



BACKGROUND

- Bacterial resistance to antibiotics has grown to become a major challenge confronting healthcare providers. The dramatic accrual of resistant bacterial pathogens concomitant with the dearth of novel antimicrobial agents is a call to action to encourage the adaptation of antimicrobial stewardship programs (ASP) and the implementation of effective interventions to halt the epidemic in health care settings.
- Global increase in the rates of bacterial resistance to available antimicrobials manifested as the emergence different phenotypes of resistant pathogens like MRSA, VRE, ESBL, CRE and MRD organisms urge health care providers and researchers to adopt effective treatment strategies and optimize antimicrobial utilization.
- Targeted interventions are needed to attain ASP objectives, for this purpose, we conducted this retrospective review of microbiology laboratory isolates in our institution to characterize prevalence of bacterial resistance and to evaluate the phenotypic/genotypic patterns in order to design the hospital antibiogram. The findings from this study (phase I) will guide formulary restriction, empiric therapy selection and review of treatment protocols (phase II) and finally prospective evaluation of outcomes (phase III) as part of a comprehensive program aiming to establish a functional ASP program.

OBJECTIVE

- This retrospective study was undertaken to compile and analyzes data about the phenotypes and resistance patterns of microbial isolates collected in our tertiary care hospital and affiliated centers, (Sohar Hospital – Northern Oman), as part of a comprehensive effort aiming to establish a functional ASP program.

METHODS

- Ethical approval of the research protocol was obtained from the research committee, Ministry of Health, Sultanate of Oman. The study conforms to all laws protecting patient confidentiality.
- We surveyed a convenience sample of all bacterial isolates collected by or referred to the central microbiology laboratory of Sohar Hospital between Jan. 1st, 2016 to Dec. 31st, 2017.
- Study data acquired from the electronic medical records and microbiology laboratory database include patient demographics (age, gender, nationality, co-morbidities), dates of interest (admission, discharge, sample request, sample collection, result availability), sample description (requesting location, specimen type, original infection), isolate identification, sensitivity, testing to determine specific resistance phenotype).
- Samples were excluded if they were linked to same patient ID number, collected within less than a week and identified the same pathogen with identical antibiotic susceptibility pattern.
- All statistical analyses were performed using Statistical Analysis System (SAS) version 9.4 (SAS Institute, Cary, NC). Quantitative data are reported either as Mean ± Standard Deviation or Median (Interquartile Range) and compared using either t-test or Wilcoxon Sum Rank test. Qualitative data are reported as Counts (Percentage) and Pearson chi-square test employed to assess association between variables. A p-value of < 0,05 was considered as statistically significant for all tests.

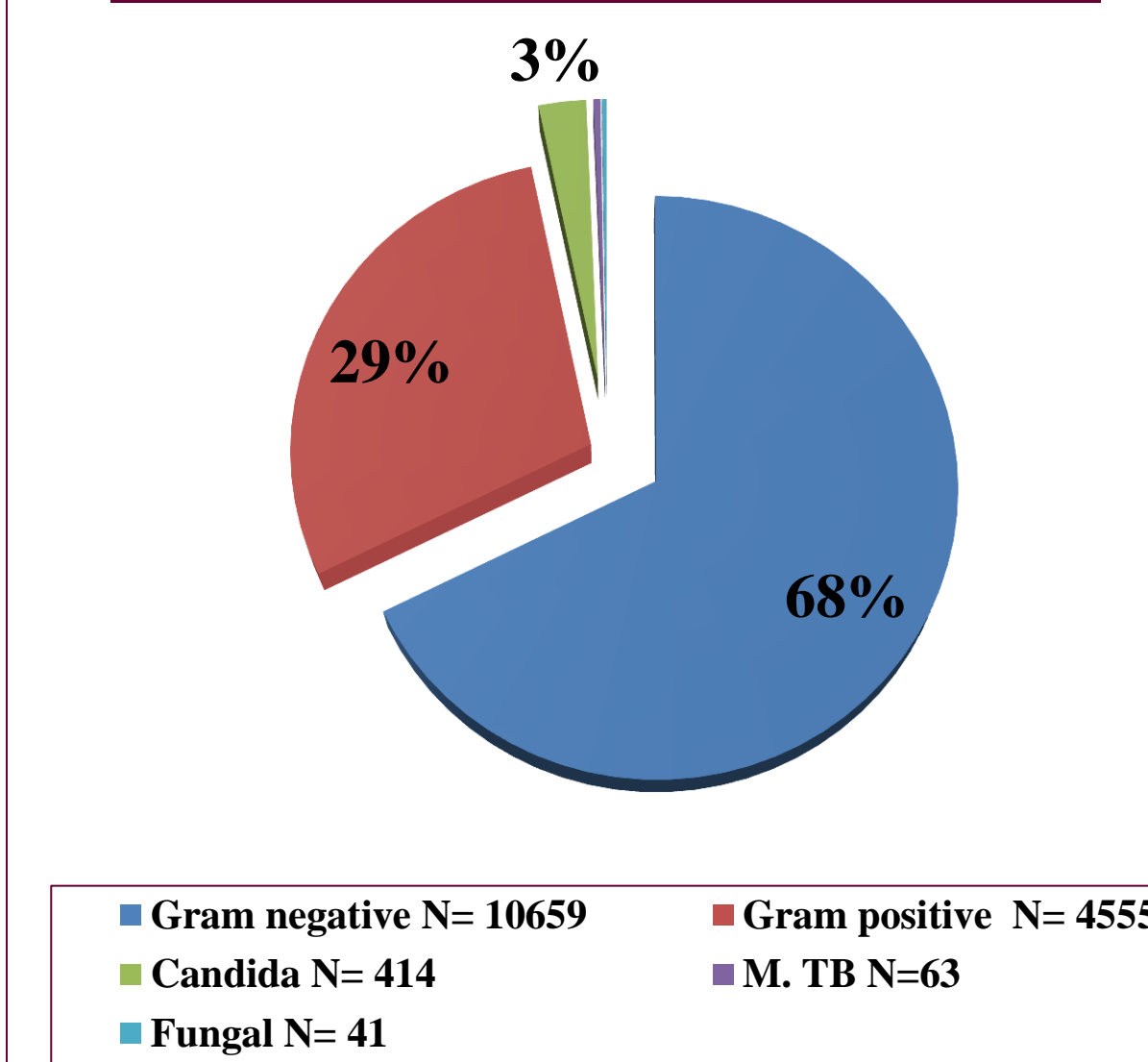
RESULTS

- A Total of 15733 isolates were positive cultures representing 9231 unique patients, of which 2434 patients with multiple cultures (number of cultures range 2-58). **Table (1)** shows the characteristics of study population.
- Positive isolates showed predominance of gram negative organisms 10659 (67.7%) over gram positive organisms 4555 (29.0%) (**Figure 1**)

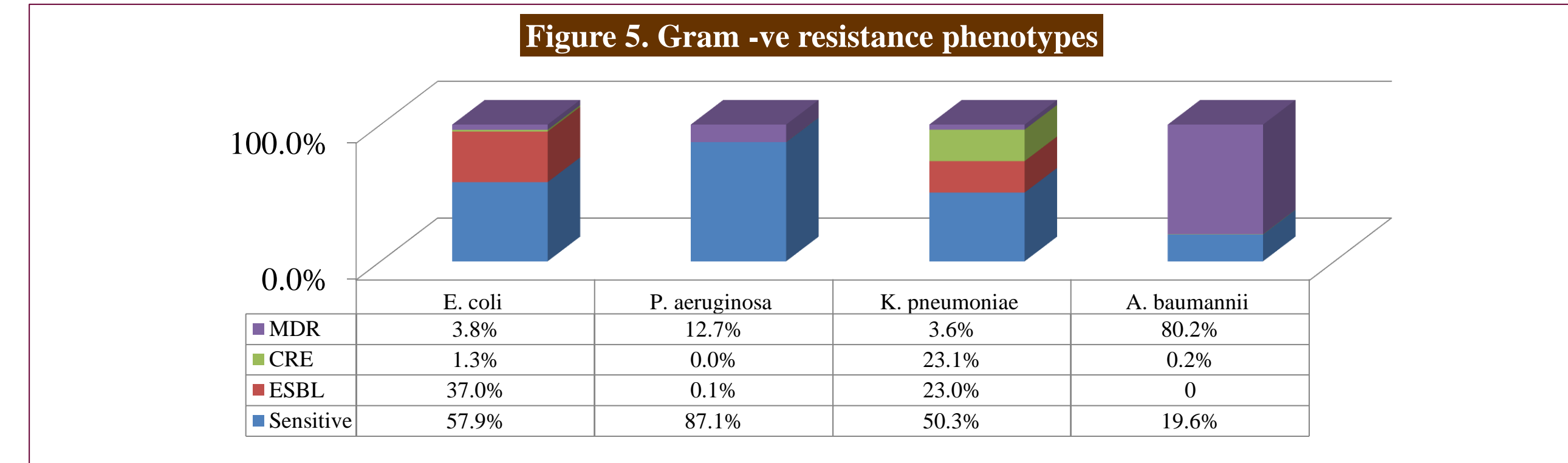
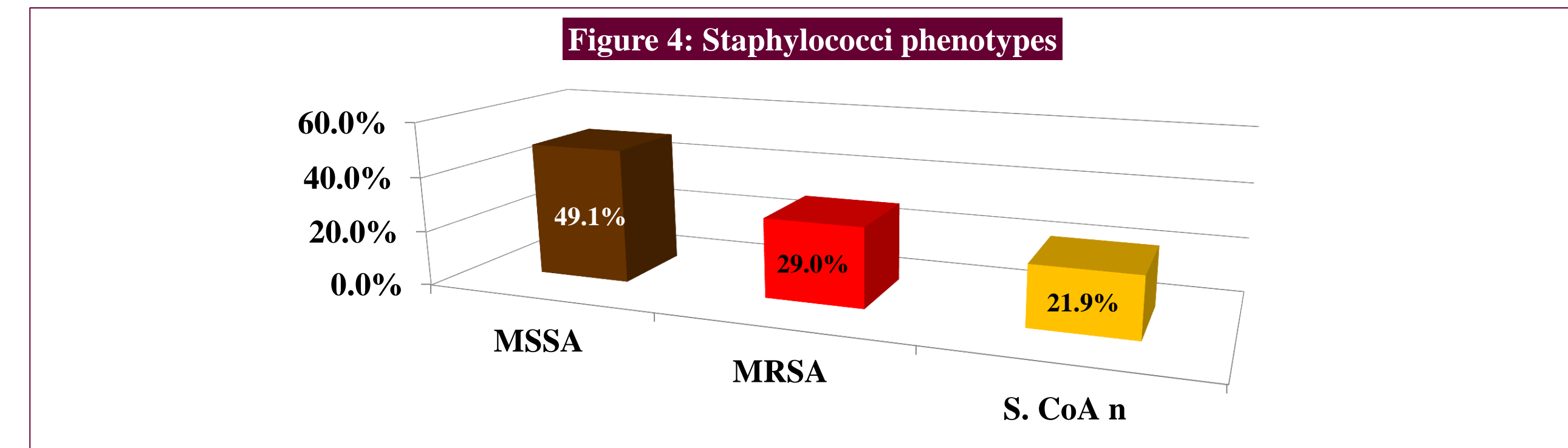
Table1. Characteristics of study population (N=9231)

Gender, n (%)	
Female	5698 (61.73%)
Male	3533 (38.27%)
Age Group, n (%)	
Infants (0-2 years)	1272 (13.78%)
Children (3-12 years)	720 (7.80%)
Adolescent (13-17 years)	296 (3.21%)
Adults (18-65 years)	5438 (58.91%)
Older adults – Seniors (65+)	1505 (16.30%)
Nationality, n (%)	
Omani	8764 (94.94%)
Other	467 (5.06%)
Patient Category, n (%)	
Outpatient (referral & other)	9576 (60.87%)
Inpatient	6155 (39.13%)
Request Location, n (%)	
Surgical wards Sohar Hosp.	4277 (27.19%)
Critical care area	4101 (26.07%)
Medical wards sohar Hosp.	3860 (24.54%)
Subordinate Polyclinics	2729 (17.35%)
Subordinate health centers	764 (4.86%)
Sample Source, n (%)	
Skin & Soft tissues	7080 (45.01%)
Urine	4701 (29.88%)
Respiratory system	2228 (14.16%)
Blood	1415 (8.99%)
Patient related devices	143 (0.91%)
Stool	116 (0.74%)
Other Body Fluids	37 (0.24%)
CSF	11 (0.07%)

Figure 1: Organism Types (N=15733)



Phenotypic stratification of most common isolates



Susceptibility pattern of most commonly isolated microorganisms among gram negative and gram positive isolates is shown in figures 6,7,8,9 respectively.

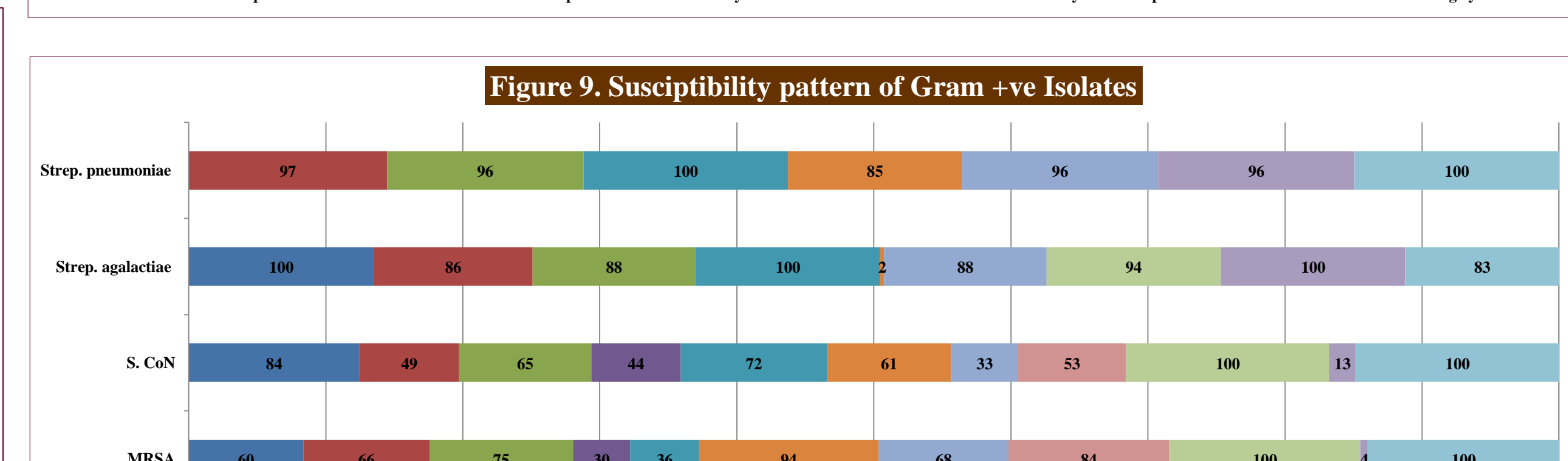
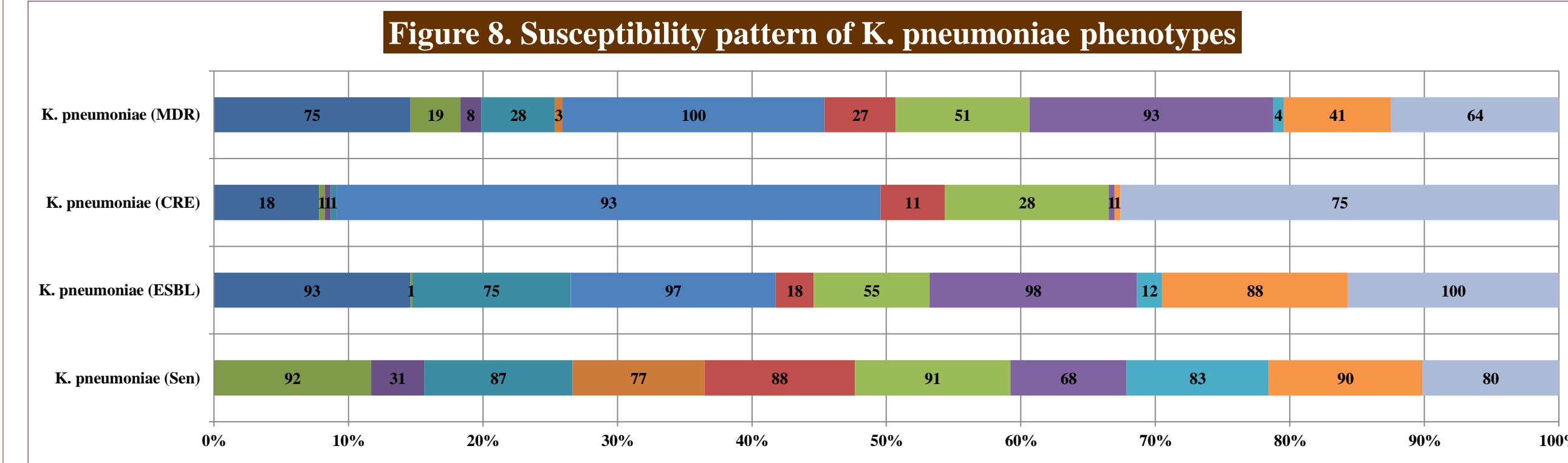
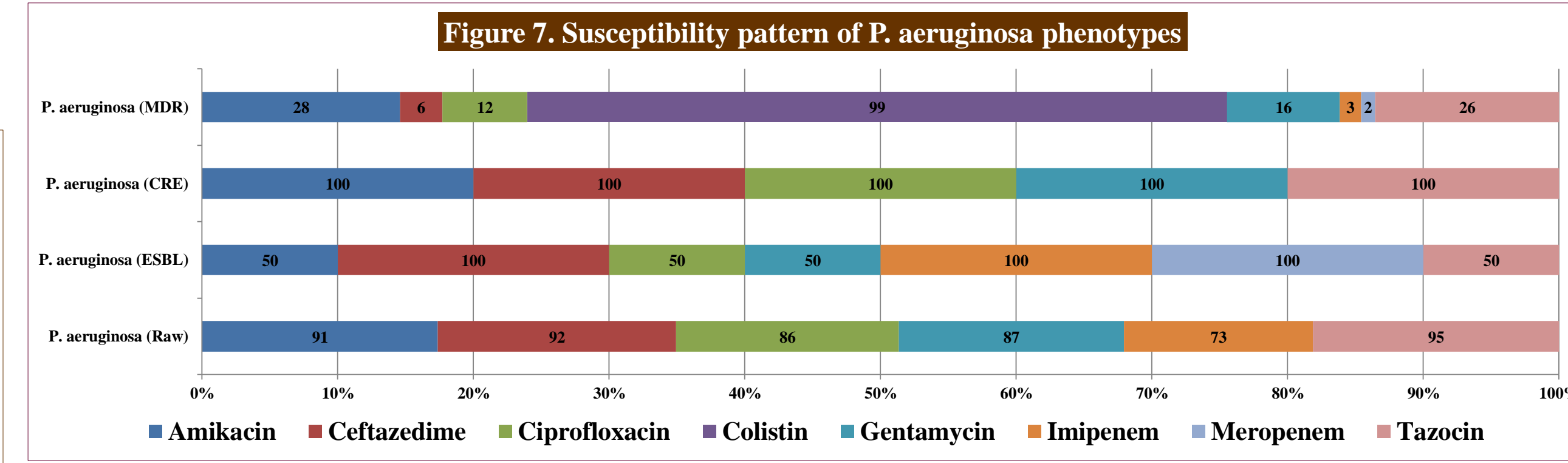
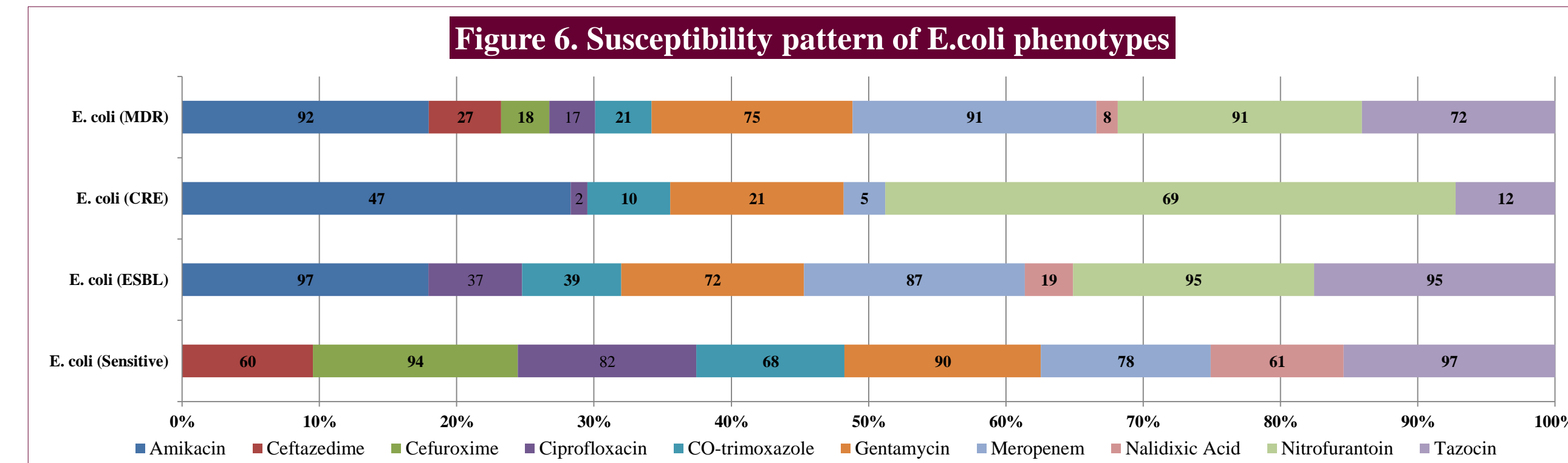


Figure 2: Organism types stratified by sample source (N=15731)

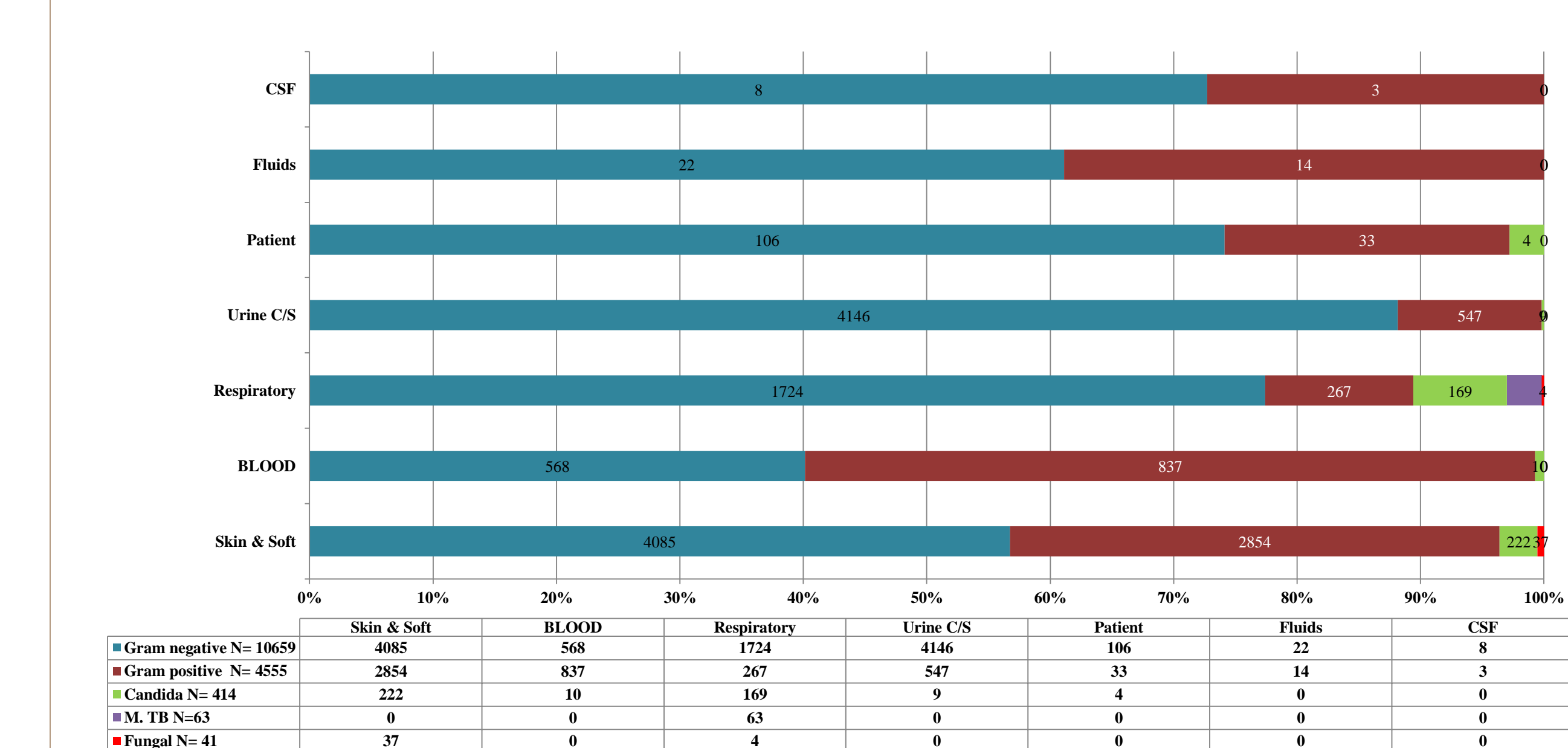
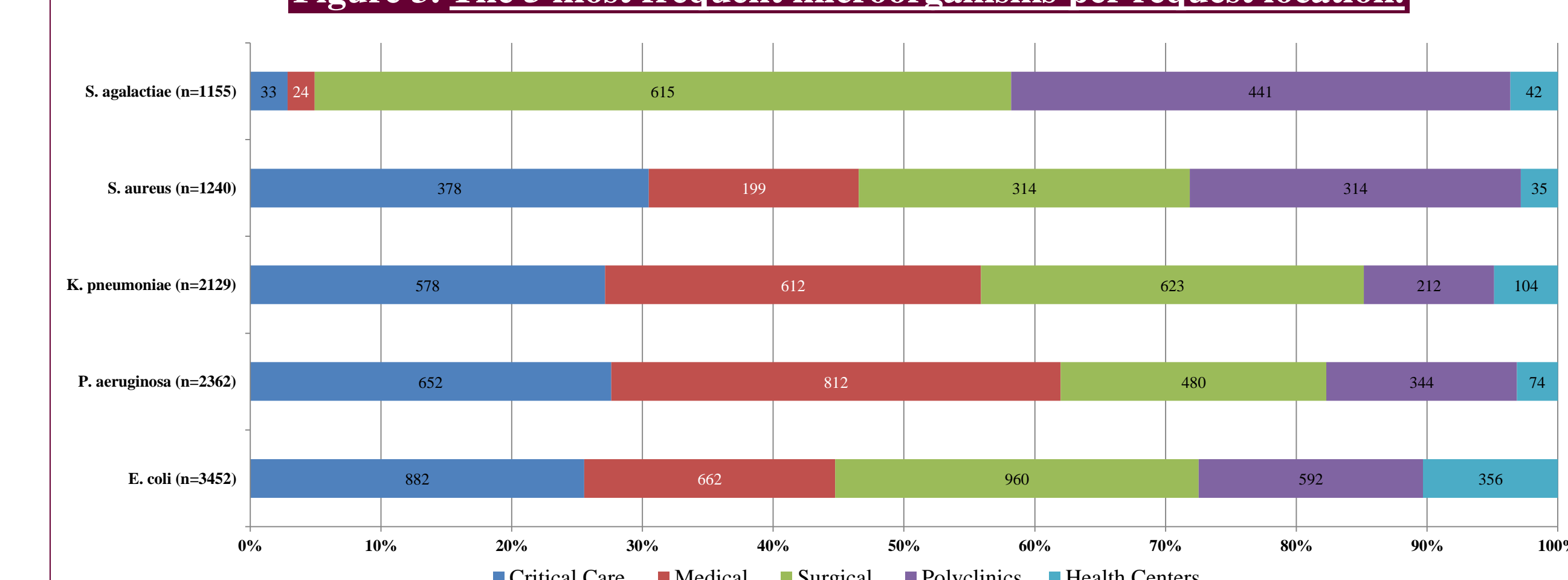


Figure 3. The 5 most frequent microorganisms per request location.



CONCLUSION

- Highly resistant (ESBL & CRE) E. coli and K. pneumoniae is a significant cause of bloodstream infection in hospitalized patients (~12%). Empirical treatment options should be revised, drug-bug match therapy instituted promptly and newer agents considered.
- Gram negative isolates showed very rare resistance to colistin and tigecycline, thus in order to maintain efficacy of both antibiotics they should be restricted to be prescribed only by consultant Id.
- Gram positive isolates showed very rare resistance to daptomycin and linezolid, with low resistance (8~20)% to clindamycin, so its recommended to restrict its prescribing against culture report contains no other alternative antimicrobials.
- Growing resistance to ciprofloxacin makes a call to restrict its use to cases where other antibiotics are not feasible.
- Almost 50% of Staphylococcus isolates (MRSA and CoNG) require vancomycin treatment, individualized dosing protocol, pharmacokinetic guided monitoring and laboratory surveillance of MICs are warranted to increase treatment success rate.
- ASP implementation based on adequate information about infections, resistance pattern and prescriber attitudes is a must in order to maximize clinical outcomes and minimize hospitalization costs.

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DISCLOSURE

The authors have nothing to disclose concerning financial or personal relationship with commercial entities that may have a direct or indirect interest in the subject matter of this presentation. For more information or a reprint, contact:
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