Economic burden in patients with CAR-T: comparison of idecabtagene vicleucel with ciltacabtagene autoleucel

Sikander Ailawadhi,[1] Yong Zhu,[2] Mary DuCharme,[2] Simran Tiwana,[3] Nicole M. Engel-Nitz,[2] Thomas Carattini,[3] Michelle Vu,[2] Pallavi Patwardhan[4]

[1]Mayo Clinic, Jacksonville, FL; [2]Optum, Eden Prairie, MN; [3]Formerly of Bristol Myers Squibb, Summit, NJ; [4]Bristol Myers Squibb, Summit, NJ; USA

Introduction

- Idecabtagene vicleucel (ide-cel) and ciltacabtagene autoleucel (cilta-cel) are B-cell maturation antigen (BCMA)-directed chimeric antigen receptor T cell (CAR-T) therapies approved in the USA for patients with relapsed or refractory multiple myeloma (RRMM)[1,2]
  - In clinical trials, both ide-cel and cilta-cel have demonstrated deep, lasting clinical responses and meaningful improvements in quality of life[3-8]
  - A recent real-world study has suggested improved efficacy with cilta-cel may be offset in a risk-benefit assessment by improved safety and tolerability with ide-cel[9]
- To date, evaluations of healthcare resource utilization (HCRU) and costs of BCMA-directed CAR-T therapies are still emerging[10-12]
- Formal analyses based on real-world clinical experience are needed to provide a more accurate assessment of the HCRU and costs associated with these CAR-T therapies in US clinical practice

Objective

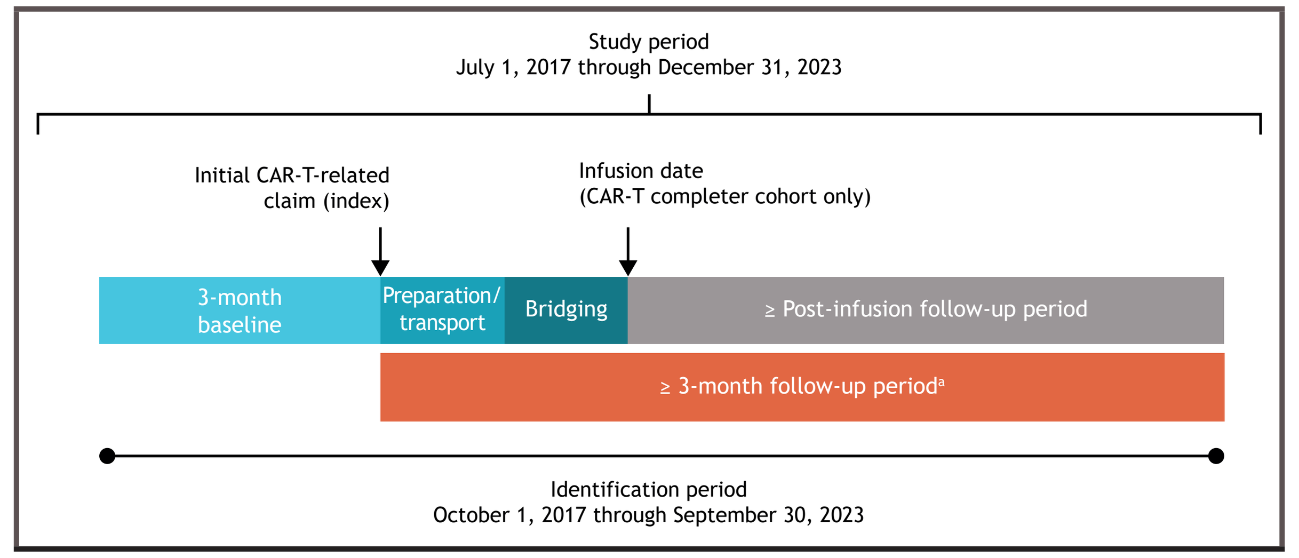
- To compare real-world post-infusion HCRU and costs among patients with RRMM receiving ide-cel or cilta-cel in real-world US clinical practice

Methods

Study design and population

- Retrospective observational study using administrative claims and Transplant Authorization data from the Optum Research Database, October 1, 2017, to December 31, 2023 (**Figure 1**)

Figure 1. Study schema


Study period
July 1, 2017 through December 31, 2023
Initial CAR-T-related claim (index)
Infusion date
(CAR-T completer cohort only)
3-month baseline
Preparation/ transport
Bridging
≥ Post-infusion follow-up period
≥ 3-month follow-up period[a]
Identification period
October 1, 2017 through September 30, 2023

[a]May be less than minimum if death occurs.

- This study focused on patients who completed their CAR-T infusion (CAR-T completers)
  - Index date was the earliest date of a medical or pharmacy claim for a CAR-T-related procedure or medication (ide-cel or cilta-cel)
  - Follow-up was from the index date to the end of the study period or death, whichever occurred first
- Eligible adults (aged ≥ 18 years) met the following criteria:
  - Medical and pharmacy coverage in a commercial health plan or Medicare Advantage with Part D
  - ≥ 1 diagnosis code for multiple myeloma (MM) during baseline (International Classification of Diseases, Tenth Revision, Clinical Modification C9000, C9001, C9002)
  - Evidence of a CAR-T procedure code or medication during the identification period
  - ≥ 3 months of continuous health plan enrollment before and after the index date (or until death in the post-index period)
  - No evidence of clinical trial participation or use of ide-cel or cilta-cel prior to their respective US approval dates (March 2021 and February 2022, respectively)

Outcomes and analysis

- Patient characteristics, HCRU, and costs were analyzed descriptively
  - Post-infusion HCRU and costs are reported per patient per month (PPPM)
  - Medical costs included those related to ambulatory (office and outpatient) visits, emergency department (ED) visits, inpatient stays, and other medical costs
- Total post-infusion healthcare costs were also evaluated using multivariable analysis adjusting for age group, sex, race/ethnicity, insurance type, region, index year, comorbidities, and baseline all-cause HCRU and costs
- All patients who met the eligibility criteria were included
- All analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC, USA; www.sas.com)

Results

Study population

- Of 105 included patients, 58 (55%) and 47 (45%) received ide-cel or cilta-cel, respectively
- Demographic and clinical characteristics were generally similar between groups (**Table 1**); significantly more patients receiving ide-cel were Non-Hispanic Black and living in the South (both $P < 0.05$)
- Distribution of index years and duration of follow-up were different between groups due to the staggered timing of US approvals (ide-cel, 2021; cilta-cel, 2022)
  - Reasons for end of follow-up were similar for ide-cel and cilta-cel: 6 patients each due to death, 41 versus 35 patients due to end of the study period, and 11 versus 6 patients due to disenrollment, respectively (all $P > 0.05$)

Table 1. Baseline patient characteristics[a]

Characteristic	Ide-cel (n = 58)	Cilta-cel (n = 47)	*P* value
Index year, n (%)			0.003
2021	6 (10)	0	0.032
2022	29 (50)	15 (32)	0.075
2023	23 (40)	32 (68)	0.006
Sex, male, n (%)	35 (60)	24 (51)	0.429
Race/ethnicity, n (%)			0.244
Non-Hispanic White	31 (54)	31 (66)	0.233
Non-Hispanic Black	14 (24)	<5 (<11)[b]	0.040
Non-Hispanic Asian	<5 (<9)[b]	<5 (<11)[b]	1.000
Hispanic	<5 (<9)[b]	<5 (<11)[b]	0.655
Unknown	10 (17)	8 (17)	1.000
Insurance type, n (%)			
Commercial	22 (38)	21 (45)	0.551
Medicare	36 (62)	26 (55)	0.551
US region, n (%)			0.126
Northeast	9 (16)	9 (19)	0.795
Midwest	11 (19)	11 (23)	0.634
South	32 (55)	16 (34)	0.048
West	6 (10)	11 (23)	0.109
NCI-adjusted CCI score, median	1.0	1.0	0.372
Mean (SD)	1.7 (1.7)	1.4 (1.7)	0.419
NCI-adjusted CCI score, n (%)			
0	19 (33)	17 (36)	0.837
1-2	22 (38)	20 (43)	0.691
≥ 3	17 (29)	10 (21)	0.378
Top 10 comorbidities, n (%)[c]			
Cancer of lymphatic and hematopoietic tissue	58 (100)	46 (98)	0.448
Maintenance chemotherapy, radiotherapy	41 (71)	39 (83)	0.171
Heart disease	42 (72)	32 (68)	0.671
Anemia	38 (66)	30 (64)	1.000
Other nervous system disorders	37 (64)	30 (64)	1.000
Hypertension	34 (59)	27 (57)	1.000
Other nutritional, endocrine, and metabolic disorders	31 (53)	26 (55)	1.000
Diseases of the urinary system	29 (50)	18 (38)	0.244
Other lower respiratory disease	21 (36)	17 (36)	1.000
Immunity disorders	22 (38)	20 (43)	0.691

[a]Percentages may not equal 100% due to rounding; [b]Cells with counts < 5 and corresponding percentages are masked; [c]The 10 most commonly occurring comorbidities according to the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications Software.
CCI, Charlson Comorbidity Index; NCI, National Cancer Institute; SD, standard deviation.

All-cause post-infusion HCRU and costs

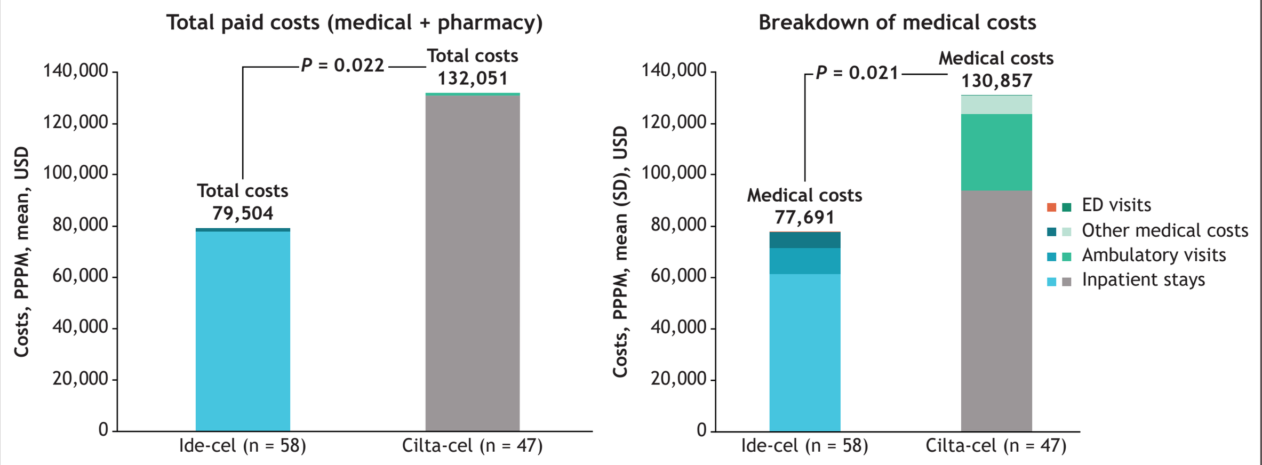
- Overall HCRU was generally comparable between groups (**Table 2**)
  - Post-infusion hospital stays were shorter for patients treated with ide-cel (mean 2.4 vs 3.9 days; $P = 0.033$) despite a comparable number of hospital stays (mean 0.2 vs 0.3, respectively; $P = 0.118$) and intensive care unit (ICU) stays (mean, 0.1 each; $P = 0.482$) between groups (**Table 2**)

Table 2. All-cause post-infusion HCRU, PPPM

	Ide-cel (n = 58)	Cilta-cel (n = 47)	*P* value
Ambulatory visits			
Mean (SD)	8.7 (5.26)	8.6 (4.84)	0.899
Median	7.79	8.08	
Office visits			
Mean (SD)	2.0 (1.94)	2.2 (2.05)	0.593
Median	1.32	1.82	
Outpatient visits			
Mean (SD)	6.9 (5.15)	6.6 (4.58)	0.762
Median	5.34	5.83	
ED visits			
Mean (SD)	0.1 (0.24)	0.1 (0.26)	0.897
Median	0	0	
Inpatient stays			
Mean (SD)	0.2 (0.24)	0.3 (0.25)	0.118
Median	0.16	0.21	
Length of inpatient stay, days			
Mean (SD)	2.4 (3.17)	3.9 (4.33)	0.033
Median	1.09	2.61	
ICU stays			
Mean (SD)	0.1 (0.23)	0.1 (0.23)	0.482
Median	0	0	
Pharmacy fills			
Mean (SD)	5.0 (3.20)	4.4 (2.33)	0.282
Median	4.37	3.99	

- Mean total all-cause post-infusion healthcare costs were $79,504 PPPM with ide-cel and $132,051 PPPM with cilta-cel ($P = 0.022$), driven by lower post-infusion medical costs with ide-cel ($77,691 vs $130,857, respectively; $P = 0.021$) (**Figure 2**)

Figure 2. Mean all-cause post-infusion healthcare costs, PPPM

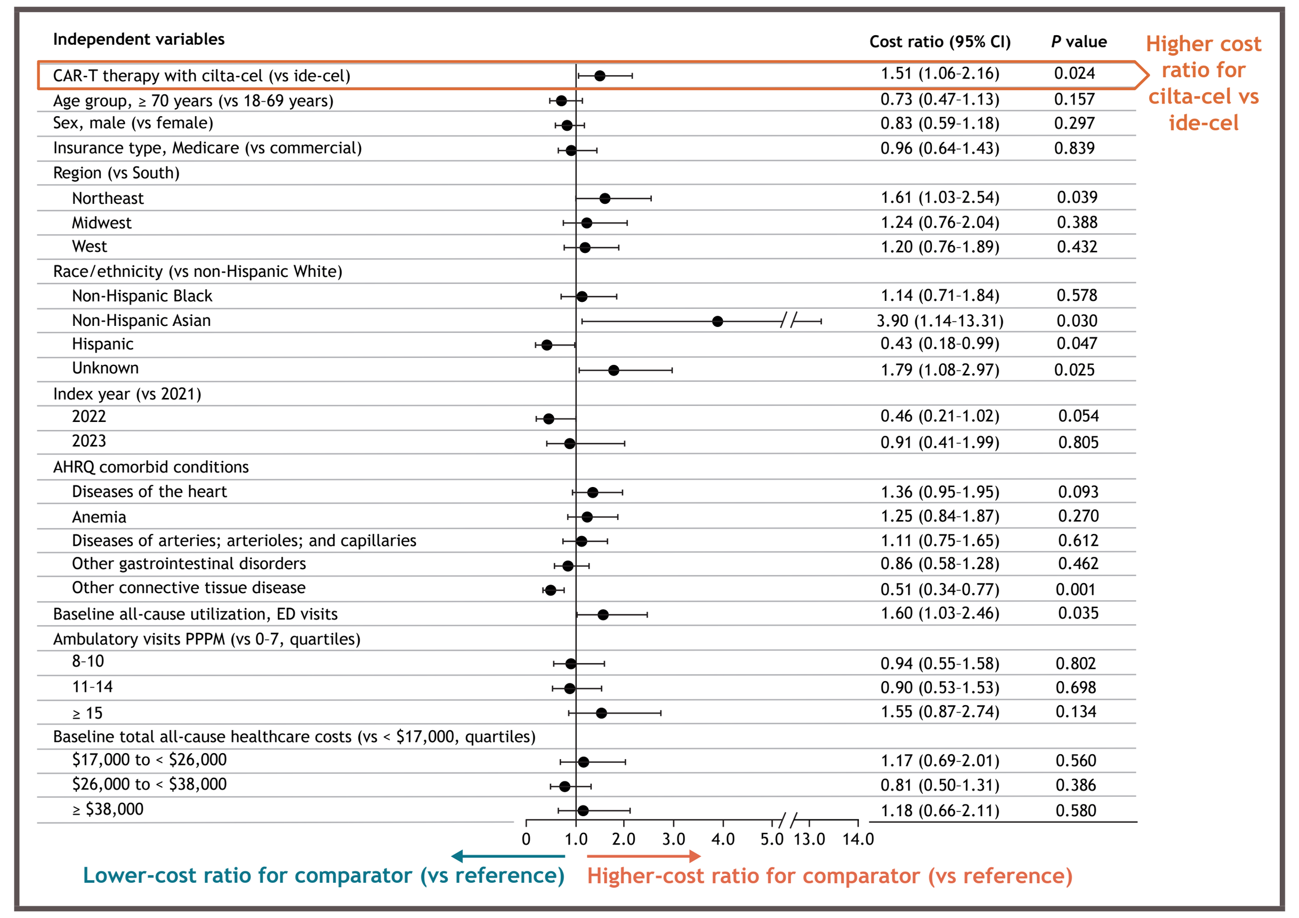

Total paid costs (medical + pharmacy)
Breakdown of medical costs
Costs, PPPM, mean, USD
Costs, PPPM, mean (SD), USD
P = 0.022
P = 0.021
Total costs 79,504
Total costs 132,051
Medical costs 77,691
Medical costs 130,857
ED visits
Other medical costs
Ambulatory visits
Inpatient stays
Ide-cel (n = 58)
Cilta-cel (n = 47)

Costs, mean (SD), USD	Ide-cel (n = 58)	Cilta-cel (n = 47)	*P* value
Total medical + pharmacy costs	79,504 (106,893)	132,051 (124,021)	0.022
Pharmacy costs	1813 (4100)	1194 (3606)	0.427
Medical costs	77,691 (107,277)	130,857 (124,116)	0.021
Ambulatory (office and outpatient) visits	9828 (18,519)	29,604 (53,381)	0.002
ED visits	93 (171)	163 (383)	0.176
Inpatient stays	61,513 (106,527)	94,036 (132,675)	0.162
Other medical costs	6258 (34,560)	7054 (24,210)	0.891

Multivariable analysis of all-cause post-infusion healthcare costs

- The multivariable analysis adjusting for key patient characteristics and baseline HCRU and costs showed 51% higher total all-cause post-infusion predicted costs with cilta-cel ($126,641) compared with ide-cel ($83,920; cost ratio, 1.51; 95% confidence interval [CI], 1.06-2.16; $P = 0.024$) (**Figure 3**)
  - The unadjusted analysis showed 66% higher total costs with cilta-cel versus ide-cel (cost ratio, 1.66; 95% CI, 1.06-2.62; $P = 0.029$)

Figure 3. Multivariable analysis of total all-cause post-infusion healthcare costs



Independent variables	Cost ratio (95% CI)	*P* value
CAR-T therapy with cilta-cel (vs ide-cel)	1.51 (1.06-2.16)	0.024
Age group, ≥ 70 years (vs 18-69 years)	0.73 (0.47-1.13)	0.157
Sex, male (vs female)	0.83 (0.59-1.18)	0.297
Insurance type, Medicare (vs commercial)	0.96 (0.64-1.43)	0.839
Region (vs South)		
Northeast	1.61 (1.03-2.54)	0.039
Midwest	1.24 (0.76-2.04)	0.388
West	1.20 (0.76-1.89)	0.432
Race/ethnicity (vs non-Hispanic White)		
Non-Hispanic Black	1.14 (0.71-1.84)	0.578
Non-Hispanic Asian	3.90 (1.14-13.31)	0.030
Hispanic	0.43 (0.18-0.99)	0.047
Unknown	1.79 (1.08-2.97)	0.025
Index year (vs 2021)		
2022	0.46 (0.21-1.02)	0.054
2023	0.91 (0.41-1.99)	0.805
AHRQ comorbid conditions		
Diseases of the heart	1.36 (0.95-1.95)	0.093
Anemia	1.25 (0.84-1.87)	0.270
Diseases of arteries; arterioles; and capillaries	1.11 (0.75-1.65)	0.612
Other gastrointestinal disorders	0.86 (0.58-1.28)	0.462
Other connective tissue disease	0.51 (0.34-0.77)	0.001
Baseline all-cause utilization, ED visits	1.60 (1.03-2.46)	0.035
Ambulatory visits PPPM (vs 0-7, quartiles)		
8-10	0.94 (0.55-1.58)	0.802
11-14	0.90 (0.53-1.53)	0.698
≥ 15	1.55 (0.87-2.74)	0.134
Baseline total all-cause healthcare costs (vs < $17,000, quartiles)		
$17,000 to < $26,000	1.17 (0.69-2.01)	0.560
$26,000 to < $38,000	0.81 (0.50-1.31)	0.386
≥ $38,000	1.18 (0.66-2.11)	0.580

CAR-T-related post-infusion HCRU and costs

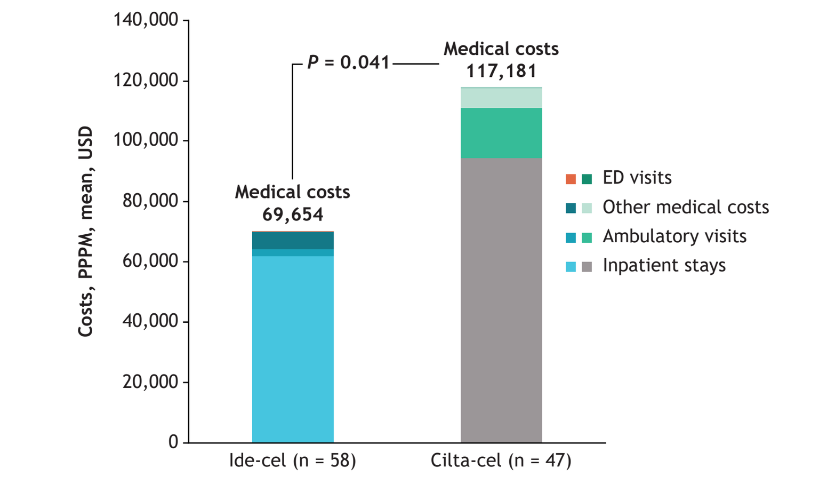
- CAR-T-related HCRU was generally comparable between groups except for the duration of post-infusion hospital stays, which was shorter for patients treated with ide-cel (mean 2.4 vs 3.9 days; $P = 0.030$), despite a comparable number of hospital stays (mean 0.2 vs 0.3, respectively; $P = 0.106$) and ICU stays (mean, 0.1 each; $P = 0.465$) between groups (**Table 3**)

Table 3. CAR-T-related post-infusion HCRU, PPPM

	Ide-cel (n = 58)	Cilta-cel (n = 47)	*P* value
Ambulatory visits			
Mean (SD)	3.1 (4.55)	3.2 (3.08)	0.862
Median	1.52	2.68	
Office visits			
Mean (SD)	0.5 (0.84)	0.6 (0.78)	0.544
Median	0.23	0.32	
Outpatient visits			
Mean (SD)	2.8 (4.45)	2.6 (2.94)	0.970
Median	1.23	1.76	
ED visits			
Mean (SD)	0.1 (0.19)	0.1 (0.23)	0.773
Median	0	0	
Inpatient stays			
Mean (SD)	0.2 (0.24)	0.3 (0.25)	0.106
Median	0.16	0.21	
Length of inpatient stay, days			
Mean (SD)	2.4 (3.17)	3.9 (4.33)	0.030
Median	1.09	2.61	
ICU stays			
Mean (SD)	0.1 (0.23)	0.1 (0.23)	0.465
Median	0	0	
Pharmacy fills			
Mean (SD)	0	0	-
Median	0	0	

- Mean total CAR-T-related post-infusion medical costs were $69,654 PPPM with ide-cel and $117,181 PPPM with cilta-cel ($P = 0.041$) (**Figure 4**)
  - Lower CAR-T-related costs with ide-cel were driven by lower costs associated with post-infusion ambulatory visits ($2123 vs $16,397 PPPM; $P < 0.001$) (**Figure 4**)
  - Ambulatory visit costs were almost entirely comprised of outpatient visits ($1966 vs $16,216 PPPM; $P < 0.001$) rather than office visits ($158 vs $181 PPPM; $P = 0.817$)

Figure 4. Mean CAR-T-related post-infusion healthcare costs, PPPM



Costs, mean (SD), USD	Ide-cel (n = 58)	Cilta-cel (n = 47)	*P* value
Medical costs	69,654 (108,717)	117,181 (125,354)	0.041
Ambulatory (office and outpatient) visits	2123 (3595)	16,397 (34,341)	< 0.001
ED visits	62 (128)	103 (276)	0.273
Inpatient stays	61,487 (106,534)	94,036 (132,675)	0.162
Other medical costs	5982 (34,502)	6644 (24,044)	0.909

Conclusions

- Patient demographic and baseline clinical characteristics were generally similar between patients receiving ide-cel or cilta-cel
- Patients with RRMM receiving ide-cel in US clinical practice have significantly shorter all-cause and CAR T-related hospital stays in the post-infusion period than those receiving cilta-cel
  - Cost differences were driven by lower medical costs with ide-cel, suggesting that patients receiving cilta-cel may require more post-discharge medical care
  - Multivariable analysis adjusting for patient characteristics and baseline HCRU and costs showed 51% higher all-cause post-infusion costs with cilta-cel compared with ide-cel
  - Lower CAR-T-related medical costs were driven by lower costs for ambulatory visits (office and outpatient visits) during the post-infusion period
- These findings may reflect observed differences in safety-related outcomes between ide-cel and cilta-cel in clinical trials, though further research is needed to better understand how real-world clinical outcomes contribute to observed differences in HCRU and costs

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Acknowledgments

- The study was supported by Bristol Myers Squibb
- All authors contributed to and approved the presentation; Felix Feng and Randall Gerdes, of Optum, provided programming and statistical support; writing and editorial assistance were provided by Jeff Frimpter, MPH, of Excerpta Medica, funded by Bristol Myers Squibb

Disclosures

S.A.: AbbVie, Amgen, Ascentage, Bristol Myers Squibb, Cellectar Biosciences, GSK, Janssen, Pharmacyclics, Xencor – research funding; Amgen, Bristol Myers Squibb, BeiGene, Cellectar Biosciences, GSK, Janssen, Pharmacyclics, Regeneron, Sanofi, Takeda – consulting. Y.Z., M.D., N.M.E-N., M.V.: Optum – employment; UnitedHealth Group - stock ownership. S.T., T.C.: Bristol Myers Squibb – employment at the time this study was conducted and stock ownership. P.P.: Bristol Myers Squibb – employment and stock ownership.

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Presented at the Academy of Managed Care Pharmacy (AMCP) Annual Meeting; March 31-April 3, 2025; Houston, TX, USA.

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