Verification of RIS data using DICOM data for the purpose of patient dose audit

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Why use RIS data?

- Patient dose audits are used to ensure that doses are ALARP.
- Previously, these have been calculated using a small, hand-written sample (≈20 records).
- RIS contains computerised data for all examinations, it’s readily available and easy to import into excel.
Methodology for Patient Dose Audit

- Data may contain kV, mAs and DAP for each examination in each room
- FFD (&/or FSD) has to be assumed based on technique and standard patient*
- kV & mAs combined with results of level B physics tests to calculate ESD including backscatter*
- *It would be relatively simple to incorporate this data to improve accuracy
Why can’t we rely on RIS data?

- Large number of ‘zero’ or blank values in kV/mAs/DAP.
- Impossible dose values frequently occur i.e. mAs of >500 or kV >150 are unlikely.
- DAP not given any units, could be µGym$^2$ or Gycm$^2$ for example

- If they are wrong, what are the real values?

DICOM!
Characteristics of DICOM Data

• Generated by the system so no chance of human error.
• Contains much more data about image acquisition parameters.

But...

• It is difficult to gather dose data quickly en masse.
• Study labelling errors remain.
Types of Error in RIS Data

• Digits typed in the wrong order i.e. 789 instead of 897.
• Wrong digits entered e.g. 228 instead of 558
• Omission of digits i.e. 119 instead of 1119.
• Insertion of digits i.e. 13690 instead of 1369.
• Errors where the user appears to have entered the ‘default’ parameters
• Transpose of data, e.g. kV value in the mAs field (& vice versa)
Distribution of Abdomen/Pelvis Examination DLPs

Relative Frequency

Dose Length Product - mGy.cm

Correct Data

Errors
Methodology in ‘cleansing’ data

- Full RIS data arrives, including all modalities
- Take out only modality that is being audited
- Remove age < 16
- Remove all data were there is < 10 records for an examination within a room
- Remove all zero or blank data

This is the data we would like to report on
Methodology in ‘calibrating’ data

• For a room that we have equivalent DICOM data, take a random sample of about 1,500 records from the 4 most common examination in that room & calculate ESD
• Using accession number, find equivalent DICOM records, record and calculate ESD
• Compare statistical profile
<table>
<thead>
<tr>
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<th>XR Abdomen</th>
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<th>XR C Spine</th>
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<tbody>
<tr>
<td></td>
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<td>DICOM</td>
<td>RIS</td>
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<tr>
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## Example

<table>
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Limitations

• DICOM only available where site has DR rooms – would need a different method of calibration for non-DR sites

• Currently collecting DICOM is still manual – takes about a day to collect c.300 records
Conclusions

• RIS data can be used for patient dose audit
• Recommend it is calibrated regularly against known data set such as DICOM
• Results of calibration can be fed back to departments, number of records removed can be set as KPI
Thanks

• Fellow authors
• Local radiographers
• Local RIS/PACS managers

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Double distribution – graphs courtesy of Tom Couch
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