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.
Analysis

• 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>Mean rate of procedures per inpatient (No. of procedures / No. of inpatients)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-</td>
</tr>
<tr>
<td>XR</td>
<td>3.02 (4161/1378)</td>
</tr>
<tr>
<td>Mean change (reference group: Pre-) (95% CIs)</td>
<td>-0.47 (-0.78, -0.17)</td>
</tr>
</tbody>
</table>
## Results

<table>
<thead>
<tr>
<th></th>
<th>Pre-</th>
<th>Post-</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CT</strong></td>
<td>1.38 (1175/854)</td>
<td>1.31 (1255/959)</td>
<td>1.30 (1239/951)</td>
</tr>
<tr>
<td><strong>Mean change (reference group: Pre-)</strong> (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

[Graph showing the mean number of repeat XR procedures per inpatient over time, with different groups indicated by dashed and solid lines.}

- Pre: (n=2363/1378)
- Post: (n=2257/1495)
- Followup: (n=2583/1650)
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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