Using OPAT to drive paediatric antimicrobial stewardship

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• Why are children prescribed IVAbs?
• Do we know what ‘good’ IVAb prescribing looks like in children?
• What do we know about the quality of IVAb prescribing in children?
• Opportunities for improving Ab stewardship within general paediatrics
  – Southampton experience
• Next steps
Paediatricians have been ambulating children on IVAbs for years!

- Children with complex infections requiring long courses of antibiotics in tertiary centres (small numbers) - e.g. the child with endocarditis
- Children with common infections requiring relatively short courses of antibiotics discharged from general paediatric wards (moderate numbers) - e.g. the stable child with pyelonephritis
- Children with possible bacterial infection ambulated directly from short-stay units or paediatric emergency departments - e.g. the febrile but stable child with a petechial rash (large numbers)

45 / year in Wessex

>2000 / year in Wessex
Why are children prescribed IVAbs?

- ARPEC study – Two one-day point-prevalence surveys (September 2011 and November 2012)
- Antibiotic prescribing in 61 UK paediatric units.

## IVAb use in secondary care settings

<table>
<thead>
<tr>
<th></th>
<th>General Hospitals</th>
</tr>
</thead>
</table>
|                  | N children on antibiotics=349 (18%)  
|                  | N antibiotic prescriptions=479                                                  |
| Age Median (IQR) | 2 (0.8, 6)                                                                        |
| PICU n children (%) | 4 (1%)                                                                            |
| Surgery n children (%) | 18 (5%)                                                                          |
| Underlying disease n (%) | 151 (43%)                                                                       |
| N children with ≥2 antibiotics (%) | 122 (35%)                                                                       |

**IVAb use in secondary care settings (UK)**

<table>
<thead>
<tr>
<th></th>
<th>General Hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No children on antibiotics=103 (15%)</td>
</tr>
<tr>
<td></td>
<td>No antibiotic prescriptions=131</td>
</tr>
<tr>
<td><strong>No (%) hospital acquired infections</strong></td>
<td>1 (1%)</td>
</tr>
<tr>
<td><strong>Narrow spectrum antibiotics No (%) prescriptions</strong></td>
<td>37 (28%)</td>
</tr>
<tr>
<td><strong>3rd generation cephalosporin + co-amoxiclave</strong></td>
<td>55 (42%)</td>
</tr>
<tr>
<td><strong>Meropenem No (%) prescriptions</strong></td>
<td>3 (2.3%)</td>
</tr>
</tbody>
</table>
Do we know what ‘good’ Ab prescribing looks like in children?

ANTIMICROBIAL STEWARDSHIP
Treatment algorithm

Start Smart → Then Focus

DO NOT START ANTIBIOTICS IN THE ABSENCE OF CLINICAL EVIDENCE OF BACTERIAL INFECTION

1. Take thorough drug allergy history
2. Initiate prompt effective antibiotic treatment within one hour of diagnosis (or as soon as possible) in patients with severe sepsis or life-threatening infections
3. Comply with local antimicrobial prescribing guidance
4. Document clinical indication (and disease severity if appropriate), dose* and route* on drug chart and in clinical notes
5. Include review of stop date or duration
6. Obtain cultures prior to commencing therapy where possible (but do not delay therapy)

CLINICAL REVIEW & DECISION AT 48-72 HOURS

Clinical review, check microbiology and make a clear plan. Document this decision

1. STOP
2. IV to oral switch
3. Change antibiotic
4. Continue
5. OPAT*

Document Decision & Next Review Date or Stop Date

DOCUMENT ALL DECISIONS

*According to weight/age in children refer to local formulary or BNFC
*Use appropriate route in line with severity/patient factors
*Outpatient Parenteral Antibiotic Therapy

The British Society for Antimicrobial Chemotherapy

University Hospital Southampton NHS Foundation Trust

SOUTHAMPTON Children’s Hospital

BSAC
Do we know what ‘good’ Ab prescribing looks like in children?

If afebrile, clinically improving and inflammatory markers improving, can switch to oral Abs.

Antibiotic duration and timing of the switch from intravenous to oral route for bacterial infections in children. Sepsis: recognition, diagnosis and early management [NG51] Systematic review and guidelines

Neonatal infection (early onset): antibiotics for prevention and treatment

*Lancet Infect Dis.* 2016 Aug;16(8):e139-52
What do we know about the quality of IVAb prescribing in children?

What do we know about the quality of prescribing in children being ambulated on IVAbs?

• Predominantly US data (retrospective):
  – A significant proportion should have been started on oral Abs rather than IVAbs
    • Pneumonia 17.6%, cellulitis 24%, UTI 27%\(^1\)
  – Of those appropriately started on IVAbs:
    • 11.4% prescribed the incorrect IVAb dose\(^2\)
    • 28% continued inappropriately on IVABs at 48 hours
      – 14% should have been stopped, 14% oral switch\(^3\)

1. Xu M et al. Pediatr Emer Care 2017
Antibiotic Stewardship and IV Ambulation in Southampton Children’s Hospital – opportunities for improvement

Emily Tanner
Aims

• Compare antibiotic stewardship for children with common presentations on short course IV antibiotics before and after the introduction of a formal ambulatory pOPAT service

• Look at further opportunities for ambulation and the impact of a more efficient OPAT service
Methodology

• Inclusion criteria
  – Secondary care general paediatric patients started on IVABs
  – Excluded patients requiring surgical interventions and tertiary patients

• Data collection sheets

• Ward rounds (three times per week) and daily assessment unit/OPAT clinic recruitment

• Communication with OPAT team

• Weekly review of patients by 2 consultants
Antibiotic management at presentation (2018)

27% of children started on IVAbs had suboptimal Ab management at presentation

<table>
<thead>
<tr>
<th>Type of mismanagement at presentation</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abs not indicated</td>
<td>9 (43%)</td>
</tr>
<tr>
<td>Wrong route (oral)</td>
<td>9 (43%)</td>
</tr>
<tr>
<td>Wrong antibiotic (too broad)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Wrong dose</td>
<td>1 (5%)</td>
</tr>
</tbody>
</table>
Working diagnosis where antibiotics “not indicated”

<table>
<thead>
<tr>
<th>Working Diagnosis</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Respiratory Tract Infection</td>
<td>6</td>
</tr>
<tr>
<td>Upper Respiratory Tract Infection</td>
<td>1</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>1</td>
</tr>
<tr>
<td>Fever without source</td>
<td>1</td>
</tr>
</tbody>
</table>
Antibiotic management at 48 hours

2016

- Appropriate: 44 (73%)
- Inappropriate: 16 (27%)

2018

- Appropriate: 48 (96%)
- Inappropriate: 2 (4%)
## Antibiotic management at 48 hours

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suboptimal management</td>
<td>Number of Patients</td>
<td>Suboptimal management</td>
</tr>
<tr>
<td>Oral Switch Indicated</td>
<td>3</td>
<td>Should Have Stopped Antibiotics</td>
</tr>
<tr>
<td>Should Have Stopped Antibiotics</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Inappropriate Course Length</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
**Rates of Ambulation**

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patients Ambulated</strong></td>
<td>17</td>
<td>49</td>
</tr>
<tr>
<td><strong>Patients Not Ambulated</strong></td>
<td>50</td>
<td>28</td>
</tr>
</tbody>
</table>

**Percentage of Patients Ambulated**

- **2016**: 25%
- **2018**: 64%
Impact of OPAT on inpatient bed days

OPAT vs Inpatient Days (2018)

- Days in Hospital: 106 (53%)
- Days in OPAT: 95 (47%)
## Admission Avoidances

<table>
<thead>
<tr>
<th></th>
<th>Admission Avoidances</th>
<th>Total Number of Patients Ambulated</th>
<th>Admissions avoided (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>6</td>
<td>17</td>
<td>35%</td>
</tr>
<tr>
<td>2018</td>
<td>21</td>
<td>49</td>
<td>43%</td>
</tr>
</tbody>
</table>
**Increasing OPAT Efficiency**

<table>
<thead>
<tr>
<th>Potential impact of optimizing the pOPAT service (based on 2018 Data)</th>
<th>Absolute numbers</th>
<th>% change</th>
<th>12 Month Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Admission Avoidances</td>
<td>7</td>
<td>↑33%</td>
<td>41 extra admissions avoided</td>
</tr>
<tr>
<td>Potential Bed Days Saved</td>
<td>16</td>
<td>↓16%</td>
<td>93 extra bed days saved</td>
</tr>
<tr>
<td>Potential IV Antibiotic Courses Avoided</td>
<td>18</td>
<td>↓23%</td>
<td>104 courses of IVAbs avoided</td>
</tr>
<tr>
<td>Potential OPAT Opportunities</td>
<td>4</td>
<td>↑8%</td>
<td>23 extra patients ambulated</td>
</tr>
</tbody>
</table>
Limitations

• Period of data collection only 9 weeks
• Small sample size
Learning points For a medical student

• Number of patients on antibiotics
• Need for understanding how to prescribe appropriately – need to be taught as part of undergraduate curriculum
• People find it hard to ‘do nothing’
  – Observation if not ‘doing nothing’
  – Child with a petechial rash and children triggering the sepsis screening tool
• The introduction of the ambulatory pOPAT service has improved Ab management across Southampton children’s hospital – has driven behaviour change
• Impact of OPAT on families and children
Next steps

• Develop clear pathways for common presentations:
  – Criteria for OPAT versus admission & treatment guidelines
    • tonsillitis
  – More complex presentations:
    • Petechial rashes, children triggering a sepsis screening tool, fever in babies<3 months of age

• Rolling out pOPAT to DGHs/secondary care hospitals:
  – Need to articulate the benefits of ambulatory pOPAT including cost saving (admission avoidance and ↓LOS), patient safety, improved Ab stewardship and patient satisfaction
  – Promote the role of paediatricians with an interest in infection