Hospital Transfusion Use and Infection-related Re-hospitalization Among Patients on Dialysis

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Introduction

- In response to both a new bundled payment system and an erythropoiesis-stimulating agent (ESA) label revision in 2011, red blood cell (RBC) transfusion rates in patients on dialysis rose.
- Decreases in hemoglobin concentrations subsequent to ESA dose reductions are thought to have contributed to the absolute increase in the number of transfusions observed among patients on dialysis recently.
- Although RBC transfusions are used widely in the US and around the world every year, providers must carefully weigh the benefit and risks of the procedure before each administration.
- Transfusions have been associated with adverse outcomes, including infection and cardiac and neurologic complications, especially in patients with critical conditions or undergoing cardiac surgery.
- Data describing the risk of infection associated with RBC transfusions in patients on dialysis is scant; understanding this risk will help providers, including hospitals and clinicians, better understand and assess the benefit-risk proposition for anemia management using RBC transfusions in patients on dialysis.
- We sought to assess the association between hospital transfusion use practices and the risk of infection-related re-hospitalization and a composite endpoint (infection-related re-hospitalization or death) among patients on in-center hemodialysis.

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Methods

- Using a retrospective cohort study design with 2011 20% Medicare general Medicare data, we first calculated hospital-level adjusted odds ratios (OR) of receiving a transfusion using a mixed effect logistic model.
- Hospitals were then categorized into quintiles of the transfusion OR distribution.
- Next we identified all patients receiving in-center HD who had an incident hospitalization event between 2012 and 2013 in the Medicare ESRD dataset.
- Using a grouped treatment approach, we used Poisson regression to estimate the association between hospital transfusion use quintile and patient-level risk of IRRH within 30 days and a composite of IRRH and death, in dialysis patients hospitalized 2012-2013, adjusting for patient demographics, comorbidities, and hospital and hospitalization characteristics.

Figure 1. Hospital Groups Based on Transfusion Likelihood

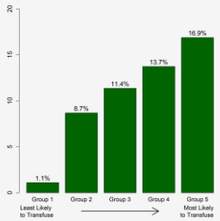


Table 1. Cohort Characteristics Overall and by Transfusion Group Practices, 2012-2013 Hospitalizations, HD Patients

		Transfusion Probability Quintile					Standardized Difference Between Group 1 and Group 5
	Overall	Group 1	Group 2	Group 3	Group 4	Group 5	
Total incident hospitalizations (N)	123,554	22,592	24,612	28,097	26,045	22,208	
Patient Demographics	%	%	%	%	%	%	
Age at discharge date of the incident hospitalization							
18-44	11.1	11.6	11.1	11.0	10.7	11.5	-0.19
45-64	38.1	37.7	37.9	37.8	38.0	38.9	2.32
65-79	36.4	36.5	36.5	36.5	36.7	35.9	-1.23
80+	14.4	14.2	14.5	14.8	14.6	13.7	-1.36
Gender							
Male	50.6	51.0	51.2	50.3	50.4	49.9	-2.14
Female	49.4	49.1	48.8	49.7	49.6	50.1	2.14
Race							
White	40.0	44.3	36.4	38.2	40.4	41.6	-5.36
Black	40.0	39.0	42.8	42.3	38.6	36.7	-4.64
Other	20.0	16.7	20.8	19.4	21.0	21.6	12.47
Primary cause of ESRD							
diabetes	48.0	47.3	47.9	48.0	47.7	49.1	3.60
Hypertension	29.0	28.7	28.4	29.1	30.2	28.3	-0.89
GN	8.3	9.0	8.4	8.3	7.9	8.2	-2.82
Other	14.7	15.1	15.3	14.5	14.2	14.5	
Dialysis duration (years)							
1<3	34.7	35.5	34.1	34.1	34.9	34.6	-1.89
3<5	24.2	24.2	24.1	24.3	24.3	24.3	0.21
>=5	41.1	40.2	41.8	41.6	40.8	41.0	1.65
Baseline Chracteristics (1 year prior to the index date of the incident hospitalization including index date)							
Comorbidity (Yes)							
ASHD	61.7	61.5	61.1	62.1	62.0	61.7	0.49
CHF	59.8	60.2	58.5	60.2	60.6	59.7	-0.94
COPD	34.1	35.2	32.8	33.9	34.0	34.9	-0.61
Cancer	10.1	10.3	10.5	10.2	10.1	9.3	-3.40
Other Cardiac	48.5	47.7	47.1	49.0	49.4	49.2	2.96
Dysrhythmia	48.7	48.6	47.9	49.4	48.7	48.5	-0.16
GI	15.0	15.0	14.6	15.0	15.1	15.2	0.53
Liver Disease	9.9	8.6	11.0	10.3	10.2	8.9	1.20
PVD	53.0	53.1	53.5	53.7	52.8	51.7	-2.78
CVA/TIA	26.1	25.7	25.8	26.3	26.7	26.1	0.94
Characteristics of the Incident Hospitalizations							
Major Diagnostic Category by DRG							
Nervous system	7.3	7.0	6.9	7.3	7.8	7.7	2.76
Eye, ear, nose, mouth and throat	0.7	0.8	0.8	0.7	0.6	0.7	-1.19
Respiratory system	6.0	6.2	5.6	5.8	6.1	6.4	1.03
Circulatory system	38.1	38.4	38.4	38.8	37.9	37.1	-2.70
Digestive system	11.0	11.1	10.7	11.1	11.1	10.8	-0.83
Hepatobiliary and pancreas	2.3	2.2	2.1	2.5	2.5	2.3	1.28
Musculoskeletal, skin, subcutaneous tissue	6.8	6.9	6.8	6.5	6.8	6.9	-0.16
Endocrine, nutritional and metabolic system	10.5	10.2	10.5	10.3	10.3	11.2	3.23
Kidney and urinary tract	9.4	9.4	10.0	9.2	9.1	9.1	-0.97
Reproductive system (male, female)	0.5	0.5	0.6	0.5	0.5	0.5	-0.15
Blood disorders, myeloproliferative DDs	2.6	2.4	2.6	2.5	2.7	2.6	1.27
Infectious and parasitic DDs	0.7	0.7	0.7	0.7	0.7	0.6	-1.21
Mental/Alcohol/Drug	0.5	0.6	0.5	0.4	0.4	0.4	-2.68
Injury	1.5	1.6	1.6	1.5	1.5	1.5	-0.98
Trauma, burns	0.1	0.1	0.1	0.1	0.1	0.2	1.36
Other	2.0	2.1	2.1	2.1	1.8	2.1	0.00
Characteristics of Hospital							
Location							
Urban	90.1	91.2	91.9	92.2	90.1	84.3	-20.97
Rural	8.5	8.4	5.3	6.7	8.7	14.2	18.28
missing	1.4	0.4	2.8	1.1	1.2	1.5	11.13

Figure 2. Unadjusted Event Rates by Hospital Transfusion Likelihood

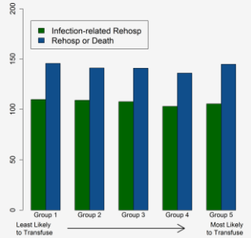
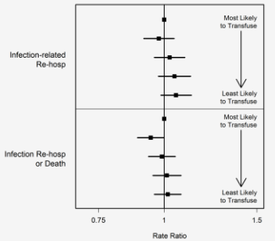


Figure 3. Adjusted Associations Between Hospital Transfusion Likelihood and Outcomes



Results

- We identified 123,554 HD patient incident hospitalizations during 2012-2013, and 2,714 hospitals.
- The probability of transfusion across quintiles of hospital groups ranged from 1.1% to 16.9% (Figure 1).
- Patient characteristics and hospitalization characteristics were generally balanced across quintiles, with the exception of race and geographic location (Table 1).
- Examining unadjusted and adjusted relative risks of IRRH or the composite of IRRH or death by hospital-level transfusion probability, dose-response relationships across quintiles of probability were not observed for primary or secondary outcomes (Figures 2, 3).
- We additionally conducted a patient-level analysis and observed a significant association between transfusions and IRRH within 30 days; adjuste HR = 1.17 (95% CI 1.13-1.22).

Conclusions

- Hospital transfusion practices were not associated with an increased risk of IRRH, although patients who did receive a transfusion were more likely to be re-hospitalized.
- Additional research, possibly using an IV methodology, may be necessary to further elucidate potential infection-related effects of blood transfusions.