Integrating the Radiology Information System with Computerised Provider Order Entry: The impact on repeat medical imaging investigations

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- Medication Safety and e-Health
- Communication and Work Innovation
- Human Factors & eHealth
- Pathology and Imaging Informatics
- Safety & Integration of Aged and Community Care Services
- Primary Care Safety and eHealth
The role of medical imaging

• Contribute to the examination, diagnosis, monitoring/documentation and treatment of patients.
• Potential safety implications of exposure of patients to carcinogenic ionising radiation
• CT procedures are among the largest source of medically-related exposures to ionising radiation
• Repeat imaging requests represents 9.2% of all imaging requests (Lee et al. Radiology, 2007)
• Potential for unintentional (inappropriate) repeat imaging requests (Kamat et al. Emer Med Journal, 2015)
Aim

To assess the impact of implementing an integrated Computerised Provider Order Entry/Radiology Information System/Picture Archiving and Communication System on the number of x-ray and computer tomography procedures (including repeat imaging requests) for inpatients at a large Sydney hospital.
Setting

- Medical imaging department located within an 855-bed Sydney teaching hospital
- Existing Cerner PowerChart (Version 2004.01) and in-house imaging results reporting system (HOSREP)
- Neither system were integrated with each other
- GE Healthcare Centricity Radiology Information System (RIS) introduced in 2009 to replace HOSREP.
- New RIS fully integrated into Cerner PowerChart
- New RIS also included PACS functionality allowing films to be captured, stored and communication electronically.
The mean number of imaging procedures per patient were calculated by dividing the number of procedures by the number of patients.

Repeat procedures were defined as those procedures when an identical procedure code was ordered for the same patient.

Inferential statistics utilised univariate ANOVA methods and 95% Confidence Intervals (CIs) for the differences in rates between time-periods used Dunnett’s C correction for multiple comparisons.

SPSS version 22

Seasonally matched comparisons

<table>
<thead>
<tr>
<th>Study period</th>
<th>Calendar period</th>
</tr>
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<tbody>
<tr>
<td>Pre-</td>
<td>Jan-Jul 2009</td>
</tr>
<tr>
<td>Post-</td>
<td>Jan-Jul 2010</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Jan-Jul 2011</td>
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</tbody>
</table>
### Results

<table>
<thead>
<tr>
<th></th>
<th>Pre-</th>
<th>Post-</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>XR</strong></td>
<td>3.02</td>
<td>2.55</td>
<td>2.58</td>
</tr>
<tr>
<td></td>
<td>(4161/1378)</td>
<td>(3807/1495)</td>
<td>(4254/1650)</td>
</tr>
<tr>
<td><strong>Mean change (reference group: Pre-) (95% CIs)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>-0.47</td>
<td>-0.44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.78, -0.17)</td>
<td>(-0.75, -0.13)</td>
</tr>
</tbody>
</table>
## Results

**Mean rate of procedures per inpatient**

(No. of procedures / No. of inpatients)

<table>
<thead>
<tr>
<th></th>
<th>Pre-</th>
<th>Post-</th>
<th>Follow-up</th>
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</thead>
<tbody>
<tr>
<td>CT</td>
<td>1.38 (1175/854)</td>
<td>1.31 (1255/959)</td>
<td>1.30 (1239/951)</td>
</tr>
<tr>
<td>Mean change (reference group: Pre-) (95% CIs)</td>
<td>-0.07 (-0.15, 0.02)</td>
<td>-0.07 (-0.16, 0.01)</td>
<td></td>
</tr>
</tbody>
</table>
Results
Results
Key findings

• Decrease in imaging procedure requests following the implementation of new RIS/PACS integrated with CPOE

• Average of 0.46 fewer x-rays and 0.07 CT procedures

• There was also a lower rate of repeat procedures – 0.13 fewer repeat x-ray procedures in 24h

• This was mainly driven by a drop in the number of x-ray procedures.
Limitations

• Observational study which utilises a dataset with information about patients with at least one imaging procedure
• Changes in imaging request rates were not compared with a control hospital.
Implications

- Enhanced clinical access to patient information including about what and when images previously requested
- Access to electronic images eliminates problems associated with misplaced and lost films
- Potential for electronic decision support at point of care as an aid to quality evidence-based decision making
Thank You

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