



## Professional practice evaluation of emergency department prescriptions for community-acquired infections in Lebanon



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### ABSTRACT

**Background:** Selecting the appropriate antibiotic regimen is extremely important in improving patient outcomes, minimizing antimicrobial resistance, and reducing costs. This study was conducted to evaluate current prescribing practices for empiric antibiotics at the time of admission to the emergency department (ED) and to assess their appropriateness in Lebanon.

**Methods:** A retrospective observational study was conducted at three different Lebanese hospitals between June and December 2016. Adult patients who received antibiotics in the ED during the study period were included. The assessment of antibiotic therapy based on adherence to international guidelines, including the choice of antibiotic, dosing, or both, was considered for analysis.

**Results:** A total of 258 patients who had a single diagnosis of an infectious disease were included. Adherence to international guidelines was noted in only 32.6% of cases; the frequency was highest for skin and soft tissue infections (50.0%), followed by urinary tract infections (40%). Among the different antibiotic classes, the highest percentage of drug incompatibility was for  $\beta$ -lactam prescriptions (70.8%). The percentage of incompatibility with guidelines for administered regimens on the basis of drug selection, dosing, or both was 53.4%, 10.3%, and 36.2%, respectively.

**Conclusions:** Inappropriate antibiotic use in the ED is prevalent, and physician adherence to international guidelines for empiric antibiotic prescriptions in the ED remains low. This emphasizes the importance of monitoring the use of antibiotics in the ED, as there is growing concern for antibiotic resistance and healthcare safety.

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### Introduction

Antibiotic resistance, complicated by the inappropriate use of antibiotics, is an increasing health problem worldwide (Mera et al., 2005; Laxminarayan et al., 2013; Spellberg et al., 2008; Donnelly et al., 2014). Infectious disease management is now more complicated due to the increase in multidrug-resistant bacteria,

which can increase the risk of mortality (Donnelly et al., 2014; Ali et al., 2006; Khalili et al., 2012; Xu et al., 2013). Selecting an appropriate antibiotic regimen for patients with bacterial infections has an important role in improving patient outcomes, minimizing antimicrobial resistance, and consequently reducing costs (Paterson, 2006; Standiford et al., 2012).

Several studies have shown that in many cases antibiotics are prescribed without a justified indication (Mera et al., 2005; Donnelly et al., 2014; Xu et al., 2013). Some studies have reported a rate of inappropriate antibiotic use of up to 43% (Xu et al., 2013; Hecker et al., 2003; O'Brien et al., 2015).

The emergency department (ED) represents a critical setting for addressing inappropriate antimicrobial prescribing practices. Antibiotics are frequently prescribed to patients admitted to the

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ED, with around 39% of these prescriptions being considered inconsistent with guideline recommendations (Xu et al., 2013; O'Brien et al., 2015; Demonchy et al., 2014; May et al., 2014; McIntosh et al., 2011).

Empiric antibiotic therapy, an initial therapy given for infections prior to microbiological results and guided by clinical presentation, is frequently practiced in the ED using broad-spectrum antibiotics to cover the most probable causes of infection (Gerding, 2000). After microbiological results become available, choosing an antibiotic with a narrower spectrum is important to prevent antimicrobial resistance in the community (Gerding, 2000).

Inappropriate antimicrobial use has been described in both ambulatory and hospital settings as the most important preventable cause of antimicrobial resistance. There are various reasons behind inappropriate antibiotic prescription in acute care units. Reasons include restricted time, a large number of prescribers being available at the time of patient admission, and the frequent changes of staff across shifts, in addition to the absence of an antibiotic stewardship program at some hospitals (Demonchy et al., 2014).

Previous studies have demonstrated that reducing aminoglycoside prescription is linked to a decreasing incidence of resistant Gram-negative bacteria (Demonchy et al., 2014; Gerding, 2000; Physicians RCo., 2014; Young et al., 1985). Similar findings have been reported for restricting the utilization of third-generation cephalosporin (Gerding, 2000; Young et al., 1985; Dancer et al., 2013; Kaier, 2012) and fluoroquinolone prescriptions (Gerding, 2000; Dancer et al., 2013; Kaier, 2012; Borde et al., 2015; Livermore et al., 2013).

In an attempt to rationalize antimicrobial therapy in order to provide better care for patients and to limit the spread of resistance, many scientific societies have developed national, regional, and international guidelines. These guidelines have been developed for the treatment of respiratory tract infections, urinary tract infections, and others, taking into consideration the microbial etiology/epidemiology, susceptibility/resistance rates, and relevant host conditions (Ali et al., 2006; Borde et al., 2015; Livermore et al., 2013; Busing et al., 2008; Di Giammarino et al., 2005; Galayduyk et al., 2008; Menendez et al., 2002; Mahungu et al., 2007).

In the Lebanese context, studies on antimicrobial susceptibility have shown a trend towards higher resistance rates to many of the commonly prescribed antibiotics. A high rate of resistance of *Streptococcus pneumoniae* to macrolides was noted in a study conducted in a tertiary care setting (Kanj et al., 2007), although all strains were still susceptible to fluoroquinolones. In another study extending over a decade (2000–2011) by Araj et al., resistance to quinolones was found in *S. pneumoniae*, *Haemophilus influenzae*, *Salmonella* species, and *Shigella* species (Araj et al., 2012).

Antimicrobial prescribing practices in Lebanon are still not optimal and resistance rates are increasing (Cheaito et al., 2014). Furthermore, there are no local guidelines to shape prescriptions based on the hospital flora and range of resistance. Thus, the aim of this study was to evaluate current prescribing practices for empiric antibiotics at the time of admission to the ED and to assess their appropriateness in accordance with international guidelines.

## Materials and methods

### Study design and setting

This was a retrospective observational study. The hospital records of all patients visiting the EDs of three different Lebanese hospitals between June and December 2016 were reviewed for inclusion. The study design was approved by the ethics committee

at the Lebanese International University and the institutional review boards of the hospitals involved. Informed consent was not obtained, as this was a retrospective study and did not pose any risk to the patients. However, data were stripped of any personal identifying information.

### Data collection

A medical records review was performed on site by the principal investigator, without interference or bias, using a validated data collection sheet. Patient demographic and clinical data were recorded, including sex, age, clinical diagnosis, comorbidities, past medical history, and the antibiotic treatment selected, including the dose and its adherence to guidelines.

In the absence of local or hospital guidelines, different international guidelines were used as a standard reference in this study. The Infectious Diseases Society of America (IDSA) international guidelines for the management of severe sepsis and septic shock (Dellinger et al., 2013) (Surviving Sepsis Campaign) were used to evaluate antibiotic use in sepsis and septic shock. According to IDSA, sepsis is defined as the presence of a probable or documented infection together with systemic manifestations of infection, including general, inflammatory, hemodynamic, organ dysfunction, or tissue perfusion manifestations. In addition, IDSA practice guidelines for the diagnosis and management of skin and soft tissue infections (SSTI) (Stevens et al., 2014) were used to assess antibiotic use in SSTI, while IDSA guidelines on the management of community-acquired pneumonia (CAP) in adults (Mandell et al., 2007) were used for the assessment of antibiotic use in CAP. With regard to urinary tract infections (UTI), IDSA guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults (Nicolle et al., 2005), IDSA guidelines for uncomplicated cystitis and pyelonephritis (Coplen, 2011), and IDSA guidelines for the diagnosis, prevention, and treatment of catheter-associated urinary tract infections in adults (Hooton et al., 2010) were used.

Adherence to the guidelines was defined as the use of the prescribed empiric antibiotics in accordance with the clinical diagnosis and guideline recommendations at admission, on the basis of drug selection, dosing, or both. Following admission of the patient to hospital, the continuation or change of antibiotics was also recorded. In cases in which cultures were performed, the culture results were recorded; these included cultures from blood, urine, or body fluids.

### Inclusion and exclusion criteria

All adult patients treated with antibiotics in the ED during the study period and who were subsequently admitted to the internal medicine department or intensive care unit (ICU) with a documented infection, i.e. CAP, UTI, sepsis, or SSTI, were included in the study. No attempt was made to verify the accuracy of the physician's diagnosis, because the aim was to assess physician attitudes to prescribing appropriate antibiotics in the ED.

Patients were excluded if they had multiple infections or infections other than those listed above, had been discharged from the ED without hospital admission, or if they had not received an antibiotic in the ED.

### Outcomes

The primary outcome was the extent of adherence of the ED physicians to the international guidelines for CAP, UTI, sepsis, and SSTI (Dellinger et al., 2013; Stevens et al., 2014; Mandell et al., 2007; Nicolle et al., 2005; Coplen, 2011; Hooton et al., 2010), determining the cause of inappropriate antibiotic prescriptions on

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