Analysis of Length of Stay and Readmissions Among End-Stage Renal Disease (ESRD) and Non-ESRD Patients Using a 5% Sample of Inpatient Claims Data from the Centers for Medicare and Medicaid Services (CMS) (2007–2008)

Camelia Graham, PhD; Steven Wilson, PhD; Steven Brunelli, MD, MSCE; T Christopher Bond, PhD

DaVita Clinical Research, Minneapolis, MN, USA

Introduction

- End-stage renal disease (ESRD) patients are frequently hospitalized and readmission rates in this patient population are high.
  - The United States Renal Data System (USRDS) 2012 Annual Data Report indicates that ESRD patients experienced a mean of 1.85 hospitalizations and 12 hospitalized days per patient-year in 2010. Among prevalent hemodialysis patients, 36.3% of discharges were followed by a readmission within 30 days.
- Length of hospital stay and readmissions are related to patient outcomes and healthcare utilization in patients with ESRD.
- Understanding the hospital-level and patient-level predictors of length of hospital stay and multiple admissions may therefore provide insights into how to improve clinical outcomes.

Objective

This retrospective study aimed to identify hospital-level and patient-level predictors of length of hospital stay and readmission rates using CMS Medicare inpatient claims data from 2007 and 2008.

Methods

- A 5% sample of CMS claims data from 2007 and 2008 was assessed.
- The "Medicare Status Code" was used to identify ESRD patients and admissions. The ESRD group consisted of patients with codes "Aged with ESRD," "Disabled with ESRD," and "ESRD only."

Length of Stay (LOS) Analysis

- The LOS outcome variable was calculated by summing claim utilization days and claim non-utilization days to reflect number of inpatient admission days at the patient and provider (hospital) level.
- Provider-level explanatory variables for the LOS analysis were mean LOS for all non-ESRD admissions for each hospital and hospital-level ESRD proportion (number of admissions among ESRD patients divided by total number of admissions). Patient-level covariates included race, age, gender, Medicare status and US geographic region.

Multiple Admissions Analysis

- All admissions related to ESRD (identified through Medicare status) were extracted and an index admission was assigned to each patient. Any additional admissions in the same or immediately following quarter were considered a readmission. The analysis of multiple admissions used a dichotomous outcome variable (yes/no) indicating whether or not a patient had more than one admission in the same or immediately following quarter.
- Provider-level explanatory variables were the provider-level mean multiple admission rate (in the same and following quarter) and the hospital-level ESRD proportion (as for LOS analysis). Patient-level covariates included race, age, gender, Medicare status and US geographic region.
- A generalized linear mixed modeling approach was used for both analyses. A multilevel modeling strategy was used because individuals with claims can be thought of as nested within each facility. Fixed and random effects were used for the covariates to account for intraclass correlation where individuals within the same group (hospital) may be more alike than individuals across groups.

Results

Table 1. Patient Characteristics

	ESRD Patients		Non-ESRD Patients		All Patients	
	N	%	N	%	N	%
Race						
White	187,988	57.03	9,626,780	85.87	9,817,768	85.05
African American	108,046	32.78	1,085,022	9.68	1,193,068	10.34
Asian	6,261	1.9	119,483	1.07	125,744	1.09
Hispanic	15,477	4.7	208,245	1.86	223,722	1.94
Other	11,873	3.6	171,701	1.53	183,574	1.59
Sex						
Female	150,799	45.75	6,401,869	57.09	6,552,668	56.76
Male	178,846	54.25	4,812,362	42.91	4,991,208	43.24
Age Group						
18-64	159,238	48.31	2,080,669	18.55	2,239,907	19.4
65-69	38,672	11.73	1,423,448	12.69	1,462,120	12.67
70-74	43,655	13.24	1,868,946	16.67	1,912,601	16.57
75-79	40,314	12.23	1,990,137	17.75	2,030,451	17.59
80-84	30,167	9.15	1,855,613	16.55	1,885,780	16.34
85+	17,599	5.34	1,995,418	17.79	2,013,017	17.44
Medicare Status						
Aged with ESRD	179,912	54.58	0	0	179,912	1.56
Aged without ESRD	0	0	9,546,905	85.13	9,546,905	82.70
Disabled with ESRD	129,804	39.38	0	0	129,804	1.12
Disabled without ESRD	0	0	1,667,326	14.87	1,667,326	14.44
ESRD only	19,929	6.05	0	0	19,929	0.17
Proportion of Patients with ESRD at Facility						
0-4%	56,942	17.27	4,621,519	41.21	4,678,461	40.53
4-6%	84,177	25.54	3,038,397	27.09	3,122,574	27.05
6-8%	74,092	22.48	1,866,114	16.64	1,940,206	16.81
> 8%	114,434	34.71	1,688,201	15.05	1,802,635	15.62
US Region						
East	64,580	19.59	2,393,364	21.34	2,457,944	21.29
Midwest	75,139	22.79	2,823,610	25.18	2,898,749	25.11
Southeast	99,355	30.14	3,299,272	29.42	3,398,627	29.44
Southwest	40,738	12.36	1,150,301	10.26	1,191,039	10.32
West	44,167	13.4	1,468,072	13.09	1,512,239	13.1
Other	5,666	1.72	17,612	0.71	85,278	0.74
Total	**329,645**		**11,214,231**		**11,543,876**	

Figure 2. Parameter Estimates of Fixed Effects for Length of Stay
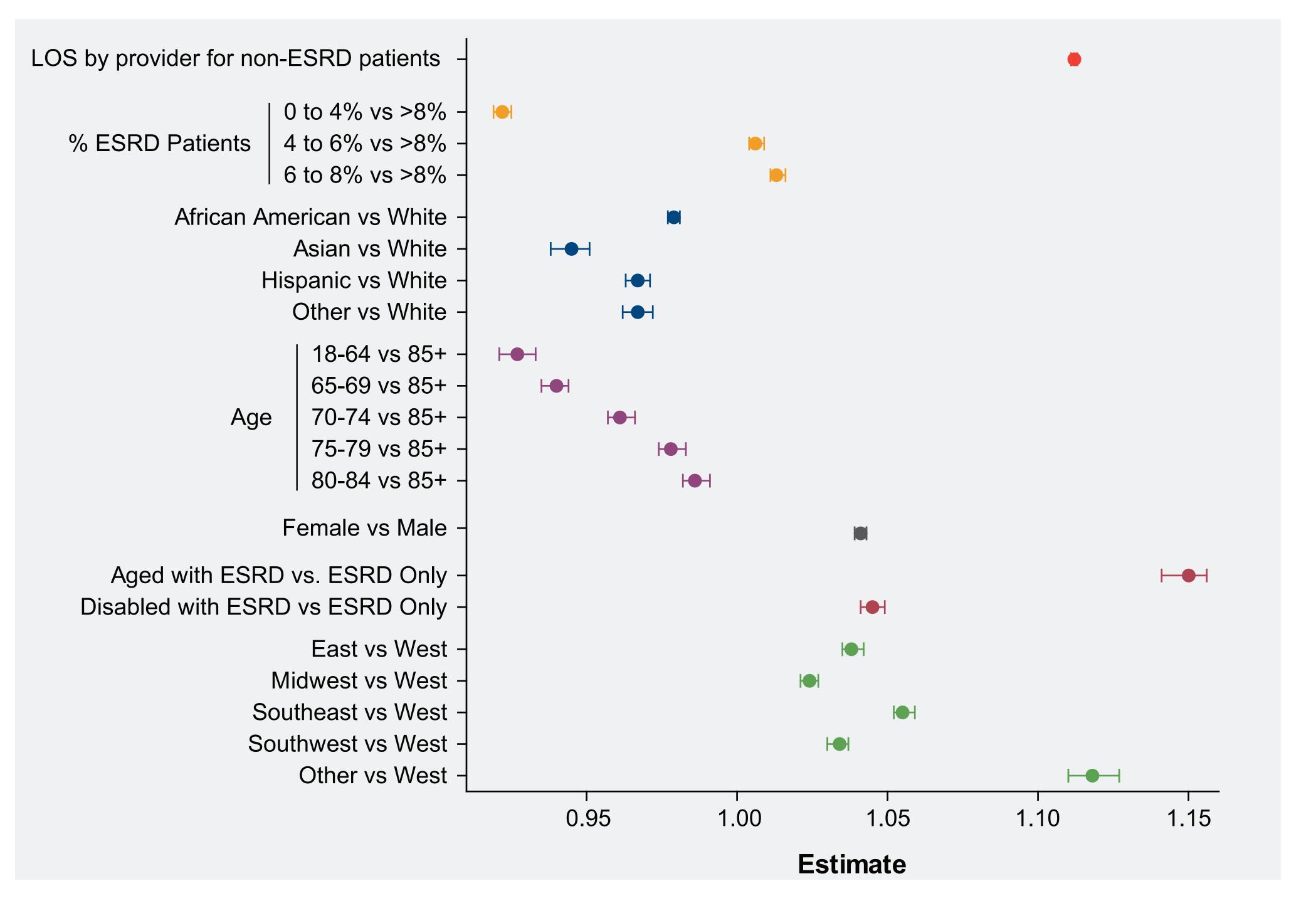
Figure 1. Distribution of Length of Stay for ESRD and Non-ESRD Hospital Admissions

ESRD

n = 1,238,194

Mean = 6.47 days (SD, 5.90)
Median = 5.00 days

Non-ESRD

n = 22,863,787

Mean = 5.48 days (SD, 5.02)
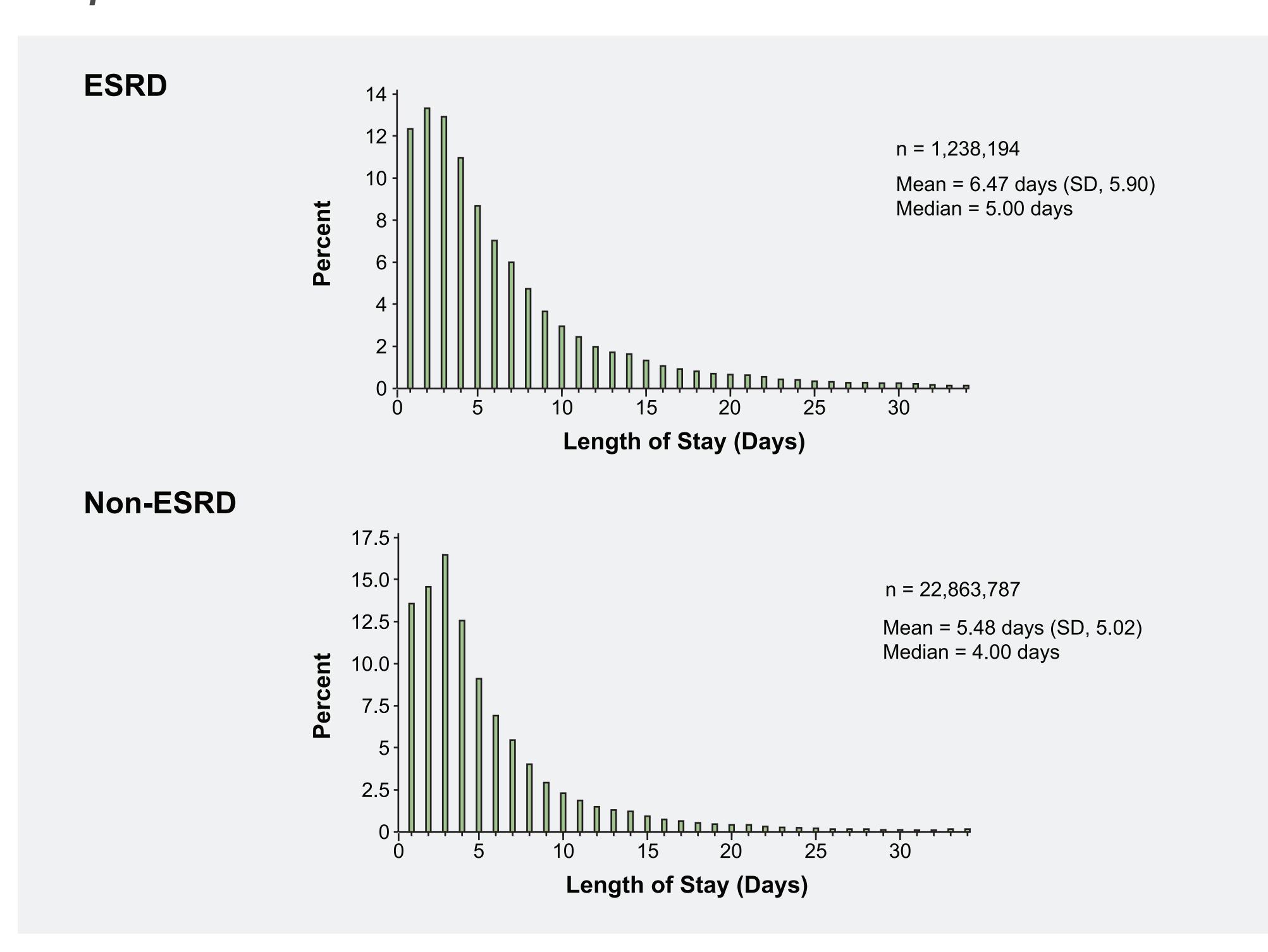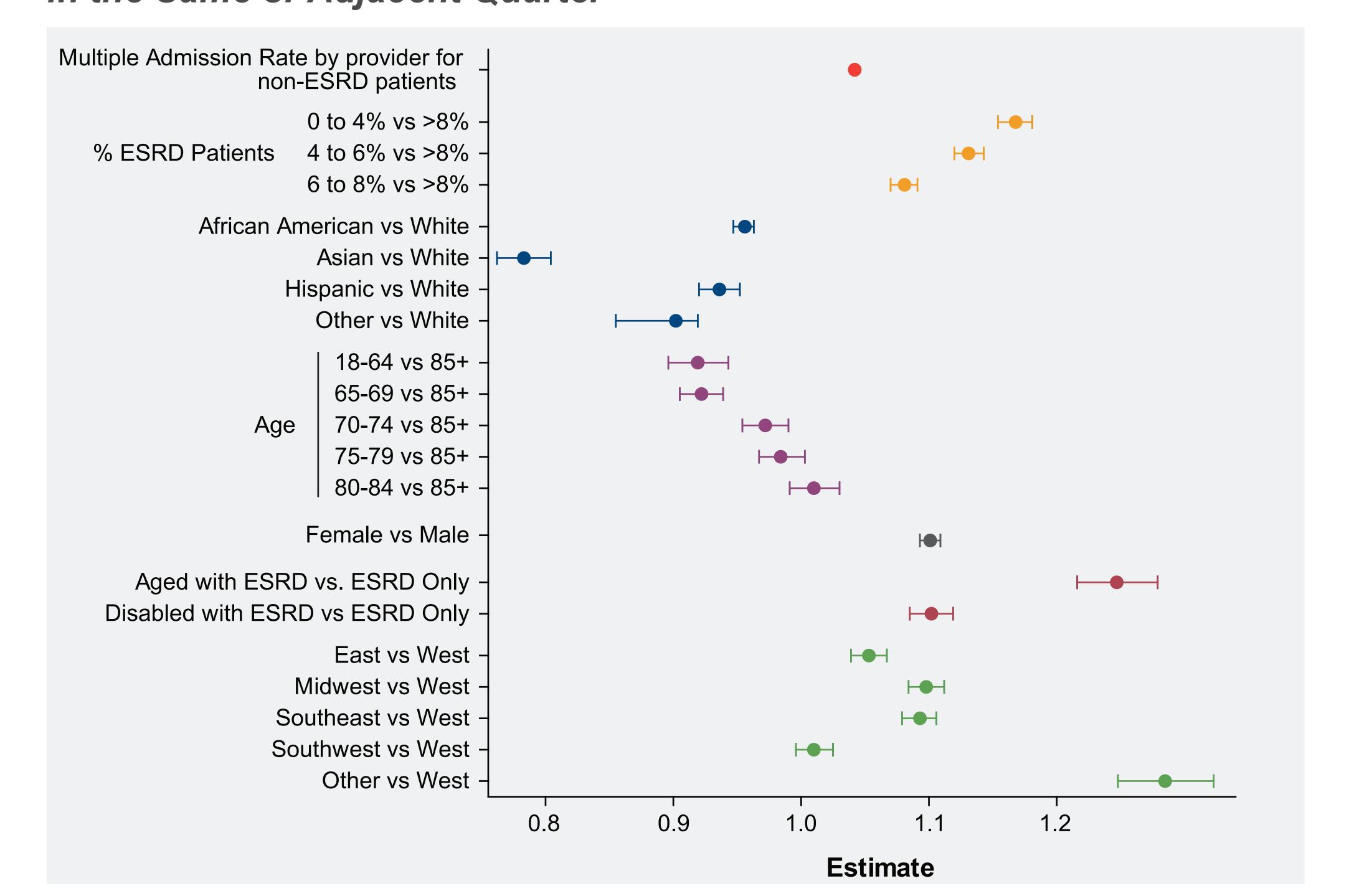Median = 4.00 days

Figure 3. Parameter Estimates of Fixed Effects for Multiple Admissions in the Same or Adjacent Quarter

Conclusions

- At the hospital level:
  - Length of stay for ESRD patients is strongly associated with length of stay for non-ESRD patients.
  - Readmission rate for ESRD patients is strongly associated with length of stay for non-ESRD patients.
- Together these findings suggest that LOS and readmission rate among ESRD patients are influenced by hospital practice patterns, which may not be remediable by dialysis facility practices.
- CMS is currently considering inclusion of a 30-day readmissions measure in the ESRD Quality Incentive Program (QIP). Such a measure should take into account the limited ability of dialysis

References

United States Renal Data System Annual Data Report 2012. Atlas of end-stage renal disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD. http://www.usrds.org/atlas.aspx.

Acknowledgments