

MEDICAL MONDAYS: ED UTILIZATION FOR MEDICAID RECIPIENTS DEPENDS ON THE DAY OF THE WEEK, SEASON, AND HOLIDAYS



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Introduction: The purpose of this study is to describe and explain the temporal and seasonal trends in ED utilization for a low-income population.

Methods: A retrospective analysis of 66,487 ED Medicaid-insured health care claims in 2009 was conducted for 2 Western New York Counties using time-series analysis with autoregressive moving average (ARMA) models.

Results: The final ARMA (2,0) model indicated an autoregressive structure with up to a 2-day lag. ED volume is lower on weekends than on weekdays, and the highest volumes are on Mondays.

Summer and fall seasons demonstrated higher volumes, whereas lower volume outliers were associated with holidays.

Discussion: Day of the week was an influential predictor of ED utilization in low-income persons. Season and holidays are also predictors of ED utilization. These calendar-based patterns support the need for ongoing and future emergency leaders' collaborations in community-based care system redesign to meet the health care access needs of low-income persons.

Key words: Emergency department utilization; Time series analysis; Medicaid; Primary care

ED utilization is a common metric for evaluating challenges and opportunities in primary care, public health, and prevention efforts.^{1,2} Often more costly than a primary care visit with similar services, ED utilization is a timely and relevant topic as policy makers, governments,

insurers, and health care industry leaders focus on interventions to improve the continuity of care and contain health care costs. Associated with 30-day mortality and return hospitalizations, the consequences of ED crowding and care quality extend beyond the walls of the hospital.³

Population-level surveillance of ED visits and trends provides insights into the needs and directions involved in redesigning health care service delivery. Although an ED visit is commonly perceived as the last resort for health care access, emergency departments are becoming an integral component of the health care system for persons with complex, chronic illnesses.⁴ In the United States, poor persons are at increased risk for ED use, and Medicaid is the insurance specifically designed for persons living in poverty.⁵⁻⁷ The purpose of this study is to describe and explain the temporal and seasonal trends in ED utilization for a population of Medicaid patients. The overarching goal is to contribute to a needs assessment for health care service delivery redesign in partnerships between ED leaders and primary, community-based care.

The concept of primary care-sensitive ED utilization is a matter of controversy and nuance. Overall, the sheer quantity of primary care providers in a community is not associated with ED use.⁸ Physicians and patients have very poor agreement with regard to what constitutes a preventable ED visit and which antecedents are amenable to primary care.⁹ The myth of "inappropriate" ED utilization, which blamed the patient for poor decision making in presenting to the

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emergency department, has been consistently dispelled by several studies that have demonstrated that frequent ED users have complex comorbidities and use all available health care services at greater rates.^{4,5,7} In addition, many ED visits stem from a referral or recommendation from the primary care provider for the patient to seek a higher level of care.¹⁰ Low-income patients express a preference for the emergency department rather than primary care for ease of access and perceptions of higher quality, even though this is considered a “low value” pattern by insurers.¹¹

Alternatively, ED utilization is linked to challenges that patients must navigate in gaining access to quality, community-based care with well-coordinated continuity. Increased copayment models are linked to less use of primary care services and more ED use.¹² For Medicaid recipients with complex, chronic illnesses, ED utilization is associated with a lack of alternative sites of care.¹³ Patient-centered medical homes that focus on high-quality, coordinated care decrease ED utilization.¹⁴ Studies have demonstrated that uninsured and Medicaid-insured patients, compared with others, are more likely to present to the emergency department with low-acuity complaints and diagnoses.¹⁵

Temporal and seasonal trends in overall ED use are well documented in studies conducted throughout the world. Seasonal trends for infectious disease spread, such as influenza, are accompanied by more subtle trends related to day-to-day lifestyle and social transitions.¹⁶ For example, day of the week is consistently the most influential predictor of ED utilization¹⁷; air pollution demonstrates an effect with a very small magnitude¹⁸; weather has been poorly replicated as a predictor of ED utilization¹⁷; ED utilization in the return to school transition has been linked to headache and asthma in the pediatric population¹⁹; and holidays and holiday seasons predict ED utilization across several populations.^{17,20–22} When divided by acuity, severe and life-threatening presentations showed different time-dependent trends compared with the lowest acuity patients.²¹ These low-acuity patients increase bottlenecks, wait times, and crowding for all ED patients, regardless of acuity.²³

Evidence regarding time and season trends in low-income or Medicaid-insured patients alone is limited and mixed. Studies demonstrate increased utilization on weekends for Medicaid patients with primary care-sensitive diagnoses and presentations¹⁵ and increased utilization during weekday business hours for more specific presentations, such as hand and wrist injuries.²⁴ As the Affordable Care Act (ACA) has been implemented in the United States, related Medicaid expansions have led to increased ED use among recipients.²⁵ Our study addresses a gap in understanding of the baseline, pre-ACA time-dependent trends of ED utilization in Medicaid patients.

Methods

We conducted a retrospective analysis of 2009 ED Medicaid claims for 2 Western New York State counties, representing claims from 12 hospitals. The setting was selected because it is the metropolitan region for one of the poorest cities in the United States with a substantial Medicaid population. The setting was also selected because it is an area vulnerable to ED crowding, because nurses have limited scope of practice to begin protocols before a prescribing provider sees the individual patient.²⁶ We used this historic, baseline dataset to represent ED utilization trends before comprehensive changes were made to the Medicaid insurance during the implementation of the ACA.²⁵

Only the date and total count of ED claims for that date were obtained for this study. Thus the daily count of ED visits was the dependent variable, and only calendar dates and seasonal dummies are used as intervention variables. The Institutional Review Board deemed this study of the de-identified dataset to be nonengaged, or not human subjects, research. Only claims for persons who belonged to the Medicaid plan for 10 or more months during 2009 were included.

All analyses were conducted using SAS, version 9.1 (SAS Institute, Cary, NC). After determining that the data were stationary on screening, a time-series analysis using autoregressive moving average (ARMA) models was conducted to explain the systematic, time-dependent variation and the random variation in daily ED volume.²⁷ Time dependency is expected and has been empirically demonstrated in ED volume data, meaning that the number of visits on any certain day is strongly correlated with (or represents a linear function of) the number of visits on past days.²⁸ In the current study, the order of autoregressive (AR) term, p , represents how daily ED volume demonstrates a relationship with a weighted sum of past values in ED volume. The order of moving average (MA) term, q , explains how an increase in volume demonstrates a relationship with a short-term trend in the time series.

We analyzed time-series plots for descriptive statistics. We examined the data for long-term trends, seasonal changes, and unexpected random events in the time series. First, we screened and accounted for seasonal variation by day of the week and annual seasonalities (eg, winter, spring, summer, and fall) by evaluating the raw time series, using the Box-Ljung statistic and simple regression. The smallest canonical correlation method and extended sample autocorrelation functions, along with autocorrelation functions (ACF) and partial autocorrelation functions (PACF), were used to empirically identify the order of preliminary p and q terms for initial model fit. We evaluated parsimony and goodness of fit of the raw time-series, preliminary, and final

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