

Dialysis Facility Ownership and Epoetin Dosing in Hemodialysis Patients: A Medical Economic Perspective

Together with the other articles in this section, the following is a commentary on Thamer M, Zhang Y, Kaufman J, Cotter D, Dong F, Hernan MA: Dialysis facility ownership and epoetin dosing in patients receiving hemodialysis. *JAMA* 297:1667-1674, 2007

The study by Thamer et al¹ indicates that the for-profit status of dialysis facilities in the United States influences epoetin treatment practices. For-profit facilities more intensively treat anemia induced by end-stage renal disease (ESRD) than do not-for-profits, ramping up administration of epoetin more quickly, and ultimately targeting a higher hematocrit level. Thamer et al concluded that for-profit facilities effectively target hematocrit levels exceeding recommended clinical guidelines. The study results raise 2 questions. First, how does this study compare with others on the relationship between for-profit status and other aspects of ESRD patient care, as well as the broader literature on for profit status and health care outcomes in general? The answers may help in the interpretation of whether the findings in the study by Thamer et al are likely to represent behavior truly related to for-profit status. Second, what should policy makers do about this situation? Should revised economic incentives be scrutinized as a strategy for improving care, and what alternative incentives could be used?

HOW DOES THIS STUDY COMPARE WITH PRIOR STUDIES?

It is conceivable that treatment differences reported by Thamer et al are attributable to factors other than for-profit status. For example, patients at for-profit facilities differ from those at other facilities in terms of age, gender, race, comorbid conditions, body mass index, years on dialysis, and vascular access type.² Thamer et al

controlled for many of these factors, casting at least some doubt on their importance. Analyses presented in both Collins et al³ and the 2006 US Renal Data System Annual Data Report⁴ reached similar conclusions. Moreover, Coyne⁵ outlined organizational factors and incentives supporting the plausibility of a relationship between financial incentives and epoetin treatment at for-profit facilities.

It is useful to see what role for-profit status has played in other aspects of ESRD patient care. A meta-analysis⁶ estimated that receiving care at a for-profit dialysis facility was associated with an 8% higher mortality relative risk ($P < 0.001$). Some studies have reported that for-profit facilities deliver ostensibly less favorable care than do not-for-profits. For example, Garg et al⁷ reported that for-profits were 26% less likely (95% confidence interval, 2%-44%) to refer patients for transplantation. On the other hand, Szczech et al² reported that for-profit facilities achieved a modestly superior mean urea reduction ratio (67.6% v 66.8%, $P < 0.0001$) and provided more dialysis time per session (201.6 v 199.0 minutes, $P < 0.0001$). Although patient characteristics in for-profit and not-for-profit facilities differed, Szczech et al found no evidence that for-profit facilities selectively recruited patients in better condition who might therefore be less costly to care for.

Studies from the broader literature on health care delivery and for-profit status indicate that the influence of financial incentives on medical treatment may be a general phenomenon.⁸ Studies have reported that not-for-profit hospice facilities,⁹ hospitals,¹⁰ and nursing home facilities¹¹ provide superior care to that provided by their for-profit counterparts. Although there are exceptions, the findings just described lend credibility to the conclusion reached by Thamer et al that financial incentives influence treatment of ESRD at for-profit dialysis facilities.

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WHAT SHOULD POLICY MAKERS DO: SHOULD INCENTIVES BE REVISED?

The potential for financial incentives to interfere with the medical treatment has led some to conclude that policy makers should minimize the role of for-profit entities in health care in general⁸ and in the provision of ESRD care in particular.⁶ However, the broader problem is not the profit motive, *per se*, but that the existing incentives for treating ESRD patients are not optimally structured. Because the Centers for Medicare and Medicaid Services (CMS) covers some 300,000 ESRD patients, of whom nearly 240,000 receive some form of dialysis (see Table K.e in reference 4), and because a majority of CMS-covered epoetin treatment claims are filed by for-profit providers,³ CMS reimbursement is a key lever to influence epoetin treatment practices. Ideally, these incentives would encourage the best care possible given the economic resources available. Viewed in this way, the key question is what steps should policymakers take to move policy in this direction?

Some observers (eg, Cotter et al¹²) have argued that CMS's current policy encourages excessive epoetin dosing by effectively guaranteeing an incremental profit for each additional unit of epoetin administered. Most recently, CMS has expanded its epoetin coverage by increasing from 37.5% to 39% the maximum 3-month average hematocrit that patients can attain before CMS reduces epoetin reimbursement.¹³ Although a CMS policy that provided a fixed payment regardless of dose would eliminate the putative incentive to target inappropriately high hematocrit levels, past experience suggests that it might cause the opposite problem, ie, an inappropriate reduction in epoetin dose.¹⁴

As an alternative, CMS could continue its variable reimbursement policy but tighten the maximum allowed average hematocrit. Congress, however, directed CMS to loosen this upper limit to accommodate natural variation in hematocrit. While such variation is undeniable, the medical community's understanding of how loose the upper hematocrit limit must be to accommodate it is limited. Research should be conducted to develop and optimize epoetin dosing algorithms. Such research might reduce the required margin needed to ensure hematocrit

levels adherent to clinical guidelines, and at the very least would provide evidence of how large that margin must be.

In addition to developing better means for achieving a clinical target range for hematocrit, policy makers should continue to evaluate the benefits of epoetin treatment to ensure that target ranges are justified on clinical and cost-effectiveness grounds. Randomized controlled trials (RCTs) have revealed that observational studies may be an invalid basis for recommending aggressive anemia treatment because a third factor, hyporesponsiveness to epoetin, can both cause low hematocrit and be indicative of disease that increases mortality risk.^{5,15,16} Limiting attention to RCTs, however, suggests more work is needed to quantify the benefits associated with epoetin-induced increases in hematocrit. The RCT results indicate no compelling survival advantage,¹⁷ and although epoetin use might be justified on quality of life grounds, quantifying this benefit is complicated by use of measurement scales that have not been well validated, and selective reporting of positive results.¹⁷

Tonelli et al¹⁸ concluded that use of epoetin to achieve hematocrit between 33% and 36% is cost effective (\$50,000 to \$60,000 per quality-adjusted life-year). As is the case with the clinical guidelines, that analysis does not recognize heterogeneity among patients. Even if epoetin benefits depend only on the achieved hematocrit, the substantial range of epoetin doses necessary to maintain hematocrit within the clinical range of 33% to 36% (see Fig 1) suggests that the cost effectiveness varies substantially across patient subgroups. That heterogeneity might suggest that treatment should target potentially responsible underlying conditions, such as malnutrition-inflammation complex syndrome,¹⁹ iron deficiency, or inadequate dialysis.¹⁶ Further research is needed to elucidate the role these conditions play in hyporesponsiveness to epoetin.

The complexity of treating ESRD-induced anemia leaves the policy maker with difficult challenges. First, how can a payer, like CMS, structure incentives to induce appropriate treatment of a multifaceted condition? Certainly, reimbursement should focus on more than just hematocrit. Instead, reimbursement should be conditioned on demonstration that underlying conditions have

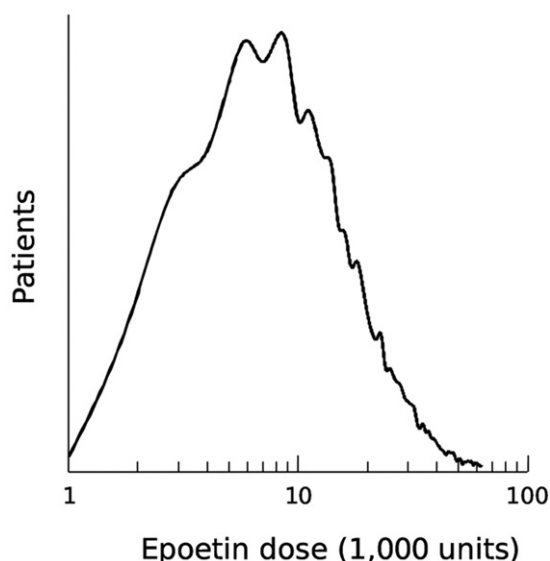


Figure 1. Distribution of epoetin doses needed to achieve hematocrit of 33% to 36%. Reprinted with permission from Zhang et al.¹⁶

been appropriately diagnosed and treated to the extent that is possible. Second, more data are needed to address many scientific questions before the type of guidelines envisioned can be developed. For example, more data on the relationship between hematocrit levels and quality of life may shed light on the value of achieving the target range of hematocrit equal to 33% to 36%. In addition, policy makers should consider development of clinical guidelines for hematocrit that recognize population heterogeneity. For example, the relatively limited quantity of epoetin needed to achieve a given hematocrit target in epoetin-responsive patients has different cost-effectiveness implications, and potentially different clinical implications, than the substantially higher epoetin dose needed to achieve the same hematocrit target in epoetin-resistant patients.

Development of a disease progression model that quantifies clinical outcomes and accounts for heterogeneity, and embedding this model within a decision analytic policy model that compares the implications of alternative treatments, could facilitate the formal evaluation of novel guidelines. These kinds of models, which have been used extensively in other disease areas, such as cardiovascular disease²⁰ and Alzheimer disease,²¹ can be used to compare the benefits, risks, and economic costs of a wide range of care strategies. A decision analysis

model for ESRD could be used to evaluate not only alternative epoetin dosing strategies, but also a wider range of treatments and services for the care of ESRD patients. As the science advances on ESRD treatment, it can be incorporated into the policy model. Finally, the policy model could help to identify the most important sources of uncertainty and help the medical community prioritize research needs. Development of enhanced treatment protocols, however, is insufficient. As incentives are implemented, appropriate data should be collected to ensure that providers are delivering the envisioned care.

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REFERENCES

1. Thamer M, Zhang Y, Kaufman J, Cotter D, Dong F, Hernan MA: Dialysis facility ownership and epoetin dosing in patients receiving hemodialysis. *JAMA* 297:1667-1674, 2007
2. Szczech LA, Klassen PS, Chua B et al: Associations between CMS's Clinical Performance Measures project benchmarks, profit structure, and mortality in dialysis units. *Kidney Int* 69:2094-2100, 2006
3. Collins AJ, Ebben JP, Gilbertson DT: EPO adjustments in patients with elevated hemoglobin levels: Provider practice patterns compared with recommended practice guidelines. *Am J Kidney Dis* 49:135-142, 2007
4. US Renal Data System: *USRDS 2006 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States*. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Disorders, 2006
5. Coyne DW: Use of epoetin in chronic renal failure. *JAMA* 297:1713-1716, 2007
6. Devereaux PJ, Schunemann HJ, Ravindran N, et al: Comparison of mortality between private for-profit and private not-for-profit hemodialysis centers: A systematic review and meta-analysis. *JAMA* 288:2449-2457, 2002
7. Garg PP, Frick KD, Diener-West M, Powe NR: Effect of the ownership of dialysis facilities on patients' survival

and referral for transplantation. *N Engl J Med* 341:1653-1660, 1999

8. Woolhandler S, Himmelstein DU: The high costs of for-profit care. *CMAJ* 170:1814-1815, 2007

9. Carlson MD, Gallo WT, Bradley EH: Ownership status and patterns of care in hospice: Results from the National Home and Hospice Care Survey. *Med Care* 42:432-438, 2004

10. Devereaux PJ, Choi PT, Lacchetti C, et al: A systematic review and meta-analysis of studies comparing mortality rates of private for-profit and private not-for-profit hospitals. *CMAJ* 166:1399-1406, 2002

11. Harrington C, Woolhandler S, Mullan J, Carrillo H, Himmelstein DU: Does investor ownership of nursing homes compromise the quality of care? *Am J Public Health* 91:1452-1455, 2001

12. Cotter D, Thamer M, Narasimhan K, et al: Translating epoetin research into practice: The role of government and the use of scientific evidence. *Health Aff (Millwood)* 25:1249-1259, 2006

13. Centers for Medicare and Medicaid Services. CMS Manual System. Pub 100-04 Medicare Claims Processing. Transmittal 1043. Change Request 5251. 8-25-2006. Available at: <http://www.cms.hhs.gov/Transmittals/Downloads/R1043CP.pdf>. Accessed June 1, 2007

14. de LG, Powe NR, Griffiths RI, et al: The relationship of provider organizational status and erythropoietin dosing in end stage renal disease patients. *Med Care* 32:130-140, 1994

15. National Kidney Foundation: KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for Anemia in Chronic Kidney Disease. Available at: http://www.kidney.org/professionals/KDOQI/guidelines_anemia/index.htm. Accessed January 18, 2007

16. Zhang Y, Thamer M, Stefanik K, Kaufman J, Cotter DJ: Epoetin requirements predict mortality in hemodialysis patients. *Am J Kidney Dis* 44:866-876, 2004

17. Strippoli GF, Navaneethan SD, Craig JC: Haemoglobin and haematocrit targets for the anaemia of chronic kidney disease. *Cochrane Database Syst Rev* CD003967, 2006

18. Tonelli M, Winkelmayer WC, Jindal KK, Owen WF, Manns BJ: The cost-effectiveness of maintaining higher hemoglobin targets with erythropoietin in hemodialysis patients. *Kidney Int* 64:295-304, 2003

19. Kalantar-Zadeh K, McAllister CJ, Lehn RS, Lee GH, Nissenson AR, Kopple JD: Effect of malnutrition-inflammation complex syndrome on EPO hyporesponsiveness in maintenance hemodialysis patients. *Am J Kidney Dis* 42:761-773, 2003

20. Blake GJ, Ridker PM, Kuntz KM: Potential cost-effectiveness of C-reactive protein screening followed by targeted statin therapy for the primary prevention of cardiovascular disease among patients without overt hyperlipidemia. *Am J Med* 114:485-494, 2003

21. McMahon PM, Araki SS, Sandberg EA, Neumann PJ, Gazelle GS: Cost-effectiveness of PET in the diagnosis of Alzheimer disease. *Radiology* 228:515-522, 2003