Antimicrobial Resistance Patterns of Urinary Escheria Coli at an Australian Tertiary Hospital

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Five-year antimicrobial resistance patterns of urinary \textit{E. coli} at an Australian tertiary hospital

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Disclosure

• Ms Oyebola Fasugba, Prof Anne Gardner and A/Prof Brett Mitchell are members of ACIPC

• A/Prof Brett Mitchell is Interim Editor-in-Chief Infection, Disease and Health and Prof Anne Gardner is on the Editorial board

• A/Prof Brett Mitchell is a member of the scientific organising committee.

• Dr George Mnatzaganian has no conflicts of interests
Introduction

- >80% of urinary tract infections (UTIs) caused by *Escherichia coli* (*E. coli*) (Nicolle, 2008)
- Community acquired (CA) or hospital acquired (HA) classification
- Standard treatment is antibiotics (Stuck et al., 2012)
- Treatment based on local susceptibility patterns (Teoh et al., 2013)
- Inappropriate treatment leads to emergence of resistant pathogens & recurrence of infection (Trautner, 2010)
Introduction

- Evidence shows urinary *E. coli* is becoming increasingly resistant to common antimicrobials (WHO, 2014)
- Whilst prevalence rates for urinary *E. coli* resistance have been reported in Australia, available data do not adjust for age & sex
- To our knowledge there are no data comparing resistance patterns for CA and HA UTIs
Aims

- To describe the antimicrobial resistance patterns of *E. coli* UTI over five years (2009-2013) in patients at the Canberra Hospital
- Compare the prevalence of resistance in community-acquired and hospital-acquired *E. coli* UTI
Significance

• Expand understanding of antimicrobial resistance in urinary *E. coli* infections in Australia

• Contribute to ongoing surveillance data in the Australian Capital Territory (ACT)

• Potential for study findings to inform treatment decisions for UTI & influence therapy based on site of acquisition
Methods

- Ethics approval granted by ACT Health and ACU HREC
- Cross-sectional design
- Inclusions: Canberra Hospital samples; *E. coli* growth of $\geq 10^7$ cfu/L
- CA UTI: within 48 hours of admission; outpatients
- HA UTI: more than 48 hours after admission or within 48 hours of discharge
Methods

• Only the first positive E. coli culture per patient per year was included in analysis
• Overall 5-year and yearly antimicrobial resistance rates were calculated
• Rates compared between CA and HA UTIs
• Prevalence of Extended Spectrum Beta Lactamase (ESBL) producing E. coli
• Crude and adjusted time series analyses were conducted to assess resistance trends over the 5-year study period
Results

- 5346 positive *E. coli* UTIs belonging to 4744 patients
  - CA UTI ➔ 84.3% (n=4505)
  - HA UTI ➔ 15.7% (n=841)
- Mean age of all patients was 57.0 years (SD=27.6)
- 80.3% (n=3806) of patients were women
- Resistance highest for ampicillin (41.9%) & trimethoprim-sulphamethoxazole (32.7%)
- Resistance lowest for meropenem (0.1%) & gentamicin (4.0%)
<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>5-year resistance %</th>
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<tbody>
<tr>
<td>Ampicillin</td>
<td>41.9</td>
</tr>
<tr>
<td>Trimethoprim-sulphamethoxazole</td>
<td>32.7</td>
</tr>
<tr>
<td>Trimethoprim</td>
<td>20.7</td>
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<tr>
<td>Norfloxacin</td>
<td>16.2</td>
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<tr>
<td>Ceftriaxone</td>
<td>13.5</td>
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<tr>
<td>Cephazolin</td>
<td>10.6</td>
</tr>
<tr>
<td>Piperacillin-tazobactam</td>
<td>10.3</td>
</tr>
<tr>
<td>Nalidixic acid</td>
<td>8.4</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>7.8</td>
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<td>Amoxycillin-clavulanic acid</td>
<td>6.7</td>
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<td>Ciprofloxacin</td>
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<td>Gentamicin</td>
<td>4.0</td>
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<tr>
<td>Meropenem</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Results

- Significantly higher resistance (P<0.05) in HA compared to CA UTI for:
  - amoxycillin-clavulanate
  - cephazolin
  - gentamicin
  - piperacillin-tazobactam

- ESBL-producing *E. coli* significantly higher (P=0.01) in HA (3.0%; n=25) compared with CA UTI (1.7%; n=75)
Results

1=Summer
2=Autumn
3=Winter
4=Spring

- AMC (P=0.008)
- Ciprofloxacin (P<0.001)
- Nitrofurantoin (P=0.015)
- TMP-SMX (P=0.002)
- Trimethoprim (P<0.001)
Results

- Significant increase in resistance trend noted for all five antimicrobials (P<0.05)
- Seasonal resistance pattern only significant for Trimethoprim (P=0.0056)
- Regression analysis indicated a possible association between ciprofloxacin resistance and trimethoprim-sulphamethoxazole resistance with older age
Discussion

- Resistance rates lower than reported for single site studies in other countries (Ma et al., 2012; Perrin et al. 1999)

- High levels of ampicillin and trimethoprim-sulphamethoxazole resistance question their use as suitable empirical agents in the management of UTI in this population

- Differences in resistance for HA and CA UTI comparable with findings reported previously (Ma et al., 2012)
Discussion

• Presence of ESBL-producing *E. coli* in both HA and CA UTI pose significant public health concern

• Evidence to support findings of increase in resistance over time

• Seasonal trimethoprim resistance should be explored further

• Association between increasing age and antimicrobial resistance consistent with published literature (Blaettler et al. 2009)
Implications and Conclusion

• While resistance rates are lower than other studies, there is need for continuous resistance surveillance in the ACT
• Amoxycillin-clavulanate and nitrofurantoin still effective in this population
• Study findings will help inform UTI treatment guidelines
• Also provide baseline resistance data for future comparison and inform future interventions that can be evaluated
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