Social media platforms and clinical records: Trend detection and intervention

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UK
• CRIS and the PHEME project

• Rumour detection on Twitter

• Case study 1 – Legal highs and mephedrone

• Case study 2 – Medication

• Case study 3 – Mental health stigma

• PHEME dashboard
Electronic Patient Journey System

De-identification
Processing pipeline
CRIS FAST
CRIS SQL
CRIS application

Maudsley Biomedical Research Centre
National Institute for Health Research
Big Data

- Volume
- Velocity
- Variety
- Value
- Variability
- Visualisation

Veracity
• CRIS and the PHEME project

• Rumour detection in Twitter

• Case study 1 – Legal highs and mephedrone

• Case study 2 – Medication

• Case study 3 – Stigma

• PHEME dashboard
• CRIS and the PHEME project

• Rumour detection in Twitter

• **Case study 1 – Legal highs and mephedrone**

• Case study 2 – Medication

• Case study 3 – Stigma

• PHEME dashboard
2009-2014 – mephedrone / 9 keywords

<table>
<thead>
<tr>
<th>Novel psychoactive substance</th>
<th>Related terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mephedrone</td>
<td>4-mmc</td>
</tr>
<tr>
<td></td>
<td>Kitty cate</td>
</tr>
<tr>
<td></td>
<td>White magic</td>
</tr>
<tr>
<td></td>
<td>Miaow miaow</td>
</tr>
<tr>
<td></td>
<td>Meph</td>
</tr>
<tr>
<td></td>
<td>Meow meow</td>
</tr>
<tr>
<td></td>
<td>m-smack</td>
</tr>
<tr>
<td></td>
<td>M-cat</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>145,578</strong></td>
</tr>
</tbody>
</table>

- Application development – 5,000 double-annotated – Kappa 0.86
- Application performance \( [P = 0.99, R = 0.90 – 7,044 \text{ mephedrone}] \)
• CRIS and the PHEME project
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• Case study 3 – Stigma
• PHEME dashboard
## 2009-2014 – 30 drugs / 123 keywords

<table>
<thead>
<tr>
<th>Drug name</th>
<th>Tweets</th>
<th>Drug name</th>
<th>Tweets</th>
</tr>
</thead>
<tbody>
<tr>
<td>lithium</td>
<td>257,854</td>
<td>risperidone</td>
<td>4,835</td>
</tr>
<tr>
<td>mirtazapine</td>
<td>243,218</td>
<td>haloperidol</td>
<td>3,303</td>
</tr>
<tr>
<td>diazepam</td>
<td>92,596</td>
<td>donepezil</td>
<td>2,305</td>
</tr>
<tr>
<td>fluoxetine</td>
<td>56,343</td>
<td>zopiclone</td>
<td>2,188</td>
</tr>
<tr>
<td>lorazepam</td>
<td>23,446</td>
<td>clozapine</td>
<td>2,087</td>
</tr>
<tr>
<td>promethazine</td>
<td>19,626</td>
<td>memantine</td>
<td>1,825</td>
</tr>
<tr>
<td>sertraline</td>
<td>18,091</td>
<td>buprenorphine</td>
<td>1,818</td>
</tr>
<tr>
<td>methadone</td>
<td>14,219</td>
<td>valproate</td>
<td>1,163</td>
</tr>
<tr>
<td>citalopram</td>
<td>13,960</td>
<td>paliperidone</td>
<td>1,016</td>
</tr>
<tr>
<td>venlafaxine</td>
<td>13,550</td>
<td>galantamine</td>
<td>562</td>
</tr>
<tr>
<td>olanzapine</td>
<td>9,907</td>
<td>lurasidone</td>
<td>333</td>
</tr>
<tr>
<td>quetiapine</td>
<td>8,445</td>
<td>pimavanserin</td>
<td>73</td>
</tr>
<tr>
<td>aripiprazole</td>
<td>6,355</td>
<td>vortioxetine</td>
<td>65</td>
</tr>
<tr>
<td>rivastigmine</td>
<td>6,175</td>
<td>cariprazine</td>
<td>55</td>
</tr>
<tr>
<td>amisulpride</td>
<td>5,871</td>
<td>brexpiprazole</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>811,296</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Application development (9,055 annotations; 1,057 double-annotated – Kappa 0.97)

- discount
- buy
- online
- best price
- next day delivery
- cheap
- no\without prescription\rx
- compare prices
- save money
- overnight delivery
- viagra
- adpharm
- for sale
- lowest price
- purchase
- free delivery
- shipping
- uk pharmacy

Application performance (P = 0.90, R = 0.92 – 67,420 ads)
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2009-2014 – 11 search groups/ 36 keywords

<table>
<thead>
<tr>
<th>Disorders</th>
<th>Tweets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>7,298,900</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>2,058,961</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>1,339,470</td>
</tr>
<tr>
<td>Autism</td>
<td>836,642</td>
</tr>
<tr>
<td>Psychosis</td>
<td>522,137</td>
</tr>
<tr>
<td>Alzheimer’s disease</td>
<td>464,814</td>
</tr>
<tr>
<td>Attention-deficit disorder</td>
<td>444,972</td>
</tr>
<tr>
<td>Obsessive-compulsive disorder</td>
<td>320,391</td>
</tr>
<tr>
<td>Dementia</td>
<td>161,074</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>136,989</td>
</tr>
<tr>
<td>Mental-health / stigma</td>
<td>31,357</td>
</tr>
<tr>
<td>Total</td>
<td>13,615,707</td>
</tr>
</tbody>
</table>
GERMANWINGS CRASH

• Collection March 24-30th 2015 – depress*, mental*, psych*

• 20,713 tweets retrieved – 2,000 double-annotated (Kappa= 0.79)

• Application performance (P= 0.98, R= 0.31 – 1,400 anti-stigma)
• January 1\textsuperscript{st} 2010 – December 31\textsuperscript{st} 2014

• Twitter
  - Daily % of schizophrenia and depression-related tweets
  - Daily % of schizophrenia and depression supportive tweets

• Clinical record
  - Daily No of crisis episodes (inpatient and HTT)
Supportive schizophrenia tweets/crisis episodes

Supportive depression tweets/crisis episodes

Day 1   Day 2   Day 3   Day 4   Day 5   Day 6   Day 7

Day 1   Day 2   Day 3   Day 4   Day 5   Day 6   Day 7

IRR CI 95%
• CRIS and the PHEME project

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• PHEME dashboard
• PHEME Project Team
• Biomedical Research Centre CRIS Team

pheme.weblyzard.com

www.maudsleybrc.nihr.ac.uk/research/informatics/pheme

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