

Ferric Citrate: An Iron-based Oral Phosphate Binder

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Introduction

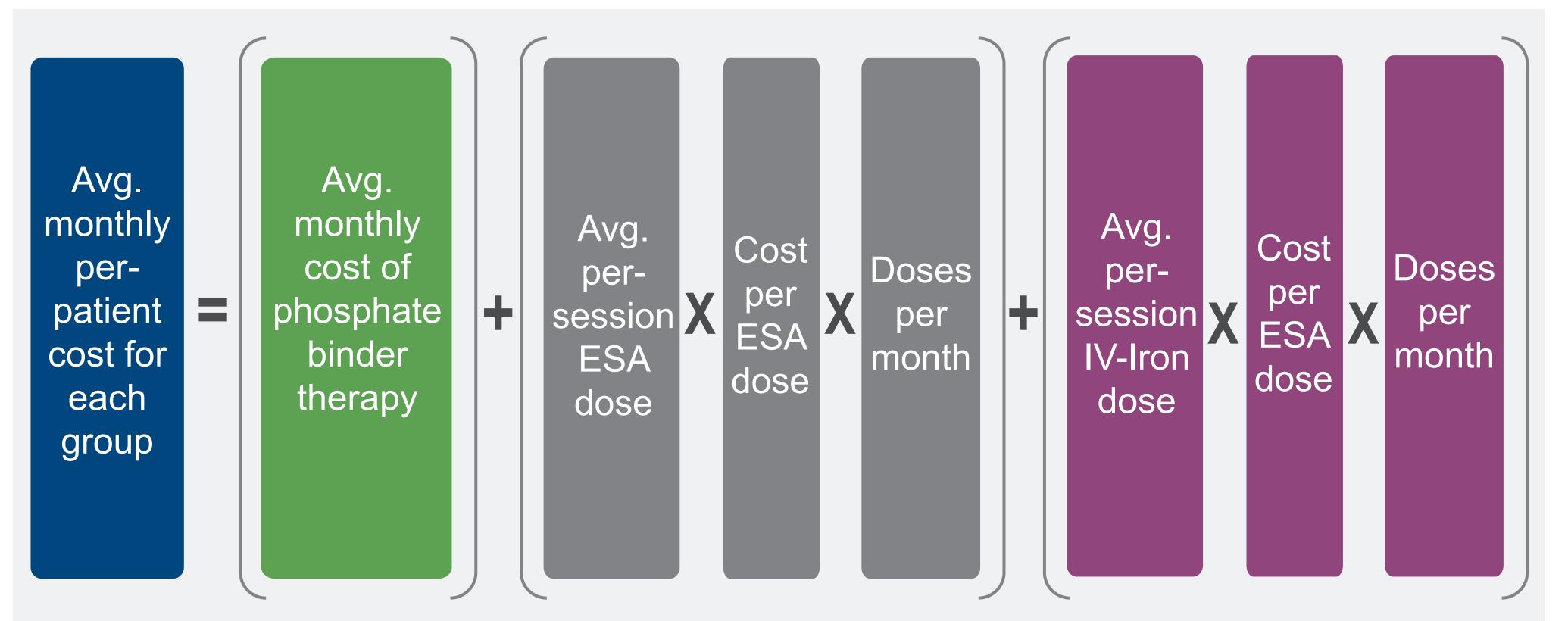
- Ferric citrate, an investigational phosphate binder for the treatment of hyperphosphatemia in dialysis patients, has been shown in clinical trials to increase serum ferritin and saturated transferrin (TSAT) and reduce use of erythropoiesis-stimulating agents (ESAs) and intravenous (IV) iron.^{1,2}
- We developed a cost-offset model quantifying potential cost savings associated with reduced ESA and IV iron dosing observed in hemodialysis patients experiencing similar increases in iron storage markers to patients in ferric citrate clinical studies.

Methods

Model

- The economic model was created to derive expected monthly costs for ferric citrate and comparator binders in terms of phosphate binder, ESA and IV iron costs. No other costs were included in the model.
- The model calculates the expected monthly cost, first assuming all patients are treated with one of the comparator binders, and a second time, assuming all patients are treated with ferric citrate; the difference between the two models represents the incremental cost of ferric citrate.
- The average per session ESA dose for ferric citrate is adjusted to reflect expected changes due to associated rises in TSAT and ferritin.

Figure 1. Model Calculation



Model Inputs

- The model assumed efficacy of ferric citrate and comparator binders was equivalent to manage bone and mineral disease.
- Unit costs for phosphate binders, ESAs, and IV iron were derived from 2011 published sources.^{3,4}
- We assumed price equivalence between ferric citrate and the comparator phosphate binders in the base case.
- Average monthly ESA and iron utilization were derived from Bond et al, 2011.⁵ Potential changes in iron and ESA dosing with ferric citrate administration were also estimated.⁵

Model Outputs

- Per patient monthly costs were calculated for ferric citrate and the comparator phosphate binders as described.
- The incremental cost of ferric citrate was calculated by subtracting the per patient monthly cost of the comparator phosphate binder from the per patient monthly cost of ferric citrate.
- Results were calculated for the overall patient population, and for moderate (4,500–< 9000 units per sessions) and high (≥ 9,000 units per session) ESA users separately.

Sensitivity Analysis

• Sensitivity analysis used the model default parameters; Two-month savings (overall population) is presented.

Results

- We identified 2,037 concurrent, non-treatment related rises in TSAT (≥ 10%) and ferritin (15%–25%) between 6/1/08 and 12/31/10, excluding patients with significant change in iron or ESA dose, hemoglobin, or change in phosphate binder in the prior month.⁵
- A mean decrease in ESA dose of 500.2 units was measured for all patients, while a reduction of 3,080.7 units was measured for patients with highest baseline ESA and iron doses.
- A mean decrease in iron dose of 5.79 mg was measured for all patients, while a 17.3 mg mean decrease was observed for patients with the highest baseline ESA and iron doses.

Results (continued)

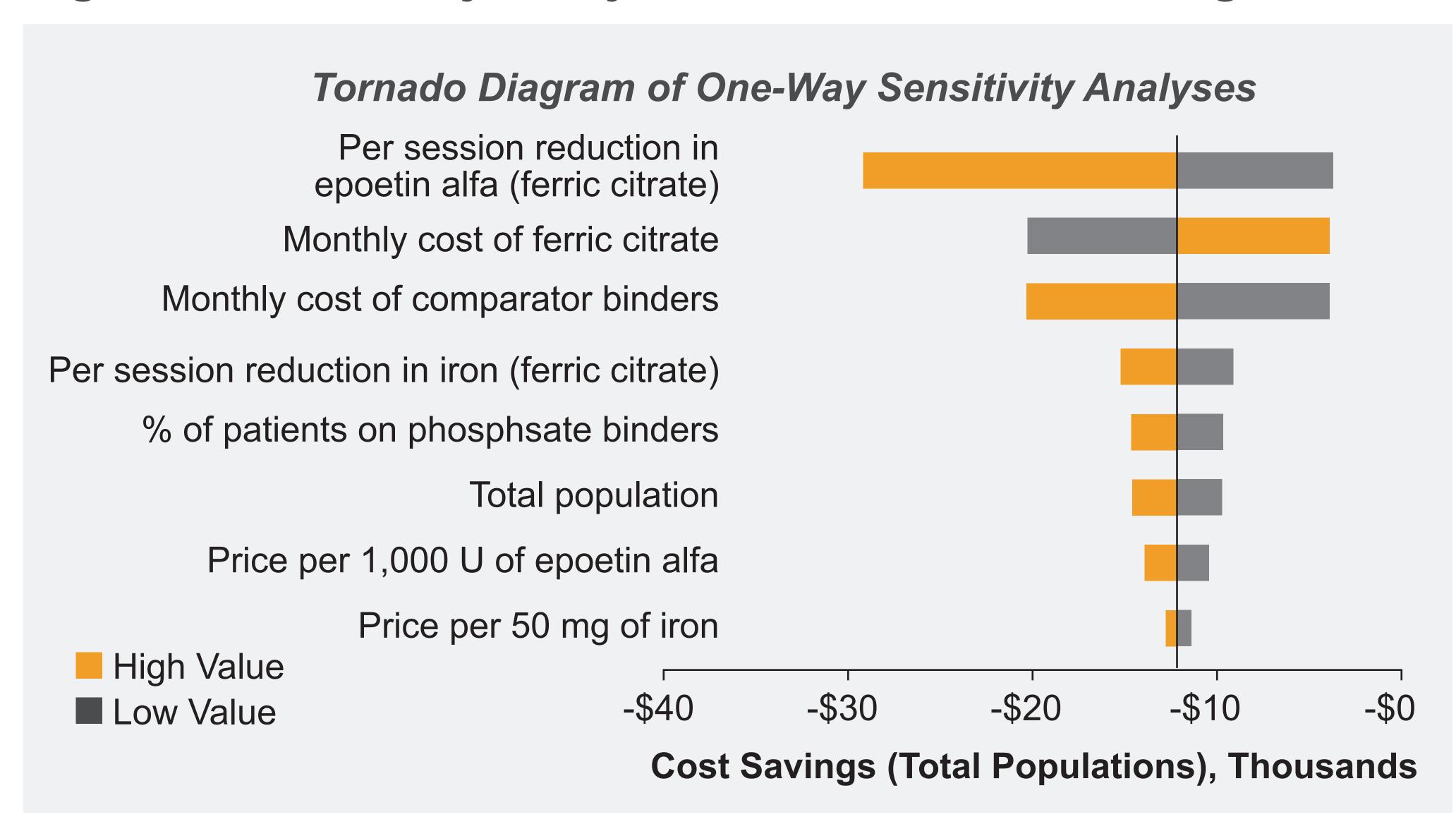
Table 1. Cost-Offset Model: Clinic and Population Assumptions

	Default Value	Value ±	Upper Values/ Lower Values
Total clinic population	96 patients	20%	77/115
% of patients on binders (67 of 96 patients)	70%	20%	56%/84%
Per patient monthly cost of comparator binders	\$609.02	10%	\$548.12/\$669.92
Per patient monthly of ferric citrate	\$609.02	10%	\$548.12/\$669.92
Published price per 1,000 U of ESA (epoetin alfa)	\$9.76	20%	\$7.81/\$11.71
Published price per 50 mg of IV iron	\$17.85	10%	\$14.28/\$21.42
Per session reduction in ESA with ferric citrate	500.2 U	1000 U	0.00 U/1,500 U
Per session reduction in IV iron with ferric citrate	5.8 mg	5 mg	0.79 mg/10.8 mg

Table 2. Potential Cost Savings With Ferric Citrate

	Per Patient Per Month	Per Clinic Per Month
High ESA users (n = 17)	\$320	\$5,380
Moderate ESA users (n = 17)	\$125	\$2,103

Figure 2. Sensitivity Analysis: 2-Month Clinic Savings



Published Epoetin alfa pricing used

Conclusions

- In addition to controlling patients' serum phosphorus, ferric citrate
 has the added benefit of increasing patients' iron stores; this may
 reduce anemia treatment costs.
- Based on physician behavior in response to ferritin and TSAT increases and ferric citrate clinical trial results, and considering model assumptions, there could be cost savings with ferric citrate use through reduced ESA and iron use.
- Sensitivity analyses show that potential reductions in ESA utilization associated with ferric citrate have the largest impact on model treatment costs, followed by the price of the phosphate binders themselves.
- Special considerations: Potential ESA-sparing dosing trends have not been measured since the June 2011 revision to FDA-approved ESA labels, which suggest dosing to a target hemoglobin level of < 11 g/dL.⁶

References

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