# History Repeats itself: RO-ILS and the Efforts to Change the Future

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ROILS RADIATION ONCOLOGY INCIDENT LEARNING SYSTEM Sponsored by ASTRD and AAPM

Disclosures

- I am a member of the Radiation Oncology Healthcare Advisory Committee (RO-HAC), the analysis arm of the AAPM & ASTRO sponsored RO-ILS: Radiation Oncology Incident Learning System<sup>®</sup>
  - Specialty specific national ILS







"Those who don't study history are doomed to repeat it. Yet those who do study history are doomed to stand by helplessly while everyone else repeats it."



RrainyQuote





#### RO-HAC Labels -- What is the Care Delivery Problem?

Documentation

#### **Approvals**

- Physician Approval Missing
- Physics Approval Missing
- Therapist Approval Missing
- Verbal
   Verbal
   Supported With Written
   Supported With Written
   Matinflow opcology:

#### Equipment Collision Issue

Network Issues

- Incomplete, Unclear, Missing Documentation • Hardware Issue/Failure Machine Malfunction
- Missing Documentation Medical Radiation Record Incomplete/Information Missing Medical Record Incomplete/Information Missing
  - Software Issue/Failure Patient
    - Incorrect Fiducial Marker Placement
      - Incorrect Patient
         Positioning
        - Incorrect Reference Point

### RO-HAC Labels -- What is the Care Delivery Problem? Incorrect Daily TD

- Planning
- Adaptive Planning Error
- Beam Energy
- Data Transfer From CT Issue
- Data Transfer To R&V Issue
- Dose Calculation

• Field Size

Sp

- by ASTRO and AAPs
- Incorrect Target Incorrect Treatment

 Incorrect Isocenter Defined

- Problem With
- Contouring
- Problem With Data Set
- Problem With DRR RADIATION ONCOLOGY

- Problem With Localization Of Scan In TPS
  - Problem With Registration Of Images

Problem With IGRT

Reference Data Set

- Potential Collision
- Shifts

#### RO-HAC Labels -- What is the Care Delivery Problem?

#### QA

- In Vivo Dosimetry • Independent Dose Calculation
- Not Done Localization Image Review
- (CBCT) Inadequate Physician Evaluation Of Plan
- Inadequate

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- Physicists Evaluation Of Plan Inadequate
- Portal Image Review Inadequate Pretreatment Chart Check Inadequate
- Pretreatment Plan
- Measurements Not Done
- Pretreatment QA Inadequate
- · Weekly Chart Check Inadequate

#### RO-HAC Labels -- What is the Care Delivery Problem?

Incorrect Contour

Incorrect Daily TD

Incorrect Documentation Of Reference Point On Data Set

#### Scheduling

- Problem Related To Scheduling Patient

#### Simulation • Field Size

- Incomplete, Unclear, Missing Documentation Of Patient Or Immobilization Devices
- Immobilization Devices RO-ILS ADIATION OKCOLORY ADIATIONO OKCOL

- Incorrect Construction Of Immobilization Devices Incorrect Position Of Patient
  - Incorrect Target
    - Incorrect Treatment
    - Incorrect Type Or Technique Of Simulation
    - Problem With Acquiring Data Images
    - Problem With
    - Administration Of Contrast To Patient

# RO-HAC Labels -- What is the Care Delivery Problem?

#### Simulation CONT'D

- Problem With Contouring
- Problem With DRR
  - So
- Problem With IGRT Reference Data Set
  Problem With Localization Of Scan In TPS
  - Problem With Prescription

#### ROILS RADIATION ONCOLOGY-INCIDENT LEARNING SYSTEM

# RO-HAC Labels -- What is the Care Delivery Problem?





# RO-HAC Labels -- What is the Care Delivery Problem?

#### Treatment

- Incorrect Accessory
- Incorrect Field
- Incorrect Monitoring Of Medical Devices

Incorrect R&V Documentation

- Incorrect Patient
- Incorrect Session Or Course
  Incorrect Treatment Delivery
- Problem With Image Guidance
- Problem With R&V Treatment Calendar

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#### Mistakes, while they can happen in new and surprising ways, have a lot of repetition

- We need to move from incident reporting to incident teaching system
- Are we at saturation with 10,000 events?



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### **RO-ILS Aggregate Report Themes**

- Treatment planning
- Hand-offs
- Value of speaking up • SBRT
- Human factors engineering
- Contouring
- Results from prescription survey Contributing Factors
- Difference between physician's intent and dosing patterns used assessment

Emergency, on-call treatments

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- Process improvement (DMAIC)
- Errors at the time of treatment

## **RO-ILS Aggregate Report Themes**

| Electron beam   |  | Communication   |
|---|--|---|
| <ul> <li>Best practice: event reporting and<br/>implementing change</li> <li>Policies and procedures</li> </ul> |  | <ul> <li>HDR</li> <li>Laterality, manual data entry,<br/>patient orientation</li> </ul> |
| IGRT/set-up     Prescription  |  | <ul> <li>Approved plan different from<br/>intent</li> </ul>                             |
| Treatment delivery to the wrong<br>target   |  | <ul> <li>Occurrence and discovery of errors<br/>within the workflow process</li> </ul>  |
| ROILS   | RADIATION ONCOLOGY*<br>INCIDENT LEARNING SYSTEM<br>Spansored by ASTRO and AAPM | <ul> <li>Rushed cases</li> <li>Changes to the course of therapy</li> </ul>              |

#### **RO-ILS Aggregate Report Themes**

- Missed treatments and prescriptions
- Physician's prescription does not match care intended/delivered
- Overall characterization of event types
- Importance of review
- Incorrect isocenter
- Time-outs
- Summary of unsafe conditions, near misses and incidents

# RO-ILS report as a training tool ROmmunication oncology\* Communication Communication

Planning on wrong scan set
Summary of incidents with medical impact

Prescription

- Distraction, multi-tasking and interruption
- Incidents with >5% dose deviation
- Time-outs

S, Most recent aggregate report had 21 recommendations from ROHAC



# Lesson from IHI: Changes Based on Human Factors Design Principles

- Simplify. Simplifying involves taking steps out of a process.
- Standardize. Standardizing removes variation and confusion, and promotes predictability and consistency.
- Use forcing functions and constraints.
- Forcing functions make it impossible to do a task incorrectly. They create a hard stop that you cannot pass unless you change your actions.
- A constraint is the state of being checked, restricted, or compelled to avoid or perform some action.



### Lesson from IHI: Changes Based on Human Factors Design Principles

- Use redundancies. A typical example is double-checking someone's work.
- Avoid reliance on memory. Checklists are a valuable tool to reduce this reliance. • Take advantage of habits and patterns.
  - Habits are those actions we perform in consistent circumstances and are triggered by our surroundings. A pattern is a recognizable regularity in events.
- · Promote effective team functioning. Teamwork and communication are promoted in many industries.
- Automate carefully. Technology can sometimes but not always be helpful.

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### Incident Teaching!!

#226. Prevention\_Ideas

What might prevent future events like this? Add Comment

#227. Intervention

What changes, if any, has the facility made in response to the event? Add Comment



AAPM WG RO-ILS

 Task Group No. 327 - Crowd-sourced solutions to the problem of wrong shift instructions (TG327)

| <b>RO•ILS</b> | RADIATION ONCOLOGY*<br>INCIDENT LEARNING SYSTEM |
|---------------|---|
|               | Commentation of The and Address                 |

# Prevention



**RO•ILS** 

# Prevention



# Intervention



**RO**•ILS

# Intervention





#### RO-ILS Case 1:

- Plan presented to therapy for check 3.5 hours prior to treatment.
- When putting the patient on the table the Exactrac was put in as a star array and not cranial array.
- Physics had to come and reimport the exac trac, causing a delay for patient on the table.



Possible Solutions Suggested by Reporting Site:

- Future state:
- Physics group working on improving workflows with physicians for planning/approval.
- Physicians will approve treatment plans within a time frame that would allow the physics and therapist teams to conduct their QA checks.



#### Unpack it!

- Recent late plan at my institution...
  - Power to push plan off
  - Staffing levels for dosimetry
  - Managing workload
  - Talking to colleagues

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#### RO-ILS Case 2:

- Patient receiving 28 fractions to chest with IMRT.
- Simulated with a vac loc bag for immobilization.
- The patient was treated correctly with the bag for his first fraction.
- However, the bag was not included in the setup note, and it was not used for fractions 2-8.
- On weekly chart review, the physicist noticed a 3 cm difference in the table vertical from fx 1 to fx 2 and raised a flag.



### Possible Solutions from Reporting Institution

- Physics and therapists should verify simulation photos with the setup note.
- Large changes in the couch vertical between fractions should alert therapists that there may be an issue.
- Further unpacking to consider:
  - Standardization- aren't chest IMRT plans always treated/simmed with VacLoc?
  - What are couch tolerances?
  - Make sim photo-set up note part of checklist?



### RO-ILS Case 3:

- Patient starts new treatment in roughly 24 hours and still waiting on MD physical approval of plan.
- MD verbally approved plan, but to verify plan was deliverable in verification sim before approval.
- Cannot move forward with rest of carepath until this is done.



#### Possible Solution from Reporting Institution

- If MD cannot approve plan by a certain time before new start then we need a policy on what to do next (ie., go to MD on call for approval, etc.) so we can have plenty of time for dosimetry to export and physics and therapists to do their QA checks.
- Further unpacking to consider: 1st tx day does not have to happen directly after Vsim; suboptimal precedent to put patient on table with unapproved plan, what's harm in later revoked approval?

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#### RO-ILS Case 4:

- Palliative case treated to 2 sites: C-spine and Sacrum, both 3000cGy/10 fx.
- The first site, C-spine, treated properly. When they went to treat the second site, sacrum, the couch and patient were never shifted to the new site.
- 100 MU of the PA sacrum field was treated to the c-spine isocenter then therapy realized.
- In consultation with physics, determined to deliver the remainder of the sacrum fields to the correct sacrum isocenter.



#### RO-ILS Case 4, continued:

• Plan sum was generated to assess delivered dose.

• The sum was reviewed with MD and it was determined it did not have a clinically significant effect on the patient's treatment outcome.



### Possible Solutions:



- Adding an alert to therapists that a different isocenter is being treated and shift is necessary on the machine.
- Forcing plan scheduling to make two sites be moded up separately on the machine.
- Have therapists always index to the same position on table and create new tolerance table for two-site patients that has a tighter tolerance on the couch parameters which would require therapists to sign off on couch overrides.



# Other Possible solutions from user institutions:

- Dedicated therapist chart checker: Robustness even when system is stressed.
- Facephotos transfer from EPIC to Aria.
- Pictures have patient identifiers embedded into them.
- Automatically scheduling of imaging as specified in prescription, rather than manual.

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#### What about beyond the Institution??

- RO-HAC has meetings with industry sponsors about the RO-ILS data
- Think about what you want to tell the ROHAC!
- ASTRO and AAPM initiatives
  - Standardized normal tissue contouring
  - Standardized nomenclature
  - Standard prescription



#### Cooperation with industry...

- Especially in setting of places where the check is weak!
- Gopan et al, physics plan checks....about 38% effective in real life, 67% in simulated
- What about physician peer review?

Gopan O, Zeng J, Novak A, Nyflot M, Ford E. The effectiveness of pretreatment physics plan review for detecting errors in radiation therapy. Med Phys. 2016 Sep;34(9):5181. doi: 10.1118/1.4961010. Gopan OI. Smith WPI Chreetsov AI, Hendrickson KI, Kalet AI, Kim MI, Nyflor KI M, Phillips MI, Young LI, Novak AI, Zeng JI, Ford E1. Utilizing simulated errors in radiotherapy plans to quantify the effectiveness of the physics plan review. Med Phys. 2018 Dec;45(12):5359-5365. doi: 10.1002/mp.13242. Epub 2018 Nov 8.



#### Cooperation with industry...

- Is MD review and peer review a weak link?
- "Problematic plan approved for treatment" was the largest category of the highest severity errors (#2, #2 "wrong shift instructions given to therapists," and "wrong shift performed at treatment.")
- Plug for Talcott et al, ASTRO 2019 Chicago Patient Safety Orals Monday morning 7:45

Ezzell, Gary et al. Common error pathways seen in the RO-ILS data that demonstrate opportunities for improving treatment safety. Practical Radiation Oncology, Volume 8, Issue 2, Radiation of Rociology\*
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#### **RO-ILS Cases and Industry**

• Multiple events where the CTV was larger than the PTV (due to MD editing, errors in naming)

• How could TG 263 and the planning software help us?



#### **RO-ILS Cases and Industry**

- Event: incompletely segmented organs at risk:
- Brainstem, nasopharynx case
- How could TG 263, Standard normal tissue contouring, and the planning software help us?
- What about a cause were the cauda equina wasn't contoured for an SBRT L5 case?



#### **RO-ILS Cases and Industry**

- Multiple cases concerned confused prescriptions:
- 20Gy in 5 fx per intent but was written 200cgy x5fx.
- Intent 180 cGy x 25 fx= 5000 cGy, but planned for 25 cGy x 180 Fx = 5000 cGy

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|----------------|---|
|                | Seasoned by ASTRO and ARRM                      |





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