IMPROVING COMPLIANCE AND DOCUMENTATION OF CT QUALITY CONTROL USING AN ELECTRONIC QUALITY ASSURANCE PRACTICE MANAGEMENT TOOL

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BACKGROUND

• Periodic quality control (QC) tests are required for computed tomography (CT) and other modalities
• Tracking compliance across larger healthcare systems can be challenging
  – Time-constrained technologists may forget to perform QC tests
  – Results historically were recorded on paper
  – Oversight and monitoring of results infrequent
  – Corrective actions are often delayed
CURRENT (BASELINE) CONDITIONS

- Daily QC maintained on paper record from 3/2015 to 3/2016
- Paper logs audited by CT physicist quarterly
- Actual QC performance was tracked using software (Radimetrics, Bayer) to detect the presence of a daily phantom scan
- CT physicist forwarded actual performance data on a monthly basis to site QC lead to encourage daily compliance
During the baseline period (3/2015 to 3/2016) the median **actual compliance** with daily QC was 89%, as measured by the daily phantom scan. **This data challenged the nearly 100% reported compliance documented on paper.**
GOAL: AIM STATEMENT

• Implement a QC management system that allows online documentation, reminders for late results, and notification of aberrant results

• Improve compliance and documentation of daily CT QC tests to 100% by 4/2016 using an online management system
A commercially available quality assurance management software (ZapIT! Medical) was implemented to track daily, monthly, and annual QC for 25 CT scanners.
## Machine Logs - Total down-time: 0 hours

<table>
<thead>
<tr>
<th>Date</th>
<th>Status</th>
<th>Category</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/10/2014 0:00</td>
<td>Closed</td>
<td>Physics (routine)</td>
<td>Annual Report</td>
</tr>
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<td>6/1/2015 0:00</td>
<td>Closed</td>
<td>Physics (routine)</td>
<td>Annual Report</td>
</tr>
<tr>
<td>2/5/2016 7:00</td>
<td>Closed</td>
<td>Physics (non-routine)</td>
<td>ACR Accreditation</td>
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<td>4/27/2016 0:00</td>
<td>Closed</td>
<td>Physics (non-routine)</td>
<td>Physicist Qualifications - MT</td>
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<td>6/28/2016 3:54</td>
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<td>Physics (routine)</td>
<td>Annual Physics Survey</td>
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<tr>
<td>3/17/2017 1:54</td>
<td>Closed</td>
<td>Manufacturer Bulletin</td>
<td>XR-29 Compliance</td>
</tr>
</tbody>
</table>

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### File Attachments

- [File 1](#)
- [File 2](#)
- [File 3](#)
- [File 4](#)
- [File 5](#)
Starting 3/2016, technologists were trained to perform daily and monthly QC per ACR recommendations and required to log results in the system.
QA HISTORY & APPROVAL

Did QC Pass?

Reviewed & Approved?

Details

Test:
- Noise and Uniformity

Status:
- Pass

Inputs:
- Axial Mean HU (center): -1.15
- Axial Mean SD (center): 3.82
- Axial Artifacts Visible?: no
- Helical Mean HU (center): 2.01
- Helical Mean SD (center): 4.06
- Helical Artifacts Visible?: no
GRAPHICAL VIEWS

- Axial Mean HU
- Axial Noise
- Helical Mean HU
- Helical Noise
NOTIFICATIONS

- Notifications are configured per individual preference
- Email or text reminders are available
- Alerts remind technologists if QC was not performed by a specified time
- Medical physicist alerted of test failures and missing QC
QC NOTIFICATIONS
IN-PATIENT SETTING

If by 7AM, QC not performed and documented, responsible Shift 1 Technologist emailed QC reminder.

If by 8AM, QC not performed in Shift 1, Shift 2 supervisor receives reminder. Assigns QC to Shift 2 Technologist.

If by 11AM, QC not performed, Medical Physicist receives notification. Medical Physicist escalates to supervisor and manager. Supervisor or manager assigns QC to Shift 2 Technologist.
• After 8/2016, the run chart showed a shift in the median compliance rate from 89% pre-implementation to 97.5% post implementation.

• 24 abnormal results were recorded and corrective actions were documented in the online tool.
## 24 ABERRANT RESULTS ADDRESSED

<table>
<thead>
<tr>
<th>Result</th>
<th>No. of Occurrences</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC Value Incorrectly Recorded</td>
<td>8</td>
<td>• Retraining&lt;br&gt;• Exclude result and repeat QC measurement</td>
</tr>
<tr>
<td>Ring Artifact Identified</td>
<td>4</td>
<td>• Air Calibration performed and/or service contacted</td>
</tr>
<tr>
<td>QC Value out of tolerance</td>
<td>4</td>
<td>• Repeat Test&lt;br&gt;• Contact Service</td>
</tr>
<tr>
<td>QC Protocol requires adjustment – baseline noise level lower than selected range</td>
<td>6</td>
<td>• Physicist corrected QC protocol</td>
</tr>
<tr>
<td>Broken Phantom</td>
<td>2</td>
<td>• Site ordered new phantom</td>
</tr>
</tbody>
</table>
CONCLUSIONS

• The online QC management tool improved compliance with daily QC from 89% to 97.5%.

• Abnormal results and remediation steps are easily documented for auditor review.

• The software tool enabled a single physicist to effectively track QC from 25 CT scanners across multiple sites.