means that days are free	As for CAPD plus technical problems and noise	
PD with nursing support	As for APD plus security (known professionals carrying out the treatment)	As for APD plus dependence on community health nurses	Improves the lifestyle for the frail and the elderly by avoiding travelling to the HD unit three times weekly. Allows patients to remain on PD in their own environment even though they have become dependent on a caregiver

* Table slightly adapted from Lee et al.[56] to make the terms used for dialysis modalities consistent with terms used in this report

As for the factors influencing the choice, similar elements were raised in our survey as in the Danish focus group interviews: flexibility and independence, sense of security, transport, maintenance of normal life. Hospital HD patients felt that dialysis-free days and a home life free of illness were advantageous. On dialysis-free days, hospital HD and satellite HD patients did not consider themselves ill until the next dialysis session, which is considered a way to normalize their everyday life. Hospital HD was found to be exhausting, however, for some patients as well as for their relatives. For some older, frail dialysis patients, PD with nursing support seemed to be the only way to have a life at all. For home dialysis patients avoiding the hospital could be a way of normalizing everyday life. Home dialysis patients considered 24-hour telephone access for advice and instructions crucial to ensure the sense of security.

The Danish survey included some additional elements, such as physical space and noise, involvement of family members in the decision making about the choice of the dialysis modality and pre-dialysis education. The dialysis machines, bags and other equipment take a lot of space. Moreover, home HD makes noise, which may be considered annoying to patients and their relatives. Involving the family in the decision making is found to be important because the dialysis also fills a large part of their lives, be it hospital HD, satellite HD or home dialysis.[56]

The Danish study also included pre-dialysis patients in its focus group interviews. The conclusion was that a move towards greater numbers of patients on out-of-hospital dialysis requires greater focus on pre-dialysis patients. In literature, not only information, but also counselling was found to be an independent predictor for choosing PD over HD. Timing of the dialysis education is important. Patients should therefore be referred early enough to the nephrologist. The focus group participants noted that it takes time to adjust to being a chronic dialysis patient and to find ways of handling the restrictive and time-consuming treatment.[56]

In conclusion, the choice of a dialysis modality depends on medical indications but also, to a large extent, on patients' expectations and wishes regarding daily life and lifestyle. Timely pre-dialysis education is likely to influence the effectiveness and acceptability of alternative dialysis modalities.

Key points

- **The respondents to the survey consider the information provided before the start of dialysis accurate and sufficient.**
- **Patients are given the opportunity to choose between dialysis modalities if medically feasible. Time given to make a decision is in general considered sufficient by the respondents to this survey.**
- **Home dialysis modalities are mainly chosen because of the flexibility they offer, while dialysis in a centre is chosen because it is performed in a more secure environment. Social support from a partner or informal caregiver is an important but not sufficient condition for choosing a home dialysis modality.**
- **Dialysis patients bear out-of-pocket costs for hospitalizations, transportation, medication and other pharmaceutical products, clinical biology and consultations. Combined with not being able to continue to work full-time, dialysis might have an important financial impact for some patients.**
- **According to the literature, pre-dialysis education and counseling are important to allow participants to adjust to their chronic disease and treatment and make an informed decision. Pre-dialysis education might influence the effectiveness and acceptability of alternative dialysis modalities.**

8 DISCUSSION AND CONCLUSIONS

8.1 EPIDEMIOLOGY OF RENAL REPLACEMENT THERAPY IN BELGIUM

The prevalence of patients on renal replacement therapy (RRT, including dialysis and renal transplantation) has been growing with about 5% per year during the last decade in Belgium. The incidence of new RRT patients grew at a rate of about 2% per year. The highest growth rate in prevalence of RRT is observed in patients aged 65 years and older. In 2007, 27% of the patients on RRT were older than 75 years of age. Compared to other countries (Austria, Finland, Sweden, the Netherlands and UK), the mean age of patients on RRT in Belgium is relatively high.

Glomerulonephritis is the most important cause of ESRD in prevalent patients in Belgium but between 2002 and 2007 renal vascular disease has become a more important cause of ESRD than diabetic nephropathy. Renal vascular disease and diabetic nephropathy are the most important major causes of ESRD in incident patients.

Patients on the transplant waiting list on average wait less long for a transplant in Belgium than in some other European countries. Also the proportion of patients transplanted pre-emptively is relatively high in Belgium, compared to some other European countries (almost 3.6% compared to 0.23% in Germany and 1.37% in the Netherlands). The use of kidneys from living donors, on the contrary, is relatively low in Belgium compared to other countries (10% in Belgium compared to 55% in the Netherlands, 22% in Germany and 18% in Austria).

The analysis of NIHDI reimbursements over the years 2003 until 2006 showed that hospital HD is still the main dialysis modality, with 68% of patients mainly being treated through this modality. Satellite HD accounted for 13% and PD for 9%. The remainder of patients were treated with mixtures of those modalities and a small proportion with home HD. The dialysis patients in Belgium are relatively old. Two-thirds are 65 and above and almost 40% are aged 75 and over. Moreover, the proportion of elderly people seems to be increasing.

The proportion of patients on PD as compared to hospital HD in Belgium is lower than in many other countries. The proportion of patients on PD in the total number of patients on dialysis was relatively stable between 2004 and 2006 but declined in 2007. However, the proportion of patients treated with satellite HD grew steadily over the years. This led to an increase in the total proportion of patients treated with alternative dialysis modalities (PD+satellite HD) from 28% in 2002 to 34% in 2007.

There are relatively few data on dialysis patient profiles in Belgium. The appropriateness of the observed distribution of patients between dialysis modalities is therefore hard to interpret. However, it can be assumed that a combination of factors is responsible for the lower proportion of PD in Belgium compared to other countries. Some of these might be:

- The higher average age of dialysis patients in Belgium compared to other countries combined with the fact that older patients are more often treated by hospital HD than by alternative dialysis modalities;
- The shorter time on the transplant waiting list in Belgium compared to other countries combined with the fact that relatively more PD and satellite HD patients than hospital HD patients are on the transplant waiting list;
- The balance between costs and revenues from PD in Belgium compared to the balance between costs and revenues from satellite HD (see 8.2);
- Patients' characteristics and preferences.

8.2 RELATIVE EFFECTIVENESS OF DIALYSIS MODALITIES

There is no evidence of a difference in survival, morbidity or quality of life specifically '*due to*' different dialysis modalities (hospital HD, satellite HD, home HD, APD and CAPD). Differences in survival were observed but almost all studies were observational and subject to several potential biases, especially confounding by indication. Based on our analysis of NIHDI reimbursements over the years 2003 until 2006, we can conclude that the survival of patients on chronic dialysis is poor. Overall four-year survival is less than 40% and this survival was worst for hospital HD patients, and better for patients on PD and satellite HD. We should be careful, however, to interpret these results with caution, as they are most probably caused by confounding by indication that influenced the initial choice of dialysis modality.

Good pre-dialysis patient care is, according to the experts, crucial for the quality of care provided to patients with renal failure. There seems to be a need for Belgian clinical guidelines for the choice and management of treatment and follow-up of patients with impaired kidney function. Clinical practice guidelines might improve the clinical decision making process related to starting dialysis treatment in patients and the appropriate allocation of patients to dialysis modalities. Patient information and preparation is an important part of pre-dialysis work-up, but as in most cases, it is finally the patient who has to be able to make an informed decision. According to the respondents to our survey on patient perceptions about dialysis treatment and choices, the information provided before the start of dialysis is technically accurate and sufficient and enough time is given to make a choice between the dialysis modalities.

8.3 COSTS OF DIALYSIS MODALITIES FROM A HOSPITAL PERSPECTIVE

According to the literature, PD is in general less costly than any type of HD from the hospital's point of view. In our cost simulation model, however, we found satellite HD to be less costly than PD from a hospital's point of view. The yearly total cost of hospital HD was estimated at €48 800 per patient. Satellite HD was estimated to cost on average about €38 300 per year per patient and PD without nursing support about €44 200 per patient per year (in values for 2006). The estimates corresponded to €313 per hospital HD session, €245 per satellite HD session and €850 per week PD without nursing support. For comparison NIHDI reimbursements were in 2006 on average €367.37 per hospital HD session, €250.98 per satellite HD session and €699.51 per week for PD without nursing support. The higher cost of PD compared to satellite HD is explained mainly by the relatively high cost of consumables for PD. About 90% of the consumable costs of PD are related to the dialysis fluids.

According to our model, that estimated the short term costs and revenues of different dialysis modalities from the perspective of the hospital, profits of a hypothetical dialysis programme with 100 patients and with average costs are maximized if 28% of the patients are treated with alternative dialysis treatments. In 2006 the average proportion of PD and satellite HD in total dialysis (excluding home HD) was 33.72% in Belgium.

It should be noted that costs from the hospital's perspective are not a good indicator for the societal costs of dialysis. For the purpose of this study, however, i.e. to compare the costs of different modalities with the revenues for the hospital, costs needed to be estimated from the narrow perspective of the hospital. From a policy point of view it is important to notice, however, that dialysis patients still bear important out-of-pocket costs related to hospitalization, transport, medication and other pharmaceutical products, clinical biology and consultations. Respondents to our survey on patient perceptions about dialysis treatment perceive these extra costs as a heavy financial burden, a feeling that is reinforced by patients' no longer being able to work full-time.

8.4 COST-EFFECTIVENESS OF DIALYSIS MODALITIES

Assessing the cost-effectiveness of different dialysis modalities is not very relevant, because for most patients there are either medical indications or contra-indications – although these are mainly based on expert opinion and consensus- and, more importantly, explicit patient preferences for or against specific modalities. Dialysis modalities can hence not be considered to be perfect substitutes. It would not make sense to conclude, for instance, that PD is the most cost-effective dialysis modality and should therefore always be first choice. There are two main reasons for this. First, PD is usually not a treatment option that can be maintained over a patients' lifetime. Most PD patients will have to switch to HD at some moment in time, unless they receive a kidney transplant or die. Second, the incremental cost-effectiveness ratio (ICER) of any dialysis modality cannot be determined because no unbiased data comparing the outcomes of different dialysis modalities are available. Almost all available data on the effectiveness of dialysis modalities are based on inherently biased observational data that are confounded by indication. Some studies have assessed the relative cost-effectiveness of starting on a specific dialysis modality and found that, for patients having a choice, starting on PD seems to be more cost-effective than starting on HD. However, these economic models are also based on the same biased observational data and hence suffer from similar weaknesses as the observational studies on clinical effectiveness.

8.5 COSTS AND REIMBURSEMENT

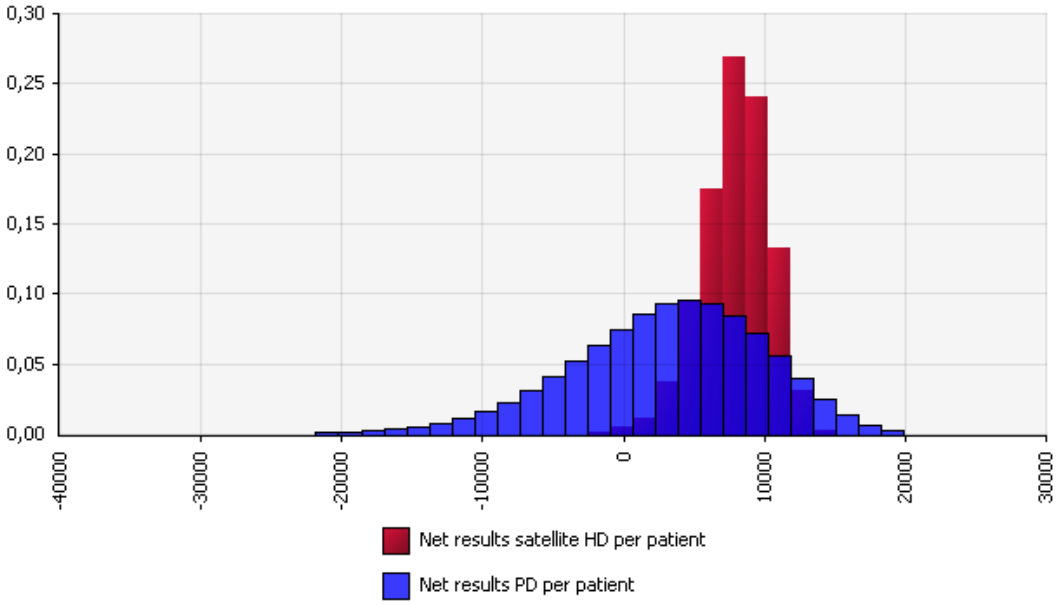
In Belgium, the financing mechanisms for the different dialysis modalities have been modified several times since 1995. The explicit goal of the modifications was to introduce incentives for the use of PD and satellite HD. The importance of the relationship between the reimbursement of dialysis and the hospital per diem price has been reduced over the years but some historical relation has always been maintained. A stepwise reimbursement mechanism was created. Currently, four levels of proportions of alternative dialysis modalities determine the amount of the incremental lump sum a hospital receives per hospital HD session: <5%, 5-10%, 10-25%, 25-35% and >35% alternative dialysis modalities, corresponding to incremental lump sums of €31.41, €76.96, €100.43, €105.95 and €119.27 respectively (baseline lump sum is €42,10 in 2009).

The NIHDI reimbursements of a complete year of dialysis treatment are the highest in case of hospital HD, followed by Home HD and PD with nursing support and then by APD, satellite HD, home HD without nursing support and finally PD without nursing support. In terms of costs for the hospital, however, PD without nursing support is more expensive than satellite HD and hence the cost-revenue balance is better for satellite HD than for PD.

The modifications in the financing mechanisms indeed had an effect on the use of alternative dialysis modalities, especially on the use of satellite HD. PD also increased but not to the same extent. This can be explained by the balance between costs and revenues of PD versus satellite HD from the hospital's point of view. For the incremental lump sum of hospital HD only the proportion of alternative dialysis modalities is important, no requirements are imposed on the distribution between satellite HD and PD within the alternative dialysis modalities. Hence the hospital can increase its proportion of alternative dialysis modalities by increasing either the number of PD patients or the number of satellite HD patients. Obviously, it is easier to increase the number of satellite HD patients than to increase the number of PD patients. According to our external experts, patients who would normally be treated with hospital HD are increasingly being treated with satellite HD, without loss of quality of care (see also 8.6). Although these patients might have a higher cost profile (e.g. because they need relatively more nursing support during their dialysis treatment than other satellite HD patients) it might, from an economic point of view still be more interesting for hospitals to carry these additional costs in satellite centres than to keep patients in the hospital HD setting. Increasing the proportion of patients on alternative dialysis modalities might bring them in a higher reimbursement level for all hospital HD patients treated in their dialysis centre.

The incremental revenue thus generated may outweigh the incremental cost of treating more patients with satellite HD. In other words, increasing the proportion of satellite patients by moving patients from hospital HD to satellite HD may be economically interesting without violating the rules of good medical practice. Moreover, treating hospital HD patients in a satellite unit may also be a practical solution for patients, e.g. if the patient lives closer to a satellite unit than to the main hospital dialysis unit. Figure 55 presents the histogram of the net results (revenues – costs) of PD and satellite HD per patient, resulting from the cost-revenues simulation described in chapter 5. Negative values on the X-axis represent deficits. The distributions are related to uncertainty and variability in costs between Belgian dialysis centres. The probability that satellite HD offers a positive net value (i.e. profit) is clearly higher than the probability that PD offers a positive net value, as reflected by the larger part of the PD histogram being in the negative values of the X-axis. In addition it may also be more feasible from a medical point of view.

Figure 55: Relative frequency of net results generated per PD patient and per satellite HD patient*



* Negative values on the X-axis represent deficits associated with PD or satellite HD.

The reimbursement system for dialysis was designed to increase the use of alternative dialysis modalities. However, the built-in financial incentive mechanisms induce a clear "financial optimum" for alternative dialysis modalities, meaning in particular that profits can be maximised if 28% of the patients are treated with alternative dialysis modalities. Increasing the proportion of patients on alternative dialysis modalities above this threshold would reduce total profits. Knowing the optimal proportion of patients on alternative dialysis modalities from a financial point of view, the crucial question becomes to what extent this corresponds with the medically optimal proportion of alternative dialysis modalities. Are the financing mechanisms providing the right incentives to provide optimal choice of treatment to each of the patients? Any financing system should be neutral with respect to the choice of treatment modalities and not provide a financial incentive in favour or against one treatment or another.

The reimbursement mechanisms for hospital HD differ from those of satellite HD, PD and home HD. Whereas the nephrologist receives a honorarium fee per hospital HD session, no honorarium fee is paid for satellite HD, home HD or PD (except for consultations). If nephrologists do not receive part of the lump sums paid for alternative dialysis modalities (e.g. after negotiations with the hospital management), a financial disincentive towards these alternative dialysis modalities might, de facto, be created.

For all dialysis modalities, the reimbursement is variable: a lump sum is paid per dialysis session or per week of dialysis treatment. This purely variable financing mechanism contrasts, especially for hospital HD, with the cost structure of dialysis. Some costs are fixed or semi-fixed (e.g. equipment, buildings and some overhead costs). Ideally, a financing system should follow as much as possible the cost structure of a service. If not, financial incentives might unintentionally or intentionally be created for or against specific services. For example, transplantation of a hospital HD patient potentially implies an important loss of income for small centres. As there are no waiting lists of chronic dialysis treatment, the empty seat might not be filled immediately.

Nursing support provided to patients dialysed at home is paid directly to the dialysis centre that follows-up the patient. There are indications that the reimbursement to home nursing services by hospitals sometimes differs between hospitals, although the lump sums include a fixed fee for nursing support.

Transport to and from the dialysis centre by other means than public transport is reimbursed by the NIHDI at €0.25 per km. This amount has not been indexed and has remained constant since 1985, although the prices of private transport have increased. Some sickness funds provide additional reimbursement for transport as part of their complementary health insurance. The formulas used, however, are highly variable across sickness funds.

8.6 LICENSING OF DIALYSIS CENTRES

The Belgian law defines the norms and criteria for the accreditation of dialysis centres. In 2007 there were 53 accredited dialysis centres, 49 of which also had one or more satellite dialysis units in or outside the main hospital building. To obtain accreditation, a dialysis centre must treat at least 40 ESRD patients, including the transplanted ESRD patients. A dialysis centre must have one nephrologist or specialist in internal medicine working full-time at the hospital to supervise the centres' activities. For every 4000 hospital HD sessions performed by the centre, the centre must have an additional nephrologist or specialist internal medicine. Per 500 hospital HD sessions the centre must employ one full-time equivalent (FTE) nurse or technician and at least 50% of the nurses should have a special qualification in dialysis nursing. However, an officially recognized qualification of dialysis nurse does not exist in Belgium. Hospitals therefore train their nursing staff in-house.

Experts believe that some of the accreditation norms are outdated and are no longer applicable in daily practice. Some hospitals, for instance, also treat hospital HD patients in satellite dialysis units with apparently equal quality of care although the criteria for personnel are less stringent for satellite units than for hospital HD units. The permanent presence of a nephrologist is for instance not required in satellite units, while this is obligatory in hospital HD units. To guarantee good quality of care, hospital management might be prepared to increase the human resources in satellite units, for reasons explained in 8.5. However, because the majority of the patients treated in a satellite unit will have a lighter health profile, it is not necessary to comply with the staff requirements imposed for hospital HD units to guarantee equal quality of care. Based on the analyses of the patients' age and mortality, we concluded that the profile of patients treated in satellite units is still clearly different from the profile of patients treated in hospital HD units: patients treated in satellite units are on average younger and have a much higher four-year survival rate, which suggests they are in a better general condition. It can therefore not be concluded from this observation that the norms imposed for hospital HD are too strict. In the cost analysis, on the other hand, we found that nephrologists spend on average about 60% of their time to the ambulatory dialysis programme. The number of "bodies" on the work floor fits with the legal requirements, but taking into account the time devoted to the dialysis programme, it might be concluded that the required number of nephrologists per 4000 hospital HD sessions might be relatively high.

8.7 NIHDI EXPENDITURES

Mean total NIHDI expenditures for dialysis per patient year (including also reimbursements for transportation and all dialysis-related honoraria) were, in 2008, about €57 000 for hospital HD, €41 000 for PD, €40 000 for satellite HD and €40 000 for home HD. The increasing number of patients on RRT in general and on dialysis in particular has led to an increase of total NIHDI expenditures for RRT. A marked increase in the growth rate of the NIHDI expenditures for dialysis was observed since 2001, the year when the stepwise incremental lump sums for hospital HD, in function of three levels of the proportion of patients on alternative dialysis modalities, was introduced. After the financing reforms in 2003, where more levels of alternative dialysis percentages were introduced to define the incremental lump sums for hospital HD, the growth rate increased even further. The increase was especially noticed in the lump sum expenditures. The proportion of honoraria expenditures in total expenditures declined slightly over the years, moving from about 40% in 2004 to about 38% in 2008.

Between 2003 and 2006, total NIHDI reimbursements for all health care for those patients rose from € 386 million to more than € 450 million (without per-diem hospital costs). Considering these total NIHDI reimbursements, hospital HD is overall the most expensive dialysis modality. Total reimbursements for patients on peripheral dialysis modalities such as satellite or home HD and PD are markedly lower. For the pure NIHDI reimbursements, ambulant dialysis is responsible for 60% of expenses. Hospital and one-day clinics come second with 30%. However, inclusion of the hospital per-diem price would add an additional 40% on the total reimbursement expenses.

Patient out-of-pocket expenses are difficult to measure since they are influenced by income, reimbursement *'statute'* (OMNIO, MAF), and additional financial benefits from mutualities. Moreover, per-diem hospital prices and some other expenses such as over the counter drugs are not included in the registration. However, taking into account those limitations, the patient's out-of-pocket expenses directly linked to partly reimbursed health care rose from € 6.1 million in 2003 to € 7.6 million in 2006. In contrast with the reimbursement data, we did not identify important or consistent differences between dialysis modalities in the patient out-of-pocket expenses. However, the patients aged 45-64 consistently incurred higher out-of-pocket expenses.

In the longitudinal analyses we noticed that overall health care reimbursement expenses start to rise in the months preceding the onset of dialysis, reach a peak during the months after dialysis initiation and show a slow decrease afterwards.

8.8 INTERNATIONAL COMPARISON

The number of patients per nephrologist in Belgium is generally comparable to that in the 11 countries included in our international comparison. Home HD is not frequently used in any of those countries, although countries with large distances between hospitals and patients' homes (e.g. New Zealand, Australia) use home dialysis modalities more frequently.

Factors impeding patients' choice between dialysis modalities include late referral, limited geographical access to dialysis facilities, governmental planning of the number and location of dialysis units or established clinical practice patterns.

ESRD treatment is almost fully reimbursed in most countries. Consequently, patient co-payments for ambulatory dialysis are usually low and mostly limited to the costs of some medications.

Cost containment measures implemented by other countries include the introduction of a flat rate lump sum reimbursement per treatment week independent of the dialysis modality but dependent on age and co-morbidity of the patient, less frequent indexing of reimbursement fees, limitation of the reimbursement of medications to medications with proven effectiveness and cost-effectiveness, moving from dose-based reimbursement to lump sum reimbursement of medications, limitation of the number of dialysis centres and penalties in case of excessive medication prescription.

8.9 PATIENT-RELATED ISSUES

Patient preferences are an important determinant for the choice of the dialysis modality. Home dialysis modalities are mainly chosen because of the flexibility and independence they offer, while dialysis in a centre is chosen because it is performed in a more secure environment. Social support from a partner or informal caregiver is an important but not sufficient condition for choosing a home dialysis modality. A crucial determinant for choosing a dialysis modality is maintenance of a normal life. This may be a reason for choosing hospital HD (being free of illness on dialysis-free days) or home dialysis (being able to work). In literature, emphasis is put on the importance of pre-dialysis education and counselling for allowing patients and their relatives to make an informed decision about their treatment modality. Pre-dialysis education is believed to have an influence on the effectiveness and acceptability of alternative dialysis modalities. Literature also suggests that there are medical contra-indications for alternative dialysis modalities in about 36% of the patients with ESRD. The remainder of the patients should get a real choice of treatment modality, supported by information and counselling of both the patient and his/her relatives. In Belgium, patients consider the information they receive from their nephrologist, the pre-dialysis teams and patient organisations as appropriate and sufficient, although counselling after the treatment has started is still considered important.

8.10 LIMITATIONS OF THE REPORT

This study focussed on adult ESRD patients. Children were not included in the assessment.

The main weakness of the cost study presented in this report is the low response rate from hospitals to the cost survey. This created a large variability in some of the cost estimates. Variability was taken into account by means of the technique of Monte Carlo simulations. This allowed reflecting the variability in the analysis results.

From the perspective of the dialysis centres, it might have been a strategic decision not to participate in a cost survey. This might have two effects: either the policy makers will use the results of the analysis based on limited data or they will take an ad hoc decision. The quality and acceptance of the results of policy preparing research would be much better if providers would participate and collaborate with this kind of research.

The assessment of patient-related issues has been hampered by many practical inconveniences. The standards for good qualitative research could not be followed. However, the findings from our limited survey in patients and patient organisations were similar to those reported previously in international literature.

8.11 FINAL CONCLUSION

This HTA focussed on chronic dialysis treatment, its organisation, financing and patient-related issues in Belgium. End-stage renal disease is a life-threatening condition that has a significant impact on patients' and their families' life. Renal transplantation is the treatment of choice for ESRD. Patients who cannot be transplanted or have to wait for a kidney transplant are treated by means of one of the different dialysis modalities: hospital HD, satellite HD, home HD, CAPD or APD. Dialysis is an expensive treatment, both for society and for patients. With the population growing older the dialysis population increases. This increases the financial burden of ESRD. As for all health care interventions, it is important to reflect about measures to ensure that dialysis patients receive appropriate care at an acceptable cost. We hope this HTA provides useful information for the development of such a policy for ESRD treatment.

9 APPENDICES

APPENDIX TO CHAPTER 2

LITERATURE SEARCH FOR CLINICAL AND ECONOMIC ASPECTS OF CHRONIC DIALYSIS

INDICATIONS FOR CHRONIC DIALYSIS

Date	18/06/2007
Database	MEDLINE Pubmed
Date covered	1950 to Present
Search Strategy	1) Search "Kidney Failure, Chronic"[Mesh] AND "Renal Replacement Therapy"[Mesh] 32771 2) Search "contraindications"[Subheading] OR "Patient Selection"[Mesh] 38284 3) Search #1 and #2 380 4) Search #3 Limits: Publication Date from 2000/01/01 to 2007/06/18 209 5) Search #4 Limits : Humans 209 6) Search #5 Limits : English, French, German, Italian, Spanish, Dutch 205
Note	

Date	18/06/2007
Database	Cochrane Database of systematic review via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 16 2) MeSH descriptor Renal Replacement Therapy explode all trees 23 3) #1 and #2 10 4) "MeSH descriptor Patient Selection explode all trees 1 5) indication in Title, Abstract or Keywords or indications in Title, Abstract or Keywords or contraindication in Title, Abstract or Keywords or contraindications in Title, Abstract or Keywords 94 6) #4 or #5 95 7) #3 and #6 0
Note	

Date	18/06/2007
Database	DARE via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 32 2) MeSH descriptor Renal Replacement Therapy explode all trees 50 3) #1 and #2 15 4) "MeSH descriptor Patient Selection explode all trees 42 5) indication in Title, Abstract or Keywords or indications in Title, Abstract or Keywords or

	contraindication in Title, Abstract or Keywords or contraindications in Title, Abstract or Keywords 15 6) #4 or #5 56 7) #3 and #6 0
Note	

Date	18/06/2007
Database	The Cochrane Central Register of Controlled Trials via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 1972 2) MeSH descriptor Renal Replacement Therapy explode all trees 5015 3) #1 and #2 1253 4) "MeSH descriptor Patient Selection explode all trees 1177 5) indication in Title, Abstract or Keywords or indications in Title, Abstract or Keywords or contraindication in Title, Abstract or Keywords or contraindications in Title, Abstract or Keywords 4994 6) #4 or #5 6139 7) #3 and #6 14 8) #7, from 2000 to 2007 7
Note	

Date	18/06/2007
Database	HTA via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 20 2) MeSH descriptor Renal Replacement Therapy explode all trees 60 3) #1 and #2 15 4) "MeSH descriptor Patient Selection explode all trees 19 5) indication in Title, Abstract or Keywords or indications in Title, Abstract or Keywords or contraindication in Title, Abstract or Keywords or contraindications in Title, Abstract or Keywords 70 6) #4 or #5 81 7) #3 and #6 2
Note	

Date	19/06/2007
Database	Embase
Date covered	1974 to present
Search Strategy	#1. 'chronic kidney failure'/exp 42,408 #2. 'kidney transplantation'/exp 73,569 #3. 'renal replacement therapy'/exp 7,084 #4. #2 OR #3 79,805 #5. #1 AND #4 6,482 #6. 'treatment contraindication'/exp 8,144 #7. 'patient selection'/exp 40,692

	#8. 'treatment indication'/exp 57,788 #9. #6 OR #7 OR #8 99,939 #10. #5 AND #9 146 #11. #5 AND #9 AND [2000-2007]/py 109 #12. #5 AND #9 AND [2000-2007]/py AND [humans]/lim 109 #13. #5 AND #9 AND [2000-2007]/py AND [humans]/lim AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim OR [italian]/lim OR [spanish]/lim) 105 #14. #5 AND #9 AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim OR [italian]/lim OR [spanish]/lim) AND [humans]/lim AND [2000-2007]/py AND [embase]/lim 55
Note	

FACTORS INFLUENCING CHOICE

Date	18/06/2007
Database	MEDLINE Pubmed
Date covered	1950 to Present
Search Strategy	1) Search "Kidney Failure, Chronic"[Mesh] AND "Renal Replacement Therapy"[Mesh] 32771 2) Search ("Patient Satisfaction"[Mesh] OR "Physician-Patient Relations"[Mesh] OR "Quality of Life"[Mesh] OR "Socioeconomic Factors"[Mesh]) 349410 3) Search #1 and #2 1335 4) Search #3 Limits: Entrez Date from 2000/01/01 to 2007/06/18 682 5) Search #4 Limits : Humans 682 6) Search #5 Limits : English, French, German, Italian, Spanish, Dutch 639 7) Search #6 Not Editorial[ptyp] OR Letter[ptyp]) 617
Note	

Date	18/06/2007
Database	Cochrane Database of systematic review via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 16 2) MeSH descriptor Renal Replacement Therapy explode all trees 23 3) #1 and #2 10 4) MeSH descriptor Patient Satisfaction explode all trees 14 5) MeSH descriptor Physician-Patient Relations explode all trees 3 6) MeSH descriptor Quality of Life explode all trees 38 7) MeSH descriptor Socioeconomic Factors explode all trees 7 8) #4 or #5 or #6 or #7 61 9) #3 and #8 0
Note	

Date	18/06/2007
Database	Dare via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 32 2) MeSH descriptor Renal Replacement Therapy explode all trees 50 3) #1 and #2 15 4) MeSH descriptor Patient Satisfaction explode all trees 61 5) MeSH descriptor Physician-Patient Relations explode all trees 26 6) MeSH descriptor Quality of Life explode all trees 147 7) MeSH descriptor Socioeconomic Factors explode all trees 61 8) #4 or #5 or #6 or #7 268 9) #3 and #8 1
Note	

Date	18/06/2007
Database	The Cochrane Central Register of Controlled Trials via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 1972 2) MeSH descriptor Renal Replacement Therapy explode all trees 5015 3) #1 and #2 1253 4) MeSH descriptor Patient Satisfaction explode all trees 4001 5) MeSH descriptor Physician-Patient Relations explode all trees 537 6) MeSH descriptor Quality of Life explode all trees 5589 7) MeSH descriptor Socioeconomic Factors explode all trees 2983 8) #4 or #5 or #6 or #7 12287 9) #3 and #8 59 10) #8, from 2000 to 2007 36
Note	

Date	18/06/2007
Database	HTA via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 20 2) MeSH descriptor Renal Replacement Therapy explode all trees 60 3) #1 and #2 15 4) MeSH descriptor Patient Satisfaction explode all trees 22 5) MeSH descriptor Physician-Patient Relations explode all trees 12 6) MeSH descriptor Quality of Life explode all trees 24 7) MeSH descriptor Socioeconomic Factors explode all trees 14 8) #4 or #5 or #6 or #7 71

	9) #3 and #8 0
Note	

Date	19/06/2007
Database	Embase
Date covered	1974 to present
Search Strategy	#1. 'chronic kidney failure'/exp 42,408 #2. 'kidney transplantation'/exp 73,569 #3. 'renal replacement therapy'/exp 7,084 #4. #2 OR #3 79,805 #5. #1 AND #4 6,482 #6. 'patient satisfaction'/exp 44,096 #7. 'treatment refusal'/exp 1,875 #8. 'doctor patient relation'/exp 59,864 #9. 'quality of life'/exp 104,051 #10. 'socioeconomics'/exp 98,802 #11. #6 OR #7 OR #8 OR #9 OR #10 293,627 #12. #5 AND #11 310 #13. #5 AND #11 AND [2000-2007]/py 182 #14. #5 AND #11 AND [2000-2007]/py AND [humans]/lim 180 #15. #5 AND #11 AND [2000-2007]/py AND [humans]/lim AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim OR [italian]/lim OR [spanish]/lim) 155 #16. #5 AND #11 AND [2000-2007]/py AND [humans]/lim AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim OR [italian]/lim OR [spanish]/lim) AND [embase]/lim 72
Note	

POSSIBLE COMPLICATIONS

Date	18/06/2007
Database	MEDLINE Pubmed
Date covered	1950 to Present
Search Strategy	1) Search "Kidney Failure, Chronic"[Mesh] AND "Renal Replacement Therapy"[Mesh] 32771 2) Search "complications "[Subheading] OR "adverse effects "[Subheading] OR "Life Expectancy"[Mesh] OR "Mortality"[Mesh] OR "Fatal Outcome"[Mesh] 2484467 3) Search #1 and #2 15958 4) Search #3 Limits: Entrez Date from 2000/01/01 to 2007/06/18 5987 5) Search #4 Limits : Humans 5974 6) Search #5 Limits : English, French, German, Dutch 5327 7) Search #6 Not Editorial[ptyp] OR Letter[ptyp]) 1203
Note	

Date	18/06/2007
Database	Cochrane Database of systematic review via Cochrane Library
Date covered	1993 to Present

Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 16 2) MeSH descriptor Renal Replacement Therapy explode all trees 23 3) #1 and #2 10 4) complication in Title, Abstract or Keywords or complications in Title, Abstract or Keywords or adverse effects in Title, Abstract or Keywords or side effects in Title, Abstract or Keywords or mortality in Title, Abstract or Keywords 2580 5) MeSH descriptor Life Expectancy explode all trees 1 6) MeSH descriptor Mortality explode all trees 37 7) #4 or #5 or #6 2580 8) #3 and #7 8 9) #8, from 2000 to 2007 8
Note	

Date	18/06/2007
Database	Dare via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 32 2) MeSH descriptor Renal Replacement Therapy explode all trees 50 3) #1 and #2 15 4) complication in Title, Abstract or Keywords or complications in Title, Abstract or Keywords or adverse effects in Title, Abstract or Keywords or side effects in Title, Abstract or Keywords or mortality in Title, Abstract or Keywords 2031 5) MeSH descriptor Life Expectancy explode all trees 2 6) MeSH descriptor Mortality explode all trees 200 7) #4 or #5 or #6 2044 8) #3 and #7 10
Note	

Date	18/06/2007
Database	The Cochrane Central Register of Controlled Trials via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 1972 2) MeSH descriptor Renal Replacement Therapy explode all trees 5015 3) #1 and #2 1253 4) complication in Title, Abstract or Keywords or complications in Title, Abstract or Keywords or adverse effects in Title, Abstract or Keywords or side effects in Title, Abstract or Keywords or mortality in Title, Abstract or Keywords 146697 5) MeSH descriptor Life Expectancy explode all trees 60 6) MeSH descriptor Mortality explode all trees 6041 7) #4 or #5 or #6 147190

	8) #3 and #7 800 9) #8, from 2000 to 2007 434
Note	

Date	18/06/2007
Database	HTA via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 20 2) MeSH descriptor Renal Replacement Therapy explode all trees 60 3) #1 and #2 15 4) complication in Title, Abstract or Keywords or complications in Title, Abstract or Keywords or adverse effects in Title, Abstract or Keywords or side effects in Title, Abstract or Keywords or mortality in Title, Abstract or Keywords 205 5) MeSH descriptor Life Expectancy explode all trees 0 6) MeSH descriptor Mortality explode all trees 12 7) #4 or #5 or #6 209 8) #3 and #7 0
Note	

Date	19/06/2007
Database	Embase
Date covered	1974 to present
Search Strategy	#1. 'chronic kidney failure'/exp 42,408 #2. 'renal replacement therapy'/exp 7,084 #3. 'kidney transplantation'/exp 73,569 #4. #2 OR #3 79,805 #5. #1 AND #4 6,482 #6. 'mortality'/exp 330,687 #7. 'life expectancy'/exp 15,068 #8. 'survival rate'/exp 68,190 #9. 'fatality'/exp 61,837 #10. complication*:ab,ti 438,251 #11. 'adverse effect':ti,ab 13,987 #12. 'adverse effects':ab,ti 54,538 #13. 'side effect':ab,ti 18,495 #14. 'side effects':ab,ti 131,091 #15. #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 1,016,883 #16. #5 AND #15 1,330 #17. #5 AND #15 AND [2000-2007]/py 737 #18. #5 AND #15 AND [2000-2007]/py AND [humans]/lim 727 #19. #5 AND #15 AND [2000-2007]/py AND [humans]/lim AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim OR [italian]/lim OR [spanish]/lim) 643 #20. #5 AND #15 AND [2000-2007]/py AND [humans]/lim AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim OR [italian]/lim OR [spanish]/lim) AND [embase]/lim 323
Note	

ECONOMIC ASPECTS OF CHRONIC DIALYSIS

Date	18/06/2007
Database	MEDLINE Pubmed
Date covered	1950 to Present
Search Strategy	1) Search "Kidney Failure, Chronic"[Mesh] AND "Renal Replacement Therapy" [Mesh] 32774 2) Search ("Economics"[Mesh:NoExp]) 24741 3) Search ("Costs and Cost Analysis"[Mesh]) 128629 4) Search ("Value of Life"[Mesh:NoExp]) 4828 5) Search ("Economics, Dental" [Mesh:NoExp]) 1722 6) Search ("Economics, Hospital"[Mesh]) 14722 7) Search ("Economics, Medical"[Mesh:NoExp]) 6720 8) Search ("Economics, Nursing"[Mesh:NoExp]) 3742 9) Search ("Economics, Pharmaceutical" [Mesh:NoExp]) 1760 10) Search #27 or #29 or #30 or #31 or #32 or #34 or #37 or #39 172842 11) Search econom*[Title/Abstract] OR cost[Title/Abstract] OR costs[Title/Abstract] OR costly[Title/Abstract] OR costing[Title/Abstract] OR price[Title/Abstract] OR prices[Title/Abstract] OR princing[Title/Abstract] OR pharmacoeconomic*[Title/Abstract] 267715 12) Search expenditure*[Title/Abstract] NOT energy[Title/Abstract] 11276 13) Search value *1 money 335 14) Search budget* 16464 15) Search #11 or #12 or #13 or #14 284152 16) Search #10 or #15 370747 17) Search #1 and #16 1276 18) Search #17 Limits: Publication Date from 2000/01/01 to 2007/06/18 579 19) Search #18 Limits: Humans 576 20) Search #19 Limits: English, French, German, Italian, Spanish, Dutch 562 21) Search #55 NOT (Editorial[ptyp] OR Letter[ptyp]) 530
Note	

Date	18/06/2007
Database	Cochrane Database of systematic review via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 16 2) MeSH descriptor Renal Replacement Therapy explode all trees 23 3) #1 and #2 10 4) MeSH descriptor Economics explode all trees 17 5) (cost):ti,ab,kw or (costs):ti,ab,kw or (costing):ti,ab,kw or (economic):ti,ab,kw or (pharmacoeconomic):ti,ab,kw 520 6) #4 or #5 521

	7) #3 and #6 2
Note	

Date	18/06/2007
Database	Dare via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 32 2) MeSH descriptor Renal Replacement Therapy explode all trees 50 3) #1 and #2 15 4) MeSH descriptor Economics explode all trees 330 5) (cost):ti,ab,kw or (costs):ti,ab,kw or (costing):ti,ab,kw or (economic):ti,ab,kw or (pharmacoeconomic):ti,ab,kw 309 6) #4 or #5 366 7) #3 and #6 3
Note	

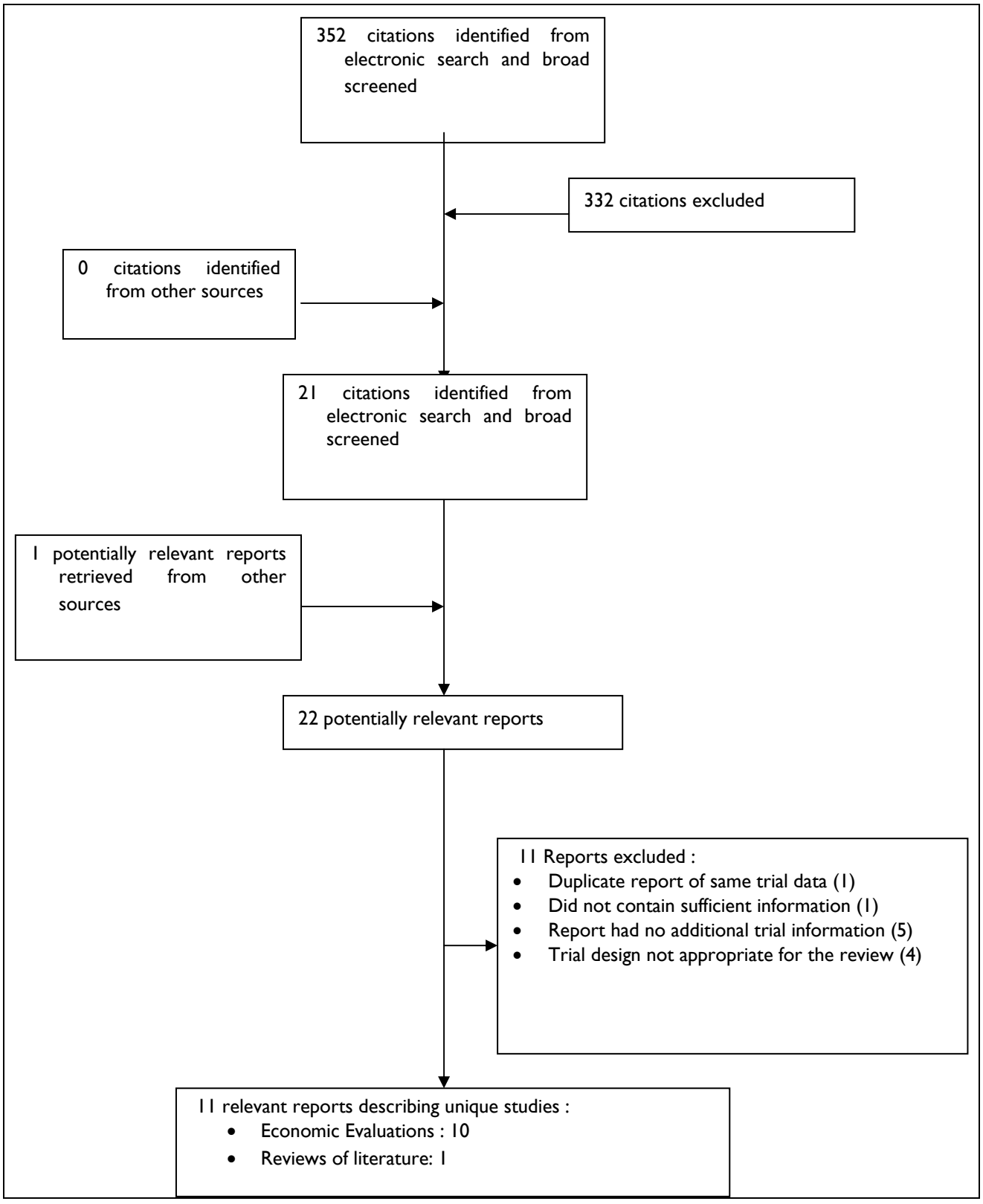
Date	18/06/2007
Database	The Cochrane Central Register of Controlled Trials via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 1972 2) MeSH descriptor Renal Replacement Therapy explode all trees 5015 3) #1 and #2 1253 4) MeSH descriptor Economics explode all trees 4918 5) (cost):ti,ab,kw or (costs):ti,ab,kw or (costing):ti,ab,kw or (economic):ti,ab,kw or (pharmacoeconomic):ti,ab,kw 12742 6) #4 or #5 13410 7) #3 and #6 48 8) #7, from 2000 to 2007 27
Note	

Date	18/06/2007
Database	HTA via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 20 2) MeSH descriptor Renal Replacement Therapy explode all trees 60 3) #1 and #2 15 4) MeSH descriptor Economics explode all trees 916 5) (cost):ti,ab,kw or (costs):ti,ab,kw or (costing):ti,ab,kw or (economic):ti,ab,kw or (pharmacoeconomic):ti,ab,kw 1013 6) #4 or #5 1054 7) #3 and #6 5
Note	

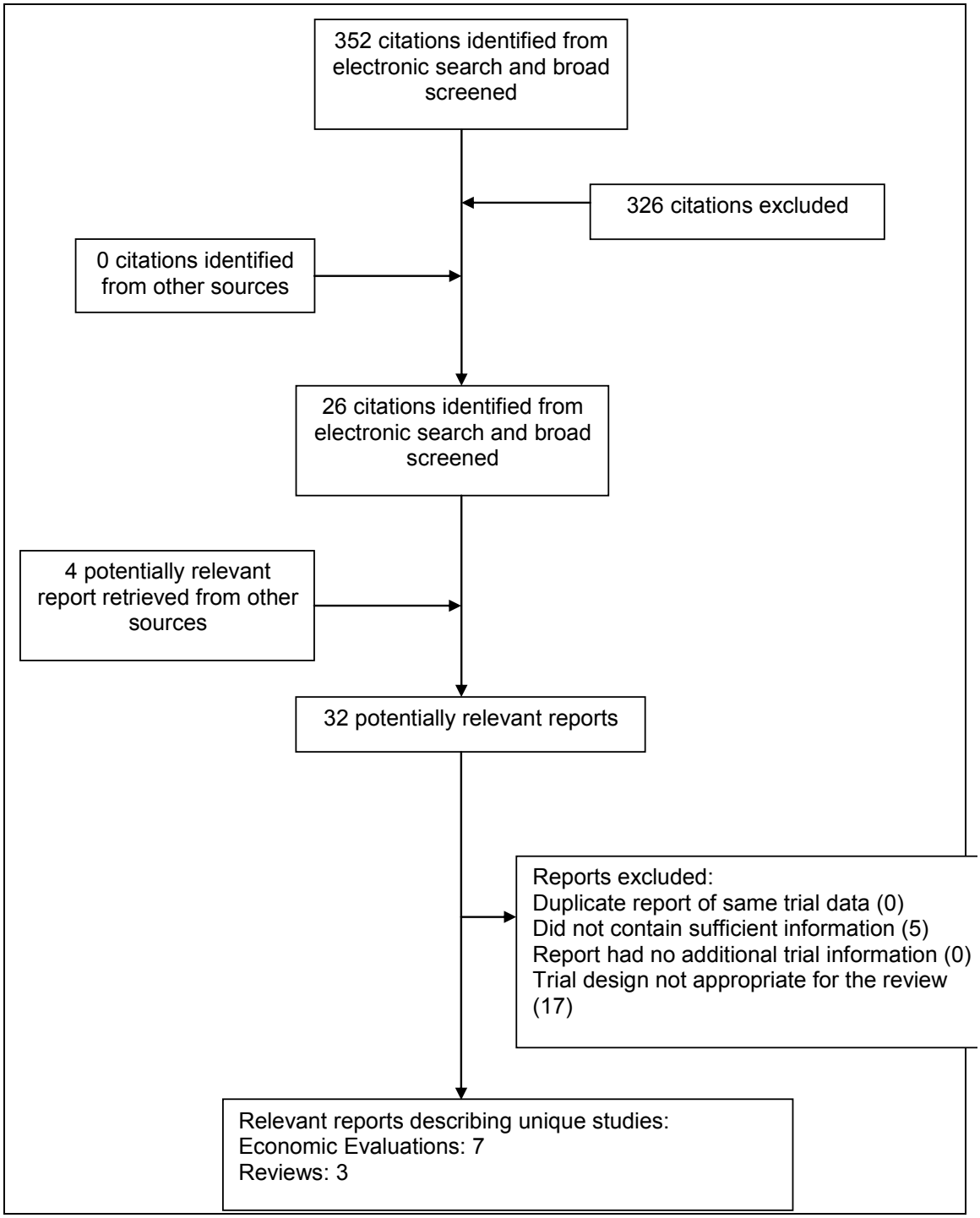
Date	18/06/2007
Database	NHS EED via Cochrane Library
Date covered	1993 to Present
Search Strategy	1) MeSH descriptor Kidney Failure, Chronic explode all trees 237 2) MeSH descriptor Renal Replacement Therapy explode all trees 451 3) #1 and #2 168 4) MeSH descriptor Economics explode all trees 18064 5) (cost):ti,ab,kw or (costs):ti,ab,kw or (costing):ti,ab,kw or (economic):ti,ab,kw or (pharmacoeconomic):ti,ab,kw 18400 6) #4 or #5 18890 7) #3 and #6 148 8) #7, from 2000 to 2007 104
Note	

Date	19/06/2007
Database	Embase
Date covered	1974 to present
Search Strategy	#1. 'chronic kidney failure'/exp 42,408 #2. 'renal replacement therapy'/exp 7,084 #3. 'kidney transplantation'/exp 73,569 #4. #2 OR #3 79,805 #5. #1 AND #4 6,482 #6. 'health economics'/de 25,132 #7. 'economic evaluation'/exp 125,778 #8. 'health care cost'/exp 119,532 #9. 'pharmacoeconomics'/exp 106,257 #10. #6 OR #7 OR #8 OR #9 295,797 #11. econom*:ab,ti OR cost:ab,ti OR costs:ab,ti OR costly:ab,ti OR costing:ab,ti OR price:ab,ti OR prices:ab,ti OR pricing:ab,ti OR pharmacoeconomic*:ab,ti 321,263 #12. expenditure*:ab,ti NOT energy:ab,ti 13,603 #13. 'value *2 money' 612 #14. budget*:ab,ti 14,478 #15. #11 OR #12 OR #13 OR #14 336,250 #16. #10 OR #15 515,337 #17. #5 AND #16 407 #18. #5 AND #16 AND [2000-2007]/py 226 #19. #5 AND #16 AND [2000-2007]/py AND [humans]/lim 223 #20. #5 AND #16 AND [2000-2007]/py AND [humans]/lim AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim OR [italian]/lim OR [spanish]/lim) 213 #21. #5 AND #16 AND [2000-2007]/py AND [humans]/lim AND ([dutch]/lim OR [english]/lim OR [french]/lim OR [german]/lim OR [italian]/lim OR [spanish]/lim) AND [embase]/lim 82
Note	

FLOW DIAGRAM FOR COST STUDIES



FLOW DIAGRAM FOR COST-EFFECTIVENESS STUDIES



UPDATE SEARCH OCTOBER 2009

The aim of this update search was to cover the period between original searches at the start of this research project in mid 2007 and the more recent literature that appeared just before the publication of this report. The search was conducted at the end of October 2009 and to allow for potentially missed publications in 2007 we broadened the search to the years 2007 untill 2009. This update search was deliberately broad and no specific selection criteria were applied concerning relevance for indication, choice, complications or economic aspects as were described in the initial search (see previous). The aim was to find the most recent information on all topics addressed in this report.

CRD

#1	MeSH Renal Replacement Therapy EXPLODE 1	780
#2	MeSH Kidney Failure, Chronic EXPLODE 1 2 3 4	405
#3	MeSH Renal Dialysis EXPLODE 1 2	457
#4	#1 or #2 or #3	919
#5	#1 or #2 or #3 RESTRICT YR 2007 2009	221

Pubmed

#1	Search (renal dialysis [Mesh]) AND systematic[sb]	06:08:24	690
#2	Search (kidney failure, chronic [Mesh]) AND systematic[sb]	06:10:40	655
#3	Search (renal replacement therapy [Mesh]) AND systematic[sb]	06:11:09	1158
#4	Search #1 or #2 or #3	06:11:41	1468
#5	Search ("2007"[Publication Date] : "3000"[Publication Date]) AND #1 or #2 or #3#	06:12:24	428

EMBASE

Search on emtree term 'renal replacement therapy', a term added to EMTREE in 2006. Registered synonyms are dialysis therapy; dialysis treatment; kidney dialysis; kidney replacement therapy; kidney support; renal dialysis; renal support

'renal replacement therapy'/exp AND ([cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim) AND [humans]/lim AND [abstracts]/lim AND [2007-2010]/py:

140 hits

Cochrane collaboration

#1	MeSH descriptor **Renal Replacement Therapy** explode all trees	6510
#2	MeSH descriptor **Kidney Failure, Chronic** explode all trees	2738
#3	MeSH descriptor **Renal Dialysis** explode all trees	3554
#4	(#1 OR #2 OR #3), from 2007 to 2009	72

Filtering and sifting based on duplicates and title

After automatic elimination of duplicates this resulted in 719 individual references. A further manual elimination of duplicates resulted in 638 different references. A further sifting based on title and sometimes abstract resulted in 31 potentially valuable references that were retrieved. Twenty-one articles were discarded while 10 selected articles were valuable for one or more of the research topics addressed in this chapter.

DATA EXTRACTION SHEETS

Systematic Reviews and meta analyses

DATA EXTRACTION FORM
Systematic review / Meta-analysis

STUDY ID	SHORT REF
….	….

TITLE

Rabindranath KS, Adams J, Ali TZ, MacLeod AM, Vale L, Cody J, Wallace SA, Daly C. Continuous ambulatory peritoneal dialysis versus automated peritoneal dialysis for end-stage renal disease. Cochrane Database Syst Rev. 2007 Apr 18;(2):CD006515.[10]

SPONSOR	CONFLICT OF INTEREST
The Cochrane Collaboration	….

OBJECTIVES

To assess the comparative efficacy of continuous ambulatory peritoneal dialysis (CAPD) versus automated peritoneal dialysis (APD) for end-stage renal disease.

SEARCH STRATEGY

Cochrane Register of Controlled Trials, MEDLINE and other databases
Most recent search May 2006

SELECTION CRITERIA

RCTs comparing CAPD and APD

RESULTS

Three trials (139 patients) were included. APD did not differ from CAPD with respect to mortality, risk for peritonitis, switching from PD to other dialysis modality, hernias, PD fluid leaks, PD catheter removal rate of hospital admissions. One study found a difference in peritonitis rate in favour of APD.

AUTHORS' CONCLUSION

APD has no significant advantages over CAPD in terms of clinical outcomes.

COMMENTS REFEREE

The 3 studies included in this review are of small size. Most recent RCT dates from 1999.

CONCLUSION

DATA EXTRACTION FORM
Systematic review / Meta-analysis

STUDY ID	SHORT REF
….	….

TITLE

Vale L, Cody J, Wallace S, Daly C, Campbell M, Grant A, Khan I, Donaldson C, MacLeod A. Continuous ambulatory peritoneal dialysis (CAPD) versus hospital or home haemodialysis for end-stage renal disease in adults. *Cochrane Database of Systematic Reviews* 2003, Issue 1. Art. No.: CD003963. DOI: 10.1002/14651858.CD003963.pub2.[11]

SPONSOR	CONFLICT OF INTEREST
The Cochrane Collaboration	….

OBJECTIVES

To assess the benefits and harms of CAPD versus hospital or home haemodialysis for adults with CKD stage V.

SEARCH STRATEGY

Cochrane Register of Controlled Trials, MEDLINE and other databases
Most recent search January 2004

SELECTION CRITERIA

RCTs and quasi-RCTs comparing CAPD to hospital or home haemodialysis for adults with CKD stage V

RESULTS

Only one trial published in abstract form was located. There was no statistical difference in death or quality adjusted life years at 2 years between peritoneal and haemodialysis.

AUTHORS' CONCLUSION

Insufficient data to allow conclusions to be drawn about the relative effectiveness of CAPD compared with haemodialysis.

COMMENTS REFEREE

The study was eventually published:
Korevaar JC, Feith GW, Dekker FW, van Manen JG, Boeschoten EW, Bossuyt PM, Krediet RT; NECOSAD Study Group. Effect of starting with hemodialysis compared with peritoneal dialysis in patients new on dialysis treatment: a randomized controlled trial.Kidney Int. 2003 Dec;64(6):2222-8.
Only 38 patients were randomised in this study.

CONCLUSION

DATA EXTRACTION FORM
Systematic review / Meta-analysis

STUDY ID	SHORT REF
….	….

TITLE

Haemodiafiltration, haemofiltration and haemodialysis for end-stage kidney disease (review)[90]

SPONSOR	CONFLICT OF INTEREST
National Kidney Research Fund (UK)	National Kidney Research Fund (UK)

OBJECTIVES

To compare convective modes of extracorporeal RRT (HF,HDF or AFB) with HD and to establish if any of these techniques is superior to each other in patients with ESKD.

SEARCH STRATEGY

MEDLINE (1966-2006), EMBASE (1980-2006), Cochrane Central Register of Controlled Trials (CENTRAL, in The Cochrane Library issue 2, 2006) and CINAHL (1872-2006).
Authors of included studies were contacted, reference lists of identified RCTs and relevant narrative reviews were screened.

SELECTION CRITERIA

RCTs comparing HF, HDF, AFB and HD for ESKD were included. Trials enrolling any patient undergoing RRT for ESKD were included

RESULTS

Description of studies (n = 20):

- RCTs

The quality of the primary studies was variable. The quality check list was:

- Allocation concealment
- Blinding
- Intention-to-treat analysis
- Completeness of follow-up

Outcomes:

- All-cause mortality.
- Hypotension (including incidence of symptomatic hypotension, hypotension requiring treatment and post-dialysis hypotension, recorded as number of treatment sessions at which event occurred or number of patients experiencing one or more episodes of these complications).
- Symptoms (headaches, nausea, vomiting) occurring during or afterHDtreatment sessions (recorded as number of treatment sessions at which event occurred or number of patients experiencing one or more episodes of headaches, nausea or vomiting).
- Number of dialysis treatments associated with "any adverse symptoms" or number of patients experiencing "any adverse symptoms".
- Number of dialysis sessions thatwere stopped early, independent of cause.
- Quality of life measures: any instrument used
- Number of hospital admissions and length of stay (as indicators of morbidity and resource use).
- Number of patients with amyloid-related complications.
- Change of dialysis modality (from HF or HDF or AFB or HD to PD).
- Adequacy of dialysis (assessed by Kt/V values or by urea reduction ratio (URR)).
- End of treatment blood pressure (measured as systolic, diastolic or mean arterial pressure, in mm Hg).
- End of treatment 2-microglobulin levels (mg/L).

AUTHORS' CONCLUSION

- We were unable to demonstrate whether convective modalities (either HF, HDF or AFB) have significant advantages over HD with regard to clinically important outcomes of mortality, dialysis-related hypotension and hospitalisation. More adequately-powered good quality RCTs assessing clinically important outcomes (mortality, hospitalisation, quality of life) are needed.

It is therefore not possible to recommend the use of one modality in preference to the other.

COMMENTS REFEREE

- A table with the duration of the study is lacking.

13 studies are cross over. As the authors removed data from cross over in the meta-analyses, I am not sure that this meta-analysis was necessary. A simple description would be sufficient.

CONCLUSION

DATA EXTRACTION FORM
Systematic review / Meta-analysis

STUDY ID	SHORT REF
….	….

TITLE

Mowatt G, Vale L, Perez J, Wyness L, Fraser C, MacLeod A, Daly C and Stearns SC. Health Technology Assessment 2003; vol 7 n°2.Mowatt R., Vale L, MacLeod A. [9] and Systematic review of the effectiveness of home versus hospital or satellite unit hemodialysis for people with end-stage renal failure. Intl J of Technology Assessment in Health Care, 2004; 20:3, 258-268. [33]

SPONSOR	CONFLICT OF INTEREST
NHS	None

OBJECTIVES

To assess the effectiveness of home hemodialysis versus hospital or satellite unit hemodialysis.

SEARCH STRATEGY

MEDLINE 1966 to October 2001; EMBASE 1980 to week 46 2001;
HealthSTAR 1975 to December 2000; CINAHL 1982 to October 2001; PREMEDLINE (Ovid) 13 December 2001;
BIOSIS (Edina) 1985 to October 2001; Science Citation Index (Web of Science) 1981 to October 2001;
The Cochrane Library (Issue 3 2001); National Research Register (Issue 3 2001);
Health Management Information Consortium (HCN) 1979 to 2001; BL Inside (December 2001);
NLM Gateway (for HSRProj, Health Services Research Meetings and Locatorplus);
Current Controlled Trials; Clinical Trials; DH Research Findings Register; and World Wide Web. Reference

SELECTION CRITERIA

Randomized controlled trials (RCTs),
Controlled clinical trials (in which the participants are assigned to alternative forms of health care using a quasi random method, for example alternation),
Comparative observational studies (in which the participants are assigned to alternative forms of health care in a nonrandom manner), and
Systematic reviews comparing home with hospital or satellite hemodialysis for people with ESRF.

RESULTS

Description of studies (n = 27):

- 4 systematic reviews
- 1 RCT
- 22 comparative observational studies

The quality of the primary studies and of the systematic review was variable:

- 11 studies had less than 100 participants
- socio-demographic characteristics and co-morbidities were not evenly balanced between the treatment groups
- in many studies, the intervention, particularly the equipment used and the duration and the frequency of dialysis was poorly described

Outcomes:

- Quality of life:
  - the QoL of home hemodialysis patients was higher and they were better able to engage in activities of daily living
  - 2 studies reported that home hemodialysis is less disruptive for the patient but more disruptive for their families than hospital dialysis
- Survival (Cox model)

- Lower mortality rate for home hemodialysis (versus hospital hemodialysis)
- 2 studies with contradictory results:
  - similar survival in home versus satellite hemodialysis
  - greater survival for home hemodialysis

- Other outcomes:
  - Hospitalisation: contradictory results:
    - Higher hospitalisation rate for home hemodialysis than for satellite hemodialysis, but the highest rate is observed for in-hospital
    - reduction in-hosptial days hemodialysis associated with daily or nocturnal hemodialysis
  - Employment: home HD patients were more likely to be employed
  - Technical survival: only one study,
  - Measures of anemia: higher hematocrit for patients in home hemodialysis
  - Biochemical indices of renal disease: difficult to interpret
  - Dialysis adequacy: difficult to interpret
  - Blood Pressure control: the home hemodialysis group achieved better control
  - Adverse events: better outcomes for home hemodialysis patients

AUTHORS' CONCLUSION

- Home hemodialysis was associated with better outcomes than both hospital dialysis and (more modestly so) satellite unit dialysis in most of the studies included and for almost all measures of effectiveness considered. It is unclear to what extent these findings are influenced by the selection bias.
- The extent to which the associations with better outcome are causally linked to home dialysis, however, is difficult to judge. People offered hemodialysis at home are a deliberately highly selected group. They are generally younger and with fewer comorbidities than those receiving dialysis in hospital or in satellite units.
- Another factor that makes interpretation difficult is that, in some studies, the primary comparison was actually between different durations/frequencies of hemodialysis rather than specifically comparing settings for hemodialysis.
- A new generation of home hemodialysis machines is under development. These machines should improve ease of use for those undertaking hemodialysis at home, reducing the rate of complications and also the burden of care on partners/carers.
- For those without a carer but who might otherwise be considered potentially eligible for home hemodialysis, community carers could be trained to fulfill this role.
- Further prospective comparative studies are needed on the effectiveness and cost-effectiveness of home versus satellite unit haemodialysis. Further qualitative research is also needed on the acceptability to patients and their carers/families of home haemodialysis as a form of treatment.

COMMENTS REFEREE

- The difficulty encountered in all studies is the bias in the attribution of patients to home hemodialysis
- I could not correctly appreciate the relevance and the exhaustivity of all other outcomes

CONCLUSION

Cost studies

Article	Purpose of study	Costs categories	Results
Nocturnal haemodialysis: an Australian cost comparison with conventional satellite haemodialysis.[16]	Compare the expenditures of a conventional satellite HD unit (SHDU) and a nocturnal home HD program (NHHD). The study was approved and financed by the Department of Human Services, Victoria (DHSV) to assess the financial cost benefits/deficit of NHHD in Australia. Data for 1 year (1 July 2003 – 30 June 2004) were collected from the Renal Unit in Geelong Hospital, Barwon Health, Victoria in Australia. N = 30 SHDU patients and 30 NHHD patients	• Staffing and recurrent costs o Wages (nursing, cleaner, technician) o Food o Pharmacy o Consumables o Domestic (cleaning, waste disposal…) o Energy (electricity, gas, water) o Administration o Maintenance • Fixed and estimated costs o Dialysis machine o Main reverse osmosis plant o Dialysis chair o Generator plant o Ancillary plant o Bricks and mortar	The total expenditures per patient per year are: NHHD: $A 32 392 SHDU: $A 36 284 Health services should encourage home HD because for a 30 patient cohort they could save $A 116 750
Economic evaluation of hemodialysis: implications for technology assessment in Greece.[91]	Provide an estimate of the direct cost of HD in a public hospital setting and an estimate of the loss of production for end stage renal disease (ESRD) patients. Data were collected . at the GGG NHS hospital in Athens . from a countrywide sample of 128 patients for the lost of productivity and costs to the patient and family . from national accounts (mean gross income) to compute lost production	• Direct health-care sector costs o Medical supplies o Drugs o Laboratory tests o Salaries and wages o Overhead expenses o Equipment, plant depreciation o Dialysis membrane o Concomitant drugs (EPO…) o Laboratory tests o Personnel costs o Other (Administration, laundry,	Health-care sector costs for each HD session is estimated at €189/session where: medical supplies and drugs = 53% staff remuneration = 31% overhead expenses = 6%

	due to absence from work N = 128 patients	housekeeping, technical, porterage, electricity, depreciation expenses…) • Mortality and Morbidity costs • Value of production lost due to the treatment: absence, change in type of work, premature retirement	
An operating cost comparison between conventional and home quotidian hemodialysis.[18]	Compare economic costs of short daily HD, long nocturnal HD and conventional thrice-weekly HD in Canada. A retrospective costs analysis of each patient on conventional HD during 12 months is compared with the costs after switching to quotidian HD N = 10 short daily HD patients, 12 long nocturnal HD patients and 22 conventional thrice-weekly HD patients	• Patient-measured costs o Treatment supplies o Consults and Intervention (consults, hospitalization days, emergency visits, laboratory tests) o Pharmaceuticals • Support-modeled costs o Physician fees o Machine o Water Maintenance of the home water system Strict testing • Labor costs Registered nurse labor Other labor • Biomedical engineering • Nontreatment supplies (administrative, direct overhead charges)	According to the retrospective analysis, the annual cost per patient is Can$ 77,055 for a conventional HD Can$ 91,793 for a nocturnal HD. These figures decrease to Can$ 67,281 when the patient switched to daily HD modality. Thus, the switch provokes an annual reduction of about Can$ 10,000 (-13%) and Can$ 17,000 (-19%) respectively.
Cost analysis of ongoing care of patients with end-stage renal disease: the impact of dialysis modality and dialysis access.[19]	Establish an accurate and updated itemized list of costs and resources required to treat patients with ESRD on dialysis therapy and contrast differences in resources needed for various dialysis modalities in Canada. N = 88 In-center HD patients,	• Outpatient dialysis expenses o Equipment costs (dialysis machine) o Staff (nursing, dieticians, clericals, social) o Consumables items o Reverse-osmosis water • Inpatient expenses o Nursing	Annual costs of care per patient per modality before adjusting them in function of the comorbidity are: In-center: US$ 51,252 Satellite: US$ 42,057 Home/self-care: US$ 29,961 Perit. Dial.: US$ 26,959

	31 Satellite HD patients, 9 Home/Self-care HD patients and 38 PD patients	o Laboratory o Diagnostic o Surgical (and surgical supplies) o Medications o Support staff • Outpatient nondialysis expenses o Clinic visits o Emergency room o Day surgery o Laboratory tests o Radiology o Medications (EPO, intravenous iron, others) • Physician fees	To maximize the efficiency with which care is provided to patients with ESRD, dialysis programs should encourage the use of home/self-care HD and PD.
Cost savings of home nocturnal versus conventional in-center hemodialysis.[20]	Cost comparison between Home nocturnal HD and In-center HD. A prospective descriptive costing study was performed at two centers in Toronto, Canada from 1 January 2000 to 1 March 2001. N = 33 HNHD patients and 23 IHD patients	• Staff o Nursing o Assistants o Technical personnel o Other (pharmacists, dieticians, social...) o Non-medical pers (admin. management) • Direct HD material o Consumables o Access-specific connectivity costs • Drugs • Overhead and support • Physician fees • Admission and procedures (costs for in-patients and out-patients) • Depreciation o Dialysis machine	The measured weekly costs per patient are (in year 2000 Canadian $): $ 1,322 for IHD modality $ 1,082 for HNHD modality The projected annual costs for the two modalities are $ 68,935 and $ 56,394 respectively.

		o Water treatment equipment o Training (staff and consumables used) o Laboratory tests and imaging	
The case for daily dialysis: its impact on costs and quality of life.[21]	Compare from the societal perspective the one-year direct health care costs for four HD modalities: in-center thrice-weekly dialysis; in-center short daily dialysis; at-home short daily dialysis and at-home nocturnal dialysis. Cost data were derived principally from the US Renal Data System, Centers for Disease Control and Medicare Payment Advisory Commission. N = 197	• Direct health care costs Inpatient and outpatient care Equipment (dialysis and water treatment) Hospitalization Supplies Medication (for blood pressure, EPO) Labor Physicians Nurses Laboratory technicians Other costs (training, equipment installation, maintenance costs) • Direct non-health care costs Patient travel costs • Productivity costs Lost or impaired ability to work or engage in leisure activities because of morbidity and lost economic productivity because of death.	Total annual direct costs and cost component including patient obligation per modality, per patient (in $ 1998): Conventional in-center: 68,400 Short daily in-center: 60,800 Short daily at home: 57,400 Nocturnal: 57,700 Results suggest that patients feel better and direct treatment costs could be reduced with daily dialysis.
Analysis and interpretation of cost data in dialysis: review of Western European literature (Brief record).[12]	Review critically the European literature in dialysis where cost data in caring for patients is available, and maximize information about the nature of the cost data in dialysis. Survey of published literature including an economic evaluation with cost values in Western Europe; 25 such studies were identified, described in 20 publications.	• Direct costs Operating room – Supplies and drugs – Outpatient clinic – Inpatient ward – Diagnostic – Equipment – Professional services – Transportation • Productivity costs Patient's ability to work • Intangible costs Non-financial costs (pain, suffering, fear) • Implicit costs	Costs between dialysis modalities, health care organisations and patient use of dialysis vary from country to country in important ways. Only four studies presented adequate descriptive information for dialysis costs.

		Land – Building – Equipment • Indirect cost Donated labor (time spent by patient's relatives…)	
Prospective analysis of global costs for maintenance of patients with ESRD. [92]	Analyse global costs for the management of an ESRD patient population supported with hemodialysis therapy in a satellite unit. It's a one-year prospective study (1 March 2000 to 1 March 2001). There are 4 data sources: - medical records in the dialysis unit - hospital patient accounting and medical system database - system that allow measurement of hospital costs - direct patient interviews. N = 76 patients	Hospital costs Hospital professional fees Dialysis center facility fees Dialysis center professional fees	The average cost for management of a patient with ESRD maintained with hemodialysis therapy in this setting is about $ 76,500 per patient per year in USA (South Carolina).
Cost analysis of renal replacement therapies in Finland. [59]	Perform a detailed analysis of direct health care costs of the most used renal replacement therapies (RRTs) in Finland: in-center HD, CAPD and cadaveric renal transplantation (XT). Retrospective study of the files of adults patients with ESRD who entered dialysis therapy between 1 January 1991 and 31 December 1996. Additional data from local hospitals and health centers were also collected.	Cost analysis take the perspective of service providers and the costing method determines direct health care costs associated with each treatment, including overhead costs caused by infrastructure, administration, amortization… • HD Session Salaries – Material, Supplies – Overhead costs • CAPD Day Fluid – Hoses – Protective caps – Disinfectants – Other equipment	The costs are converted from Finnish marks to US $ and the prices are those of year 1997. Mean cost per patient: - for months 1-6 HD = $ 32,566 CAPD = $ 25,504 - for months 7-12 HD = $ 26,272 CAPD = $ 24,218

	N = 138 in-center HD patients and 76 CAPD patients		- for year 2 HD = $ 54,140 CAPD = $ 45,262 - for year 3 HD = $ 54,490 CAPD = $ 49,299
Comparison of hemodialysis and peritoneal dialysis - A cost-utility analysis.[28]	Compare both health-related quality of life and costs for both HD and PD in a defined population in Sweden. The study has a societal perspective. Cost data come from the annual accounts for 1998 and are looked in relation to the number of HD sessions carried out and the number of patients receiving PD that year. Other data were obtained from a matched population by a quality-of-life questionnaire. Retrospective record study: N = 68 matched patients pairs Prospective questionnaire study: N = 21 matched patients triplets	• Direct costs Staff External activities analysis, anesthesia, X rays, consultations Activity related material pharmaceuticals, fluids, dialyzers, testing and bandage materials, chemicals and provisions Other activity costs rent, cleaning, porters and technicians, laundry, communication, administration Inpatient care Secretarial and financial costs, depreciation Transportation costs • Indirect costs Home care Lost spare time on the part of patients and relatives Lost working time on the part of patients	Costs per patient per month for HD = US$ 8,257 for PD = US$ 6,240
The marginal cost of satellite versus in-center hemodialysis.[93]	Establish the efficiencies associated with shifting resources and patients form In-center HD (ICHD) to SHD (Satellite HD unit) by finding the break-even volume (number of	• In-center Unit Variable costs Nephrologists Nursing	The financial viability of a specific-sized SHD unit is expressed in terms of break-even volume: the number of patient needed in the satellite unit such that the yearly

	patients needed) in a satellite unit such that the yearly cost of SHD treatment would be the same as ICHD treatment. For that, a cost analysis of both modalities from a societal perspective was performed. Patient volume is 10 for the SHD unit 198 for the ICHD	Other patient care Dialysis supplies Laboratory Drugs Patient travel Fixed costs Other patient care (nurse practitioner) Administration and support Operating overhead Machine and water treatment • Satellite Unit Variable costs Idem + Standby staff and Dialysis assistant Fixed costs Idem except Other patient care	costs of HD treatment would be the same in that satellite unit as in hospital. Two parts compose the total yearly cost: a fixed cost plus a variable cost. The SHD fixed costs can be fully offset if the volume of SHD patients is 7 per year. Shifting patients from ICHD to SHD can result in significant savings both to the health-care system and to patients: - SHD has lower costs for nursing and physician fees. - Mean travel costs saving of $ 12,364 per patient per year.

Dialysis modalities taken into account by the articles

	Hospital HD	Satellite HD[1]	Home HD		PD	RTX[2]
Article			**Day**	**Night**		
Peeters 2000[12]	European Literature review					
Agar 2005[16]		X		X		
McFarlane 2002[20]	X			X		
Kroeker 2003[18]	X		X	X		
Mohr 2001[21]	X		X	X		
Soroka 2006[93]	X	X				
Lee 2002[19]	X		X		X	
Salonen 2003[59]	X				X	X
Sennfalt 2002[28]	X				X	
Kaitelidou 2005[91]	X					
Ploth 2003[92]		X				

1 Low-care Haemodialysis

Cost categories taken into account by the articles

		Personnel	Medical Equipment	Consumables	Pharma	Overheads	Labo,imag.	Hospitalis.	Productivity	Surgical procedures	Travel	Training
Peeters 2000 [12]	Western Europe	X	X	X	X	X	X	X	X		X	
Agar 2005 [16]	Australia	X	X	X	X	X						
McFarlane 2002 [20]	Canada	X	X	X	X	X	X	X		X		X
Kroeker 2003 [18]	Canada	X	X	X	X	X		X				X
Mohr 2001 [21]	USA	X	X	X	X	X	X	X				X
Soroka 2005 [93]	Canada	X	X	X	X	X	X				X	
Lee 2002 [19]	Canada	X	X	X	X	X		X		X		
Salonen 2003 [59]	Finland	X	X	X	X	X	X	X		X	X	
Sennfalt 2002 [28]	Sweden	X	X	X	X	X	X	X	X		X	
Kaitelidou 2005 [91]	Greece	X	X	X	X	X	X	X	X			
Ploth 2003 [92]	USA	X						X				

Medical equipment: dialyzer and water treatment machines; Pharma = Pharmaceuticals: drugs and medication
Overhead: administration, cleaning, electricity… ; Hospitalis = hospitalisation costs
Labo,imag = laboratory tests, imaging, consultations

Population analyzed and measure's unit

	Dialysis Units	Population	Measure's unit
Agar 2005 [16]	1 hospital	30 Hospital HD patients 30 Low care HD patients	Costs per patients, per month
McFarlane 2002 [20]	2 hospitals	23 Hospital HD patients 33 Home nocturnal HD patients	Measured weekly costs, projected annual costs for health care delivery
Kroeker 2003 [18]		10 Short daily HD patients 12 Long nocturnal HD patients 22 Conventional thrice-weekly HD patients	Costs per patient-year

Mohr 2001 [21]		26 short daily HD patients 13 nocturnal HD patients	Annual direct costs of treatment for HD patients
Soroka 2005 [93]	1 hospital 1 Low care HD unit	198 Hospital HD patients 10 Low care patients	Fixed costs are expressed as a total amount for all patients; Variable costs are calculated per patient per year
Lee 2002 [19]		88 Hospital HD patients 31 Low care patients 9 Home HD patients 38 PD patients	Annual cost per patient
Salonen 2003 [59]	1 university hospital	138 Hospital HD patients 76 PD patients	Mean costs for months 1-6, months 7-12, year 2 and year 3
Sennfalt 2002 [28]	All dialysis departments in the southeastern health-care region of Sweden	Retrospective record study: 136 patients Prospective questionnaire study: 81 patients	Cost per patient, per month
Kaitelidou 2005 [91]	1 hospital	128 hospital HD patients	Cost per session extrapolated to obtain cost per year for entire ESRD population
Ploth 2003 [92]	1 hospital	76 HD patients	ESRD global costs, average costs per patient per month

Units of resources measures

Costs categories	Personnel	Medical Equipment	Consumables	Medicines	Overheads	Hospitalisation
Agar 2005 [16]	FTE	Amortization: Purchase price/number of years of use	Item	Doses	FTE, Square metre (m^2), amortization or depreciation	NA
McFarlane 2002 [20]	FTE	Amortization: Purchase price/number of years of use	Per-treatment basis	Per medication	Paid hours, m^2, percentage	Number of admissions
Kroeker 2003 [18]	No detail	Amortization: Purchase price/number of years of	No detail	No detail	No detail	No detail

		use				
Mohr 2001 [21]	No detail					
Soroka 2005 [93]	Fee per treatment, or hours of care	No detail	Item	Item	Hours of work, m², number of utilities	NA
Lee 2002 [19]	Hours of care	Session	Item	Doses	No detail	Number of admissions
Salonen 2003 [59]	No detail					
Sennfalt 2002 [28]	No detail					
Kaitelidou 2005 [91]	Time spent performing various activities	Amortization: Purchase price/number of years of use	No detail	No detail	Kilowatt, functioning hours	Inpatient day
Ploth 2003 [92]	TRENDSTAR: a hospital ABC system that classify all expense accounts into costs components and allows overhead to revenue-producing departments					

FTE = Fulltime equivalent; NA = Not applicable

Costs' measure values

Costs categories	Personnel	Medical Equipment	Consumables	Medicines	Overheads	Hospitalisation
Agar 2005 [16]	Actual costs: Physicians: Salary Nurses: Salary Technicians: Wages Calculation method not explained	Estimated costs: Price divided by the number of machine expected life years divided by the number of patients using the same machine	Actual costs: Negotiated prices of articles used for a session multiplied by the number of sessions per month	Actual costs Calculation method not explained	Estimated costs Calculation method not explained	NA
McFarlane 2002 [20]	Mean number of FTE determined weekly on a per-patient basis	Amortization over 7 years	The weekly cost (that equals each patient's per-treatment cost multiplied by their weekly average number of treatments) is multiplied by 52.14 to	A daily drug profile was generated for each patient for every day of the study period. Then a series of methods (not explained) were used to assign a cost to	One of the hospitals participating calculates the overhead as a percentage of the dialysis program annual budget. For the other centre, a series of calculations was performed to allocate	Each hospitalization was identified for all patients.

			obtain a projected annual cost	each medication.	these costs in function of the measure units (table 4). The calculation methods is not developed.	
Kroeker 2003 [18]	Nephrologists: capitated weekly fee per patient	Amortization over 5 years	Calculation method not explained	Calculation method not explained	Calculation method not explained	Calculation method not explained
Mohr 2001 [21]	The costing method is explained in another article which is not available					
Soroka 2005 [93]	Fixed costs are expressed as a total amount for all patients; Variable costs are calculated per patient per year					
	Cost per hour multiplied by the number of hours of work	Purchase price (fixed cost)	Sum of the individual cost per item from hospital purchasing	Number of drugs used multiplied by their price	Annual salaries of administrative personnel, cost of utilities and housekeeping per m^2	NA
Lee 2002 [19]	Direct nursing costs: estimated for each patient for every dialysis session Indirect nursing costs: divided equally among patients	Price divided by the number of years of use and by the total of runs estimated per year	The number of units used by each patient was multiplied by the price per unit		Allocation between 3 modalities per standard Calgary Health Region (Canada) costing procedure	Cost calculated using a provincially approved method (not developed)
Salonen 2003 [59]	The files of patients are studied retrospectively; The calculation method is not explained					
Sennfalt 2002 [28]	Costs based on the proportion of the total number of performed HD session or the total number of PD patients		Amount of consumables needed per session multiplied by their price	Quantity of drugs prescribed during the year of the study multiplied by their price	Costs based on the proportion of the total number of performed HD session or the total number of PD patients	
Kaitelidou 2005 [91]	The analyse was performed using a micro-costing evaluation of health-care resources consumed for HD sessions					
	Calculation method not explained	Amortization over 5 years for the dialysis machines and over 7 years for the water preparation system	Calculation method not explained	Calculation method not explained	Calculation method not explained	The cost of an inpatient day is multiplied by the length of stay to estimate the total cost
Ploth 2003 [92]	TRENDSTAR: a hospital ABC system that classify all expense accounts into costs components and allows overhead to revenue-producing departments					

Data sources

Categories	Personnel	Medical Equipment	Consumables	Medicines	Overheads	Hospitalisation
Agar 2005 [16]	Receipts and payments made through the Department of Finance	No detail	Department of finance	Hospital Pharmacy records	Department of finance	NA
McFarlane 2002 [20]	Hospital data	No detail	Individualized per-treatment	. Physician order . Pharmacist notes . Computer based pharmacy records	. Percentage of the dialysis program annual budget . Costs split in function of m², hours, percentage…	Identified for all patients (hospital records)
Kroeker 2003 [18]	Workload measurement tool: Ambulatory Resource Measurement System	No detail	Costs obtained from vendors and reflect fair market values	T-2 case-costing system: use general ledger information and relative values assigned to procedures		
Mohr 2001 [21]	Data sources: the US Renal Data System (Annual report) ; Health Care Financing Administration ; Centers for Disease Control ; Medicare Payment Advisory Commission					
Soroka 2005 [93]	Data come from the hospital and the Low care centre					NA
Lee 2002 [19]	Recorded workload measurement unit (WLM)	No detail	Data recorded in the monthly dialysis supplies records	Frequency and dosage were extracted from the Southern Alberga Renal Program (SARP) database for each patient	No detail	SARP data base records the number of clinic visits made by each patient
Salonen 2003 [59]	Hospital data			Medication recorded in detail for each patient	Source: hospital data	Hospital records
Sennfalt 2002 [28]	Hospital data					
Kaitelidou 2005 [91]	Data for the year 2000 were collected at the Georgios Gennimatas General NHS hospital in Athens					
Ploth 2003 [92]	. Medical records in the dialysis unit . KEANE: the hospital patient accounting and medical record system database (record all information about patient visit) . TRENDSTAR: system that classify all expense accounts into costs components and allows overhead to revenue-producing departments . Direct patient interviews to identify health care utilization by the patient during the interdialysis interval					

Cost-effectiveness analyses

Authors (Year)	Gonzalez-Perez JG, Vale L, Stearns SC, Wordsworth S 2005 [22]
Funding	UK department of Health
Country	UK
Design	CUA - Markov model
Perspective	Not clearly specified (Health Care Payer?)
Time window	5-10 years
Interventions	Satellite, home and hospital hemodialysis (HD)
Population	A typical cohort of patients starting home, hospital or satellite hemodialysis with high, moderate and low risks.
Assumptions	1) Once patients died, were transplanted or were transferred to continuous peritoneal ambulatory dialysis, further costs or benefits incurred by these states were not included in the analysis. 2) Each row of the matrix of possible transitions should sum to one, some estimates were thus deduced using this requirement. 3) For hospital HD, lifespan of building and equipment were assumed to be 50 and 10 years respectively. For home HD, lifespan of home conversion and equipment were assumed to be 4 and 10 years respectively. 4) Costs per year were calculated assuming that dialysis occurred 3 times per week. 5) Access/set up, training, dialysis sessions and complication costs for satellite and hospital hemodialysis were assumed to be equal, except for staff costs. Cost of access and consumable were assumed to be the same between home, satellite and hospital hemodialysis. 6) Transfer probabilities from home HD to hospital HD and to satellite HD, and from hospital HD to home HD and satellite HD were assumed to be zero. 7) Mortality rate for satellite hemodialysis and hospital hemodialysis were assumed to be equal. 8) Home and satellite hemodialysis were assumed to have same utilities.
Data source for costs	Mowatt 2003 [9], Valderrabano 1996[94], Bremer 1989[37], Westlie 1984[95], Mackenzie 1998[96], renal administration at the Grampian University Hospital Trust and Kirby 2001 [13].
Cost items included	Direct health care costs: access/set up, training, dialysis sessions and complication. Items: Labor, consumable, capital and overheads. Transportation costs were not included (Costs: 2001/2002 UK £).
Data source for outcomes	Mowatt 2003 [9], Probabilities: UK Renal Registry 2001.[97] Survival rates : Hellerstedt 1984.[98] QALYs: De Wit 1998 (EQ-5d) [99] and Churchill 1988.[100]
Discounting	Costs : 6%, Outcomes : 1,5%
Costs	1) Satellite HD: 5 years: £46,001 / 10 years: £62,054. 2) Home HD : 5 years : £47,657 / 10 years : £63,539 3) Hospital HD: 5 years: £48,254 / 10 years: £65,131. 4) Short daily or home nocturnal HD: 5 years: £53,494 / 10 years: £71,616.
Outcomes	1) Satellite HD: 5 years: 2.08 QALY / 10 years: 3.03 QALY. 2) Home HD: 5 years: 2.32 QALY / 10 years: 3.45 QALY. 3) Hospital HD: 5 years: 1.69 QALY / 10 years: 2.47 QALY. 4) Short daily or home nocturnal HD: 5 years: 2. 32 QALY / 10 years: 3.45 QALY.

Cost-effectiveness	1) Home HD versus Satellite HD: 5 years: £6,665/QALY / 10 years: £3,493/QALY. 2) Home HD versus Hospital HD: 5 years: Home HD dominant / 10 years: Home HD dominant. 3) Short daily or home nocturnal HD versus Satellite HD: 5 years: £30,188/QALY / 10 years: £22,515/QALY. 4) Short daily or home nocturnal HD versus Hospital HD: 5 years: £7,586/QALY / 10 years: £6,696/QALY.
Sensitivity analysis	A univariate sensitivity analysis was performed on QALYS but also on staffing levels of home and satellite HD and on the impact of similar mortality rate between modalities. Home hemodialysis was dominant compared to hospital for all variations investigated in the study. The maximal ICER of home versus satellite HD among the variations investigated in the study was £31,460/QALY at 10 years and £41,764/QALY at 5 years. A specific analysis for diabetic patients aged less than 50 years showed that home HD was a dominant strategy compared to hospital and satellite HD. For diabetic patients over 65 years, the ICER of home versus satellite HD was £36,007/QALY and the ICER of home versus hospital was £6,597/QALY.
Conclusions	Satellite and home HD are dominant strategies compared to hospital HD at 5 and 10 years. Satellite HD seems to be less costly but also less effective than home dialysis but more data are needed to make a decision between these two strategies (considerable uncertainty concerning effectiveness data). Efficiency of home HD required that patients do not change of modality for a reasonable period (home HD become less costly than hospital HD only after 5 years). Further researches are needed (RCT, studies taking into account different organizations of care for satellite HD or improved technologies, etc.).
Remarks	1) As explained in their discussion, more effectiveness data are needed, especially from RCT. Some cost and utility data came from assumptions. Real values should be investigated in the future. QALYs found in this studies differ from the study of Mowatt *et al* [9], even if same sources and assumptions were used. We did not find any explications for these differences. 2) Quantities of resources were also not reported separately from their unit costs. However, sources were given and in these sources quantities of resources were given. Compared to the study of Mowatt *et al* [9], this study included the costs of converting a home for HD, which explain why costs of home HD were higher in this study. Finally, only direct health care costs were included. 3) Short daily home dialysis seems to deteriorate the cost-effectiveness ratio but such result was not taking into account in the conclusion. 4) Once patients were transplanted or were transferred to continuous peritoneal ambulatory dialysis, further costs or benefits incurred by these states would have been included in the analysis. 5) The univariate sensitivity analysis was not performed on all uncertain parameters. A probabilistic sensitivity analysis on all uncertain parameters should be performed. 6) Even if the choice of alternative was justified, they did not compare all existing modalities. 7) They should choose a lifelong timeframe instead of 10 years.

Authors (Year)	Hooi LS, Lim TO, Goh A, Wong HS, Tan CC, Ahmad G, Morad Z (2005) [101]
Funding	Ministry of Health (MOH) research grant
Country	Malaysia

Design	CEA - retrospective observational study
Perspective	Ministry of Health
Time window	Not clearly specified
Interventions	1) In-center hemodialysis (HD) versus no treatment. 2) Continuous ambulatory peritoneal dialysis (CAPD) versus no treatment.
Population	Patients with end stage renal failure who were on dialysis between 1980 and 2001, who had been on either HD or CAPD for at least 5 years and who had not change modality when they were on dialysis.
Assumptions	No assumption
Data source for costs	National renal registry database
Cost items included	Direct health care costs: Labor, consumable, capital and overheads costs. Costs borne by patients were excluded. (Costs: 2001 RM; USD 1 = 3.80 RM).
Data source for outcomes	National renal registry database; Department of statistics, Malaysia[102]
Discounting	Costs : 3% / Outcomes : 3%
Costs	Total cost not given. HD : mean cost : RM 169 / HD; CAPD : mean cost : RM 2186/patient/month
Outcomes	1) HD: Life expectancy : 10.96 years 2) CAPD: Life expectancy : 5,21 years
Cost-effectiveness	1) HD: MR 33,641.96/life year 2) CAPD: MR 31,634.93/life year (average cost per life year saved).
Sensitivity analysis	Uncertainty was not handled by confidence intervals. Some parameters were varied in an univariate sensitivity analysis. In all situation investigated, the average cost per life year saved of CAPD was better than for HD. When age increased, this ratio for both modalities got worse.
Conclusions	The average costs per life year saved were similar for HD and CAPD. The use of these 2 modalities should thus be promoted.
Remarks	1) Effectiveness data come from an observational study (no RCT). 2) Major outcome was the number of life years gained, which is an appropriate outcome. However, QALY should have been interesting. 3) They do not perform an incremental analysis between HD and CAPD. Thus, they do not assess an incremental cost-effectiveness ratio. 4) Even if calculation of costs seems appropriate, total cost of both modalities on a lifelong period was not given. Moreover, quantities of resources were not reported separately from their unit costs. The generalisability to other settings is thus more difficult. Finally, only direct health care costs were included. 5) Uncertainty was not handled by confidence intervals for the cost-effectiveness ratios. 6) The choice of modalities compared was not justified, they did not compare all existing modalities and they did not clearly describe modalities compared.

Authors (Year)	Kirby L, Vale L (2001) [13]
Funding	Chief Scientist Office of the Scottish Executive Health Department.
Country	UK
Design	CEA - Markov model (cycles of one month)
Perspective	Not clearly specified (Health Care Payer?)
Time window	Not clearly specified (lifelong?)

Interventions	Hospital? hemodialysis (HD) versus Continuous ambulatory peritoneal dialysis (CAPD).
Population	Patients with end stage renal disease.
Assumptions	1) Patients only switched treatment modality after a complication. 2) Each row of the matrix of possible transitions should sum to one, some estimates were thus deduced using this requirement. 3) Each patient was treated the same way.
Data source for costs	Grampian University Royal Hospitals NHS Trust and British National Formulary.[103]
Cost items included	Direct health care costs: access, dialysis sessions and complication (e.g. peritonitis, access problems, etc.). Items: Labor, consumable, capital and overheads. (Costs : 1999 UK £)
Data source for outcomes	MacLeod 1998,[60] Burton 1989,[104] Charytan 1986,[105] Gokal 1987.[106]
Discounting	Costs and outcomes: 0%, 6% and 10%.
Costs	Incremental cost of HD compared to CAPD: varied from -£13,056 to £14,417 according to the scenario. (high and low estimates of probabilities and costs combined for each discount rate (0-6-10%) : 16 x 3 scenario were presented)
Outcomes	Incremental effectiveness of HD compared to CAPD: varied from 0.01 to 0.82 additional life-years according to the scenario. (high and low estimates of probabilities and survival rates combined for each discount rate (0-6-10%) : 16 x 3 scenario were presented)
Cost-effectiveness and sensitivity analysis	In half of the scenario investigated (24/48), HD was a dominant strategy compared to CAPD. For the remaining scenario, HD was more effective but more costly and the ICER was £50,122 in the worst case.
Conclusions	Starting with hospital HD may be more cost-effective than with CAPD. However, more robust and pragmatic primary researches (especially RCT) are needed to address such issue.
Remarks	1) Effectiveness data come from 3 observational studies (no RCT) but the method to deduce parameters of the model from these three studies was not given. 2) Major outcome was the number of life years gained, which is an appropriate outcome. However, QALY should have been interesting. 3) Even if calculation of costs seems appropriate, quantities of resources were not reported separately from their unit costs. The generalisability to other settings is thus more difficult. Finally, only direct health care costs were included. 4) Sensibility analysis on all uncertain parameters was performed but the method to obtain the ranges tested was not clear. A probabilistic sensitivity analysis on all uncertain parameters should be performed. 5) Even if the choice of modalities compared was justified, they did not compare all existing modalities. Moreover, they did not clearly describe modalities compared. 6) They concluded that HD was a more cost-effective strategy compared to CAPD. However, it is more correct to conclude that HD is a dominant strategy in some situations and is more effective but more costly strategy in other situations.

Authors (Year)	McFarlane PA, Bayoumi AM, Pierratos A, Redelmeier DA 2003[25]
Funding	The Canadian Society of Nephrology and the Kidney Foundation
Country	Canada
Design	CUA - Cross-sectional study
Perspective	Not specified. (Health care payer perspective according to data sources for costs).
Time window	Costs: 1 year and 2 months: January 1, 2000 to March 1, 2001.
Interventions	In-center hemodialysis (IHD) (19 patients – one center) versus home nocturnal hemodialysis (HNHD) (24 patients).
Population	43 patients with end-stage renal disease, being proficient in English, having the capacity for self-care training and having a life expectancy of longer than 1 year. Moreover, either the patient or someone living in the home must have sufficient dexterity, vision, and auditory acuity to perform HNHD dialysis and patients had to be performing the modality for at least 3 months.
Assumptions	/
Data source for costs	A prospective descriptive costing study from January 1, 2000 to March 1, 2001. (McFarlane 2002) [20]
Cost items included	Direct health care costs: Labor, consumable, capital and overheads costs. (Costs: 2000 Canadian dollars).
Data source for outcomes	Interview of patients at the Humber River Regional Hospital and the St. Michael's Hospital in Toronto. Utilities: Standard gamble technique.
Discounting	Not specified (but short term study => not appropriated).
Costs	HNHD : $55,139 +/- $7,651 / IHD : $66,367 +/- $17,502 (p = 0.03)
Outcomes	Utilities : HNHD : 0.77 +/- 0.23 / IHD : 0.53 +/- 0.35 (p = 0.03)
Cost-effectiveness	HNHD = dominant strategy.
Sensitivity analysis and handle of uncertainty	Bootstrap analysis with 2500 iterations. ICER 95%: -$13,976 to -$142,998.
Conclusions	HNHD is a dominant strategy compared to IHD: HNHD is associated with a higher quality of life and a lower cost when compared to IHD.
Remarks	1) Time horizon was too short and the sample size was small. As explained in their discussion, more long term data are needed, especially from large-scale RCT. 2) Patients were in general younger, had less diabetes and cardiovascular disease, and had been on dialysis for longer than typical patients, which may bias the utility scores (higher values) and limits the generalisability of the analysis. Moreover, interviews were delayed if there were recent events that could significantly lower utility scores, which also bias utilities toward higher values. 3) Quantities of resources were not reported separately from their unit costs. The generalisability to other settings is thus more difficult. Moreover, only direct health care costs were included and methods to obtain them were not explained. Only sources were given. 4) A bootstrap analysis was performed which reduce the uncertainty of data. 5) They did not compare all existing modalities and they did not assess changing in modalities.
Authors (Year)	McFarlane PA, Bayoumi AM, Pierratos A, Redelmeier DA 2006 [26]
Funding	The Canadian Society of Nephrology and the Kidney Foundation of Canada
Country	Canada
Design	CUA - Markov model (cycles of one week)
Perspective	Health care payer
Time window	Lifelong
Interventions	In-center hemodialysis (IHD) versus starting on IHD and subsequently transferring to home nocturnal hemodialysis (HNHD).

Population	Patients with a mean age of 47.2, with few co-morbidities and who have been on dialysis on average for 9.4 years.
Assumptions	1) Delay before switching from IHD to HNHD = 5-year. 2) Home and conventional HD have similar mortality rate. 3) Many of the known health benefits of HNHD do not directly lead to cost savings. 4) Capital costs of HNHD were not amortized over a long period of time and were assumed to be borne at the initiation of the modality. 5) Graft functioned initially after transplantation but short and long-term graft losses with subsequent return to IHD were allowed. Re-transplantations were not allowed (because it is a rare event). 6) The weekly probability of death from home dialysis complications was 10%, the weekly probability of resolution of home dialysis complications was 80%, the proportion of patients eligible for transplantation was 50% and the proportion of transplantations from live donors was 33%. 7) Health care costs unrelated to end stage renal disease were assume to be equal. (N.B.: Authors specified that all these assumptions were conservative, i.e. supporting stating on IHD).
Data source for costs	Laupacis 1996,[107] McFarlane 2002,[20] McFarlane 2003, [25], Redelmeier 1996,[108] and Robers 2001.[109]
Cost items included	Direct health care cost of dialysis, complications and transplantations. (Costs : 2003 Canadian $)
Data source for outcomes	Canadian Organ Replacement Registry 2001,[110] Wolfe 1999,[3] Laupacis 1996,[107] McFarlane 2002 [20], McFarlane 2003 [25], Coyte 1996,[111] Levin 1992,[112] Kroeker 2003,[18] a study of 1992 and authors' opinions.
Discounting	Outcomes: 3%; Costs: 3%.
Costs	HNHD: $538,094; IHD: $543,602
Outcomes	1) Life expectancy: IHD → HNHD: 13.4 years; IHD: 13.2 years. 2) QALY: IHD → HNHD: 5.79; IHD: 5.31.
Cost-effectiveness	IHD → HNHD is a dominant strategy compared to IHD for a lifetime period.
Sensitivity analysis	If the cost of IHD was less than HNHD, if IHD was associated with higher utility or if the benefits of HNHD declined rapidly, HNHD is not anymore a cost-effective strategy (>$ 50,000/QALY). If transplantation was allowed, the cost-effectiveness ratio gets worse. A Monte Carlo analysis with 1000 iterations showed that HNHD was dominant in 75.9% of iteration and was cost-effective (i.e. < $50,000/QALY) for 99.7% of iterations.
Conclusions	HNHD is a dominant strategy compared to IHD for a lifetime period.
Remarks	1) As explained in their discussion, more effectiveness data are needed, especially from large-scale RCT. 2) The method to deduce parameters of the model from the selected studies was not given. 3) Quantities of resources were not reported separately from their unit costs. The generalisability to other settings is thus more difficult. Moreover, only direct health care costs were included and methods to obtain them were not explained. 4) A probabilistic sensitivity analysis on all uncertain parameters was performed which reduce the uncertainty of data. 5) Even if the choice of modalities compared was justified, they did not compare all existing modalities. Moreover, they did not clearly describe modalities compared. 6) Authors seem to have done conservative assumptions.

Authors (Year)	Sennfält K, Magnusson M, Carlsson P 2002[28]
Funding	Research Council of Southeastern Sweden (FORSS) and the County Council in Östergötland
Country	Sweden
Design	CUA - decision-tree modeling (cycles of 6 months).
Perspective	Societal
Time window	5 years
Interventions	1) Hemodialysis (HD) 2) Peritoneal dialysis (PD)
Population	136 patients eligible for either HD or PD (68 matched pairs: HD-PD) who began treatment during the period 1990-1993 at all dialysis departments in the southeastern health-care region of Sweden, with no known contraindications regarding dialysis treatments and with ability to understand Swedish. Quality of life questionnaire: 81 patients (27 matched triplets: HD-PD-Transplantation) being treated with dialysis or having received a kidney transplant in February 1999 in the Southeastern health-care region.
Assumptions	1) An infection would last 2 weeks. 2) For patients in HD, up to the age of 65 years: Lost working time = 12-15 (mean 13.5) hours per week for treatment and 3 hours per week for travel / Lost spare time = 0; after 65 years old: Lost working time = 0 / Lost spare time = 12-15 (mean 13.5) hours per week for treatment and 3 hours per week for travel. 3) For patients on PD, up to the age of 65 years: Lost working time = 1.5 hours per day / Lost spare time = 0.5 hours per day; after 65 years old: Lost working time = 0 / Lost spare time = 2 hours per day. 4) Lost spare time on behalf of relatives: 2 hours per day for both HD and PD. 5) Wage for industrial workers: US $ 20.9/hours.
Data source for costs	Retrospective data on health care resources (dialysis departments in the southeastern health-care region of Sweden) and The Swedish National Road Administration Year 1998.
Cost items included	Direct health care costs: Labor, consumable, capital, overheads, and transportation costs. Indirect costs: Lost spare time on the part of patients and relatives, lost working time on the part of patients and home care. (Costs: 1998 US dollars).
Data source for outcomes	Retrospective data on health care resources (dialysis departments in the southeastern health-care region of Sweden). QALY: EQ-5D and EQ-VAS.
Discounting	Costs and outcomes: 3%.
Costs	PD: $201,000 / HD $222,450. (Not discounted?)
Outcomes	Expected survival: PD: 3.58 years; HD: 3.56 years (not discounted?). QALY not specified.
Cost-effectiveness	1) Costs per life year (discounted): with direct costs only: PD: $35,120/LY / HD : $36,780/LY ; with total direct and indirect costs : PD : $56,960/LY / HD: $62,990/LY. (When only direct costs were compared, PD resulted in a lower cost per life year up to the age of 60 years but not after.) 2) Costs per QALY (discounted): with direct costs only : PD : $50,830/QALY / HD : $57,540/QALY; with total direct and indirect costs : PD : $82,470/QALY / HD: $98,530/QALY. (When only direct costs were compared, PD resulted in a lower cost per QALY in all analyzed age groups : 21-40 years, 41-60 years, 61+ years) NB : The ICER between the two strategies was not reported.

Sensitivity analysis	An univariate sensitivity analysis was performed but not on all uncertain parameters. Only inpatients care costs and external activities (analysis, anesthesia, X Rays and consultation costs) for HD (but not for PD) were varied. As results, the cost-effectiveness ratio varied from $90,760/QALY to $100,070/QALY for HD (costs and outcomes not discounted). Variations in transplantation rate were also investigated but neither the range, nor the results were given. They only specified that there were few impacts on results. Variations in other costs and outcomes were not investigated.
Conclusions	1) PD and HD resulted in similar frequencies of transplantation and expected survival for the period studied (5 years). 2) PD resulted in more favorable expected cost/LY and cost/QALY than HD.
Remarks	1) As explained in their discussion, more long term data are needed. 2) Data come from a retrospective studies based on databases (no RCT) 3) Quantities of resources were not reported separately from their unit costs. The generalisability to other settings is thus more difficult. Moreover, all assumptions made to estimate costs do not seem to be described. 4) They do not perform an incremental analysis between HD and PD. Thus, they do not assess an incremental cost-effectiveness ratio. 5) An univariate sensitivity analysis was performed but parameters investigated were insufficient to correctly handle uncertainty. A probabilistic sensitivity analysis on all uncertain parameters should be performed. 6) Even if the choice of modalities compared was justified, they did not compare all existing modalities. Moreover, they did not clearly describe modalities compared.

Authors (Year)	Teerawattananon Y, Mugford M, TangcharoensathienV. 2007[29]
Funding	The National Health Security Office (NHSO) and the World Health Organization (WHO) country office.
Country	Thailand.
Design	CUA - Markov model.
Perspective	The National Health Security Office and the societal perspectives
Time window	Lifelong (99-year period)
Interventions	1) Peritoneal dialysis (PD) as initial care followed by hemodialysis (HD) if complications/switching occur compared to the "palliative care" option. 2) HD as initial care followed by PD if complications/switching occur compared to the "palliative care" option. N.B. : PD = Continuous ambulatory peritoneal dialysis (CAPD) / HD = Hospital HD
Population	ESRD patients aged between 20 to 70 years.
Assumptions	1) PD and HD are equally effective in terms of patient survival (based on results of systematic reviews). 2) Short half-life of patients with palliative care (1-3 months). 3) Quality of life of ESRD patients with dialysis and complications was assumed to be equal to the quality of life of ESRD patients without dialysis because other data were not available. 4) They assumed independence between the occurrence of complications and switching between treatment modalities in the model.
Data source for costs	Micro-costing survey in two public hospitals and one private hospital. Tisayathikom 2003,[113] Sriwajana 1997,[114] and Homvijitkul 1999.[115]
Cost items included	Health care costs: Labor, material, and capital costs + Opportunity costs lost by patients and relatives (2004 Thai Baht / 1US$ 2004 = 12.868 Thai Baht).

Data source for outcomes	Survival : Thailand Renal Replacement Therapy Registry (follow-up 4 years), MacLeod 1998 (systematic review)[60] Korevaar 2003 (RCT),[41] Van Biesen 2000 (observational study),[116] Complication rate : Tangcharoensathien 2001,[117] Wongsiripisaan 2003,[118] Quality of life : meta-analysis of 3 thesis and one study : Sriwajana 2003,[114] Maharatanavirosn 1999,[119] Pukpobsuk 2001,[120] and Kusoom 2004.[121]
Discounting	Base case : Costs and outcomes : 3.5% / sensitivity analysis : 0-6%
Costs	1) PD: NHSO's perspective: from 3,126,000 to 7,804,000 Bath according to the patient age. Societal perspective: from 3,286,000 to 8,277,000 Bath according to the patient age. 2) HD: NHSO's perspective: from 3,235,000 to 7,956,000 Bath according to the patient age. Societal perspective: from 3,775,000 to 9,286,000 Bath according to the patient age. 3) Palliative care: NHSO's perspective: 72,000 Baht. Societal perspective: 224,000 Baht.
Outcomes	1) PD: life year (LY): from 6.53 to 17.65 according to the age and the calculation of survival. QALY : from 4.60 to 12.32 according to the age and the calculation of survival 2) HD: LY: from 6.53 to 17.65 according to the age and the calculation of survival. QALY: from 4.38 to 11.89 according to the age and the calculation of survival. 3) Palliative care: LY: 0.34 / QALY: 0.20.
Cost-effectiveness	1) PD versus palliative care: NHSO's perspective: from 447,000 Bath/LY to 495,000 Bath/LY and from 641,000 Bath/QALY to 696,000 Bath/QALY. Societal perspective: from 466,000 Bath/LY to 497,000 Bath/LY and from 667,000 Bath/QALY to 700,000 Bath/QALY. 2) HD versus palliative care: NHSO's perspective: from 456,000 Bath/LY to 512,000 Bath/LY and from 675,000 Bath/QALY to 759,000 Bath/QALY. Societal perspective: from 525,000 Bath/LY to 575,000 Bath/LY and from 777,000 Bath/QALY to 850,000 Bath/QALY.
Sensitivity analysis	A probabilistic sensitivity analysis using a second-order Monte Carlo simulation. Results: Proving PD first was the optimal choice for a societal willingness-to-pay threshold of 700,000 Bath/QALY for age group 20 years and 750,000 Bath/QALY for age group 70 years. Variation in the interest rate did not change major direction of results.
Conclusions	Proving PD first was the optimal choice but was only considered as a cost-effective strategy if the societal willingness-to-pay threshold was 700,000 Bath/QALY for age group of 20 years and 750,000 Bath/QALY for age group of 70 years.
Remarks	1) Effectiveness and costs data came from national registry and national studies, which limits the generalisability of the analysis to others setting, especially to developed countries. 2) More evidence on PD versus HD survival should be conducted, in this study, they were assumed to be equal. 3) Quantities of resources were not reported separately from their unit costs. The generalisability to other settings is thus more difficult. Moreover, they came from different sources and methods to obtain them were only partially explained. In most cases, only sources were given. 4) Few details were given about parameters used in the model. 5) A probabilistic sensitivity analysis was used to reduce uncertainty. 6) They did not clearly described modalities compared. 7) Transfer to transplantation and further costs or benefits incurred by this were not included in the analysis.

Authors (Year)	Mowatt G, Vale L, Perez J, Wyness L, Fraser C, MacLeod A, Daly C, Stearns SC[9]
Funding	UK National Health Service (NHS)
Country	UK
Design	CUA - Markov model
Perspective	NHS
Time window	5-10 years
Interventions	Satellite, home and hospital hemodialysis (HD)
Population	A typical cohort of patients starting home, hospital or satellite hemodialysis with high, moderate and low risks.
Assumptions	1) Once patients died, were transplanted or were transferred to continuous peritoneal ambulatory dialysis, further costs or benefits incurred by these states were not included in the analysis. 2) Each row of the matrix of possible transitions should sum to one, some estimates were thus deduced using this requirement. 3) For hospital HD, lifespan of building and equipment were assumed to be 50 and 10 years respectively. For home HD, lifespan of home conversion and equipment were assumed to be 4 and 10 years respectively. 4) Costs per year were calculated assuming that dialysis occurred 3 times per week. 5) Access/set up, training, dialysis sessions and complication costs for satellite and hospital hemodialysis were assumed to be equal, except for staff costs. Cost of access and consumable were assumed to be the same between home, satellite and hospital hemodialysis. 6) Transfer probabilities from home HD to hospital HD and to satellite HD, and from hospital HD to home HD and satellite HD were assumed to be zero. 7) Mortality rate for satellite hemodialysis and hospital hemodialysis were assumed to be equal. 8) Home and satellite hemodialysis were assumed to have same utilities.
Data source for costs	Valderrabano 1996 [94], Bremer 1989 [37], Westlie 1984 [95], Mackenzie 1998 [96], renal administration at the Grampian University Hospital Trust and Kirby 2001 [13].
Cost items included	Direct health care costs: access/set up, training, dialysis sessions and complication. Items: Labor, consumable, capital and overheads. Transportation costs and productivity changes are reported separately (Costs: 2001/2002 UK £).
Data source for outcomes	Probabilities: UK Renal Registry 2001 [97]. Survival rates: Hellerstedt 1984 [98]. QALYs: De Wit 1998 [99] (EQ-5d) and Churchill 1988 [100].
Discounting	Costs : 6%, Outcomes : 1,5%
Costs	1) Satellite HD: 5 years: £46,001 / 10 years: £62,054. 2) Home HD: 5 years: £46,551 / 10 years: £63,717. 3) Hospital HD: 5 years: £48,254 / 10 years: £65,131. 4) Short daily or home nocturnal HD: 5 years: £54,133 / 10 years: £74,232.
Outcomes	1) Satellite HD: 5 years: 2.48 QALY / 10 years: 3.43 QALY. 2) Home HD: 5 years: 2.73 QALY / 10 years: 3.86 QALY. 3) Hospital HD: 5 years: 2.02 QALY / 10 years: 2.80 QALY. 4) Short daily or home nocturnal HD: 5 years: 2. 73 QALY / 10 years: 3.86 QALY.

Cost-effectiveness	1) Home HD versus Satellite HD: 5 years: £2,215/QALY / 10 years: £3,914/QALY. 2) Home HD versus Hospital HD: 5 years: Home HD dominant / 10 years: Home HD dominant. 3) Short daily or home nocturnal HD versus Satellite HD: 5 years: £32,753/QALY / 10 years: £28,669/QALY. 4) Short daily or home nocturnal HD versus Hospital HD: 5 years: £8,307/QALY / 10 years: £8,585/QALY.
Sensitivity analysis	An univariate sensitivity analysis was performed on QALYS but also on staffing levels of home and satellite HD, on the impact of similar mortality rate between modalities, and on the inclusion of travel costs and careers' allowance for home HD. Home hemodialysis was dominant compared to hospital for most variations investigated in the study. The maximal ICER of home versus satellite HD among the variations investigated in the study was £37,242/QALY at 5 years and £31,879/QALY at 10 years. With the inclusion of travel costs, home HD is dominant strategy compared to both hospital and satellite HD. On the other hand, inclusion of high allowances to home HD patients would dramatically increase the ICER of home HD compared to hospital or satellite HD. A specific analysis for diabetic patients aged less than 50 years and for diabetic patients over 65 years was also performed. As results, home HD was a dominant strategy compared to hospital and satellite HD (for patients over 65 years, home was a dominant strategy only after 2 years).
Conclusions	Satellite and home HD are dominant strategies compared to hospital HD at 5 and 10 years. Satellite HD seems to be less costly but also less effective than home dialysis but more data are needed to make a decision between these two strategies (considerable uncertainty concerning effectiveness data). Efficiency of home HD required that patients do not change of modality for a reasonable period. Further researches are needed.
Remarks	1) As explained in their discussion, more effectiveness data are needed, especially from RCT. Some cost and utility data came from assumptions. Real values should be investigated in the future. QALYs found in this studies differ from the study of Gonzalez-Perez *et al* [22], even if same sources and assumptions were used. We did not find any explications for these differences. 2) Compared to the study of Gonzalez-Perez *et al* [22], this study did not include the costs of converting a home for HD, which explain why costs of home HD were lower in this study. Finally, the impact of added transportation and allowances costs on the ICER were investigated. 3) Short daily home dialysis seems to deteriorate the cost-effectiveness ratio but such result was not taking into account in the conclusion. 4) Once patients were transplanted or were transferred to continuous peritoneal ambulatory dialysis, further costs or benefits incurred by these states would have been included in the analysis. 5) The univariate sensitivity analysis was not performed on all uncertain parameters. A probabilistic sensitivity analysis on all uncertain parameters should be performed. 6) Even if the choice of alternative was justified, they did not compare all existing modalities. 7) They should choose a lifelong timeframe instead of 10 years.

Quality assessment checklists economic evaluations

Study design	Gonzalez [22]	Hooi [101]	Kirby [13]	McFarlane 2003 [25]	McFarlane 2006 [26]	Sennfält [28]	Teerawat-tananon [29]	Mowatt [9]
The research question is stated	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
The economic importance of the research question is stated	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
The viewpoints of the analysis are clearly stated and justified	No	Not justified	No	No	Yes	Yes	Yes	Yes
The rationale for choosing the alternative programmes or interventions compared is stated	Yes	No	Yes	No	Yes	Yes	Yes	Yes
The alternatives being compared are clearly described	Partially	No	No	Partially	No	No	Partially	Partially
The form of economic evaluation used is stated	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
The choice of form of economic evaluation is justified in relation to the questions addressed	Yes	Partially	Partially	Yes	Yes	Yes	Yes	Yes

Data collection	Gonzalez [22]	Hooi [101]	Kirby [13]	McFarlane 2003 [25]	McFarlane 2006 [26]	Sennfält [28]	Teerawat-tananon [29]	Mowatt [9]
The sources of effectiveness estimates used are stated	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Details of the design and results of effectiveness study are given (if based on a single study)	NA	Yes	NA	Yes	NA	Yes	NA	NA
Details of the method of synthesis or meta-analysis of estimates are given (if based on an overview of a number of effectiveness studies)	Not detailed but sources were given	NA	No	NA	No	NA	Partially	Yes
The primary outcome measure(s) for the economic evaluation are clearly stated	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Methods to value health states and other benefits are stated	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Details of the subjects from whom evaluations were obtained are given	No	Yes	No	Yes	Yes	Yes	No	No
Productivity changes (if included) are reported separately	NA	NA	NA	NA	NA	Yes	No	Yes
The relevance of productivity changes to the study question is discussed	No	No	No	No	Yes	No	No	Yes
Quantities of resources are reported separately from their unit costs	Sources were given	Not reported	Not reported	No	No	Not reported	No	Yes
Methods for the estimation of quantities and unit costs are described	Partially	Yes	Yes	No (sources given)	No	Partially	No	Yes
Currency and price data are recorded	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Details of currency or price adjustments for inflation or currency conversion are given	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Details of any model used are given	Yes	NA	Yes	NA	Yes	Yes	Yes	Yes
The choice of model used and the key parameters on which it is based are justified	Partially	NA	Partially	NA	Partially	Partially	No	Partially

Analysis and interpretation of results

	Gonzalez [22]	Hooi [101]	Kirby [13]	McFarlane 2003 [25]	McFarlane 2006 [26]	Sennfält [28]	Teerawat-tananon [29]	Mowatt [9]
Time horizon of costs and benefits is stated	Yes	Not clearly	Not clearly	Not clearly	Yes	Yes	Yes	Yes
The discount rate(s) is stated	Yes	Yes	Yes	NA	Yes	Yes	Yes	Yes
The choice of rate(s) is justified	Yes	No	No	NA	No	Yes	Yes	Yes
An explanation is given if costs or benefits are not discounted	NA	NA	NA	NA	NA	NA	NA	NA
Details of statistical tests and confidence intervals are given for stochastic data	NA	No	NA	Yes	NA	NA	NA	NA
The approach to sensitivity analysis is given	Yes	Yes	Yes	NA	Yes	Yes	Yes	Yes
The choice of variables for sensitivity analysis is justified	No	No	Yes	NA	Yes	No	Yes	Partially
The ranges over which the variables are varied are stated	Yes	Not for all variables	Yes	NA	Yes	Not for all variables	Partially	Yes
Relevant alternatives are compared	No	No	No	No	No	No	No	No
Incremental analysis is reported	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Major outcomes are presented in a disaggregated as well as aggregated form	Yes	No	No	Yes	Yes	Yes	No	Yes
The answer to the study question is given	Yes	Partially	Yes	Yes	Yes	Partially	Yes	Yes
Conclusion follow from the data reported	Partially	Yes	Partially	Yes	Yes	Yes	Yes	Partially
Conclusions are accompanied by the appropriate caveats	Yes	No	Yes	Yes	Yes	No	Yes	Yes

Primary economic evaluations

	CUA	CEA
HD comparisons	Gonzalez [22] Mowatt [9] McFarlane 2003 [25] McFarlane 2006 [26]	/
PD versus HD	Sennfält [28] Teerawattananon [29]	Hooi [101] Kirby {Kirby, 2001 #177}

APPENDIX TO CHAPTER 4

SELECTION OF DATA

Relevant dialysis procedure data were extracted from the IMA data retrieval XS2CI111 of invoiced healthcare expenses (CHDI.Dm_soins_sante_pharmanet_v) for years 2002 and 2003- 2006 for all patients with the following RIZIV procedure codes:

Code	Procedure	Type
761272	HDH (Haemodialysis hospital)	1 (HDH)
761283	HDH (Haemodialysis hospital)	1 (HDH)
470470	HDH (Haemodialysis hospital)	1 (HDH)
470481	HDH (Haemodialysis hospital)	1 (HDH)
761515	HDS (Haemodialysis satellite)	2 (HDS)
761526	HDS (Haemodialysis satellite)	2 (HDS)
761456	HDD (Haemodialysis domicile)	3 (HDD)
761493	HDD (Haemodialysis domicile)	3 (HDD)
470374	DP (Peritoneal Dialysis)	4 (DP)
470385	DP (Peritoneal Dialysis)	4 (DP)
761471	DP (Peritoneal Dialysis)	4 (DP)
761530	DP (Peritoneal Dialysis)	4 (DP)
761552	DP (Peritoneal Dialysis)	4 (DP)
761574	DP (Peritoneal Dialysis)	4 (DP)
761655	DP (Peritoneal Dialysis)	4 (DP)
761670	DP (Peritoneal Dialysis)	4 (DP)
318010	TP (Transplantation)	9 (TP)
318021	TP (Transplantation)	9 (TP)

DATA PROCESSING STUDY POPULATION.

Cleanup corrected invoice data.

Observations containing corrected invoice data were deleted in case of negative and matching positive invoice amounts by date and based on number of cases, number of days, RIZIV reimbursement, franchise and supplement.

Week numbers.

SAS week number function numbers were used to allocate unique week numbers for the study period 2002-2006.
2002: (SAS week number –54 to -1)
2003: (SAS week number 1 to 52)
2004: (SAS week number 53 to 106)
2005: (SAS week number 107 to 158)
2006: (SAS week number 159 to 211)

Procedures performed on 01 January 2005 and between 02 – 08 January were allocated week number 107 to ensure continuity in weekly dialysis data.

Population variables.

All population data for patients selected were extracted from the IMA DMPOPU(YY).Dm_POPULATION_V datasets for years 2002 and 2003- 2006.

Birth year, gender, national institute of statistics code, major and minor risk insurance codes, anonymized beneficiary and titular numbers, year and month of death were derived from the last known value in successive 6-month snapshots of the source population.

Inclusion criteria.

Patients were included in the analysis if they had at least one continuous 7 week dialysis treatment during the study period consisting of the following combination of dialysis procedure types:

Dialysis type	RIZIV code	Number of procedures during 7 weeks
HDH	761272	18
HDH	761283	18
HDH	470470	18
HDH	470481	18
HDS	761515	18
HDS	761526	18
HDD	761456	18
HDD	761493	18
DP	470374	42
DP	470385	42
DP	761471	6
DP	761530	6
DP	761552	6
DP	761574	42
DP	761655	42
DP	761670	42

Different dialysis procedures codes were aggregated into the corresponding dialysis type for the benefit of the inclusion criteria evaluations:

1. In a First step, a patient was considered evaluable if the specified number of procedures above where performed during the first 7 weeks after dialysis start.

2. A second step detected continuous 7 week dialysis treatment during ongoing treatment.

3. The results of both methods were combined into an overall inclusion flag per patient. Patients without any evaluable dialysis period were flagged as excluded. Any included patients were excluded from further analysis if the patient was younger than 18 during a given analysis year or if they had a renal transplant prior to dialysis treatment.

Proportion of dialysis and group allocation.

Dialysis group allocation was based on the weekly proportion of dialysis types during the study period. For weeks with a combination of dialysis types, a corresponding occurrence week fraction was allocated to each type. Any weeks without dialysis data were excluded from proportion calculation. Excluded patients were allocated to group 0.

Group definition:
Group 0: Excluded patients
Group 1: At least 80% of HDH during dialysis treatment
Group 2: At least 80% of HDS during dialysis treatment
Group 3: At least 80% of HDD during dialysis treatment
Group 4: At least 80% of DP during dialysis treatment
Group 5: At least 80% of HDH/HDS during dialysis treatment
Group 6: At least 80% of DP+HDH during dialysis treatment
Group 7: At least 80% of DP+HDS during dialysis treatment
Group 8: All other proportional combinations.

DATA PROCESSING EXPENSES.

Health care expenses

All healthcare expenses for included patients were extracted from the IMA data retrieval XS2CI111 of invoiced healthcare expenses (CHDI.Dm_soins_sante_pharmanet_v) for years 2002 and 2003- 2006.

Ambulatory pharmaceutical expenses

All ambulatory pharmaceutical expenses for included patients were extracted from the IMA data retrieval XF2CI111 (CHDIv1.Dm_soins_sante_pharmanet_v) for years 2002 and 2003- 2006.

Observations for both expense types containing corrected invoice data were deleted in case of negative and matching positive invoice amounts by date and based on number of cases, number of days, RIZIV reimbursement, franchise and supplement.

Negative franchise invoice amounts pertaining to a data correction were set to '0' if a corresponding correction was present for the RIZIV reimbursement on the same date. If no corresponding RIZIV correction matched by date and procedure code was found, the negative values were retained.

Based on the date of procedure or dispense a corresponding SAS week number was allocated according to the same criteria as for the dialysis procedural dates.

NIHDI NOMENCLATURE CODES USED

Population nomenclature

NIHDI Code	Label	Libellé	AorH
318010	Niertransplantatie	Transplantation du rein	A
318021	Niertransplantatie	Transplantation du rein	H
470374	Peritoneale dialyse in een verplegingsinrichting ten gevolge van een chronische nierinsufficiëntie tijdens de hospitalisatie wegens een intercurrente aandoening van een patiënt die met peritoneale autodialyse wordt behandeld per dag	Dialyse péritonéale, en milieu hospitalier, suite à une insuffisance rénale chronique lors de l'hospitalisation suite à une affection intercurrente d'un patient traité par autodialyse péritonéale par jour	A
470385	Peritoneale dialyse in een verplegingsinrichting ten gevolge van een chronische nierinsufficiëntie tijdens de hospitalisatie wegens een intercurrente aandoening van een patiënt die met peritoneale autodialyse wordt behandeld per dag	Dialyse péritonéale, en milieu hospitalier, suite à une insuffisance rénale chronique lors de l'hospitalisation suite à une affection intercurrente d'un patient traité par autodialyse péritonéale par jour	H
470470	Extrarenale zuivering, verricht voor de behandeling van een chronische nierinsufficiëntie in een ziekenhuis volgens de techniek van de hemodialyse of de intermitterende hemofiltratie, inclusief het hemofiltratiemateriaal	Epuration extra-rénale réalisée pour le traitement d'une insuffisance rénale chronique en centre hospitalier par la technique d'hémodialyse ou d'hémofiltration intermittente y compris le matériel d'hémofiltration	A
470481	Extrarenale zuivering, verricht voor de behandeling van een chronische nierinsufficiëntie in een ziekenhuis volgens de techniek van de hemodialyse of de intermitterende hemofiltratie, inclusief het hemofiltratiemateriaal	Epuration extra-rénale réalisée pour le traitement d'une insuffisance rénale chronique en centre hospitalier par la technique d'hémodialyse ou d'hémofiltration intermittente y compris le matériel d'hémofiltration	H
761272	Vast bedrag voor verpleegdag - andere gevallen - nierdialyse	Forfait pour journée d'entretien - autres cas - dialyse rénale	A
761283	Vast bedrag voor verpleegdag - andere gevallen - nierdialyse	Forfait pour journée d'entretien - autres cas - dialyse rénale	H
761456	Hemodialyse thuis - hemodialyse thuis met verpleegkundige assistentie aan huis	Hémodialyse à domicile - hémodialyse à domicile avec assistance d'un praticien de l'art infirmier à domicile	A

761471	Peritoneale dialyse thuis - peritoneale dialyse thuis met verpleegkundige assistentie aan huis (weekforfait)	Dialyse péritonéale à domicile - dialyse péritonéale à domicile avec assistance d'un praticien de l'art infirmier à domicile (forfait par semaine)	A
761493	Dialyse thuis of in een centrum : Hemodialyse thuis	Dialyse à domicile ou dans un centre : Hémodialyse à domicile	A
761515	Dialyse thuis of in een centrum : Dialyse in een collectief auto-dialysecentrum	Dialyse à domicile ou dans un centre : Dialyse dans un centre collectif d'autodialyse	A
761526	Dialyse thuis of in een centrum : Dialyse in een collectief auto-dialysecentrum	Dialyse à domicile ou dans un centre : Dialyse dans un centre collectif d'autodialyse	H
761530	Peritoneale dialyse thuis : Peritoneale dialyse thuis met continue uitwisseling van dialysaat via een pompsysteem (CCPD)	Dialyse péritonéale à domicile : Dialyse péritonéale à domicile avec transfusion continue de dialysat par le biais d'un système de pompe (CCPD)	A
761552	Dialyse thuis of in een centrum : Peritoneale dialyse thuis (weekforfait)	Dialyse à domicile ou dans un centre : Dialyse péritonéale à domicile (forfait par semaine)	A
761574	Dialyse thuis of in een centrum : Gefractioneerde peritoneale dialyse thuis (per dag)	Dialyse à domicile ou dans un centre : Dialyse péritonéale à domicile fractionnée (par jour)	A
761655	Peritoneale dialyse thuis - gefractioneerde peritoneale dialyse thuis met continue uitwisseling van dialysaat via een pompsysteem (CCPD)	Dialyse péritonéale à domicile - dialyse péritonéale fractionnée à domicile avec transfusion continue de dialysat par le biais d'un système de pompe (CCPD)	A
761670	Peritoneale dialyse thuis - gefractioneerde peritoneale dialyse thuis met verpleegkundige assistentie aan huis	Dialyse péritonéale à domicile - dialyse péritonéale fractionnée à domicile avec assistance d'un praticien de l'art infirmier à domicile	A

Specific dialysis nomenclature

For the section on specific ambulatory dialysis expenditures (chapter 4) only the « A » codes (or odd in the 5th digit have been used.

NIHDI code	Label_NL	Libellé_FR	A or H
470374	Peritoneale dialyse in een verplegingsinrichting ten gevolge van een chronische nierinsufficiëntie tijdens de hospitalisatie wegens een intercurrente aandoening van een patiënt die met peritoneale autodialyse wordt behandeld per dag	Dialyse péritonéale, en milieu hospitalier, suite à une insuffisance rénale chronique lors de l'hospitalisation suite à une affection intercurrente d'un patient traité par autodialyse péritonéale : par jour	A

470385	Peritoneale dialyse in een verplegingsinrichting ten gevolge van een chronische nierinsufficiëntie tijdens de hospitalisatie wegens een intercurrente aandoening van een patiënt die met peritoneale autodialyse wordt behandeld per dag	Dialyse péritonéale, en milieu hospitalier, suite à une insuffisance rénale chronique lors de l'hospitalisation suite à une affection intercurrente d'un patient traité par autodialyse péritonéale : par jour	H
470400	Installatie van en toezicht op een peritoneale dialyse, inclusief het plaatsen van de catheters, met uitsluiting van de peritoneale dialyses verricht voor de behandeling van chronische nierinsufficiëntie tijdens de opleiding van een patiënt voor chronische autodialyse of tijdens de opneming in een ziekenhuis van een patiënt die wordt behandeld met peritoneale dialyse thuis : de eerste dag	Installation et surveillance d'une dialyse péritonéale, y compris la mise en place des cathéters, à l'exclusion des dialyses péritonéales réalisées pour le traitement de l'insuffisance rénale chronique au cours de la formation d'un patient à l'autodialyse chronique ou lors de l'hospitalisation d'un patient traité par dialyse péritonéale à domicile : le 1er jour	H
470422	Installatie van en toezicht op een peritoneale dialyse, inclusief het plaatsen van de catheters, met uitsluiting van de peritoneale dialyses verricht voor de behandeling van chronische nierinsufficiëntie tijdens de opleiding van een patiënt voor chronische autodialyse of tijdens de opneming in een ziekenhuis van een patiënt die wordt behandeld met peritoneale dialyse thuis : de volgende dagen, per dag, maximum 6 weken.	Installation et surveillance d'une dialyse péritonéale, y compris la mise en place des cathéters, à l'exclusion des dialyses péritonéales réalisées pour le traitement de l'insuffisance rénale chronique au cours de la formation d'un patient à l'autodialyse chronique ou lors de l'hospitalisation d'un patient traité par dialyse péritonéale à domicile : les jours suivants, par jour, un maximum de 6 semaines.	H
470433	Peritoneale dialyse in een verplegingsinrichting tijdens de opleiding van een patiënt voor chronische autodialyse langs peritoneale weg (gedurende maximum drie opeenvolgende weken) : per dag	Dialyse péritonéale, en milieu hospitalier, au cours de la formation d'un patient à l'autodialyse chronique par voie péritonéale (pendant un maximum de trois semaines consécutives) : par jour	A
470444	Peritoneale dialyse in een verplegingsinrichting tijdens de opleiding van een patiënt voor chronische autodialyse langs peritoneale weg (gedurende maximum drie opeenvolgende weken) : per dag	Dialyse péritonéale, en milieu hospitalier, au cours de la formation d'un patient à l'autodialyse chronique par voie péritonéale (pendant un maximum de trois semaines consécutives) : par jour	H
470470	Extrarenale zuivering, verricht voor de behandeling van een chronische nierinsufficiëntie in een ziekenhuis volgens de techniek van de hemodialyse of de intermitterende hemofiltratie inclusief het hemofiltratiemateriaal	Epuration extra-rénale réalisée pour le traitement d'une insuffisance rénale chronique en centre hospitalier par la technique d'hémodialyse ou d'hémofiltration intermittente y compris le matériel d'homofiltration	A

470481	Extrarenale zuivering, verricht voor de behandeling van een chronische nierinsufficiëntie in een ziekenhuis volgens de techniek van de hemodialyse of de intermitterende hemofiltratie inclusief het hemofiltratiemateriaal	Epuration extra-rénale réalisée pour le traitement d'une insuffisance rénale chronique en centre hospitalier par la technique d'hémodialyse ou d'hémofiltration intermittente y compris le matériel d'homofiltration	H
761272	Forfaitaire verpleegdag nierdialyse	Forfait pour journée d'entretien dialyse rénale	A
761283	Forfaitaire verpleegdag nierdialyse	Forfait pour journée d'entretien dialyse rénale	H
761456	Hemodialyse thuis - hemodialyse thuis met verpleegkundige assistentie aan huis	Hémodialyse à domicile - hémodialyse à domicile avec assistance d'un praticien de l'art infirmier à domicile	A
761471	Peritoneale dialyse thuis - peritoneale dialyse thuis met verpleegkundige assistentie aan huis (weekforfait)	Dialyse péritonéale à domicile - dialyse péritonéale à domicile avec assistance d'un praticien de l'art infirmier à domicile (forfait par semaine)	A
761493	Dialyse thuis of in een centrum : Hemodialyse thuis	Dialyse à domicile ou dans un centre : Hémodialyse à domicile	A
761515	Dialyse thuis of in een centrum : Dialyse in een collectief auto-dialysecentrum	Dialyse à domicile ou dans un centre : Dialyse dans un centre collectif d'autodialyse	A
761526	Dialyse thuis of in een centrum : Dialyse in een collectief auto-dialysecentrum	Dialyse à domicile ou dans un centre : Dialyse dans un centre collectif d'autodialyse	H
761530	Peritoneale dialyse thuis : Peritoneale dialyse thuis met continue uitwisseling van dialysaat via een pompsysteem (CCPD)	Dialyse péritonéale à domicile : Dialyse péritonéale à domicile avec transfusion continue de dialysat par le biais d'un système de pompe (CCPD)	A
761552	Dialyse thuis of in een centrum : Peritoneale dialyse thuis (weekforfait)	Dialyse à domicile ou dans un centre : Dialyse péritonéale à domicile (forfait par semaine)	A
761574	Dialyse thuis of in een centrum : Gefractioneerde peritoneale dialyse thuis (per dag)	Dialyse à domicile ou dans un centre : Dialyse péritonéale à domicile fractionnée (par jour)	A
761596	Dialyse thuis of in een centrum, reiskosten dialyse	Dialyse à domicile ou dans un centre, frais de déplacement dialyse	A
761655	Peritoneale dialyse thuis - gefractioneerde peritoneale dialyse thuis met continue uitwisseling van dialysaat via een pompsysteem (CCPD)	Dialyse péritonéale à domicile - dialyse péritonéale fractionnée à domicile avec transfusion continue de dialysat par le biais d'un système de pompe (CCPD)	A
761670	Peritoneale dialyse thuis - gefractioneerde peritoneale dialyse thuis met verpleegkundige assistentie aan huis	Dialyse péritonéale à domicile - dialyse péritonéale fractionnée à domicile avec assistance d'un praticien de l'art infirmier à domicile	A

Hospital stays

*Dialyses;
RIZIV code =
(470374,470385,470433,470444,470470,470481)

*MaxiForfait;
RIZIV code =
(761235,761246)

*MiniForfait;
RIZIV code =
(761213)

*Forfait A;
RIZIV code =
(761132,761143)

*Forfait B;
RIZIV code =
(761154,761165)

*Forfait C;
RIZIV code =
(761176,761180)

*Forfait D;
RIZIV code =
(761191,761202)

*Other procedures;
(112011≤RIZIV code≤149623 or
301011≤RIZIV code≤309164 or
371011≤RIZIV code≤379164 or
350033≤RIZIV code≤355961 or
200012≤RIZIV code≤203420 or
211013≤RIZIV code≤214922 or
220091≤RIZIV code≤300425 or
310516≤RIZIV code≤318920 or
431012≤RIZIV code≤432762 or
215014≤RIZIV code≤216086 or
219951≤RIZIV code≤219984 or
450015≤RIZIV code≤469943 or
433016≤RIZIV code≤444603 or
449912≤RIZIV code≤449923 or
470013≤RIZIV code≤470373 or
470386≤RIZIV code≤470432 or
470445≤RIZIV code≤470469 or
470482≤RIZIV code≤470540 or
531016≤RIZIV code≤532766 or
558390≤RIZIV code≤558994 or
540013≤RIZIV code≤556544 or
559016≤RIZIV code≤559661 or
559812≤RIZIV code≤559860 or
592270≤RIZIV code≤593176 or
591091≤RIZIV code≤591603 or
590100≤RIZIV code≤590995 or
596024≤RIZIV code≤599804 or
590015≤RIZIV code≤590052 or
599513≤RIZIV code≤599966 or
588011≤RIZIV code≤588921 or
589013≤RIZIV code≤589923 or
RIZIV code = (592001)

*Implants;
(613056≤RIZIV code≤613185) or
(680013≤RIZIV code≤699860) or
(730015≤RIZIV code≤733600)

*EPO;
CNKcode =
(07694141,0783951,0769489,0784033,0769422,0783696,0769497,0784041,0769430,0783977,
0769448,0783985,0769505,0784058,0769455,0783993,0769513,0784009,0778100,0784066,
0769463,0784017,0769471,0784025,0744532,0744565,0744540,0762161,0744557,0766865,
0768812,0768820,0768846,0786996,0761874,0761916,0760157,0761882,0761924,0760165,
0761890,0778266,0764969,0761908,0761866,0764977,0764985)

*Venofer;
CNKcode =
(0741603)

*Renagel;
CNKcode =
(1785005,0773036,1770502,0773044)

*Other medications;
RIZIV code =
(750035,750050,750234,750256,750315,750455,750470,750514,750536,750551,750573,
750595,750724,750746,750761,750783,750805,750816,750831,750842,750853,750864,
750875,750886,750890,750901,750912,750923,750934,750956,750971,750993,751026,
751041,751085,751166,751203,751542,751564,751586,751645,751660,751682,751741,
751763,751785,753336,753373,753723,753745,753760,753782,753804,753911,753933,
753955,753970,753992,754073,754095,754736,754773,754832,754854,754876,754891,
754913,754935,756000,756022,756044,756066,756081,756103,756125,756140,756162,
756184,756206,756221,756243,756265,756280,756302,756324,756346,756361,756383,
756405,756420,756442,756486,756501,756545,756641,756700,756722,756744,756825,
756943,757002,757120)

Consultations

*Consultations;
101010≤RIZIV code≤104871

Surgery

*Fistules;
RIZIV code =
(235174,235185,611715,611726,589374,598385)

*Vascular catheter;
RIZIV code =
RIZIV code =
(354336,354340)

*Peritoneal catheter;
RIZIV code =
(244672,244683,470072,470083,611752,611763)

*Thoracic surgery;
RIZIV code =
(229014≤RIZIV code≤229644)

*Vascular surgery;
RIZIV code =
(235012≤RIZIV code≤235173) or

*Other surgery;
(235186≤RIZIV code≤238253) or
(238266≤RIZIV code≤239341)
((220091≤RIZIV code≤228200) or
(230230≤RIZIV code≤432762))
and RIZIV code not in
(235174,235185,611715,611726,589374,598385,354336,354340,
244672,244683,470072,470083,611752,611763)
and not (229014≤RIZIV code≤229644)
and not (235012≤RIZIV code≤235173)
and not (235186≤RIZIV code≤238253)
and not (238266≤RIZIV code≤239341)

Cardiology

*Echography;
RIZIV code =
(460456,460460,460574,460585,461230,461241,461252,461263,469652,
469663,469674,469685,469814,469825,469836,469840,469873,469884)

*Diagnostic coronarography;
RIZIV code =
(453110,453121,453132,453143,464111,464122,464133,464144)

*Intervention coronarography;
RIZIV code =
(589153,589164,589175,589186,589455,589466,689776,689780)

*Other Cardiology;
RIZIV code =
(475016,475020,475075,475086,475090,475532,475543,475650,475661) or
(475812≤RIZIV code≤476081) or
(476195≤RIZIV code≤476346) or
(476615≤RIZIV code≤476663) or
RIZIV code in (476114,476125,476136,476140)

Clinical Biology

*Blood analyses;
(540013≤RIZIV code≤542780)

*Microbiology;
(549010≤RIZIV code≤550981)

*Other clinical biology;
(543012≤RIZIV code≤548726)or
(551014≤RIZIV code≤559661)

Ambulatory medication

*EPO;
CNK code =
(07694141,0783951,0769489,0784033,0769422,0783696,0769497,0784041,0769430,0783977,0769448,0783985,0769505,0784058,0769455,0783993,0769513,0784009,0778100,0784066,0769463,0784017,0769471,0784025,0744532,0744565,0744540,0762161,0744557,0766865,0768812,0768820,0768846,0786996,0761874,0761916,0760157,0761882,0761924,0760165,0761890,0778266,0764969,0761908,0761866,0764977,0764985)

*Rénegel;
CNK code = (0741603)

*Venofer;
CNK code = (1785005,0773036,1770502,0773044)

*Forfait;
RIZIV code = (756000)

*Class A;
RIZIV code = (750514,750514,750315)

*Class Magistral;
RIZIV code = (750234,750256,750271,750293)

*Class B;
RIZIV code = (750470,750536)

*Class C;
RIZIV code = (750551,750455,754095,754736)

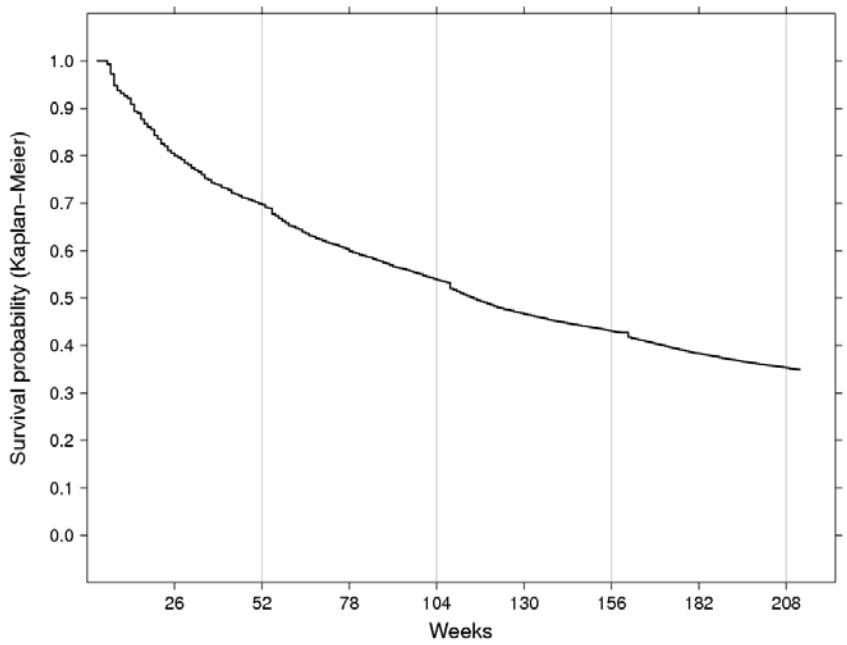
*Class Cs;
RIZIV code = (750573)

*Class Cx;
RIZIV code = (750595)

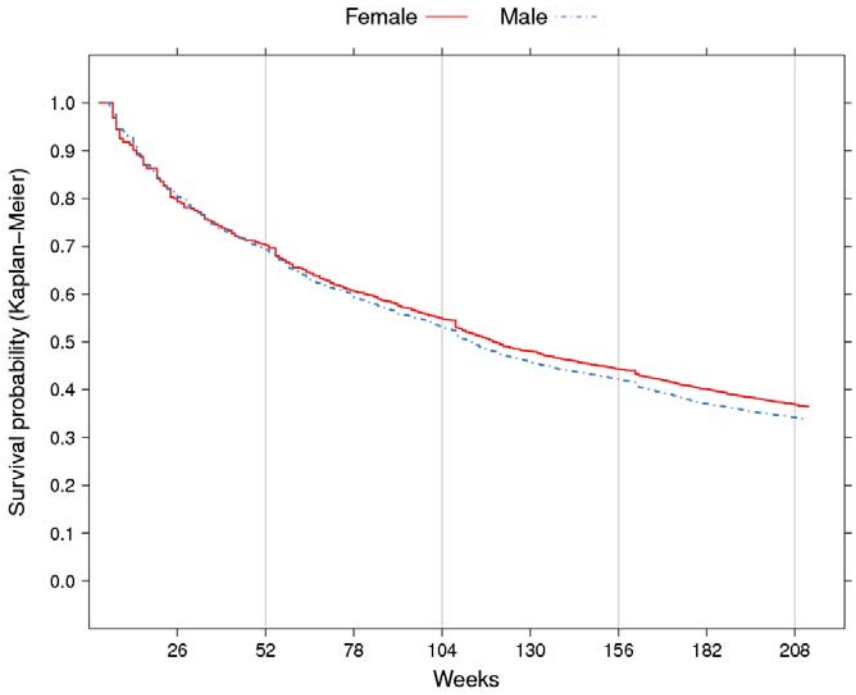
*Exception for independents, tritherapy, emergency;
RIZIV code = (754913,754876,754854,754935,754891,754832,754073,754412)

SURVIVAL ANALYSIS

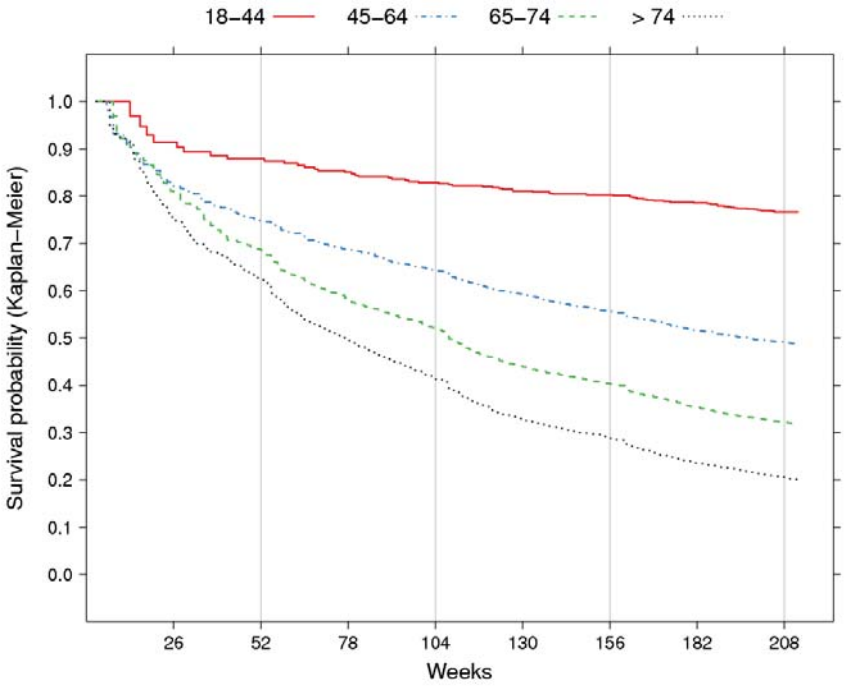
Overall survival



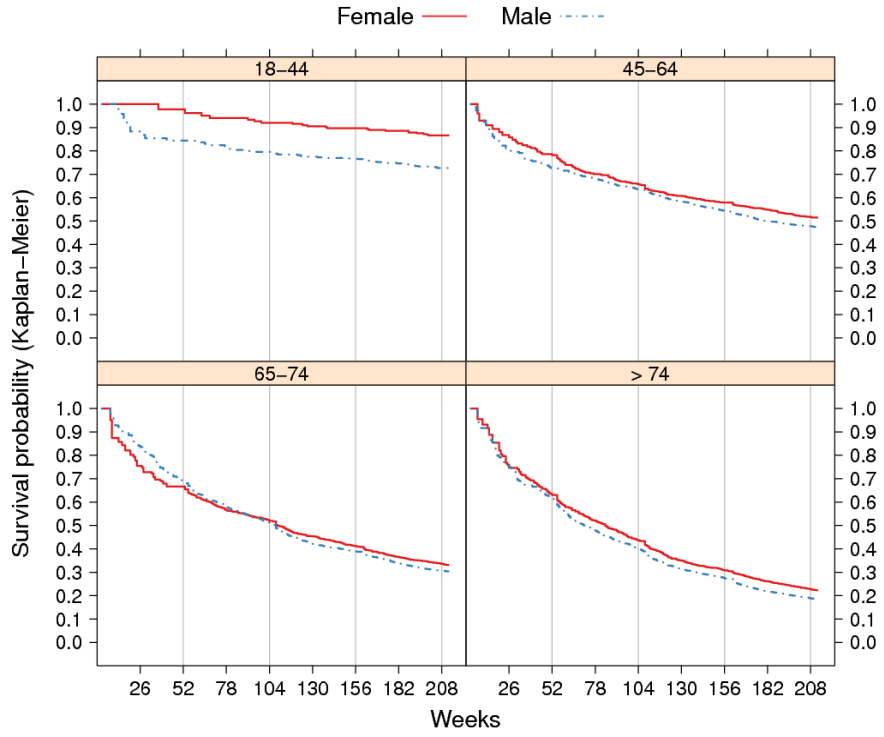
Survival by gender



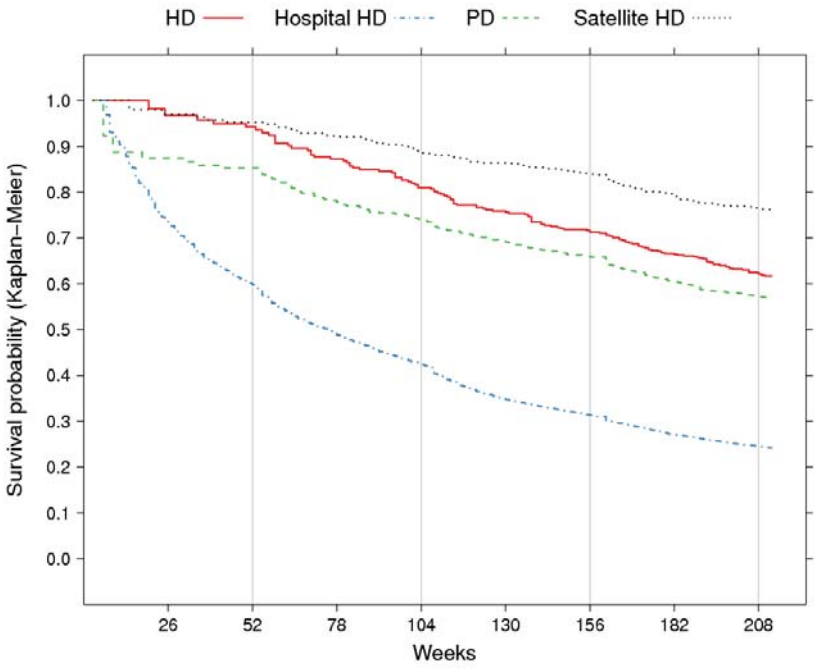
Survival by age category



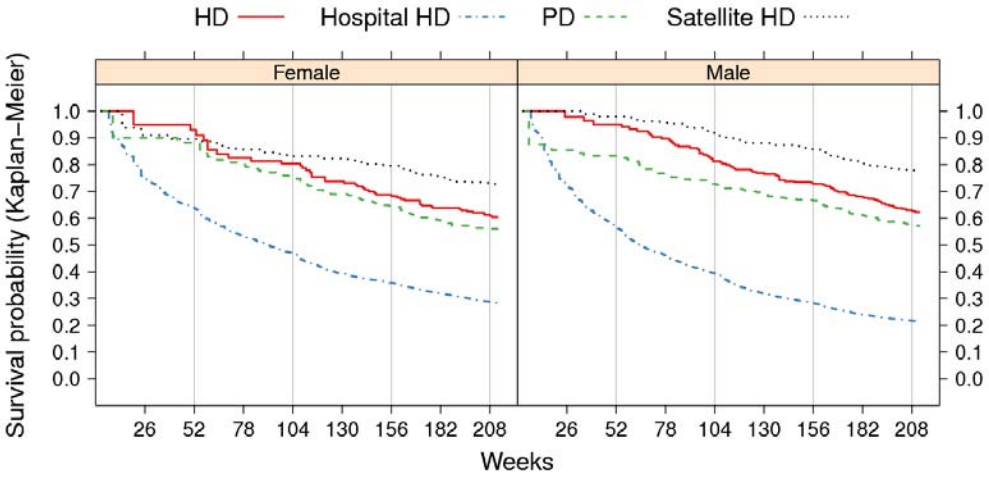
Survival by age and gender

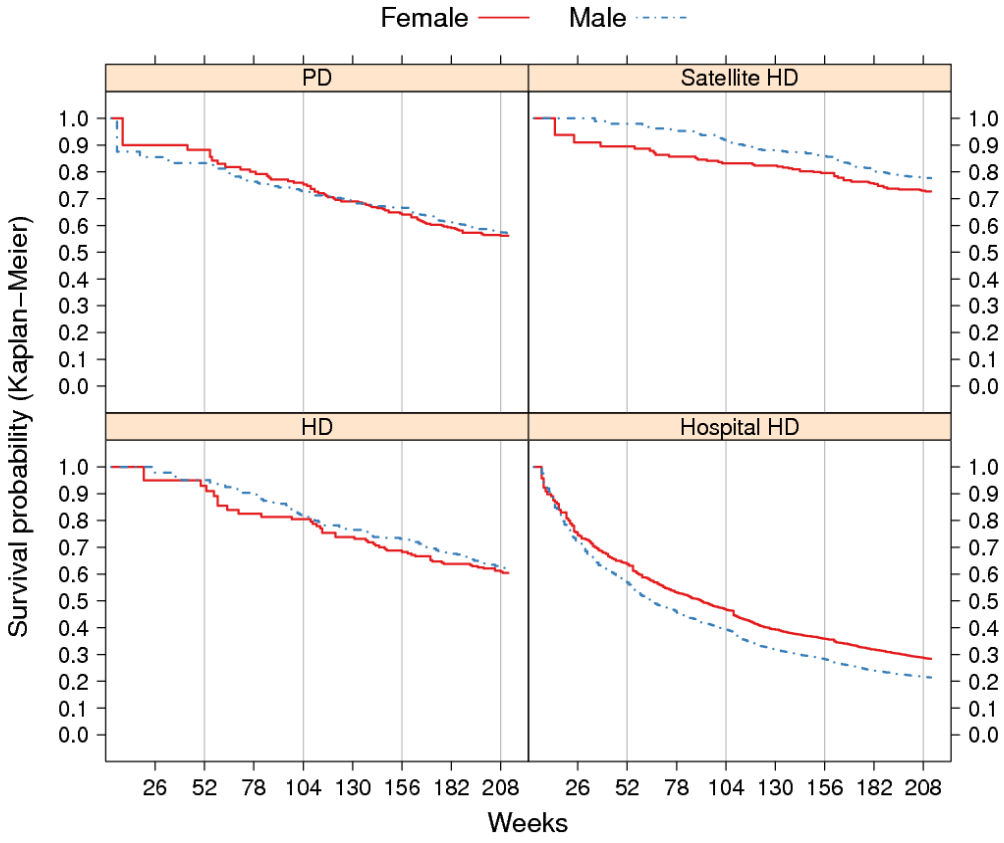


Survival by group

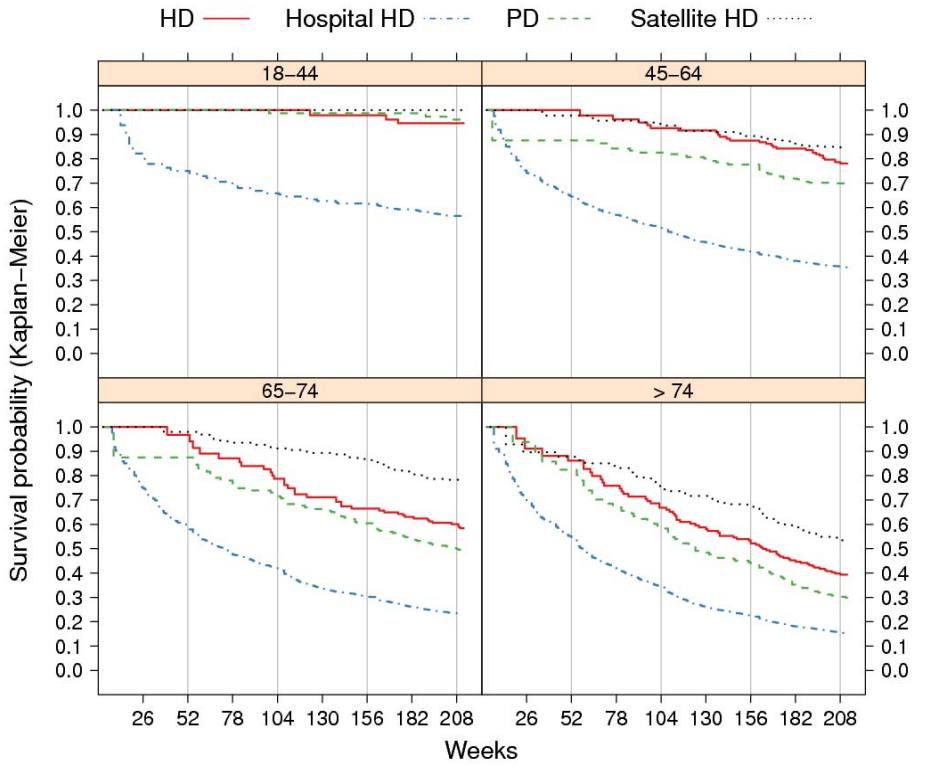


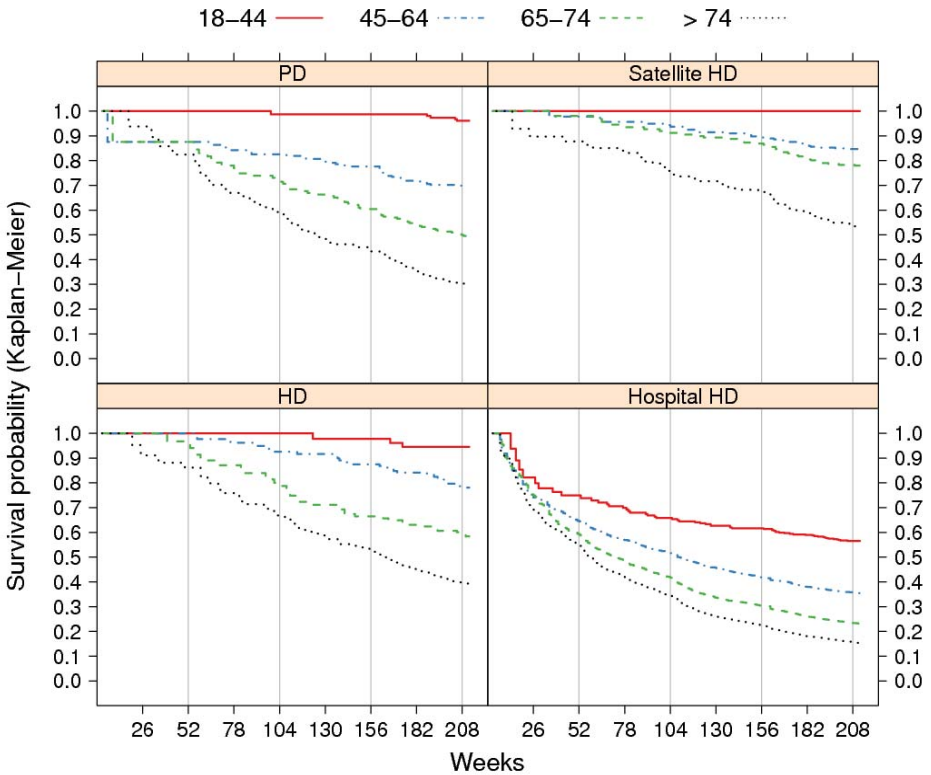
Survival by group and gender



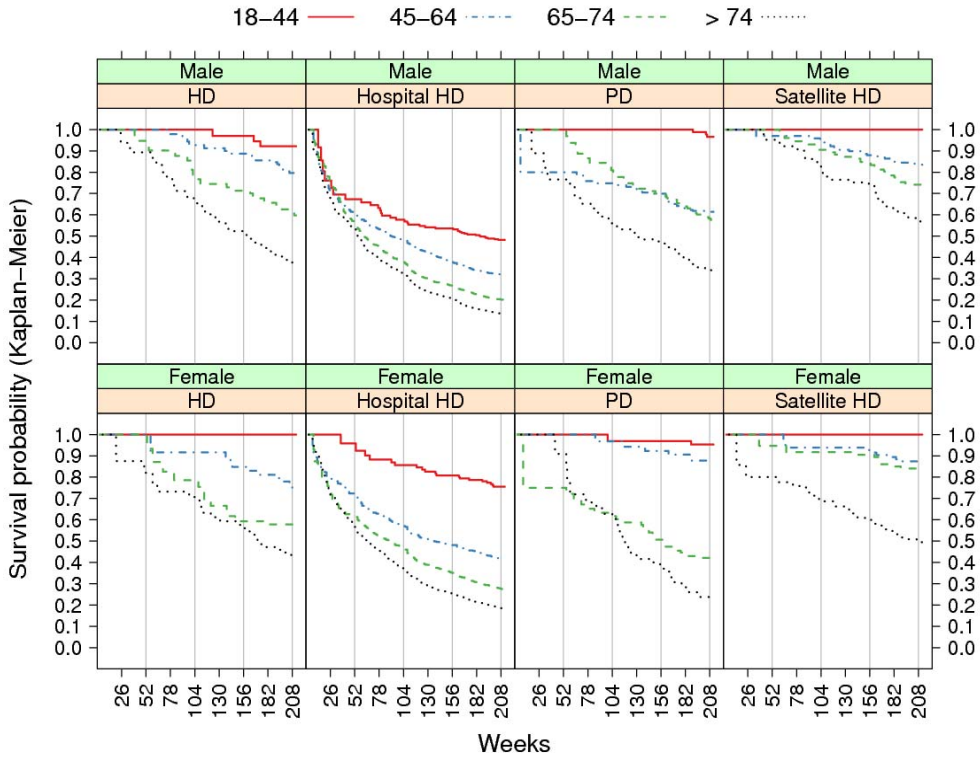


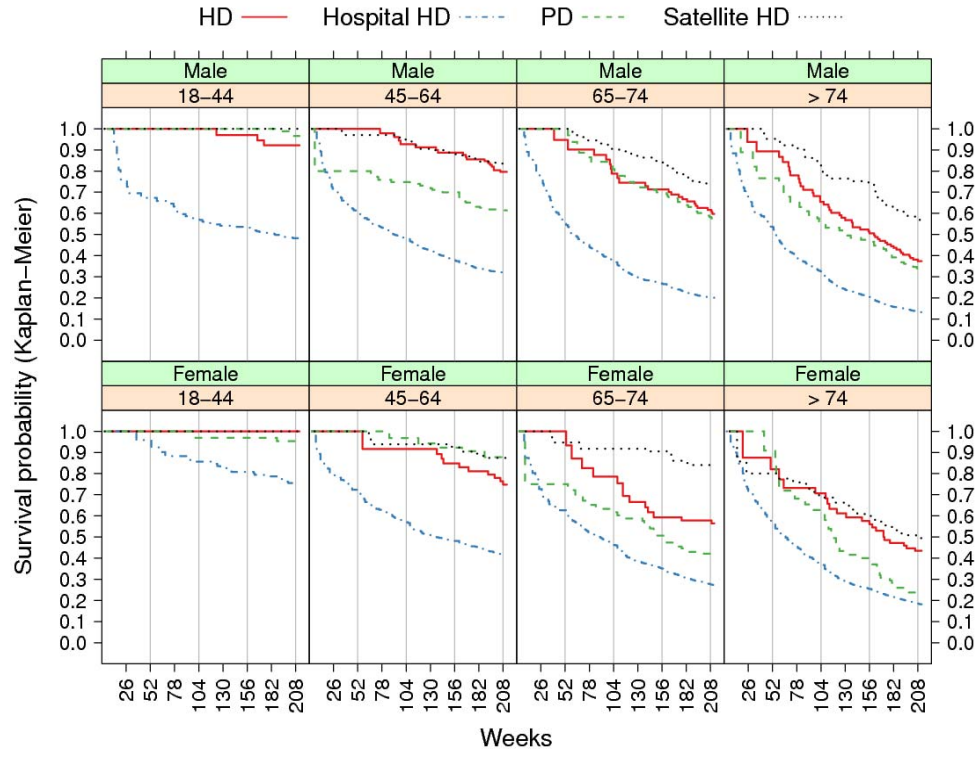
Survival by group and age category

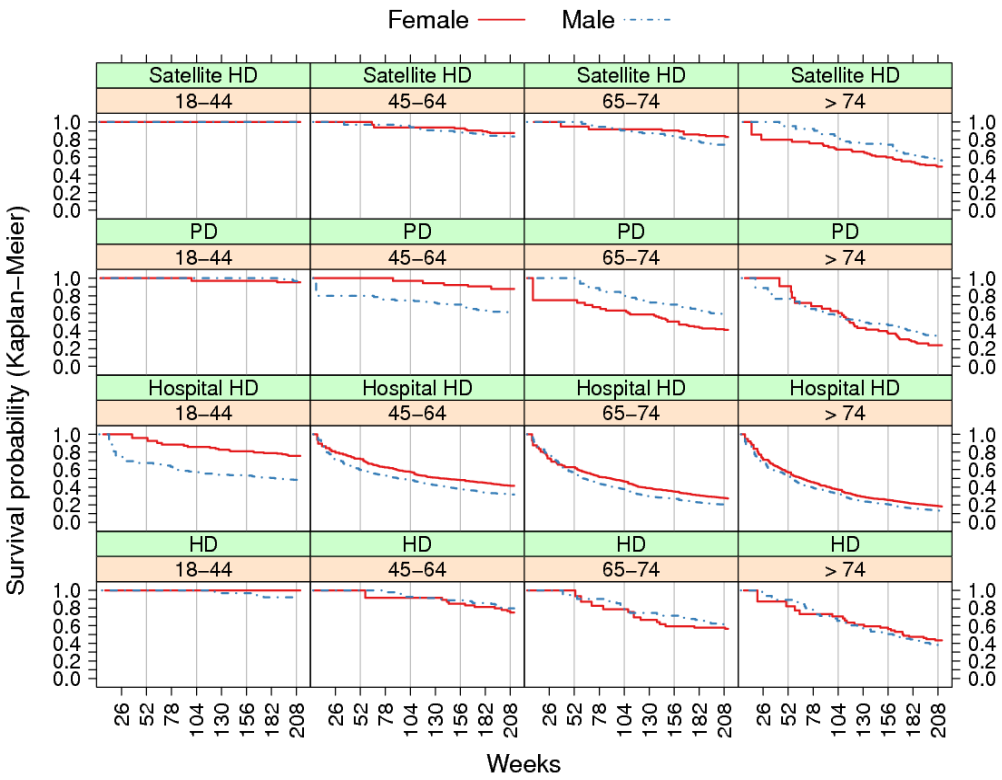




Survival by group, age and gender







APPENDIX TO CHAPTER 5

DIALYSIS COST SURVEY

The survey was provided to all dialysis centres in a print-friendly Microsoft Excell format. Each Excell sheet is presented here on a separate page, the title of the pages being the names of the respective Excell sheets.

START - INFORMATION

PRIOR GENERAL INFORMATION

* In this file you find 7 sheets to be completed :
  - Sheet "general questions" contains some general questions related to the dialysis programme in your hospital
  - Sheet "Human Resources" relates to the human resources costs associated with the dialysis programme in your hospital
  - Sheet "Consumables" relates to the costs of consumables associated with the dialysis programme in your hospital
  - Sheet "Equipment" relates to the costs of equipment associated with the dialysis programme in your hospital
  - Sheet "Overhead" relates to the overhead costs associated with hospital or satellite haemodialysis
  - Sheet "Other costs" relates to potential other costs associated with the dialysis programme in your hospital that were not yet included in one of the previous sheets.
  - Sheet "Time Medical Staff" contains a questionnaire that should help you to define the figures needed to fill out the table "Medical Staff" in sheet "Human Resources".

* Cells to be filled in are in pink. If you are not able to fill in a pink cell, please comment why it was not possible.

* Data should be drawn from the annual accounts of **2006**.

* For the equipment, please give the original purchase price (also if the equipment was not bought in 2006 but in some previous year)

* For consumables and overhead costs, items to be included are detailed to obtain consistent figures accross hospitals.
  It is not necessary however to give the precise cost for each of the individual items; they may be added up to obtain a total cost figure.
  If the totals do not include certain items mentioned in the list, please specify which ones were excluded.

  Thank you very much for your collaboration.

GENERAL QUESTIONS

YES
NO **General questions**
not applicable

* Does your hospital have a satellite dialysis centre ?

* Which dialysis modalities does your hospital offer and how many sessions (for haemodialysis) or weeks (for peritoneal dialysis)?
Some types of dialysis cannot be charged separately to the RIZIV/INAMI. These cells are made opaque and should not be filled in.

	Presence	Number of sessions or weeks	
High care Haemodialysis in hospital		sessions	Yes
High care Haemodialysis in a satellite unit			No
Low-care Haemodialysis in hospital		sessions	
Low-care Haemodialysis in a satellite unit		sessions	
or Total Low-care Haemodialysis sessions		sessions	
Home Haemodialysis with nursing support		sessions	
Home Haemodialysis without nursing support		sessions	
Peritoneal Dialysis with nursing support		weeks	
Peritoneal Dialysis without nursing support		weeks	
CCPD		weeks	

* Are medical doctors (nephrologists) in your hospital salaried ?

* Are medical doctors (nephrologists) working in the satellite centre shared with the hospital haemodialysis programme?

* Are nurses working in the satellite centre shared with the hospital haemodialysis programme?

* For high care haemodialysis, it is stipulated that 1 nephrologist is needed per 4000 high-care haemodialysis sessions.
According to your experience, how many nephrologists are needed for the required support of **low-care** haemodialysis:

1 nephrologist per low-care haemodialysis sessions

According to your experience, how many nephrologists are needed for the required support of **peritoneal** dialysis patients:

1 nephrologist per peritoneal dialysis patients

* Is the dialysis equipment in your hospital leased or provided 'for free' from a company providing the dialysate?

Comment:

* Does your accounting system use specific allocation bases for overhead costs, such as m², number of full-time equivalents, other?

* If your answer to the previous question is "Yes", what are the (assumed) overhead costs per unit of the allocation base and for which cost item(s) are they used?
(e.g. building space, cleaning, heating, lighting, laundry, mortuary, waste…)

Unit cost in €	Allocation base	Overhead cost item(s) allocated using the allocation base
	m²	
	FTE	
	kilogram	
	meals	

Number of square meters (m²)of the hospital dialysis unit (excluding satellite unit)		m²
Number of square meters (m²)of the satellite dialysis unit, if available		m²
If the number of m² is not separately available for the satellite and hospital dialysis unit, total number of square meters (m²) of the dialysis units		m²

HUMAN RESOURCES

HUMAN RESOURCES

Please fill out how many full-time equivalents of each personnel category is working for the dialysis programme in your hospital.
For each category, estimate the % of total time devoted to the ambulatory dialysis programma and to each dialysis type.

Medical staff

The estimation of the % of total times devoted to the ambulatory dialysis programme and to each dialysis type by medical staff might require a short survey in the medical staff members.
In Sheet "Time Medical staff" you will find a template that will help to complete the table.

Medical staff	Total number of full-time equivalents of medical staff involved in the ambulatory dialysis programme	Total remuneration cost of all medical staff involved in the dialysis programme (euros) *Read comment (put cursor on this cell)*	Average length of service (anciënniteit / ancienneté)	Estimated % of total personnel time devoted to the ambulatory dialysis programme	Estimated % of total personnel time devoted to other patient care (unrelated to ambulatory dialysis)	Estimated % of total personnel time devoted to other activities (education, research, management)	Estimated % of total personnel time devoted to low-care haemodialysis (expressed as a % of total time devoted to the ambulatory dialsyis programme)	Estimated % of total personnel time devoted to high-care haemodialysis in hospital unit (expressed as a % of total time devoted to the ambulatory dialsyis programme)	Estimated % of total personnel time devoted to peritoneal dialysis (expressed as a % of total time devoted to the ambulatory dialsyis programme)	Estimated % of total personnel time devoted to home haemodialysis (expressed as a % of total time devoted to the ambulatory dialsyis programme)
- Medical staff										
. Permanent doctors										
. Physicians in training										
. Non-permanent doctors										

Nursing, technical and other staff

Please provide the total number of full-time equivalents of nursing, technical, administrative, paramedical and other staff involved in the dialysis programme in your hospital in the first table below.
If you can make a distinction between the staff costs for the different types of dialysis (e.g. if different cost places are used for different dialysis types), please provide separate figures for each of the relevant dialysis types (second and following tables).
If no separate cost places are used for the different dialysis types, you only need to fill out table 1 but please make sure these figures encompass all ambulatory dialysis activities.

	Total number of full-time equivalents of each staff category involved in the ambulatory dialysis programme	Total remuneration cost of all staff involved in the dialysis programme (euros)	Average length of service (anciënniteit / ancienneté)	% of total personnel time devoted to low-care dialysis	% of total personnel time devoted to haemodialysis in hospital unit	% of total personnel time devoted to peritoneal dialysis	% of total personnel time devoted to home haemodialysis	Your comments
Nursing staff								
. A1 Nurses : graduated * Nurse in chief * Nurse in chief assistant * Graduated . Nurses A2 : brevet . Nurse's aide . Assistant (logistics…)								
Technician staff								
. Machine maintenance . Machine reparation . Equipment delivery . Stock management								
Administrative staff (secretariat dialysis unit)								
Paramedics								
Dietetician								
Other (specify)								

Nursing, technical and other staff for the hospital haemodialysis unit

	Total number of full-time equivalents of staff working for the hospital haemodialysis unit	Total remuneration cost of all staff involved in the dialysis programme (euros)	Average length of service (anciënniteit / ancienneté)	Your comments
Nursing staff . A1 Nurses : graduated * Nurse in chief * Nurse in chief assistant * Graduated . Nurses A2 : brevet . Nurse's aide . Assistant (logistics…)				
Technician staff . Machine maintenance . Machine reparation . Equipment delivery . Stock management				
Administrative staff (secretariat dialysis unit)				
Paramedics				
Dietetician				
Other (specify)				

Nursing, technical and other staff for the satellite haemodialysis unit

	Total number of full-time equivalents of staff working for the satellite haemodialysis unit	Total remuneration cost of all staff involved in the dialysis programme (euros)	Average length of service (anciënniteit / ancienneté)	Your comments
Nursing staff . A1 Nurses : graduated * Nurse in chief * Nurse in chief assistant * Graduated . Nurses A2 : brevet . Nurse's aide . Assistant (logistics…)				
Technician staff . Machine maintenance . Machine reparation . Equipment delivery . Stock management				
Administrative staff (secretariat dialysis unit)				
Paramedics				
Dietetician				
Other (specify)				

Nursing, technical and other staff for peritoneal dialysis

	Total number of full-time equivalents of staff working for peritoneal dialysis	Total remuneration cost of all staff involved in the dialysis programme (euros)	Average length of service (anciënniteit / ancienneté)	Your comments
Nursing staff . A1 Nurses : graduated * Nurse in chief * Nurse in chief assistant * Graduated . Nurses A2 : brevet . Nurse's aide . Assistant (logistics…)				
Technician staff . Machine maintenance . Machine reparation . Equipment delivery . Stock management				
Administrative staff (secretariat dialysis unit)				
Paramedics				
Dietetician				
Other (specify)				

Nursing, technical and other staff for home haemodialysis

	Total number of full-time equivalents of staff involved for home haemodialysis	Total remuneration cost of all staff involved in the dialysis programme (euros)	Average length of service (anciënniteit / ancienneté)	Your comments
Nursing staff . A1 Nurses : graduated * Nurse in chief * Nurse in chief assistant * Graduated . Nurses A2 : brevet . Nurse's aide . Assistant (logistics…)				
Technician staff . Machine maintenance . Machine reparation . Equipment delivery . Stock management				
Administrative staff (secretariat dialysis unit)				
Paramedics				
Dietetician				
Other (specify)				

CONSUMABLES

Please give the total cost of consumables booked on cost places 560 to 569.
In case you can make a distinction between the different types of dialysis (e.g if different cost places are used for different dialysis types), please provide total consumables costs for the relevant dialysis type.
In case you provide a total cost for all consumables costs, please specify whether the individual consumables listed are
included or not in the "included Yes/no" column for each dialysis type.

	Total costs in 2006 (euros)	Your comments
Total consumables costs		

	Included Yes/No	Total costs in 2006 (euros)	Your comments
For haemodialysis in hospital			
Total consumables cost			
including:			
- medication			
- artificiel kidney			
- blood lines			
- bicart			
- concentrat			
- heparine			
- saline solution			
- needles			
- connector/deconnector			
- desinfectant			
- dustbin			
- syringes			
- perfusion sets			
- other:			
-			
-			
-			
-			
-			

	Included Yes/No	Total costs in 2006 (euros)	Your comments
For haemodialysis in satellite			
Total consumables cost including:			
- medication			
- artificiel kidney			
- blood lines			
- bicart			
- concentrat			
- heparine			
- saline solution			
- needles			
- connector/deconnector			
- desinfectant			
- dustbin			
- syringes			
- perfusion sets			
- other:			
-			
-			
-			
-			
-			

	Included Yes/No	Total costs in 2006 (euros)	Your comments
For peritoneal dialysis, consumables provided by the hospital			
Total consumables cost including:			
- dialysate			
- desinfectant fluids			
- clips			
- connector/deconnector			
- nursing kits			
- tape			
- belts			
- needles			
- micropore			
- dustbin			
-			
-			
-			
-			
-			
-			
-			

	Included Yes/No	Total costs in 2006 (euros)	Your comments
For home haemodialysis, consumables provided by the hospital			
Total consumables cost including:			
- medication			
- artificiel kidney			
- blood lines			
- bicart			
- concentrat			
- heparine			
- saline solution			
- needles			
- connector/deconnector			
- desinfectant			
- dustbin			
- syringes			
- perfusion sets			
- other:			
-			
-			
-			
-			
-			
-			

EQUIPMENT

EQUIPMENT

Please fill out how many units of the specified equipment were available in your hospital in 2006 for each type of dialysis, their catalogue price per unit, the year of purchase and the estimated number of years of use.

Equipment haemodialysis in hospital and satellite centre	Number of units (including reserves)	Catalogue price per unit (euros)	Year of purchase	Estimated number of years of use	Your comments
- Dialysis equipment					
. Dialysis machines					
. Seats					
. Weighing devices					
. Tensiometer					
- Water purification machine					

Equipment peritoneal dialysis provided by the hospital	Number of units (including reserves)	Catalogue price per unit (euros)	Year of purchase	Estimated number of years of use	Your comments
- Dialysis equipment provided by hospital					
. Dialysis machine (in case of AP)					
. Heating plate					
. Weighing devices					
. Tensiometer					
. serum standard					
. buckets					
.					
.					
.					

Equipment home haemodialysis provided by the hospital	Number of units (including reserves)	Catalogue price per unit (euros)	Year of purchase	Estimated number of years of use	Your comments
- Dialysis equipment					
. Dialysis machines					
. Seats					
. Weighing devices					
. Tensiometer					
- Water purification machine					
.					
.					
.					

OVERHEAD

OVERHEAD COSTS

Please give the total overhead cost booked on the haemodialysis unit(s);
In case you provide a total cost for all overhead costs, please indicate whether the individual overhead costs listed are included in the total in the "included Yes/no" column.
In case you can make a distinction between the different types of dialysis (e.g if different cost places are used for different dialysis types), please provide total overhead costs for the relevant dialysis type (second and third table).

	Included Yes/No	Total costs (euros)	Your comments
Total overhead costs allocated to the haemodialysis unit(s), hospital+satellite			
- Building space			
- laundry			
- meals			
- mortuary			
- help desk			
-			
-			
-			

For hospital haemodialysis unit

	Included Yes/No	Total costs (euros)	Your comments
Total overhead costs allocated to the hospital haemodialysis unit			
- Building space			
- laundry			
- meals			
- mortuary			
- help desk			
-			
-			
-			

For satellite haemodialysis unit

	Included Yes/No	Total costs (euros)	Your comments
Total overhead costs allocated to the hospital haemodialysis unit			
- Building space			
- laundry			
- meals			
- mortuary			
- help desk			
-			
-			
-			

OTHER COSTS

OTHER COSTS

Here you can specify other costs that can be attributed to the dialysis that have not yet been included in the previous tables. Please specify the cost item.

Haemodialysis in hospital	Total costs (euros)	Explanation
-		
-		
-		
-		
-		
-		
-		
-		

Haemodialysis in satellite unit	Total costs (euros)	Explanation
-		
-		
-		
-		
-		
-		
-		
-		

Peritoneal dialysis	Total costs (euros)	Explanation
-		
-		
-		
-		
-		
-		
-		
-		

Home Haemodialysis	Total costs (euros)	Explanation
-		
-		
-		
-		
-		
-		
-		
-		

RESOURCE ITEMS WITH THEIR ASSUMED DISTRIBUTION USED IN THE COST SIMULATION

UNIT COSTS

Cost component	Resource item	Mean	s.d.	Distribution	alpha	beta	n
Human resources, per year	Medical staff	269.490	129.010	Gamma	4,36	61.759,42	8
	Nursing staff	54.313	3.437	Gamma	249,75	217,47	6
	Technical staff	62.106	4.773	Gamma	169,30	366,83	6
	Administrative staff	49.603	8.527	Gamma	33,84	1.466,00	4
	Dietician	57.098	15.903	Gamma	12,89	4.429,49	3
Equipment, per year	*Haemodialysis*						
	Dialysis machines	3.168,05	736,34	Gamma	18,51	171,14	6
	Seats	317,37	129,87	Gamma	5,97	53,14	6
	Weighing devices	631,43	616,56	Mean			3
	Tensiometer	195,34	264,15	Mean			2
	Water purification machine	20.519,06	16.048,50	Gamma	1,63	12.552	7
	Peritoneal dialysis						
	Dialysis machine for AP			no data available			0
	Heating plate	24,08		Mean			1
	Weighing devices	19,95	17,74	Mean			3
	Tensiometer	18,15	4,47	Mean			3
Consumables	total of "all consumables"						
	Hospital HD, per session	64,14	11,07	Gamma	33,59	1,91	6
	Satellite HD, per session	56,72	12,58	Gamma	20,33	2,79	7
	PD, per week	499,77	239,44	Gamma	4,36	114,72	6
Overheads	m²	167,47	64,62	Mean			5
	FTE	10.766,02	3.759,62	Mean			5
	FTE nurse	1.404,19	309,07	Mean			5
	meal	19,20	4,16	Mean			2
	total of "all overheads"						
	Hospital HD, per session	51,73	10,37	Gamma	24,89	2,08	5
	Satellite HD, per session	58,97	44,41	Gamma	1,76	33,44	4
	PD, per week	84,83	101,43	Mean			3
Other costs	total of "all other costs"						
	Hospital HD, per session	4,85	3,00	Mean			5
	Satellite HD, per session	2,72	1,61	Mean			4
	PD, per week	17,00	17,53	Mean			5

VOLUMES HOSPITAL HD

Cost component	Resource item	Mean	s.d.	Distribution	alpha	beta	n
Human resources, per session	Medical staff	0,000135	0,000050	Gamma	7,4389	0,00002	6
	Nursing staff	0,00200	0,00060	parameter value			6
	Technical staff	0,00009	0,00004	Mean			5
	Administrative staff	0,00010	0,00010	Mean			4
	Dietician	0,00002	0,00000	Mean			3
Equipment	Dialysis machines	0,00289	0,00078	Gamma	13,6049	0,0002	7
	Seats	0,00190	0,00115	Gamma	2,7210	0,0007	7
	Weighing devices	0,00072	0,00043	Gamma	2,7782	0,0003	5
	Tensiometer	0,00106	0,00017	Mean			3
	Water purification machine	0,00023	0,00020	Gamma	1,3202	0,0002	7
Overheads, per session	m²	0,10480	0,03138	Gamma	11,1558	0,009394	5
	FTE	0,00251	0,00059	Gamma	17,7538	0,0001	6
	FTE nurse	0,002		Parameter value			
	meal	1		Parameter value			

VOLUMES SATELLITE HD

Cost component	Resource item	Mean	s.d.	Distribution	alpha	beta	n
Human resources, per session	Medical staff	0,00012	0,0000	Gamma	7,8518	0,0000	7
	Nursing staff	0,00110	0,00109	parameter value			6
	Technical staff	0,00009	0,00016	Mean			5
	Administrative staff	0,00010	0,00018	Mean			4
	Dietician	0,00002	0,00003	Mean			3
Equipment, per session	Dialysis machines	0,00289	0,00078	Gamma	13,6049	0,0002	7
	Seats	0,00190	0,00115	Gamma	2,7210	0,0007	7
	Weighing devices	0,00072	0,00043	Gamma	2,7782	0,0003	5
	Tensiometer	0,00106	0,00017	Mean			3
	Water purification machine	0,00023	0,00020	Gamma	1,3202	0,0002	7
Overheads	m^2	0,10480	0,03138	Gamma	11,1558	0,009394	5
	FTE	0,00198	0,00104	Gamma	3,6512	0,0005	6
	FTE nurse	0,00110		parameter value			
	meal	1		parameter value			

VOLUMES PD

Cost component	Resource item	Mean	s.d.	Distribution	alpha	beta	n
Human resources, per week	Medical staff	0,00059	0,0003	Gamma	3,0506	0,0002	6
	Nursing staff	0,00150	0,0019	Parameter value			5
	Technical staff	0,00000		Parameter value			4
	Administrative staff	0,00010	0,0001	Mean			3
	Dietician	0,00002	0,0000	Mean			3
Equipment, per week	Dialysis machine for AP	0,01411	0,0081	Mean			3
	Heating plate	0,02058	0,0103	Mean			3
	Weighing devices	0,01934	0,0037	Mean			3
	Tensiometer	0,01080	0,0111	Mean			3
Overheads	FTE	0,00344	0,0016	Gamma	4,4325	0,0008	6
	FTE nurse	0,00150		Parameter value			

APPENDIX TO CHAPTER 7

QUESTIONNAIRE SENT TO REPRESENTATIVES OF THE PATIENT ORGANISATIONS

FRENCH VERSION

Bruxelles, jeudi 3 septembre 2009

Sujet: Questionnaire dialyse – point de vue des patients

Chère Madame, Cher Monsieur,

Le présent questionnaire fait partie d'une étude du Centre Fédéral d'Expertise des Soins de Santé (KCE). Au moyen de cette étude, le KCE vise à analyser la situation en matière de dialyse chronique en Belgique. Un volet important de l'étude s'intéresse au point de vue du patient.

L'étude est centrée sur les patients souffrant d'une affection rénale chronique traitée au moyen d'une forme déterminée de dialyse. Tous les modes de dialyse chronique (hémodialyse en milieu hospitalier, hémodialyse dans un centre satellite, hémodialyse à domicile, hémodialyse de nuit et dialyse péritonéale) sont pris en compte. Nous souhaitons mieux connaître la perspective des patients qui viennent d'entamer un traitement par dialyse que de ceux qui s'y soumettent déjà depuis longtemps. En plus, nous sommes intéressés par la perspective des patients qui sont passés d'un mode de dialyse à une autre (par exemple de la dialyse péritonéale à l'hémodialyse).

Vous trouverez ci-dessous une liste de questions que nous souhaiterions vous soumettre.. Ce questionnaire est adressé à tous les membres du Conseil d'Administration de FENIER-BABIR. Ces questions seront examinées par Lors de la réunion du Conseil du 17 septembre 2009, vous aurez l'occasion de discuter ensemble ces questions. Nous vous faisons parvenir dès à présent ce questionnaire afin que vous puissiez préparer cette discussion. Nous vous serions très reconnaissants si vous pouviez communiquer vos réponses sous forme écrite mais de manière anonyme, à l'équipe de recherche du KCE.

Important! Nous vous saurions gré d'y répondre en qualité de représentant des membres de votre association, et non sur la base de votre perception personnelle. Nous vous serions très reconnaissants si vous pouviez contacter vos membres afin d'apporter à nos questions, une réponse la plus nuancée possible

Nous aimerions connaître le point de vue de différents groupes de patients, à savoir:

- Les patients **qui viennent d'entamer** une dialyse chronique
- Les patients **qui se soumettent depuis longtemps** à une dialyse
- Les patients **jeunes** et les patients **âgés**
- Les patients **isolés**, les patients vivant **en couple**, les patients vivant **en famille**
- Les patients qui ont **changé** de forme de dialyse et les patients qui n'en ont **pas changé**

- …

Lorsque cela s'avère relevant, pouvons-nous vous demander de faire la distinction entre différents groupes de patients , en précisent par exemple "Pour les jeunes patients qui travaillent hors domicile…" ou "Pour les patients isolés qui bénéficient d'une dialyse péritonéale…"

Les informations quant aux divers modes de dialyse

1. Avant d'entamer une dialyse, le patient est-il informé de l'existence de l'existence de divers modes de dialyse?
    a. De quelle manière cette information est-elle communiquée: oralement, par dépliant, DVD, contact avec d'autres dialysés, contact avec une association de patients…?
    b. Quel est le moyen d'information préféré par les patients et pourquoi?
2. Les patients **qui entament une dialyse** considèrent-ils comme suffisantes les informations qui leur sont prodiguées quant aux divers modes de dialyse?
3. A posteriori, les patients considèrent-ils les informations relatives au mode de dialyse qu'ils ont choisi comme suffisante et correcte afin dese forger une bonne opinion de leur impact sur leur vie quotidienne?

Le choix du mode de dialyse

4. Avant d'entamer leur dialyse, les patients ont-ils l'occasion de choisir entre divers modes de dialyse?

    Dans la négative, leur explique-t-on pourquoi ce choix ne peut leur être offert?
5. Les patients considèrent-ils qu'ils bénéficient d'un délai suffisant pour intégrer ces informations, pour évaluer les avantages et les inconvénients, et ensuite pour faire un choix éclairé?
6. Les patients estiment-ils qu'ils sont suffisamment accompagnés par les professionnels de santé afin d'effectuer un choix en faveur d'une forme de dialyse déterminée ?
7. Quels sont les éléments quidéterminent finalement le choix du patient pour un mode de dialyse déterminé (tels que davantage de flexibilité, plus de certitude que les complications seront prises en charge rapidement, le médecin est le facteur de choix le plus déterminant, …)

    - Pour cette réponse, faites si nécessaire la distinction entre les différents groupes de patients (en fonction de l'âge, de l'activité professionnelle, de la situation familiale, etc.)
8. Quelles sont les raisons le plus souvent invoquées par le patient pour justifier un changement de mode de dialyse?

    Cette question ne doit être posée qu'aux patients qui ont changé de mode de dialyse.

Les avantages et inconvénients des différent modes de dialyse

9. Quels sont respectivement les avantages et les inconvénients, pour le patient, des divers modes de dialyse (à titre d'exemple, les éléments que nous avons pu observer par nous-mêmes sont notamment la sensation de sécurité grâce à la surveillance, la flexibilité, l'investissement en temps, la mobilité, etc. D'autres facteurs pourraient être : la charge pour la famille, la compétence des soignants, la qualité des soins, le maintien de la vie sociale?

    - Dans la réponse, faites la distinction entre les différents groupes de patients (en fonction de l'âge, de l'activité professionnelle, de la situation familiale, etc.)

    - Apportez également vos considérations en ce qui concerne les différentes phases et différents évènements qui ont eu lieu au cours de tout le parcours du patient dialysé (par exemple : lors du commencement du traitement, lors de complications ou d'évènements imprévus…)

    Veuillez également indiquer les sources sur lesquelles vous vous fondez pour répondre à cette question (telles que témoignages de patients lors d'un forum, contact direct avec des patients

membres de votre association, etc.) Vous ne devez pas nécessairement fournir une réponse pour chaque mode de dialyse si vous ne disposez pas de sources pour le type de patients en question.

10. Du point de vue des différents groupes de patients, quel est l'ordre d'importance de chacun de ces éléments?

L'encadrement lors de la dialyse à domicile (dialyse péritonéale, hémodialyse à domicile)

11. Du point de vue des patients qui se soumettent à une dialyse à domicile, est-il indispensable de pouvoir compter d'un 'aidant naturel' (à savoir un parent, conjoint ou connaissance qui prodigue une aide quelconque lors du traitement)?

    – Le cas échéant, faites la distinction entre les différents groupes de patients (nouveaux dialysés, dialysés de longue date, jeunes, personnes âgées, etc.)

Les aspects financiers

12. La dialyse est-elle un traitement onéreux pour le patient?

    - Quels sont les coûts directs ? Quels sont les coûts directement liés à la dialyse et que le patient doit supporter
    - Quels sont les coûts indirects que les patients peuvent être amenés à supporter (p.ex. l'achat de nouveau mobilier, adaptation d'une pièce, changement de profession…)?

      – Faites une distinction selon les modes de dialyse

Divers

13. En votre qualité de Président d'une association, existe-t-il d'autres éléments importants pour les patients dialysés, et dont vous désirez nous faire part?

Dutch version

Brussel, donderdag 3 september 2009

Subject: Vragenlijst dialyse - patiëntenperspectief

Geachte

Deze vragenlijst kadert in een studie van het Federaal Kenniscentrum voor de Gezondheidszorg (KCE). Het KCE tracht in deze studie de situatie van chronische dialyse in België in kaart te brengen. Een belangrijk deel van de studie gaat over het perspectief van de patiënten.

Het onderzoek focust op patiënten met chronische nierziekte die worden behandeld met één of andere vorm van dialyse. Alle vormen van chronische dialyse (hemodialyse in het ziekenhuis, hemodialyse in een satellietcentrum, hemodialyse thuis, nachthemodialyse en peritoneale dialyse) worden in aanmerking genomen. Wij willen meer inzicht verwerven in het perspectief van zowel de patiënten bij wie de dialysebehandeling pas is opgestart als van de patiënten die reeds lang een dialysebehandeling volgen. Ook het perspectief van patiënten die zijn overgestapt van één vorm naar een andere vorm van dialyse (bijvoorbeeld van peritoneale dialyse naar hemodialyse) interesseert ons.

Hieronder vindt u een lijst van vragen die wij graag willen bespreken. Deze vragenlijst wordt naar alle leden van de Raad van Bestuur van FENIER-BABIR gestuurd. Op de Raad van Bestuur van 17 september 2009 zullen jullie deze vragen gezamenlijk bespreken. U ontvangt deze vragenlijst zodat u zich al wat kan voorbereiden. Wij zouden het zeer op prijs stellen als u uw voorbereide antwoorden ook in geschreven vorm, maar anoniem, doorgeeft aan het KCE onderzoeksteam.

Belangrijk! Gelieve de vragen te beantwoorden als vertegenwoordiger van de leden van uw vereniging en niet louter vanuit uw persoonlijke beleving. We zouden het zeer op prijs stellen indien u uw leden contacteert om een genuanceerd antwoord te kunnen formuleren op onze vragen.

Wij zijn geïnteresseerd in het standpunt van verschillende groepen van patiënten, bijvoorbeeld:

- **beginnende** patiënten in chronische dialyse
- patiënten die reeds **lang** een dialysebehandeling volgen
- **jonge** en **oudere** patiënten
- **alleenstaande** patiënten, patiënten met een **partner**, patiënten met een **gezin**
- patiënten die zijn **veranderd** van dialysevorm en mensen die **niet** zijn **veranderd** doorheen de jaren
- **…**

Maak in uw antwoord waar het relevant is het onderscheid tussen verschillende groepen. Bijvoorbeeld: "voor jongere patiënten die buitenshuis werken …" of "voor alleenstaanden die peritoneale dialyse volgen …"

Informatie over dialysevormen

1. Wordt de patiënt, vooraleer er wordt gestart met dialyse, geïnformeerd over het feit dat er verschillende vormen van dialyse bestaan?
    - In welke vorm wordt de informatie gegeven: folder, mondeling, dvd, contact met andere patiënten op dialyse, contacten met patiëntenverenigingen…?
    - Welke vorm(en) van informatie verkiezen de patiënten en waarom?
2. Ervaren patiënten de informatie die hen wordt geboden over de verschillende dialysevormen **bij de start van de dialysebehandeling** als voldoende?
3. Was, **achteraf** beschouwd, volgens de patiënten, de informatie over de dialysevorm die de patiënt heeft gekozen, voldoende en correct om een goed idee te verwerven over de impact of hun leven?

Keuze van dialysevorm

4. Krijgen patiënten, vooraleer ze starten met dialyse, de mogelijkheid om te kiezen tussen verschillende vormen van dialyse?

    Indien niet, wordt er dan uitgelegd waarom die keuze niet kan worden geboden?
5. Vinden patiënten dat zij voldoende tijd hebben om de informatie te verwerken, de voor- en nadelen af te wegen en vervolgens een bewuste keuze te maken?
6. Vinden patiënten dat ze degelijk begeleid worden door de zorgprofessionals voor het maken van de keuze voor de vorm van dialyse?
7. Welke elementen bepalen uiteindelijk de keuze van patiënten voor een bepaalde vorm van dialyse (bijv. meer flexibiliteit, meer zekerheid dat complicaties snel worden verholpen, de arts is het meest bepalend,…)

    - maak zo nodig een onderscheid tussen verschillende groepen van patiënten (naar leeftijd, professionele activiteiten, familiesituatie, …)
8. Wat zijn redenen die patiënten vaak aanhalen om te veranderen van dialysevorm? - *Deze vraag moet worden gesteld aan patiënten die van één dialysevorm naar een andere zijn overgeschakeld*

Voor- en nadelen van verschillende dialysevormen

9. Wat zijn respectievelijk de voor- en nadelen van de verschillende vormen van dialyse voor de patiënten (bijv. elementen die wij zelf zijn tegengekomen zijn onder andere het gevoel van veiligheid door toezicht, de flexibiliteit, de tijdsinvestering, mobiliteit, … andere factoren zouden kunnen zijn: de belasting voor het gezin, de competentie van de verpleging, de kwaliteit van zorg, onderhouden sociaal leven, …

    - maak bij deze vraag een onderscheid tussen verschillende groepen van patiënten (naar type dialyse, leeftijdcategorie, professionele activiteiten, familiesituatie, …).

    - maak ook een reflectie over de verschillende fases en gebeurtenissen in het langdurig verloop van de dialyse (bijv. bij opstart van de behandeling, bij complicaties of onverwachte gebeurtenissen …)

    Gelieve aan te geven op welke bronnen u zich baseert bij het beantwoorden van deze vraag (bijv. individuele getuigenissen op een forum, rechtstreekse contactname met patiënten uit de vereniging, …). U hoeft niet voor elk type dialyse een antwoord te formuleren indien u geen bronnen ter beschikking hebt.
10. Wat is de volgorde van belangrijkheid van elk van deze elementen voor de verschillende types van patiënten?

Ondersteuning bij thuisdialyse (peritoneale dialyse, thuis-hemodialyse)

11. Is het volgens patiënten die thuisdialyse krijgen noodzakelijk een mantelzorger te hebben (een mantelzorger is bijv. een familielid, partner, kennis, die op één of andere manier helpt bij de behandeling)?

–maak zo nodig het onderscheid tussen verschillende groepen patiënten (beginnende patiënten, patiënten die reeds lang een dialysebehandeling krijgen, jongeren, ouderen,…)

Financiële aspecten

12. Is dialyse een dure behandeling voor de patiënten?
    - Wat zijn de directe kosten? Welke kosten die direct verbonden zijn aan de dialyse moeten patiënten zelf betalen?
    - Zijn er indirecte kosten (bijvoorbeeld aankoop van nieuwe meubels, aanpassing kamers, veranderen van werk …) die patiënten moeten dragen?

      – maak een onderscheid tussen de verschillende vormen van dialyse

Andere …

13. Zijn er andere zaken waarvan u uit uw functie als voorzitter van de vereniging weet dat ze belangrijk zijn voor de patiënten die een dialysebehandeling volgen die u ons wenst mee te delen?

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Wettelijk depot : D/2010/10.273/11

KCE reports

1. Effectiviteit en kosten-effectiviteit van behandelingen voor rookstop. D/2004/10.273/1.
2. Studie naar de mogelijke kosten van een eventuele wijziging van de rechtsregels inzake medische aansprakelijkheid (fase 1). D/2004/10.273/2.
3. Antibioticagebruik in ziekenhuizen bij acute pyelonefritis. D/2004/10.273/5.
4. Leukoreductie. Een mogelijke maatregel in het kader van een nationaal beleid voor bloedtransfusieveiligheid. D/2004/10.273/7.
5. Het preoperatief onderzoek. D/2004/10.273/9.
6. Nationale richtlijn prenatale zorg. Een basis voor een klinisch pad voor de opvolging van zwangerschappen. D/2004/10.273/13.
7. Validatie van het rapport van de Onderzoekscommissie over de onderfinanciering van de ziekenhuizen. D/2004/10.273/11.
8. Financieringssystemen van ziekenhuisgeneesmiddelen: een beschrijvende studie van een aantal Europese landen en Canada. D/2004/10.273/15.
9. Feedback: onderzoek naar de impact en barrières bij implementatie – Onderzoeksrapport: deel 1. D/2005/10.273/01.
10. De kost van tandprothesen. D/2005/10.273/03.
11. Borstkankerscreening. D/2005/10.273/05.
12. Studie naar een alternatieve financiering van bloed en labiele bloedderivaten in de ziekenhuizen. D/2005/10.273/07.
13. Endovasculaire behandeling van Carotisstenose. D/2005/10.273/09.
14. Variaties in de ziekenhuispraktijk bij acuut myocardinfarct in België. D/2005/10.273/11.
15. Evolutie van de uitgaven voor gezondheidszorg. D/2005/10.273/13.
16. Studie naar de mogelijke kosten van een eventuele wijziging van de rechtsregels inzake medische aansprakelijkheid. Fase II : ontwikkeling van een actuarieel model en eerste schattingen. D/2005/10.273/15.
17. Evaluatie van de referentiebedragen. D/2005/10.273/17.
18. Prospectief bepalen van de honoraria van ziekenhuisartsen op basis van klinische paden en guidelines: makkelijker gezegd dan gedaan.. D/2005/10.273/19.
19. Evaluatie van forfaitaire persoonlijk bijdrage op het gebruik van spoedgevallendienst. D/2005/10.273/21.
20. HTA Moleculaire Diagnostiek in België. D/2005/10.273/23, D/2005/10.273/25.
21. HTA Stomamateriaal in België. D/2005/10.273/27.
22. HTA Positronen Emissie Tomografie in België. D/2005/10.273/29.
23. HTA De electieve endovasculaire behandeling van het abdominale aorta aneurysma (AAA). D/2005/10.273/32.
24. Het gebruik van natriuretische peptides in de diagnostische aanpak van patiënten met vermoeden van hartfalen. D/2005/10.273/34.
25. Capsule endoscopie. D/2006/10.273/01.
26. Medico–legale aspecten van klinische praktijkrichtlijnen. D2006/10.273/05.
27. De kwaliteit en de organisatie van type 2 diabeteszorg. D2006/10.273/07.
28. Voorlopige richtlijnen voor farmaco-economisch onderzoek in België. D2006/10.273/10.
29. Nationale Richtlijnen College voor Oncologie: A. algemeen kader oncologisch kwaliteitshandboek B. wetenschappelijke basis voor klinische paden voor diagnose en behandeling colorectale kanker en testiskanker. D2006/10.273/12.
30. Inventaris van databanken gezondheidszorg. D2006/10.273/14.
31. Health Technology Assessment prostate-specific-antigen (PSA) voor prostaatkankerscreening. D2006/10.273/17.
32. Feedback : onderzoek naar de impact en barrières bij implementatie – Onderzoeksrapport : deel II. D/2006/10.273/19.
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34. Trastuzumab bij vroegtijdige stadia van borstkanker. D/2006/10.273/23.
35. Studie naar de mogelijke kosten van een eventuele wijziging van de rechtsregels inzake medische aansprakelijkheid (fase III)- precisering van de kostenraming. D/2006/10.273/26.
36. Farmacologische en chirurgische behandeling van obesitas. Residentiële zorg voor ernstig obese kinderen in België. D/2006/10.273/28.

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44. Een procedure voor de beoordeling van nieuwe medische hulpmiddelen. D/2006/10.273/50.
45. HTA Colorectale Kankerscreening: wetenschappelijke stand van zaken en budgetimpact voor België. D/2006/10.273/53.
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49. Antivirale middelen bij seizoensgriep en grieppandemie. Literatuurstudie en ontwikkeling van praktijkrichtlijnen. D/2006/10.273/65.
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57. Organisatie en Financiering van Musculoskeletale en Neurologische Revalidatie in België. D/2007/10.273/18.
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63. Wetenschappelijke ondersteuning van het College voor Oncologie: een nationale praktijkrichtlijn voor de aanpak van borstkanker. D/2007/10.273/35.
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65. Organisatie en financiering van genetische diagnostiek in België. D/2007/10.273/44.
66. Health Technology Assessment: Drug-Eluting Stents in België. D/2007/10.273/47
67. Hadrontherapie. D/2007/10.273/50.
68. Vergoeding van schade als gevolg van gezondheidszorg – Fase IV : Verdeelsleutel tussen het Fonds en de verzekeraars. D/2007/10.273/52.
69. Kwaliteit van rectale kankerzorg – Fase 1: een praktijkrichtlijn voor rectale kanker D/2007/10.273/54.
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87. Het gebruik van kinesitherapie en van fysische geneeskunde en revalidatie in België. D/2008/10.273/54.
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93. Detectie van adverse events in administratieve databanken. D/2008/10.273/73.
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