

# Mortality among Elderly Patients Newly Diagnosed with Acute Lymphoblastic Leukemia (ALL), Using 100% Medicare ALL Data

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## Introduction

- ALL is a rare disease. In 2016, it is estimated that 6590 new cases accounted for 0.4% of all new cancer cases in the US.
- The incidence of ALL in adults increases with age; thus, as the general population continues to age, the number of older adults with ALL will also increase.
- Elderly patients with ALL have a markedly poor prognosis that may be attributable to age, higher likelihood of Ph-positive disease, and use of less aggressive therapy.
- Mortality data for elderly ALL patients has been limited by the underrepresentation of elderly ALL patients in clinical trials and the scarcity of large population-based studies.
- Thus, we assessed the risk of death in a population-based cohort of elderly patients diagnosed with ALL in 2008-2011.

## Methods

- Data Source:** 100% Medicare ALL data, 2007-2012.
- Cohort:** Patients aged  $\geq 66$  years, newly diagnosed with ALL in 2008-2011, and continuously enrolled in Medicare fee-for-service (FFS) for 12 months before ALL diagnosis date (baseline period).
- ALL diagnosis** was defined by  $\geq 1$  Part A inpatient (IP)/skilled nursing facility (SNF)/home health agency (HHA)/hospice (HS) or  $\geq 2$  Part A outpatient (OP)/Part B (PB) claims on different dates in any 2-month interval carrying an ICD-9 code of ALL (204.OX).

## Results

### Patient Characteristics (Table 1)

- The cohort included 1843 patients (mean [SD] age: 78.7 [7.8] years; 53% female; 88% white).
- Comorbidity level was low, medium, and high for 52%, 30%, and 18%, respectively.
- Diabetes (31%) was the most common comorbid condition, followed by COPD (21%), CHF (16%), PVD (15%), and renal disease (13%).

### Mortality (Table 2, Figures 1 & 2)

- Mean (SD) follow-up: 12.8 (13.1) months
- The unadjusted CP (95% CI; %) of death was 21.5 (19.7-23.5) at 30 days, 57.4 (55.2-59.7) at 1 year, and 72.9 (70.7-75.1) at 3 years.
- The unadjusted CP of death was significantly higher for patients diagnosed at older ages and with greater comorbidity ( $P < 0.001$ ).

Table 1. Baseline characteristics of elderly patients newly diagnosed with ALL in 2008-2011.

	N	%
Overall	1843	100.0
Age at ALL diagnosis (years)		
66-69	258	14.0
70-74	399	21.6
75-79	362	19.6
80-84	365	19.8
$\geq 85$	459	24.9
Sex		
Male	865	46.9
Female	978	53.1
Race		
White	1613	87.5
Non-white	230	12.5
Year of ALL diagnosis		
2008	486	26.4
2009	485	26.3
2010	431	23.4
2011	441	23.9
Charlson comorbidity index		
0 (low)	966	52.4
1-2 (medium)	545	29.6
$\geq 3$ (high)	332	18.0

Figure 1. Unadjusted survival probability by age at ALL diagnosis

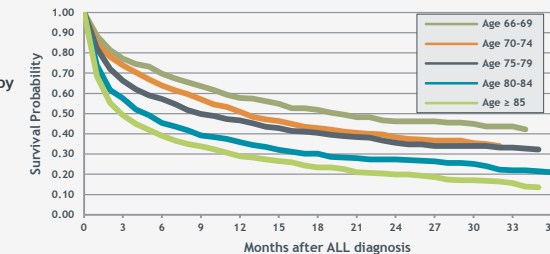


Figure 2. Unadjusted survival probability by Charlson comorbidity index

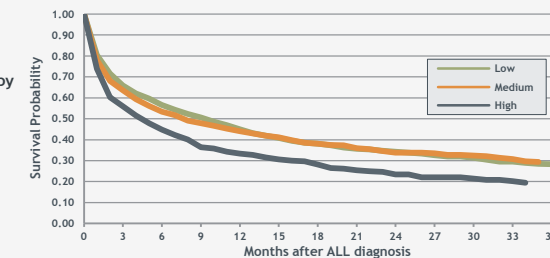


Table 2. Unadjusted cumulative probability of death, overall and by patient characteristics.

	N(%) of deaths	Cumulative probability (95% CI) of death						P value
		30-day	90-day	6-month	1-year	2-year	3-year	
Overall	1280(69.5)	21.5(19.7,23.5)	36.4(34.3,38.7)	46.5(44.2,48.8)	57.4(55.2,59.7)	67.9(65.7,70.1)	72.9(70.7,75.1)	
Age at ALL diagnosis (years)								<0.001
66-69	141(54.7)	11.6(8.3,16.2)	22.9(18.2,28.5)	30.6(25.4,36.6)	42.3(36.5,48.5)	53.8(47.7,60.2)	57.7(51.4,64.3)	
70-74	249(62.4)	15.5(12.3,19.5)	26.1(22.1,30.7)	36.2(31.7,41.1)	49.0(44.3,54.1)	61.8(56.8,66.7)	66.1(61.0,71.1)	
75-79	235(64.9)	17.7(14.1,22.0)	33.5(28.9,38.6)	42.7(37.8,48.0)	53.4(48.3,58.6)	64.4(59.3,69.5)	67.8(62.6,72.8)	
80-84	276(75.6)	26.1(21.9,31.0)	42.5(37.6,47.7)	54.7(49.6,59.9)	64.2(59.2,69.1)	72.6(67.9,77.2)	79.0(74.3,83.3)	
$\geq 85$	379(82.6)	31.6(27.6,36.1)	50.6(46.1,55.3)	60.9(56.5,65.4)	71.1(66.9,75.2)	80.1(76.2,83.8)	86.5(82.7,89.8)	
Sex								0.54
Male	605(69.9)	20.6(18.1,23.5)	37.0(33.9,40.3)	47.5(44.2,50.9)	59.3(56.0,62.6)	68.4(65.2,71.6)	73.0(69.8,76.2)	
Female	675(69.0)	22.3(19.8,25.0)	35.9(33.0,39.0)	45.6(42.6,48.8)	55.8(52.7,58.9)	67.4(64.3,70.4)	72.8(69.7,75.8)	
Race								0.68
White	1113(69.0)	22.1(20.2,24.2)	37.1(34.8,39.6)	47.1(44.7,49.6)	57.8(55.4,60.2)	67.4(65.0,69.7)	72.0(69.6,74.3)	
Non-white	167(72.6)	17.0(12.7,22.6)	31.4(25.9,37.9)	41.9(35.8,48.6)	54.8(48.4,61.3)	72.2(65.8,78.3)	80.8(74.4,86.5)	
Charlson comorbidity index								<0.001
0 (low)	656(67.9)	19.6(17.2,22.2)	33.9(31.1,37.0)	43.3(40.3,46.5)	55.1(52.0,58.3)	65.8(62.7,68.9)	71.7(68.5,74.7)	
1-2 (medium)	367(67.3)	22.0(18.8,25.8)	36.4(32.5,40.6)	46.8(42.7,51.1)	55.9(51.8,60.1)	66.2(62.1,70.3)	70.6(66.4,74.6)	
$\geq 3$ (high)	257(77.4)	26.2(21.8,31.3)	43.7(38.5,49.2)	55.1(49.9,60.5)	66.6(61.5,71.6)	76.6(71.8,81.1)	80.5(75.6,85.1)	

## Discussion

- We observed high 30-day mortality among elderly patients diagnosed with ALL that clearly highlights the unmet medical need in this patient population.
- Unadjusted analyses demonstrate that the risk of death significantly increased with advancing age and comorbidity level.
- Patients aged 85 years or older had the highest risk of death, which may have been exacerbated by increased frailty and a decreased likelihood of receiving intensive therapy options.
- Strengths:**
  - Large population-based study
  - Real-world rates of mortality among older ALL patients.
- Limitations:**
  - Identification of patients with ALL was based on diagnosis codes in administrative claims data; the potential for misclassification exists using this methodology.
  - Clinical and biological characteristics of ALL are not available in the Medicare database.
- Future studies that assess the real-world management of ALL in elderly patients will provide additional insight into factors contributing to the high early mortality risk observed in this patient population.

Disclosures: S Li and J Molony report no conflict of interest. V Chia and A Katz are employees and shareholders of Amgen Inc.



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