With the implementation of a Radiology Information System (RIS) there is often a need to regularly update the RIS with new features. In order for these new features to be implemented the system must undergo periods of downtime resulting in:

- Inability to use the RIS system
- Lack of connectivity/communication between the RIS and other hospital information systems i.e. order entry, dissemination of reports

A need for a robust and comprehensive process to address these downtime was identified.
Downtime System Limitations

Features Disabled During RIS Downtime
• Electronic requests for medical imaging studies
• Electronic scheduling and documentation of studies
• Online reporting of images in the RIS
• Automated transfer of reports to referring physician

Features Enabled During RIS Downtime
• Ability to send and store acquired images
• Electronic access for radiologists to view and manipulate acquired images
• Electronic access for referrers via online web based Coral Viewer software

Downtime Challenges

Downtime Planning (Before)
• Fragmented planning and communication processes
• Focus on system implementation planning as opposed to delivery of care
• No key points of escalation or decision points

Downtime Execution (During)
• Lack of clear workflows for delivery of care
• No defined clinical staff roles and responsibilities
• Delays to reporting of images following downtime
• Focus on needs of imaging as opposed to needs of referrer

Recovery (After)
• Poor documentation of study information back into RIS system resulting in incorrect or missing information
JDMI Major Downtime Timelines

Implementation of Coral RIS 3.5 system
- Apr 2014
  - 25 1900 to 27 2100

Implementation of Coral RIS 3.6 upgrade
- Jan 2015
  - 24 1800 to 25 0200
- Aug 2015
  - 8 1800 to 9 0600
- Sep 2015
  - Downtime Workshop
- May 2016
  - 1 0000 to 1 0800

System upgrade with feature update and bug fixes
- Jan 2015
  - 24 1800 to 25 0200
- Aug 2015
  - 8 1800 to 9 0600
- May 2016
  - 1 0000 to 1 0800

- Interface with new Hospital Information System established
- Interdisciplinary workshop to develop downtime planning and execution processes

Pre Downtime Workshop

What Worked Well
- Risks to the organization clearly identified, understood and communicated
- Workflows and roles/responsibilities for clinical staff during downtime identified

What Didn’t Work
- Fragmented planning process
- Short time frames for planning of downtime
- Lack of escalation points and decision making triggers
- Poorly understood communication channels
- Lack of role clarity with respect to downtime planning
**Downtime Workflow**

**1st Iteration – Electronic Workflow**

**Benefits**
- IP Ward/ED requires medical imaging exam
- Resident or Radiologist
- Technologist

**Downtime Support**
- E-Imaging
- Ward/ED calls Medical Imaging
- Resident to request procedure
- Resident enters request info onto list and instructs Ward/ED to fill req
- Resident or support staff informs tech of request
- Tech will add patient’s name and information to tech list
- Tech will call Ward/ED for patient
- Ward/ED sends patient to imaging with requisition on chart
- Exam is completed using Coral Downtime Form which is attached to requisition
- Resident/Radiologist dictates into email body and forwards email to separate email IP Ward/ED if finding is significant

**E-imaging staff print and fax reports to ward/ED and files documents by modality for recovery following downtime resolution**

**2nd Iteration - Paper Process**

**Downtime Workflow**

**Support staff picks up downtime forms and brings to resident**

**Tech**
- Tech will fill out downtime form
- Tech will add patient’s name and relevant information to tech list
- Tech will call resident

**Resident**
- Resident enters relevant order information onto resident list
- Resident calls tech to inform of request

**IP Ward/ED**
- IP Ward/ED receives report

**Night Email sent to Resident**

**Email sent to various divisional mailboxes**
**Recovery Process**

All Technologist Downtime Lists are collected by support staff. All Downtime Reports Lists are collected by support staff. Support staff creates an order from attached documents in Coral (ED Prioritized).

- Support staff enters order in Coral on IP or ED visit (Prioritize ED visit).
- Order will appear in technologist worklist Queue.
- Technologists perform exam and document in Coral.
- Study enters radiologist reporting queue.
- Staff/Residents report in Coral.

If the order is not performed (Regular mode), lists are reconciled for outstanding orders not performed. Support staff to fax/scan downtime documents into patient profile. Not Performed (Downtime Mode).

- Support staff enters order from attached documents in Coral (ED Prioritized).
- Technologist enters procedure documentation and completes procedure.
- Study enters radiologist reporting queue.
- Staff/Residents report in Coral using downtime forms and prelim report.

**Downtime Workshop Solutions**

*In an effort to address challenges identified in previous downtimes a process improvement workshop was held*

**Issues Identified**

1. Fragmented planning process
2. Lack of escalation points and decision making triggers
3. Poorly understood communication channels

**Implemented Solutions**

- Downtime governance structure established to ensure appropriate individuals are engaged during decision making
- Comprehensive and collaborative planning workflow developed outlining clear triggers, decision making points and owners
- Clinical service delivery prioritized during downtime planning process
- Implemented standard communication methodologies and standard timelines
**Downtime Workshop**

*Solutions Continued*

<table>
<thead>
<tr>
<th>Issues Identified</th>
<th>Implemented Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short timeframe for downtime notification</td>
<td>✓ Standard planning time of 3 months established in order to allow adequate time for recruitment and training of staff</td>
</tr>
<tr>
<td></td>
<td>✓ Development of new features to be released post-downtime closed once date and length of downtime established</td>
</tr>
<tr>
<td>Lack of clear roles and responsibilities for staff members</td>
<td>✓ Process and action item owners identified</td>
</tr>
<tr>
<td></td>
<td>✓ Job action sheets developed to ensure process and action item owners know what to do and when to do it when planning and executing downtimes</td>
</tr>
<tr>
<td></td>
<td>✓ Downtime workflows revised and updated with feedback from IT and clinical stakeholders</td>
</tr>
</tbody>
</table>

**Departmental Planning Workflow**
Departmental Planning Workflow

Job Action Sheet
Senior Clinical Director

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Task</th>
<th>Execution Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before Downtime</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>• Communicate Downtime Date and Time</td>
<td>3 Months Prior to Downtime</td>
</tr>
<tr>
<td>Downtime Date to Management</td>
<td>• Initiate planning</td>
<td></td>
</tr>
<tr>
<td>Team</td>
<td>• Create leadership and frontline schedule</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Engage physician stakeholders</td>
<td></td>
</tr>
<tr>
<td><strong>During Downtime</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downtime Start</td>
<td>• Conduct staff visits and support where necessary</td>
<td>Immediately when downtime begins</td>
</tr>
<tr>
<td></td>
<td>• Participate in status calls</td>
<td></td>
</tr>
<tr>
<td><strong>After Downtime</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downtime End Status Calls</td>
<td>• Initiate communication to IP units</td>
<td>Immediately following end of downtime</td>
</tr>
<tr>
<td></td>
<td>• Initiate Recovery Process</td>
<td></td>
</tr>
</tbody>
</table>
Communication Plan

**Audience**
- IT Departments
- Leadership
- Frontline Staff

**Key Message**
- Downtime date, time, length, impacts and risks
- Outline of services unavailable during downtime
- Processes to follow and contingency plans for all departments

**Before Downtime**
- IT Departments
- Leadership
- Frontline Staff

**During Downtime**
- IT Departments
- Imaging Leadership
- All on site staff

**After Downtime**
- IT Departments
- Imaging Leadership
- All on site staff

Post Downtime Workshop

**What Worked Well**
- Clarity in roles and responsibilities for clinical and administrative staff with respect to planning and execution
- Reliable processes established and understood by all staff
- Clear and transparent communication process and channel
- Key points of escalation and decision making established

**What Didn’t Work**
- Timeframe of downtime resulted in challenges for product delivery team in both implementation of product and post downtime monitoring of system
Downtime Performance

Lessons Learned

- Consolidated departmental workflow with key points of escalation, communication and decision points allowed for safe and effective management of clinical operations
- Paper processes with appropriate supporting workflows proved to be more reliable and less susceptible to error
- Alignment of downtime timeframes with low periods of clinical activity resulted in fewer requests and better performance
Conclusion

- Key components of a good plan are communication and coordination
- Individual workflows and plans with little transparency between teams results in inefficient and error prone planning and execution of events
- In situations where regular downtimes are needed, having the appropriate planning and focus can ensure that patient care is not compromised

Next Steps

- Develop process workflows for unplanned downtimes
- Improve data capture processes to better measure performance during downtime events
- Consider consistent dates and times for downtimes in order to minimize impact to patients and external departments while balancing pressure on product delivery team
Additional Information

For additional information please contact Paul Cornacchione at paul.cornacchione@uhn.ca

Appendix
## Second Downtime

<table>
<thead>
<tr>
<th>Volumes (Number of Studies Performed)</th>
<th>Average Exam Turnaround Time (Study Requested to Study Performed Hrs)</th>
<th>Average Report Turnaround Time (Study Requested to Study Reported Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg Regular Overnight</td>
<td>Downtime Overnight</td>
</tr>
<tr>
<td>CT</td>
<td>20.1</td>
<td>20</td>
</tr>
<tr>
<td>General Radiography</td>
<td>45</td>
<td>57</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

*Variance of +/- 5% of regular data, or better than regular operations considered acceptable*

## Third Downtime

<table>
<thead>
<tr>
<th>Volumes (Number of Studies Performed)</th>
<th>Average Exam Turnaround Time (Study Requested to Study Performed Hrs)</th>
<th>Average Report Turnaround Time (Study Requested to Study Reported Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg Regular Overnight</td>
<td>Downtime Overnight</td>
</tr>
<tr>
<td>CT</td>
<td>20.1</td>
<td>30</td>
</tr>
<tr>
<td>General Radiography</td>
<td>45</td>
<td>59</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

*Variance of +/- 5% of regular data, or better than regular operations considered acceptable*
## First Post Workshop Downtime

<table>
<thead>
<tr>
<th></th>
<th>Volumes (Number of Studies Performed)</th>
<th>Average Exam Turnaround Time (Study Requested to Study Performed Hrs)</th>
<th>Average Report Turnaround Time (Study Requested to Study Reported Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg Regular Downtime</td>
<td>Downtime Variance</td>
<td>Regular Downtime</td>
</tr>
<tr>
<td><strong>CT</strong></td>
<td>20.1</td>
<td>15</td>
<td>-25.4%</td>
</tr>
<tr>
<td><strong>General Radiography</strong></td>
<td>45</td>
<td>35</td>
<td>-22.2%</td>
</tr>
<tr>
<td><strong>Ultrasound</strong></td>
<td>2</td>
<td>2</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Time Required to Recover:**
2 hours and 44 minutes

*Variance of +/- 5% of regular data, or better than regular operations considered acceptable

### Relevant Files

<table>
<thead>
<tr>
<th>File</th>
<th>Description</th>
<th>Attachments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Plan</td>
<td>Detailed plan outlining which stakeholders to engage and when</td>
<td><img src="attachment" alt="Communication Plan" /></td>
</tr>
<tr>
<td>Senior Clinical Director Job Action Sheet</td>
<td>Detailed instructions for required actions pre, during and post downtime</td>
<td><img src="attachment" alt="Job Action Sheet" /></td>
</tr>
<tr>
<td>Planning Workflow</td>
<td>Comprehensive workflow for departmental planning of downtime</td>
<td><img src="attachment" alt="Planning Process" /></td>
</tr>
</tbody>
</table>