Automated reconciliation of radiology reports & discharge summaries

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Checking X-ray reports & reviewing patient records:
An IT solution to prevent missed fractures
DEM RBWH, 2014

- 74,858 patients
- 30 doctors / 24 hr
60 F, fall on outstretched hand
1,434 limb X-rays, 2014

Number of X-rays

- Wrist & hand
- Elbow & forearm
- Shoulder & arm
- Ankle & foot
- Knee & lower leg
- Hip & upper leg
Colles fracture
38 M, motor bike accident
Radial head fracture
74 M, fall
Base of phalanx fracture
42 F, fall
Defect through cortex
CT: proximal tibia fracture
Work Flow

ED doctor ➔ view X-ray
➔ treat patient

Radiologist ➔ report X-ray (not in real time)

ED staff ➔ check X-ray report
➔ check ED diagnosis
➔ recalls patient if fractures missed
Checking reports & reviewing records
Labour intensive process

- Check X-ray reports
- Check ED diagnosis
- Reconcile reports with diagnosis
- Recall patient if fractures missed
Time (in)efficiencies

- Delays in reporting
- Delays in checking reports
- Delays in recalling patients
Hastening the checking of reports

- Automated detection of fractures from X-ray reports
- Reconciliation of X-ray reports with ED diagnosis
- A clinical problem with an IT solution
System Workflow

ED-Radiology Reconciliation Software
Clinical natural language processing & machine learning

Potential missed diagnoses

ED
Abnormal
Normal

Radiology
Abnormal
Normal
Evaluation

• **Data:** Three hospitals – 2378 reports

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Description</th>
<th>#Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBWH</td>
<td>Royal Brisbane &amp; Womens’ Hospital (adult)</td>
<td>1,480</td>
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<tr>
<td>RCH</td>
<td>Royal (Brisbane) Childrens’ Hospital (child)</td>
<td>498</td>
</tr>
<tr>
<td>GCH</td>
<td>Gold Coast Hospital (adult 62% &amp; child 38%)</td>
<td>400</td>
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</tbody>
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• **Gold Standard:** Annotated by ED Registrar & SMO and adjudicated by Senior Staff Specialist

• **Empirical Evaluation:** Reconciliation of X-ray findings & ED diagnosis
Reconciliation Outcomes

262 (11%) patient records need to be retrieved & reviewed

1855 (78%) of patient records assigned lower priority / no action required

Recall patient:
No injury found, patient did not wait

Further review:
Crush injury, self-harm, …

262 (11%) patient records need to be retrieved & reviewed

1855 (78%) of patient records assigned lower priority / no action required
Sourcing data

- X-ray data dumps
- ED data dumps
- Currently not in real time
Challenges in getting real time data

• Multi layers of data ownership
• Differences in radiology + IT systems
• Communication across systems
Next Steps

• Help needed to hook up radiology feeds in real time
  – technically possible but administratively challenging

• Implement & evaluate the IT solution locally

• Roll out across the state
End result

Streamlining work process

Improving efficiencies – saving time & labour

Better outcomes for patients
?