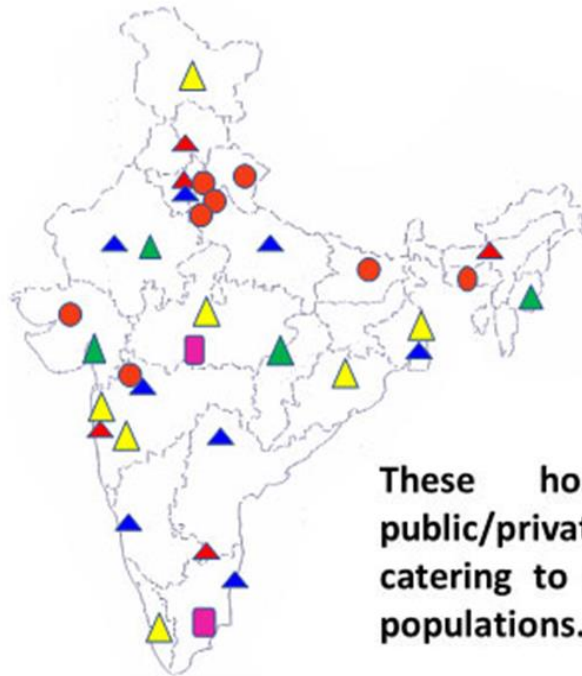# Capacity Building and Strengthening of Hospital Infection Control to detect and prevent antimicrobial resistance in India

4th PI meeting

# Participating Centers

- ICMR- AIIMS centres- 24 (23 Functional)

-  NCDC centres- 4

- Centers trained under Swachhatta Action Plan- 7

These hospitals are a mix of public/private/missionary/army hospitals, catering to a diverse category of patient populations.

# ICUs Included

- Total ICUs included in the surveillance
  <span style="color:red">93</span>

- Number of ICUs reporting in surveillance-
  <span style="color:red">86</span>

# Distribution of ICUs

| | |
|---|---|
| **Medical ICU** | **20 (21.5%)** |
| **Neonatal ICU** | **13 (14%)** |
| **Pediatric Medical ICU** | **13** |
| **Surgical ICU** | **13** |
| **Medical/Surgical ICU** | **10 (10.4%)** |
| **Cardiothoracic Surgical ICU** | **4** |
| **Gastrointestinal ICU** | **3** |
| **Neurosurgical ICU** | **3** |
| **Pediatric Medical/Surgical ICU** | **3** |
| **High Dependency Unit** | **2** |
| **Respiratory ICU** | **2** |
| **Burn ICU** | **1** |
| **Cardiac ICU** | **1** |
| **Neurologic ICU** | **1** |
| **Oncologic Medical ICU** | **1** |
| **Oncologic Medical/Surgical ICU** | **1** |
| **Oncologic Surgical ICU** | **1** |
| **Trauma Surgical ICU** | **1** |
| **Total** | **93** |

# Blood stream Infections

## Data from May, 2017 to June, 2018

# BSI cases - ICU wise

| ICU Type | BSI cases (CRFs); N (%) |
|---|---|
| Medical/Surgical ICU | 433  (25) |
| Medical ICU | 291  (16.8) |
| Neonatal ICU | 290 (16.8) |
| Surgical ICU | 224 (13) |
| Pediatric Medical ICU | 149 (8.6) |
| Neurosurgical ICU | 90 (5.2) |
| Trauma ICU | 76 (4.4) |
| Gastrointestinal ICU | 60 (3.4) |
| Cardiothoracic Surgical ICU | 33 (1.9) |
| Respiratory ICU | 25 (1.4) |
| Oncologic Medical ICU | 19 (1) |
| Pediatric Medical/Surgical ICU | 11 (0.6) |
| Burn ICU | 9 (0.5) |
| High Dependency Unit | 8 (0.4) |
| Oncologic Surgical ICU | 5 (0.2) |
| Cardiac ICU | 2 (0.1) |
| Total BSI CRFs | 1,725 |

| Gender | Number | Age (years) | |
| --- | --- | --- | --- |
| | | Range | Median |
| Male | 1,129 (65.5%) | -1 to 95 | 35 |
| Female | 596 (34.5) | -1 to 90 | 29 |

| Length of stay | |
|---|---|
| Average * | 24 days |
| Range * | >2 to 242 days |
| Median* | 17 days |

(* Episodes with pending final outcomes are excluded)
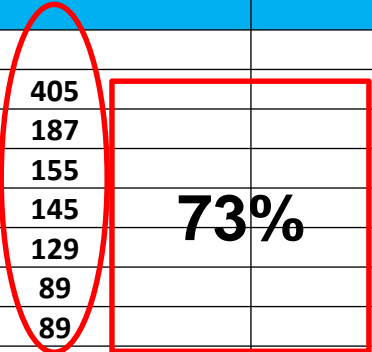
No. of episodes without final outcome= 140

| | |
|---|---|
| **14 day fatal outcome** | **672 (39%)** |
| **Final fatal outcome*** | **831 (48%)** <span style="color:red">**(includes the 672 )**</span> |

**(\* Episodes with pending final outcomes excluded)**

# Time between Date of Admission to surveillance unit and Date of event

| Duration of stay btw date of admission in unit and DOE (Days) | Number of patients | Duration of stay btw date of admission in unit and DOE (Days) | Number of patients |
|---|---|---|---|
| | | 35 | 5 |
| >2-3 | 405 | 36 | 2 |
| 4 | 187 | 37 | 2 |
| 5 | 155 | 38 | 3 |
| 6 | 145 | 39 | 8 |
| 7 | 129 | 42 | 3 |
| 8 | 89 | 43 | 1 |
| 9 | 89 | 44 | 1 |
| 10 | 63 | 45 | 2 |
| 11 | 54 | 46 | 2 |
| 12 | 42 | 47 | 1 |
| 13 | 36 | 48 | 3 |
| 14 | 39 | 49 | 3 |
| 15 | 17 | 50 | 1 |
| 16 | 21 | 51 | 4 |
| 17 | 22 | 53 | 1 |
| 18 | 18 | 55 | 2 |
| 19 | 15 | 56 | 1 |
| 20 | 11 | 57 | 2 |
| 21 | 18 | 59 | 1 |
| 22 | 14 | 60 | 2 |
| 23 | 6 | 61 | 1 |
| 24 | 12 | 62 | 1 |
| 25 | 11 | 68 | 1 |
| 26 | 10 | 74 | 1 |
| 27 | 12 | 77 | 1 |
| 28 | 6 | 83 | 1 |
| 29 | 8 | 85 | 1 |
| 30 | 9 | 90 | 3 |
| 31 | 7 | 96 | 1 |
| 32 | 5 | 102 | 1 |
| 33 | 3 | 146 | 1 |

**73%**

# Time between Date of Admission to surveillance unit and Date of event

- Range : 2-146 Days

- Median: 5 days

  – Repeat CRFs from one case…

- Implications for Prevention?
  (early onset BSIs?/CLABSIs/ Secondary)

- Duration between insertion of a central line and CLABSI

- Early Onset Vs Late onset CLABSIs

- Insertion Vs Maintenance problem

- **DATE OF CENTRAL LINE INSERTION**

# Location of Central Lines

| Location of central line | Number (%) |
|---|---|
| Jugular | 592 (55.7) |
| Subclavian | 328 (30.9) |
| Umbilical | 100 (9.4) |
| Branchial | 19 (1.8) |
| Femoral | 16 (1.5) |
| Hickman Line | 1 (0.1) |
| Left basilic vein | 1 (0.1) |
| Left leg | 1 (0.1) |
| Peripheral | 1 (0.1) |
| Right Basilic vein | 1 (0.1) |
| Right hand | 1 (0.1) |
| Right leg | 1 (0.1) |
| Total | 1,062 |

# BSI Rates

| BSI Type | Number |
|---|---|
| CLABSI | 778 (45%) |
| Non CLABSI | 569 (33%) |
| Secondary BSI | 378 (22%) |
| Total | 1,725 |

# BSI Rates

| | |
|---|---|
| **Patient Days** | **260,033** |
| **Central Line Days** | **89,301** |
| **CLABSI** | **783** |
| **NON- CLABSI** | **569** |
| **Secondary BSI** | **369** |

| | |
|---|---|
| **Total BSI Rate** | **6.62** |
| **CLABSI Rate** | **8.77** |
| **Sec. BSI Rate** | **1.42** |
| **NON-CLABSI Rate** | **2.19** |

# Organisms causing BSIs

| Organism Type | Number |
|---|---|
| Gram Negative | 1,335 |
| Gram Positive | 295 |
| Candida | 227 |
| Total | 1,857 |

**Distribution of organisms causing BSI**



Candida 12%

Gram Positive 16%

Gram Negative 72%
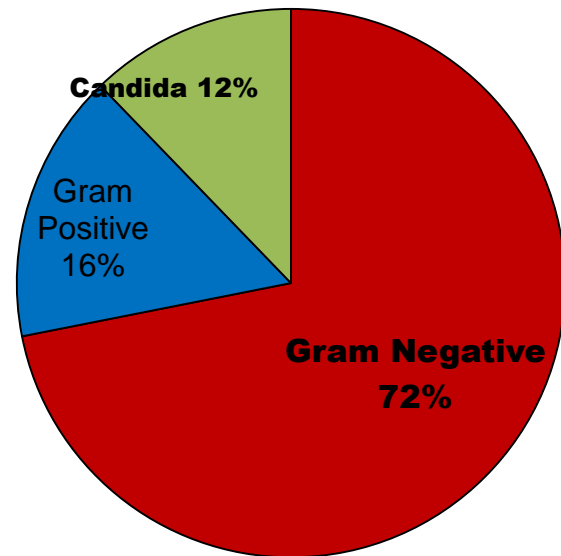
# BSI causing Organisms distribution

| Organisms | Number |
|---|---|
| *Klebsiella* spp. | 428 |
| *Acinetobacter* spp. | 387 |
| *Candida* spp. | 221 |
| *Enterococcus* spp. | 152 |
| *Staphylococcus* spp. | 141 |
| *Pseudomonas* spp. | 127 |
| *Escherichia coli* | 104 |
| *Enterobacter* spp. | 75 |
| *Burkholderia* spp. | 70 |
| Others | 42 |
| *Citrobacter* spp. | 34 |
| *Stenotrophomonas* spp. | 29 |
| *Serratia* spp. | 26 |
| *Chryseobacterium* spp. | 10 |
| *Proteus* spp. | 7 |
| *Ralstonia* spp. | 4 |
| Total | 1857 |

| Species | Number |
|---|---|
| *Klebsiella pneumoniae* | 408 |
| *Acinetobacter baumannii* | 341 |
| *Staphylococcus aureus* | 105 |
| *Pseudomonas aeruginosa* | 103 |
| *Enterococcus faecium* | 97 |
| *Burkholderia cepaciae* | 64 |
| *Enterobacter aerogenes* | 34 |
| *Enterococcus faecalis* | 28 |
| *Citrobacter freundii* | 16 |
| *CANDIDA…* | |

# Percentage distribution of Gram Negative Organisms causing BSI

| Organisms | Number (%) |
|---|---|
| *Klebsiella* spp. | 428 (32.1) |
| *Acinetobacter* spp. | 387 (29) |
| *Pseudomonas* spp. | 127 (9.5) |
| *Escherichia coli* | 104 (7.8) |
| *Enterobacter* spp. | 75 (5.6) |
| *Burkholderia* spp. | 70 (5.2) |
| *Citrobacter* spp. | 34 (2.5) |
| *Stenotrophomonas* spp. | 29 (2.2) |
| *Serratia* spp. | 26 (1.9) |
| *Chryseobacterium* spp. | 10 (0.7) |
| *Proteus* spp. | 7 (0.5) |
| *Achromobacter xylosoxidans* | 6 (0.4) |
| *Morganella morganii* | 6 (0.4) |
| *Elizabethkingia meningoseptica* | 5 (0.4) |
| *Sphingomas paucimobilis* | 5 (0.4) |
| *Ralstonia* spp. | 4 (0.3) |
| *Myrodies spp.* | 3 (0.2) |
| *Gram Negative Non Fermenter* | 2 (0.1) |
| *Alcaligenes faecalis* | 1 (0.1) |
| *Delftia acidovorans* | 1 (0.1) |
| *Moraxella* spp. | 1 (0.1) |
| *Onchrobactrum anthropi* | 1 (0.1) |
| *Pandoraea pnomenusa* | 1 (0.1) |
| *Providencia* spp. | 1 (0.1) |
| *Raoultella planticola* | 1 (0.1) |
| **Total** | **1335** |

# Distribution of GN organisms at species level

| Organisms | Number (%) |
|-----------|------------|
| *Klebsiella pneumoniae* | 408/428 (95.3) |
| *Acinetobacter baumannii* | 341/387 (88.1) |
| *Pseudomonas aeruginosa* | 103/127 (81.1) |
| *Burkholderia cepaciae* | 64/70 (91.4) |
| *Enterobacter aerogenes* | 34/75 (45.3) |
| *Enterobacter cloacae* | 30/75 (40.0) |
| *Citrobacter freundii* | 16/34 (47.1) |
| *Citrobacter koseri* | 7/34 (20.6) |

# Percentage distribution of Gram Positive Organisms

| Organisms | Number (%) |
|---|---|
| *Enterococcus* spp. | 152 (51.5) |
| *Staphylococcus* spp. | 141 (47.8) |
| *Leuconostoc pseudomesenteroides* | 1 (0.3) |
| *Streptococcus pneumoniae* | 1 (0.3) |
| **Total** | **295** |

| Organism Name | Number (%) |
|---|---|
| *Staphylococcus aureus* | 107/141 (75.9) |
| *Enterococcus faecium* | 97/152 (63.8) |
| *Staphylococcus* spp. | 34/141 (24.1) |
| *Enterococcus faecalis* | 28/152 (18.4) |
| *Enterococcus* spp. | 27/152 (17.8) |

# Percentage distribution of *Candida* Sp.

| Organisms | Number (%) | Organisms | Number (%) |
|---|---|---|---|
| *C. tropicalis* | 68 (30) | *Trichosporon ashaii* | 2 (0.9) |
| *C. utilis* | 43 (19) | *Cryptococcus neoformans* | 1 (0.4) |
| *C. albicans* | 27 (12) | *Geotrichum capitatum* | 1 (0.4) |
| *C. auris* | 23 (10) | *Kodamaea ohmeri* | 1 (0.4) |
| *C. parapsilosis* | 23 (10) | *Yeast* spp. | 1 (0.4) |
| *C. glabrata* | 18 (8) | | |
| *Candida* spp. | 7 (3) | | |
| *C. pelliculosa* | 5 (2) | | |
| *C. haemulonii* | 3 (1) | *Total* | 227 |
| *C. lusitaniae* | 2 (1) | | |
| *Non albican candida* | 2 (1) | | |

# Distribution of Organism causing BSI
# CRFs 1725, Organisms 1857

| CLABSI | 778 CRFs |
|---|---|
| GN | 627  (72%) |
| GP | 128 (14.6) |
| Candida | 117 (13.4%) |
| Total | **872** |

| Secondary BSI | 378 |
|---|---|
| GN | 342 (89.5) |
| GP | 25 (6.5) |
| Candida | 15 (4) |
| Total | **382** |

| NON-CLABSI | 569 |
|---|---|
| GN | 366 (60.6) |
| GP | 142 (23.5) |
| Candida | 95 (15.7%) |
| Total | **603** |

# Polymicrobial BSIs

|  | No. of episode |
|---|---|
| 2 Gram Negative | 39 |
| 1 Gram Negative & 1 Gram Positive | 16 |
| 1 Candida & 1 Gram Negative | 6 |
| 2 Gram Negative & 1 Gram Positive | 2 |
| 2 Gram Positive | 2 |
| 1 Candida & 1 Gram Positive | 2 |
| 4 Gram Negative | 1 |
| 2 Candida | 1 |
| 1 Candida & 2 Gram Negative | 1 |
| 1 Candida & 1 GN & 1 GP | 1 |

# CLABSIs
# Distribution of organisms

# Percentage distribution of Gram Negatives causing CLABSI
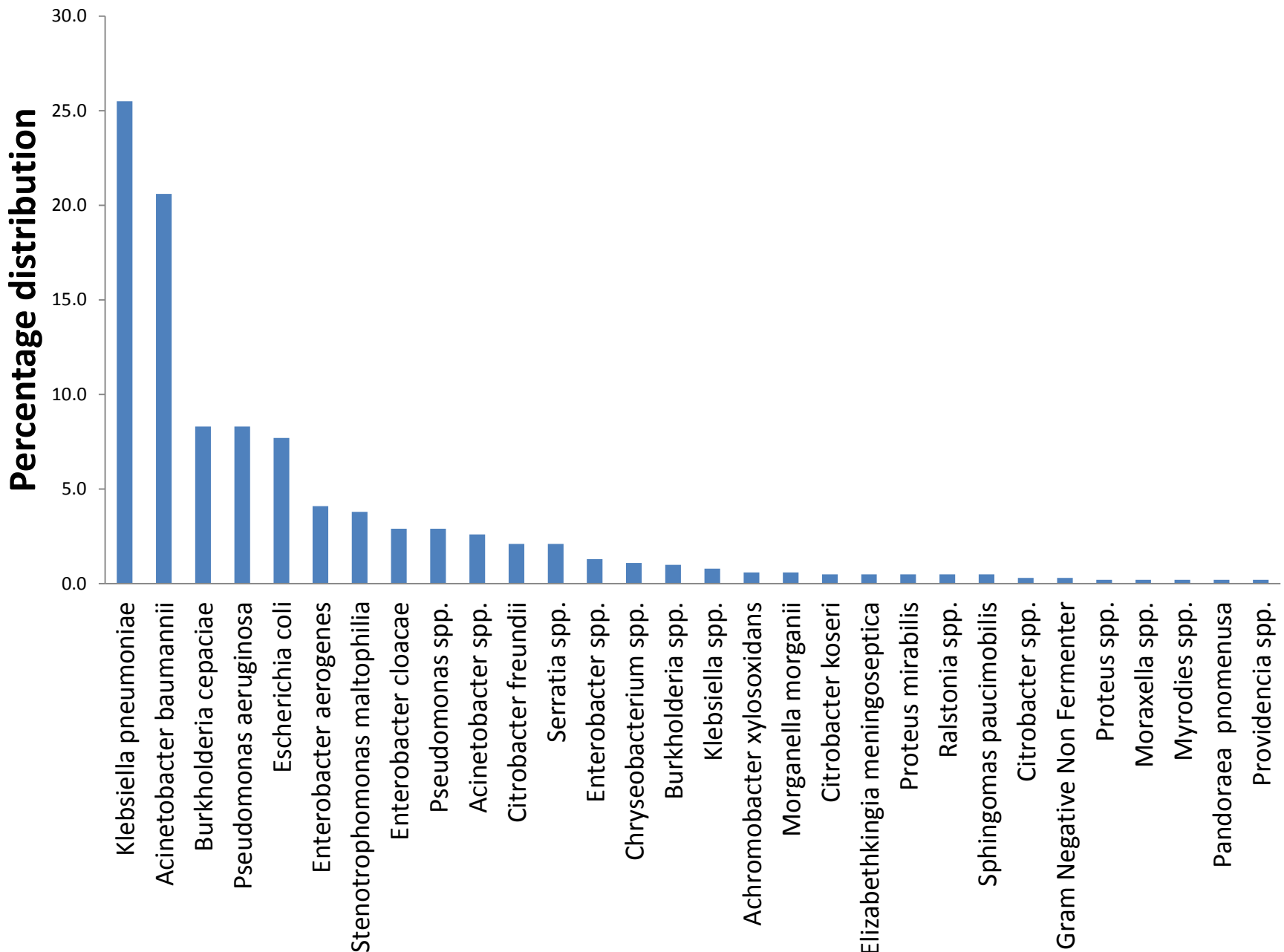
**Percentage distribution of Gram Positive causing CLABSI**
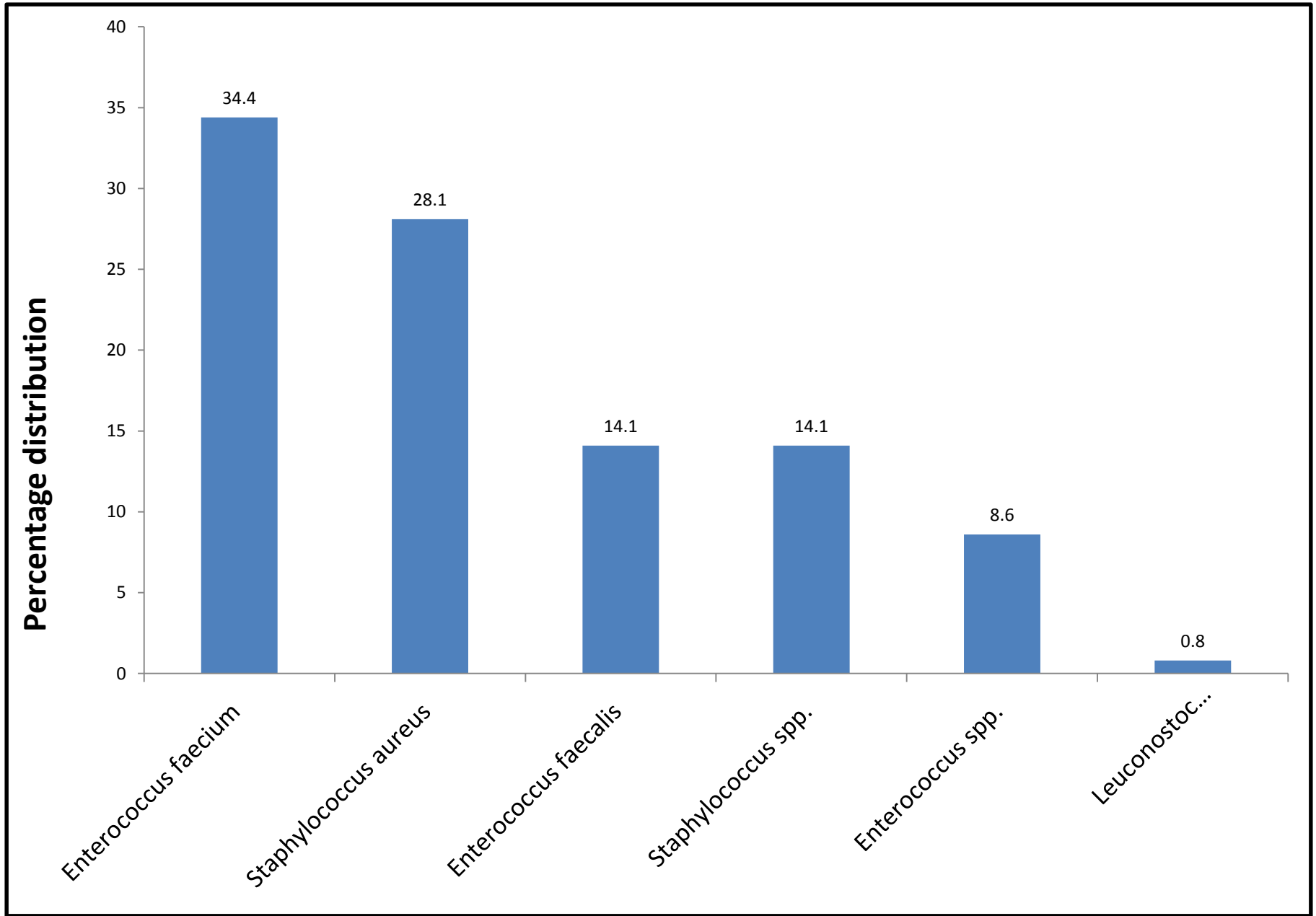
# Percentage distribution of Fungi causing CLABSI



Bar chart with y-axis labeled "Percentage distribution" ranging from 0.0 to 45.0.

| Fungus | Percentage distribution |
|---|---|
| Candida tropicalis | 38.5 |
| Candida albicans | 15.4 |
| Candida parapsilosis | 14.5 |
| Candida auris | 12.8 |
| Candida spp. | 11.1 |
| Candida glabrata | 6.0 |
| Trichosporon asahii | 0.9 |
| Yeast spp. | 0.9 |
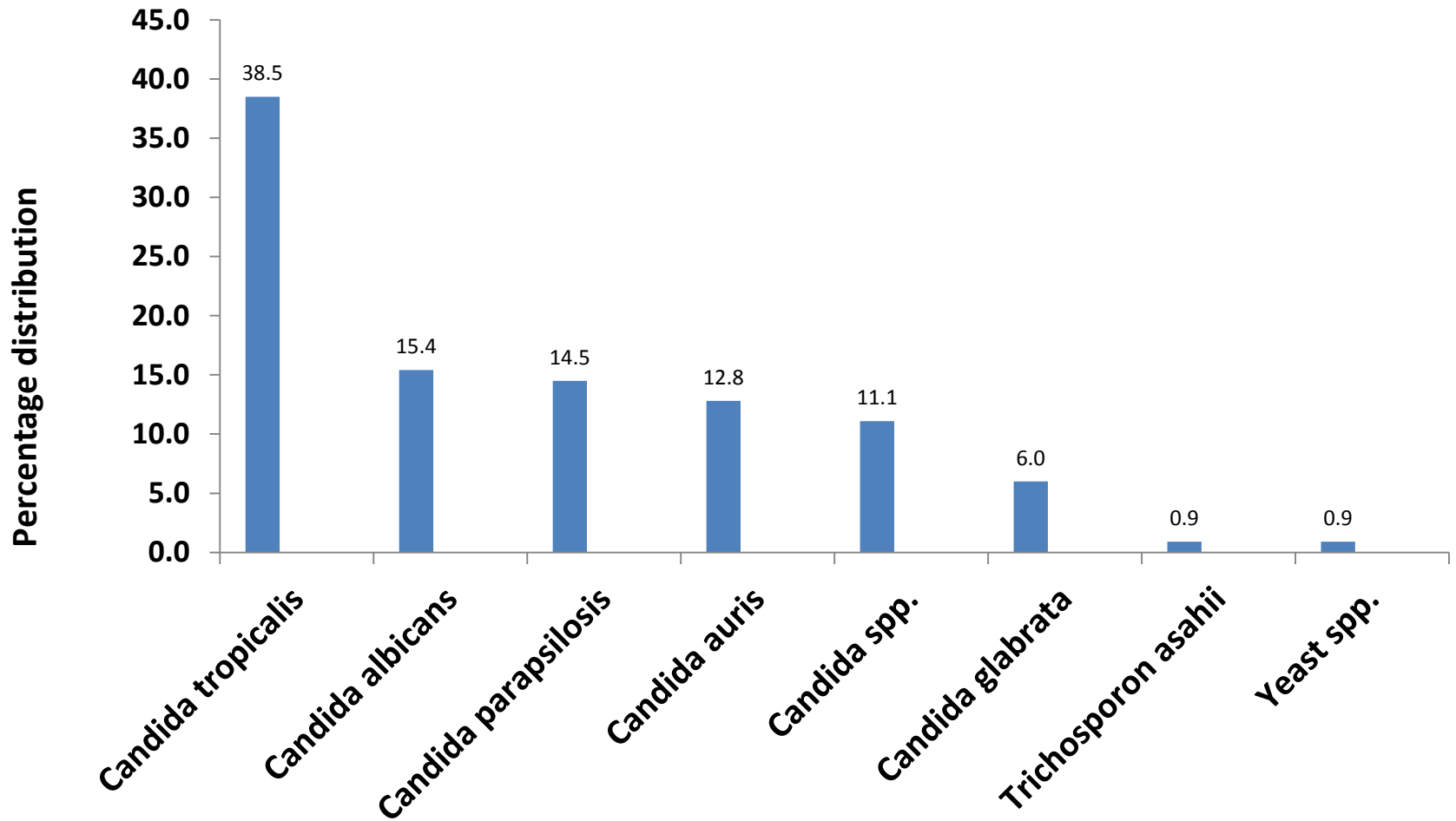
# Secondary BSIs

# Secondary BSI

| Total Number of Secondary BSI episodes | 412 |
|---|---|
| Number of Secondary sources | 489 |
| Total Organisms | 489 |
| BSI with two sources | 67 (16%) |

# Difference of days between DOE and date of secondary sample positivity (source positive culture)

| | |
|---|---|
| **Average difference of days btw DOE and date of secondary sample** | **-1.0 days** |
| **Median difference of days btw DOE and date of secondary sample** | **0 days** |
| **Range difference of days btw DOE and date of secondary sample** | **-14 to 6 days** |

| Difference btw DOE and Sec. Positive culture | No. of episodes |
| --- | --- |
| -14 | 1 |
| -13 | 1 |
| -12 | 2 |
| -11 | 2 |
| -10 | 2 |
| -9 | 6 |
| -8 | 13 |
| -7 | 13 |
| -6 | 8 |
| -5 | 11 |
| -4 | 11 |
| -3 | 20 |
| -2 | 28 |
| -1 | 29 |
| 0 | 179 |
| 1 | 39 |
| 2 | 14 |
| 3 | 12 |
| 4 | 6 |
| 5 | 6 |
| 6 | 9 |

## Percentage distribution of organism Causing Secondary BSIs

| Organisms | Number (%) |
|---|---|
| *Acenetobacter baumanii* | 182 (37.2) |
| *Klebsiella pneumoniae* | 168 (34.4) |
| *Pseudomonas aeruginosa* | 25 (5.1) |
| *Pseudomonas* spp. | 21 (4.3) |
| *Escherichia coli* | 20 (4.1) |
| *Staphylococcus aureus* | 17 (3.5) |
| *Candida* spp. | 9 (1.8) |
| *Enterococcus* spp. | 6 (1.2) |
| *Candida tropicalis* | 5 (1) |
| *Enterococcus* spp. | 5 (1) |
| *Enterococcus faecalis* | 3 (0.6) |
| *Serratia* spp. | 3 (0.6) |
| *Serratia marcescens* | 3 (0.6) |
| *Morganella morganii* | 2 (0.4) |
| *Candida albicans* | 2 (0.4) |
| *Stenotrophomonas spp.* | 2 (0.4) |
| *Proteus mirabilis* | 2 (0.4) |
| *Burkholderia cepacia* | 2 (0.4) |
| *Morganella* spp. | 1 (0.2) |
| *Staphylococcus epidermis* | 1 (0.2) |
| *Enterobacter aerogenes* | 1 (0.2) |
| *Cryptococcus* spp. | 1 (0.2) |
| *Staphylococcus haemolytica* | 1 (0.2) |
| *Klebsiella* spp. | 1 (0.2) |
| *Citrobacter freundii* | 1 (0.2) |
| *Enterobacter* spp. | 1 (0.2) |
| *Raoultella* spp. | 1 (0.2) |
| *Enterobacter cloacae* | 1 (0.2) |
| *Acenotobacter* spp. | 1 (0.2) |
| *Streptococcus pneumoniae* | 1 (0.2) |
| **Total** | **491** |

# Identified Secondary sources of BSIs

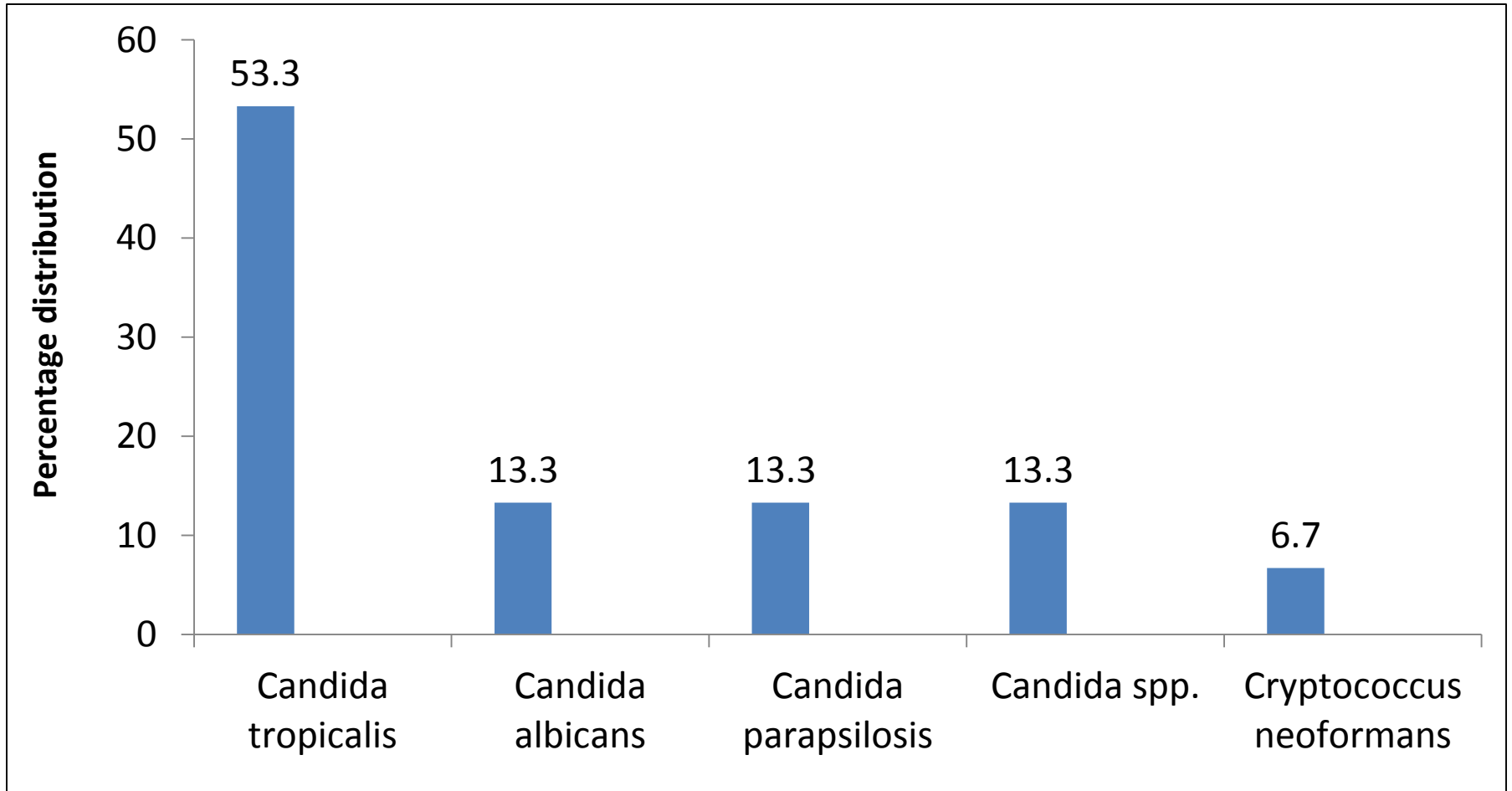| Secondary Sources | Number (%) |
|---|---|
| Bal | 251  (51.3) |
| Pus/ wound/ tissue | 83  (17) |
| Respiratory samples | 66  (13.5) |
| Urine | 52  (10.6) |
| Fluids | 32  (6.5) |
| Bile | 3  (0.6) |
| PD Tip | 1  (0.2) |
| Stool | 1  (0.2) |
| Total | 489 |

**Percentage distribution of Gram Negative causing Secondary BSI N=342**
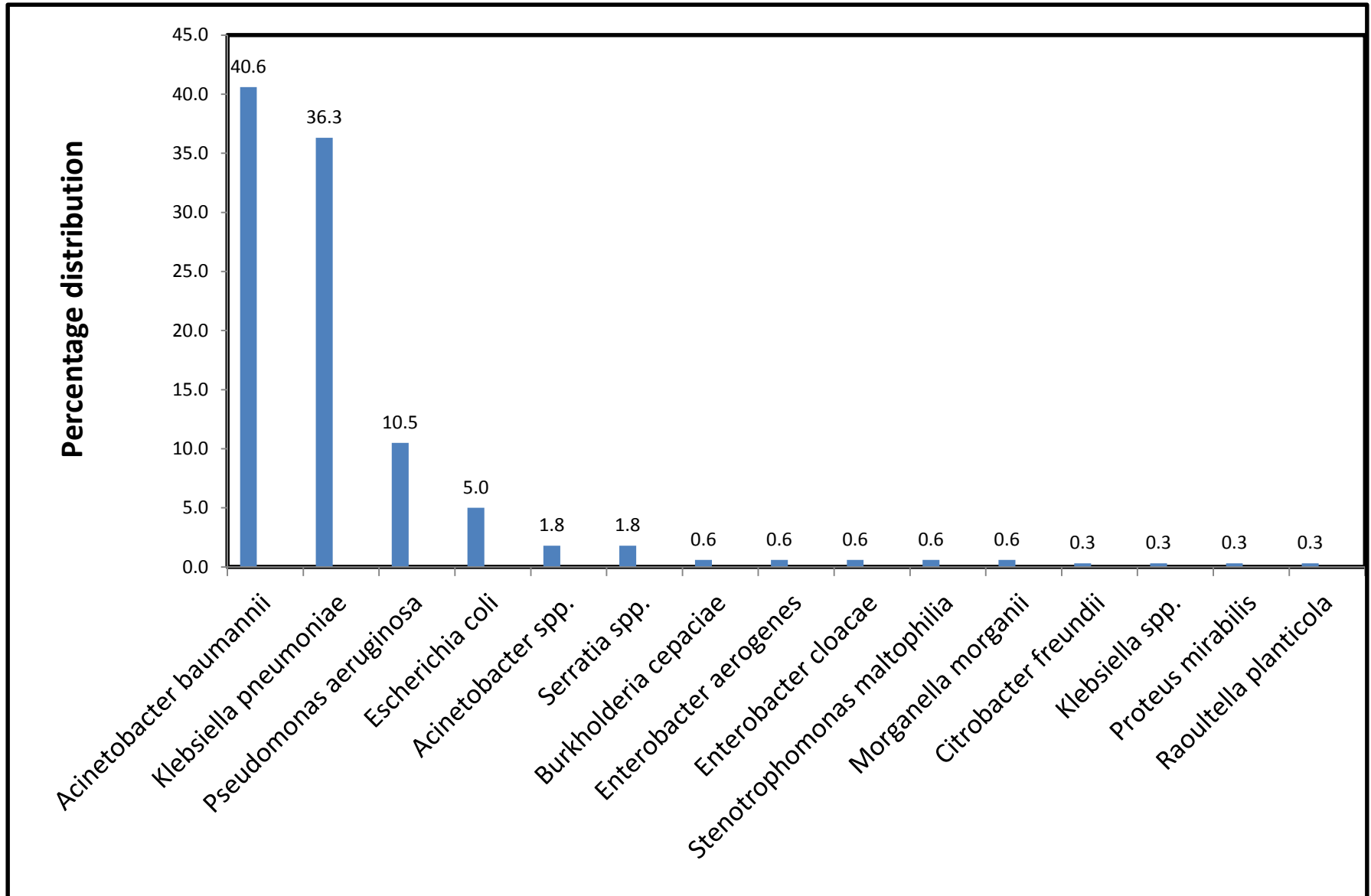
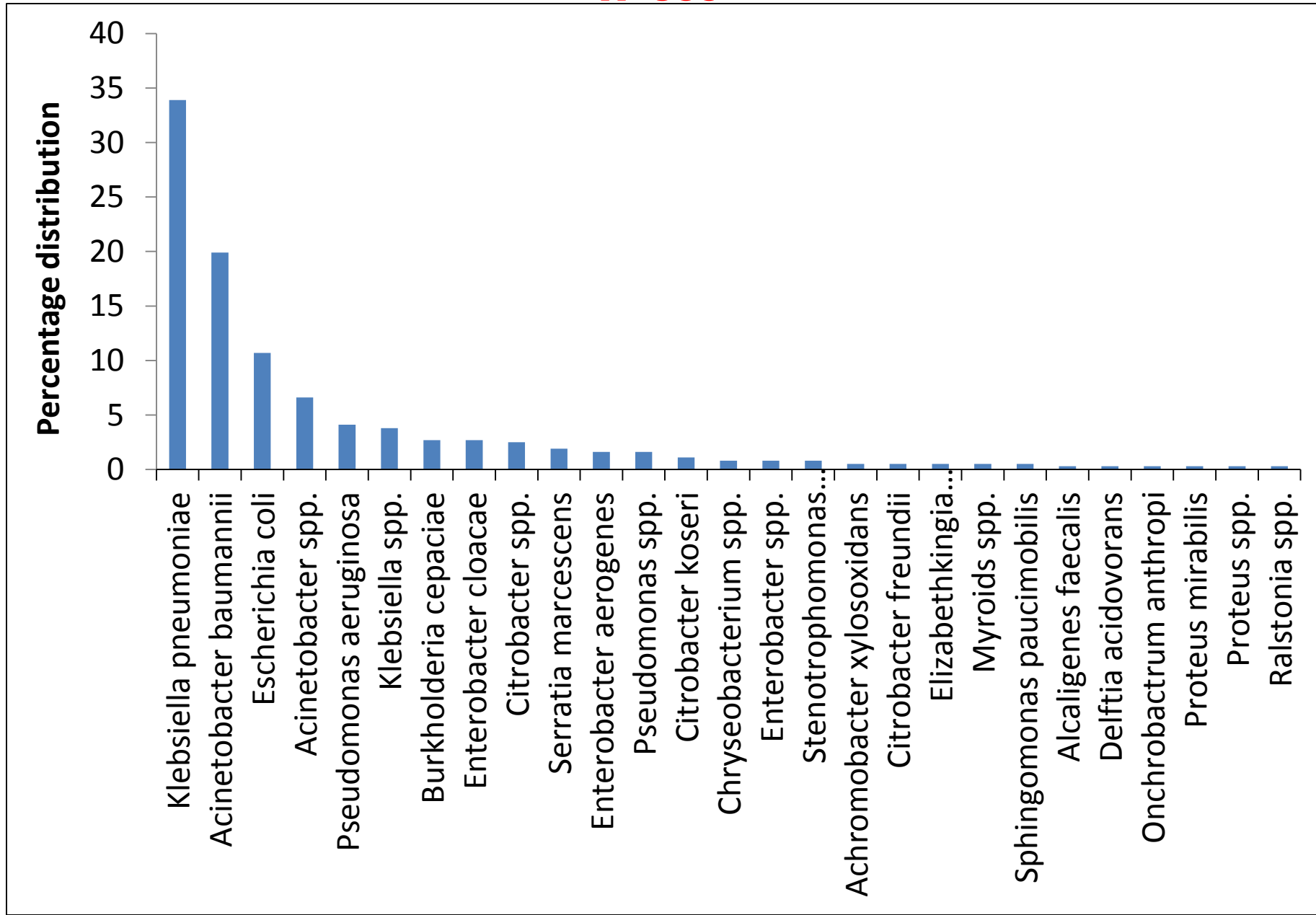**Percentage distribution of Gram Positive causing Secondary BSI N= 25**
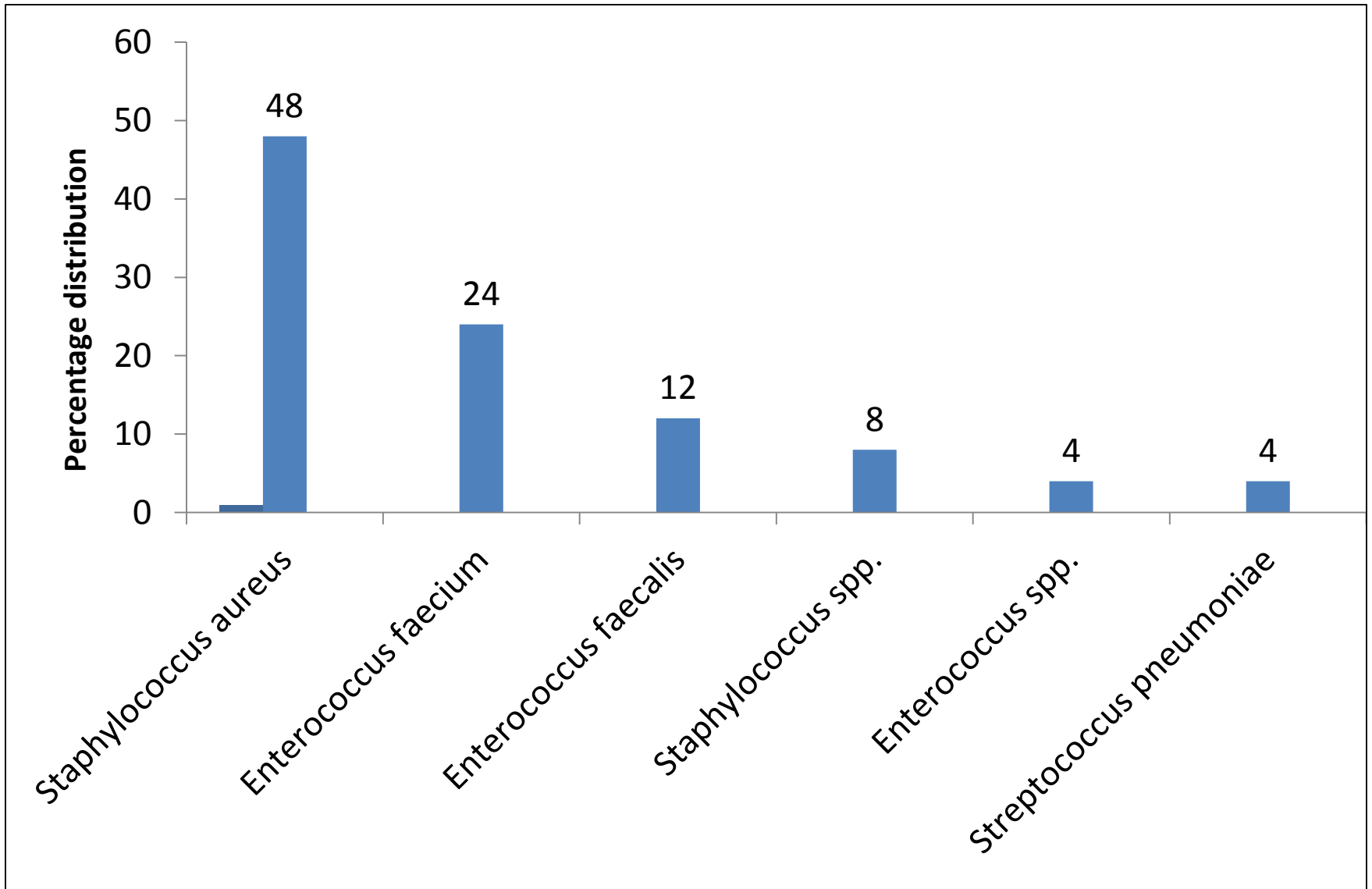
# Percentage distribution of Fungi causing Secondary BSIs N=15

# Primary Non-CLABSI


# Distribution of organisms

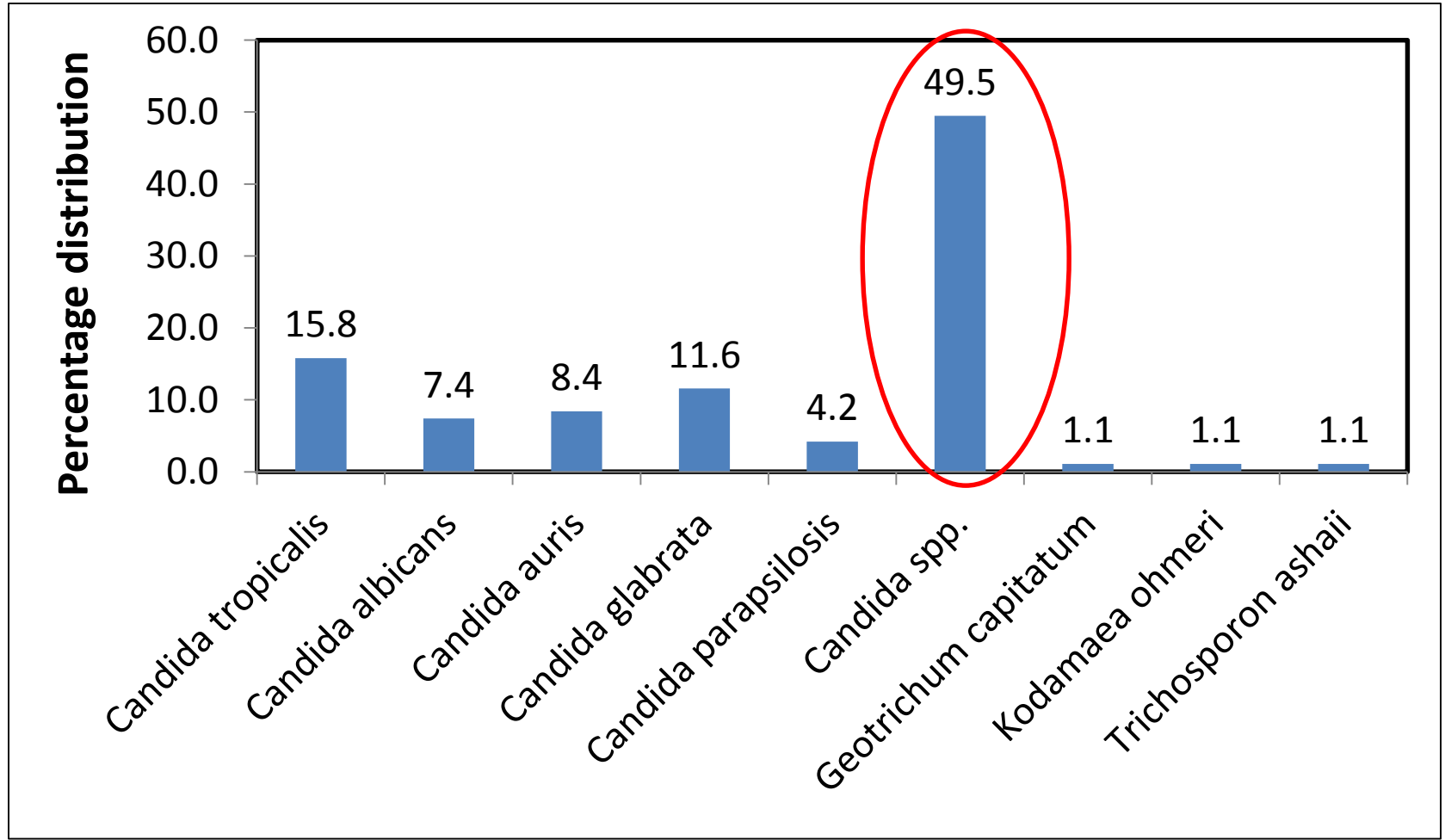**Percentage distribution of Gram Negative causing NON-CLABSI N=366**

**Percentage distribution of Gram Positive causing NON-CLABSI N=142**
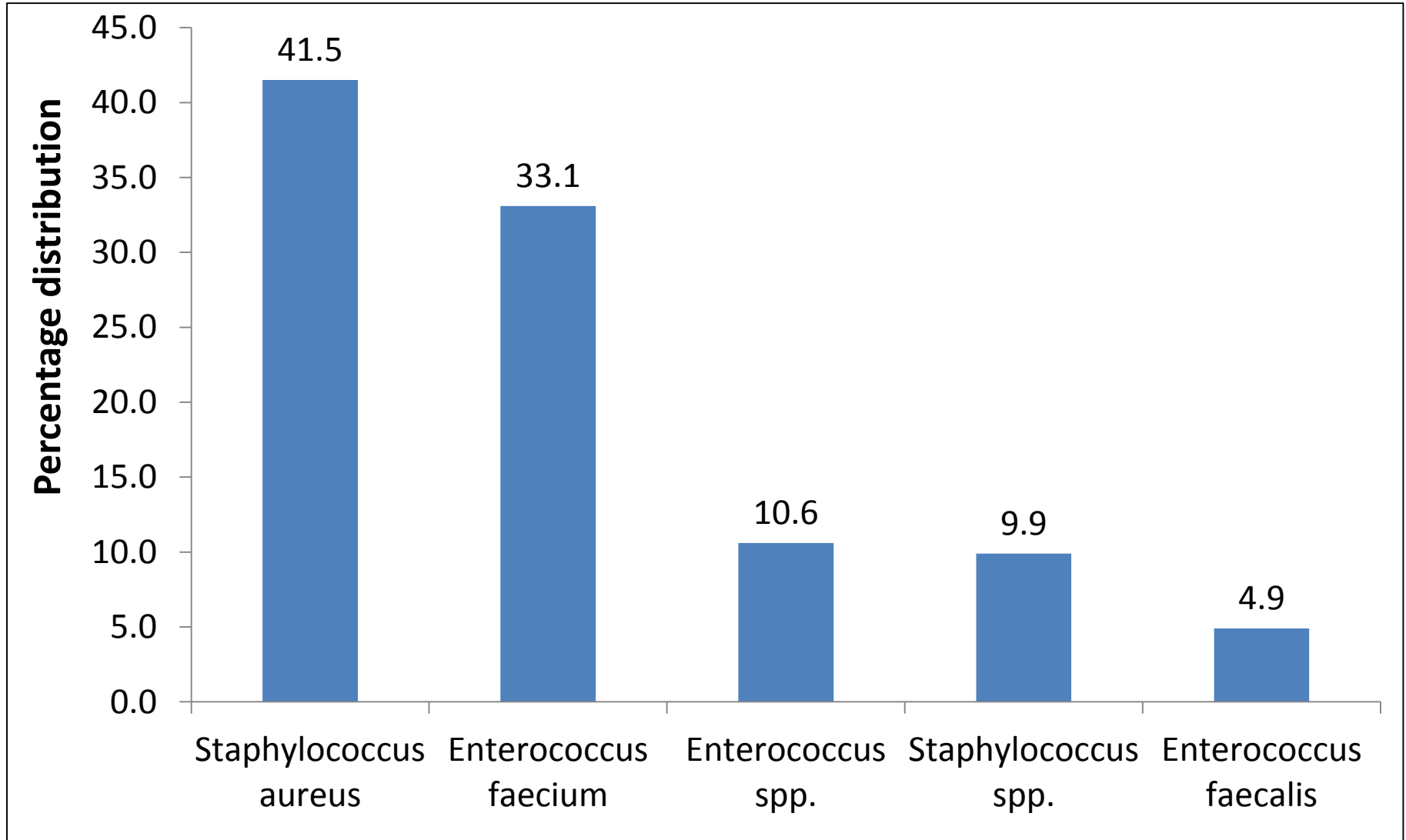
**Percentage distribution of Fungi causing NON-CLABSI N-95**

# Antimicrobial Susceptibility Profile

# *Klebsiella pneumoniae* ; n= 408

| Antibiotic name | Number | %R |
|---|---|---|
| Amikacin | 389 | 64.5 |
| Piperacillin/Tazobactam | 385 | 76.4 |
| Imipenem | 377 | 58.4 |
| Ciprofloxacin | 370 | 75.1 |
| Meropenem | 366 | 69.9 |
| Gentamicin | 338 | 68.9 |
| Cefepime | 333 | 84.7 |
| Colistin | 304 | 9.9 |
| Tigecycline | 290 | 27.6 |
| Ertapenem | 229 | 72.1 |
| Ceftazidime | 222 | 91.9 |
| Trimethoprim/Sulfamethoxazole | 166 | 56.6 |
| Levofloxacin | 148 | 84.5 |
| Minocycline | 133 | 63.2 |
| Doripenem | 93 | 76.3 |
| Doxycycline | 74 | 47.3 |
| Tetracycline | 63 | 47.6 |
| Nitrofurantoin | 42 | 90.5 |
| Moxifloxacin | 12 | 83.3 |

# Klebsiella pneumoniae
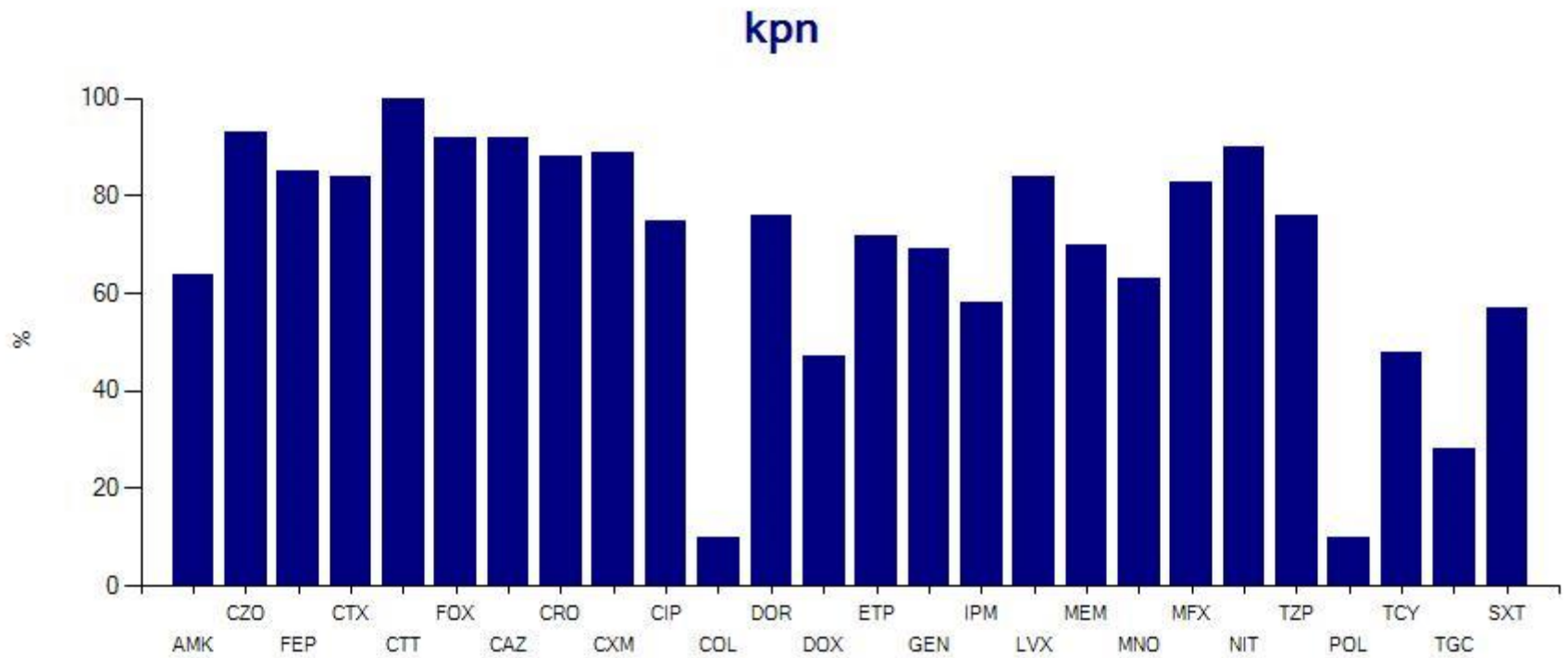
# E. Coli; n= 104

| Antibiotic name | Number | %R |
|---|---|---|
| Amikacin | 96 | 47.9 |
| Ceftazidime | 55 | 87.3 |
| Ciprofloxacin | 90 | 85.6 |
| Colistin | 76 | 2.6 |
| Cefotaxime | 26 | 88.5 |
| Doripenem | 28 | 64.3 |
| Doxycycline | 10 | 40 |
| Ertapenem | 43 | 48.8 |
| Cefepime | 78 | 80.8 |
| Imipenem | 94 | 50 |
| Levofloxacin | 46 | 82.6 |
| Meropenem | 95 | 53.7 |
| Minocycline | 25 | 32 |
| Trimethoprim/Sulfamethoxazole | 42 | 66.7 |
| Tetracycline | 13 | 53.8 |
| Tigecycline | 62 | 1.6 |
| Piperacillin/Tazobactam | 96 | 64.6 |

# E. Coli
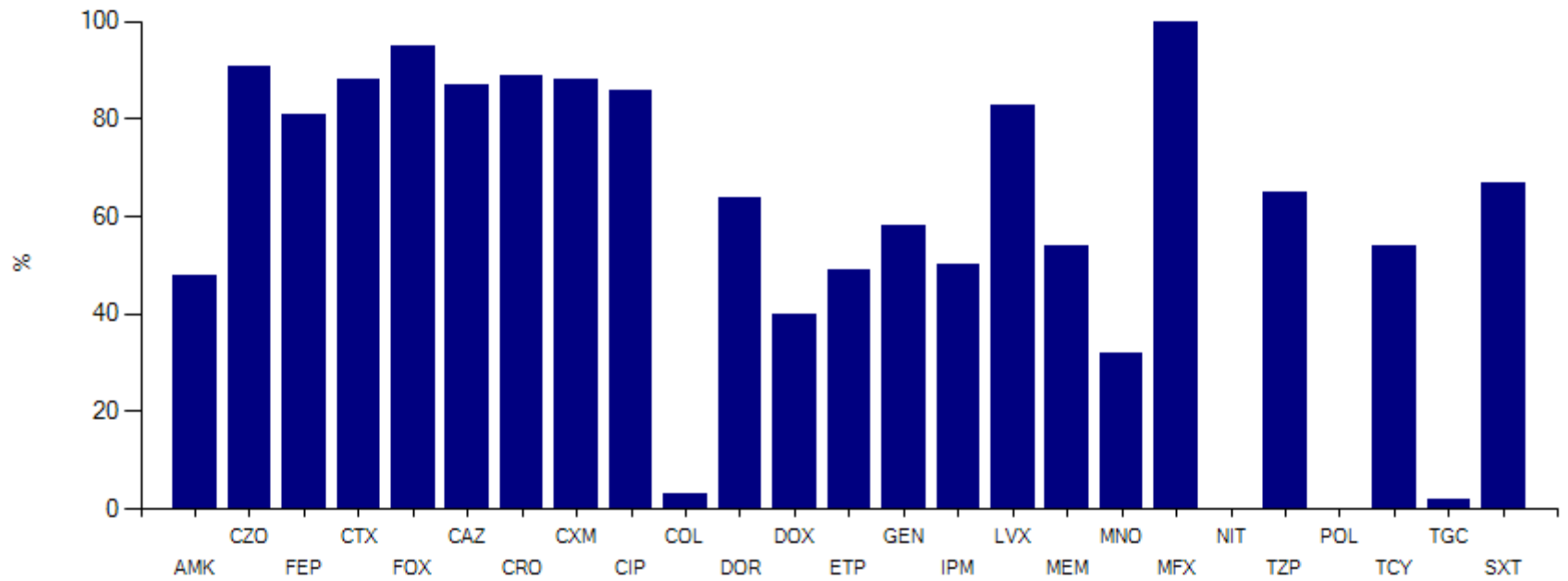
# *Acinetobacter baumannii;* n= 341

| Antibiotic name | Number | %R |
|---|---|---|
| Amikacin | 247 | 88.3 |
| Ceftazidime | 282 | 91.1 |
| Ciprofloxacin | 291 | 87.3 |
| Colistin | 248 | 3.2 |
| Doripenem | 128 | 90.6 |
| Doxycycline | 38 | 50 |
| Imipenem | 308 | 87.3 |
| Levofloxacin | 235 | 78.7 |
| Meropenem | 312 | 83.7 |
| Minocycline | 174 | 34.5 |
| Netilmicin | 81 | 84 |
| Polymixin B | 49 | 20.4 |
| Ampicillin/Sulbactam | 81 | 66.7 |
| Trimethoprim/Sulfamethoxazole | 238 | 81.9 |
| Ticarcillin/Clavulanic acid | 173 | 91.9 |
| Tetracycline | 54 | 74.1 |
| Tobramycin | 86 | 74.4 |
| Piperacillin/Tazobactam | 290 | 87.6 |

# *Acinetobacter baumannii*
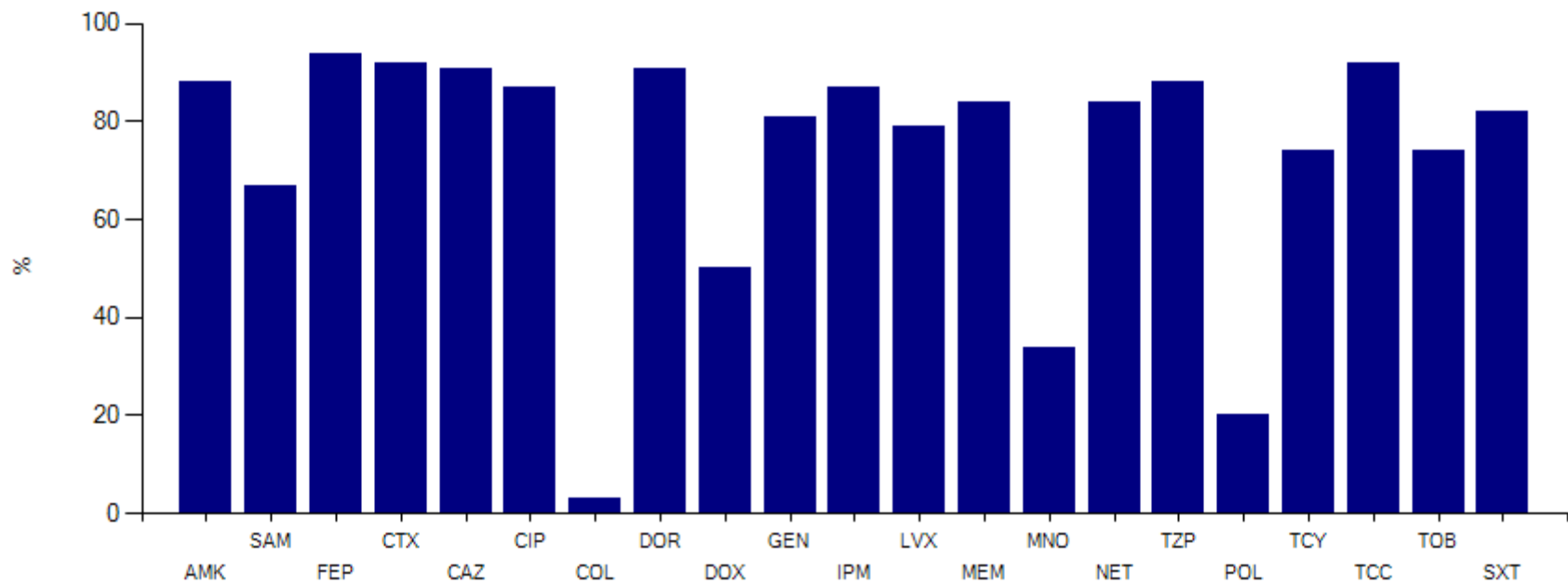
# *Pseudomonas aeruginosa; n= 103*

| Antibiotic name | Number | %R |
|---|---|---|
| Amikacin | 96 | 61.5 |
| Aztreonam | 50 | 42 |
| Ceftazidime | 97 | 63.9 |
| Ciprofloxacin | 87 | 52.9 |
| Colistin | 74 | 2.7 |
| Doripenem | 39 | 43.6 |
| Cefepime | 83 | 60.2 |
| Gentamicin | 80 | 61.2 |
| Imipenem | 93 | 54.8 |
| Levofloxacin | 71 | 60.6 |
| Meropenem | 92 | 48.9 |
| Netilmicin | 29 | 69 |
| Polymixin B | 14 | 7.1 |
| Tobramycin | 45 | 73.3 |
| Piperacillin/Tazobactam | 88 | 44.3 |

# Pseudomonas aeruginosa
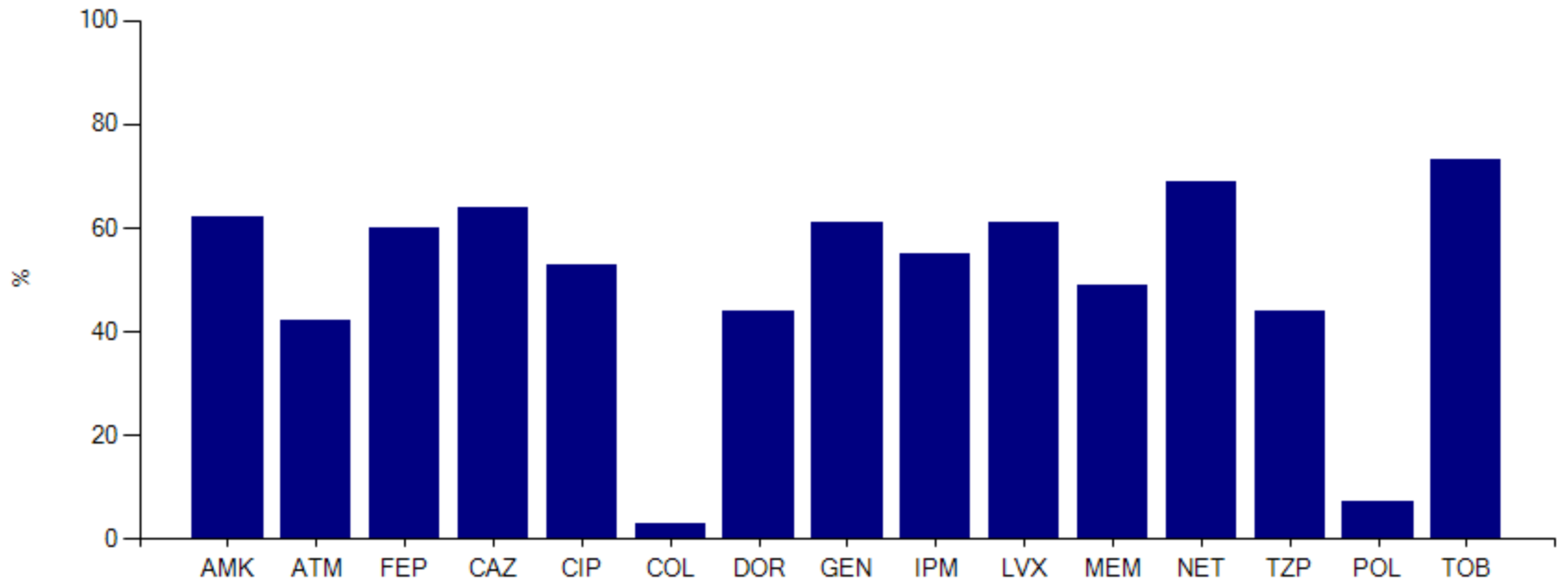
# *Bulkholderia cepaciae; n=58*

| Antibiotic name | Number | %R |
|---|---|---|
| Amoxicillin/Clavulanic acid | 6 | 100 |
| Amikacin | 16 | 93.8 |
| Ampicillin | 1 | 100 |
| Amoxicillin | 1 | 100 |
| Aztreonam | 9 | 77.8 |
| Ceftazidime | 44 | 6.8 |
| Chloramphenicol | 2 | 0 |
| Ciprofloxacin | 12 | 50 |
| Colistin | 15 | 93.3 |
| Ceftriaxone | 6 | 0 |
| Doripenem | 2 | 100 |
| Cefepime | 14 | 35.7 |
| Gentamicin | 24 | 75 |
| Imipenem | 16 | 81.2 |
| Levofloxacin | 50 | 28 |
| Meropenem | 52 | 7.7 |
| Minocycline | 37 | 5.4 |
| Netilmicin | 3 | 100 |
| Polymixin B | 14 | 100 |
| Trimethoprim/Sulfamethoxazole | 37 | 21.6 |
| Ticarcillin/Clavulanic acid | 5 | 100 |
| Tigecycline | 33 | 15.2 |
| Tobramycin | 4 | 100 |
| Piperacillin/Tazobactam | 20 | 60 |

Intrinsic R should not be reported

# *Bulkholderia cepaciae;*



pce
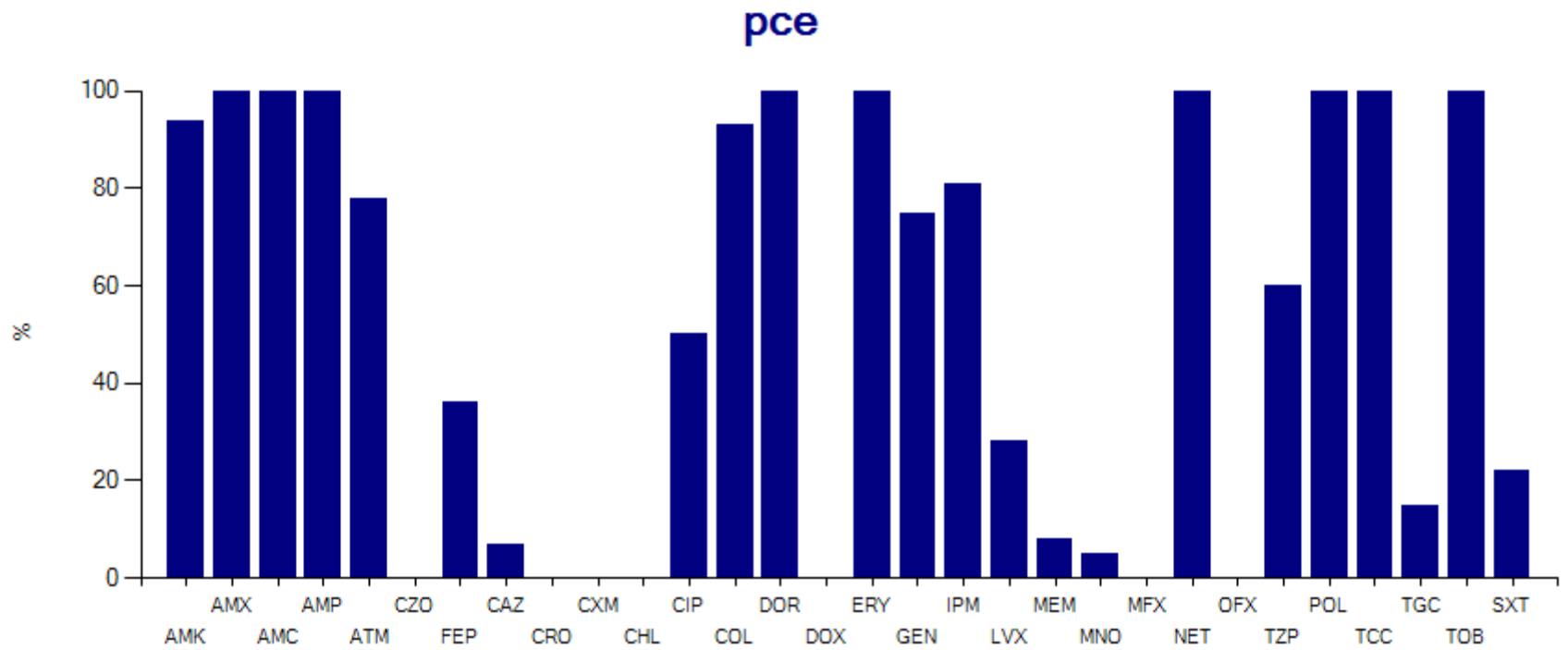
# Enterobacter spp.; n=41

| Antibiotic name | Number | %R |
|---|---|---|
| Amikacin | 38 | 39.5 |
| Ceftazidime | 17 | 70.6 |
| Ciprofloxacin | 31 | 32.3 |
| Colistin | 30 | 3.3 |
| Doripenem | 8 | 12.5 |
| Doxycycline | 8 | 25 |
| Ertapenem | 19 | 31.6 |
| Cefepime | 31 | 51.6 |
| Imipenem | 37 | 29.7 |
| Levofloxacin | 11 | 27.3 |
| Meropenem | 37 | 27 |
| Minocycline | 7 | 14.3 |
| Polymixin B | 6 | 0 |
| Trimethoprim/Sulfamethoxazole | 14 | 57.1 |
| Tigecycline | 22 | 9.1 |
| Piperacillin/Tazobactam | 36 | 33.3 |

# Enterobacter spp.



ecl
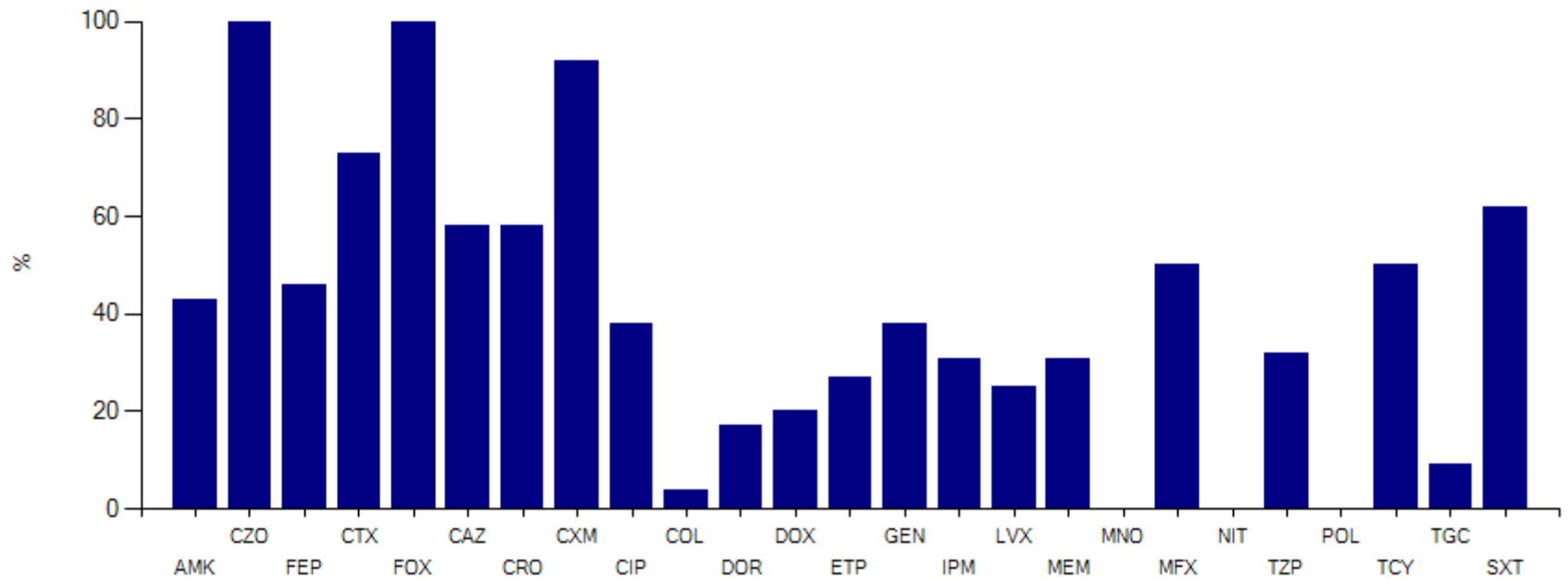
# Staphylococcus aureus; n=107

| Antibiotic name | Number | %R |
|---|---|---|
| Ciprofloxacin | 54 | 63 |
| Clindamycin | 80 | 56.2 |
| Daptomycin | 22 | 4.5 |
| Doxycycline | 21 | 4.8 |
| Erythromycin | 93 | 69.9 |
| Cefoxitin | 45 | 73.3 |
| Gentamicin | 65 | 32.3 |
| Linezolid | 77 | 1.3 |
| Levofloxacin | 63 | 63.5 |
| Moxifloxacin | 7 | 85.7 |
| Minocycline | 6 | 16.7 |
| Nitrofurantoin | 3 | 0 |
| Oxacillin | 36 | 47.2 |
| Rifampin | 24 | 25 |
| Trimethoprim/Sulfamethoxazole | 75 | 45.3 |
| Tetracycline | 50 | 34 |
| Teicoplanin | 36 | 0 |
| Tigecycline | 18 | 0 |
| Vancomycin | 79 | 1.3 |

# Staphylococcus aureus
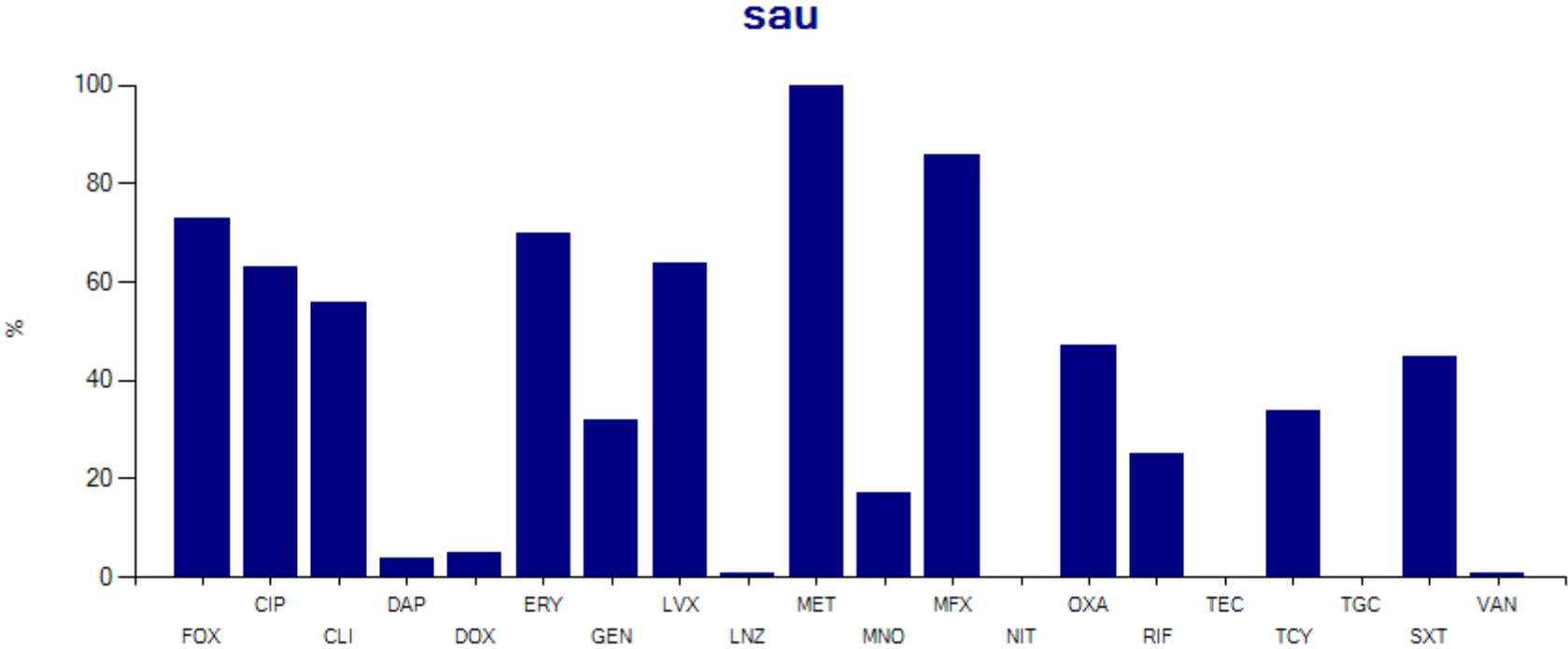
## Enterococcus faecium
## n=97

| Antibiotic name | Number | %R |
|---|---|---|
| Ampicillin | 47 | 89.4 |
| Ciprofloxacin | 60 | 91.7 |
| Daptomycin | 13 | 7.7 |
| Gentamicin-High | 69 | 84.1 |
| Linezolid | 90 | 3.3 |
| Nitrofurantoin | 16 | 25 |
| Teicoplanin | 76 | 30.3 |
| Vancomycin | 95 | 30.5 |

## Enterococcus faecalis
## n=28

| Antibiotic name | Number | %R |
|---|---|---|
| Ampicillin | 19 | 73.7 |
| Ciprofloxacin | 21 | 71.4 |
| Daptomycin | 7 | 0 |
| Gentamicin-High | 16 | 50 |
| Linezolid | 21 | 0 |
| Nitrofurantoin | 1 | 0 |
| Teicoplanin | 14 | 7.1 |
| Vancomycin | 27 | 7.4 |

# Enterococcus faecalis
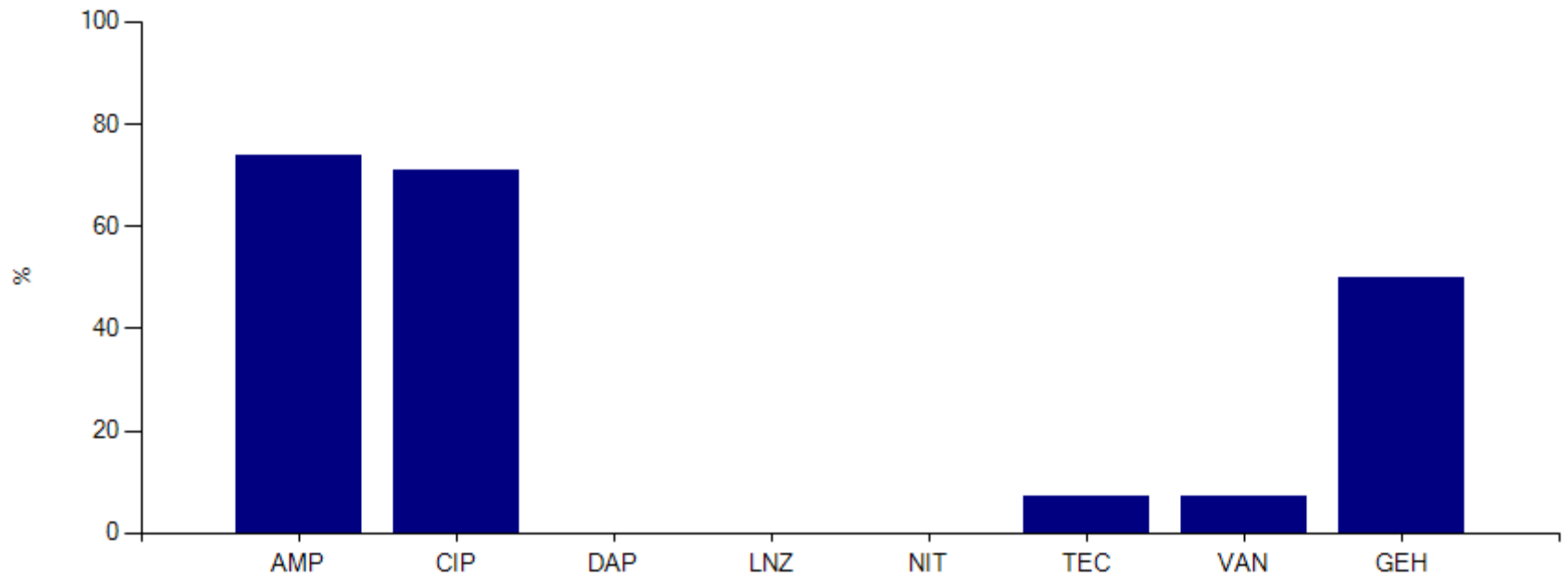
# Enterococcus faecium
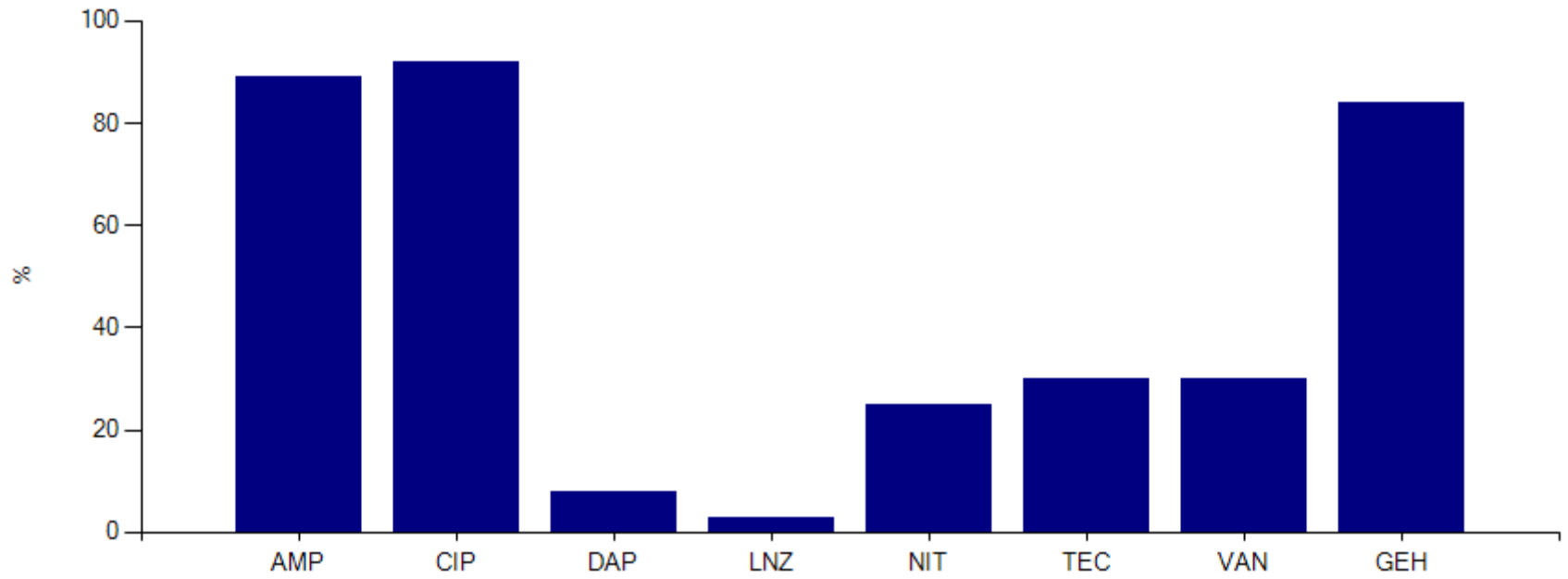
# Candida spp.; n= 221

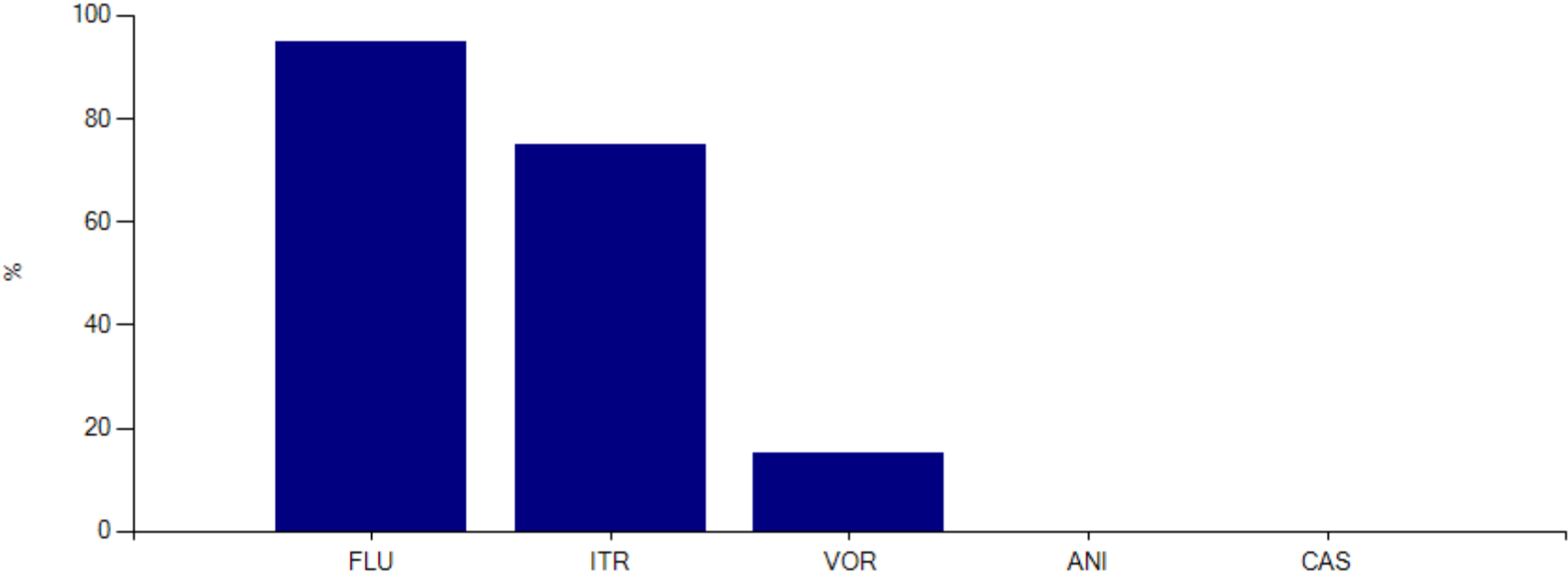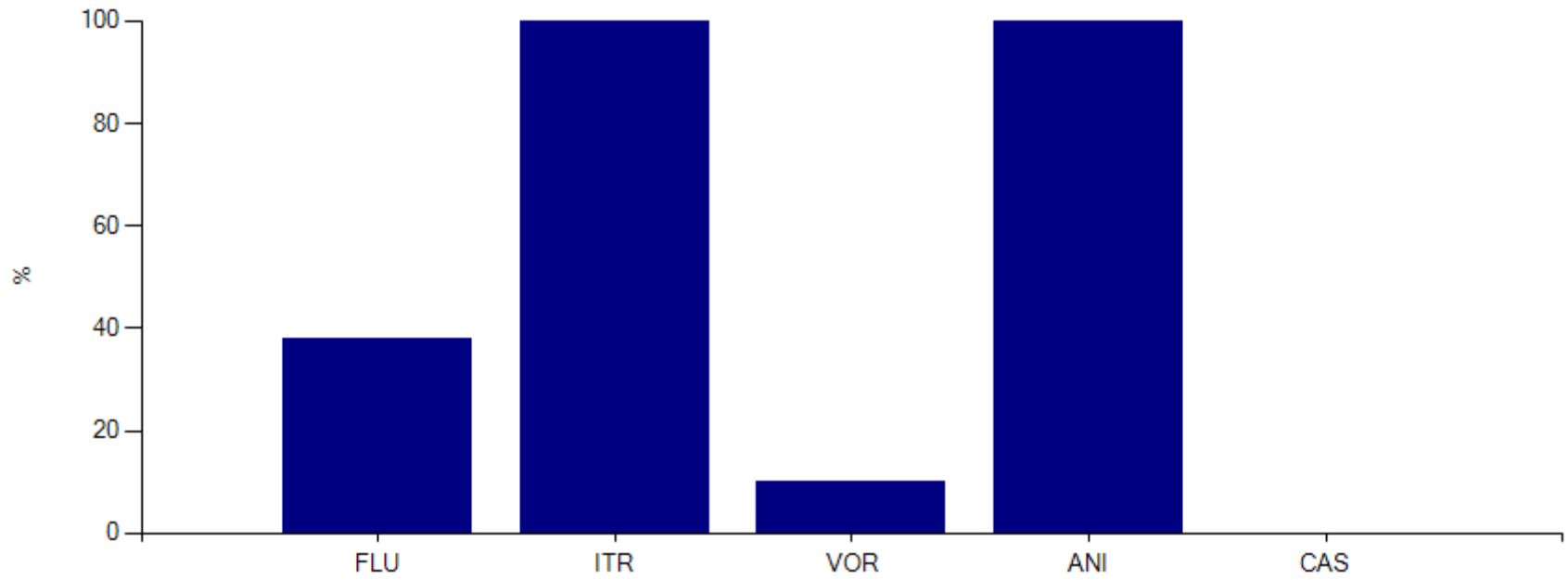| Antibiotic name | Number | %R |
|---|---|---|
| Anidulafungin | 17 | 5.9 |
| Caspofungin | 152 | 1.3 |
| Fluconazole | 184 | 18.5 |
| Itraconazole | 11 | 45.5 |
| Voriconazole | 186 | 3.2 |

# *Candida albicans*
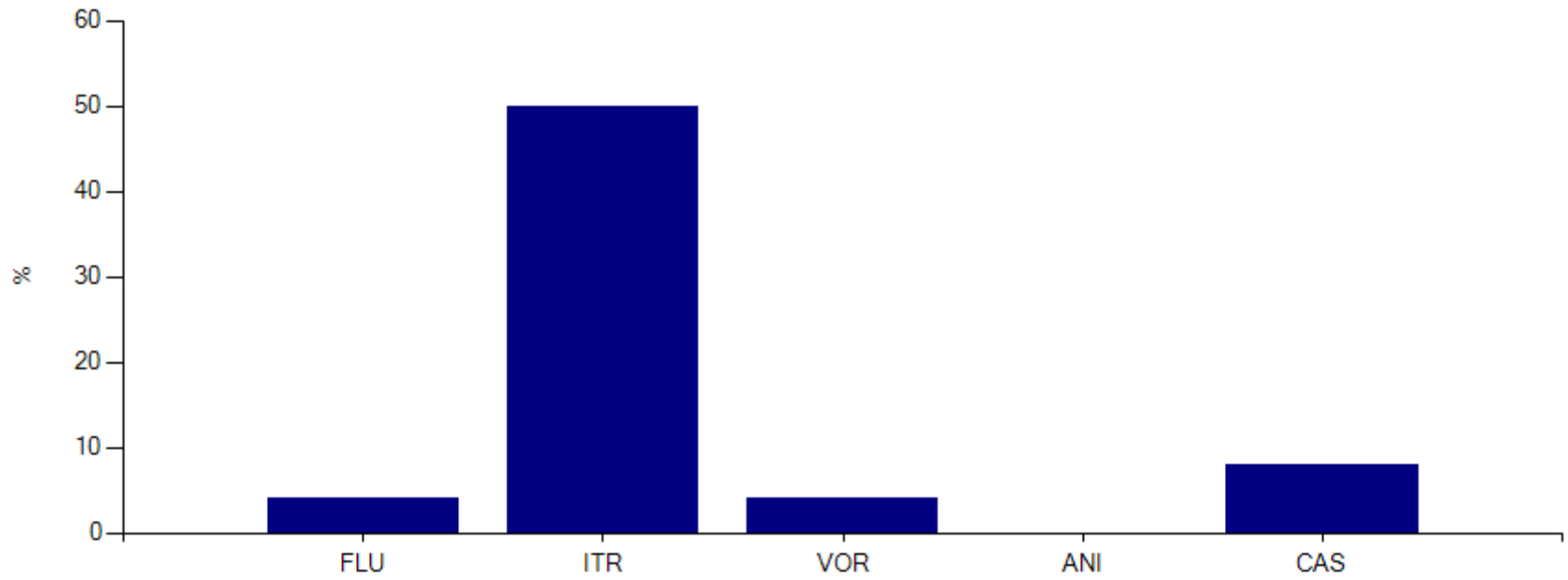
# *Candida auris*

# *Candida parapsilosis*

# UTI

# Number of UTI cases- ICU wise

| ICU Type | Number of UTI cases |
|---|---|
| Medical/Surgical ICU | 128 |
| Medical ICU | 126 |
| Surgical ICU | 62 |
| Pediatric Medical ICU | 53 |
| Neurosurgical ICU | 48 |
| Trauma ICU | 47 |
| Oncologic Medical ICU | 10 |
| Gastrointestinal ICU | 7 |
| High Dependency Unit | 7 |
| Neonatal ICU | 7 |
| Pediatric Medical/Surgical ICU | 6 |
| Respiratory ICU | 6 |
| Oncologic Surgical ICU | 3 |
| Total | 510 |

| Gender | Number | Age Range | Age Median |
|--------|--------|-----------|------------|
| Male | 221 | -1 to 85 | 40 |
| Female | 289 | -1 to 85 | 42 |

| | |
|---|---|
| **Average length of stay in Unit *** | **29** |
| **Range of Stay*** | **>2-213** |
| **Median of Stay*** | **23** |

| | |
|---|---|
| **14 day fatal outcome** | **115 (22.5%)** |
| **Final fatal outcome *** | **174 (34%)** |

**(\* = Episodes with pending final outcomes)**
**No. of episodes without final outcome= 67**

| Duration between DOA in unit and DEO (Days) | Patients | Duration between DOA in unit and DEO (Days) | Patients |
|---|---|---|---|
| | | 31 | 3 |
| 2-3 | 126 | 32 | 3 |
| 4 | 59 | 33 | 1 |
| 5 | 34 | 35 | 2 |
| 6 | 36 | 36 | 1 |
| 7 | 30 | 37 | 2 |
| 8 | 34 | 39 | 2 |
| 9 | 19 | 40 | 2 |
| 10 | 23 | 42 | 2 |
| 11 | 22 | 45 | 2 |
| 12 | 10 | 48 | 1 |
| 13 | 13 | 50 | 2 |
| 14 | 15 | 51 | 1 |
| 15 | 9 | 53 | 2 |
| 16 | 19 | 54 | 3 |
| 17 | 8 | 60 | 1 |
| 18 | 7 | 61 | 1 |
| 19 | 7 | 63 | 1 |
| 20 | 8 | 66 | 1 |
| 21 | 2 | 68 | 1 |
| 22 | 4 | 77 | 1 |
| 23 | 2 | 78 | 1 |
| 24 | 3 | 80 | 1 |
| 25 | 5 | 81 | 1 |
| 26 | 3 | 90 | 1 |
| 27 | 3 | 144 | 1 |
| 28 | 4 | 173 | 1 |
| 29 | 2 | 333 | 1 |
| 30 | 6 | | |

- Range : 2- 333 Days

- Median: 30

- What about repeat CRFs from one case?

- Implications for Prevention?

# Data from May, 2017 to June, 2018
## (Organisms causing UTI)

| Organism Type | Number |
|---|---|
| Gram Negative | 268 |
| Candida | 174 |
| Gram Positive | 113 |
| Total | 555 |

**Distribution of organisms causing UTI**



Gram Negative 48%

Fungus 31%

Gram Positive 21%
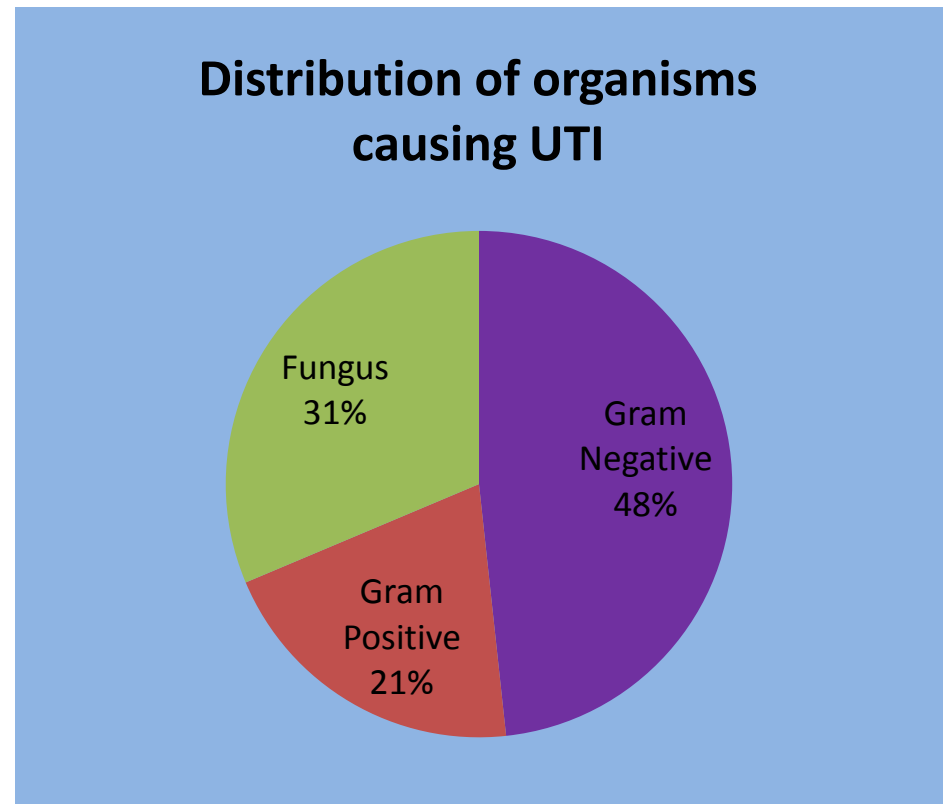
# Data from May, 2017 to June, 2018

| UTI Type | Number |
|----------|--------|
| CAUTI | 479 (94%) |
| Non CAUTI | 31 |
| Total | 510 |

# UTI Rates

| | |
|---|---|
| **Patient Days** | **260,013** |
| **Urinary Catheter Days** | **162,569** |
| **CAUTI** | **474** |
| **NON- CAUTI** | **31** |

| | |
|---|---|
| **Total UTI Rate** | **1.94** |
| **CAUTI Rate** | **2.92** |
| **NON-CAUTI Rate** | **0.12** |

# UTI causing Organisms

| Organisms | Number |
|---|---|
| *Candida spp.* | 167 |
| *Enterococcus spp.* | 111 |
| *Escherichia coli* | 90 |
| *Klebsiella spp.* | 68 |
| *Pseudomonas spp.* | 39 |
| *Acinetobacter spp.* | 23 |
| *Proteus spp.* | 11 |
| *Citrobacter spp.* | 9 |
| *Providencia spp.* | 9 |
| *Enterobacter spp.* | 7 |
| *Trichosporon spp.* | 7 |
| *Myroides spp* | 4 |
| *Morganella morganii* | 3 |
| *Staphylococcus aureus* | 2 |
| *Burkholderia spp* | 1 |
| *Chryseobacterium sp* | 1 |
| *Ralstonia spp.* | 1 |
| *Serratia marcescens* | 1 |
| *S. maltophilia* | 1 |
| Total | 555 |

| Organisms | Number |
|---|---|
| *Enterococcus faecium* | 63 |
| *Klebsiella pneumoniae* | 58 |
| *Pseudomonas aeruginosa* | 32 |
| *Enterococcus faecalis* | 22 |
| *Acinetobacter baumannii* | 17 |
| *Citrobacter freundii* | 5 |
| *Enterobacter aerogenes* | 3 |
| *Staphylococcus aureus* | 2 |
| *Burkholderia cepaciae* | 1 |

# Gram Negative Organisms causing UTI

| Organism Name | Number (%) |
|---|---|
| *Escherichia coli* | 90  (33.6) |
| *Klebsiella* spp. | 68  (25.4) |
| *Pseudomonas* spp. | 39  (14.6) |
| *Acinetobacter* spp. | 23  (8.6) |
| *Proteus* spp. | 11  (4.1) |
| *Citrobacter* spp. | 9  (3.4) |
| *Providencia* spp. | 9  (3.4) |
| *Enterobacter* spp. | 7  (2.6) |
| *Myroides* spp. | 7  (2.6) |
| *Burkholderia cepaciae* | 1  (0.4) |
| *Chryseobacterium indologenes* | 1  (0.4) |
| *Ralstonia* spp. | 1  (0.4) |
| *Serratia marcescens* | 1  (0.4) |
| *Stenotrophomonas maltophilia* | 1  (0.4) |
| *Total* | 268 |

| Organism Name (Species level) | Number (%) |
|---|---|
| *Klebsiella pneumoniae* | 58/68 (85.3) |
| *Pseudomonas aeruginosa* | 32/39 (82.1) |
| *Acinetobacter baumannii* | 17/23 (73.9) |
| *Proteus mirabilis* | 9/11  (81.8) |
| *Citrobacter freundii* | 5/9 (55.6) |
| *Citrobacter koseri* | 3/9 (33.3) |
| *Enterobacter aerogenes* | 3/7  (42.9) |
| *Enterobacter cloacae* | 1/7  (14.3) |

# Gram Positive Organisms causing UTI

| Organism Name | Number (%) |
|---|---|
| *Enterococcus faecium* | 63  (55.8) |
| *Enterococcus* spp. | 26  (23) |
| *Enterococcus faecalis* | 22  (19.5) |
| *Staphylococcus aureus* | 2  (1.8) |
| Total | 113 |

# Distribution of Candida sp causing UTI

| Organism Name | Number (%) |
|---|---|
| *Candida spp.* | 43  (24.7) |
| *Candida tropicalis* | 41  (23.6) |
| *Candida albicans* | 39  (22.4) |
| *Candida auris* | 11  (6.3) |
| *Candida glabrata* | 9  (5.2) |
| *Candida parapsilosis* | 8  (4.6) |
| *Trichosporon ashaii* | 6  (3.4) |
| *Candida utilis* | 4  (2.3) |
| *Candida lusitaniae* | 3  (1.7) |
| *Candida non-albicans* | 3  (1.7) |
| *Candida cryptococcus laurentii* | 1  (0.6) |
| *Candida famata* | 1  (0.6) |
| *Candida kefyr* | 1  (0.6) |
| *Candida krusei* | 1  (0.6) |
| *Candida pelliculosa* | 1  (0.6) |
| *Candida pseudotropicalis* | 1  (0.6) |
| *Trichosporon spp.* | 1  (0.6) |
| Total | 174 |

# Distribution of Organism causing UTI

| Total CAUTI CRFs | 479 |
|---|---|
| GN | 249 (47.7) |
| GP | 107 (20.5) |
| Candida | 165 (31.6) |
| Total organisms | 521 |

| Total Non-CAUTI CRFs | 31 |
|---|---|
| GN | 19 (56) |
| GP | 6 (17.6) |
| Candida | 9 (26.4) |
| Total organisms | 34 |

# Polymicrobial event

|  | No. of episode |
|---|---|
| 2 Gram Negatives | 14 |
| 1 Gram Negative & 1 Gram Positive | 5 |
| 1 Candida & 1 Gram Negative | 2 |
| 1 Candida & 1 Gram Positive | 6 |
| 2 Candida | 1 |
| 1 Candida & 1 GN & 1 GP | 1 |

# Percentage distribution of Gram Negative Organism causing CAUTI
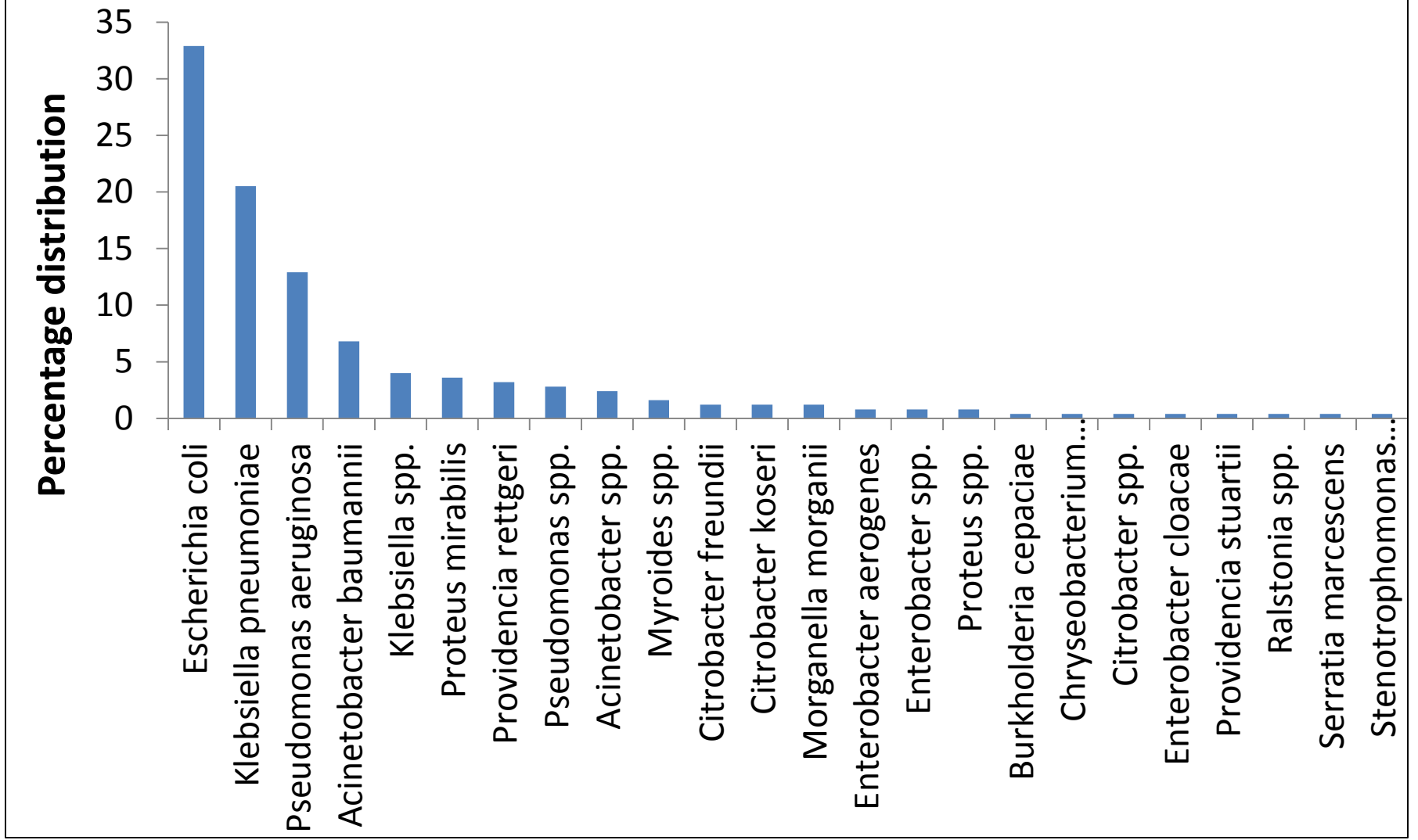
# Percentage distribution of Gram Positive Organism causing CAUTI
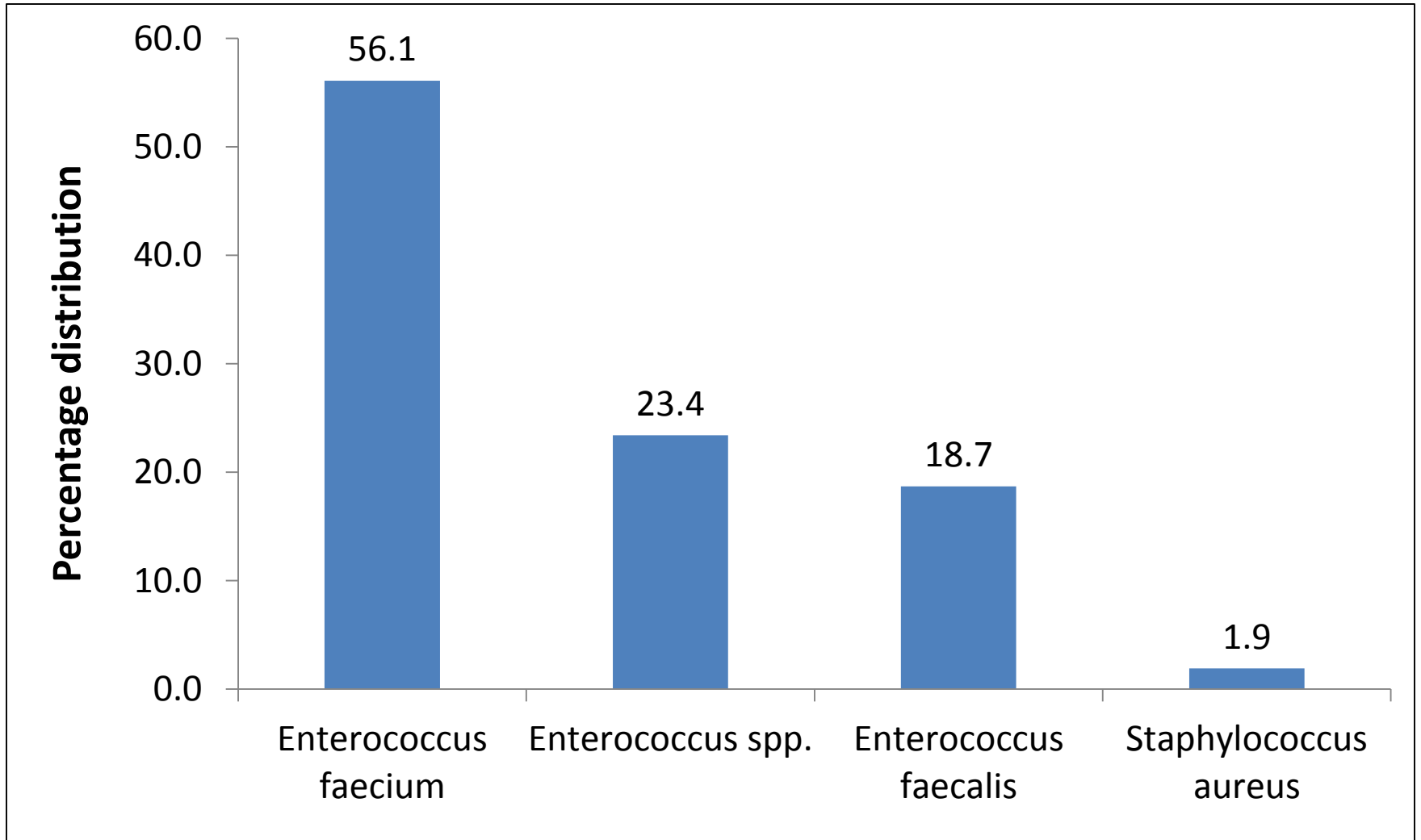
**Percentage distribution of Candida causing CAUTI**
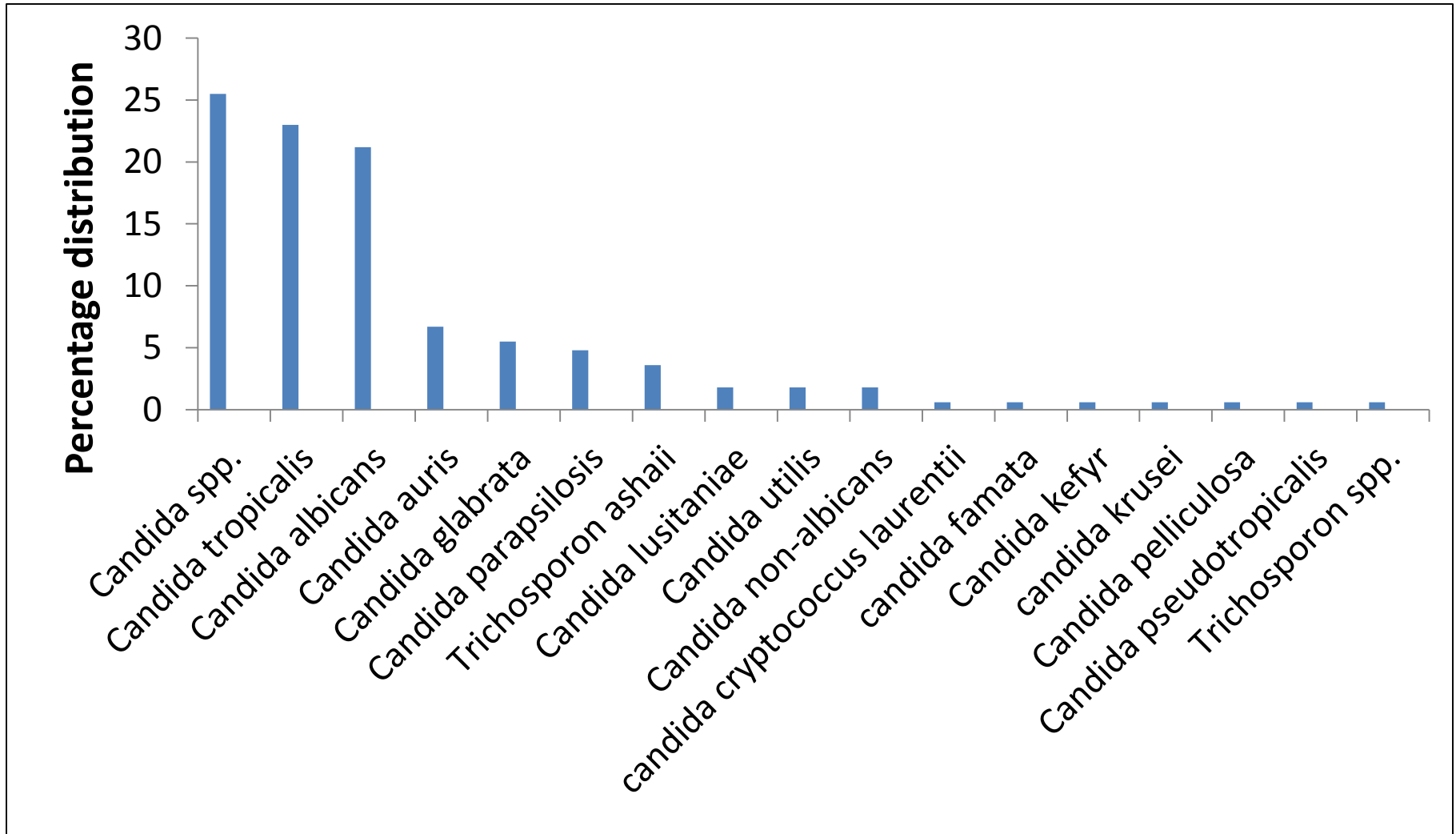
**Percentage distribution of Gram Negative Organism causing Non-CAUTI**
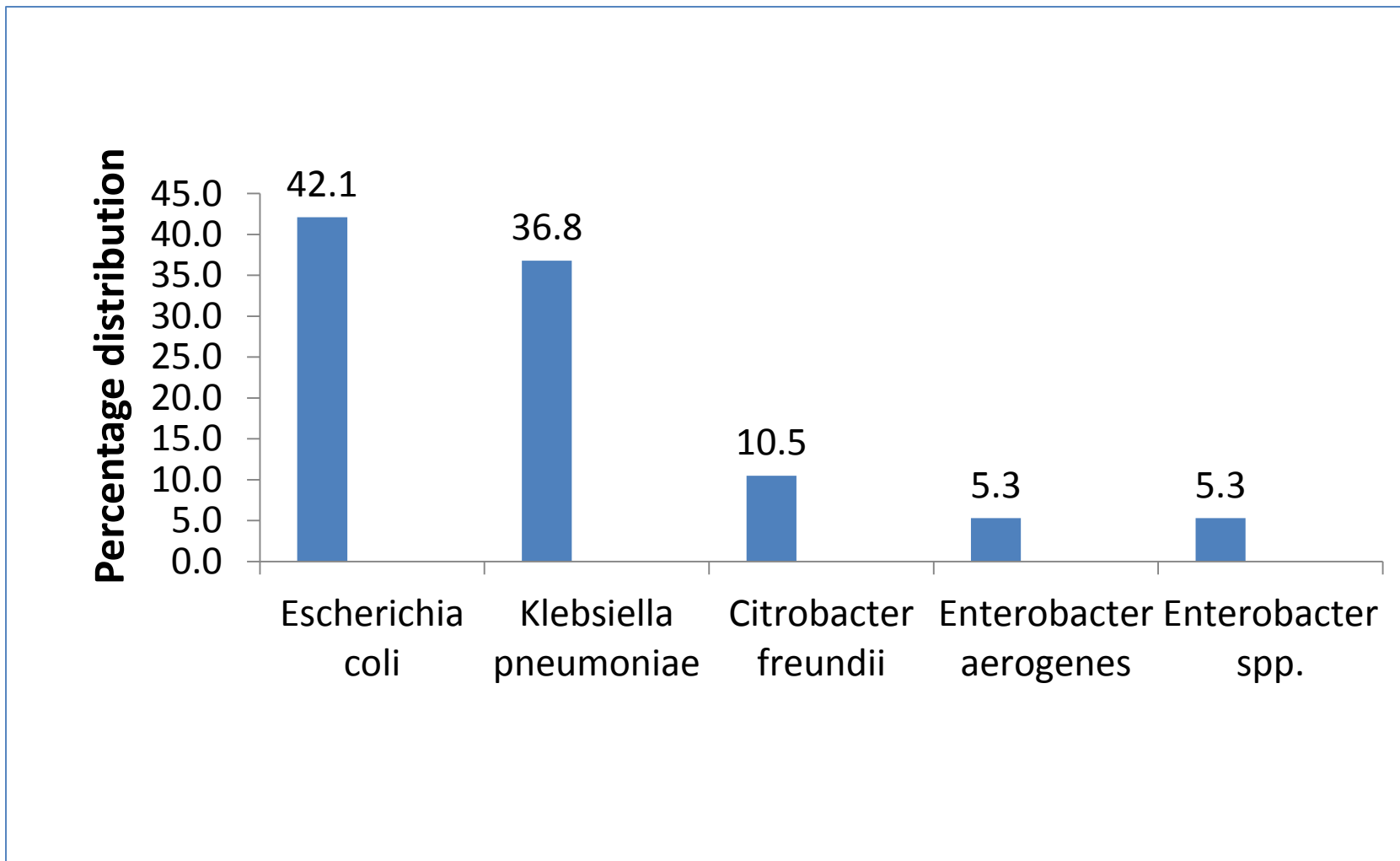
**Percentage distribution of Gram Positive Organism causing Non-CAUTI**
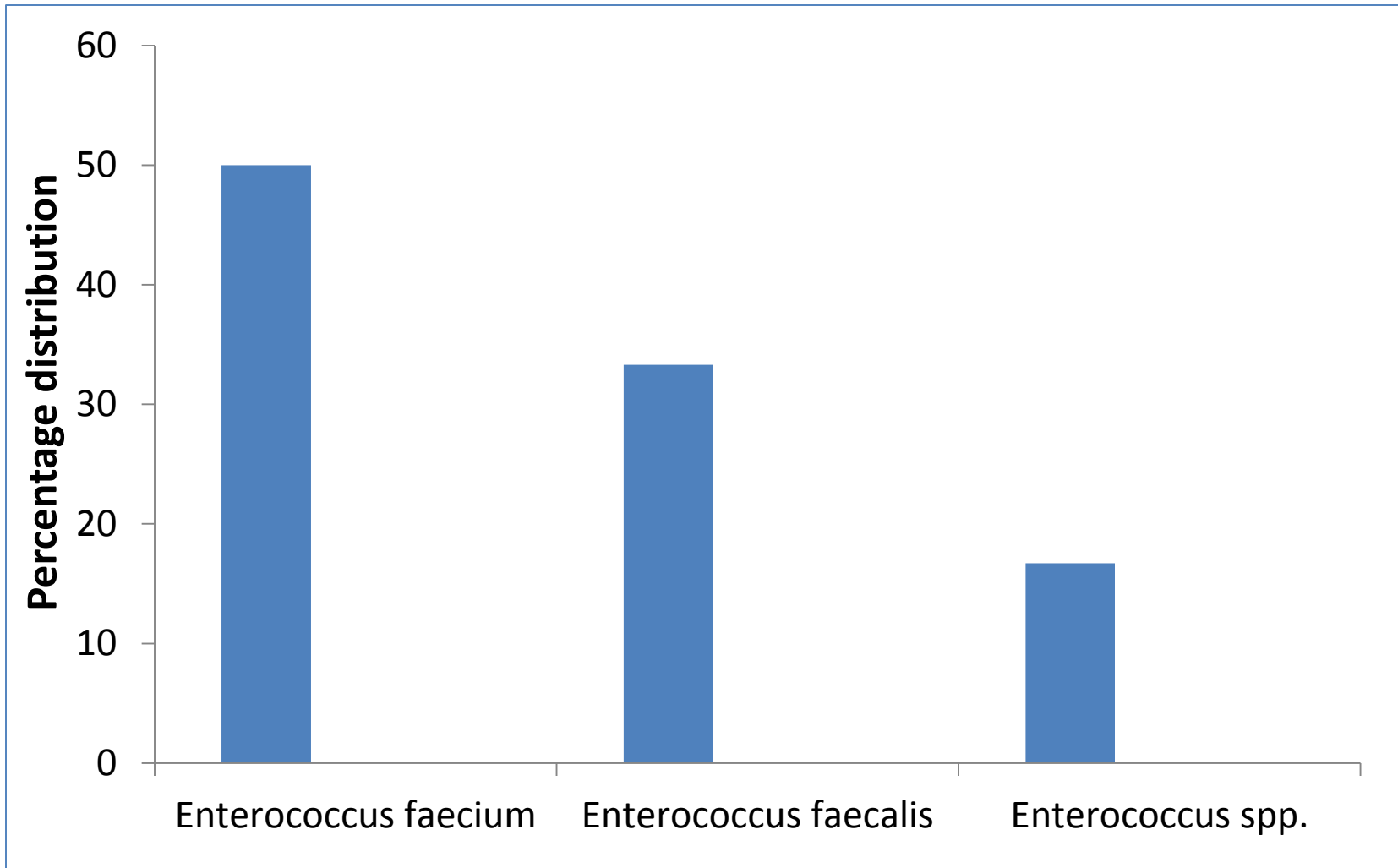
# Percentage distribution of Candida causing Non-CAUTI
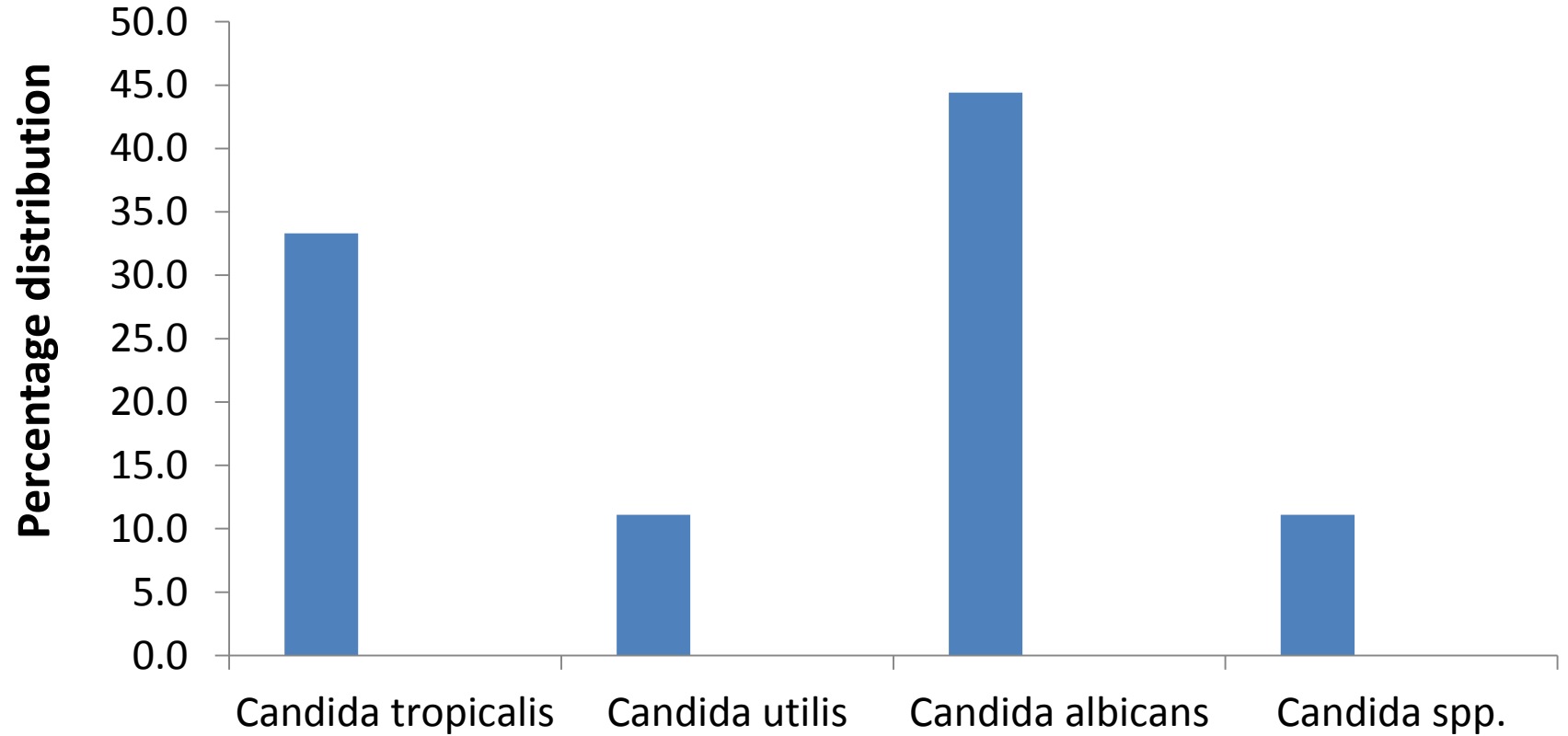
# UTI causing Candida

| Candida Spp. | Number |
|---|---|
| *Candida* spp. | 43 |
| *Candida tropicalis* | 41 |
| *Candida albicans* | 39 |
| *Candida auris* | 11 |
| *Candida glabrata* | 9 |
| *Candida parapsilosis* | 8 |
| *Candida utilis* | 4 |
| *Candida lusitaniae* | 3 |
| *Candida non-albicans* | 3 |
| *candida cryptococcus laurentii* | 1 |
| *candida famata* | 1 |
| *Candida kefyr* | 1 |
| *candida krusei* | 1 |
| *Candida pelliculosa* | 1 |
| *Candida pseudotropicalis* | 1 |
| Total | 167 |

# *Klebsiella pneumoniae; n= 58*

| Antibiotic name | Number | %R |
|---|---|---|
| Amikacin | 52 | 63.5 |
| Ceftazidime | 29 | 93.1 |
| Ciprofloxacin | 53 | 71.7 |
| Colistin | 39 | 7.7 |
| Doripenem | 18 | 77.8 |
| Ertapenem | 36 | 72.2 |
| Cefepime | 34 | 82.4 |
| Imipenem | 46 | 67.4 |
| Levofloxacin | 25 | 80 |
| Meropenem | 40 | 70 |
| Minocycline | 13 | 46.2 |
| Nitrofurantoin | 33 | 72.7 |
| Trimethoprim/Sulfamethoxazole | 27 | 63 |
| Piperacillin/Tazobactam | 49 | 73.5 |

# Klebsiella pneumoniae
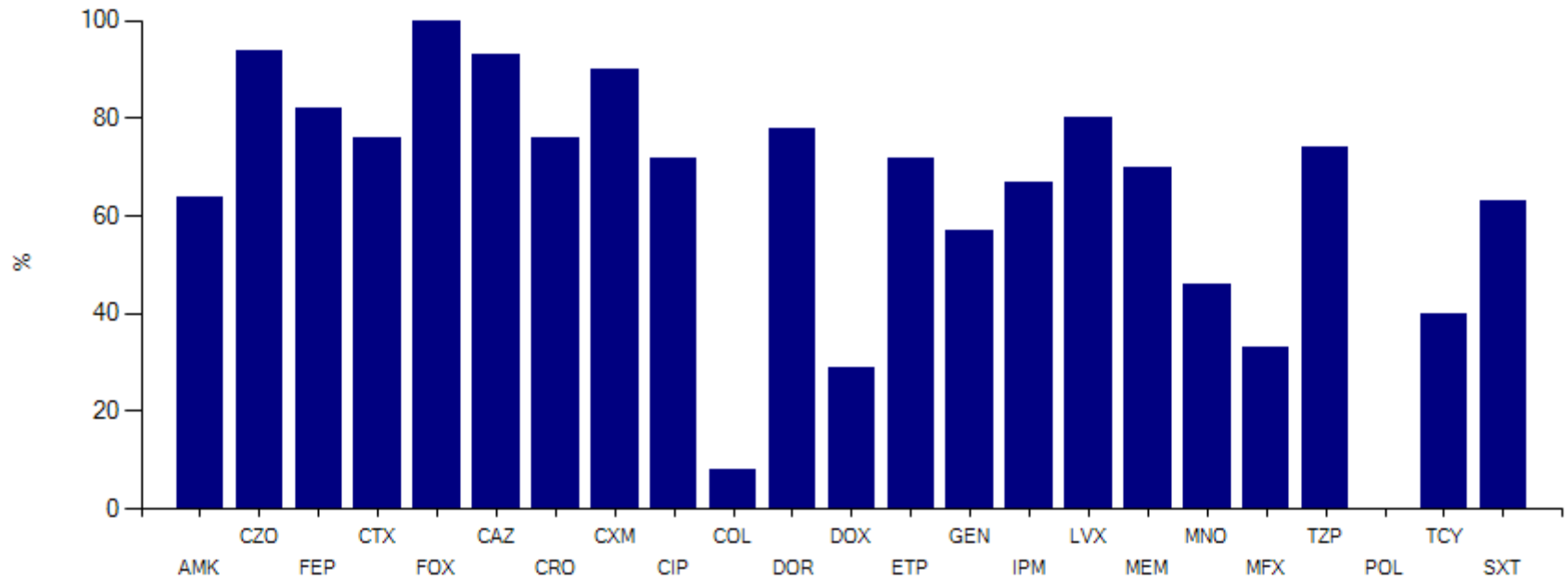
# E. coli, n= 90

| Antibiotic name | Number | %R |
|---|---|---|
| Amikacin | 86 | 47.7 |
| Ceftazidime | 42 | 85.7 |
| Ciprofloxacin | 80 | 87.5 |
| Colistin | 54 | 0 |
| Doripenem | 28 | 53.6 |
| Doxycycline | 17 | 58.8 |
| Ertapenem | 46 | 63 |
| Imipenem | 72 | 54.2 |
| Levofloxacin | 45 | 80 |
| Meropenem | 70 | 52.9 |
| Minocycline | 18 | 72.2 |
| Nitrofurantoin | 61 | 16.4 |
| Trimethoprim/Sulfamethoxazole | 51 | 78.4 |
| Tetracycline | 18 | 61.1 |
| Piperacillin/Tazobactam | 75 | 68 |

# E. coli
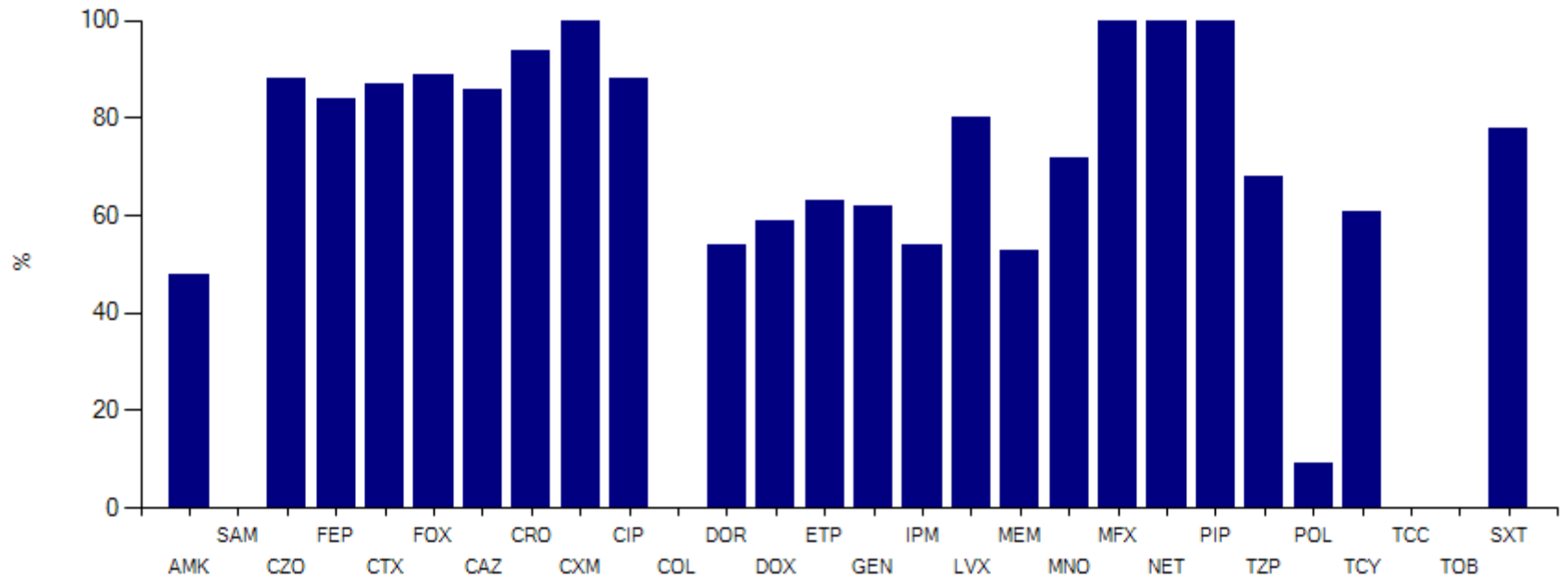
# *Acinetobacter baumannii, n= 17*

| Antibiotic name | Number | %R |
|---|---|---|
| Amikacin | 14 | 92.9 |
| Ceftazidime | 12 | 100 |
| Ciprofloxacin | 15 | 93.3 |
| Colistin | 10 | 10 |
| Doripenem | 7 | 100 |
| Gentamicin | 13 | 92.3 |
| Imipenem | 15 | 86.7 |
| Levofloxacin | 12 | 83.3 |
| Meropenem | 14 | 64.3 |
| Minocycline | 5 | 20 |
| Ampicillin/Sulbactam | 7 | 71.4 |
| Trimethoprim/Sulfamethoxazole | 11 | 81.8 |
| Ticarcillin/Clavulanic acid | 9 | 100 |
| Tetracycline | 6 | 83.3 |
| Tobramycin | 6 | 83.3 |
| Piperacillin/Tazobactam | 16 | 93.8 |

# *Acinetobacter baumannii*
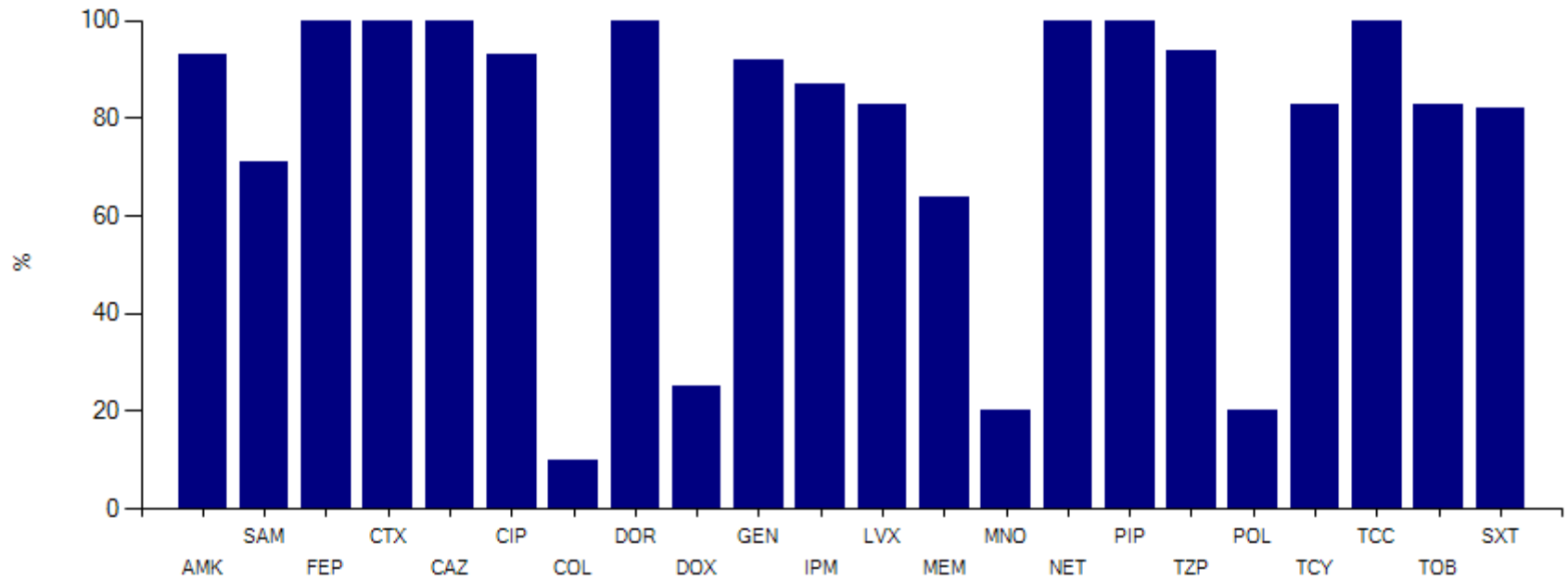
# *Pseudomonas aeruginosa*; n= 32

| Antibiotic name | Number | %R |
|---|---|---|
| Amikacin | 29 | 75.9 |
| Aztreonam | 22 | 59.1 |
| Ceftazidime | 29 | 89.7 |
| Ciprofloxacin | 29 | 79.3 |
| Colistin | 20 | 0 |
| Doripenem | 14 | 71.4 |
| Imipenem | 29 | 55.2 |
| Levofloxacin | 24 | 83.3 |
| Meropenem | 30 | 66.7 |
| Netilmicin | 10 | 90 |
| Tobramycin | 21 | 85.7 |
| Piperacillin/Tazobactam | 28 | 64.3 |

# Pseudomonas aeruginosa
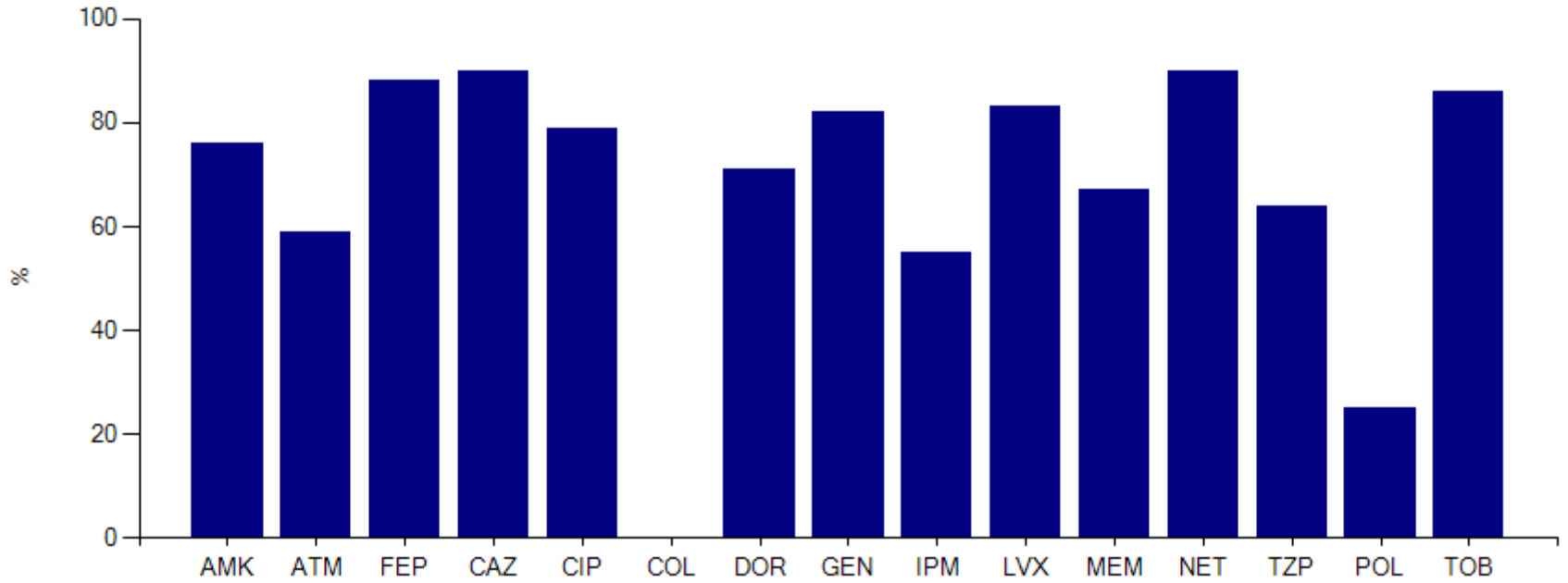
## *Enterococcus faecalis* n=22

| Antibiotic name | Number | %R |
|---|---|---|
| Ampicillin | 15 | 93.3 |
| Ciprofloxacin | 16 | 100 |
| Daptomycin | 2 | 0 |
| Gentamicin-High | 8 | 62.5 |
| Linezolid | 14 | 0 |
| Nitro | 14 | 57.1 |
| Teicoplanin | 8 | 25 |
| Vancomycin | 22 | 13.6 |

## *Enterococcus faecium* n= 63

| Antibiotic name | Number | %R |
|---|---|---|
| Ampicillin | 45 | 97.8 |
| Ciprofloxacin | 55 | 100 |
| Daptomycin | 18 | 0 |
| Gentamicin-High | 42 | 88.1 |
| Linezolid | 58 | 10.3 |
| Nitro | 39 | 69.2 |
| Teicoplanin | 51 | 52.9 |
| Vancomycin | 63 | 49.2 |

# Enterococcus faecalis
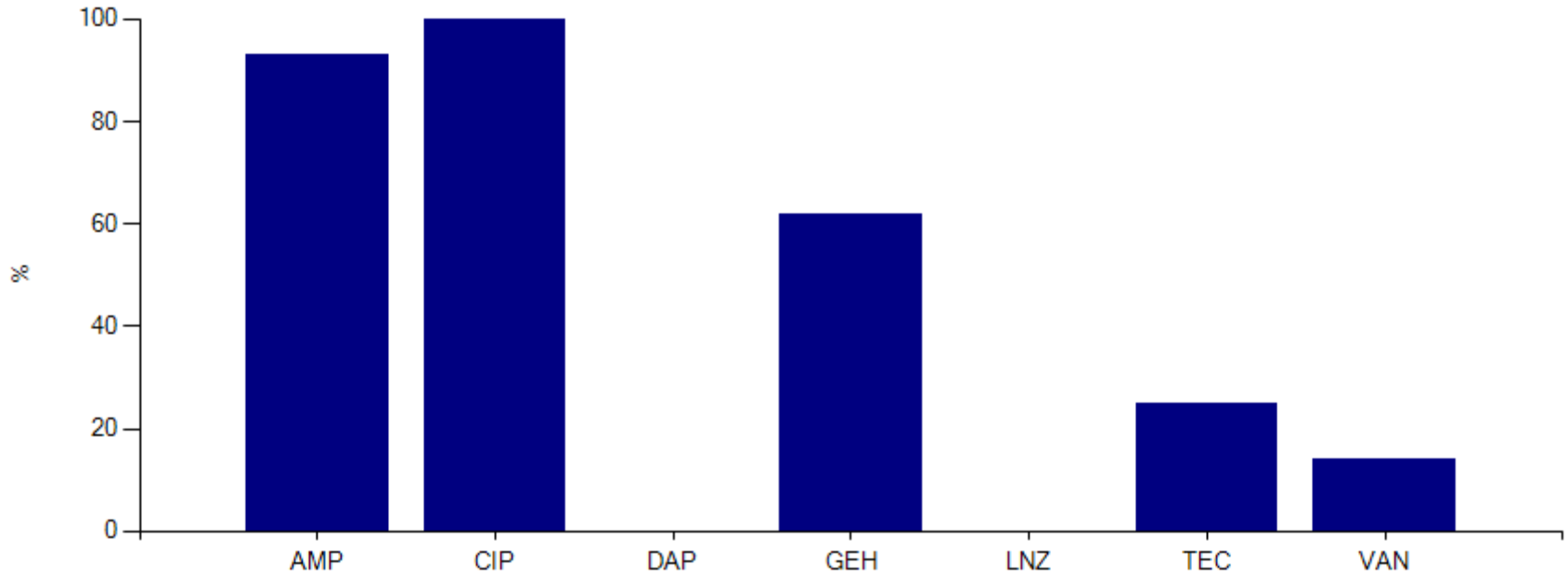
# Enterococcus faecium
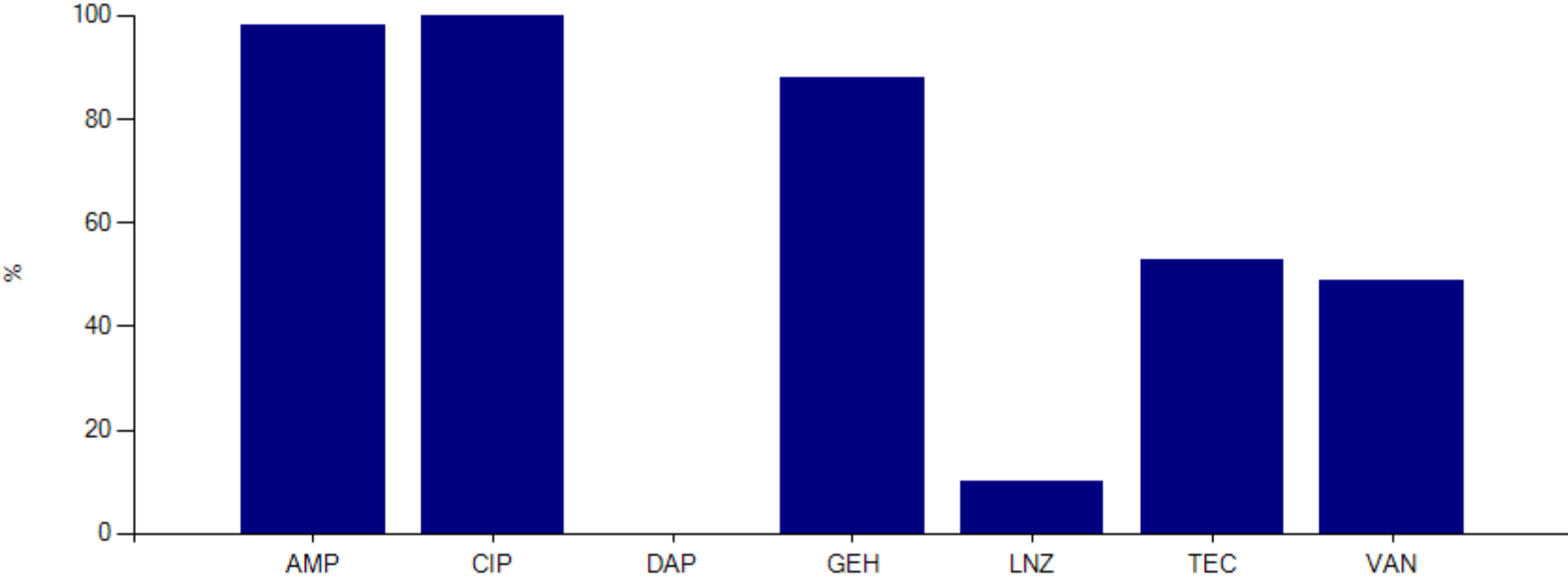
# Candida spp.; N= 167

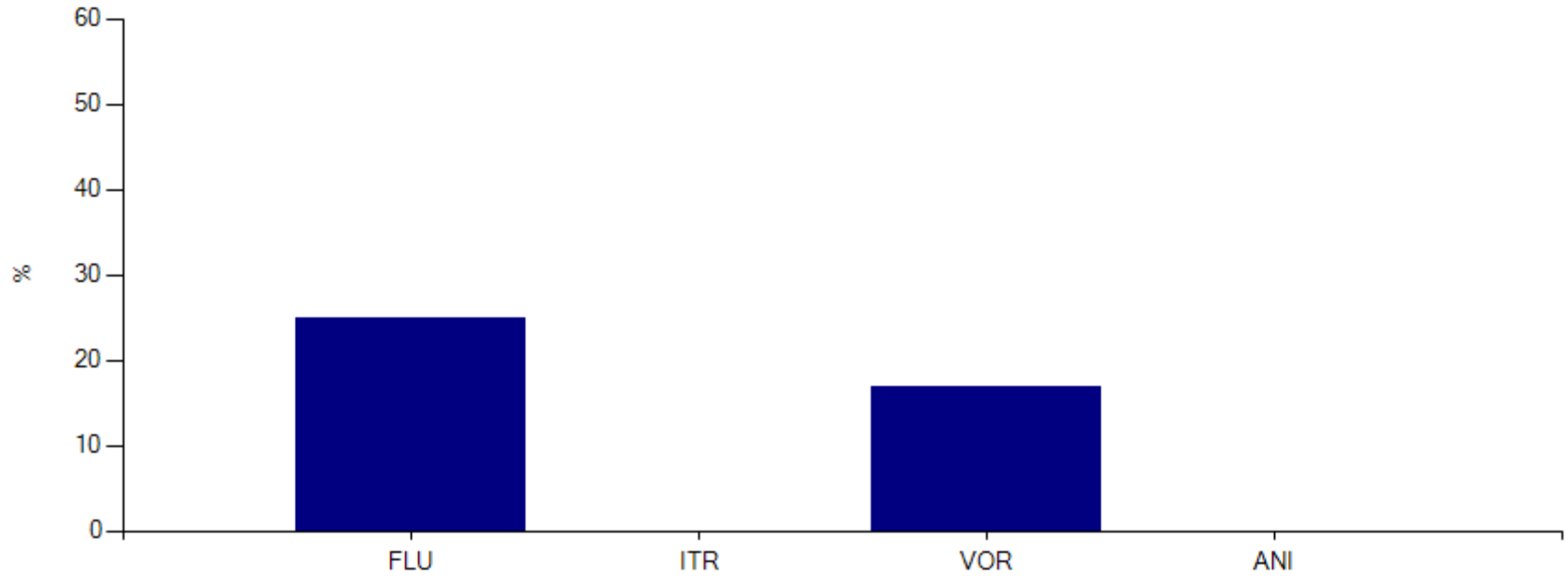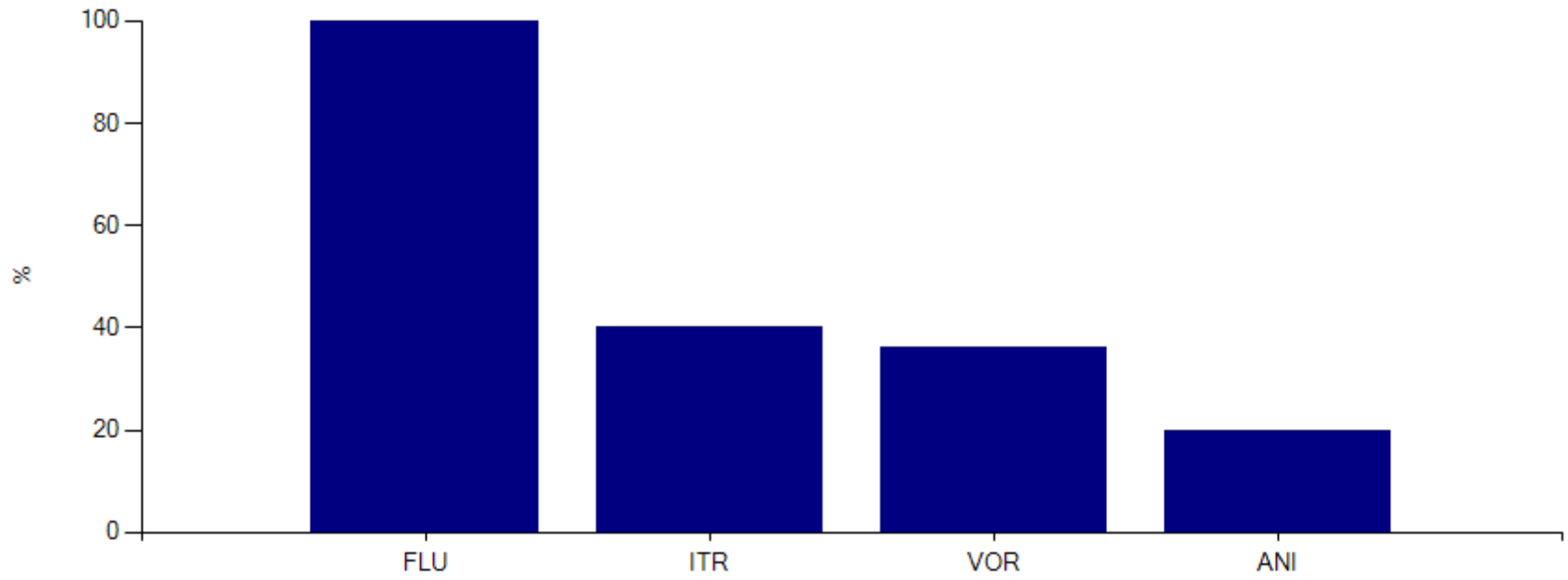| Antibiotic name | Number | %R |
|---|---|---|
| Anidulafungin | 19 | 26.3 |
| Caspofungin | 74 | 4.1 |
| Fluconazole | 117 | 18.8 |
| Itraconazole | 15 | 40 |
| Voriconazole | 109 | 8.3 |

# Candida albicans
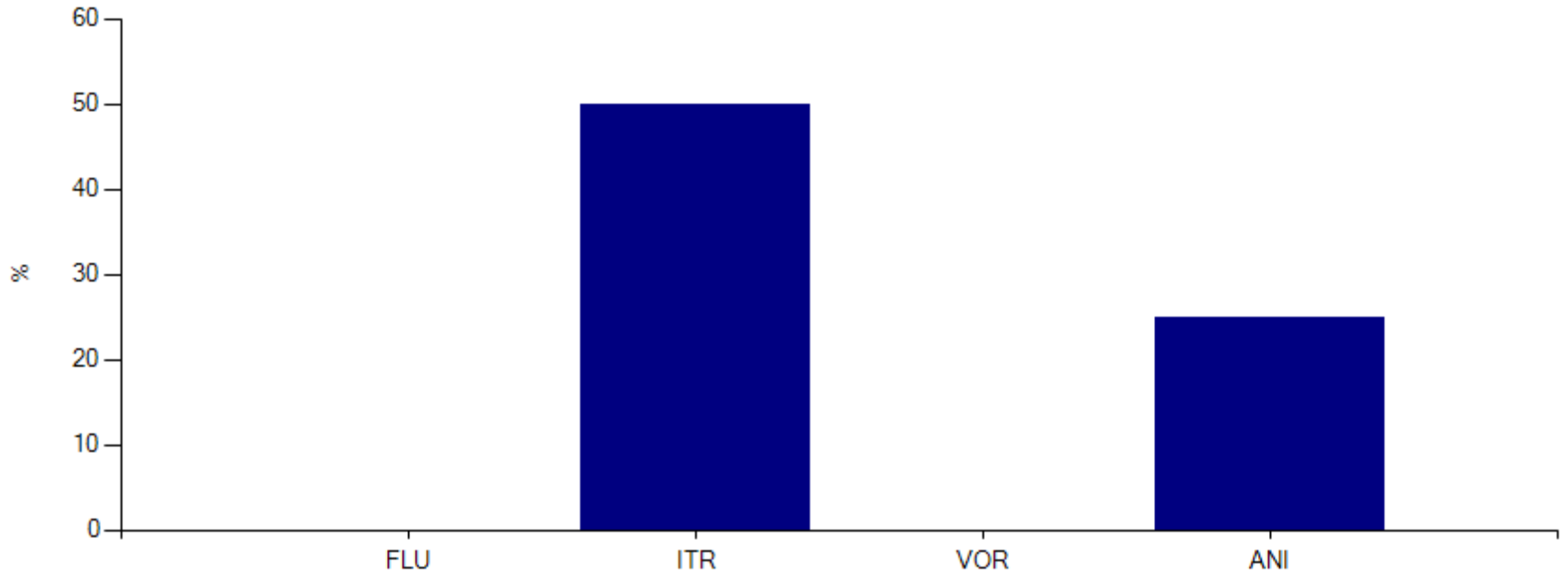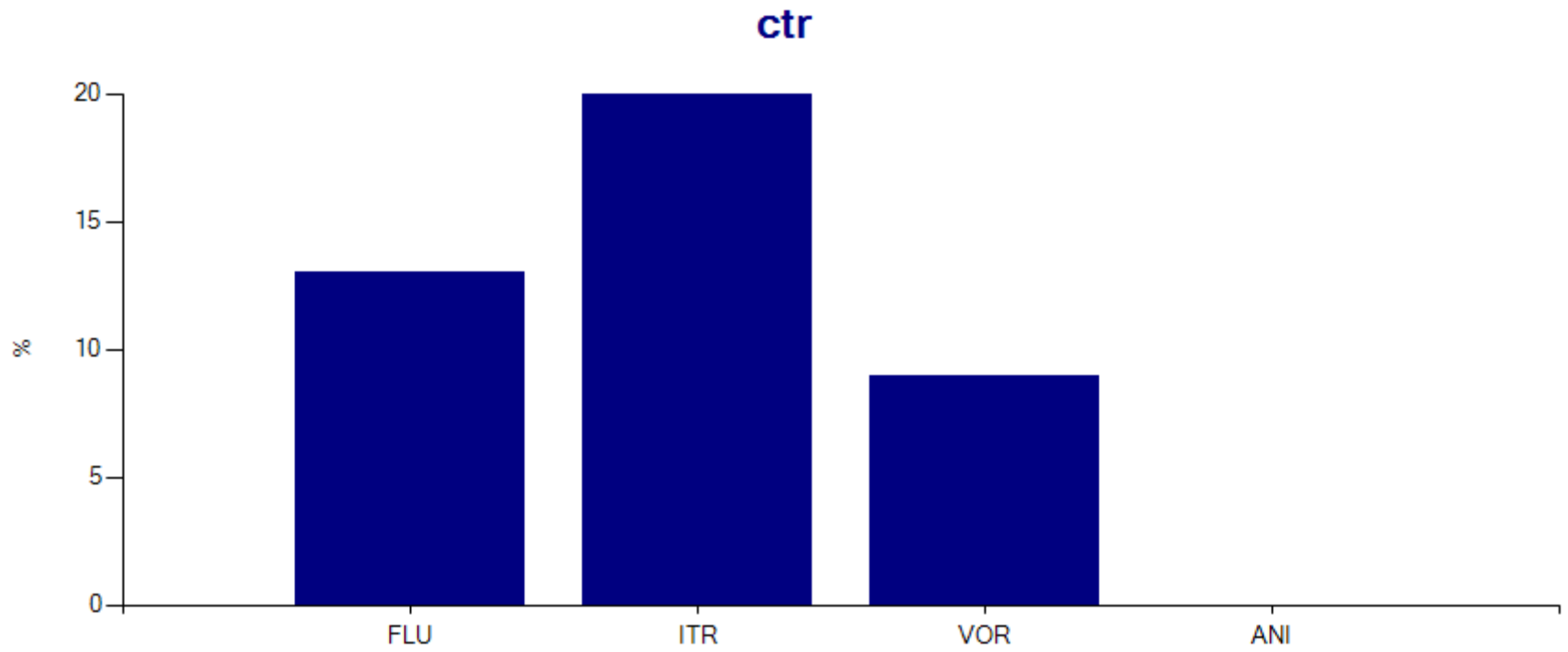
*Candida glabrata*
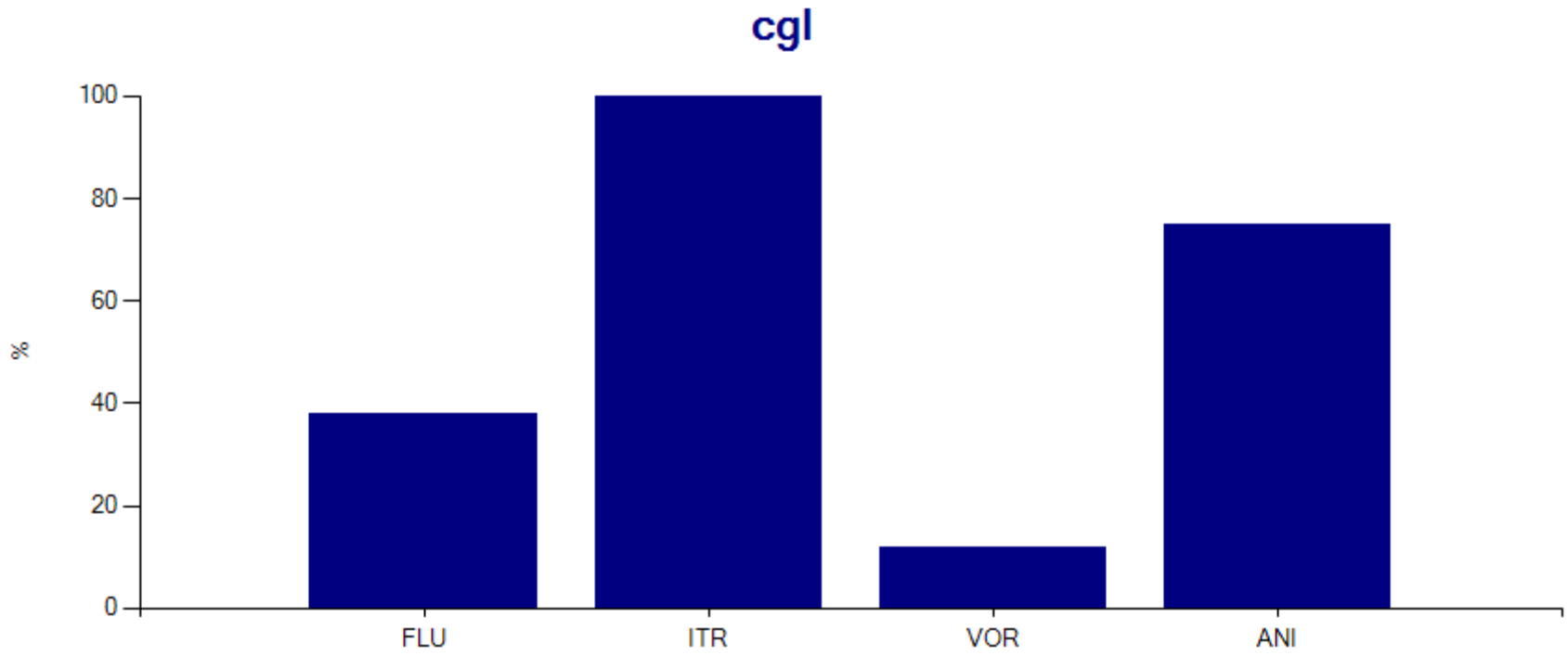
# *Candida parapsilosis*

**cpa**

# Candida auris



**crs**

*Candida tropicalis*

# Surveillance

- DATA QUALITY
- UNIFORMITY
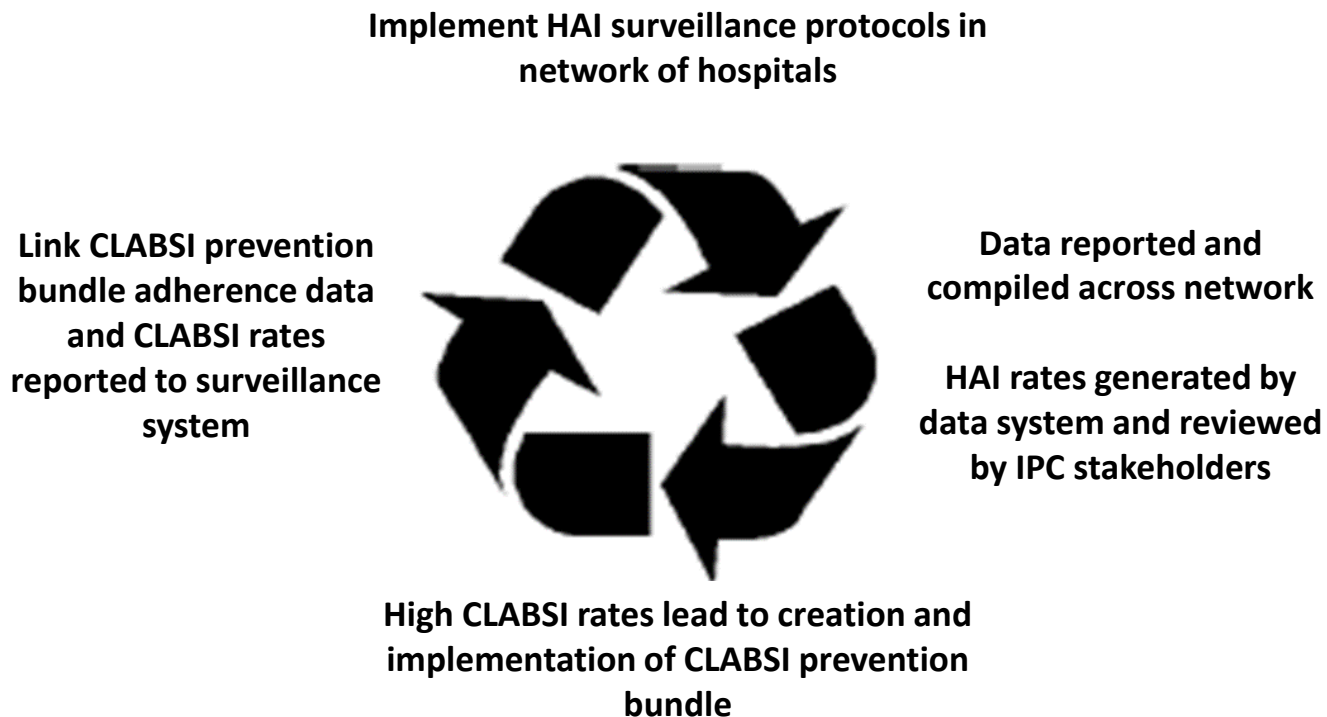- TROUBLE SHOOTING
- TRAININGS
- DATA DRIVEN PREVENTION ACTIVITIES

Like a protocolized surveillance activity, data quality assessment is also a structured measurement exercise

- Are we piking up all Lab/ clinically confirmed cases?

- Are we entering them right

- Are samples (blood/ urine being sent for ALL febrile episode)

- Data Quality Monitoring


- Site support visits

# The surveillance cycle – an HAI example



Implement HAI surveillance protocols in network of hospitals

Link CLABSI prevention bundle adherence data and CLABSI rates reported to surveillance system

Data reported and compiled across network

HAI rates generated by data system and reviewed by IPC stakeholders

High CLABSI rates lead to creation and implementation of CLABSI prevention bundle

# BSI Rates

| BSI Type | Number |
|---|---|
| CLABSI | 778 (45%) |
| Non CLABSI | 569 (33%) |
| Secondary BSI | 378 (22%) |
| Total | 1,725 |