Healthcare resource utilization and costs associated with transfusion dependence and anemia severity in patients with myelofibrosis: A retrospective analysis of the Medicare Fee-for-Service claims data

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Introduction

- Anemia is a key clinical feature of myelofibrosis (MF), which is present in more than one-third of patients at the time of diagnosis and increases in both frequency and severity over time[1-3]
- While hemoglobin (Hb) levels <10 g/dL are considered a negative prognostic indicator in MF risk assessment, anemia of any severity negatively impacts quality of life and survival[3-7]
- Although red blood cell (RBC) transfusions are a mainstay of anemia management in MF, they may be associated with further negative quality of life and prognostic impact[1,3,6-9]
- A previous analysis of US-based claims data found significantly higher rates of healthcare resource utilization (HCRU) and costs for patients with MF who were transfusion dependent (TD) compared with those who were not, even after controlling for differences in age, sex, and baseline comorbidities[10]
- To gain additional insights into the HCRU and cost burdens associated with transfusion dependence and anemia in MF, an analysis of patients with MF among the US Medicare Fee-for-Service (FFS) population was conducted

Objective

- Among the US Medicare FFS population, the objective was to describe baseline characteristics, HCRU, and costs based on transfusion status and anemia severity in patients diagnosed with MF

Methods

- This retrospective cohort study included patients in the 100% Medicare FFS Parts A, B, and D databases with ≥1 inpatient or ≥2 outpatient claims (on separate dates within 90 days) with *International Classification of Diseases, Ninth* or *Tenth Revision, Clinical Modification* (*ICD-9-CM*/*ICD-10-CM*) diagnostic codes for MF between January 1, 2012, and December 31, 2020 (**Figure 1**)
  - The earliest of the first inpatient or second outpatient MF claim was set as the MF diagnostic index date (MFDID)
  - Patients were required to have continuous enrollment of ≥12 months before the MFDID (baseline) and ≥6 months after (follow-up; continued until end of enrollment, death, or end of data)
  - The full set of patient selection criteria are outlined in **Figure 2**

Data Sources

- **Medicare 100% FFS** data comprise 100% of Medicare Parts A and B medical encounters for all settings (eg, physician office, home health, hospice, skilled nursing facility, inpatient, outpatient, mental health, and emergency department [ED])
  - The Part D Prescription Drug Event file contains all retail, mail-order, and specialty pharmacy encounters for this population
  - The Medicare Master Beneficiary Summary file includes enrollment data, patient demographics, and date of death where applicable
- The **Prognos Biomarker and Laboratory Data** include test result data from hundreds of laboratories and nearly 200 million patients

Methods (cont)

Patient Cohorts

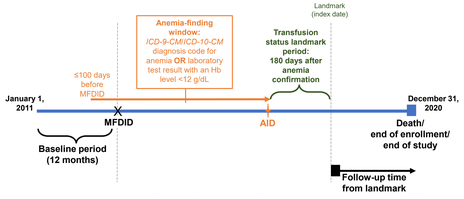
Anemia Severity

- Anemia was defined by *ICD-9-CM*/*ICD-10-CM* diagnostic codes or a complete blood count laboratory test result with an Hb level <12 g/dL in the laboratory databases beginning 100 days before and anytime after the MFDID
  - The earliest service date with an anemia diagnosis or Hb level <12 g/dL was set as the anemia index date (AID); if anemia was diagnosed in the 100 days prior to the MFDID, the AID was set to the MFDID
  - Anemia severity cohorts were defined in patients with available Hb data as:
    - **Mild** (Hb ≥10 to <12 g/dL)
    - **Moderate** (Hb ≥8 to <10 g/dL)
    - **Severe** (Hb <8 g/dL)

Transfusion Status

- Transfusion status determination required ≥180 days of continuous enrollment following the AID, set as the transfusion status landmark period
  - Cohorts were defined as:
    - **Transfusion independent** (TI; had no transfusion claims during the landmark period)
    - **Transfusion requiring** (TR; had ≥1 transfusion claim during the landmark period but did not meet the criteria for TD)
    - **Transfusion dependent** (TD; had transfusion claims that occurred on 6 separate dates over any 12-week window during the landmark period)

Figure 1. Study Design



AID, anemia index date; Hb, hemoglobin; *ICD-9-CM*/*ICD-10-CM*, *International Classification of Diseases, Ninth* or *Tenth Revision, Clinical Modification*; MFDID, myelofibrosis diagnostic index date.

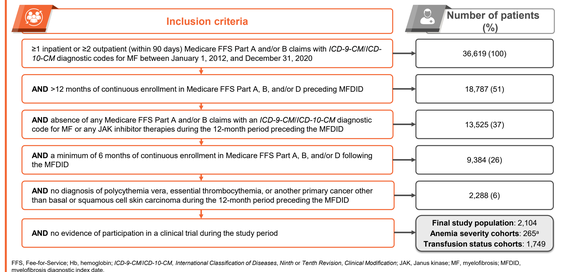
Analysis

- Across cohorts, demographics and disease characteristics at baseline and all-cause HCRU and medical/pharmacy costs per patient per month (PPPM) during follow-up after the transfusion status landmark period were summarized descriptively

Results

- On average, TR/TD patients or those with moderate/severe anemia had a higher Deyo-Charlson Comorbidity Index than those who were TI or had mild anemia **(Table 1)**
- In the transfusion status cohorts, greater all-cause outpatient, inpatient, and ED utilization as well as medical and pharmacy costs were observed in the TR and TD cohorts vs the TI cohort (**Figures 3** and **4**)
- In the anemia severity cohorts, incremental increases in HCRU and costs with increasing anemia severity were also observed (**Figures 5** and **6**)

Figure 2. Patient Selection and Attrition



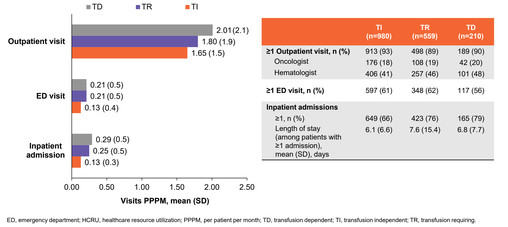
FFS, Fee-for-Service; Hb, hemoglobin; *ICD-9-CM*/*ICD-10-CM*, *International Classification of Diseases, Ninth* or *Tenth Revision, Clinical Modification*; JAK, Janus kinase; MF, myelofibrosis; MFDID, myelofibrosis diagnostic index date.
[a] Defined in patients with available Hb laboratory data.

Table 1. Baseline Characteristics

Key patient characteristics[a]	Overall (N=1,749)	Transfusion status cohorts: TI (n=980)	TR (n=559)	TD (n=210)	Anemia severity cohorts: Overall (N=265)	Mild (n=128)	Moderate (n=99)	Severe (n=38)
Age, mean (SD), years	74.8 (12.0)	74.7 (11.6)	75.4 (12.8)	73.8 (11.8)	73.6 (11.2)	71.8 (11.2)	75.7 (11.0)	74.3 (11.1)
>65 years, n (%)	1,508 (86)	840 (86)	488 (87)	180 (86)	227 (86)	104 (81)	89 (90)	34 (89)
Male, n (%)	837 (48)	457 (47)	266 (48)	114 (54)	126 (48)	59 (46)	45 (45)	22 (58)
Race/ethnicity, n (%)								
White	1,429 (82)	807 (82)	449 (80)	173 (82)	211 (80)	102 (80)	81 (82)	28 (74)
Black or African American	216 (12)	120 (12)	75 (13)	21 (10)	39 (15)	18 (14)	15 (15)	<11 (NA)
Hispanic or Latino	31 (2)	14 (1)	12 (2)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (NA)
Native Hawaiian and Other Pacific Islander	27 (2)	17 (2)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (N/A)	<11 (NA)
American Indian and Alaska Native	12 (1)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (NA)
Unknown	34 (2)	15 (2)	11 (2)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (NA)	<11 (NA)
Deyo-CCI, mean (SD)	3.0 (2.7)	2.8 (2.6)	3.3 (2.9)	3.1 (2.9)	2.8 (2.8)	2.7 (2.7)	3.0 (2.9)	3.0 (2.8)
Most common comorbidities, n (%)[b]								
Hypertension	1,373 (79)	771 (79)	433 (77)	169 (80)	203 (77)	97 (76)	77 (78)	29 (76)
Cardiovascular disease	1,141 (65)	612 (62)	395 (71)	134 (64)	151 (57)	68 (53)	61 (62)	22 (58)
Thrombocytopenia during follow-up	1,007 (58)	474 (48)	378 (68)	155 (74)	168 (63)	73 (57)	62 (63)	33 (87)
Thrombocytopenia[c] 30 days prior to MFDID	298 (17)	123 (13)	115 (21)	60 (29)	41 (15)	14 (11)	18 (18)	<11 (NA)
Diabetes mellitus without complications	667 (38)	372 (38)	208 (37)	87 (41)	100 (38)	51 (40)	38 (38)	11 (29)
Chronic pulmonary disease	640 (37)	319 (33)	237 (42)	84 (40)	78 (29)	37 (29)	29 (29)	12 (32)

CCI, Charlson Comorbidity Index; *ICD-9-CM*/*ICD-10-CM*, *International Classification of Diseases, Ninth* or *Tenth Revision, Clinical Modification*; MFDID, myelofibrosis diagnostic index date; NA, not applicable; TD, transfusion dependent; TI, transfusion independent; TR, transfusion requiring.
[a] Reporting of patient counts <11 not permitted per Centers for Medicare & Medicaid Services guidelines. [b] The five most common comorbidities (excluding anemia) in the overall transfusion status cohort are listed. [c] Defined by *ICD-9-CM*/*ICD-10-CM* codes.

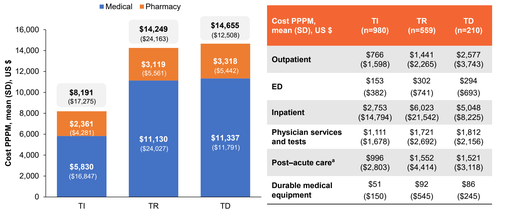
Figure 3. All-Cause HCRU Based on Transfusion Status



	TI (n=980)	TR (n=559)	TD (n=210)
≥1 Outpatient visit, n (%)	913 (93)	498 (89)	189 (90)
Oncologist	176 (18)	108 (19)	42 (20)
Hematologist	406 (41)	257 (46)	101 (48)
≥1 ED visit, n (%)	597 (61)	348 (62)	117 (56)
Inpatient admissions			
≥1, n (%)	649 (66)	423 (76)	165 (79)
Length of stay (among patients with ≥1 admission), mean (SD), days	6.1 (6.6)	7.6 (15.4)	6.8 (7.7)

ED, emergency department; HCRU, healthcare resource utilization; PPPM, per patient per month; TD, transfusion dependent; TI, transfusion independent; TR, transfusion requiring.

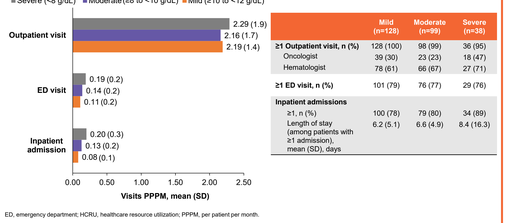
Figure 4. All-Cause Healthcare Costs Based on Transfusion Status



Cost PPPM, mean (SD), US $	TI (n=980)	TR (n=559)	TD (n=210)
Outpatient	$766 ($1,598)	$1,441 ($2,265)	$2,577 ($3,743)
ED	$153 ($382)	$302 ($741)	$294 ($693)
Inpatient	$2,753 ($14,794)	$6,023 ($21,542)	$5,048 ($8,225)
Physician services and tests	$1,111 ($1,678)	$1,721 ($2,692)	$1,812 ($2,156)
Post–acute care[a]	$996 ($2,803)	$1,552 ($4,414)	$1,521 ($3,118)
Durable medical equipment	$51 ($150)	$92 ($545)	$86 ($245)

ED, emergency department; PPPM, per patient per month; TD, transfusion dependent; TI, transfusion independent; TR, transfusion requiring.
[a] Includes hospice, home health, skilled nursing facility, inpatient rehabilitation facility, and long-term acute care hospital.

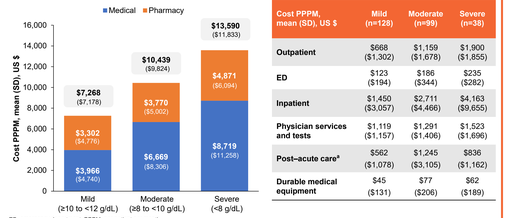
Figure 5. All-Cause HCRU Based on Anemia Severity



	Mild (n=128)	Moderate (n=99)	Severe (n=38)
≥1 Outpatient visit, n (%)	128 (100)	98 (99)	36 (95)
Oncologist	39 (30)	23 (23)	18 (47)
Hematologist	78 (61)	66 (67)	27 (71)
≥1 ED visit, n (%)	101 (79)	76 (77)	29 (76)
Inpatient admissions			
≥1, n (%)	100 (78)	79 (80)	34 (89)
Length of stay (among patients with ≥1 admission), mean (SD), days	6.2 (5.1)	6.6 (4.9)	8.4 (16.3)

ED, emergency department; HCRU, healthcare resource utilization; PPPM, per patient per month.

Figure 6. All-Cause Healthcare Costs Based on Anemia Severity



Cost PPPM, mean (SD), US $	Mild (n=128)	Moderate (n=99)	Severe (n=38)
Outpatient	$668 ($1,302)	$1,159 ($1,678)	$1,900 ($1,855)
ED	$123 ($194)	$186 ($344)	$235 ($282)
Inpatient	$1,450 ($3,057)	$2,711 ($4,466)	$4,163 ($9,655)
Physician services and tests	$1,119 ($1,157)	$1,291 ($1,406)	$1,523 ($1,696)
Post–acute care[a]	$562 ($1,078)	$1,245 ($3,105)	$836 ($1,162)
Durable medical equipment	$45 ($131)	$77 ($206)	$62 ($189)

ED, emergency department; PPPM, per patient per month.
[a] Includes hospice, home health, skilled nursing facility, inpatient rehabilitation facility, and long-term acute care hospital.

Limitations

- Administrative claims data are subject to potential data coding limitations and data entry errors, which may result in missing or erroneous information[11]
- This study was limited to patients with Medicare FFS insurance; therefore, the results may not be generalizable to patients with other types of insurance (eg, Medicaid or Medicare Advantage) or those who are uninsured

Conclusions

- This retrospective analysis of the US Medicare FFS database suggests that achieving or maintaining transfusion independence in patients diagnosed with MF may minimize healthcare costs and reduce the financial burden for patients and healthcare systems
- Similar trends were seen when descriptively comparing mild, moderate, and severe anemia, suggesting that improving or maintaining Hb levels reduces the financial burden to healthcare systems
  - HCRU and costs in anemic vs nonanemic (Hb levels ≥12 g/dL) patients with MF may warrant investigation in a future analysis
- Total costs (medical and pharmacy) were approximately 1.8 times greater for patients with TD vs TI and for patients with severe vs mild anemia
- Overall, this study illustrates the need for additional treatments that support maintenance or achievement of transfusion independence and mitigate anemia severity, which would offset costs for patients with MF

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Disclosures

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References

1. Tefferi A, et al. *Mayo Clin Proc*. 2012;87(1):25-33.
2. Bose P, Verstovsek S. *Curr Hematol Malig Rep*. 2018;13(3):164-172.
3. Naymagon L, Mascarenhas J. *Hemasphere*. 2017;1(1):e1.
4. Cervantes F. *Blood*. 2014;124(17):2635-2642.
5. Nicolosi M, et al. *Leukemia*. 2018;32(5):1254-1258.
6. Elena C, et al. *Haematologica*. 2011;96(1):167-170.
7. Tefferi A, et al. *Clin Ther*. 2014;36(4):560-566.
8. Gangat N, et al. *J Clin Oncol*. 2011;29(4):392-397.
9. Mesa R, et al. ASCO 2023. Poster 7066.
10. Gerds AT, et al. ASH 2022. Poster 1729.
11. Mues KE, et al. *Clin Epidemiol*. 2017;9:267-277.