

# Real-World Health Care Utilization and Costs in Patients With Newly Diagnosed AL Amyloidosis

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## INTRODUCTION

- Amyloid light chain (AL) amyloidosis is a rare, progressive, and typically fatal disease caused by extracellular deposition of misfolded immunoglobulin light chains (LCs)<sup>1</sup>
- Soluble toxic aggregates and deposited fibrils (amyloid) lead to progressive failure of vital organs, including the heart, kidneys, and nervous system, causing significant morbidity and mortality<sup>2,3</sup>
- The economic burden of AL amyloidosis has not been well characterized<sup>4</sup>
- The objective of this study was to estimate all-cause health care utilization and costs among patients with newly diagnosed AL amyloidosis in a real-world setting

## METHODS

### Study Design and Data Source

- Retrospective, longitudinal cohort study using 2007-2015 Truven Health MarketScan<sup>®</sup> Commercial and Medicare Supplemental databases
  - Covering approximately 65 million commercially insured patients and their dependents, and 5.3 million Medicare-eligible retired employees

### Study Population

- Adults ≥18 years of age with newly diagnosed AL amyloidosis were identified if they
  - Had ≥1 inpatient or ≥2 outpatient claims consistent with AL amyloidosis (*International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] code 277.30 or 277.39; International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] code E85.4x, E85.8x, or E85.9x*) in any diagnosis field during the identification period between January 1, 2008 and December 31, 2014
  - Underwent 1 AL amyloidosis-specific treatment (e.g., chemotherapy, hematopoietic stem cell transplantation [HSCT]) on or after the first amyloidosis diagnosis (index date: the first date of amyloidosis diagnosis)
  - Did not receive a diagnosis of AL amyloidosis in the year before the index date (1-year disease-free period)
  - Were enrolled continuously for 1 year before their index date (baseline), and were followed until end of enrollment or 12/31/2015

### Study Measures

- For all identified patients, actual health care utilization (i.e., outpatient, inpatient, and pharmacy use) and costs within 1 year after index date were reported
- For patients whose follow-up duration was ≥2 years, annualized health care utilization and costs in each follow-up year were reported

### Statistical Analysis

- Means, standard deviations (SD), and relative frequencies and percentages for continuous and categorical data, respectively, were reported
- Cost estimates were converted to 2015 US dollars using the Consumer Price Index to adjust for inflation
- Data transformations and statistical analyses were performed using SAS<sup>®</sup> version 9.4 (SAS Institute, Cary, NC)

## RESULTS

- The overall study sample included 2,018 patients with newly diagnosed AL amyloidosis
  - Mean (SD) age was 63.8 (12.8); 45.9% were women; all US regions were represented, and most patients had commercial insurance and PPO plans (**Table 1**)
  - In the year following diagnosis, 64.6% (n=1,303) of patients were admitted to the hospital ≥1 time, and 16.6% (n=335) were admitted ≥3 times (**Table 2**)
  - 37.9% (n=764) of patients had ≥1 emergency department (ED) visit (includes both emergency room and urgent care visits, but excludes ED visits resulting in hospital admission). The mean (SD) number of non-ED outpatient service visits was 48.0 (37.1) times per year. 81.0% (n=1,635) underwent chemotherapy for AL amyloidosis (**Table 2**)
  - Among admitted patients, mean (SD) hospital length of stay was 16.9 (22.1) days

**Table 1. Demographic Characteristics and Insurance Type for Patients With Newly Diagnosed AL Amyloidosis by Duration of Follow-Up**

Characteristic	With 2+ Years' Follow-up	All
<b>N, (%)</b>	887 (44.0)	2,018
<b>Age, years, mean (SD)</b>	63.3 (13.6)	63.8 (12.8)
<b>Female, n (%)</b>	426 (48.0)	926 (45.9)
<b>Region, n (%)</b>		
Midwest	252 (28.4)	554 (27.5)
Northeast	188 (21.2)	416 (20.6)
South	292 (32.9)	703 (34.8)
West	155 (17.5)	345 (17.1)
<b>Database, n (%)</b>		
Commercial	469 (52.9)	1,112 (55.1)
Medicare supplement <sup>a</sup>	418 (47.1)	906 (44.9)
<b>Plan type, n (%)</b>		
PPO	413 (46.6)	1,014 (50.2)
Other	474 (53.4)	1,001 (49.8)

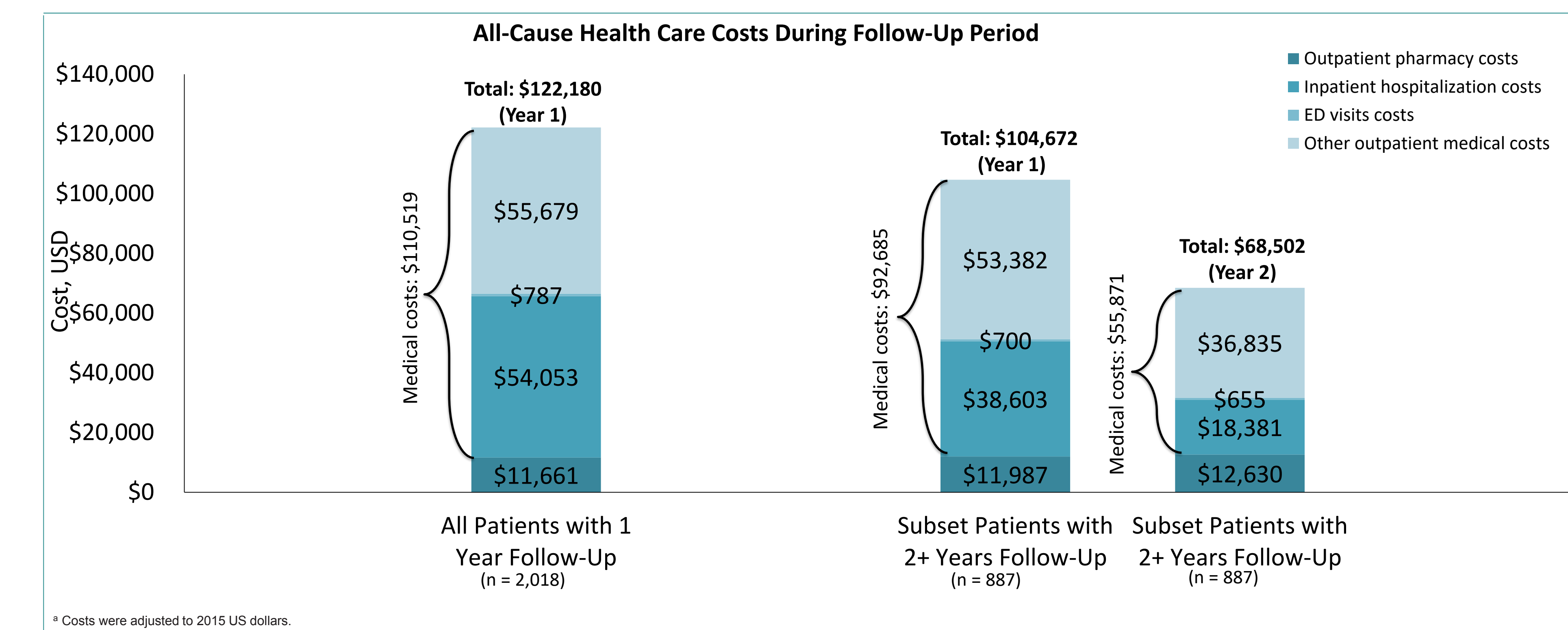
AL, amyloid light chain; PPO, preferred provider organization.  
<sup>a</sup>This sample size is the overall patient sample with 2+ years of follow-up, looking at post year 1 and post year 2, respectively.

**Table 2. Post-Index Utilization of Inpatient and Outpatient Hospital Services for Patients With Newly Diagnosed AL Amyloidosis**

	All		
	Post Year 1 n = 2,018	Post Year 1 n = 887 <sup>a</sup>	Post Year 2 n = 887 <sup>a</sup>
<b>No. inpatient hospital admissions, mean (SD)</b>	1.32 (1.67)	1.05 (1.27)	0.57 (1.14)
0, n (%)	715 (35.4)	344 (38.8)	604 (68.1)
1, n (%)	667 (33.1)	325 (36.6)	157 (17.7)
2, n (%)	301 (14.9)	126 (14.2)	79 (8.9)
3+, n (%)	335 (16.6)	92 (10.4)	47 (5.3)
Total days of stay, n (mean) [SD]	1,303 (16.9) [22.1]	543 (12.5) [15.6]	283 (10.4) [14.2]
<b>No. of ED visits, mean (SD)</b>	0.78 (2.10)	0.73 (2.23)	0.63 (1.66)
0, n (%)	1,254 (62.1)	577 (65.1)	607 (68.4)
1, n (%)	441 (21.9)	189 (21.3)	164 (18.5)
2, n (%)	173 (8.6)	57 (6.4)	58 (6.5)
3+, n (%)	150 (7.4)	64 (7.2)	58 (6.5)
<b>Non-ED outpatient services, mean (SD)</b>	48.0 (37.1)	49.2 (35.6)	39.7 (36.1)
<b>AL amyloidosis treatment (chemotherapy based or HSCT), n (%)</b>	1,635 (81.0)	599 (67.5)	486 (54.8)

AL, amyloid light chain; ED, emergency department; HSCT, hematopoietic stem cell transplantation.  
<sup>a</sup>This sample size is the overall patient sample with 2+ years of follow-up, looking at post year 1 and post year 2, respectively.  
 Mean (SD) total annual all-cause health care costs were \$122,180 (159,074), with \$11,661 (23,543) accrued from outpatient pharmacy costs and \$110,519 (154,625) from inpatient hospital admissions, ED visits, and outpatient medical costs (Figure 1).

**Figure 1. Post-Index All-Cause Health Care Costs<sup>a</sup> for Patients with Newly Diagnosed AL Amyloidosis During the Follow-Up Period.**



<sup>a</sup> Costs were adjusted to 2015 US dollars.

- Among a subgroup of patients with newly diagnosed AL amyloidosis who had ≥2 years of follow-up (n=887)
  - Hospital admissions declined from 61.2% in the first year after diagnosis to 31.9% in the second year, and use of AL amyloidosis chemotherapy-based treatment declined from 67.5% to 54.8% (**Table 2**)
  - Total costs declined from \$104,672 in the first year after diagnosis to \$68,502 in the second year

## DISCUSSION AND CONCLUSIONS

- Patients with AL amyloidosis required substantial use of health care resources and incurred substantial costs
  - More than half of the patients with newly diagnosed AL amyloidosis were admitted to the hospital in the year following diagnosis; the average length of stay was more than 2 weeks
  - Patients visited laboratories, offices, and other outpatient sites almost 4 times per month
  - The total cost of this care was more than \$120,000 per patient per year
- Among a subgroup of patients with ≥2 years of follow-up, health care costs decreased over time
  - This decline in cost may be due to decreased hospital admissions over the 2-year period; however, the cost may have increased in the final stages of life as suggested in previous studies<sup>5</sup>
- New therapies aimed at improving organ response have the potential to reduce disease burden and health care utilization
- Limitation
  - Our cost estimates include direct health care costs only and do not take into account important indirect costs associated with caregiver burden, loss of productivity, or reduced quality of life

## REFERENCES

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