Persistent Increases in ESA Utilization Following Hospitalization of End-Stage Renal Disease Patients

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Introduction

- Hemodialysis patients are frequently hospitalized, with a national mean of 1.9 hospitalizations per patient-year in 2009 according to the United States Renal Data System 2011 Annual Data Report.[1]
- In 2009, 36% of hospitalizations in hemodialysis patients were followed by another hospitalization within 30 days.[1] Post-hospitalization anemia control has been shown to reduce re-hospitalization rates.[2]
- A combination of the reasons for hospitalization and an interruption of normal dialysis treatment leads to lowered hemoglobin (Hb) levels and increased utilization of erythropoiesis-stimulating agents (ESAs) in the post-hospitalization period.[3]
- Solid et al found that it takes 2 months for patient Hb to recover to pre-hospitalization levels and that optimal ESA use over this time period has yet to be determined.[4] Brophy et al confirmed that <20% of dialysis patients receive any ESA dose while hospitalized.[5]
- The session-level information available in this analysis allows a more thorough exploration of changes in ESA dosing surrounding a hospitalization event.

Objective

We have carried out a retrospective analysis to assess the extent and persistence of changes in ESA dosing following hospitalization of end-stage renal disease patients.

Methods

- Data from adult (≥18 years old) hemodialysis patients receiving in-center dialysis ≥3 times/week between 1 January 2009 and 31 December 2010 were assessed.
- Data analysis was restricted to hospitalizations that occurred >30 days after a previous hospitalization discharge.
- Mean per session ESA (epoetin alfa) dose before and after hospitalization was assessed as follows:
  - Last non-zero dose before hospitalization and first non-zero dose after hospitalization. Analysis was limited to patients with at least 1 non-zero dose in the 15 days before and after discharge.
  - Mean dose in the 15 days before hospitalization versus the 15 days after hospitalization. Analysis was limited to patients with data before and after hospitalization.
  - Mean dose in the 30 days before hospitalization versus the 30 days after hospitalization. Analysis was limited to patients with data before and after hospitalization.
- Mean total monthly ESA doses for the 2 months before and 6 months after hospitalization were also calculated.

Results

- Of a total of 289,042 hospitalizations, 181,595 (62.8%) occurred >30 days after any previous hospitalization event, and qualified for inclusion (**Table 1**).
- For the majority of hospitalizations (73.9%) there was no change in ESA dose between the last pre-hospitalization dose and the first post-hospitalization dose (**Table 2**).
- Comparison of the 15 days before and after hospitalization showed that 53.6% of hospitalizations were associated with a rise in mean per session ESA dose, 13.8% showed no change, and 32.6% were followed by a drop in ESA dose (**Table 2**).
- Comparison of the 30 days before and after hospitalization showed that 60.8% of hospitalizations were followed by an increase in mean per session ESA dose, 4.9% showed no change in dose, and 34.3% were associated with a decrease (**Table 2**).
- Mean per session dose increases (for all hospitalizations) were 227 U, 843 U, and 1,322 U (SD: 2,890, 4,320 and 5,161) for the immediate,15- and 30-day analyses, respectively (**Table 2**).
- Total monthly ESA dose increased in the month immediately preceding hospitalization compared to dose in the previous month (31-60 days pre-hospitalization), and increased further following hospitalization: 104,316 U and 107,193 U for days 0-30 and 31-60 post-hospitalization, respectively, versus 87,054 U and 97,708 U for days 31-60 and 0-30 pre-hospitalization, respectively (**Table 3**).
- Monthly doses returned to levels seen for days 31-60 pre-hospitalization after 91-120 days (**Table 3**).

Table 1. Summary Statistics—Hospitalizations

Characteristic	
All Hospitalizations	
Patients	138,762
Number of hospitalizations	289,042
Length of stay (days)	
Mean ± SD	7.76 ± 10.36
Median	5
Time between hospitalizations (days)	
Mean ± SD	74.1 ± 96.7
Median	37
Hospitalizations Included in Analysis	
Patients	85,775
Number of hospitalizations	181,595
Length of stay (days)	
Mean ± SD	7.39 ± 10.05
Median	5

Abbreviation: SD, standard deviation

Table 2. Per Session ESA Dose Before and After Hospitalization

	Number of Hospitalizations	Change in Per Session ESA Dose (Units)			
		Mean (SD)	Median	Q1	Q3
Last Pre-Hospitalization Dose/ First Post-Hospitalization Dose					
All	160,817	+ 227 (2,890)	0	0	0
ESA rise	23,050 (14.3%)	+ 4,453 (4,265)	+ 3,300	+ 2,200	+ 5,500
ESA unchanged	118,863 (73.9%)	–	–	–	–
ESA drop	18,904 (11.8%)	- 3,494 (3,595)	- 2,200	- 4,400	- 1,100
15 Days Before/After Hospitalization					
All	178,073	+ 843 (4,320)	+ 367	- 733	+ 2,493
ESA rise	95.467 (53.6%)	+ 3,339 (3,501)	+ 2,200	+ 1,048	+ 4,400
ESA unchanged	24,555 (13.8%)	–	–	–	–
ESA drop	58,051 (32.6%)	- 2,904 (3,536)	- 1,729	- 3,614	- 733
30 Days Before/After Hospitalization					
All	179,929	+ 1,322 (5,161)	+ 900	- 945	+ 3,691
ESA rise	109,420 (60.8%)	+ 4,091 (3,918)	+ 2,933	+ 1,283	+ 5,600
ESA unchanged	8,740 (4.9%)	–	–	–	–
ESA drop	61,769 (34.3%)	- 3,395 (3,784)	- 2,141	- 4,463	- 846

Table 3. Total Monthly ESA Dose Before and After Hospitalization

	Percent With Dose Increase Post-Hospitalization[a]	N (Hospitalizations)	Mean Monthly ESA Dose (Units)	SD (Units)
Pre-Hospitalization				
Days 31-60		142,891	87,054	86,696
Days 0-30		179,929	97,708	92,050
Post-Hospitalization				
Days 0-30	54.9%	180,073	104,316	91,279
Days 31-60	55.8%	168,722	107,193	91,944
Days 61-90	48.5%	160,893	95,713	90,110
Days 91-120	44.2%	154,201	88,488	87,387

[a] Increase relative to mean monthly dose in days 0-60 pre-hospitalization

Summary and Conclusions

- Although differences between the last ESA dose before hospitalization and the first ESA dose after hospitalization were minimal, 54% of hospitalization events were associated with a rise in per session ESA dose in the 15 days post-hospitalization, while 60% showed an increase in the 30-day post-hospitalization period.
- Total monthly ESA dose was increased after hospitalization and was also found to increase in the month immediately preceding hospitalization, compared to the period 31-60 days before hospitalization.
- Strategies for better management of anemia during hospitalization and in the post-hospitalization period should be assessed.

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