Prevalence of Extended Spectrum Beta-Lactamase Producing and Quinolone Non-susceptible Enterobacteriaceae in Inpatient and Outpatient Settings in the USA from 2011-2017

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ABSTRACT (revised)

Background: Rising rates of resistance to quinolones and cephalosporins have been reported recently amongst E.coli and other gram-negative pathogens that cause urinary tract infections (UTI). We sought to define the regional prevalence of quinolone-non-susceptible (QNS) and extended spectrum (ESBL) producing gram-negative pathogens in the United States (US).

Methods: An electronic research dataset from 192 US hospitals (BD Insights Research Database; Becton, Dickinson & Company) was analyzed to study trends in prevalence of QNS and ESBL organisms from 2011 to Q2 2017. All non-duplicate Escherichia coli, Klebsiella pneumoniae, Klebsiella oxytoca and Proteus mirabilis isolates were characterized as ESBL if confirmed as ESBL-positive per commercial panels or intermediate/resistant to either ceftriaxone, cefotaxime, ceftazidime or cefepime and categorized as QNS if identified as intermediate or resistant to either ciprofloxacin, levofloxacin or moxifloxacin. Isolates were categorized by specimen collection location as follows: (a) Inpatient if collected in hospitalized patients and (b) Ambulatory: isolates not collected during hospital admission.

Methods:

• The data source was the BD Insights Research Database (Becton, Dickinson & Company) from 192 US hospitals (2011 – June 2017) and 379 facilities in Q2 2017.
• All non-duplicate Escherichia coli, Klebsiella pneumoniae, Klebsiella oxytoca and Proteus mirabilis isolates were characterized as: o ESBL if confirmed as ESBL-positive per commercial panels or intermediate/resistant to either ceftriaxone, cefotaxime, ceftazidime or cefepime and categorization of ESBL if identified as intermediate or resistant to either ciprofloxacin, levofloxacin or moxifloxacin. Isolates were categorized by specimen collection location as follows: (a) Inpatient if collected in hospitalized patients and (b) Ambulatory: isolates not collected during hospital admission.

Results:

• The prevalence of ESBLs or AmpC-type β-lactamase producing and quinolone non-susceptible pathogens has been rising worldwide and includes both hospital acquired and community onset infections (ICHE 2016;37:1288–1301).
• In hospitals, 13.4% ESBL resistance nationally, with rates as high as 24% reported in some Northeastern, Southern and Western states.
• Over a third of E.coli isolates in 2014 were resistant to quinolones.
• Oral antibiotic treatment options are extremely limited for patients with these infections
• Resulting in lengthy hospital stays to facilitate administration of intravenous antibiotics, even for those with uncomplicated infections.
• Sulopenem is a thienopenem antibiotic being developed for the treatment of infections caused by multi-drug resistant bacteria
• Exerts bactericidal activity through inhibition of bacterial cell wall synthesis by binding to penicillin-binding proteins
• Has potent activity against Enterobacteriaceae, including those with ESBLs or AmpC-type β-lactamases
• Is available as intravenous and oral formulations.

CONCLUSIONS

• ESBL-producing organisms at these sentinel hospitals have been rising since 2011.
• Quinolone resistance remains persistently elevated in both inpatient and outpatient settings
• Oral antibiotics with good activity against ESBL-producing and quinolone non-susceptible pathogens are needed