In 2016, the UK government announced an ambition to reduce healthcare-associated GNBSI by 50% by 2020. NHS Improvement (NHSI) mandated the reporting from April 2017 of Klebsiella species, and Pseudomonas aeruginosa BSI cases (in addition to E. coli) to Public Health England (PHE). Guidance on the definition of healthcare associated GNBSI was issued by PHE and NHSI in July 2017 (Figure 1).

**Table 1**: Categories of GNBSI at Royal Free Hospital (RFH) compared to England.

<table>
<thead>
<tr>
<th>Category</th>
<th>Name</th>
<th>England Jan-Sep</th>
<th>RFH Apr-Sep</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+B+C</td>
<td>All infections</td>
<td>32300 (100)</td>
<td>183 (100)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>E. coli</td>
<td>15687 (29)</td>
<td>37 (20)</td>
<td></td>
</tr>
<tr>
<td>B+C</td>
<td>COHCA</td>
<td>8203 (71)</td>
<td>186 (65)</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>COHCA</td>
<td>12850 (38)</td>
<td>27 (41)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>A+B+C</td>
<td>E. coli</td>
<td>21882 (41)</td>
<td>39 (24)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>E. coli</td>
<td>50608 (55)</td>
<td>126 (76)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Figure 1**: Guidance on the definition of different categories of Gram-negative bloodstream infections.

According to this guidance, a healthcare associated GNBSI was defined as a case in a patient who had: received healthcare in either the community or the hospital in the previous 28 days, including but not limited to: indwelling vascular access devices (insertion, in situ, or removal) urinary catheterisation (in situ with or without manipulation, or removal) other devices (insertion, in situ with or without manipulation, or removal) invasive procedures (eg endoscopic retrograde cholangiopancreatography, prostate biopsy, surgery including, but not restricted to, gastrointestinal tract surgery) neutropenia (<500/mcrol at time of bacteremia) antimicrobial therapy, and/or had an intervention up to 12 months earlier that remained operational during the previous 28 day period eg urinary catheter, and/or onset at least 48 hours after admission, and/or onset within 28 days of discharge, and/or been receiving nursing home care.

Opportunities to intervene “should not be lost”.

“The presence of a healthcare associated risk factor is enough to assume that the GNBSI is healthcare associated.”

**AIM**

We reviewed the epidemiology of the first six months of cases detected at the Royal Free Hospital (RFH), a London teaching hospital, to inform infection control actions.

**METHODS**

Individual patient hospital and summary care records were reviewed. GNBSI were categorised above. Antibiotic sensitivity results were obtained from the laboratory information system. Chi-squared tests were performed using Open-Epi version 3.01 (www.openepi.com).

**RESULTS**

From April to September 2017, 163 GNBSI were detected, 110 (67%) E. coli, 31 (19%) Klebsiella species and 22 (14%) P. aeruginosa. 88 (54%) cases occurred in males. Females predominated in age groups up to age 50, above which males predominated (Figure 2).

39 cases (24%) were community onset, non-healthcare associated (CO-non-HCA); 124 (76%) HCA; and 57 (35%) Hospital onset (HO). 67 (41%) of total were community onset, healthcare-associated (COHCA) versus 30% for England (p<0.01), of which 28 (17% of total) and 39 (24% of total) were associated with community and hospital care, respectively. Comparison with proportions for England are shown in Table 1.

There were differences in the focus of infection for E. coli, Klebsiella species, and P. aeruginosa. The most common sources were, respectively: hepatobiliary 29(26%), 12(39%), 2(9%); lower respiratory tract 76(67%), 37(12%), 10(7%); upper UT 30(27%), 7(23%), 6(7%); arterial 4(3%), 1(3%), 0(0%) (Figure 3). A primary focus in the UT was significantly less common in Klebsiella species cases (11, 35%) than E. coli (58, 53%) (p=0.048).

The most common HCA risk factors were antimicrobial therapy (42%), urinary catheter (UC) (28%), UC manipulation (20%), surgery (20%) and a vascular device (20%). Risk factors differed by organism (Figure 4).

**DISCUSSION**

1. High proportion of HCA and COHCA cases. This may be the result of patient case mix factors, and/or the more inclusive definitions used in our data compared to a recent study of E. coli BSI in England, which formed the basis for the guidance. Compared to this study, our E. coli cases were more likely to have a hepatobiliary focus (26% versus 16%, p=0.031) which may reflect our large tertiary hepatopancreatoabdominal surgery service. 81% of these cases were HCA compared to 76% of the total.

2. Causative organism varied by primary focus and risk factors. Klebsiella species predominated in hepatobiliary infections while P. aeruginosa predominated in lower respiratory tract infections and lower UT infections and when a urinary catheter was present or had been manipulated in the previous 28 days. These findings should be considered when managing individual cases and when updating prophylactic and empiric antimicrobial guidelines.

3. Organisms varied by healthcare onset status and susceptibilities varied by hospital onset status. Klebsiella species and P. aeruginosa were more prevalent in HCA cases and antimicrobial resistance was higher in HO cases. These findings should be considered when managing cases and updating guidelines.

**REFERENCES**


**Figure 2**: Gram-negative bloodstream infections by group and sex (N=135). Compared to cases arising on day <2 of admission (non-HO), cases arising on day ≥2 (HO) were more likely to be non-susceptible to piperacillin-tazobactam (18% versus 6%, p=0.031) and tominocillin (25% versus 7%, p=0.005) (Figure 6).