

Correlation of International Classification of Diseases (ICD) codes to initial provider-selected antibiotic indications in hospitalized adult patients within the Duke Antimicrobial Stewardship Outreach Network (DASON)

Spencer Livengood¹, Travis Jones^{2,3}, Rebekah Moehring^{2,3}, S. Shaefer Spires^{2,3}, Melissa Johnson^{2,3}, April Dyer^{2,3}, Angelina Davis^{2,3}, Elizabeth Dodds Ashley^{2,3}

1- Campbell University College Of Pharmacy & Health Sciences, Buies Creek, NC, USA;
2- Duke Antimicrobial Stewardship Outreach Network, Durham, NC, USA; 3- Division Of Infectious Diseases, Duke University Medical Center, Durham, NC, USA

Abstract

Background/Purpose: Prescriber documentation of antibiotic indications are a measure to help track antibiotic utilization and facilitate stewardship activities. International Classification of Diseases 10th version (ICD-10) codes have been widely used in the medical field for a variety of purposes, including billing for reimbursement, disease epidemiology, administration, and research. The ability of these codes to accurately describe the true patient course have been questioned. The purpose of this study is to provide insight into correlation between ICD-10 codes and provider-selected antibiotic indications recorded at the time of antibiotic ordering.

Methods: This multicenter, retrospective cohort study was performed using data from 17 hospitals in the DASON network. Antibiotic orders during calendar year 2019 for inpatients > 18 years of age that included a prescriber provided indication for use were extracted from the DASON antimicrobial stewardship assessment portal (ASAP). Orders with a selected indication category of prophylaxis (medical or surgical) and other were excluded. The primary outcome was agreement between provider reported indication at antibiotic ordering and any discharge ICD-10 code from the same hospital admission. Secondary analyses stratified results by antibiotic and indication. Descriptive statistics were used to describe outcomes.

Results: A total of 246,999 unique antibiotic orders were identified. After removing prophylaxis (n=75,124) and other (n=36,359), 135,516 were included in the analysis. Most orders did not have an ICD-10 code matching the prescriber indication (92,237 [68%]). All indications except HEENT (18% mismatch) and genitourinary infections (46% mismatch) lacked a corresponding diagnosis code in more than 50% of cases (Table). Urinary tract infections (93%), bloodstream infections (90%), and central nervous system infections (80%) showed the highest rates of mismatch among indications (Table 1).

Conclusion/Clinical Relevance: We observed a high rate of mismatch between prescriber-selected antibiotic indications and ICD-10 codes. Utilizing provider-selected antibiotic indications at the time of empiric treatment is a poor indicator of ultimate diagnosis.

Background

- Documentation of antibiotic indications can be an important measure to help assess antibiotic use in hospitals.^{1,2}
- International Classification of Diseases (ICD) system is used to classify disease states. These codes have been widely used in the medical field for a variety of purposes, including billing for reimbursement, disease epidemiology, administration, and research.¹
- The correlation between ICD codes and provider-selected antibiotic indications recorded at the time of ordering has not been reported in the published literature.³
- Answering this question may provide insight into best practices for obtaining antimicrobial usage data if ICD codes reflect indication for antibiotic usage.

Objectives

Primary: To describe the percentage of initial antibiotic orders accompanied by an indication at the time of order that are reflective of final ICD 10 codes at discharge

Methods

Design: Retrospective, multicenter, cohort study

Population:

Inclusion

- ≥ 18 years of age
- Received ≥ 1 antibiotic administered as an inpatient from January 1st 2019 to December 31st 2019.

Exclusion

- Patients with incomplete data available for collection
- Antibiotics used for surgical prophylaxis, medical prophylaxis, or "other"

DASON

- DASON is a network associated with Duke University Hospital that provides expert antimicrobial stewardship consultation to community hospitals across the nation.
- Services: data collection, data analysis, data feedback, data integration, provider education, and personalized consultation with an infectious disease specialist.

Data Collection and Analysis

- Subjects were screened for eligibility using existing deidentified data collated from different electronic health records and stored in the DASON ASAP from 17 hospitals
- Data fields collected: DASON subject number, antibiotic name, administration time and date, clinician selected indication, ICD 10 codes at time of hospital discharge, and hospital name
- ICD 10 codes were manually reviewed and given a primary and secondary clinical infectious disease indicator that aligned with the indications able to be selected by providers at the time of antibiotic ordering
- Included administration's indications were then associated with the infectious disease ICD 10 codes for any included admission
- Patient specific ICD 10 codes were then matched to antimicrobials administered during patient admissions
- Descriptive statistics were utilized for analysis

Results

Figure 1. Patient Screening and Enrollment

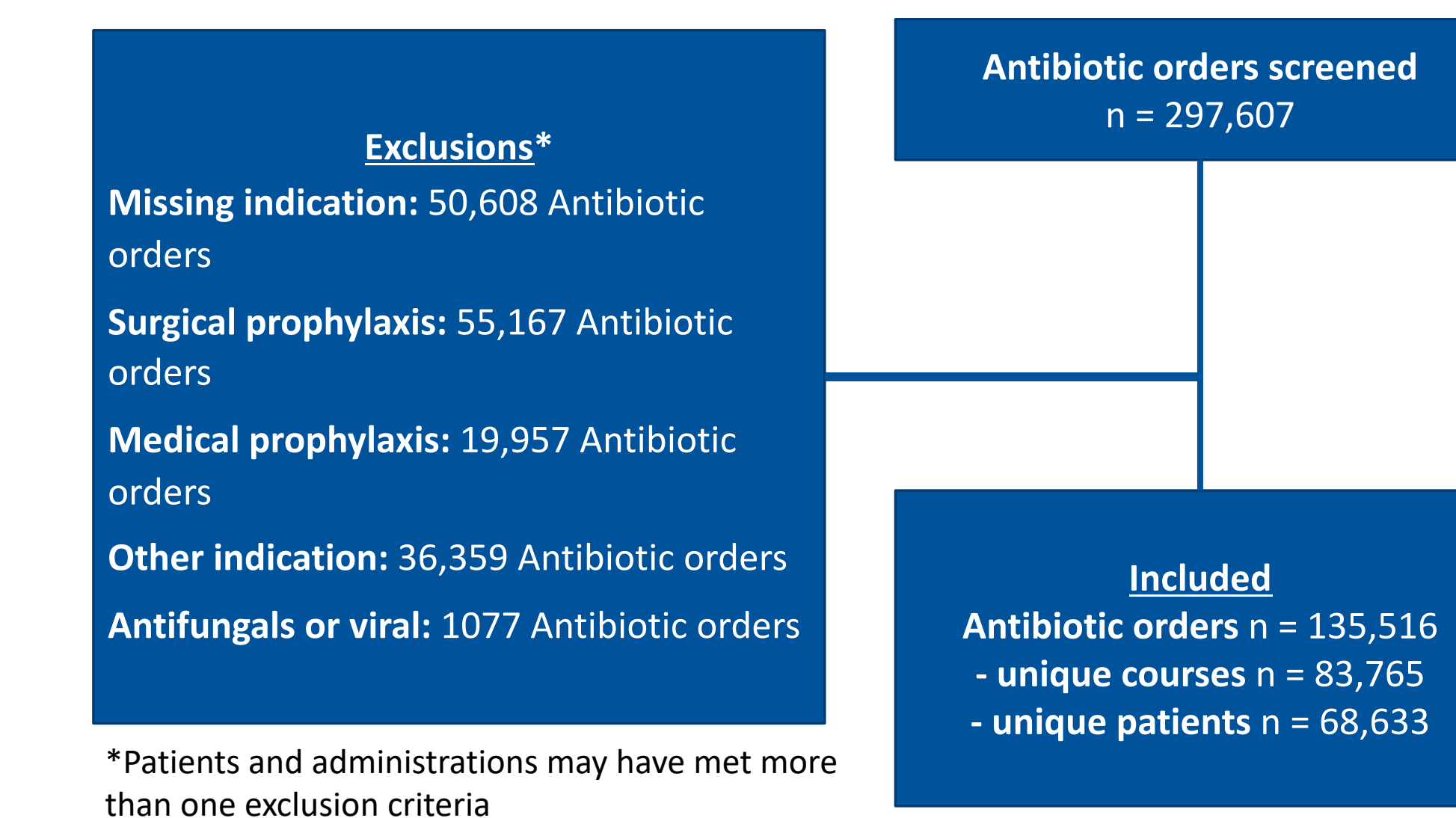


Figure 2. ICD-10 Codes Matching Provider Selected Indications (n=135,516)

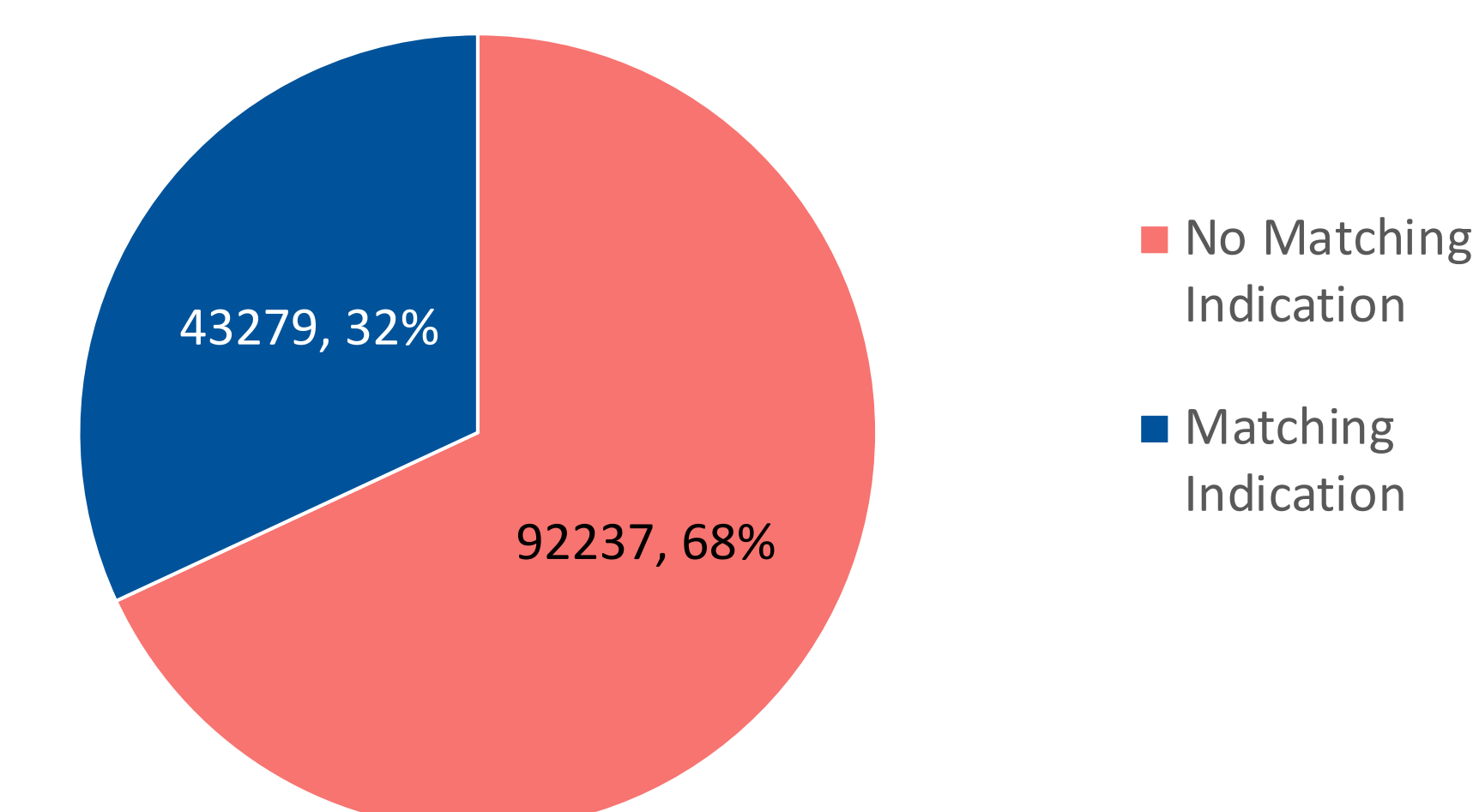


Table 1. Correlation of Provider-Selected Indications to ICD-10 Codes (n=135,516)

Provider-Selected Clinical Indication	N	Match - n (%)	Mismatch - n (%)
Pneumonia	32,648	14,023 (43.0)	18,625 (57.0)
Skin or Soft Tissue Infection	30,878	12,303 (39.8)	18,575 (60.2)
Urinary Tract Infection	27,349	1,939 (7.1)	25,410 (93.9)
Intra-abdominal Infection	15,681	6,579 (42.0)	9,102 (58.0)
Blood Infection	9,226	877 (9.5)	8,349 (90.5)
Sepsis	8,179	3,085 (37.7)	5,094 (62.3)
Bone or Joint Infection	5,280	1,530 (29.0)	3,750 (71.0)
<i>Clostridium difficile</i>	1,805	847 (47.0)	958 (53.0)
HEENT	1,531	1,249 (81.6)	282 (18.4)
Neutropenic Fever	1,247	402 (32.2)	845 (68.8)
CNS infection	1,066	209 (19.6)	857 (80.4)
Cardiovascular	371	130 (35.0)	241 (65.0)
Tuberculosis/NTM	183	67 (36.6)	116 (63.4)
Genitourinary	72	39 (54.2)	33 (45.8)

Discussion

- To the best of our knowledge, the correlation between ICD 10 codes and provider selected indications has not been reported.
- Provider-selected indications reported through the DASON ASAP portal have been previously validated to match provider clinical differential at the time of antibiotic ordering.
- These data are reflective of practices of large academic medical centers and large to small community hospitals.
- The highest match rate occurred in HEENT infection, and the lowest rate occurred in urinary tract infections.
- High rates of mismatch are likely shown due to the treatment of presumed sepsis and asymptomatic bacteriuria with early discontinuation of therapy.

Limitations

- Data set is from multiple centers but may only reflect practice in a single region of the United States.
- ICD 10 codes were manually reviewed and categorized by the author.
- Early discontinuation of antibiotics was not taken into account.

Conclusions

- High rates of mismatch were observed in the provider-selected indications when compared to ICD 10 codes.
- Utilizing provider-selected antibiotic indications at the time of empiric treatment is a poor indicator of ultimate diagnosis.

References

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Conflict of interest: Nothing to disclose