

Post-infusion monitoring costs by site of care among patients with relapsed or refractory large B-cell lymphoma who received second-line treatment with lisocabtagene maraleucel (liso-cel) in the TRANSFORM study: a United States subgroup analysis

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Introduction

- Chimeric antigen receptor (CAR) T cell therapies are approved for the treatment of relapsed or refractory (R/R) large B-cell lymphoma (LBCL) after 2 or more lines of therapy,^{1–3} and are under investigation in earlier lines of therapy
- CAR T cell therapy is generally administered in the inpatient setting, with limited outpatient utilization due to treatment site capabilities and the safety profile of CAR T cell therapies with considerations for cytokine release syndrome (CRS) and neurological events (NE). Opportunities exist for treatment in the outpatient setting, which may reduce health care resource utilization (HCRU), hospital bed days, and subsequent costs^{4–7}
- Lisocabtagene maraleucel (liso-cel) is an autologous, CD19-directed, defined composition, 4-1BB CAR T cell product administered at equal target doses of CD8⁺ and CD4⁺ CAR⁺ T cells and has demonstrated low rates of grade ≥3 CRS and NE in several clinical studies, which may provide the opportunity for outpatient administration^{8–10}
- A previous analysis in patients treated with liso-cel as third- or later-line therapy reported lower HCRU and costs with outpatient versus inpatient administration¹
- Liso-cel is currently under investigation as 2L therapy for patients with primary refractory or early relapsed LBCL intended for autologous hematopoietic stem cell transplantation in the TRANSFORM trial

- Post-infusion monitoring practices for patients treated with liso-cel in the TRANSFORM trial may differ between the US and other countries; studies are needed to assess HCRU and post-infusion monitoring costs among patients treated with liso-cel in the United States, by site of CAR T cell administration

Objective

- To characterize the post-infusion HCRU and monitoring costs by site of care among US patients with transplant-intended R/R LBCL treated with liso-cel as 2L therapy in the TRANSFORM trial

Methods

Study methodology

- This study was a retrospective analysis of individual patient-level case report forms among patients who were administered liso-cel as 2L treatment for transplant-intended, R/R LBCL in the US
- A 2-step microcosting methodology was used that quantified HCRU and estimated associated costs
 - Key HCRU (through a 6-month time frame after infusion) was analyzed
 - Unit costs were applied to each HCRU (eg, number of inpatient and intensive care unit [ICU] days, procedures, diagnostics, and medications) were identified from the administration of liso-cel and aggregated across 6 months to estimate total post-infusion monitoring costs
- Key cost inputs are summarized in **Table 1**
 - Medication cost data were obtained from IBM® Micromedex® RED BOOK® (as of 2021) using wholesale acquisition costs (WAC)
 - Diagnostic and procedure costs were obtained from the Centers for Medicare & Medicaid Services (CMS) 2021 first quarter (Q1) laboratory fee schedule, physician fee schedule (as of 2021), outpatient prospective payment system (OPPS; 2021), CMS durable medical equipment fee schedule (2021), and peer-reviewed literature¹¹
 - Unit costs were measured from the health care system perspective and adjusted to 2021 US dollars (USD). Cost estimates were also adjusted by site of care
 - Analyses were stratified by site of liso-cel administration. A patient was classified as an “outpatient” if on the day of liso-cel infusion they left the clinic or were discharged from the hospital at the end of the observation period. All other patients were classified as “inpatients”

Table 1. Key cost inputs

Input	Cost median/range, USD	Reference
Cost per office visit	\$121	2021 OPPS national reimbursement rate
Cost per inpatient day	\$2880	Healthcare Cost and Utilization Project (National Inpatient Sample 2018) ^a
Cost per ICU day	\$8245	Dasta et al 2005, ¹¹ estimated per ICU day cost without mechanical ventilation ^a
Diagnostic laboratory tests	\$6–\$17	2021 clinical laboratory fee schedule Q1 by HCPCS code, national reimbursement rates
Diagnostic tests	\$15–\$1481	2021 OPPS and physician fee schedule national reimbursement rates
Procedures	\$62–\$953	2021 OPPS and physician fee schedule national reimbursement rates
Medications/drugs	\$0.01–\$10,385 per dose	IBM Micromedex RED BOOK, WAC price ^b

Costs were applied to any HCRU that met temporality and guideline requirements from the provider perspective.

^aInflated to 2021 USD; ^bCosted to prescribed amounts.
HCPCS, Healthcare Common Procedure Coding System.

Study population

- TRANSFORM is a randomized, open-label, parallel-group, multicenter study of adult patients with transplant-intended, R/R LBCL to assess the safety and efficacy of standard of care therapy versus liso-cel
- This study analysis included 56 TRANSFORM patients in the liso-cel arm who received liso-cel as 2L treatment in the US

Inclusion criteria

- Patients were eligible for this study if they met the following criteria:
 - Enrolled in the TRANSFORM study
 - Randomized to the liso-cel arm in TRANSFORM
 - Administered liso-cel in the US

Exclusion criteria

- No formal exclusion criteria were established for this study

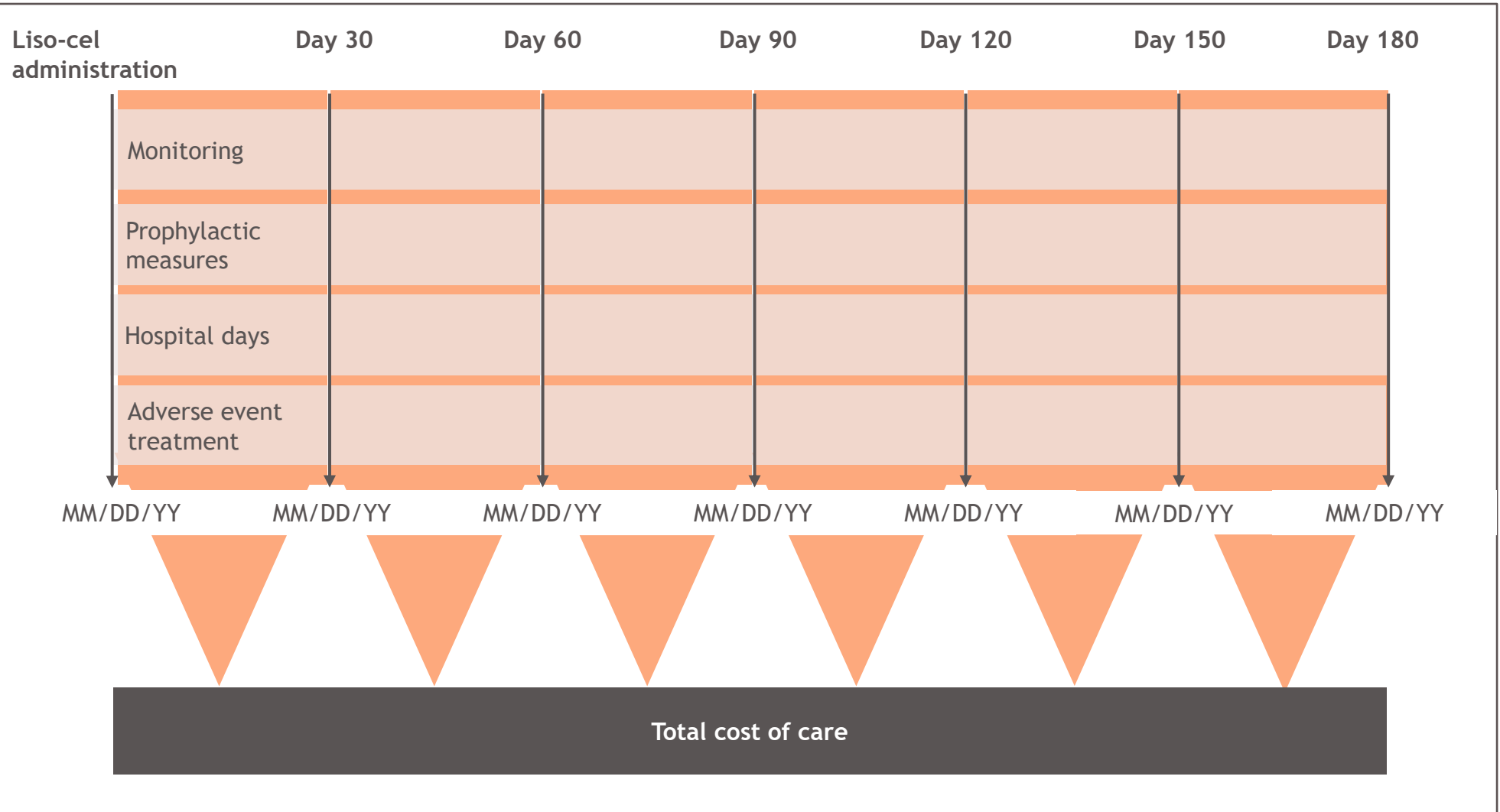
Study outcomes

- Primary outcome
 - Estimated post-infusion monitoring costs (facility, diagnostics, drugs, procedures) in the 6 months after liso-cel infusion, and by site of care (**Figure 1**)
- Secondary outcomes
 - Key HCRU by site of care
 - Diagnostics (eg, laboratory tests, imaging)
 - Drugs/medications (excluding liso-cel; eg, tocilizumab, corticosteroids)
 - Procedures (eg, dialysis, mechanical ventilation, spinal tap)
 - Facility
 - Hospitalization and median length of stay (LOS)
 - ICU use
 - Estimated post-infusion monitoring costs (facility, diagnostics, drugs, procedures) described longitudinally by month after liso-cel administration, and by site of care

Statistical analyses

- Descriptive statistical analyses were performed on individual patient-level data from the TRANSFORM trial, among patients fulfilling study inclusion criteria
- Baseline patient demographics, total costs, and HCRU were assessed descriptively

Figure 1. Study methodology



Results

- Among the 56 patients treated with liso-cel in TRANSFORM in the US, 17 (30.4%) were treated as outpatients and 39 (69.6%) were treated in the inpatient setting
- Among inpatients, the median age was slightly higher and the percentage of male patients was slightly lower compared with outpatients, racial distribution and ethnicity were similar, and sum of the product of perpendicular diameters ≥50cm² was slightly higher among inpatients (**Table 2**)

Table 2. Patient baseline characteristics by site of care

	Inpatients (n = 39)	Outpatients (n = 17)
Age, median (range), y	66 (20.0–74.0)	62 (25.0–72.0)
Male, n (%)	18 (46.2)	9 (52.9)
Race, n (%)		
White	31 (79.5)	13 (76.5)
Black	2 (5.1)	2 (11.8)
Asian	4 (10.3)	1 (5.9)
Other/unknown	2 (5.1)	1 (5.9)
Ethnicity, n (%)		
Not Hispanic or Latino	35 (89.7)	15 (88.2)
B-NHL subtype, n (%)		
DLBCL	26 (66.7)	10 (58.8)
HGBCL	11 (28.2)	5 (29.4)
Other	2 (5.1)	2 (11.8)
SPD ≥50 cm ² , n (%)	3 (7.7)	0
LDH ≥500 units/L, n (%)	3 (7.7)	1 (5.9)
CRP ≥20 mg/dL, n (%)	7 (17.9)	4 (23.5)

B-NHL, B-cell non-Hodgkin lymphoma; CRP, C-reactive protein; DLBCL, diffuse large B-cell lymphoma; HGBCL, high-grade B-cell lymphoma; LDH, lactate dehydrogenase; SPD, sum of the product of perpendicular diameters.

- Less than half of outpatients (47.1%) were subsequently hospitalized
- ICU admissions were rare, with only 1 inpatient (2.6%) being admitted (**Table 3**)
- The median (range) total LOS was longer for inpatients than outpatients (13 [1–80] vs 9 [4–21] days)
- Among patients administered liso-cel in the outpatient setting (infused as inpatients and discharged after one night of observation), median (range) time from liso-cel infusion to first inpatient admission was 18 (2–160) days

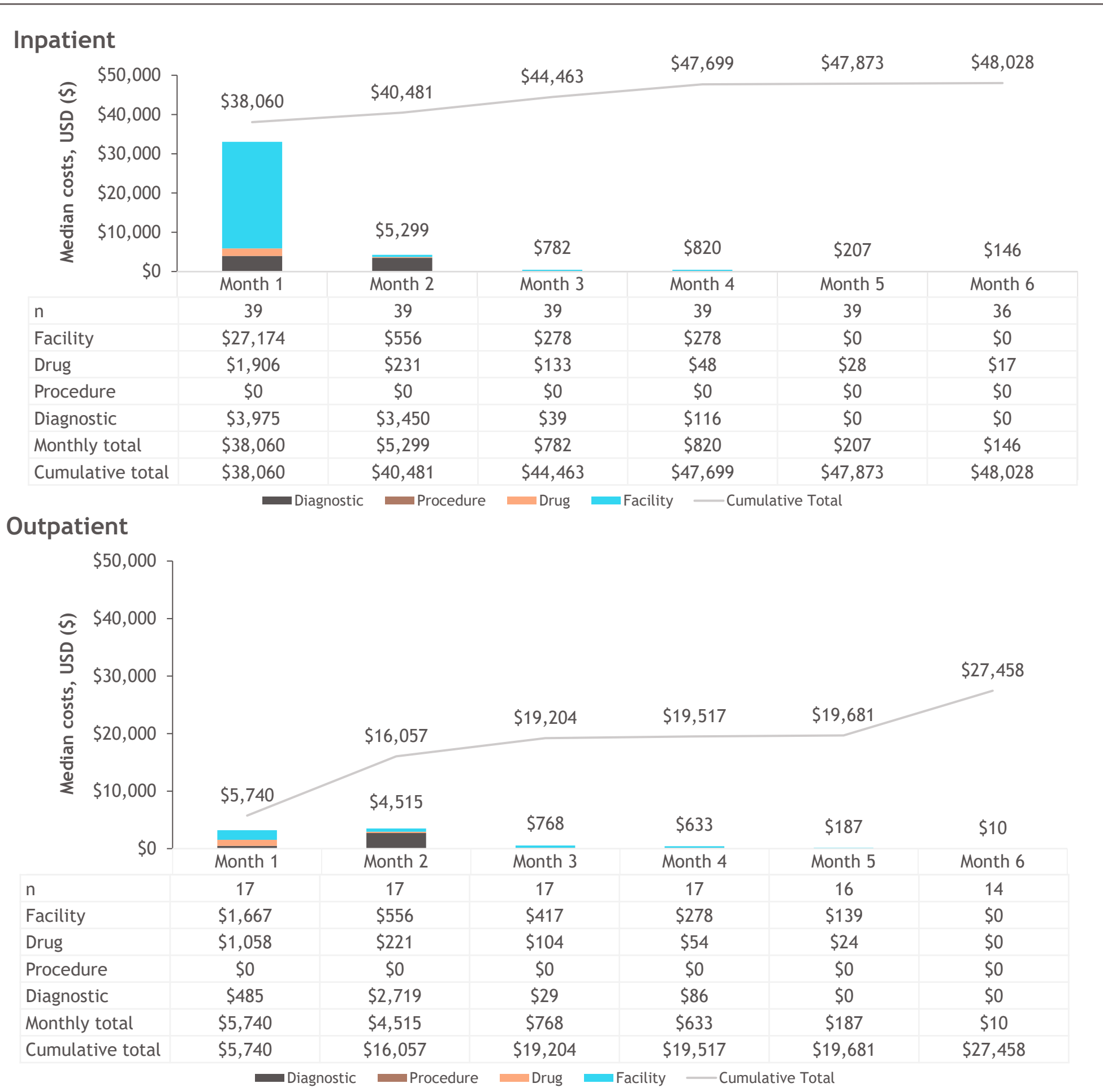
Table 3. Key HCRU by site of care

	Inpatients (n = 39)	Outpatients (n = 17)
Facility, n (%)		
Hospitalization	35 (89.7)	8 (47.1)
ICU	1 (2.6)	0
Median (range) LOS, days ^a		
Hospitalization LOS	12 (1–80)	9 (4–21)
ICU LOS	3 (3–3)	0
Total LOS	13 (1–80)	9 (4–21)
Drug, n (%)		
Tocilizumab	8 (20.5)	3 (17.6)
Corticosteroids	4 (10.3)	3 (17.6)
Procedures, n (%)		
Dialysis	0	0
Intubation ^b	0	2 (11.8)

^aThese data reflect only patients who were subsequently hospitalized. ^bIntubation was used as a proxy for mechanical ventilation.

- Estimated mean (median) 6-month total post-infusion monitoring costs (excluding liso-cel acquisition) were \$72,218 (\$48,028) and \$35,086 (\$27,458) for inpatients and outpatients, respectively, with a difference of \$37,132 (\$20,570) between sites of care (**Figure 2**), which is a 51% decrease in mean cost for outpatients
- Facility costs were the primary driver of costs among inpatients, and facility fees and diagnostic costs were the key drivers among outpatients
- Overall, 79.2% of total median costs for inpatients occurred in the first month, whereas for outpatients, 58.4% of costs occurred in the first 2 months

Figure 2. Estimated 6-month median post-infusion monitoring cost by site of care



Median total costs may not equal the sum of the component categories as the cost shown in each category reflects the median applicable to that category. Bars within the graph show median diagnostic, drug, procedure, and facilities costs and may not match the median total costs stated above the bar. Costs reported in the poster differ from those in the abstract because of an update in methodology to more conservatively count multiple related laboratory tests in the same day as a single laboratory test.

Conclusions

- In the US, patients treated with liso-cel in the outpatient setting demonstrated lower costs and reduced LOS when compared with those treated in the inpatient setting
- Outpatient post-infusion monitoring resulted in a median cost savings of 43% compared with inpatient monitoring, largely due to lower facility costs
- This study illustrates potential cost savings, reduced LOS, and HCRU with outpatient administration of liso-cel in the TRANSFORM trial, and confirms findings in later lines of therapy

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