

# Erythropoiesis-Stimulating Agent (ESA) Dose Recovery Following Hospitalization of End-Stage Renal Disease (ESRD) Patients

S Wang, MS<sup>1</sup>; TC Bond, PhD<sup>1</sup>; J Rubin, MA<sup>1</sup>; A Yang, MD<sup>2</sup>

<sup>1</sup>DaVita Clinical Research, Minneapolis, MN, USA; <sup>2</sup>Affymax, Inc., Palo Alto, CA, USA

#### Introduction

- Hemodialysis patients are frequently hospitalized, with a national mean of 1.9 hospitalizations per patient-year in 2009 according to the USRDS 2011 Annual Data Report.<sup>1</sup>
- In 2009, 36% of hospitalizations in hemodialysis patients were followed by another hospitalization within 30 days. Post-hospitalization anemia control has been shown to reduce re-hospitalization rates.
- A combination of the reason for hospitalization and an interruption of normal dialysis treatment leads to lowered hemoglobin levels and increased utilization of erythropoiesis-stimulating agents (ESAs) in the post-hospitalization period.<sup>3</sup>
- Solid *et al*. found that Hb levels take 2 months to recover to pre-hospitalization levels and that optimum ESA usage over this time period has yet to be determined.<sup>4</sup> Brophy *et al*. confirmed that < 20% of dialysis patients receive any ESA dose while hospitalized.<sup>5</sup>

## Objective

• We have carried out a retrospective time-to-event analysis to determine the time for hemodialysis patients to recover to pre-hospitalization ESA dose.

### Methods

- Data from adult (> 18 years old) hemodialysis patients between January 1, 2009 and December 31, 2010 were assessed.
- Inclusion criteria:
- Receiving in-center dialysis ≥ 3 times/week.
- Hospitalizations that were preceded by > 30 hospital-free days.
- For patients experiencing an increase in ESA dose in the 30 days after hospitalization compared to the 30 days before hospitalization, a time-to-event analysis assessed time (in days) to reach an ESA dose ≤ the median per-session dose in the 30 days pre-hospitalization.
- The pre-hospitalization ESA dose level was considered achieved at the first instance of 3 consecutive dialysis sessions where the ESA dose was greater than 0 and ≤ median dose given in the 30 days before hospitalization.
- Patient time was censored at re-hospitalization, transplant, death, or discontinuation of dialysis.
- By definition, the analysis did not include patients who had a median dose of 0 in the 30 days before hospitalization.
- Several outcomes were calculated: median time to recovery (time at which 50% of the non-censored population had recovered), and 75% recovery time (time at which 75% of the non-censored population had recovered).

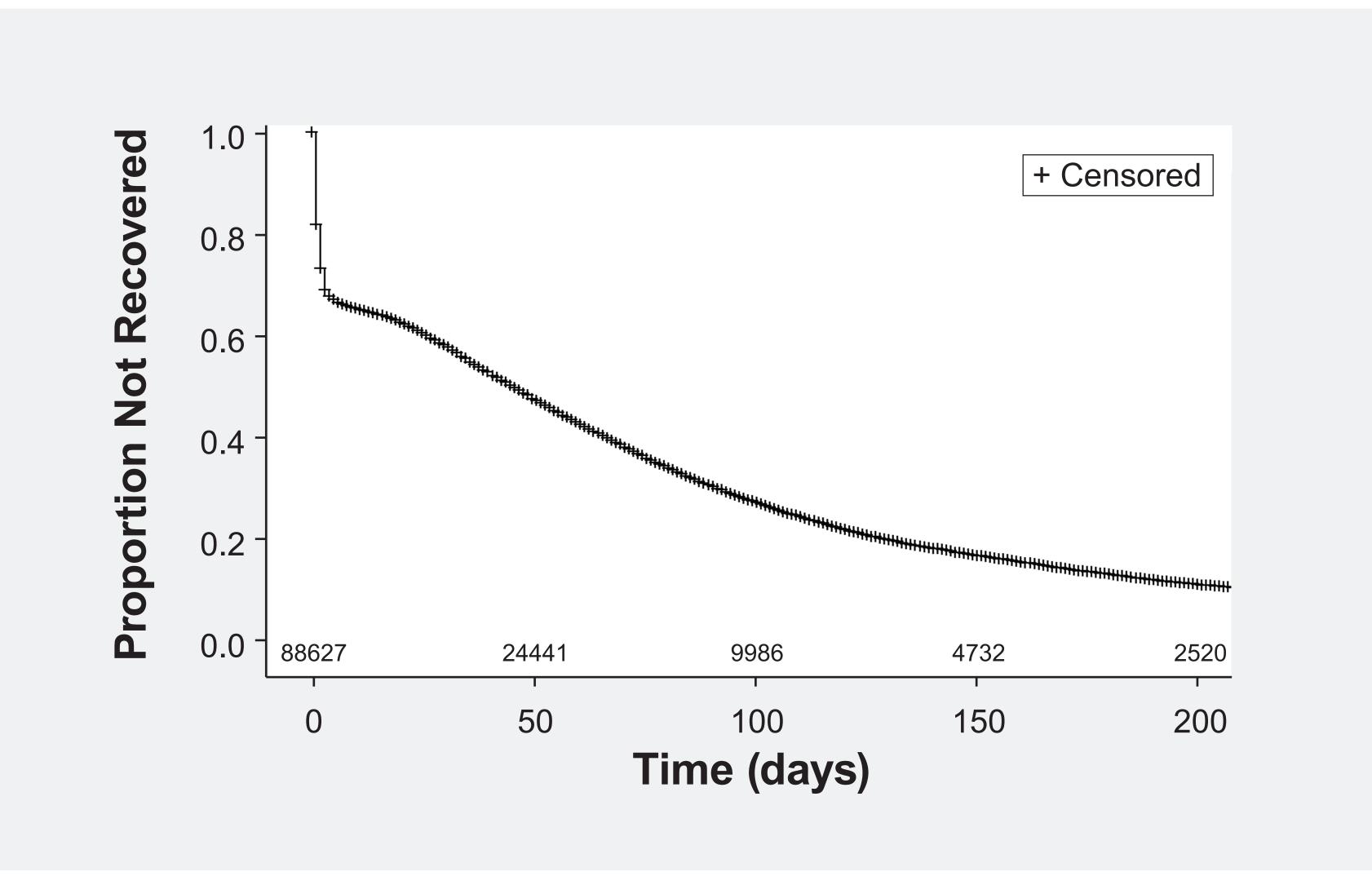
#### Results

- Of a total of 289,042 hospitalizations, 181,595 (62.8%) occurred > 30 days after any previous event, and qualified for inclusion.
- The analysis was limited to hospitalizations where ESA dose data for the preand post-hospitalization periods were available (N = 179,929). Of these, 60.8% of events were associated with a mean rise in ESA dose. For these 109,420 events, the mean ESA dose was 6,733 U/session pre-hospitalization, and 10,825 U/session post-hospitalization, a mean rise of 4,091 U/session (SD = 3,918) (Table 2).

Table 1. Summary Statistics: Hospitalizations

	Mean ± SD				
Patients	138,762				
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				

Figure 1. Time to ESA Dose Recovery\*



<sup>\*</sup> Hospitalizations associated with an increase in ESA dose, excluding hospitalizations with zero ESA dose in the month prior to hospitalization (N = 88,627)

- For patients experiencing increases in ESA dose in the 30 days after hospitalization, the median time to recover to the median pre-hospitalization dose was 49 days. By day 118, 75% of the non-censored population had reached their previous median dose. Overall, 40.1% of events were censored before ESA dose reached the previous median, mostly due to re-hospitalization (Figure 1 and Table 3).
- Restricting the analysis to events for which the pre-hospitalization median dose
  was not in the top or bottom 10% of doses gave a median time to recovery of 51
  days. Censoring occurred for 40.6% of these events.

Table 2. ESA Dose Per-Session in the 30 Days Pre- and Post-Hospitalization

	Number of Hospitalizations		Mean Post- Hospitalization ESA Dose	Mean Change in ESA Dose (SD)
AII	179,929 (100%)	8,213 U	9,535 U	+ 1,322 U (5,161)
ESA rise	109,420 (60.8%)	6,733 U	10,825 U	+ 4,091 U (3,918)
ESA unchanged	8,740 (4.9%)	10,890 U	10,890 U	<u>—</u>
ESA drop	61,769 (34.3%)	10,456 U	7,061 U	- 3,395 U (3,784)

#### Table 3. Dose Recovery by Month\*

	% Recovered	% Censored	% Remained Above Pre-Median
Month 1	37.86%	22.63%	39.52%
Month 2	46.47%	30.96%	22.57%
Month 3	51.92%	34.87%	13.21%
Month 4	54.96%	37.09%	7.95%
Month 5	56.45%	38.28%	5.27%
Month 6	57.34%	39.08%	3.58%
End of Study	59.01%	40.99%	0.00%

<sup>\*</sup> Hospitalizations associated with an increase in ESA dose, excluding hospitalizations with zero ESA dose in the month prior to hospitalization (N=88,627)

#### Conclusions

- Hospitalizations frequently require an increase in post-hospitalization ESA dose: Approximately 60% of hospitalization events were associated with a rise in ESA dose in the 30 days after hospitalization compared to the 30 days before hospitalization, with a mean dose change of + 4,091 U/session. For all events, the mean dose change was +1,322 U/session.
- For patients who recover to their pre-hospitalization ESA dose, post-hospitalization dose increases frequently persist for several months.
- In 40% of hospitalization events patients did not recover to their pre-hospitalization median dose, mostly due to re-admission.
- Strategies for better management of anemia during hospitalization and in the post-hospitalization period should be assessed.

#### References

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## Acknowledgements

Our sincere appreciation is extended to the teammates in more than 1600 DaVita clinics who work every day to take care of patients but also to ensure the extensive data collection on which our work is based. We thank DaVita Clinical Research® (DCR®), and specifically acknowledge Abigail Hunt, PhD of DCR for editorial contributions in preparing this poster. DCR is committed to advancing the knowledge and practice of kidney care.

This analysis was funded by Affymax Inc. and Takeda Pharmaceutical Company Limited.

\*Correspondence: t.christopher.bond@davita.com

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International Society for Pharmacoeconomics and Outcomes Research 17th Annual International Meeting, June 2-6, 2012, Washington, DC