

- quality of life among dialysis patients on three continents: the Dialysis Outcomes and Practice Patterns Study. *Kidney Int* 64:1903–1910, 2003
3. Lopes AA, Albert JM, Young EW, Satayathum S, Pisoni RL, Andreucci VE, Mapes DL, Mason NA, Fukuhara S, Wikstrom B, Saito A, Port FK: Screening for depression in hemodialysis patients: associations with diagnosis, treatment, and outcomes in the DOPPS. *Kidney Int* 66:2047–2053, 2004
  4. Mapes DL, Lopes AA, Satayathum S, McCullough KP, Goodkin DA, Locatelli F, Fukuhara S, Young EW, Kurokawa K, Saito A, Bommer J, Wolfe RA, Held PJ, Port FK: Health-related quality of life as a predictor of mortality and hospitalization: the Dialysis Outcomes and Practice Patterns Study (DOPPS). *Kidney Int* 64:339–349, 2003
  5. Lopes AA, Bragg-Gresham JL, Satayathum S, McCullough K, Pifer T, Goodkin DA, Mapes DL, Young EW, Wolfe RA, Held PJ, Port FK: Health-related quality of life and associated outcomes among hemodialysis patients of different ethnicities in the United States: the Dialysis Outcomes and Practice Patterns Study (DOPPS). *Am J Kidney Dis* 41:605–615, 2003
  6. Lopes AA, Bragg J, Young E, Goodkin D, Mapes D, Combe C, Piera L, Held P, Gillespie B, Port FK: Depression as a predictor of mortality and hospitalization among hemodialysis patients in the United States and Europe. *Kidney Int* 62:199–207, 2002
  7. Lopes AA, Bragg-Gresham JL, Goodkin DA, Fukuhara S, Mapes DL, Young EW, Gillespie BW, Akizawa T, Greenwood RN, Andreucci VE, Akiba T, Held PJ, Port FK: Factors associated with health-related quality of life among hemodialysis patients in the DOPPS. *Qual Life Res* 16:545–557, 2007
  8. Moist LM, Bragg-Gresham JL, Pisoni RL, Saran R, Akiba T, Jacobson SH, Fukuhara S, Mapes DL, Rayner HC, Saito A, Port FK: Travel time to dialysis as a predictor of health-related quality of life, adherence, and mortality: the Dialysis Outcomes and Practice Patterns Study (DOPPS). *Am J Kidney Dis* 51:641–650, 2008
  9. Elder SJ, Pisoni RL, Akizawa T, Fissell R, Andreucci VE, Fukuhara S, Kurokawa K, Rayner HC, Furniss AL, Port FK, Saran R: Sleep quality predicts quality of life and mortality risk in haemodialysis patients: results from the Dialysis Outcomes and Practice Patterns Study (DOPPS). *Nephrol Dial Transplant* 23:998–1004, 2008
  10. Hays RD, Kallich JD, Mapes DL, Coons SJ, Carter WB: Development of the Kidney Disease Quality of Life (KDQOL) instrument. *Qual Life Res* 3:329–338, 1994
  11. Kimmel PL: Psychosocial factors in dialysis patients. *Kidney Int* 59:1599–1613, 2001
  12. Andresen EM, Malmgren JA, Carter WB, Patrick DL: Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *Am J Prev Med* 10:77–84, 1994

## International Economics of Dialysis: Lessons from the DOPPS

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In addition to directly addressing clinical practices and patient outcomes, the Dialysis Outcomes and Practice Patterns Study (DOPPS) has been used as a platform for economic and policy analyses. This paper will summarize the results of two such efforts. The first is the International Study of Health Care Organization and Finance (ISHCOF), an important sub-study of the DOPPS. The second summarized study shifts the focus to incentives faced by dialysis patients, using DOPPS patient survey data to assess out-of-pocket costs and their impact on cost-related underuse of medication. Potential new directions will also be highlighted.

### International Study of Health Care Organization and Finance (ISHCOF)

The ISHCOF implemented a one-time survey of economics policy investigators in each of the 12 DOPPS countries in 2004–2005 to assess economic incentives and dialysis practices and outcomes at the country level. The policy investigators summarized findings, and each prepared a paper (1–12). The following summary is based largely on an integrative overview paper (13) and the 12 country-level papers. The policy investigators' judgments were supplemented with data from secondary sources such as published articles, national registry

reports, government documents, and websites. The underlying premise of the ISHCOF study was that dialysis practices and outcomes result not only from pure clinical judgments, but also from the economic incentives and constraints created by each country's health-care financing system and institutional structure. These studies focused primarily on the incentives faced by dialysis providers in each national payment system.

The first set of issues pertained to macro-level functioning of the end-stage renal disease (ESRD) payment and care systems. Health-care systems vary markedly across the ISHCOF countries, ranging from the United States' relatively market-based system, to systems with primarily private providers with funding either through competing "sick funds" (e.g., Germany) or governments (e.g., Canada), to systems where the government is both payer and provider of care (e.g., United Kingdom). Total spending (not just for direct ESRD care) adjusted to 2003 US dollars ranged from \$24,000 per patient-year in New Zealand to \$60,000 in the United States. This variation was significantly, but not perfectly, correlated with per capita expenditures on health care for the countries' general populations ( $r = 0.70$ ,  $p = 0.01$ ). The lack of perfect correlation may reflect ESRD care being treated as a "special case" within some countries' financing systems. For example, US ESRD patients have a unique, disease-specific entitlement to coverage through the federal Medicare program. Partly through cost controls in this program, US spending on ESRD patients, while still higher than that in other countries, is not at the "outlier" level seen for health spending in the US general population. In particular, the US payment for the actual dialysis treatment is the second lowest among the ISHCOF countries.

There appears to be little, if any, aggregate association between total spending and patient mortality ( $r = 0.30$ ,

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$p = 0.35$ ). As adjusting for case-mix (i.e., patient health status) across countries can never be complete, the study could not determine if the finding that higher spending did not significantly improve outcomes could be attributed to system inefficiency. Therefore, assessment of the role of resources and incentives in shaping ESRD care and outcomes needs to be done on a more detailed basis. The case studies compiled by the policy investigators for the ISHCOF may allow a more nuanced view of these issues, but conclusions should still be regarded as suggestive.

This more detailed comparison can begin with provider payment methods and levels. Payment methodologies for dialysis centers differ substantially across countries. Some countries employ variants of a per-treatment payment, which may include a bundle of ancillary services (e.g., Italy), or may allow separate, fee-for-service billing for ancillary services such as injectable medications (e.g., United States). Other countries use variants of global budgeting systems administered by regional authorities, which may provide relatively fixed budgets to facilities (e.g., Canada, New Zealand), or may allow facilities to compete on a fee-for-service basis for a greater share of the regional budget (e.g., Germany).

Nephrologist payment models range from fee-for-service (e.g., Belgium) to capitation (e.g., United States) to salary (e.g., Spain). Nephrologists' incomes vary more than fourfold, ranging from \$58,000 in Sweden to \$250,000 in the United States and Canada. Patients in countries with higher physician incomes may receive less physician contact time, but this finding was not statistically significant ( $r = -0.32, p = 0.31$ ).

The DOPPS has also documented wide variations in intermediate outcome measures, including attained serum albumin levels and hemoglobin values. Hemoglobin values are relatively high in Sweden and the United States, the latter of which pays facilities on a fee-for-service basis for higher delivered doses of erythropoiesis-stimulating agents (ESAs) (14). Likewise, the DOPPS documents variability in process measures such as dialysis modality, vascular access, labor inputs, dose of dialysis, and dialyzer reuse practices. Dialysis modality appears particularly amenable to incentives created by health-care financing. High use of peritoneal dialysis, which generally has lower costs than hemodialysis (HD), might result from dialysis payment rates that do not fully fund the cost of HD. High transplant rates appear to result in countries that provide the most generous resources to procure and transplant organs. Other practices, such as dialyzer reuse in the United States, may be cost-saving measures in response to relatively low payments per dialysis treatment. Comparing practices across countries can lead providers to reconsider their own practices and how incentives might influence them to practice differently than colleagues elsewhere.

These variations in outcomes and processes of care suggest a potential role for direct quality incentives ("pay-for-performance"). However, at the time of the surveys, financial incentives focused on quantity of care rather than quality. For example, there were no financial incentives to encourage the use of arteriovenous fistulae for vascular access despite evidence of better outcomes.

One of the few clear quality incentives is dialyzer reuse, where many countries denied payment for hemodialysis treatments if dialyzers were reused. Clearly, quality incentives are an area for potential change. The United States is currently studying quality incentives as part of a demonstration project and in the broader context of expanding the set of services included in the capitation payment. Further, the United States has already created indirect quality incentives by measuring and publicly reporting on several dimensions of quality. To the extent that physicians and patients use such information to select facilities, financial incentives for better performance would be created.

Finally, incidence rates of treated ESRD are positively correlated with country per capita income ( $r = 0.72, p = 0.02$ ). Although it is possible that underlying disease patterns are correlated with income, this pattern suggests more generous acceptance onto dialysis therapy in countries with higher incomes. In the country-level papers, only the authors from New Zealand, Canada, and the United Kingdom acknowledged that rationing may occur in their countries.

### Patient Out-of-Pocket Costs and Medication Adherence

Patients also face financial incentives via out-of-pocket payments. In most countries, government programs, private insurers, or other ancillary sources of funds pay the vast majority of direct dialysis costs, leaving patients facing little financial obligation. However, countries vary more substantially with regards to patient out-of-pocket costs for prescription drugs.

A recent study based on DOPPS data (15) explored the relationship between patient-reported out-of-pocket costs for medication and nonadherence with pharmaceutical therapy. There was wide variation in out-of-pocket costs for prescription drugs, ranging from \$8 per patient month in the United Kingdom to \$114 in the United States. Costs in the other DOPPS countries were more closely distributed (Fig. 1). Similarly, self-reported

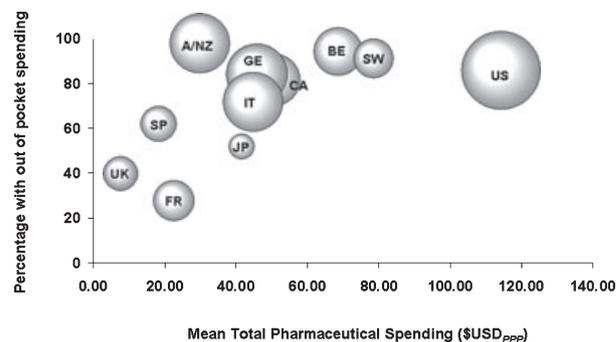


FIG. 1. Percentage of patients reporting having some out-of-pocket drug spending versus mean total monthly spending, by country, 2002–2004. Source: Author's calculations using data from the DOPPS. The area of each bubble equals the percentage of patients reporting nonpurchase of medication because of cost.  $R^2 = 0.4372$ . PPP, purchasing power parity. Hirth et al. (15).

nonadherence due to cost ranged widely from 3% of patients in Japan to 29% in the United States. Fig. 1 shows the relationship between two dimensions of out-of-pocket cost (mean monthly spending and percentage of patients reporting any out-of-pocket costs) and non-adherence rates, which are represented by the size of the “bubbles.” Generally, nonadherence rates rose with higher mean out-of-pocket costs, but several countries were outliers from this overall trend ( $r^2 = 0.437$ ,  $p < 0.05$ ). Swedish patients faced relatively high costs, but were less likely than average to report cost-related nonadherence. This result may possibly arise due to the relatively high level of income supports provided by the Swedish welfare state. Similarly, Japanese patients faced moderate costs, but almost never reported nonadherence. This result may arise from either cultural or financial reasons (e.g., Japanese physicians often directly sell pharmaceuticals to their patients). Overall, good adherence rates seemed to be related to national policies that exempted large groups of patients from facing out-of-pocket costs. In countries where such costs remain significant, clinicians may be able to encourage adherence by discussing costs and methods to acquire free or discounted prescriptions.

### Changes in Policy and Practice

The DOPPS has functioned as an important independent data source to report changes in dialysis practice associated with changes in policy. As one example, the Japan DOPPS has monitored effects of the 2006 erythropoietin (EPO) reimbursement policy change on anemia management practices in Japan. Our findings suggest that the EPO bundling policy resulted in reduced EPO dosing and an increase in intravenous iron use, while maintaining hemoglobin level, in Japanese HD patients (16).

In the United States, important reimbursement policy changes are forthcoming, as legislation mandates [1] expansion by January 2011 of the current partially bundled payment system to include separately billable services (including ESA therapy) and [2] the introduction in January 2012 of a quality incentive payment structure. With implementation of these changes, the US dialysis community will witness a major shift in the basic structure for dialysis payment, which may prompt substantial changes in certain dialysis practices. The DOPPS can be a vehicle to assist with monitoring national trends in clinical practices, dialysis services offered, and achievement of performance measures that occur along with these important policy changes.

### Conclusion

The DOPPS research summarized here highlights the potential value to clinicians of considering how eco-

omic incentives affect dialysis practices and patients' decisions. Further, understanding international variations may provide insight into alternatives to current arrangements in one's own country, thereby serving as the basis for policy advocacy by professionals and their associations. Finally, by using multiple waves of data, the DOPPS platform can be used to examine the effects on clinical practice of changes in policies and incentives over time.

### References

- Harris A: The organization and funding of the treatment of end-stage renal disease in Australia. *Int J Health Care Finance Econ* 7:113–132, 2007
- Van Biesen W, Lameire N, Peeters P, Vanholder R: Belgium's mixed private/public health care system and its impact on the cost of end-stage renal disease. *Int J Health Care Finance Econ* 7:133–148, 2007
- Manns BJ, Mendelssohn DC, Taub KJ: The economics of end-stage renal disease care in Canada: incentives and impact on delivery of care. *Int J Health Care Finance Econ* 7:149–169, 2007
- Durand-Zaleski I, Combe C, Lang P: International study of health care organization and financing for end-stage renal disease in France. *Int J Health Care Finance Econ* 7:171–183, 2007
- Kleophas W, Reichel H: International study of health care organization and financing: development of renal replacement therapy in Germany. *Int J Health Care Finance Econ* 7:185–200, 2007
- Pontoriero G, Pozzoni P, Vecchio LD, Locatelli F: International Study of Health Care Organization and Financing for renal replacement therapy in Italy: an evolving reality. *Int J Health Care Finance Econ* 7:201–215, 2007
- Fukuhara S, Yamazaki C, Hayashino Y, Higashi T, Eichleay MA, Akiba T, Akizawa T, Saito A, Port FK, Kurokawa K: The organization and financing of end-stage renal disease treatment in Japan. *Int J Health Care Finance Econ* 7:217–231, 2007
- Ashton T, Marshall MR: The organization and financing of dialysis and kidney transplantation services in New Zealand. *Int J Health Care Finance Econ* 7:233–252, 2007
- Luno J: The organization and financing of end-stage renal disease in Spain. *Int J Health Care Finance Econ* 7:253–267, 2007
- Wikstrom B, Fore M, Eichleay MA, Jacobson SH: The financing and organization of medical care for patients with end-stage renal disease in Sweden. *Int J Health Care Finance Econ* 7:269–281, 2007
- Nicholson T, Roderick P: International study of health care organization and financing of renal services in England and Wales. *Int J Health Care Finance Econ* 7:283–299, 2007
- Hirth RA: The organization and financing of kidney dialysis and transplant care in the United States of America. *Int J Health Care Finance Econ* 7:301–318, 2007
- Dor A, Pauly MV, Eichleay MA, Held PJ: End-stage renal disease and economic incentives: the International Study of Health Care Organization and Financing (ISHCOF). *Int J Health Care Finance Econ* 7:73–111, 2007
- McFarlane SI, Chen SC, Whaley-Connell AT, Sowers JR, Vassalotti JA, Salifu MO, Li S, Wang C, Bakris G, McCullough PA, Collins AJ, Norris KC: Prevalence and associations of anemia of CKD: Kidney Early Evaluation Program (KEEP) and National Health and Nutrition Examination Survey (NHANES) 1999–2004. *Am J Kidney Dis* 51(4 Suppl. 2):S46–S55, 2008
- Hirth RA, Greer SL, Albert JM, Young EW, Piette JD: Out-of-pocket spending and medication adherence among dialysis patients in twelve countries. *Health Aff (Millwood)* 27:89–102, 2008
- Hasegawa T, Bragg J, Pisoni R, BM R, FK P, Fukuhara S, Akizawa T: Change in anemia management and hemoglobin levels after erythropoietin (EPO) bundling policy in Japan: results from the Japan Dialysis Outcomes and Practice Patterns Study (JDOPPS). *Nephrol Dial Transplant* 2(Suppl. 2):M588, 2009