Ayliffe Lecture 2019

Pneumocystis – an important healthcare-associated infection?

Dr Tim Boswell
Consultant Medical Microbiologist & Deputy Director of Infection Prevention and Control
Nottingham University Hospitals

www.webbertraining.com

September 24, 2019
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Broadcast live from the 2019 Infection Prevention Society conference

The Graham Ayliffe Training Fellowship Award

The Graham Ayliffe Fellowship Award was established in 2013 to enable specialty trainees and infection control nurses currently working in the field of infection prevention and control (IPC) to take a one year paid leave of absence to pursue their specialist area by broadening their knowledge base and imparting that knowledge to the wider scientific and medical community.

Opportunity to work with the Journal of Hospital Infection:

For the 2019 funding round, the Graham Ayliffe Training Fellow will use 50% of their fellowship year to train as a part-time editor for the JHI (0.5 FTE). The Fellow will join the Editor in Chief and other members of the JHI editorial board to develop their skills in work as an editor and to help promote the JHI. A role description is available for download and a template job plan is available on request.

Areas of special interest

In addition to the part-time editorial role, we would like the applicant to use the remainder of their fellowship year in an innovative and novel way in order to pursue their own specialist focus within IPC. Applicants could consider working within a specialist service, developing expertise, undertaking a significant audit project, developing and implementing a guideline or performing a well defined piece of research.

- Maximum size of award: £72,000
- Duration: max 1 year
- What Specialty Registrars and Infection Control Nurses
- Allowances: salary, training and research
- Fellowship must be UK or Ireland based
- Availability: one award per year

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What do we know about Pneumocystis?

- *P. jirovecii* (previously *P. carinii*)
- Fungal infection (previously thought to be protozoan)
- Outbreaks 1st reported in 1950's
  - Malnourished children in orphanages
- Came to prominence in 1980's
  - HIV epidemic
- Increasingly recognised cause of pneumonia in non-HIV immunosuppressed patients
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**Latent vs de novo Infection**

**Latency**
- Traditional view: infection resulted from reactivation of latent colonisation
- High prevalence of seropositivity in healthy children/adult blood donors

**De Novo**
- No residual organisms detected on autopsy studies of lungs in immunocompetent people
- Mice previously infected with PCP did not reactivate the infection when immunosuppressed
- Clustering of specific genotypes according to place of residence not birth
- Outbreaks involving a single identical strain of *P. jirovecii*

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**What did we learn from the systematic review of PCP outbreaks?**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Figures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outbreaks</td>
<td>30</td>
</tr>
<tr>
<td>Location</td>
<td>70% in Europe</td>
</tr>
<tr>
<td>Patient cohort</td>
<td>90% adult patients</td>
</tr>
<tr>
<td></td>
<td>83% solid organ transplants</td>
</tr>
<tr>
<td>Median number of patients</td>
<td>12.5</td>
</tr>
<tr>
<td>Median outbreak duration</td>
<td>9 months</td>
</tr>
<tr>
<td>Epidemiological assessment</td>
<td>77% of studies</td>
</tr>
<tr>
<td>(transmission map)</td>
<td></td>
</tr>
<tr>
<td>Genotyping</td>
<td>47% of studies</td>
</tr>
<tr>
<td>Precipitating factors</td>
<td>No or suboptimal PCP prophylaxis</td>
</tr>
<tr>
<td></td>
<td>No isolation policies</td>
</tr>
<tr>
<td>Outbreak Control Measures</td>
<td>Outbreaks universally terminated by blanket PCP prophylaxis</td>
</tr>
</tbody>
</table>

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**Summary of Nottingham PCP outbreaks**

<table>
<thead>
<tr>
<th></th>
<th>Adult renal transplant</th>
<th>Adult oncology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
<td>2015</td>
<td>2016-17</td>
</tr>
<tr>
<td><strong>Number of patients</strong></td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td><strong>Number of deaths</strong></td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td><strong>Transmission map</strong></td>
<td>Renal outpatient clinics</td>
<td>Oncology outpatient clinic, in-patient transmission, other</td>
</tr>
<tr>
<td><strong>Genotyping</strong></td>
<td>Identical strain</td>
<td>Not done</td>
</tr>
<tr>
<td><strong>Case-control study</strong></td>
<td>Rate of attendance and number of clinic overlaps</td>
<td>Rate of attendance and number of clinic overlaps</td>
</tr>
<tr>
<td><strong>Control measures</strong></td>
<td>Chemoprophylaxis, masks in clinic, patient isolation</td>
<td>Chemoprophylaxis, masks in clinic, patient isolation</td>
</tr>
</tbody>
</table>

**Renal transplant outbreak: case-control study**

<table>
<thead>
<tr>
<th></th>
<th>Cases (10)</th>
<th>Controls (44)</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rate of clinic attendance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low rate</td>
<td>1</td>
<td>28</td>
<td>13.52</td>
<td>1.53 - 119.43</td>
<td>0.019</td>
</tr>
<tr>
<td>High rate</td>
<td>9</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<th>Controls (44)</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Binary overlap</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>19</td>
<td>12.01</td>
<td>1.33 – 109.77</td>
<td>0.027</td>
</tr>
<tr>
<td><strong>Dose related overlap</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 overlap</td>
<td>1</td>
<td>16</td>
<td>1.59</td>
<td>0.09 – 28.3</td>
<td></td>
</tr>
<tr>
<td>2 or more overlaps</td>
<td>8</td>
<td>3</td>
<td>71.88</td>
<td>5.62 – 919.45</td>
<td>P value for trend = 0.001</td>
</tr>
</tbody>
</table>

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Environmental investigations

- Ventilation Assessment
- Air-Sampling

PCP outbreak curve: adult oncology

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Spectrum of disease

Case:control study

<table>
<thead>
<tr>
<th></th>
<th>Cases n=22</th>
<th>Controls n=68</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male v female</td>
<td>8 v 14</td>
<td>37 v 31</td>
<td>0.21</td>
</tr>
<tr>
<td>Median age (range)</td>
<td>59.5 (39-78)</td>
<td>60 (27-85)</td>
<td></td>
</tr>
<tr>
<td>Lymphopenic</td>
<td>17 (77%)</td>
<td>24 (35%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Steroids</td>
<td>12 (55%)</td>
<td>20 (29%)</td>
<td>0.042</td>
</tr>
<tr>
<td>Cancer type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>9</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td>6</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Testicular</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Colorectal</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Oesophageal</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
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Oncology
Outpatients

Case 1
Case 2
Case 4
Case 6
Case 9
Case 10
Case 11
Case 12
Case 13
Case 14
Case 15
Case 16
Case 17
Case 18
Case 19
Case 20
Case 21
Case 22

CT scan

Case 4
Case 5
Case 8
Case 10
Case 11

Fraser

Case 4
Case 5
Case 8
Case 9
Case 10
Case 11

Chemo day-case

Main OPD

Case 5
Case 10
Case 11
Case 16
Case 18

Main OPD

Case 11
Case 10
Case 16
Case 18

X-ray

Hogarth

Oncology PCP outbreak: case-control study

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Current Guidance

<table>
<thead>
<tr>
<th>Organisation (reference)</th>
<th>Year of Publication</th>
<th>Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDSA</td>
<td>2014</td>
<td>Note the existence of outbreaks but state that data insufficient to support isolation of patients with PCP from others at risk</td>
</tr>
<tr>
<td>BHIVA</td>
<td>2011</td>
<td>State evidence for nosocomial infection exists but is limited. No guidance regarding infection control / isolation.</td>
</tr>
<tr>
<td>NHMRC (Australia)</td>
<td>2010</td>
<td>State that Transmission route is uncertain. Recommend standard precautions.</td>
</tr>
<tr>
<td>CDC</td>
<td>2007</td>
<td>Advise avoidance of placement with PCP in the same room as an immunocompromised patient</td>
</tr>
</tbody>
</table>

Local approach: PCP infection prevention and control

- *P. jirovecii* designated an ALERT organism
- PCP an ALERT condition
- Patients with confirmed/suspected pneumocystis ISOLATED (respiratory precautions)
- Pneumocystis surveillance
  - 2 linked cases? Outbreak
- High risk outpatient areas: renal transplant, clinical haematology, oncology
  - Use of masks for patients with cough, cold, coryza, URTI
- Review of PCP chemoprohylaxis

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Local approach: PCP infection prevention and control (2)

- Contact tracing: renal transplant
- Assume patients may be infectious for up to 90 days prior to diagnosis
  - Review of potential other transplant patients in contact
- Short course co-trimoxazole (960mg bd for 2 weeks) offered to these at risk contacts

Summary

- *P. jirovecii* is an airborne transmissible pathogen
  - Capable of causing significant morbidity and mortality
  - Capable of causing large HCAI outbreaks
  - Numerous outbreaks have been described
- Patients appear to be infectious for several weeks prior to diagnosis
- Transmission often takes place in out-patient or day-case facilities
- Important to consider PCP as an ALERT condition
  - Surveillance important to detect potential clustering
- IPC guidelines are needed
- Lots of opportunity for further study and investigation...
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POSITIVE DEVIANCE AND HAND HYGIENE: WHAT CAN WE LEARN FROM THE BEST?
Speaker: Josiane Létourneau, University of Montreal

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BEWARE OF DRY BIOFILMS: THE NEXT CHALLENGE IN INFECTION CONTROL
Speaker: Prof. Jean-Yves Maillard, Cardiff University, Wales

October 3, 2019

ENDOSCOPE REPROCESSING: PARADIGM SHIFT
Speaker: Dr. Michelle Alfa, University of Manitoba

October 10, 2019  (South Pacific Teleclass)

SELF-REPORTED BEHAVIORS AND PERCEPTIONS OF AUSTRALIAN PARAMEDICS IN RELATION TO HAND HYGIENE AND GLOVING PRACTICES IN PARAMEDIC-LED HEALTHCARE
Speaker: Prof. Nigel Barr, University of the Sunshine Coast, Australia

October 16, 2019

INFECTION CONTROL ISSUES IN HEALTHCARE CONSTRUCTION, PART 2 – NEW BUILD
Speaker: Andrew Streifel, University of Minnesota

October 24, 2019

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13
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