**Supplementary Materials**

**Appropriateness of Empirical Antibiotic Therapy in Bacterial Culture-Positive Inpatients: a retrospective cohort study**

Yuting Luo1, Zhaowang Guo2, Ying Li1, Hui Ouyang1, Shanfeng Huang1, Yuanli Chen3, Kenan Li1, Yuxin Ji1, Hongqiong Zhu1, Wentao Luo1, Jinyu Xia1, and Xi Liu1

1Department of Infectious Diseases, The Fifth Affiliated Hospital, Sun Yat-sen University, Zhuhai, China

2Clinical Laboratory, The Fifth Affiliated Hospital, Sun Yat-sen University, Zhuhai, China

3Department of Hospital Infection Control, The Fifth Affiliated Hospital, Sun Yat-sen University, Zhuhai, China

***Corresponding author***: Xi Liu and Jinyu Xia, Department of Infectious Diseases, The Fifth Affiliated Hospital, Sun Yat-sen University, Zhuhai, China, 52 Meihua East Road, Xiangzhou District, zip code 519000.

*e-mail address*: [liuxi26@mail.sysu.edu.cn](mailto:liuxi26@mail.sysu.edu.cn); [xiajinyu@mail.sysu.edu.cn](mailto:xiajinyu@mail.sysu.edu.cn)

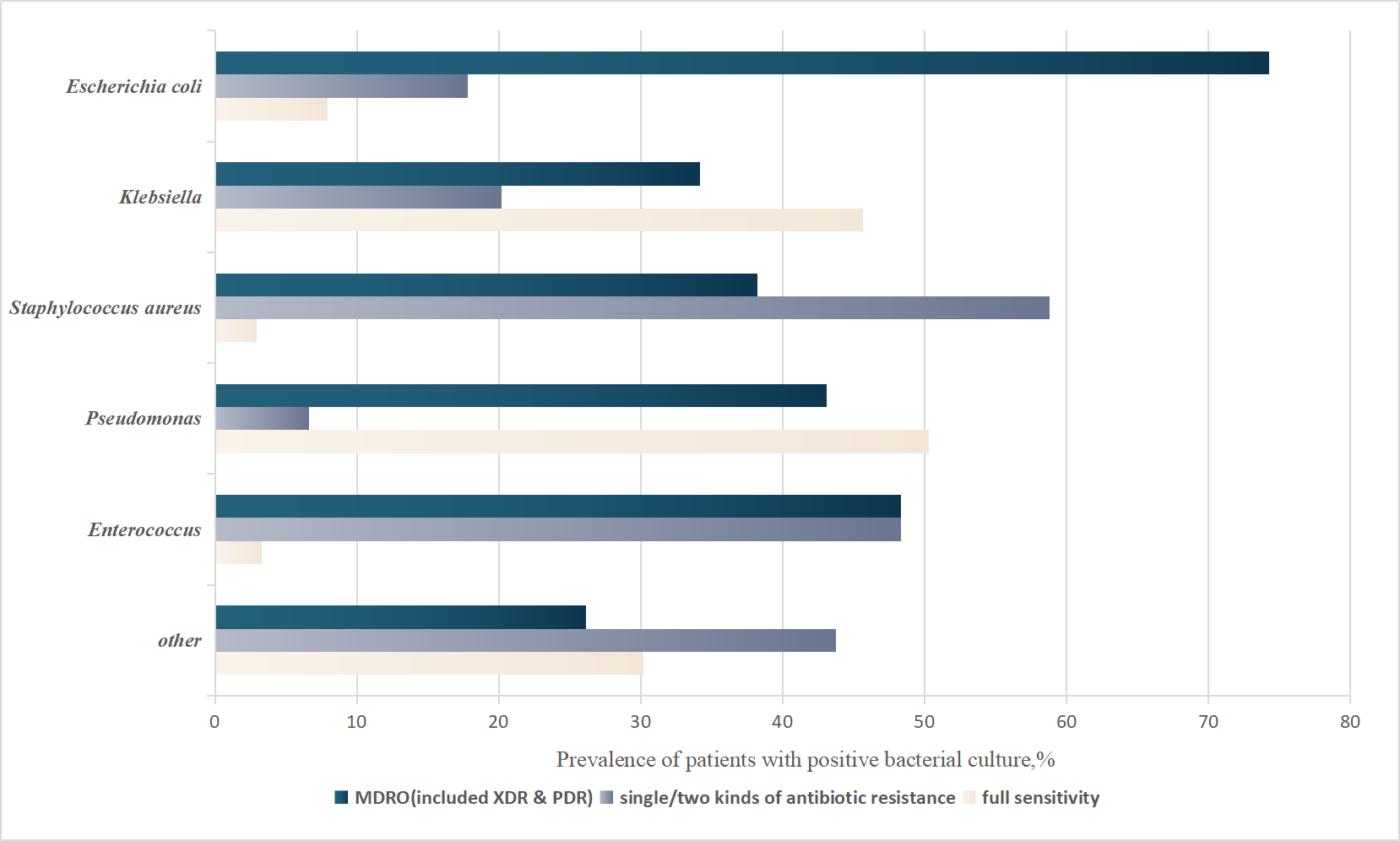
Figure S1: Drug sensitivity test report of culture-positive bacteria

Figure S2: The common culture positive bacteria in patients with respiratory/urinary tract infection, and the different therapeutic regimens and drug sensitivity results of different bacterial species.

Table S1: The Laboratory Indicators Related with EAT

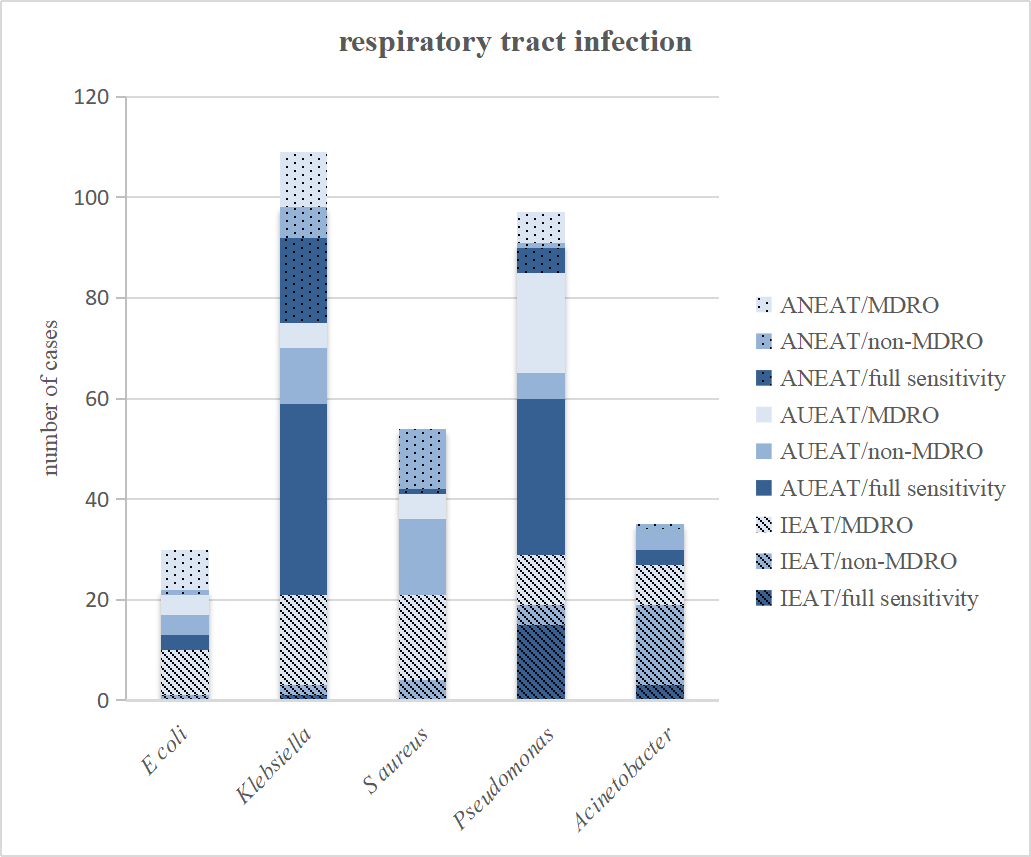
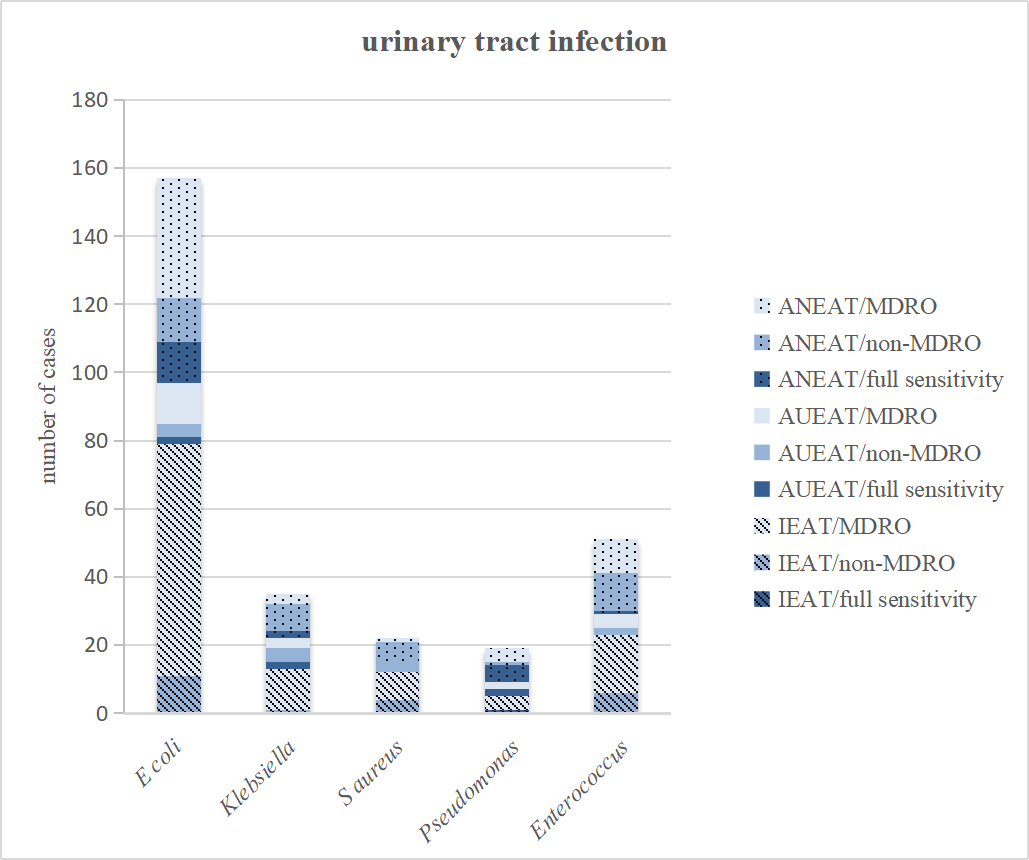
Table S2: Pathogen Distribution and Site of Infection in Patients infected with MDRO and received IEAT

Table S3: Antibiotic Use in Patients infected with MDRO and received IEAT



MDRO: multidrug-resistant organism; XDR: extensively drug resistant; PDR: pandrug resistant. These are the same in the following figures.

**Figure S1: Drug sensitivity test report of culture-positive bacteria**

**Figure S2: The common culture positive bacteria in patients with respiratory/urinary tract infection, and the different therapeutic regimens and drug sensitivity results of different bacterial species.**

ANEAT: appropriate and necessarily empirical antibiotic therapy; AUEAT: appropriate but unnecessarily broad-spectrum empirical antibiotic therapy; IEAT: inappropriate empirical antibiotic therapy. The MDRO in the table included patients of XDR and PDR, and non-MDRO included patients of one or two kinds of antibiotic resistance.

**TableS1: The Laboratory Indicators Related with EAT**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Total (n=1257)** | **ANEAT (n=390)** | **AUEAT (n=398)** | ***P* value** | **IEAT (n=469)** | ***P* value** |
| White blood cell count (×109/L) | 8.4(6.1-12.1) | 7.9(5.9-11.6) | 9.2(6.3-13.4) | .002 | 8.1(6.0-11.7) | .962 |
| Neutrophil count (×109/L) | 6.0(3.8-9.9) | 5.5(3.7-9.5) | 7.3(4.2-11.1) | ＜.001 | 5.7(3.6-9.4) | .981 |
| Proportion of neutrophils (%) | 75% (63%-85%) | 74% (63%-83%) | 79% (67%-87%) | ＜.001 | 73% (61%-85%) | .863 |
| Lymphocyte count (×109/L) | 1.2(0.8-1.8) | 1.3(0.8-1.9) | 1.1(0.7-1.6) | ＜.001 | 1.2(0.8-1.8) | .173 |
| Platelet count (×109/L) | 223(163-295) | 231(170-298) | 206(149-295) | .041 | 225(170-293) | .826 |
| Hemoglobin (g/L) | 117(98-133) | 121(105-137) | 113(92-131) | ＜.001 | 118(99-134) | .076 |
| Procalcitonin, PCT a (ng/ml) | 0.22(0.10-1.14) | 0.16(0.10-0.83) | 0.37(0.10-2.53) | ＜.001 | 0.18(0.10-0.79) | .751 |
| 0-0.5 | 620(49.3%) | 180(68.4%) | 190(54.0%) | ＜.001 | 250(69.8%) | .564 |
| ＞0.5-10 | 268(21.3%) | 68(25.9%) | 118(33.5%) | 82(22.9%) |
| ＞10 | 85(6.8%) | 15(5.7%) | 44(12.5%) | 26(7.3%) |
| C-reactive protein (mg/L) | 33.7(5.5-97.5) | 29.8(3.5-89.3) | 48.9(11.0-111.9) | .010 | 24.4(3.9-84.7) | .781 |
| Erythrocyte sedimentation rate (mm/H) | 50.0(19.0-85.0) | 42.5(14.0-83.0) | 53.5(26.5-96.0) | .067 | 49.0(16.3-82.8) | .684 |
| Prothrombin time (s) | 12.2(11.3-13.5) | 12.0(11.1-13.1) | 12.5(11.5-14.2) | ＜.001 | 12.0(11.1-13.2) | .557 |
| Activated partial thromboplastin time (s) | 30.6(28.3-33.2) | 30.7(28.2-32.9) | 31.0(28.2-33.9) | .096 | 30.3(28.3-32.8) | .441 |
| D-dimer (ng/ml) | 442(176-1146) | 331(133-843) | 569(224-1320) | ＜.001 | 441(163-1229) | .006 |
| Urea (mmol/L) | 5.5(4.1-7.9) | 5.3(4.1-7.1) | 5.9(4.1-9.1) | .016 | 5.2(4.1-7.5) | .952 |
| Serum creatinine (μmol/L) | 73(57-99) | 73(58-99) | 75(57-108) | .662 | 71(56-94) | .460 |
| Cystatin-C (mg/L) | 1.05(0.90-1.39) | 1.05(0.88-1.35) | 1.14(0.94-1.66) | .012 | 1.04(0.91-1.38) | .522 |
| Alanine aminotransferase (U/L) | 16(10-30) | 16(11-27) | 17(10-37) | .530 | 16(10-29) | .645 |
| Aspartate aminotransferase (U/L) | 21(16-34) | 20(15-31) | 23(17-41) | ＜.001 | 21(15-32) | .775 |
| Total bilirubin (g/L) | 9.1(6.4-14.1) | 8.9(6.5-13.7) | 9.6(7.0-16.7) | .019 | 8.7(6.2-12.8) | .225 |
| Albumin (g/L) | 36(32-40) | 38(32-41) | 34(30-39) | ＜.001 | 37(32-40) | .367 |
| Troponin I (μg/L) | 35.39(-33.74-104.52) | 0.26(-0.13-0.65) | 90.2(-86.8-267.21) | .014 | 0.05(0.02-0.07) | .695 |
| Brain natriuretic peptide (pg/ml) | 395(129-1440) | 343(129-1193) | 638(154-2370) | .017 | 305(114-1128) | .886 |
| Creatine kinase (U/L) | 73(41-145) | 72(43-134) | 79(42-158) | .501 | 64(37-150) | .467 |
| Lactate dehydrogenase (U/L) | 191(158-253) | 185(154-231) | 205(165-292) | .001 | 188(157-246) | .276 |

EAT: empirical antibiotic therapy; ANEAT: appropriate and necessarily empirical antibiotic therapy; AUEAT: appropriate but unnecessarily broad-spectrum empirical antibiotic therapy; IEAT: inappropriate empirical antibiotic therapy. These are the same in the following tables. Laboratory indicators that reflected the general state of the patient and correlate with infection specificity were collected. As some patients were not tested for all indexes at the first blood draw on admission, the test results were collected for the first time in His system during the study period.

a Procalcitonin (PCT) is an index with high specificity of bacterial infection. The concentration of procalcitonin could reflect the severity of infection and guide clinicians in the formulation of antibiotic treatment plan, including dosage and duration1-3. PCT was not tested in some patients during the study period, and only valid PCT data were included for statistical analysis.

**TableS2: Pathogen Distribution and Site of Infection in Patients infected with MDRO and received IEAT**

|  |  |  |
| --- | --- | --- |
| **Pathogen** | | **Number of strains/cases(n=305)** |
| **Gram-negative bacteria (GNB)** |  |  |
| ***Enterobacteriaceae*** | *Escherichia coli* | 116(38.0%) |
| *Klebsiella* species | 38(12.5%) |
| *Enterobacter* | 13(4.3%) |
| *Proteus* species | 8(2.6%) |
| *Salmonella* species | 3(1.0%) |
| **Non-fermenting Gram-negative Bacilli** | *Pseudomonas* species | 24(7.9%) |
| *Acinetobacter* species | 11(3.6%) |
| *Stenotrophomonas* | 2(0.7%) |
| *Comamonas* | 1(0.3%) |
| *Achromobacter* | 1(0.3%) |
| ***Flavobacteriaceae*** | *Elizabethkingia* species | 1(0.3%) |
| **Total** |  | 218(71.5%) |
| **Gram-positive bacteria (GPB)** |  |  |
| ***Staphylococcaceae*** | *Staphylococcus aureus* | 23(7.5%) |
| Coagulase-negative *Staphylococci* | 38(12.5%) |
| ***Enterococcaceae*** | *Enterococcus* species | 26(8.5%) |
| **Total** |  | 87(28.5%) |
| **Site of infection** | |  |
| Urinary tract |  | 123(40.3%) |
| Respiratory |  | 74(24.3%) |
| Skin or soft tissue |  | 29(9.5%) |
| Blood |  | 29(9.5%) |
| Abdomen |  | 27(8.9%) |
| Multisite |  | 17(5.6%) |
| Catheter-related bloodstream infection |  | 3(1.0%) |
| Other |  | 3(1.0%) |

**TableS3: Antibiotic Use in Patients infected with MDRO and received IEAT**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Antimicrobial Spectrum** b | **Total (n=304) c** | ***Enterobacteriaceae* (n=178)** | **Non-fermenting Gram-negative Bacilli (n=39)** | ***Staphylococcaceae* (n=61)** | ***Enterococcaceae* (n=26)** |
| **Non-multidrug resistant GNB** | 86(28.3%) | 53(24.4%) | 7(3.2%) | 18(20.7%) | 8(9.2%） |
| **Non-multidrug resistant GPB** | 66(21.7%) | 44(20.3%) | 7(3.2%) | 13(14.9%) | 2(2.3%) |
| **Cover both GNB and GPB** | 128(42.7%) | 66(30.4%) | 21(9.7%) | 26(29.9%) | 15(17.2%) |
| Non-multidrug resistant bacteria | 64(21.1%) | 50(23.0%) | 4(1.8%) | 4(4.6%) | 6(6.9%) |
| Multidrug resistant GNB | 63(20.7%) | 15(6.9%) | 17(7.8%) | 22(25.3%) | 9(10.3%) |
| Multidrug resistant GPB | 1(0.3%) | 1(0.5%) | 0(0.0%) | 0(0.0%) | 0(0.0%) |
| **Other d** | 24(7.9%) | 15(6.9%) | 4(1.8%) | 4(4.6%) | 1(1.1%) |

GNB: Gram-negative bacteria; GPB: Gram-positive. b Classified according to antibacterial spectrum and antimicrobial susceptibility testing report (e.g., the first and second generation cephalosporins mainly acted on Gram-positive cocci, and the third generation cephalosporins mainly acted on Gram-negative bacilli; β-lactam /β-lactamase inhibitor antibiotics (e.g., cefoperazone sodium sulbactam) can cover *Enterobacteriaceae*, *Pseudomonas Aeruginosa* sensitive strains and methicillin-sensitive *Staphylococcus aureus*, as well as extended-spectrum β-lactamase (ESBL) Gram-negative organism; Carbapenems can cover most Gram-positive cocci and Gram-negative bacilli, and also have effects on Gram-negative bacilli that are multidrug-resistant but sensitive to them). c 1 multidrug resistant *Elizabethkingia-meningosepticum* was not included in the analysis. d Other included use anti-fungal or anti-mycobacterial drug.

**References**

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