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

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Disclosures

- Consulting: BeiGene
- Board of Directors: Starton, Collector, Alphan2
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- Stocks: Starton, Collector, Alphan2, NanoDev

Introduction

- 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

Objectives

- To examine real-world treatment patterns, costs and healthcare resource utilization

- To identify disparities and risk factors associated with costs incurred in US hospitals

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Methods

- **Data Source:** PINC AITM Healthcare Database (formerly known as Premier Healthcare Database), a geographically diverse all-payer, hospital administrative database

- **Study Design:** A retrospective observational study

- **Study Population:**
  - 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

- **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 regressions: to examine the disparities in total hospital cost across age, gender, race/ethnicity, insurance payor groups, andrisk factors for higher hospital costs within each lymphoma type
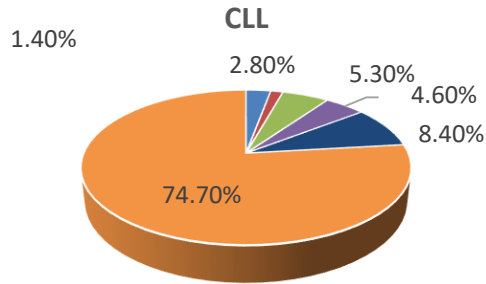
Results: Patient Demographics and Clinical Characteristics

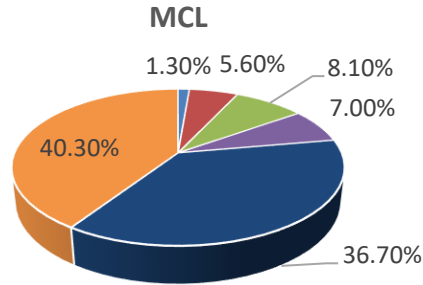|	CLL (n=23,952)	MCL (n=3,387)	MZL (n=2,655)	WM (n=1,811)
Age (n%)				
Age < 65 years	5,010 (20.9)	1,076 (31.8)	933 (35.1)	375 (20.7)
Age ≥ 65 years	18,942 (79.1)	2,311(68.20)	1,722 (64.9)	1,436 (79.3)
Sex (n%)				
Male	14,040 (58.6)	2,427 (71.7)	1,157 (43.6)	1,044 (57.7)
Female	9,910 (41.4)	960 (28.3)	1,498 (56.4)	766 (42.3)
Race (n%)				
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)
Ethnicity (n%)				
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 (97.7)
Primary Payor (n%)				
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)
Provider Area (n%)				
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)

- 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 Midwest in all four types of lymphoma
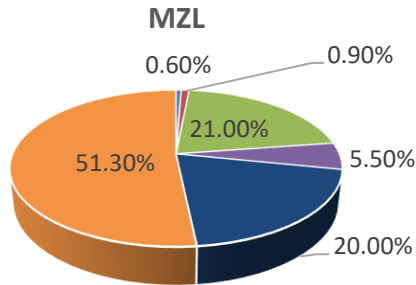
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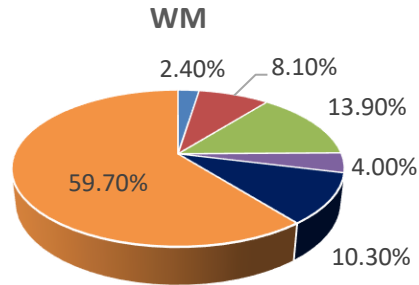
Results: Treatment Regimen

CLL
- 1.40%
- 2.80%
- 5.30%
- 4.60%
- 8.40%
- 74.70%

Legend: TTA, TTC, RA, CA, CI, SA

MCL
- 1.30%
- 5.60%
- 8.10%
- 7.00%
- 36.70%
- 40.30%

Legend: TTA, TTC, RA, CA, CI, SA

MZL
- 0.60%
- 0.90%
- 21.00%
- 5.50%
- 20.00%
- 51.30%

Legend: TTA, TTC, RA, CA, CI, SA

WM
- 2.40%
- 8.10%
- 13.90%
- 4.00%
- 10.30%
- 59.70%

Legend: TTA, TTC, RA, CA, CI, SA

- 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 the symptoms

Abbreviations: SA=steroid alone; CA=Chemotherapy alone; CI=chemo-immunotherapy; RA-Rituximab alone; TTA=targeted therapy alone; TTC=targeted therapy + combo

Results: Mean Total Cost by Demographic characteristics

CLL

Age:<65 years	65928
Age:≥65 years	52393
Female	52413
Male	57212
Non-white	65400
White	53654
Non-Hispanic	54894
Hispanic	67894

MCL

Age:<65 years	98604
Age:≥65 years	77593
Female	80515
Male	85746
Non-white	99789
White	82112
Non-Hispanic	83347
Hispanic	102383

MZL

Age:<65 years	87534
Age:≥65 years	72957
Female	74665
Male	82508
Non-white	88613
White	75637
Non-Hispanic	77778
Hispanic	83794

WM

Age:<65 years	79563
Age:≥65 years	60319
Female	62139
Male	65914
Non-white	77980
White	62214
Non-Hispanic	64680
Hispanic	48058

- Unadjusted results show that patients ages 65 and younger, males and those who were non-white had higher hospital cost in all four lymphoma types

- Hispanics incurred higher cost compared to non-Hispanic in CLL, MCL, and MZL, but not in the WM group

Results: Predictors of Higher Total cost

	CLL % Difference	MCL % Difference	MZL % Difference	WM % Difference
Age (Ref= Age ≥ 65 years)				
Age < 65 years	10.27*	1.32	8.04	-1.74
Sex (Ref= Male)				
Female	-7.76 *	-5.6	-5.94	0.26
Race (Ref= White)				
Non-White	11.98 *	13.88 *	15.09 *	11.41
Ethnicity (Ref=Not Hispanic or Latino/Unknown)				
Hispanic or Latino	17.5 *	15.07 *	6.37	-9.86
Primary Payor (Ref=Medicare)				
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
Provider Area (Ref= South)				
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
Charlson Comorbidity Index score	2.31 *	1.35	4.55 *	1.23
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 *
Treatment Regimen (Ref=Steroids alone)				
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 *
Length of follow up in months	1.3 *	1.27 *	0.89 *	1.16 *

* $p < 0.05$; % difference = (exp(coefficient) -1) * 100

- CLL cohort:
  - Disparities across patient groups: age, gender, race, ethnicity, primary payor, and hospital region
  - Risk factors associated with increased total hospital costs included: age<65, male, non-white races, Hispanic or Latino, Medicaid, Northeast region, higher Charlson Comorbidity Index

- MCL cohort:
  - Disparities in total costs: racial, ethnic, and regional disparities
  - Risk factors associated with increased total cost included: non-white races, Hispanic or Latino, Northeast or West region

- MZL cohort:
  - Disparities in total costs: racial and regional disparities were confirmed by regression
  - Risk factors associated with increased total cost included: non-white races, Hispanic or Latino, Northeast or West region, higher Charlson Comorbidity Index

- WM cohort:
  - Disparities across primary payor were seen in WM patients, with Medicaid patients associated with an increased total hospital cost compared to Medicare patients

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

Discussion

- Major Driver of cost: Inpatient admissions to manage adverse events
- Inpatient Cost per hospitalization:
  - CLL: $19,548 ; MCL: $24,333; MZL: $19,815 ; WM: $20,170
- Study confirms costs varied considerably by treatment regimen and care setting
- Targeted therapy in combination with other therapy, and chemo-immunotherapy were associated with higher costs
- Being Black, Hispanic, or having disadvantaged socio-economic status were associated with poorer overall survival outcomes
- Results confirm racial and ethnic disparities in the management of the four lymphomas

Strengths and Limitations

- **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 significant economic burden associated with hospitalization in patients with CLL, MCL, MZL, and WM

- Race and ethnic minorities, Medicaid enrollees were likely to incur increased hospital cost

- Given the increased availability of effective oral therapeutics, optimal and timely disease control in the outpatient settings can potentially prevent or decrease hospitalizations and reduce economic burden on healthcare systems and payors