Experiences of using GE DoseWatch Software for CT Dose Management

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2. Radiation Protection, Southampton General Hospital, Southampton
Overview

• DoseWatch system was installed in 2013
  – Connected to 3 CT scanners (+ fluoroscopy & cardiology) & RIS software

• A) 6 common examinations filtered in 4 different ways using data collected over 4 months in 2014

• B) Dose audit:- for each scanner against national DRLs using the same data

• DoseWatch email alert system & other features
3 CT Scanner

- 2 scanners at University Hospital, Coventry
  - GE 750HD in radiology
  - GE VCTx in A&E (2008)

- 1 GE VCT at St Cross Hospital, Rugby (2006)
# A) Six Common Examinations

<table>
<thead>
<tr>
<th>Study description</th>
<th>NICIP code</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT Head(^1)</td>
<td>CSKUH(^1)</td>
</tr>
<tr>
<td>CT Cervical Spine</td>
<td>CCSPN</td>
</tr>
<tr>
<td>CT Chest- high resolution(^2)</td>
<td>CHRC(^2)</td>
</tr>
<tr>
<td>CT Pulmonary Angiogram</td>
<td>CAPUG</td>
</tr>
<tr>
<td>CT Kidneys-ureters-bladder (KUB)</td>
<td>CURIT</td>
</tr>
<tr>
<td>CT Thorax abdomen pelvis</td>
<td>CCHAPC</td>
</tr>
</tbody>
</table>

1. The head examinations were a mixture of helical and axial
2. The hi-res chest examinations were helical
A) NICIP Code Transfer from RIS
A) The 4 Filtering Methods

1. Study description
2. NICIP code
3. Protocol name
4. NICIP code, protocol name, ≥21 years, number of series (to exclude repeat or added scans) & dosimetry phantom (IEC head or body)

- Filtering 1 to 3 can be done in DoseWatch
- Filter 4 = reference data set required exporting to Excel
A) Filtering in DoseWatch
A) Filtering in DoseWatch

- St Cross CT
- 13/10/15 to 13/11/15
- CAPUG= Pulmonary Angiogram (CTPA)
The ‘Reference’ Data Set: 4th Filtering Method

- 1 months data was downloaded at a time
- Filtered 4 month of data in Excel for:
  - NICIP code,
  - protocol name,
  - >21 years,
  - number of series (to exclude repeat or added scans)
  - dosimetry phantom (IEC head or body)
Radiology CT : 750HD

- KUB identical all filters
- Hi-res Chest & CTPA statistically no sig diff
CT Head: Scanner 1

<table>
<thead>
<tr>
<th>Filter Method</th>
<th>No Exams</th>
<th>Mean DLP (mGy.cm)</th>
<th>Std Dev</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; Q</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Description</td>
<td>781</td>
<td>899.2</td>
<td>32.8</td>
<td>560.3</td>
<td>819.1</td>
</tr>
<tr>
<td>NICIP Code</td>
<td>605</td>
<td>667.1</td>
<td>8.0</td>
<td>555.9</td>
<td>763.0</td>
</tr>
<tr>
<td>Protocol</td>
<td>334</td>
<td>643.9</td>
<td>14.5</td>
<td>425.8</td>
<td>762.9</td>
</tr>
<tr>
<td>Reference</td>
<td>230</td>
<td>603.1</td>
<td>11.8</td>
<td>425.8</td>
<td>743.0</td>
</tr>
</tbody>
</table>

- Study description gave higher mean DLP (p<0.05). No sig diff between other 3 filtering methods

- Due to inclusion of a number of CT trauma scans in ‘CT Head’ (1<sup>st</sup> series performed in trauma scan)
  ED CT (scanner 2) had similar result for same reason

- Rugby CT also higher dose for study filter because of inclusion of pre & post contrast scans in the ‘CT head’ study description
Study B

• Using the reference data set, compared the mean DLPs across the 3 scanners for the 6 examinations
• Compared mean DLPs with National DRLs
• All mean DLPs were found to be below, or within 2xSD of the National DRLs 😊
• For all examinations (except C-spine) there was a significant difference between scanner DLPs 😞
Study B: Comparing Scanner DLPs and against National DRLs
Study B: Protocol Changes

- NDRL = 440mGy.cm
- Max mA allowed on scanner 3 was lower than scanner 1 & 2
- Changed all max mA to equal scanner 2.

- NDRL = 1000mGy.cm
- Scanner 1 mean DLP = 961 ± 456mGy.cm (N=215)
- Changes: NI 32 to 35, min mA 180 to 150, changed 1st scout PA to AP
- Now mean DLP = 649 ± 428mGy.cm (N=191)
Conclusions: Study A & B

- NICIP code or Protocol Name can be used within DoseWatch for immediate summary of an examination dose. Done by Radiologists, Radiographers and Physicists
- DoseWatch gives a quick and easy method for physics to perform dose audits (we use the reference data set)
- Including a large number of examinations does not compensate for incorrect data
- Quickly highlighted inadvertent difference between scanner protocols, which have been corrected.

RM Nicol, SC Wayte et al. Experiences of using a commercial dose management system (GE DoseWatch) for CT examinations. Br J Radiol 2016; 89: 20150617
DoseWatch: Useful Features

• Can set-up e-mail alert, so immediately know when examination has exceeded pre-set DLP value, or number of series.
• Currently get about 8 to 10 emails per day
• Usually because DoseWatch has temporarily lost connection to RIS & no NICIP code information
• Some genuine alerts
### Reason for Notification

This alert is triggered by the following event(s):

- Examination DLP is over DLP threshold

### DLP (mGy.cm)

<table>
<thead>
<tr>
<th>Current value</th>
<th>Warning</th>
<th>Alert</th>
</tr>
</thead>
<tbody>
<tr>
<td>430.62</td>
<td>124.94</td>
<td>124.94</td>
</tr>
</tbody>
</table>

### Study Information

- **Date / Time:** 2015-10-23 - 15:49
- **Device:** rkb01cts04
- **Model:** Discovery CT750 HD
- **Modality:** CT
- **Site:** UHCW NHS Trust - Radiology
- **Accession number:** RKB22146574
- **Study Description:** CORBB,CSINU
- **Protocol:** 2.6 CT ORBITS
- **BMI:**
- **Weight (Kg):** 0.0
- **Height (cm):** 0.0
Alert emails: lost RIS connection

### Reason for Notification

This alert is triggered by the following event(s):

- Examination DLP is over DLP threshold
- Total number of irradiation is over threshold

<table>
<thead>
<tr>
<th></th>
<th>Current value</th>
<th>Warning</th>
<th>Alert</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLP (mGy.cm)</td>
<td>5114.97</td>
<td>2048.92</td>
<td>1920.48</td>
</tr>
<tr>
<td>TNI</td>
<td>7</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

### Study Information

- **Date / Time:** 2015-11-14 - 21:54
- **Device:** rkb02cted
- **Model:** LightSpeed VCT
- **Modality:** CT
- **Site:** UHCW NHS Trust - Radiology
- **Accession number:** RKB22212635
- **Study Description:** CT Head
- **Protocol:** 1.13 CT MULTIPLE TRAUMA (OVER 50 YRS)
- **Standard Study Description:**
- **BMI:**
- **Weight (Kg):** 0.0
- **Height (cm):** 0.0
DoseWatch: Useful Features

• Physics dose audits quick & simple, e.g. audits for medical exposure committee

• Audits using DoseWatch (We haven’t customised this yet.)

• Aim to get lead CT radiographers & radiologists more involved in dose audit/optimisation
Acknowledgements

• Chris Koller: Obtaining DoseWatch, enabling connection to RIS, idea for study A & B.
• Ruth Nicol: Carrying out Study A & B, & all the statistical analysis to publish
• Andy Bridges: Protocol changes, helpful suggestions throughout Study A & B

Thank You For Listening