Characterizing Antimicrobial Resistance Post-Hospitalization: A Retrospective Analysis Using Administrative Claims Data

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INTRODUCTION

- The Centers for Disease Control and Prevention (CDC) labels AMR as one of the greatest public health challenges of our time. Each year in the U.S., at least 2.8 million people get an antibiotic-resistant infection, and more than 35,000 people die.
- Post-hospitalization periods are critical for monitoring AMR due to the high risk of infection spread and the development of resistance stemming from the extensive use of antibiotics in hospitals and the potential prescribing of outpatient antibiotics
- Many prior studies on AMR are constrained by small sample sizes, limiting their generalizability and statistical power to detect significant patterns. Research often focuses on single hospital settings or specific patient groups, which may not provide a complete picture of the AMR landscape across different populations and regions.
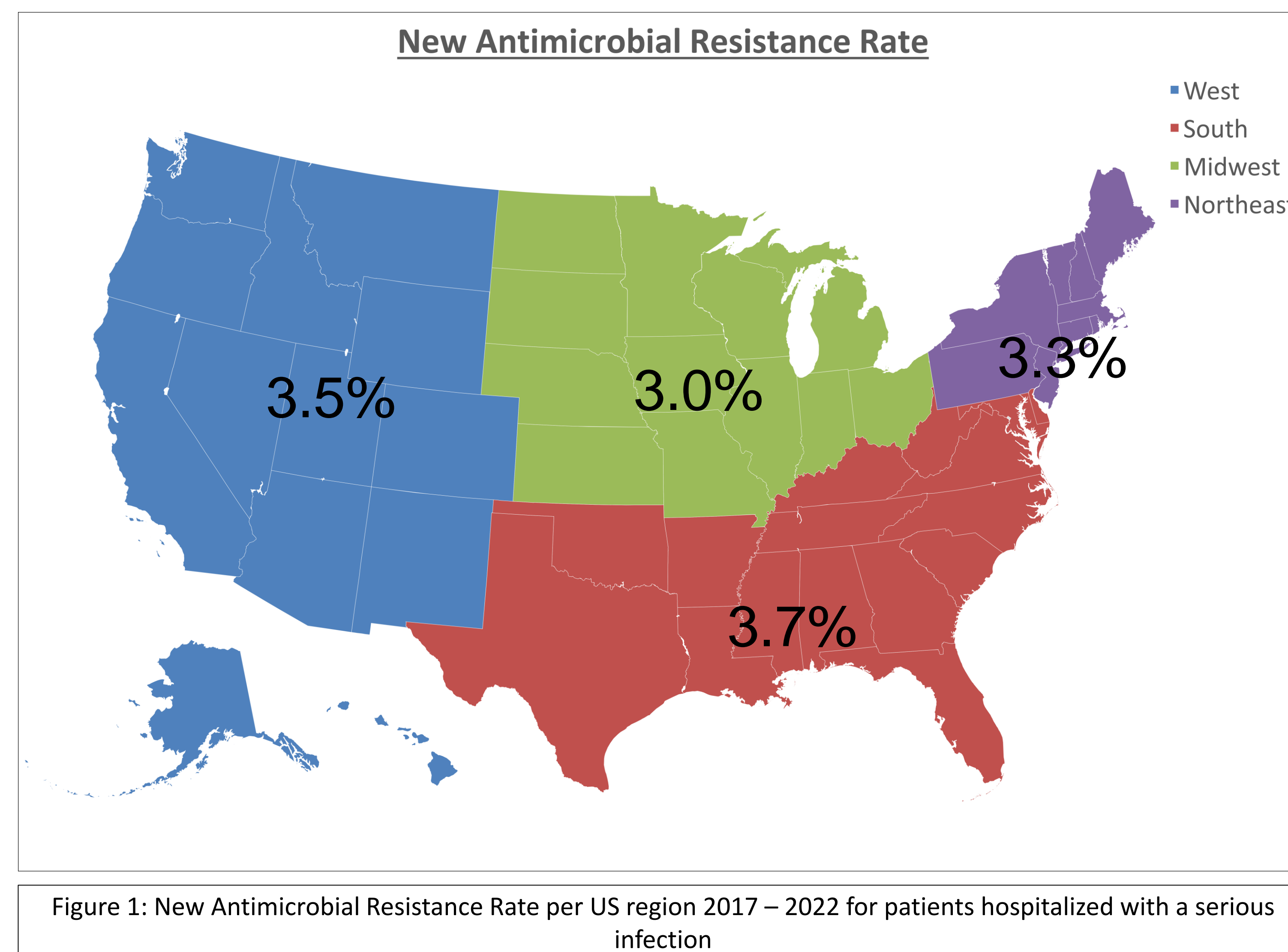
OBJECTIVE

- To evaluate the incidence and characteristics of antimicrobial resistance (AMR) in patients following hospitalization for serious infections using a comprehensive administrative claims database

METHODS

- This study was conducted using a retrospective cohort extracted from the Inovalon claims database. It is a closed, longitudinal healthcare database containing integrated medical and pharmacy claims spanning from 2016 to 2022. This registry includes comprehensive coverage data, enabling detailed tracking of patient diagnostics and interventions.
- Eligible participants included patients hospitalized for serious infections between January 2017 and December 2021. Inclusion criteria required patients to have a minimum of 12 months of continuous enrollment prior to their index hospitalization to ensure adequate baseline data availability for new antimicrobial resistance (AMR) identification.
- Patients were followed longitudinally from the date of initial hospitalization for a serious infection to the earliest of the following endpoints: termination of insurance coverage or the development of AMR. This follow-up design allows for the assessment of AMR emergence post-hospitalization.
- The primary endpoint of this study was the development of new AMR, identified via ICD-10 diagnostic codes specific to resistant microbial infections. The utilization of these codes provides a standardized method for identifying AMR cases in large healthcare datasets.

		Patients
1	Patients with an infection between 01/01/2016 and 12/31/2022	120,686,308
2	Patients with a serious infection requiring hospitalization	7,134,946
3	Patients with at least 1 year of continuous enrollment prior to index hospitalization	1,595,100
4	Patients with at least 1 month of continuous enrollment post discharge	1,225,279
5	Patients with a new resistance code post discharge	42,190

Table 1: Flow Diagram of Patient Inclusion

New Antimicrobial Resistance Rate

West
South
Midwest
Northeast

3.5%
3.0%
3.3%
3.7%

Figure 1: New Antimicrobial Resistance Rate per US region 2017 – 2022 for patients hospitalized with a serious infection

DISCLOSURES

No external financial support was provided for this project.

CONTACT INFORMATION

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ICD10 Code	Resistance type	Patient Counts
Z16.1x	beta lactam resistance	19,556
Z16.24	multiple antibiotic resistance	10,716
Z16.3x, Z16.20, Z16.29, Z16.0, Z16.82	unspecified antibiotic resistance	6,376
Z16.21,Z16.22	vancomycin resistance	3,733
Z16.23	quinolones resistance	1,711
Z16.34x	antimycobacterial drug resistance	98

Table 2:Antimicrobial Resistance ICD10 codes used and frequency of codes

RESULTS

- A total of 1,225,279 patients were included with an average follow-up duration of 894 days.
- Most patients were exposed to some degree of antibiotic therapy during the observation period, with 28.1% receiving antibiotics prior to index hospitalization and 73.1% receiving antibiotics at some point after discharge.
- Overall, 3.4% of patients developed resistance in the follow-up period, with the average time to resistance development from hospital discharge of 304 days.
- AMR was higher in females compared to males and increased with age.
- The relationship between antibiotic, duration of therapy, and route of administration with AMR has been elusive to understand using traditional methods.
- This approach may provide some more insight into this relationship with notable limitations. Namely the lack of validation of AMR ICD10 codes and the lack of inpatient antibiotic administration in the current administrative claims database.
- Future directions include planned validation study using EHR data containing both medical billing and laboratory results to establish baseline accuracy of AMR ICD10 codes, and imputation of typical antibiotic therapies for inpatient stays.

CONCLUSION

- This study is among the first utilizing real-world administrative claims data and ICD-10 codes to estimate AMR incidence post-hospitalization. Older patients showed the lowest rate of SGLT2i usage compared to other age groups.
- Our large sample size and extended follow-up provide a more realistic estimate of the AMR burden and associated characteristics.