Big Data in Asia Pacific – Opportunities with cross country data-base analyses

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The Asian Pharmacoepidemiology Network
http://aspennet.asia/aboutus.html

- Australia; University of South Australia
- China; Peking University Health Science Center
- Hong Kong; University of Hong Kong
- Japan; Nihon University; Tokyo University of Science
- Korea; Seoul National University
- Singapore; National University of Singapore
- Taiwan; National Cheng Kung University
- Thailand; Ubon Ratchathani University

- Building research and collaboration across the region

AsPEN
## Datasets in AsPEN

<table>
<thead>
<tr>
<th>Country</th>
<th>Data source</th>
<th>Population (N) (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Drug Utilisation Subcommittee dataset</td>
<td>23</td>
</tr>
<tr>
<td>Australia (DVA)</td>
<td>Department of Veterans’ Affairs</td>
<td>.3</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Clinical Data Analysis and Reporting System</td>
<td>7</td>
</tr>
<tr>
<td>Korea</td>
<td>Health Insurance Review and Assessment Service</td>
<td>50</td>
</tr>
<tr>
<td>Taiwan</td>
<td>National Health Insurance Research Database</td>
<td>23</td>
</tr>
<tr>
<td>Japan I</td>
<td>Medical Data Center database</td>
<td>.33</td>
</tr>
<tr>
<td>Japan II</td>
<td>Hamamatsu University hospital database</td>
<td>.175</td>
</tr>
</tbody>
</table>

### Common data

- Data sets available include electronic health records and administrative health claims data
- All participants have data on medicine
- All countries have diagnostic data in hospital data sets, some have outpatients
- All countries except Japan using ATC coding
- All countries using ICD 9 or ICD 10 coding
- Big challenge
  - Different medicines are available across all countries
How we work: distributed network model
How we work: Distributed Network Model

- Common SAS code with global Macro variables
  ```sas
  %let patientid=XXXXXXXX;
  %let medcde=XXXXXXXX;
  %let atccde=XXXXXXXX;
  %let supplydt=XXXXXXXX;
  %let country=JAPAN;
  %let datea='01JAN1999'd;
  %let dateb='31DEC2009'd;
  ```
- Macros
  ```sas
  %macro wt(atc,x,include,exclude,label);
  %macro pssa(atc1,atc2,days,label1,label2);
  ```

Opportunities

- Compare utilisation of medicines across countries
- Undertake safety studies
- Identify differences in the safety profile of medicines across countries
  - Particularly where frequently occurring pharmacogenetic differences may affect side effects
Rosiglitazone and heart failure risk

Hong Kong, Korea, Taiwan

Study or Subgroup | $\text{log[Risk Ratio]}$ | SE | Weight | IV, Fixed, 95% CI | IV, Fixed, 95% CI
--- | --- | --- | --- | --- | ---
Hong Kong | 1.2149 | 0.1867 | 0.11 | 3.37 [0.85, 17.47] | 
Korea | 0.1354 | 0.0298 | 79.8% | 1.14 [1.08, 1.21] | 
Taiwan | 0.1089 | 0.0561 | 20.3% | 1.12 [0.99, 1.25] | 

Australia and Canada

Study or Subgroup | $\text{log[Risk Ratio]}$ | SE | Weight | IV, Random, 95% CI | IV, Random, 95% CI
--- | --- | --- | --- | --- | ---
Aust (CVAs) | 0.5277 | 0.1218 | 2.9% | 1.70 [1.34, 2.15] | 
Australia | 0.4525 | 0.0801 | 29.9% | 1.62 [1.51, 1.75] | 
Canada | 0.5008 | 0.0254 | 67.2% | 1.65 [1.57, 1.73] | 

ADIPOQ C-11377 CC genotype more common
CYP2C9*1 genotype less common than in Asian pop'ns

Risk of clostridium difficile infections with proton pump inhibitors

Study or Subgroup | $\text{log[Risk Ratio]}$ | SE | Weight | IV, Random, 95% CI | IV, Random, 95% CI
--- | --- | --- | --- | --- | ---
Australia CVAs | 0.5866 | 0.238 | 18.9% | 1.76 [1.41, 2.19] | 
Australia PBs | 0.9308 | 0.1206 | 20.3% | 2.48 [1.86, 3.14] | 
Canada | 0.3665 | 0.1103 | 20.5% | 1.45 [1.16, 1.79] | 
Japan | 1.6685 | 0.2283 | 17.1% | 3.40 [2.45, 4.58] | 
Japan PBs | 1.1639 | 0.1763 | 18.8% | 3.21 [2.27, 4.53] | 
Taiwan | 0.9825 | 0.0677 | 6.5% | 2.70 [0.72, 10.17] | 

Total (95% CI) | 100.0% | 2.53 [1.69, 3.70] | 

Heterogeneity: $\text{I}^2 = 0.19$, $\text{Chi}^2 = 36.54$, $df = 5$ ($P < 0.00001$), $I^2 = 86$
Test for overall effect: $Z = 4.52$ ($P < 0.00001$)

2-6% Caucasians poor metabolisers
20% of Japanese poor metabolisers

Favours Vancomycin
Favours PPIs
Other opportunities with big data

- Universal Health Care – Access to Medicines Network
  - An initiative supported by the Western Pacific Regional Office of the World Health Organization
- Using big data to examine differences in policy implementation across countries

Comparing generic pricing policy

<table>
<thead>
<tr>
<th>Australia</th>
<th>South Korea</th>
<th>Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference pricing and mandatory price reduction when first generic enters market</td>
<td>Reference pricing and mandatory price reduction when first generic enters market</td>
<td>No regulation on drug prices. Tender process by the SingHealth Group Procurement Office</td>
</tr>
</tbody>
</table>
| • Mandatory 16% reduction in price. Subsequent reductions in price are based on a price disclosure policy. | First year after patent expiry:  
  • 30% reduction in the price of originator. Second year after patent expiry:  
  • 53.5% of originator price for all generic medicines and original drug, |                                                                                     |
| • Companies must disclose sales revenue, sales volume and the value of incentives or discounts. This is used to determine a weighted average disclosed price (WADP) |                                                                                     |
Cumulative price reduction from year generic introduced

(year of generic introduction is the reference year)
The global potential

- USA Sentinel: 200 million persons
- Canada C-Nodes: 26 million persons
- Europe Protect: 34 partners
- AsPEN: 100-200 million persons
Current work: medicine utilisation study for ADHD medicines

Medicines for ADHD by age: Australia 2014

17 participating countries

<table>
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<td>Iceland</td>
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<tr>
<td>Netherlands</td>
<td>Spain</td>
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<td>Italy</td>
<td>France</td>
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<td>UK</td>
<td>Japan</td>
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<td>Denmark</td>
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<td>Finland</td>
<td>Australia</td>
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<tr>
<td>Norway</td>
<td>USA</td>
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<tr>
<td></td>
<td>Canada</td>
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</tbody>
</table>

Why might global networks be necessary

- New drug development becoming increasingly specialised with many treatments for rare diseases
- Challenge, we are once again seeing medicines registered for market on phase II evidence (no randomised controlled trials)
- Single country data sources will not be sufficient to assess this post-market
Conclusions

• Significant opportunity to use electronic health claims data to inform and improve health care
• Significant opportunities for collaboration across the Asia Pacific region and beyond to support health care improvement and further build the research network