

# REAL-WORLD DISEASE BURDEN, COSTS AND RESOURCE UTILIZATION OF HOSPITAL-BASED CARE AMONG MANTLE CELL LYMPHOMA, WALDENSTRÖM MACROGLOBULINEMIA, MARGINAL ZONE LYMPHOMA AND CHRONIC LYMPHOCYTIC LEUKEMIA: DISPARITIES AND RISK FACTORS

Asher Chanan-Khan<sup>1</sup>, Keri Yang<sup>2</sup>, Sizhu Liu<sup>2</sup>, Zhun Cao<sup>3</sup>, Dorothy Baumer<sup>3</sup>, Shanthi Krishnaswami<sup>3</sup>, Boxiong Tang<sup>2</sup>, Sikander Ailawadhi<sup>1</sup>

<sup>1</sup>Mayo Clinic, Jacksonville, FL; <sup>2</sup>BeiGene USA, San Mateo, CA; <sup>3</sup>Premier, Inc., Charlotte, NC

## BACKGROUND

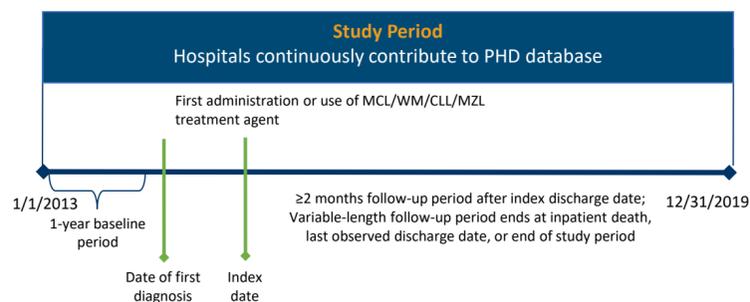
- Chronic lymphocytic leukemia (CLL), mantle cell lymphoma (MCL), marginal zone lymphoma (MZL), and Waldenström macroglobulinemia (WM) are subtypes of non-Hodgkin's lymphoma
- Collectively, these subtypes constitute a large proportion of all B-cell malignancies; however, they are typically associated with survival spanning several years with multiple interspersed treatment periods due to frequent relapses
- This can predispose patients to repeated hospitalizations resulting in significant economic impact
- There is limited real-world data on the real-world economic burden of the four types of lymphomas

## OBJECTIVE

- To examine real-world treatment patterns, costs and healthcare resource utilization for patients with these lymphomas
- To identify disparities and risk factors associated with costs incurred in US hospitals

## METHODS

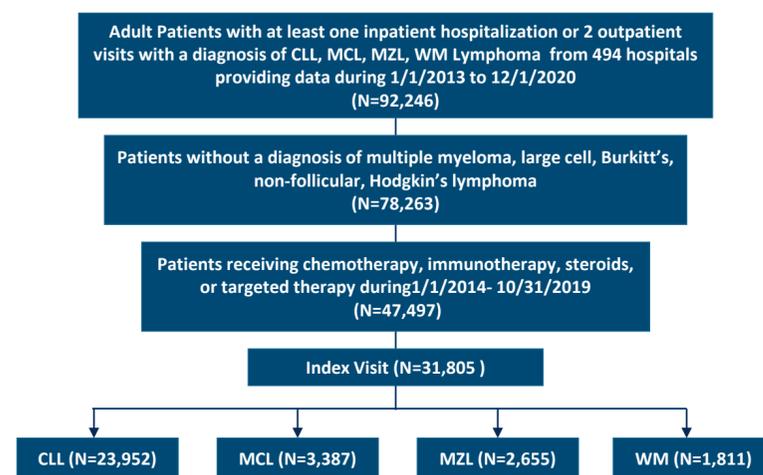
- Data Source:** PINC AITM Healthcare Database (PHD; formerly known as Premier Healthcare Database), a hospital administrative database currently containing data from more than 1 billion patient encounters (inpatient and outpatient) in the U.S
- Study Design:** retrospective observational study
- Patient Selection Criteria:**
  - Aged ≥18 years with ≥1 inpatient or 2 hospital-based outpatient visits with a CLL, MCL, MZL, or WM diagnosis
  - Received treatment (steroids, chemotherapy, immunotherapy, rituximab, or targeted therapy) for these conditions from 1/1/2014 to 10/31/2019
  - Index date: the admission date of the first hospitalization/visit with a CLL, MCL, MZL, or WM diagnosis



- Primary Study Outcome:**
  - Total hospital cost during index and follow-up period
- Statistical Methods:**
  - Descriptive analysis to examine total hospital cost, inpatient LOS, use of supportive care, and treatment regimens for each lymphoma type
  - Multivariable Generalized Linear Model (GLM) regressions to examine the disparities in total hospital cost across age, gender, race/ethnicity, and insurance payor groups, as well as risk factors for higher hospital costs within each lymphoma type

## RESULTS

Figure 1. Study Population Attrition



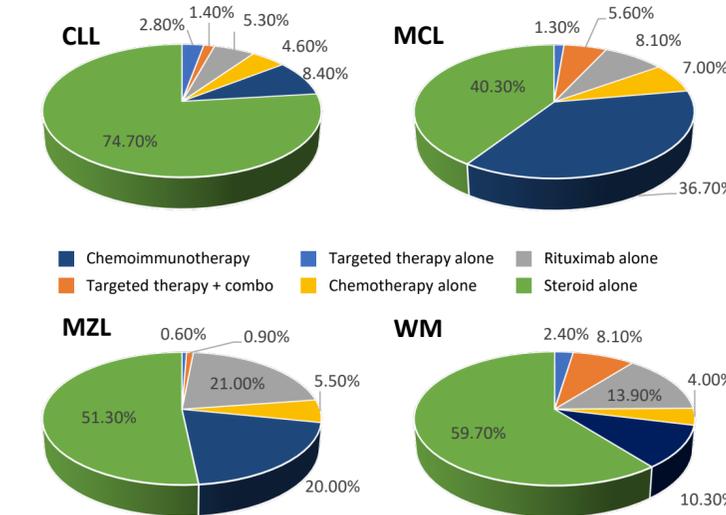
### Patient characteristics (Table 1)

- In all lymphoma types, majority of patients were older than 65 years
- Majority of patients in the CLL, MCL, and WM cohorts were male, but the majority of MZL patients were female
- In all four cohorts, Medicare was the most frequent insurance, followed by commercial insurance
- South region saw the largest proportion of patients, followed by the Midwest in all four types of lymphoma

Table 1. Demographic Characteristics of Study Population

	CLL (n=23,952)	MCL (n=3,387)	MZL (n=2,655)	WM (n=1,811)
<b>Age (n%)</b>				
Age < 65 years	5,010 (20.9)	1,076 (31.8)	933 (35.1)	375 (20.7)
Age ≥ 65 years	18,942 (79.1)	2,311 (68.2)	1,722 (64.9)	1,436 (79.3)
<b>Sex (n%)</b>				
Male	14,040 (58.6)	2,427 (71.7)	1,157 (43.6)	1,044 (57.7)
Female	9,910 (41.4)	960 (28.3)	1,498 (56.4)	766 (42.3)
<b>Race (n%)</b>				
White	20,749 (86.6)	2,975 (87.8)	2,155 (81.2)	1,571 (86.8)
Non-White	3,203 (13.4)	412 (12.2)	500 (18.8)	240 (13.2)
<b>Ethnicity (n%)</b>				
Not Hispanic or Latino/Unknown	23,345 (97.5)	3,224 (95.2)	2,521 (94.9)	1,770 (97.7)
Hispanic or Latino	607 (2.5)	163 (4.8)	134 (5.1)	41 (9.7)
<b>Primary Payor (n%)</b>				
Medicare	18,524 (77.3)	2,266 (66.9)	1,747 (65.8)	1,406 (77.6)
Medicaid	855 (3.6)	158 (4.7)	140 (5.3)	49 (2.7)
Other	797 (3.3)	150 (4.4)	107 (4.0)	56 (3.1)
Commercial Insurance	3,776 (15.8)	813 (24.0)	661 (24.9)	300 (16.6)
<b>Provider Area (n%)</b>				
South	11,490 (48.0)	1,716 (50.7)	1,280 (48.2)	821 (45.3)
Midwest	6,022 (25.1)	801 (23.7)	679 (25.6)	427 (23.6)
Northeast	3,704 (15.5)	443 (13.1)	391 (14.7)	319 (17.6)
West	2,736 (11.4)	427 (12.6)	305 (11.5)	244 (13.5)

Figure 2. Patterns of Treatment Regimen



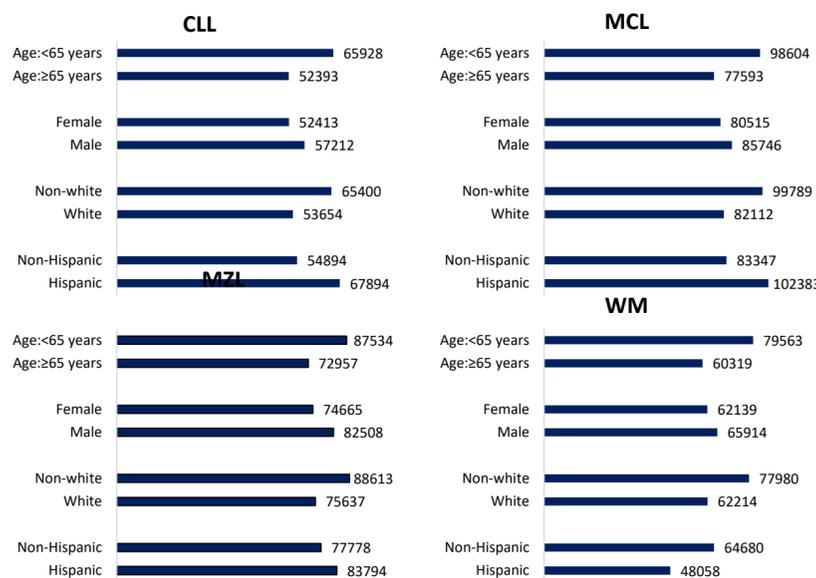
### Treatment Patterns (Figure 2)

- In CLL and MCL patients, chemo-immunotherapy was the most frequently used therapy aside from steroids alone
- In MZL and WM patients, rituximab was the most frequent therapy other than steroids alone
- A high proportion of patients were treated with steroids alone to control their symptoms

### Total hospital costs (Figure 3 and Table 2)

- Patients aged 65 and younger, males and those who were non-white had higher hospital cost in all four lymphoma types
- Hispanic patients incurred higher cost compared to non-Hispanic in CLL, MCL, and MZL, but not in the WM group
- Disparities across primary payor were seen in WM patients, with Medicaid patients associated with an increased total hospital cost compared to Medicare patients

Figure 3. Mean Total Hospital Cost by Demographic Characteristics



- Supportive care use (blood transfusion, use of granulocyte colony stimulating factors), treatment regimens that include any chemotherapy, immunotherapy, or targeted therapy were associated with significantly higher total hospital cost during the follow-up period

Table 2. Factors Associated with Total Hospital Cost, by lymphoma type

	CLL % Difference	MCL % Difference	MZL % Difference	WM % Difference
<b>Age (Ref= Age ≥ 65 years)</b>				
Age < 65 years	10.27*	1.32	8.04	-1.74
<b>Sex (Ref= Male)</b>				
Female	-7.76 *	-5.6	-5.94	0.26
<b>Race (Ref= White)</b>				
Non-White	11.98 *	13.88 *	15.09 *	11.41
<b>Ethnicity (Ref=Not Hispanic or Latino/Unknown)</b>				
Hispanic or Latino	17.5 *	15.07 *	6.37	-9.86
<b>Primary Payor (Ref=Medicare)</b>				
Medicaid	7.73*	-6.16	13.61	69.28 *
Other	-9.9 *	-6.53	-0.53	-0.51
Private Insurance	-6.92 *	-8.23	-0.98	10.75
<b>Provider Area (Ref= South)</b>				
Midwest	1.7	6.34	7.38	-0.71
Northeast	39.51 *	57.7 *	41.92 *	7.13
West	19.66	12.29 *	14.23 *	9.9
<b>Charlson Comorbidity Index score</b>				
Any red blood cell or platelet transfusion	74.46 *	50.37 *	66.97 *	58.22 *
Any use of granulocyte colony stimulating factors	57.29 *	61.38 *	40.81 *	79.75 *
<b>Treatment Regimen (Ref=Steroids alone)</b>				
Chemotherapy alone	39.63 *	36.9 *	53.07 *	19.81
Chemo-Immunotherapy	65.73 *	102.5 *	119.4 *	81.67 *
Other	16.44 *	4.63	25.18	-0.17
Rituximab alone	56.5 *	53.82 *	61.25 *	40.71 *
Targeted therapy alone	56.96 *	29.61 *	64.83 *	6.11
Targeted therapy combined with other therapy	112.2 *	116.8 *	121.7 *	94.56 *
<b>Length of follow up in months</b>	1.3 *	1.27 *	0.89 *	1.16 *

\* p<0.05; % difference = (exp(coefficients) -1) \* 100

## DISCUSSION

### Strengths:

- All payer, geographically diverse hospital database
- Larger study sample with the four types of lymphoma
- Utilization of hospital charge master data to examine the real-world in-hospital treatment patterns

### Limitations:

- Lab test results are not available in the database
- Patients can only be followed only if they received treatment in the same hospital
- The PHD database only captures medication received during inpatient hospitalizations or hospital-based outpatient visits. Medication prescriptions filled in pharmacies are not captured

## CONCLUSIONS

- Real-world data demonstrated the significantly high total hospital costs once patients with MCL, WM, MZL, and CLL patients were hospitalized, with significantly higher impact to minority populations
- Given the increased availability of effective oral therapeutics, optimal and timely disease control in the outpatient setting can potentially prevent or decrease hospitalizations and reduce economic burden on healthcare systems and payors
- Future studies are needed to explore the reason for admission, clinical outcomes, and potential preventive interventions