Introduction

• Identifying ways to reduce medical imaging radiation dose is an important public health initiative.
• CT-related dose is the primary driver for increasing population medical radiation exposure.
• Epidemiological evidence of small increase in cancer risk attributable to ionizing radiation.
• ALARA mandates that any radiation dose, no matter how small, without direct benefit, should be avoided.
• ACR established a joint task force with the RSNA to create the Image Wisely campaign to increase awareness about adult radiation protection.

Methods

• In September 2018, we created a task force to implement anatomic guidelines for CT chest exams.
• In collaboration with the chest division leadership, we trained radiologists, technical supervisors, and technologists to set the superior and inferior margins as the lung apices on the frontal scout view and the posterior costophrenic sulci on the lateral scout view, respectively.
• Technical supervisors provide daily support and assist technicians to enforce the anatomic guidelines. Continuous feedback from physicians using our Radiology Information System which provides a messaging mechanism to alert technical staff about scan deficiencies at the time of interpretation.

Primary outcome: radiation dose of our most common chest CT applications - routine non-contrast chest and contrast enhanced pulmonary embolism protocol

Performance indicators: CT dose index (CTDIvol) and dose-length product (DLP) which were mined from every exam using the DoseMonitor software for a 4 month period prior to and after our intervention. The month of the intervention was excluded.

Negative control: ACR instituted guidelines in 2014 to provide extra radiation risk and uncertain benefit for how small, without direct benefit, should be avoided.

To assess the statistical significance of the dose reduction, we used linear regression models with the log of the CTDIvol or DLP in the lung cancer screening studies as the explanatory variable, and age, gender, and weight as covariates.

Results

• CTDIvol and DLP values for 3110 routine chest CTs prior to and 3109 routine chest CTs after our intervention, for 1629 PE studies prior to and 1831 PE studies after our intervention (Table 1).

<table>
<thead>
<tr>
<th>Study</th>
<th>Pre CTDIvol (mGy)</th>
<th>Post CTDIvol (mGy)</th>
<th>Change</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>5.8%</td>
<td>9.7%</td>
<td>-5.8%</td>
<td>1.33x10^-3</td>
</tr>
<tr>
<td>Routine</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Pre DLP (mGy cm)</td>
<td>14.1</td>
<td>13.2</td>
<td>-0.9%</td>
<td>0.076</td>
</tr>
<tr>
<td>Post DLP</td>
<td></td>
<td></td>
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<tr>
<td>Pre DLP</td>
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<td></td>
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<tr>
<td>Post DLP</td>
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• Marginal reduction in CTDIvol in the routine chest CTs (1.93%, p=0.03).

The purpose of this study was to implement a lasting intervention to decrease unnecessary radiation dose by reduction of Chest CT scan length.

Conclusion

• Creation of smoothing lines showed no evidence of return to pre-intervention dose levels for several months post-intervention (Figures 1 and 2).
• Report analysis of 100 pre and 100 post noncontrast chest CTs showed no difference in the number of incidental abdominal findings (62/100 cases had one or more finding both before and after intervention).
• Further imaging was recommended for 1/100 of the pre and 2/100 of the post CTs for evaluation of abdominal findings.
• No report mentioned that portions of the lungs were cut off in the 100 pre or 100 post chest CTs analyzed.

References

• Branner DJ, Hall EJ. Cancer risks from CT scans: now we have data, what next? Radiology 2012; 266:330-331.