

Appropriateness of Antimicrobial Selection Based on Provider-Selected Indications in an Electronic Medical Record

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ABSTRACT

Background: An antimicrobial indication system was implemented in the electronic medical record at a 450-bed community teaching hospital in the Midwest in November of 2019 in order for the healthcare team to more easily assess antimicrobial appropriateness. With this system, providers are required to choose an indication from a pre-populated list for every antimicrobial that is ordered. **Methods:** This is a retrospective chart review study using data from April 1-April 30, 2020. All antimicrobials administered to patients aged 0-99 during the timeframe were included in the analysis with no other exclusion criteria. The indication selected by the physician using the electronic health record was compared with the antimicrobial selected and assessed for appropriateness based on institution-specific protocols, professional society treatment guidelines, FDA approved indications, patient specific factors, and various other studies. Antimicrobials were considered inappropriate if they were not possibly able to treat the selected indication based on pharmacokinetic or pharmacodynamic principles, or if the dosage form of the antimicrobial in question did not match the selected indication. Antimicrobials were not required to be first line therapy options to be considered appropriate. **Results:** Chart review for appropriateness was completed on 4178 antimicrobials administered within the timeframe. 8 orders (0.19%) were found to be inappropriate and 4170 orders (99.81%) were deemed appropriate. Orders deemed inappropriate included one order for vancomycin IV for *Clostridioides difficile* infection, two orders for aztreonam IV for *Clostridioides difficile* infection, one order for oral vancomycin for intra-abdominal infection, two orders for linezolid IV orders for oral stepdown therapy, and two orders for micafungin IV for urinary tract infection. **Conclusion:** The vast majority of antimicrobials ordered in a one-month time span were appropriate (99.81%) when compared to the indication selected from a pre-populated list upon order entry.

Background

An antimicrobial indication system was implemented in the electronic medical record at a 450-bed community teaching hospital in the Midwest in November of 2019 in order for the healthcare team to more easily assess antimicrobial appropriateness. With this system, providers are required to choose an indication from a pre-populated list for every antimicrobial that is ordered. Prior to this study, this system had yet to be evaluated for proper use in clinical practice. When utilizing antimicrobial therapies, it is necessary to consider if they are being used appropriately. Inappropriate use of antimicrobials can lead to problems such as untreated infections, avoidable adverse effects, and antibiotic resistance. Additionally, antibiotic stewardship is becoming increasingly important with the development of resistance to many of our treatment options.

Purpose

Our study aims to investigate the appropriateness of antimicrobials utilized for various infections using an electronic antimicrobial indication system. This data can be used to determine which indications and antimicrobials have the highest rates of inappropriateness and serve as the basis for providing more targeted education.

Methods

Retrospective chart review study

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> • Patient age 0-99. • Received an antimicrobial medication between April 1-30, 2020. 	<ul style="list-style-type: none"> • Antimicrobial was ordered but never administered.

In this study, the indication selected by the physician using the electronic health record was compared with the antimicrobial selected and assessed for appropriateness based on institution-specific protocols, professional society treatment guidelines, FDA approved indications, patient specific factors, and various other studies.

Indications Available for Selection

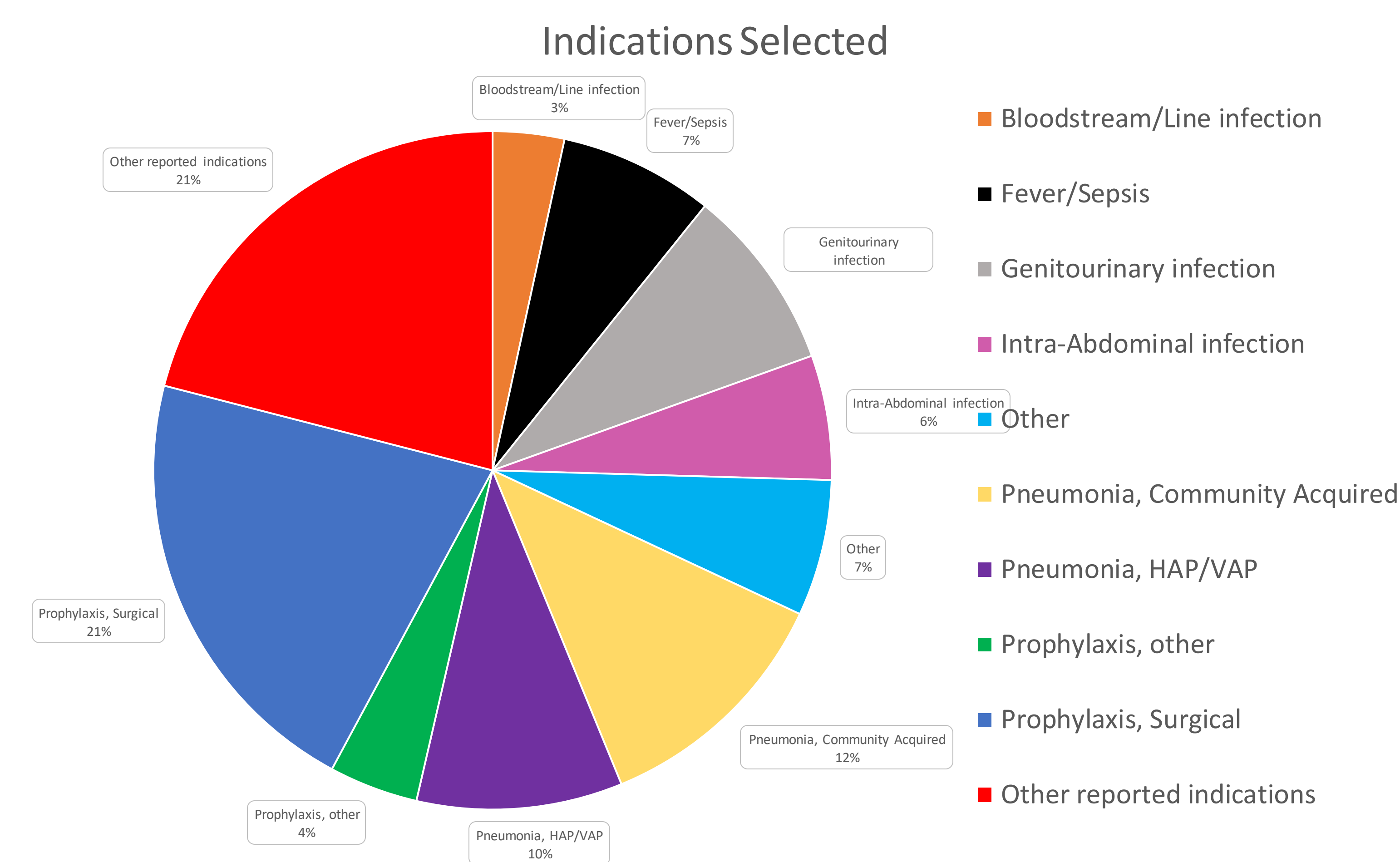
AECOPD - failed first line therapy	Febrile Neutropenia	MRSA pneumonia	Pseudomonas aeruginosa infection
Bloodstream/Line infection	Fever/Sepsis	MRSA pneumonia oral stepdown therapy	Pyelonephritis stepdown therapy
Bone/Joint infection	Genitourinary infection	MRSA SSTI oral stepdown therapy	Skin & Soft tissue infection
CAP if beta-lactam allergy	Gram negative bacteremia stepdown therapy	MRSA SSTI with vancomycin failure/intolerance	Surgical prophylaxis if beta-lactam allergy
Clostridioides difficile	ID consult	Multi drug resistant organism	Upper Respiratory Tract infection
CNS infection	Immunosuppressed	Other	UTI if beta-lactam allergy
Cytomegalovirus	Intra-Abdominal infection	Pneumonia, Community Acquired	VAP/HAP due to MRSA
Endocarditis	Leukemia antibiotic prophylaxis	Pneumonia, HAP/VAP	VRE infection
Failed or worsening condition on clinical alternative	Lower respiratory tract infection, other	Prophylaxis, other	
Documented diagnosis or history of MULTI-DRUG RESISTANT gram negative organism			
Documented severe ALLERGY to penicillins or fluoroquinolones			
Documented severe ALLERGY to penicillins, cephalosporins, quinolones with ICU or ID consult			
ID Consult with MDR organism (MDR = susceptible only to polymyxins & aminoglycosides)			

Antimicrobials were considered inappropriate if they were not possibly able to treat the selected indication based on pharmacokinetic or pharmacodynamic principles, or if the dosage form of the antimicrobial in question did not match the selected indication.

Antimicrobials were not required to be first line therapy options to be considered appropriate.

Results

Chart review for appropriateness was completed on 4178 antimicrobials administered within the timeframe.



Of the 4178 orders assessed, 8 orders (0.19%) were found to be inappropriate and 4170 orders (99.81%) were deemed appropriate.

Orders deemed inappropriate included:

- 1 order of vancomycin IV for *Clostridioides difficile* infection
- 2 orders of aztreonam IV for *Clostridioides difficile* infection
 - 8.8% of *Clostridioides difficile* infection orders inappropriate (n = 34)
- 1 order of oral vancomycin for intra-abdominal infection
 - 0.4% of intra-abdominal infection orders inappropriate (n = 284)
- 1 order of linezolid IV for MRSA pneumonia oral stepdown therapy
 - 33.3% of MRSA pneumonia oral stepdown therapy orders inappropriate (n=3)
- 1 order of linezolid IV for MRSA SSTI oral stepdown therapy
 - 100% of MRSA SSTI oral stepdown therapy orders inappropriate (n=1)
- 2 orders of micafungin IV for urinary tract infection.
 - 0.5% of genitourinary infection orders inappropriate (n=418)

Conclusions

The vast majority of antimicrobials ordered in a one-month time span were appropriate (99.81%) when compared to the indication selected from a pre-populated list upon order entry.

MRSA oral stepdown therapy indications had the highest percentage of inappropriate orders; however, this may be falsely inflated due to low sample size of these indications.

Targeted education regarding proper treatment of *Clostridioides difficile* infection is most warranted.