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COMPARATIVE EFFECTIVENESS AND HEALTH POLICY

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Cost-effectiveness of Treating Chronic Anemia with Epoetin Alfa among Hemodialysis Patients in the United States

Peter Quon, MPH[a], Matthew Gitlin, PharmD[b], John J. Isitt, MS[b], Sumit Mohan, MD[c], William M. McClellan, MD, MPH[d], Jill Javier, BS[a], Gregory de Lissovoy, PhD, MPH[e], Christopher S. Hollenbeak, PhD[f]

[a]United BioSource Corporation, Chevy Chase, MD; [b]Global Health Economics, Amgen Inc., Thousand Oaks, Calif; [c]Department of Medicine, Division of Nephrology, Columbia University College of Physicians & Surgeons, New York, NY; [d]Departments of Medicine and Epidemiology, Emory University, Atlanta, GA; [e]Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD; and [f]Departments of Surgery and Public Health Sciences, College of Medicine, Penn State University, Hershey, PA

ABSTRACT

OBJECTIVES: The objectives of this analysis were to assess health and economic consequences of targeting hemoglobin (Hb) levels around 10-11 g/dL relative to 9-10 g/dL using an economic model and to explore the impact of different assumptions on cost-effectiveness.

STUDY DESIGN: Clinical and economic impact of treating anemia in the US hemodialysis population to target Hb levels of 10-11 g/dL and 9-10 g/dL was assessed using a Markov model. A sensitivity analysis assessed the effects of varying assumptions on the model.

RESULTS: Our cost-effectiveness analysis suggests that maintaining Hb 10-11 g/dL would result in average reductions of 0.51 hospitalizations and increases of 0.09 quality-adjusted life years per patient, with hospitalization cost offsets of $15,340 over 5 years when compared with Hb of 9-10 g/dL. Over the lifetime of the patient, cost-effectiveness improved with hospitalization cost offsets of $21,450 and increases of 0.12 quality-adjusted life years. Sensitivity analysis of individual parameters showed that mortality, hospitalization, health preference, and time horizon of the model had the most influence on cost-effectiveness.

CONCLUSIONS: Our analysis suggests that epoetin alfa use targeting Hb levels of 10-11 g/dL relative to 9-10 g/dL may result in better patient outcomes and lower costs. The sensitivity analysis highlighted how assumptions affected cost-effectiveness conclusions; the appropriateness of these assumptions will remain uncertain until new research in today's dialysis population examining the effects of targeting to lower Hb levels is conducted.

See funding, conflict of interest, and authorship disclosures at the end of this article.

KEYWORDS: Anemia; Erythropoiesis-stimulating agent; Hemodialysis; Hemoglobin; Iron

For patients with chronic kidney disease (CKD) receiving hemodialysis, evidence suggests that use of erythropoiesis-stimulating agents (ESAs) to maintain Hb ≥10 g/dL improves patient-reported outcomes and leads to marked reductions in risks of transfusion and hospitalization.[1] Before the availability of ESAs, anemia was a substantial burden in dialysis patients,[2-5] with mean hemoglobin (Hb) values around 7 g/dL.[2] The majority of patients required transfusions to manage chronic anemia,[2] which also placed patients at risk to allosensitization and elevations in panel reactive antibody levels that can reduce renal graft survival rates after transplantation,[6,7] as well as the inherent risks associated with transfusion.[8,9] After the development of recombinant human erythropoietin, randomized clinical trial results demonstrated that patients previously dependent on transfusions for the treatment of chronic anemia became transfusion independent.[3] Hemodialysis patients now receiving ESAs for treatment of chronic anemia have increased their mean Hb levels to ≥10 g/dL,[10] and there has been a significant reduction in allosensitization.[11,12]

Until recently, an Hb target of 10-12 g/dL was recommended by the US Food and Drug Administration (FDA) for patients with CKD.[13] In June 2011, the FDA replaced this target range with a recommendation to consider initiating ESA treatment when Hb levels are <10 g/dL and to reduce or interrupt ESAs when Hb approaches or exceeds 11 g/dL.[14] The revised label cited risks seen in the Normal Hematocrit Study (NHCT),[15] the Correction of Anemia with Epoetin Alfa in Chronic Kidney Disease (CHOIR) study,[16] and the Trial to Reduce Cardiovascular Events with Aranesp Therapy (TREAT) study,[17,18] which demonstrated increased cardiovascular events and mortality when higher Hb levels were targeted (≥13 g/dL) and achieved (≥12.5 g/dL).

Therefore, this study was designed to understand the potential clinical and economic consequences of targeting to lower Hb levels around 10-11 g/dL. There are no data on the absolute risks of these lower Hb targets, as they have been previously compared only with higher Hb targets of (≥13 g/dL); these studies demonstrated no benefit and increased risk for acute myocardial infarction and stroke at the higher targets. A further goal of this study was to identify the gaps in evidence for cost-effectiveness of the recent Hb management recommendations using ESAs. There are limited studies examining the cost-effectiveness of ESAs in hemodialysis patients[19,20] and they used different assumptions about mortality, hospitalization rates, and quality of life, resulting in varying conclusions.[21,22] This constitutes a substantial limitation of health economic models assessing anemia treatment because these parameters have a profound influence on results.[22] The current analysis was designed to further explore the contributions of these model parameters and assumptions and their impact on health economic analyses. The primary objective of the analysis was to compare the cost-effectiveness of maintaining Hb at 10-11 g/dL, versus 9-10 g/dL in hemodialysis patients in the US.

METHODS

A Markov model assessed the clinical and economic impact of correcting anemia from the Medicare perspective over a 5-year time period (referred to as "time horizon") in the US hemodialysis population. The base case analysis assessed patients targeting Hb 10-11 g/dL versus Hb 9-10 g/dL, levels that pertain to maintenance with epoetin alfa. These patients were either with or without diabetes and were subject to annual probabilities of hospitalization, death, and transplantation. Patients receiving transplantation were assumed to cease dialysis. Nevertheless, these patients may experience graft failure and return to dialysis.

The Markov model (depicted in Supplemental Figure S1) used expected estimates of clinical and economic parameters (ie, averages) to estimate expected costs and outcomes. A probabilistic sensitivity analysis (PSA) was conducted to verify the robustness of these results, taking into account the uncertainty around parameters, and a sensitivity analysis was conducted to explore the impact of different model assumptions.