Epidemiology of *Escherichia coli* bacteraemia secondary to a urinary tract focus of infection: An analysis of local surveillance data

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Background *Escherichia coli* is the most common cause of bacteraemia in England and is associated with 15-20% mortality. The incidence of *E. coli* bacteraemia is rising annually and urinary tract infection is consistently the most common primary focus. There is a requirement for 10% annual reduction in cases of *E coli* bacteraemia across primary and secondary healthcare. Understanding the susceptibility of strains causing urosepsis, in the context of local antibiotic prescribing practices and guidelines, is therefore essential.

Aim To evaluate risk factors associated with *E. coli* bacteraemia from a primary urinary focus and review antibiotic resistance profiles of *E. coli* blood and urine isolates in the context of current antibiotic prescribing guidelines.

Methods All cases of *E. coli* bacteraemia reported via National Enhanced Mandatory Surveillance in North Bristol Trust (NBT) between April 2017 and September 2018 were scrutinised. Cases reported with either 'urinary' or 'unknown' primary focus were included in the study. Information was collected on urinary risk factors, current antibiotic therapy and antibiotic susceptibility for *E. coli* blood and urine isolates.

Results A total of 460 cases of *E. coli* bacteraemia were reported. Of these 230 had an underlying urinary focus (50%) and in 20 cases the source was 'unknown' (8%); these 250 constituted the study cases.

- 76 (30.4%) had a urinary catheter in situ and twenty-three (9.2%) had another urinary tract abnormality
- Fifty-seven (22.8%) were defined as healthcare associated infections (HCAIs)
- 61 (24.4%) were taking antibiotics at the time of the initial positive blood culture
- The antibiotic prescription recorded was in accordance with acute Trust or community policy in approximately half of cases (N = 32; 52.4%)
- 94-100% of isolates were susceptible to antibiotics prescribed in accordance to Trust or community policy respectively, compared to 52% when guidelines were not followed
- Antibiotic resistance was most commonly reported to amoxicillin (59.2%) and co-amoxiclav (44.4%) among blood culture isolates and to amoxicillin (60.7%) and trimethoprim (37.2%) among urine isolates
- With the exception of nitrofurantoin, individual antibiotic non-susceptibility was consistently higher in HCAIs compared to community acquired infections (CAI) and in catheterised patients compared to non-catheterised patients (figures 1 & 2)

Figure 1 - Antibiotic non-susceptibility among *E. coli* blood culture isolates

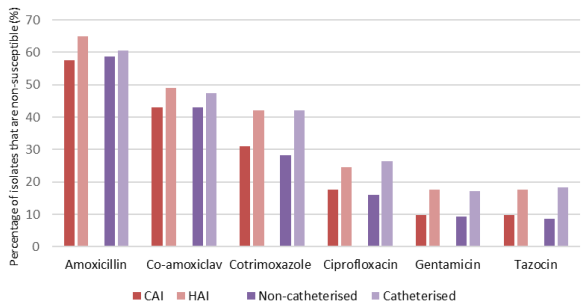
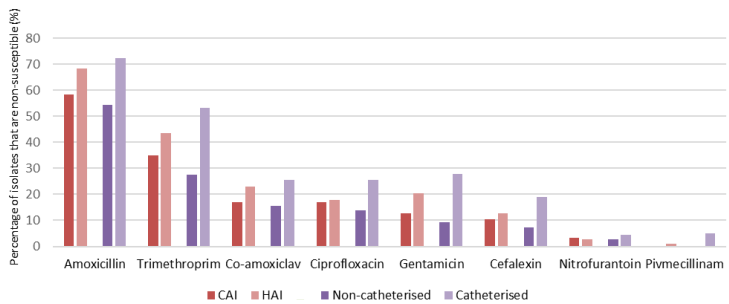


Figure 2 - Antibiotic non-susceptibility among *E. coli* urine culture isolates



- Similarly among *E. coli* blood cultures isolates, proportions of extended-spectrum beta-lactamase-producing isolates and multi-drug resistant isolates were consistently higher in HCAIs compared to CAIs and in catheterised patients compared to non-catheterised patients

Blood culture isolate	HCAI (N = 57)	CAI (N = 193)	Catheterised (N = 76)	Non-catheterised (N = 174)
ESBL producing	17.5% (N = 10)	8.8% (N = 17)	13.2% (N = 10)	9.8% (N = 17)
Multi-drug resistant	8.8% (N = 5)	7.3% (N = 14)	15.8% (N = 12)	4.0% (N = 7)

Conclusions

Urinary tract infection is the most common primary focus of *E. coli* bacteraemia and risk factors include urinary catheterisation and other urinary tract abnormalities. Whilst our local antibiotic guidelines effectively target the majority of *E. coli* causing urosepsis, adherence to them appears low (although other ward-based audits find higher compliance rates). This apparent discrepancy may in part represent uncertainty about initial source of infection at time of blood cultures (i.e. initial antibiotics may be targeting chest infection rather than urosepsis). Measures to address *E. coli* bacteraemia should focus on compliance with antibiotic prescribing guidelines and early recognition of urosepsis.

References: (1) Public Health England, "Annual epidemiological commentary: MRSA, MSSA and E. coli bacteraemia and C. difficile infection data, up to and including financial year April 2017 to March 2018," Public Health England, London, 2018. (2) Public Health England, "Escherichia coli (E. coli) bacteraemia: quarterly count by acute trust and CCG, and financial year counts and rates by acute trust and CCG, up to financial year 2017 to 2018", Public Health England, London, 2018. (3) Abernethy JK, Johnson AP, Guy R, Hinton N, Sheridan EA, Hope RJ. Thirty day all-cause mortality in patient with Escherichia coli bacteraemia in England. *Clin Microbiol Infect* 2015;**21**:251-258. (4) Healthcare-associated infections: prevention and control (2011) NICE guideline PH36.