

## Healthcare Resource Utilization and Costs of Patients with AL Amyloidosis: An Analysis of Hospitalizations in the Premier Database

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### Abstract

**INTRODUCTION:** The amyloidoses are a group of protein-folding disorders characterized by extracellular tissue deposition of aggregated proteins as  $\beta$ -pleated sheet fibrils. One of the most common and severe types is immunoglobulin light chain (AL), or "primary", amyloidosis. Prior studies of healthcare cost and resource use were hampered by the absence of an International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) code specific to AL amyloidosis. Since 10/1/2017, the ICD-10-CM has included a diagnosis code for AL amyloidosis (E85.81). We believe the current study is the first to report healthcare cost and resource use using this new code.

**METHODS:** To understand characteristics, healthcare resource utilization, costs, and clinical outcomes associated with AL amyloidosis for patients treated in US hospitals, this retrospective analysis used 2017-2020 data from the Premier Perspective® Database. The study population comprised of hospitalized patients aged  $\geq 18$  years with  $\geq 1$  inpatient claim consistent with AL amyloidosis (ICD-10-CM: E85.81) in any diagnosis field; the first qualifying hospitalization during the study period was included. Study outcomes included APR-DRG severity of illness subclass (a measure of disease burden based on the extent of organ system loss of function or physiologic decompensation), length of stay (LOS), intensive care unit (ICU) use, mortality and hospitalization costs and charges as reported in the database (inflated to 2020 USD). To provide context, we compared costs and charges to most recent national averages calculated from the 2018 National

Inpatient Sample (NIS). We will also tabulate NT-proBNP, troponin and differential free light chain values and report Mayo stage when possible.

**RESULTS:** 1,341 patients were admitted to the hospital with a diagnosis of AL amyloidosis; mean (SD) age was 67.2 (11.2) years, 44.1% were female, 64.3% were White, and 62.4% had Medicare coverage. The mean (SD) Charlson Comorbidity Index was 3.9 (2.3), and 90.9% of patients had cardiac and/or renal impairment (Table 1). More than 80% of patients had either major or extreme disease according to the APR-DRG severity of illness measure. 87.6% of admissions were urgent or emergent, and 8.0% (95% CI [6.5%,9.4%]) of admitted patients died in the hospital. The mean (SD) LOS was 9.5 (9.7) days (Figure 1); during the hospital stay, 20.1% of patients were admitted to the ICU, with a mean (SD) ICU LOS of 6.5 (7.6) days (Table 2). The mean (SD) total hospitalization costs were \$27,099 (\$34,849) and total charges were \$111,234 (\$144,853) for hospitalized patients with AL amyloidosis while similar measures for all US hospital stays were \$13,702 (\$121) and \$5,799 (\$694), respectively (Figure 2).

**CONCLUSIONS:** Disease burden and hospital costs associated with AL amyloidosis are high, particularly within this group of patients who have advanced disease as indicated by the APR-DRG classification. Mean hospitalization costs were above \$27,000 per patient and many patients were admitted to the ICU. New therapies aimed at improving survival and providing clinical benefits have the potential to reduce disease burden and to yield substantial cost savings.

Table 1: Demographic and other characteristics of 1,341 hospitalized patients with AL amyloidosis between 2017 and 2020

		All adult AL amyloidosis patients
N		1,341
%		100.0
Age	Mean	67.2
	(SD)	(11.2)
	[Median]	[68]
<b>Age group</b>		
18-34	no.	7
	(%)	(0.5)
35-54	no.	163
	(%)	(12.2)
55-64	no.	353
	(%)	(26.3)
65 or older	no.	818
	(%)	(61.0)
Female	no.	592
	(%)	(44.1)
<b>Race</b>		
White	no.	862
	(%)	(64.3)
African American	no.	306
	(%)	(22.8)
Other	no.	124
	(%)	(9.2)
Asian	no.	19
	(%)	(1.4)
Unable to determine	no.	30
	(%)	(2.2)
<b>Primary payer type</b>		
Medicare	no.	837
	(%)	(62.4)
Medicaid	no.	128
	(%)	(9.5)
Commercial	no.	100
	(%)	(7.5)
Self-pay	no.	15
	(%)	(1.1)
Managed care	no.	219
	(%)	(16.3)
Other	no.	42
	(%)	(3.1)

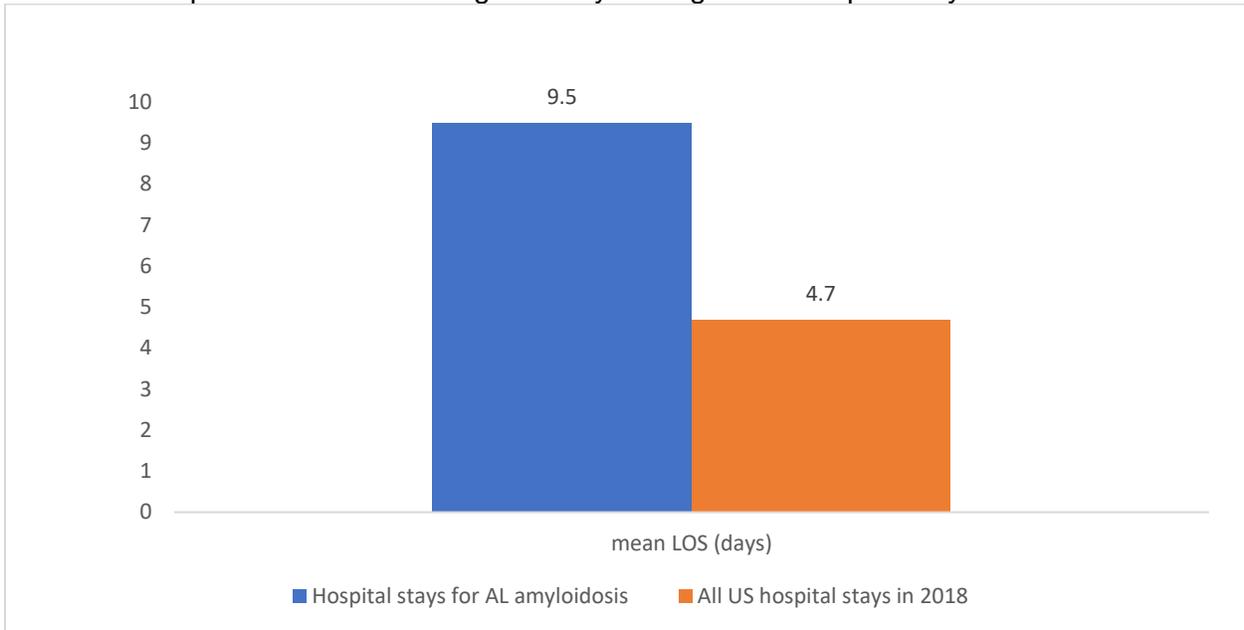
		All adult AL amyloidosis patients
<b>Year of hospitalization</b>		
2017	no.	80
	(%)	(6.0)
2018	no.	385
	(%)	(28.7)
2019	no.	469
	(%)	(35.0)
2020	no.	407
	(%)	(30.4)
<b>Cardiac/ renal impairment</b>		
Cardiac and renal	no.	734
	(%)	(54.7)
Cardiac only	no.	176
	(%)	(13.1)
Renal only	no.	309
	(%)	(23.0)
No cardiac or renal involvement	no.	122
	(%)	(9.1)

Table 2: Healthcare utilization of 1,341 hospitalized patients with AL amyloidosis between 2017 and 2020

		Adult AL Amyloidosis Patients
N		1,341
<b>APR-DRG Severity of illness</b>		
Minor	no.	6
	(%)	(0.4)
Moderate	no.	203
	(%)	(15.1)
Major	no.	763
	(%)	(56.9)
Extreme	no.	369
	(%)	(27.5)
<b>Discharge status</b>		
Home or home with nursing care	no.	891
	(%)	(66.4)
Transferred to hospice, rehabilitation center, or nursing home	no.	269
	(%)	(20.1)
Death during hospitalization	no.	107
	(%)	(8.0)
Other/Unknown	no.	74
	(%)	(5.5)
<b>Length of stay</b>		
Overall length of stay (days)	Mean	9.5
	(SD)	(9.7)
	Median	6.0
Intensive care unit (ICU)	no.	269
	(%)	(20.1)
Length of ICU stay among utilizers	Mean	6.5
	(SD)	(7.6)
	Median	3.0
ED	no.	915
	(%)	(68.2)
<b>Transplant</b>		
Autologous stem cell transplant	no.	80
	(%)	(6.0)
Solid organ <sup>a</sup> transplant	No.	2
	(%)	(0.1)

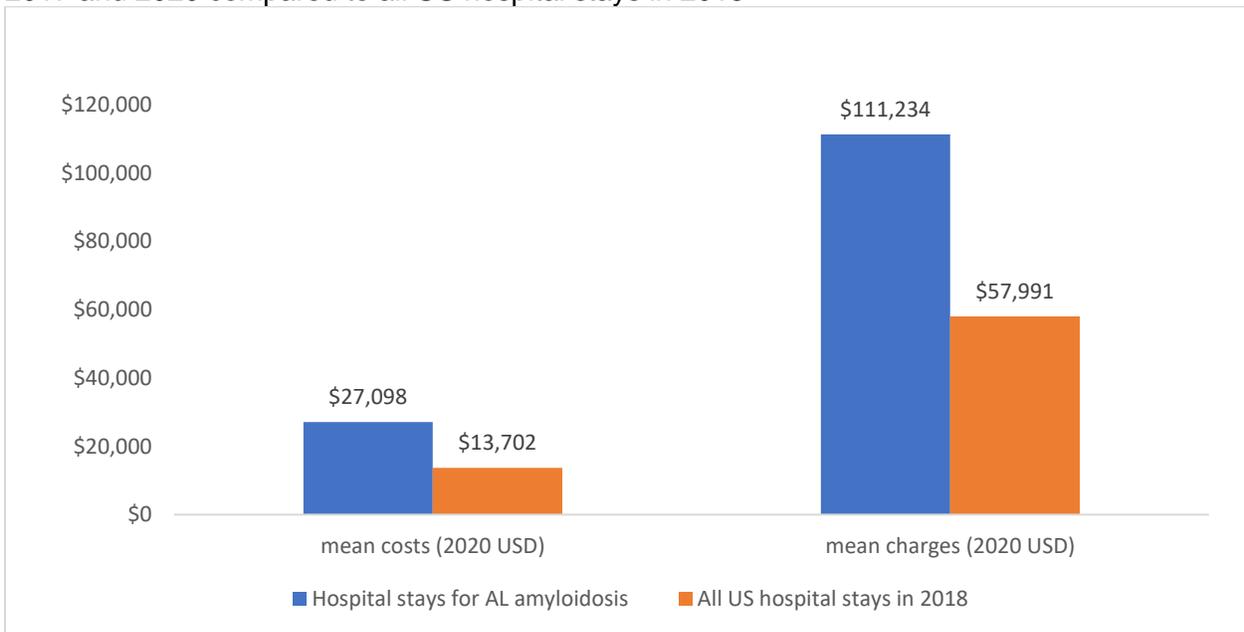
<sup>a</sup>Kidney, liver, or heart transplant

Figure 1: Length of stay among 1,341 hospitalized patients with AL amyloidosis between 2017 and 2020 compared to the mean length of stay among all US hospital stays in 2018\*



\*The most recent NIS data available

Figure 2: Mean costs and charges for 1,341 hospitalized patients with AL amyloidosis between 2017 and 2020 compared to all US hospital stays in 2018\*



\*The most recent NIS data available