One-year Economic Burden Among Patients with Community-Acquired Pneumonia (CAP) Initially Managed in the Outpatient Setting: A Retrospective US Cohort Study, 2012-2017

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Presenter Disclosure Information

- This study was funded by Nabriva Therapeutics US, Inc.
- Victoria Divino and Mitch DeKoven are employees of IQVIA, which received funding for this study from Nabriva
- Miao Jiang was an employee of IQVIA at the time of the study
- Jennifer Schranz is an employee of Nabriva
- Hemal Shah is president and founder of Value Matters, LLC and received consulting fees from Nabriva for this study
- Marya Zilberberg is president and CEO of EviMed Research Group, LLC and received consulting fees from Nabriva for this study

Introduction

- Community-acquired pneumonia (CAP) is a leading infectious cause of morbidity and mortality among adults[1]
- Each year, approximately six million cases of CAP are reported, resulting in more than 4 million ambulatory care visits[2]
- Treatment guidelines from the Infectious Diseases Society of America and American Thoracic Society recommend empiric treatment which targets likely pathogens based on epidemiologic risk factors[3]
- Previous real-world studies had reported high costs associated with CAP, and the economic burden of CAP in the United States (US) is estimated at ~$17B annually[4-6]

1. Jain S, et al. *N Engl J Med.* 2015;373(5):415-427.
2. Community-Acquired Pneumonia Clinical Decision Support Implementation Toolkit. January 2018. AHRQ.
3. Mandell LA. *Clin Infect Dis*. 2007;44 Suppl 2:S27-72.
4. File Jr. TM, Marrie TJ. *Postgrad Med*. 2010;122(2):130-141.
5. Llop CJ, et al. *Hosp Pract* (1995). 2017;45(1):1-8.
6. Signorovitch JE, et al. *Curr Med Res Opin*. 2010;26(2):355-363.

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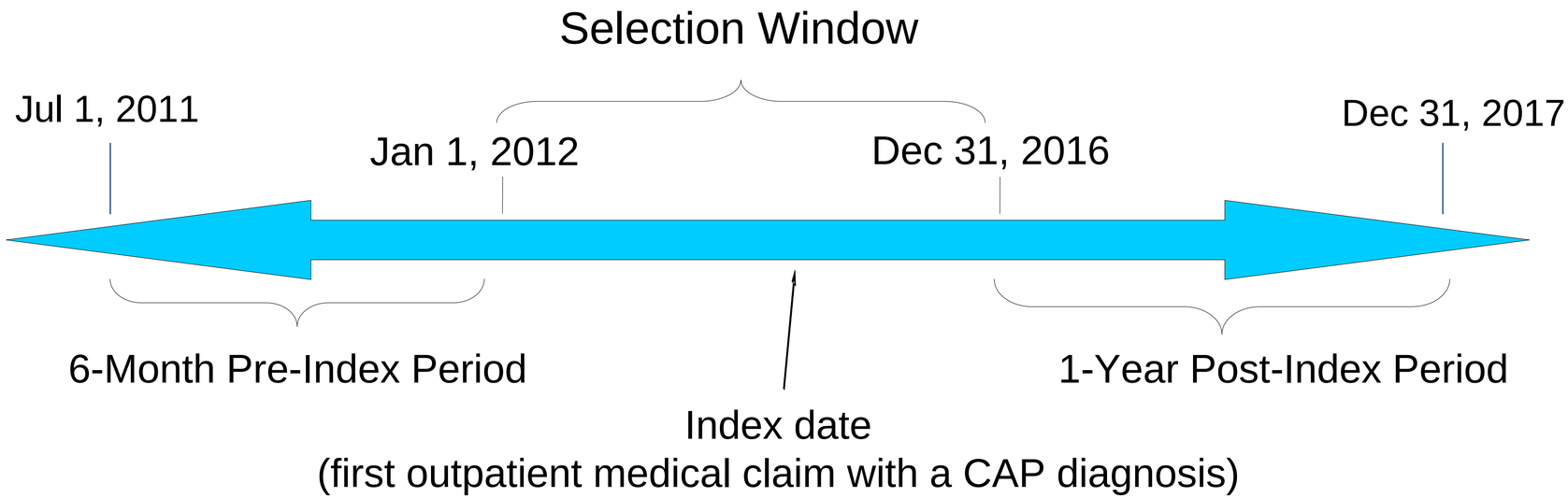
Objective and Rationale

- Assess healthcare resource utilization (HCRU) and costs over a 1-year follow-up period among patients diagnosed with CAP and treated with empiric antimicrobial therapy as monotherapy (EM) or combination therapy (EC) in the outpatient setting
- Previous studies have evaluated the economic burden of outpatient CAP; however, they either did not evaluate the burden over a 1-year follow-up period, did not require the use of empiric antimicrobial treatment and/or did not require a diagnostic chest x-ray

Study Design

- Retrospective cohort study using IQVIA Real-World Data Adjudicated Claims - US Database
  - –Adjudicated claims for >150 million unique enrollees
    - Representative of the commercially-insured US population
  - –Longitudinal data
    - Detailed medical and outpatient pharmacy claims and associated reimbursed costs



Patient Selection

Inclusion Criteria

1. ≥1 CAP* diagnosis on an outpatient medical claim between 1/1/2012 - 12/31/2016; first claim termed the “index date”
2. Empiric antimicrobial treatment (either combination [EC] or monotherapy [EM]) on the index date or 1 day after
3. Chest x-ray within 1 day of the index date
4. ≥180-days continuous enrollment (CE) pre-index and ≥360-days CE post-index
5. ≥18 years of age at index

Exclusion Criteria

1. Diagnosis of pneumonia in the 6-month pre-index period; OR
2. Hospitalization with diagnosis of CAP on the index date or day after; OR
3. Incomplete data coverage or data quality issues

*CAP diagnosis codes included diagnoses for pneumonia caused by bacterial, viral and unspecified organisms, but did not include ventilator-associated pneumonia

CAP included community-onset pneumonia and healthcare-associated pneumonia, which was defined based on a prior hospitalization in the 90-days pre-index, or hemodialysis or immune suppression (chemotherapy, immunotherapy, radiation, transplant, corticosteroids) in the 6-month pre-index

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Methods

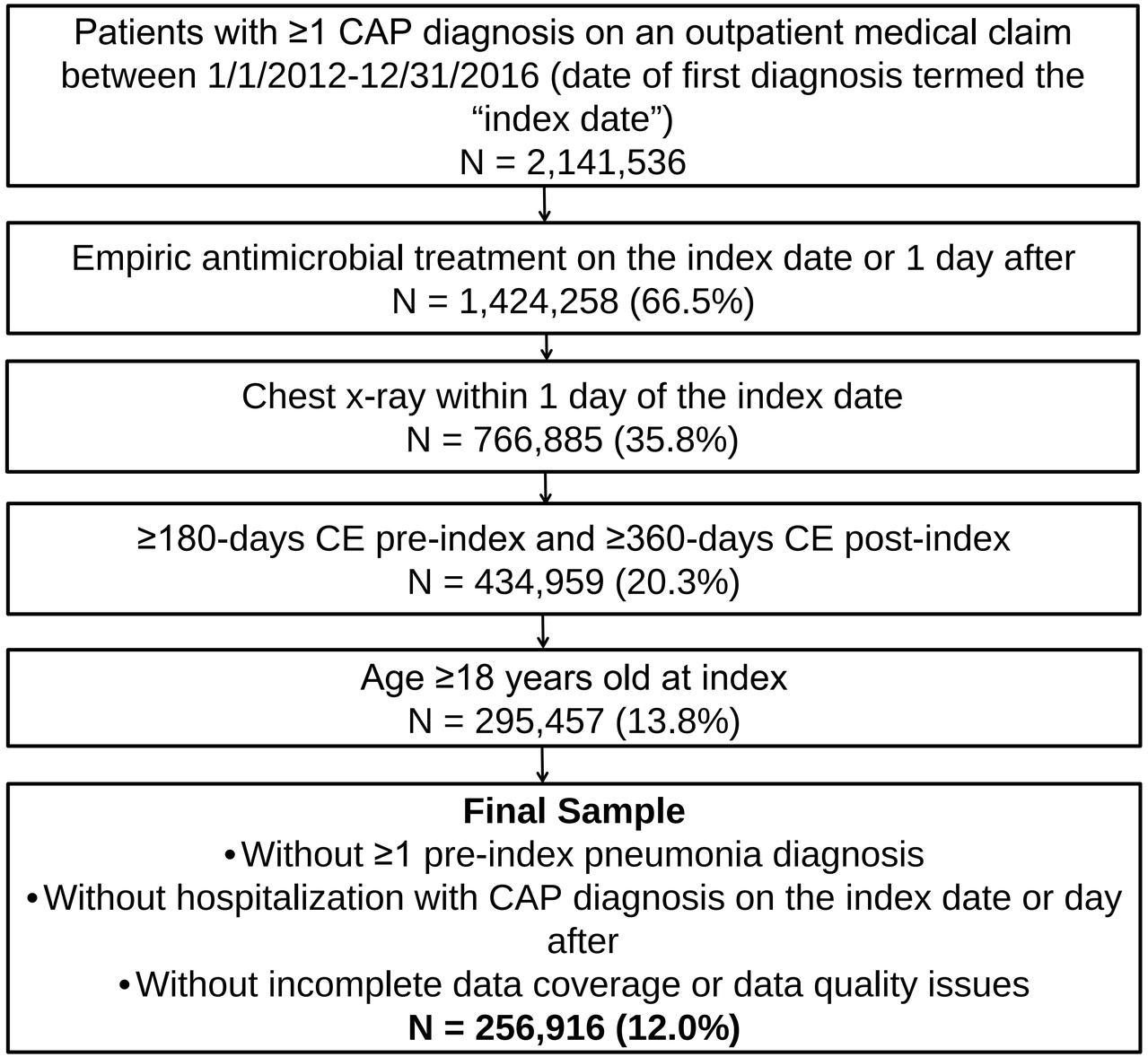
Study Measures

- Baseline demographic and clinical characteristics
- All-cause and CAP-related HCRU and cost over the 1-year follow-up
  - CAP-related defined as:
    1. Outpatient medical claims with a CAP diagnosis
    2. CAP-related outpatient drug claims
    3. Hospitalization with a) admitting or primary discharge diagnosis of CAP, or b) secondary discharge diagnosis of CAP with primary discharge diagnosis of sepsis or respiratory failure

Statistical Analyses

- Unadjusted pair-wise comparisons between EM and EC patients
  - Parametric t-test and the chi-square test
- Generalized linear models (GLMs)
  - Examine the association between baseline characteristics and total all-cause cost
  - Calculate adjusted mean all-cause costs
  - Baseline characteristics were included in the model in a stepwise approach ($p<0.10$ for inclusion and retention)

Attrition


Patients with ≥1 CAP diagnosis on an outpatient medical claim between 1/1/2012-12/31/2016 (date of first diagnosis termed the "index date")
N = 2,141,536
Empiric antimicrobial treatment on the index date or 1 day after
N = 1,424,258 (66.5%)
Chest x-ray within 1 day of the index date
N = 766,885 (35.8%)
≥180-days CE pre-index and ≥360-days CE post-index
N = 434,959 (20.3%)
Age ≥18 years old at index
N = 295,457 (13.8%)
Final Sample
• Without ≥1 pre-index pneumonia diagnosis
• Without hospitalization with CAP diagnosis on the index date or day after
• Without incomplete data coverage or data quality issues
N = 256,916 (12.0%)

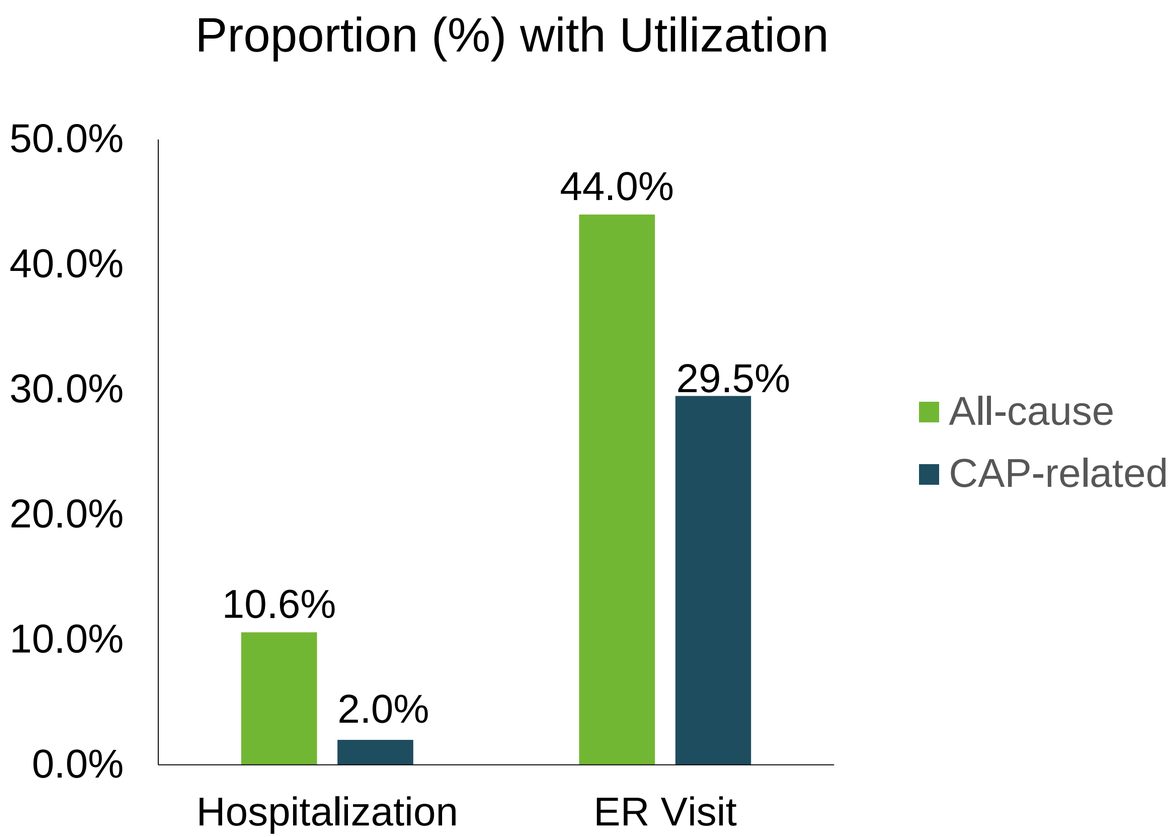
Baseline Patient Characteristics

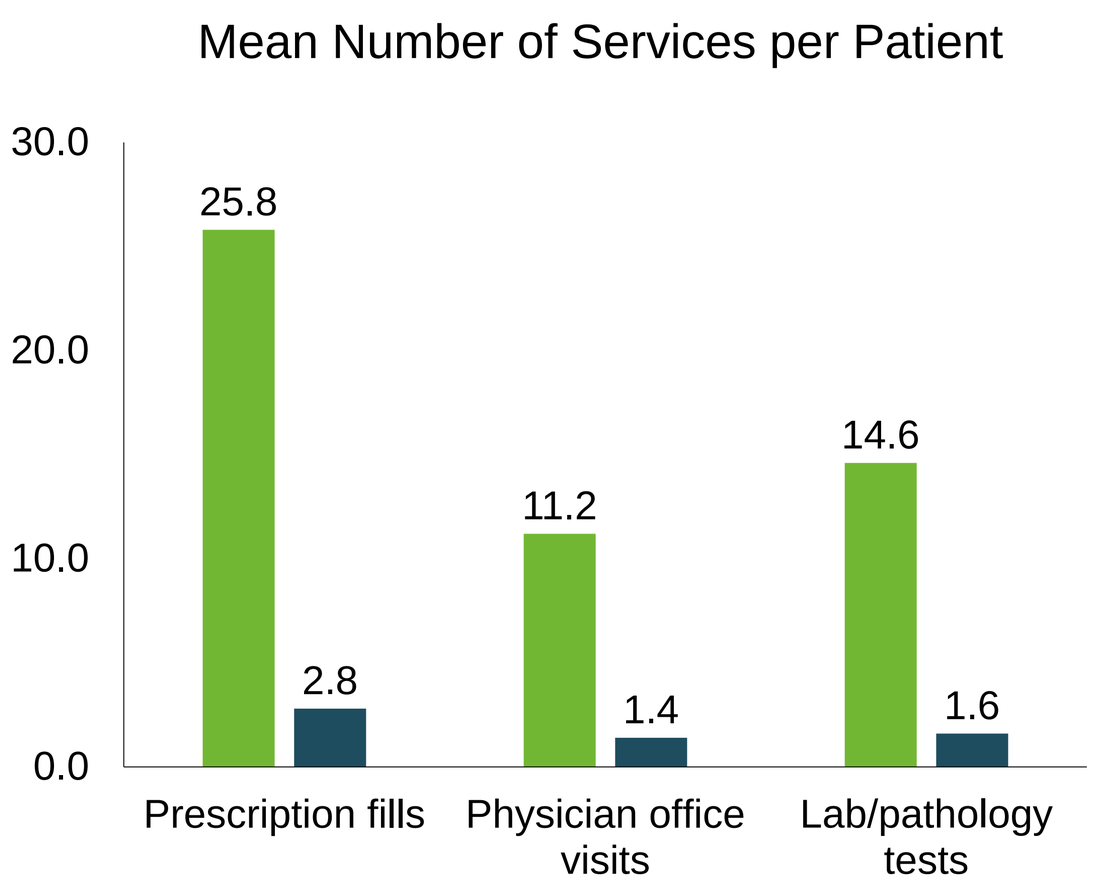
Characteristic	Overall N=256,916
Mean (SD) age	45.7 (12.9)
Female (n, %)	133,698 (52.0%)
Geographic region (n, %)	
Northeast	48,693 (19.0%)
Midwest	69,199 (26.9%)
South	108,442 (42.2%)
West	30,582 (11.9%)
Payer type (n, %)	
Commercial	150,880 (58.7%)
Self-insured	89,648 (34.9%)
Other	16,388 (6.4%)
Mean (SD) total 6-month pre-index cost	$5,036 ($16,508)
Mean (SD) CCI score	0.5 (1.0)
Frequent physician specialties at index (n, %)	
Primary care	132,579 (51.6%)
Emergency medicine	29,768 (11.6%)
CAP type (n, %)	
Community-onset	185,165 (72.1%)
Healthcare-associated	71,751 (27.9%)

Characteristic	Overall N=256,916
Index therapy type (n, %)	
EM	194,838 (75.8%)
Fluoroquinolones	80,165 (31.2%)
Macrolides	72,132 (28.1%)
EC	62,078 (24.2%)
Beta-lactams + Macrolides	26,859 (10.5%)
Baseline comorbidities (n, %)	
Asthma	19,324 (7.5%)
COPD	9,739 (3.8%)
Diabetes	24,588 (9.6%)
Dyslipidemia	50,033 (19.5%)
Hypertension	58,094 (22.6%)
Smoking	19,181 (7.5%)
Pre-index medications (n, %)	
Inhalers for lung disease	43,249 (16.8%)
Beta-lactams	54,755 (21.3%)
Fluoroquinolones	24,470 (9.5%)
Macrolides	44,590 (17.4%)
Corticosteroids	67,521 (26.3%)

CCI = Charlson Comorbidity Index; EM = Empiric monotherapy; EC = Empiric combination therapy

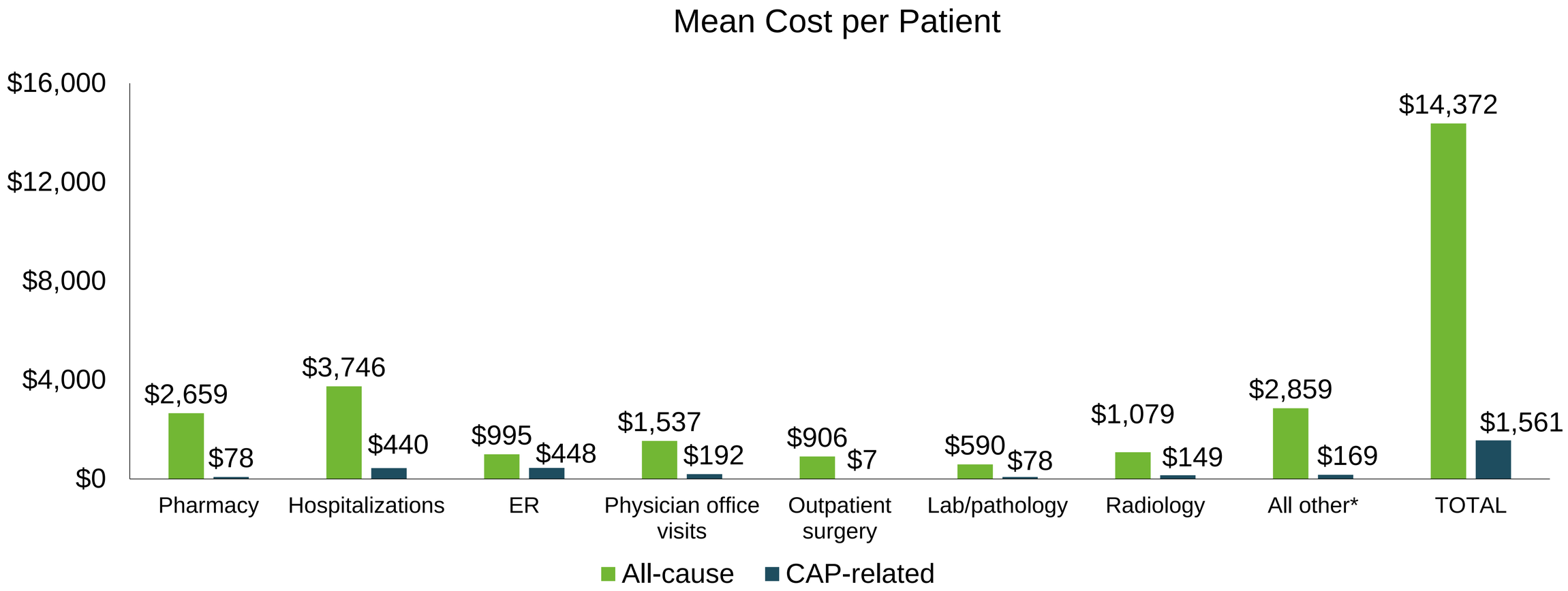
HCRU Over the 1-Year Post-Index





- Among patients with ≥1 all-cause hospitalization, 18.7% had a CAP-related hospitalization
- The first CAP-related hospitalization was associated with mean (SD) length of stay per patient of 5.8 (6.3) days

Cost Over the 1-Year Post-Index



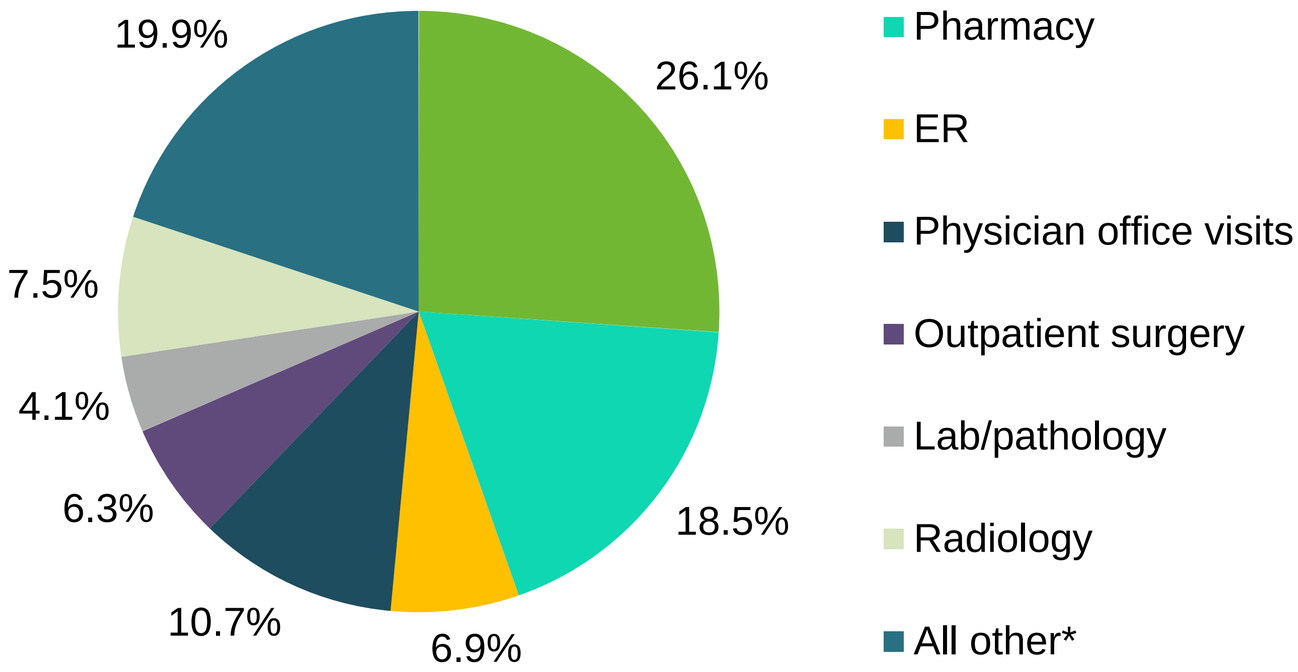
- Among patients with a CAP-related hospitalization, the first CAP-related hospitalization was associated with a mean (SD) inpatient cost per patient of $18,649 ($29,500)
- Total all-cause cost per patient was significantly higher among EC vs. EM patients ($14,944 vs. $14,189, p<0.0001)

Outpatient care = ER, physician office visits, outpatient surgery, lab/pathology, radiology, all other

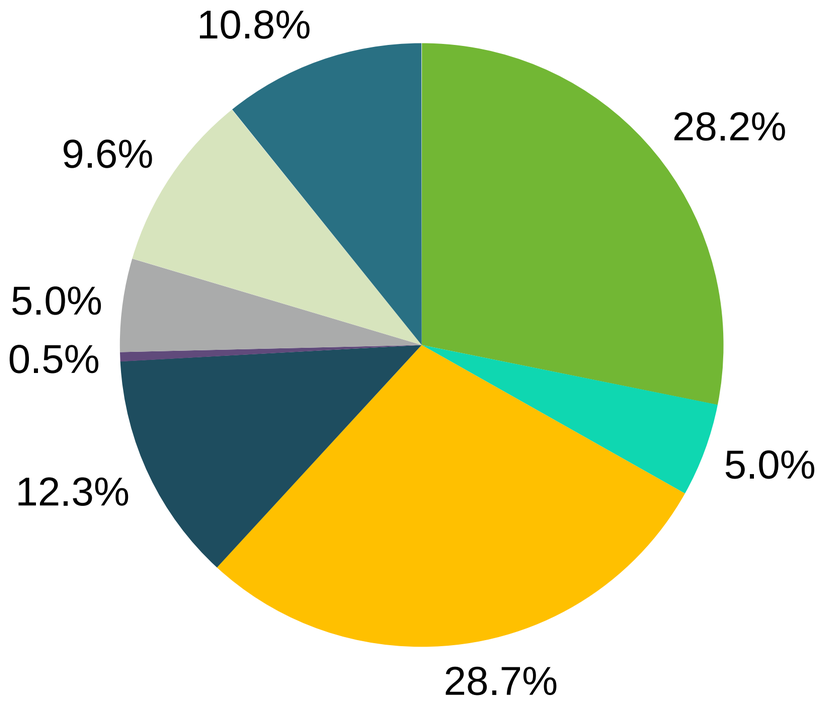
*All other = outpatient ancillary and HCPCS drugs

Cost Over the 1-Year Post-Index

All-Cause Mean Cost per Patient
Total: $14,372



CAP-Related Mean Cost per Patient
Total: $1,561



- Total CAP-related costs accounted for 10.9% of total all-cause costs
- Inpatient care was the primary cost component of all-cause costs and accounted for 26.1% of the total
- Inpatient care and ER visits were the primary cost components of CAP-related costs (28.7% and 28.2%, respectively)

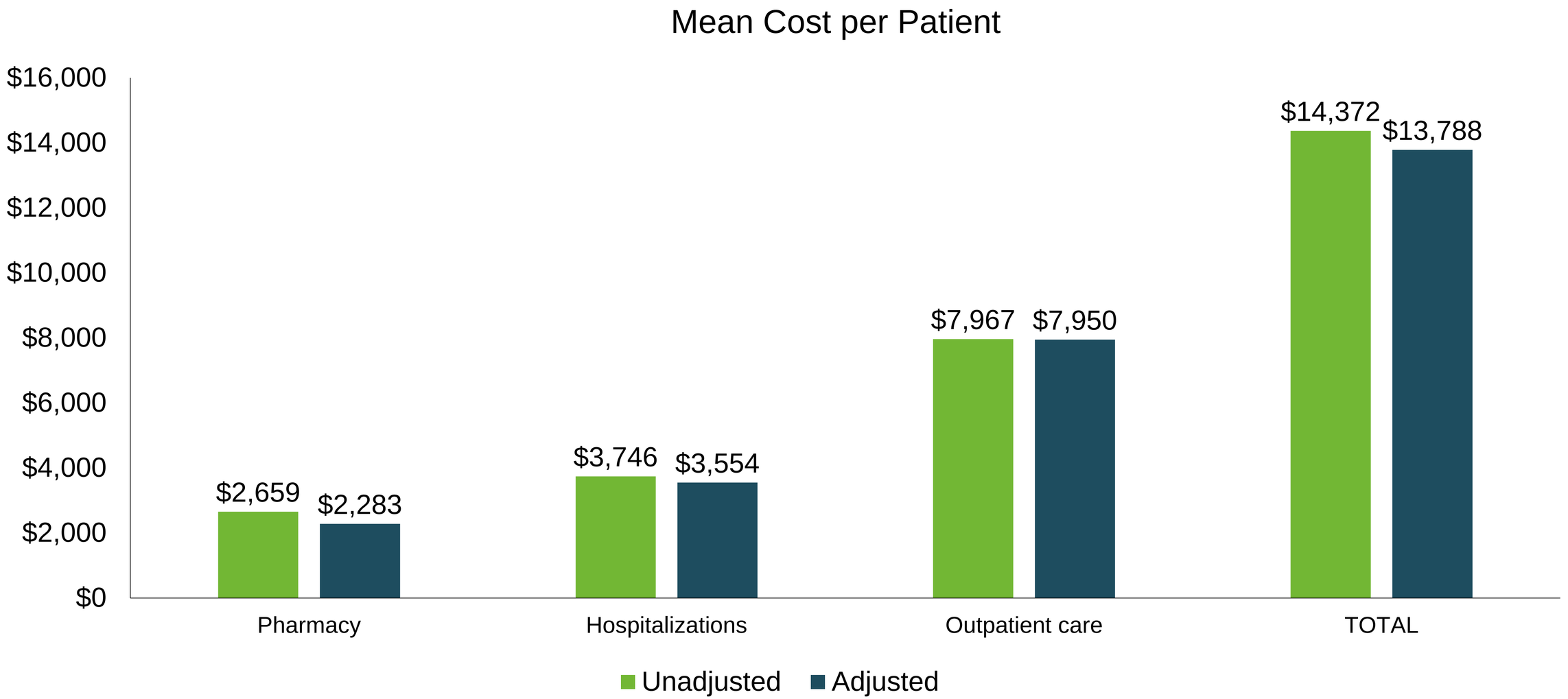
Outpatient care = ER, physician office visits, outpatient surgery, lab/pathology, radiology, all other
*All other = outpatient ancillary and HCPCS drugs

GLM for Total All-Cause Cost Over the 1-Year Post-Index

	Cost ratio	95% CI
Dependent Variable - All-Cause Total Costs in the 1-Year Post-Index		
Age (Reference: 18-34 years)		
45-54 years	1.48	[1.46, 1.50]
55+ years	1.91	[1.88, 1.93]
Healthcare-associated pneumonia (Reference: Community-onset pneumonia)	1.55	[1.54, 1.57]
Emergency medicine specialist at index (Reference: Primary care)	1.28	[1.26, 1.29]
Baseline comorbidities (Reference: No)		
Cardiac Arrhythmia	1.61	[1.57, 1.64]
Chronic Pain/Fibromyalgia	1.42	[1.40, 1.45]
Depression	1.35	[1.33, 1.37]
Diabetes	1.72	[1.69, 1.75]
Osteoarthritis	1.28	[1.26, 1.30]
Sleep Disorders	1.29	[1.27, 1.31]
Smoking	1.33	[1.30, 1.35]
Baseline medications (Reference: No)		
Fluoroquinolones	1.34	[1.32, 1.37]
Folate pathway inhibitors	1.28	[1.25, 1.31]

Table reduced to significant variables at p<0.0001

Adjusted All-Cause Costs Were Similar to Unadjusted Costs



Outpatient care = ER, physician office visits, outpatient surgery, lab/pathology, radiology, all other

*All other = outpatient ancillary and HCPCS drugs

Conclusions

- Patients with CAP initially diagnosed and managed in the outpatient setting had a substantial 1-year economic burden in both unadjusted and adjusted analyses
- For their index pneumonia episode
  - Two-thirds of patients (76%) were treated with empiric monotherapy antimicrobials, most frequently fluoroquinolones (31%); a quarter (24%) were treated with empiric combination therapy
  - The vast majority (72%) was community-onset
  - Inpatient care accounted for a quarter (26%) of total all-cause costs
- ER visits and inpatient care accounted for more than half (57%) of total CAP-related costs