Reducing Frequency of Radiation Therapy Treatment Planning Errors

AHNCI – Division of Radiation Oncology

December 10, 2021
Institutional Overview

Allegheny Health Network Cancer Institute

Division of Radiation Oncology

• 13 facilities across Western PA and OH, main facility in Pittsburgh (Allegheny General Hospital)

• AHN, as a network, offers the full array of radiation oncology services including External Beam Radiation Therapy (including SBRT), Gamma Knife radiosurgery, and a variety of brachytherapy applications

• Actively accredited through the ASTRO Accreditation Program for Excellence (APEx)
# Team members

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russell Fuhrer, MD</td>
<td>Team Lead; Physician</td>
<td>AHNCI – Radiation Oncology</td>
</tr>
<tr>
<td>Maria Clements</td>
<td>Team Member; Clinical Informatics Nurse</td>
<td>AHNCI</td>
</tr>
<tr>
<td>Brandon Weiss</td>
<td>Team Member/Facilitator; Manager, Radiation Therapist</td>
<td>AHNCI – Radiation Oncology</td>
</tr>
<tr>
<td>Andrew Soldner</td>
<td>Contributor; Medical Physicist</td>
<td>AHNCI – Radiation Oncology</td>
</tr>
<tr>
<td>Mark Word</td>
<td>Contributor; Medical Dosimetrist</td>
<td>AHNCI – Radiation Oncology</td>
</tr>
<tr>
<td>Lisa Ciafre</td>
<td>Executive Sponsor; Quality Director</td>
<td>AHNCI</td>
</tr>
</tbody>
</table>
Problem Statement

ANHCl provides [external beam] radiation treatment for approximately 400 patients per month. Each course of radiation treatment requires a patient-specific treatment planning process that will establish the type, dose and frequency of radiation treatment the patient will receive, as well as the custom radiation beam design that will deliver dose to the prescribed treatment area(s).

During the period of 1/1/2020 – 7/7/2021 it was found that there was a median of 4 errors per month.

These errors increase risk of downstream, systematic errors in radiation therapy treatment delivery.
Outcome Measure

Baseline data summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measure:</strong></td>
<td>Treatment Planning Safety events</td>
</tr>
</tbody>
</table>
| **Patient population:**  
* (Exclusions, if any)                      | Patients receiving radiation treatment at AHNCI – Division of Radiation Oncology (excluding brachytherapy)  
* (all locations except 1 contracted facility that is not reporting in the AHN incident reporting system). | |
| **Calculation methodology:**  
* (i.e. numerator & denominator)         | **Numerator:** # of “Treatment Planning” safety events (85)  
**Denominator:** Total # of Treatment plans completed (5059) |
| **Data source:**                          | AHN incident reporting system – RL6                                                                                                                                               |
| **Data collection frequency:**            | Per occurrence of event  
Date range: 1/1/20 – 7/7/2021                                                                                                                                             |
| **Data limitations:**  
* (if applicable)                            | Reliant on compliance with event reporting                                                                                                                                 |
Outcome Measure
Baseline data

Treatment Planning Safety Events (n=85)

Count of Reports
Median
Aim Statement

Reduce the number of “Treatment Planning” reported safety events at ANHCl to ≤ 4 per month, by December 31, 2021.
Process map – Overview: Process of Care

Radiation Therapy – Process of Care
Process map – Overview: Process of Care

Radiation Therapy – Process of Care

Total reported safety events in the date range of this project: 285
Process map – Overview: Process of Care

Radiation Therapy – Process of Care

Total reported safety events in the date range of this project: 285

30% of these events occurred during “treatment planning”. This step is the focus of the project.
Summary of Learning:

- 6 main steps in the process
- About 20% of the process involves a hand-off
- There are at least 2 individual staff members involved in every plan
- Staff working together on a treatment plan may not always be in the same physical location – many handoffs occur via task alert in electronic health record system
• Complex and iterative process – many moving parts
• Not always reflected with a rigid yes/no decision, rather a balancing of goals vs. achievable reality (art vs. science)
• Critical elements of documentation must reconcile the entire process at the end to ensure congruency between prescription, planning directive and actual treatment plan
• Black arrows = failure modes with existing metrics (reported in system)
• Gold arrows = failure modes provided during discussion
• Info input & output are both buckets of critical documentation
19% of tx planning errors

41% of tx planning errors

Treatment planning safety events:
Median – 4 per month

Incorrect studyset transferred from MiM to Monaco
Wrong scan used for fusion
Prescription ≠ intent
Structures contoured incorrectly
counted structures ≠ care plan structures
orders ≠ intent
Planning directive not patient-specific or well-defined
PTV ≠ planning directive

Scan reference point sent incorrectly in Monaco (wrong shifts)
Density overrides not done (contrast/artifact)
Deviation from SOP plan approach
Using incorrect calc parameters/settings
Plans created with unrealistic/undeliverable scenario
Ambiguous policy on planning practices
Re plans done to create options (resource burden)

Treated areas do not match consent
Incorrect or missing bolus documentation
Shifts – entered incorrectly into site setup
Beams/Fields labeled incorrectly in MQ
Missed documentation updates b/w plan and Rx
Plan documentation not thoroughly completed
Plan not meeting constraint/no physician note

QCL for volumes complete before volumes actually completed
Protocol alert not launched
Peer review recommendations leading to re-plan
Change in process without appropriate notification
Communication breakdown due to loss of QCL task chain
Communication breakdown during transfer of care b/w facilities
Staffing coverage leading to changes in plan

Planning software malfunctions

Standard procedure

Communication

Equipment
## Process Measure

### Diagnostic Data summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measure:</strong></td>
<td>Treatment Planning Safety events involving output documentation</td>
</tr>
<tr>
<td><strong>Patient population:</strong></td>
<td>Patients receiving radiation treatment at AHNCI – Division of Radiation Oncology (excluding brachytherapy) (all locations except 1 contracted facility that is not reporting in the AHN incident reporting system).</td>
</tr>
<tr>
<td><strong>Calculation methodology:</strong></td>
<td>Numerator: # of “Treatment Planning Output Documentation” safety events (35) Denominator: Total # of “Treatment Planning” safety events (85)</td>
</tr>
<tr>
<td><strong>Data source:</strong></td>
<td>AHN incident reporting system – RL6</td>
</tr>
<tr>
<td><strong>Data collection frequency:</strong></td>
<td>Per occurrence of event Date range: 1/1/20 – 7/7/2021</td>
</tr>
<tr>
<td><strong>Data limitations:</strong></td>
<td>Reliant on compliance with event reporting</td>
</tr>
</tbody>
</table>
Process Measure

Diagnostic Data

Treatment Planning Errors - Output Documentation

- Missed documentation updates b/w plan and Rx
- Shifts – entered incorrectly into site setup
- Beams/Fields labeled incorrectly in MQ
- Incorrect or missing bolus documentation
- Plan documentation not thoroughly completed
- Treated area as do not match consent

Error Type
## Priority / Pay-off Matrix

### Countermeasures

<table>
<thead>
<tr>
<th>Impact</th>
<th>Ease of Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Easy</td>
</tr>
<tr>
<td>High</td>
<td>Difficult</td>
</tr>
</tbody>
</table>

#### High Impact

- **Easy**: Create ‘accountability’ report to send to management
- **Difficult**: Combine two existing reconciliation tools with final result
- **Difficult**: Hire a Quality Manager
- **Difficult**: Software fix
- **Difficult**: Hire a role to complete the documentation
- **Difficult**: Standardize the process
- **Difficult**: Track the errors by individual

#### Low Impact

- **Easy**: Track the errors by individual
# Test of Change

## PDSA Plan

<table>
<thead>
<tr>
<th>Date</th>
<th>PDSA Description</th>
<th>Lead</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/12</td>
<td>Propose change to treatment planning manager</td>
<td>QTP Team</td>
<td>Done</td>
</tr>
<tr>
<td>11/4</td>
<td>Distribute change proposal presentation – recorded power point – to treatment planning</td>
<td>Brandon Weiss &amp; Dr. Fuhrer</td>
<td>Done</td>
</tr>
<tr>
<td>11/23</td>
<td>Update change proposal presentation with modifications and distribute to wider audience for comment</td>
<td>Brandon Weiss</td>
<td>In progress</td>
</tr>
<tr>
<td>12/16</td>
<td>Present at committee for process change</td>
<td>QTP Team</td>
<td>Scheduled</td>
</tr>
<tr>
<td>12/16</td>
<td>Initiate system change process</td>
<td>Brandon Weiss</td>
<td>Not Started</td>
</tr>
<tr>
<td>12/16</td>
<td>Communicate &amp; Educate all impacted team members (allow 1-2 week lead time)</td>
<td>QTP Team</td>
<td>Not Started</td>
</tr>
<tr>
<td>Jan 2022</td>
<td>Implementation</td>
<td>QTP Team</td>
<td>Not Started</td>
</tr>
<tr>
<td>Jan 2022</td>
<td>Collect change data</td>
<td>Brandon Weiss</td>
<td>Not Started</td>
</tr>
</tbody>
</table>
Education Material

Material developed for change proposal and training: Recorded PowerPoint file.
Outcome Data - Overall

Summary:

- Total defect data demonstrates a process NOT in statistical control
- “Start” represents the start of the QTP program
- Not enough data from the start of the program to current day
Outcome Data – Drill down

Summary:

- “Missed documentation updates” refers to the focus of the countermeasure.
- 5 points of “0” data adjacent to the start of the program: potentially an effect of low engagement with reporting.
## Next Steps

<table>
<thead>
<tr>
<th>Item</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare the final change proposal presentation and submit to committee</td>
<td>Brandon Weiss</td>
</tr>
<tr>
<td>Determine the style of measurement for collecting change data</td>
<td>QTP Team</td>
</tr>
<tr>
<td>Implement change, collect data and compare to baseline</td>
<td>QTP Team</td>
</tr>
</tbody>
</table>
Conclusion

1. The proposed countermeasure is one that resonates with staff
   - Something that people have been wanting to change (anecdotal evidence)

2. The proposed countermeasure is achievable in a relatively short time frame (priority matrix)

3. The baseline data brought forward validation of the effort to make the change (fishbone diagram + c-chart)
   - Prioritize the work relative to the list of all projects

4. The process map assisted in the realization of number of hand-offs in the process, which further confirms the value in developing effective reconciliation tools for documentation