

**GENERIC AZATHIOPRIN FOR KIDNEY TRANSPLANT PATIENTS—ANALYSIS OF COST SAVINGS**

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**OBJECTIVES:** To analyze the cost savings after an introduction of the generic version of azathioprin for patients with transplanted kidney. **METHODS:** Prospective observational study of the cost of pharmacotherapy of patients was performed during 2009–2010. It was collected information for 121 patients previously treated with the originator and transferred to the generic medicines. The patient sample was systematized according to patient age, gender, additional medicines used for main therapy, and monthly cost of pharmacotherapy. **RESULTS:** The average monthly cost of the combined immunosuppressing therapy when the original product was included was €320.99 and after the introduction of the generic version it became €311.29. On the other hand the monthly cost of the therapy only with azathioprin changed from €6.71 to €5.78 per patient per month. The patients' number varies among 121 to 96 during different months due to the drop out. After the introduction of the generic version 7 patients were switched to another immunosuppressive agent, while for the originator the corresponding figure is 2 patients. For the switched patients the cost of pharmacotherapy did not increase. **CONCLUSIONS:** In spite of the contradictory introduction of generic versions of immunosuppressors, due to their narrow therapeutic index the drop out of the patients is not higher and the savings for the health care system are possible.

PUK10

**A COST EVALUATION OF PERITONEAL DIALYSIS AND HEMODIALYSIS IN THE TREATMENT OF ESRD IN SÃO PAULO, BRAZIL**

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**OBJECTIVES:** ESRD patient survival is similar for hemodialysis (HD) and peritoneal dialysis (PD). In Brazil, access to dialysis is universal, although the resources consumed and their costs are poorly understood. We compare the resources used for the treatment of patients undergoing HD or PD who are covered by public insurance. **METHODS:** A one-year prospective study comparing resource use and total costs of prevalent patients treated with HD (n = 210) and PD (n = 194) was conducted in 5 dialysis units in Sao Paulo, Brazil. Inclusion criteria: ≥18 years of age and clinically stable on chronic dialysis. The study period was April 2007 to February 2009. Data were obtained at baseline, 6 and 12 months using surveys and medical records. Cost categories included hospitalizations, diagnostic and therapeutic procedures, medications, professional fees, transportation, and lost productivity (current homemakers who stopped working due to dialysis). Government reimbursement rate was used as a proxy for the direct costs related to the act of dialysis (maintenance). The study took the societal perspective. **RESULTS:** Approximately 50% of HD and 48% of PD patients were female (p = 0.75); 54% and 58% were white (p = 0.48); mean age was 55.2 and 60.6 (P < 0.001); 62% and 71% had diabetes (p = 0.0528); and 59% and 55% had coronary heart disease (p = 0.37), respectively for HD and PD. Overall average costs per patient-year of follow up was US\$23,283 for HD and US\$23,285 for PD patients. The average annual cost per patient-year, per category, for HD and PD were respectively, US\$11,774 and US\$14,058 for maintenance dialysis costs; US\$9,208 and US\$7,559 for medications; US\$94 and US\$43 for hospitalization, US\$796 and US\$487 for travel costs and US\$323 and \$264 for current homemakers lost income due to dialysis. **CONCLUSIONS:** Mean annual total cost of PD and HD are nearly identical, even though the former were significantly older and more diabetic.

PUK11

**THE ECONOMIC IMPACT OF RENAL GRAFT FAILURE: A COST ANALYSIS IN A UK SETTING**

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**OBJECTIVES:** Compared to dialysis, kidney transplantation is a highly cost-effective choice for most patients with ESRD. Post transplantation, a key objective is to maintain a functioning graft. When graft failure occurs, the majority of patients return to dialysis. This study is performed to assess the cost of renal graft failure in a UK setting. **METHODS:** A model was built using data from the UK renal registry (2007–2008) to estimate the number of graft failures occurring in the first year after transplantation. Costs for procurement, transplantation, and for the treatment of graft failure, were derived from the result of a systematic review. This study adopted an investment perspective—all the medical resource used from organ procurement to the treatment of graft failure were taken into consideration. **RESULTS:** In the UK, the cost of renal graft failure was approximately £58,847 when taking account the medical resource used from an investment point of view (including transplantation cost, immunosuppressive medication cost and resource to treat post transplantation adverse events for graft failure patients). The post graft failure cost was £28,179. The most important cost contributors are dialysis cost, transplantation cost and post transplantation immunosuppressive medication cost. **CONCLUSIONS:** Estimating the economic impact of graft loss should take into account the cost of management of patients post graft failure, as well as previous medical investment that is lost with the graft (includ-

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ing costs associated with procurement of the organ and transplantation). Improvements in the management of renal transplant patients are needed to reduce the risk of graft loss and the economic burden of graft failure to the health care system.

**INCIDENCE AND COST OF HOSPITALIZATIONS FOR ACUTE URINARY RETENTION ATTRIBUTABLE TO BENIGN PROSTATE HYPERPLASIA IN FRANCE**

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**OBJECTIVES:** Acute urinary retention (AUR) is one of the most significant complications of long-term benign prostatic hyperplasia (BPH) and often leads to prostate surgery. AUR also represents an important and feared event that needs to be quantified from an economic perspective as well as from the viewpoint of BPH patients. **METHODS:** French hospital information program (PMSI) databases from 2005 to 2008 were used to assess the number of hospitalizations for AUR and their management among males ≥50 years old presenting with a diagnosis of BPH. Number of patients concerned and rates of re-hospitalizations and deaths due to AUR were estimated using the linking system of the PMSI. Cost estimation was performed for the year 2008 adopting the Sickness Funds perspective. **RESULTS:** During the 4-year period, AUR frequency increased to 38,914 hospitalizations (+20.5%, +8.2%, +1.2% compared with 2005, 2006 and 2007, respectively). In 2008, mean length of stay was 5.5 ± 6.9 days and decreased of 6.6% within the study period. Proportion of stays referred by emergency department was 28.8% (14.1%, 20.6%, 25.3% in 2005, 2006 and 2007, respectively). 26,581 males were concerned by at least one AUR (+15.4%, +5.9%, +0.0% compared with 2005, 2006 and 2007, respectively) of whom 32.6% were concerned by a recurrence (28.9%, 30.7%, 31.4% in 2005, 2006 and 2007, respectively). Mean age was 74.1 years (SD:10.4) (stable over the period) and 232 patients (0.9%) deceased during their hospitalization in 2008. Mean cost per patient in 2008 was €2400 (€2663 vs. €1997 in public and private hospitals, respectively). Global cost of hospitalizations for RAU was estimated at €93.4 million (67.2% in public hospitals). **CONCLUSIONS:** AUR attributable to complicated BPH globally increased but tend to become stable in 2008. However, proportion of emergency utilization and recurrent stays amplified. Despite appropriate available therapies, prevention of BPH complications remains suboptimal.

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**HEALTH CARE COST OF RENAL REPLACEMENT THERAPY IN HUNGARY**

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**OBJECTIVES:** Annual cost of renal replacement therapy is an important benchmark for public reimbursement of all health care services. The last report was presented more than 10 years ago in Hungary, so our objective was to calculate the current annual cost of waiting listed dialysis and renal transplantation. **METHODS:** We selected all waiting listed or renal transplanted patients between July 2004 and March 2008. Resource utilization of all health care services with public reimbursement per patient in Q1 2008 were aggregated by linking claims records with anonymised patient IDs. We calculated health care costs of waiting listed and renal transplanted patients. Results were adjusted to gender, age and onset of ESRD by multivariate regression analysis. A total of 135 HUF/USD GDP specific PPP exchange rate was employed to convert results into USD. 2008 cost calculations were compared to results of the 1997 analysis. **RESULTS:** A total of 2209 patients were selected to the analysis. 3 year cost of waiting listed dialysis and renal transplantation was US\$110,742 and US\$87,420 respectively. Renal transplantation is cost-saving within 2 years compared to dialysis. **CONCLUSIONS:** Between 1997 and 2008 the 3-year cost of waiting listed dialysis increased by 60.3%, 3-year cost of renal transplantation increased by 96.8% without correction for inflation. In real values the health care costs waiting listed dialysis and renal transplantation is reduced by 26.7% and 10.0%. During this period the cost-containment measures of the National Health Insurance Fund were successful.

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**RESOURCE USE AND COSTS OF PATIENTS UNDERGOING DIALYSIS IN BELGIUM**

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**OBJECTIVES:** This study was conducted to identify and compare resources and costs used by dialysis patients in Belgium. **METHODS:** The records of 130 patients undergoing dialysis were retrospectively reviewed to identify direct medical and non-medical resources used over year 2006. Data collected: baseline medical characteristics, dialysis-related information and resources used (hospitalizations, ambulatory care, medication, transport). Official tariffs were used for costing. **RESULTS:** Patients were hospitalized 1.5 ± 1.7 times for 18.1 ± 29.1 days. Laboratory tests were performed more frequently in hemodialysis (HD) patients than in peritoneal dialysis (PD) patients (295.6 ± 137.7 vs. 120.1 ± 75.5; P < 0.0001). Patients on HD took more medications (12.4 ± 3.7 vs. 10.7 ± 4.3; P = 0.0254). 79% of patients received EPO (average dose: 10,587 ± 14,114 IU). Patients on PD had more ambulatory consultations (9.7 ± 8.8

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vs.  $4.6 \pm 8.9$ ;  $P = 0.0029$ ) and interventions ( $5.8 \pm 11.1$  vs.  $0.7 \pm 1.1$ ;  $P = 0.0042$ ). Only 11.6% of PD patients used an ambulance or transport organized by the dialysis center/sickness fund, compared with 67.8% for HD. The estimated annual cost for the public payer (PP) was €72,350 per HD and €55,343 per PD patient (i.e., 31% more). As in 2006 there were approximately 6400 patients on dialysis (90% on HD, 10% on PD), the PP total cost is estimated to be around €452 million (2.45% of 2006 health care budget). The dialysis procedure was the main cost driver (66% of costs) being 27% more expensive for HD. Hospital and ambulatory services were respectively 28% and 45% more expensive for HD. **CONCLUSIONS:** The economic burden of dialysis is important in Belgium. Considering that survival of PD patients is at least as good as that of HD patients and that home-treatment reduces exposure to hospital pathogens, PD represents good value for money and should be considered in more patients.

PUK16

#### **COST OF ILLNESS ASSOCIATED WITH RENAL TRANSPLANTATION AND DIALYSIS IN END STAGE RENAL DISEASE IN THE UNITED STATES**

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**OBJECTIVES:** A patient suffering from end stage renal disease (ESRD) has two treatment options, lifelong dialysis or renal transplantation. The aim of this review is to determine economic cost of illness associated with renal transplantation and dialysis in ESRD in the United States (US). **METHODS:** The information was retrieved from databases including Medline, EMBASE, United States Renal Data System (USRDS), WHO and relevant grey literature. Studies reporting data for cost associated with transplantation and dialysis in ESRD in the US were included. **RESULTS:** In 2007, hemodialysis (HD) was initiated in 99,886 patients, peritoneal dialysis (PD) in 6376 patients and transplantation in 2500 patients in the US. Total Medicare costs associated with these were \$17.6 billion for HD, \$949 million for PD and \$1.9 billion for transplantation (USRDS 2009). Unadjusted average annual Medicare expenditure (2004 US\$) for PD and HD as first modalities was \$53,277 and \$72,189 respectively (Shih 2005). Patients with HD were twice as likely to be hospitalised over a 12-month period compared to matched PD patients. The median health care costs associated with hospitalization were \$173,507 for HD patients vs. \$129,997 for PD patients (Berger 2009). The mean length of stay was significantly less for PD with 6.57 days ( $P < 0.0001$ ) vs. 7.25 days for HD (Walker 2009). The mean cost of treating *S. aureus* bacteraemia in HD patients, including readmissions and outpatient costs, was \$24,034 per episode (Engemann 2005). Over a 25 year time horizon, renal transplantation resulted in significant cost savings with a cost of \$376,577/patient and life expectancy of 7.4 years compared to \$568,670/patient and life expectancy of 6.7 years with long term dialysis (Quinn 2007). **CONCLUSIONS:** Renal transplantation results in significant cost savings compared to long term dialysis. The total health care costs associated with hemodialysis are higher compared to peritoneal dialysis.

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#### **PATIENT CO-MORBIDITIES AFFECT THE COST OF DIALYSIS PATIENTS IN BELGIUM**

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**OBJECTIVES:** This analysis was done to assess if co-morbidities influence the public payer (PP) cost of dialysis patients in Belgium. **METHODS:** The data from a cost study (retrospective chart review of 130 Belgian patients undergoing dialysis in 2006) was analyzed *a posteriori*. Baseline medical characteristics were used to compute the Charlson co-morbidity score (CCMS). Costs included: dialysis procedure and medical management (i.e., hospitalizations, outpatient visits and procedures, laboratory and imaging tests, and transport). Multivariate analyses were performed with the logarithmic transformation of costs as the dependent variable and CCMS, dialysis modality (hemodialysis: HD or peritoneal dialysis: PD) and gender as the independent variables. The regression model was weighted by number of patient months in the study. CCMS was categorized as low (<4), moderate (4–5), high (6–7) and very high (>= 8). **RESULTS:** All 3 variables had a significant impact on costs. Total costs to the PP were 16% higher for HD than for PD patients ( $p = 0.0039$ ) and were 13% higher in women than in men ( $p = 0.0207$ ). The costs in patients with a very high CCMS were 21% higher than those with a low or moderate score ( $p = 0.0072$  and  $p = 0.0094$  respectively) and 10.7% higher than those with a high score, but this latter difference did not reach statistical significance ( $p = 0.1160$ ). The differences were larger when excluding the cost of dialysis procedure and considering medical management only, but only reached statistical significance or patients having a very high CCMS score vs. low or moderate CCMS ( $p = 0.0036$  and  $0.0056$  respectively). **CONCLUSIONS:** This analysis showed that patient co-morbidities have a significant impact on medical management and total costs of dialysis patients. It is therefore important to take this into consideration when studying the costs of dialysis patients, especially if a total cost approach (i.e., procedure plus medical management) is taken.

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#### **COST-EFFECTIVENESS ANALYSIS OF TIMELY VERSUS LATE DIALYSIS REFERRAL AFTER RENAL TRANSPLANT FAILURE IN SPAIN**

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**OBJECTIVES:** Complications due to late dialysis referral after graft loss involve higher medical costs, together with a worsened health status and higher mortality rates. The efficiency of timely (TDR) versus late dialysis referral (LDR) after renal transplant failure is evaluated for the Spanish case. **METHODS:** A Markov model was developed and 6 health states were defined: hemodialysis (HD), peritoneal dialysis (PD), transplant (TX), late referral hemodialysis (LRHD), late referral peritoneal dialysis (LRPD) and death (D). A hypothetical cohort of patients aged 45 was observed during 40 years, considering age-dependent mortality rates. Transition probabilities were estimated using data from the Spanish Nephrology Society registry. Costs (in 2009 EUR) were obtained from a comprehensive literature review and included both direct (DC) (medical and non-medical) and indirect costs (IC) (lost labor productivity due to mortality and morbidity). Effectiveness was measured in terms of Quality Adjusted Life-years (QALYs). Health utilities were estimated from a proprietary database. A discount rate of 3.5% was considered for both cost and effectiveness figures. All the model parameters were supported by an expert panel. Incremental Cost-Effectiveness Ratios (ICERs) and Net Health Benefits (NHBs) were computed. A willingness-to-pay threshold of €35,000/QALY was taken into account. Both univariate and Monte Carlo multivariate sensitivity analyses were performed. **RESULTS:** The ICER was €27,385/QALY (IC not included) and €34,051/QALY [IC included], providing NHBs of (0.08) [0.01]. TDR yielded 0.37 additional QALY/patient. The multivariate sensitivity analysis showed that TDR was efficient in (54%) [53%] and dominant in (28%) [27%] of the simulations. The probability of accepting TDR was (55%) [50%]. **CONCLUSIONS:** TDR is an efficient scenario when compared to LDR, providing a greater number of QALYs with yet an affordable increase in costs. Our results, however, raise the debate on the suitability of the willingness-to-pay threshold as a rigid decision tool.

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#### **ECONOMIC EVALUATION OF ALISKIREN IN TYPE 2 DIABETES AND HYPERTENSION PATIENTS WITH NEPHROPATHY IN MEXICO**

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**OBJECTIVES:** To determine the most cost-effective alternative between a) Losartan, and b) Losartan + Aliskiren in type 2 diabetes and hypertension patients with microalbuminuria in the Mexican Institute of Social Security. **METHODS:** A complete economic evaluation was performed from institutional perspective, using a Markov model as analytical tool with semi-annual cycles and follow up until death, with transversal analyses at 10, 15 and 20 years. Simulating a cohort with a 53 years old patient with type 2 diabetes, hypertension, and microalbuminuria and using a discounting rate of 5% in costs and effectiveness. One assumption is that all patients that require dialysis receive it. Proportion of patients who have not received dialysis, as well as survival and quality of life were considered as effectiveness end points. Transition probabilities were obtained from AVOID study and IMSS information. Resource use was obtained from IMSS data and costs are considered in 2009 USD. Probabilistic and non-probabilistic sensitivity analysis was performed. **RESULTS:** Keeping a patient in stages prior to dialysis at 20 years of follow-up requires an investment of \$19,647 with Losartan and \$18,774 with Losartan + Aliskiren. After 14 years of follow up, Aliskiren + Losartan is dominant versus the use of Losartan. **CONCLUSIONS:** Aliskiren + Losartan is a cost-saving alternative if administered for prolonged periods, being the most effective regardless the period of monitoring and effectiveness measurement used.

PUK20

#### **THE COST-EFFECTIVENESS OF LANTHANUM CARBONATE VS. SEVELAMER HYDROCHLORIDE IN PATIENTS WITH END-STAGE RENAL DISEASE**

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**OBJECTIVES:** To assess the cost-effectiveness between two non-calcium binders, lanthanum carbonate (LC) and sevelamer hydrochloride (SH), in end-stage renal disease (ESRD) patients previously treated with calcium-based binders. **METHODS:** A Markov model was developed to estimate incremental costs for three health outcomes: 1) quality-adjusted life-years (QALYs), 2) Life-years saved (LYS) and 3) percent who successfully met serum phosphorus (SP) level goals (3.5–5.5 mg/dl) between the two non-Ca binders. The model incorporated patient-level data from a randomized head-to-head crossover study which compared the reduction of SP using fixed doses of LC for 4 weeks. For this analysis the model included patients previously treated with calcium-based binders. The 'intent-to-treat' (ITT) population and the 'completer' population were assessed. Baseline risks of cardiovascular disease (CVD), overall mortality, and CVD mortality were derived from a large US epidemiological study. Utilities, costs and relative risks of CVD were derived from published sources. Patient outcomes were modeled for 10 years, and incremental cost-effectiveness ratios (ICERs) were calculated for LC relative to SH. Clinical and economic outcomes were dis-