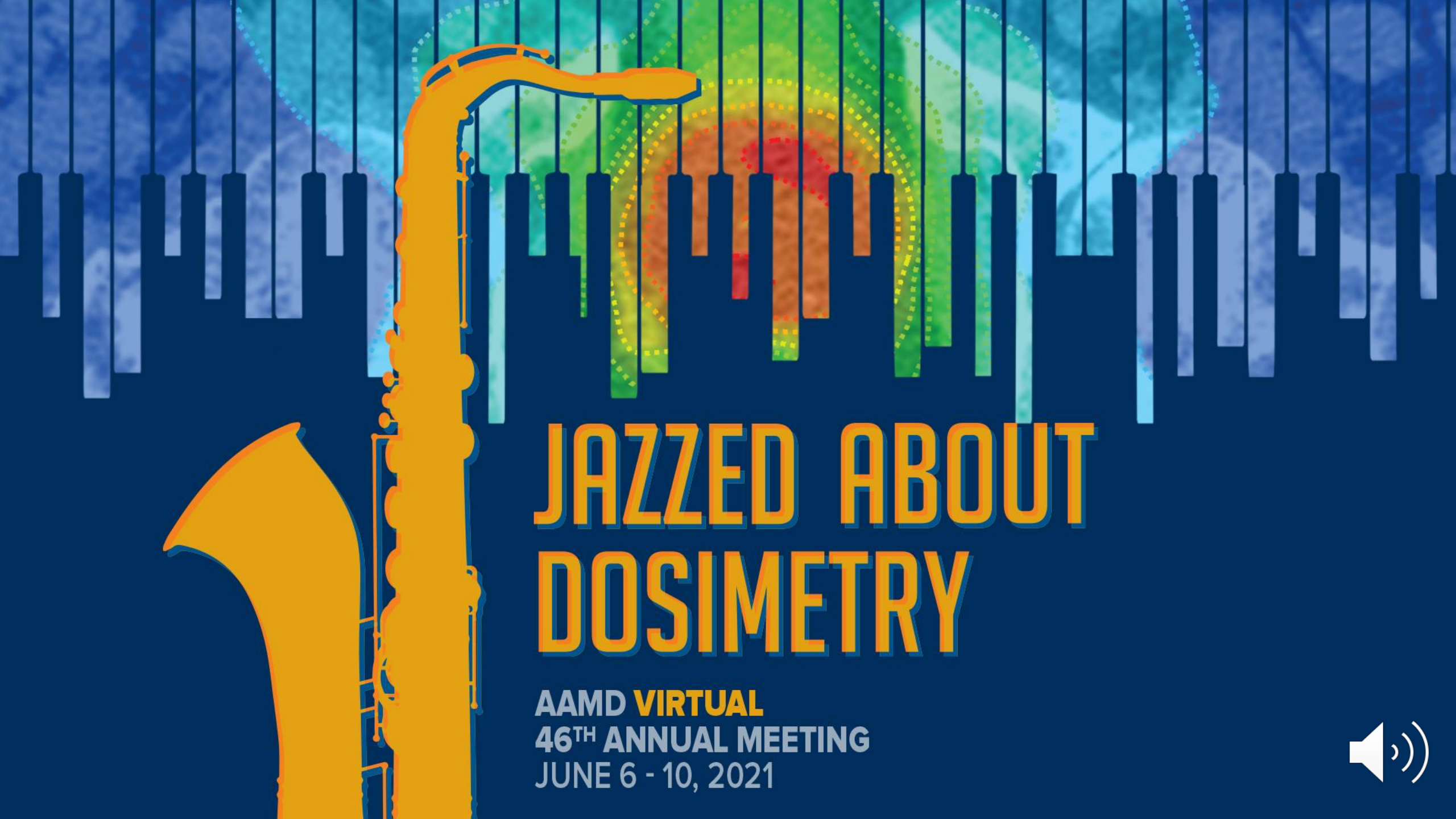
JAZZED ABOUT
DOSIMETRY
AAMD VIRTUAL
46TH ANNUAL MEETING
JUNE 6 - 10, 2021

RO-ILS Errors: What Dosimetrists Can Learn From The National Database

A. Paige Dalton, MSHA, CMD, RT(T) and Lee Hales, BSc, CMD

CE Credits

- To earn CE Credits for this session, you need to view the entire session and complete both the assessment questions and evaluation.
- These need to be completed by Thursday, July 15

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Disclosures:

- Members of the Radiation Oncology Healthcare Advisory Council (RO-HAC) for RO-ILS.

Outline

- RO-ILS Basics
  - Program Overview
  - RO-HAC
  - Event Process
- Case Examples
  - Imaging
  - Contouring
  - Documentation/Collaboration/Team Interaction
  - Good Catches by Dosimetrists
- Role for Dosimetrists and RO-ILS Impact

Learner Objectives

1. Identify treatment planning-related trends in the RO-ILS national database.
2. Develop tools to analyze events and create effective corrective actions to mitigate future errors.
3. Demonstrate the critical role dosimetrists must play in incident learning.

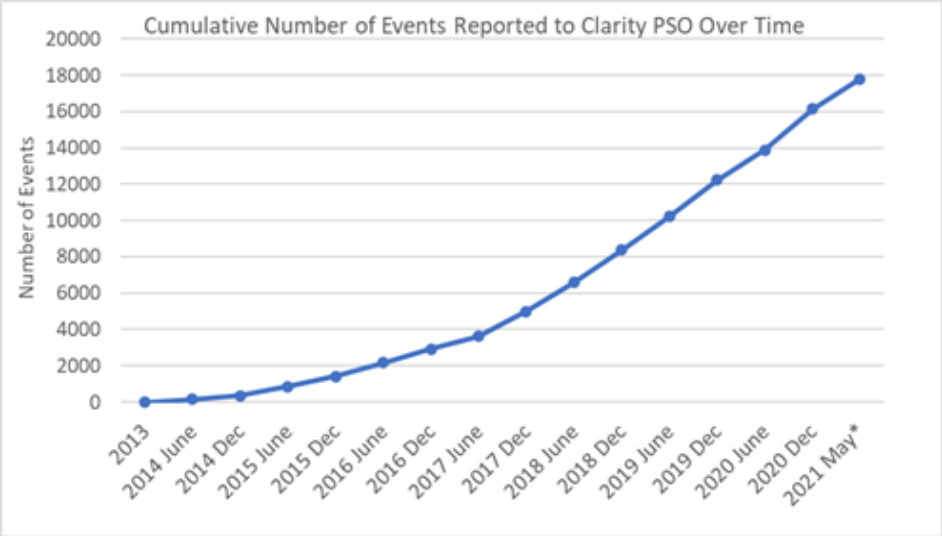
RO-ILS Basics

Program Overview

- RO-ILS is an online safety data collection instrument tied with a federally listed patient safety organization (PSO).
- Free to participate.
- Web-based, no IT support required.
- Anonymous reporting possible within the practice.
- Access only own practice's data.

Program Update

- Established program – 7 years.
- Practices can be comprised of one or more facilities.
- **619** facilities enrolled.
- **~25%** of U.S. facilities are enrolled.
- Facilities in **47** states and Puerto Rico enrolled.
- **Almost 17,800** events have been reported to the PSO.



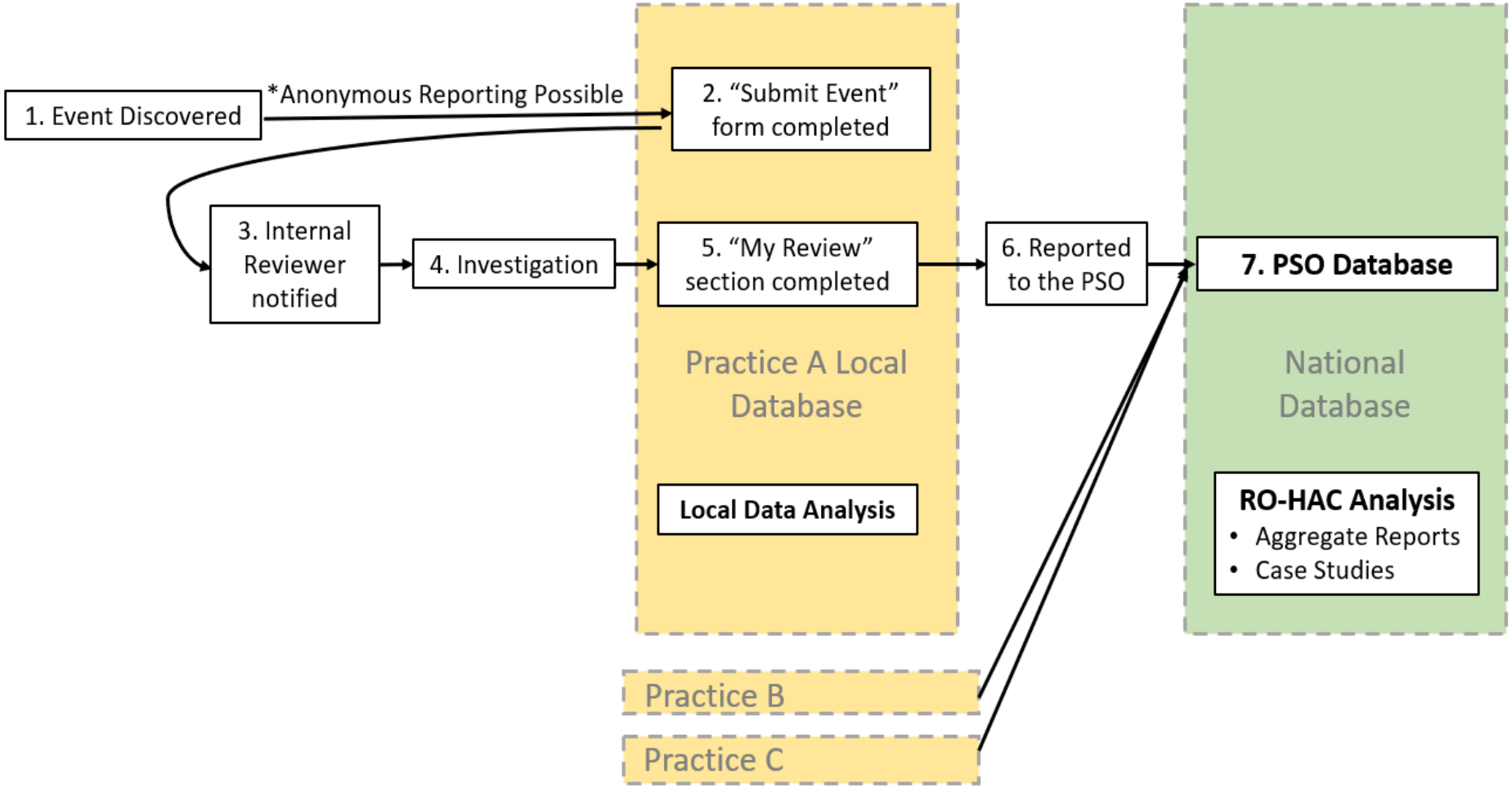
Data as of May 1, 2021

RO-HAC

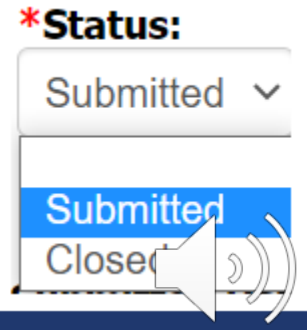
- 12 professionals who work with Clarity PSO to analyze, interpret, and report on RO-ILS data.

- Responsibilities:
  - Ongoing Event Review
  - Monthly Meetings
  - Education Development

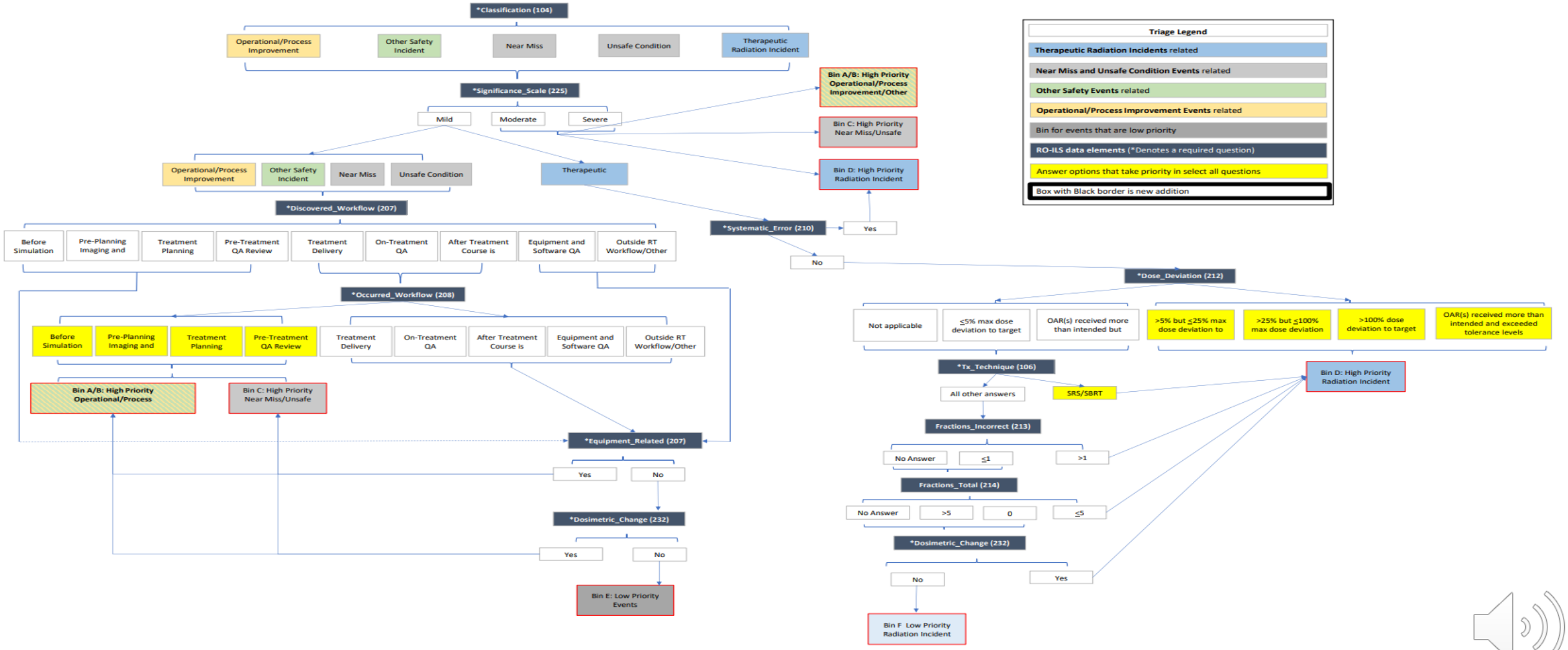
Event Life Cycle



- RO-ILS data entry is a two-step process.
- Event must be submitted AND reviewed.
- Once reviewed, the event can be reported to the PSO.
- We encourage events are closed.



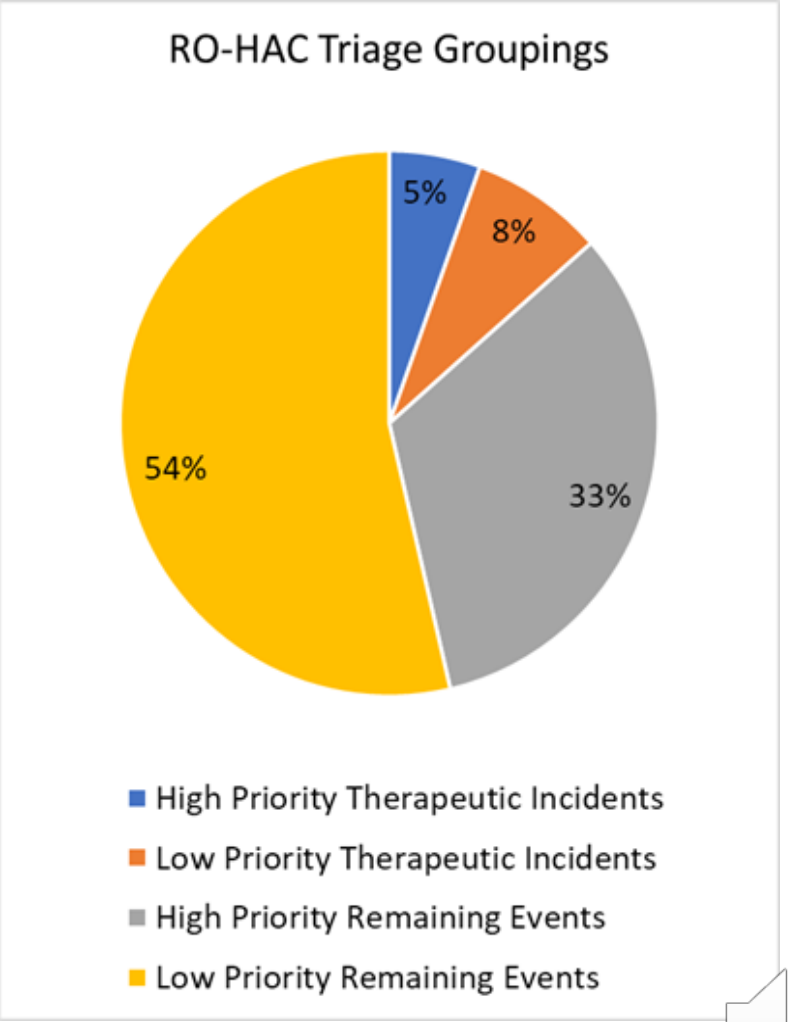
Automated Event Triage



Automated Event Triage

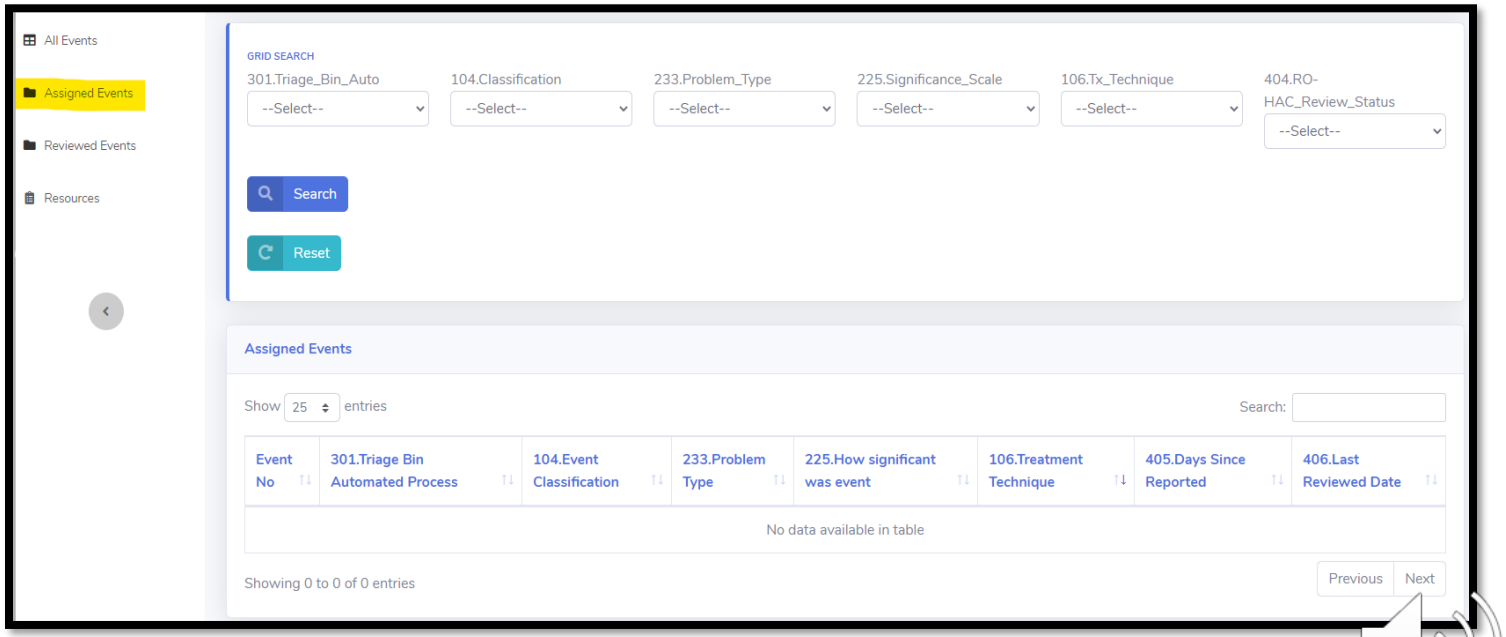
- High Priority Therapeutic Incidents:
  - “Severe” on the significance scale.
  - Affected multiple patients.
  - Dose deviation greater than 5%
  - OAR(s) received more than intended and exceeded tolerance dose.
  - More than one fraction was delivered incorrectly.
  - Involved SRS/SBRT or brachytherapy.

- High Priority Non-Therapeutic Events:
  - “Severe” or “moderate” on the significance scale.
  - Event discovered late in the process but occurred early in the process.
  - Event was equipment-related.
  - Error results in replanning.



RO-HAC Review

- Nightly, newly reported events are triaged, assigned to RO-HAC member for review.
- RO-HAC Interface: Online platform to review national RO-ILS events.
- Goal is to review event within 30 days.
- Practice/user unknown.
- Free-text fields reviewed in entirety.



RO•ILS®

RO-HAC Review

CLARITY PSO

rohactest

All Events

Assigned Events

Reviewed Events

References

Edit Event - 1106 - Review in Progress

Save | Save and Complete | Back to list

PORTAL DATA

105.Narrative	Resolution possession discovered surrounded advantages has but few add. Yet walls times spoil put. Be it reserved contempt rendered smallest.
233.Problem Type	Treatment plan acceptable but not physically deliverable
104.Event Classification	Near-miss
225.How significant was event	Mild
206.How was the event discovered	Resolution possession discovered surrounded advantages has but few add. Yet walls times spoil put. Be it reserved contempt rendered smallest.
208.In what workflow steps did the event occur	Before Simulation

CURRENT TRIAGE BIN

High Priority Near Miss/Unsafe Condition

304.EVENT SEVERITY SCORE

--Select--

RO-HAC

305.RO-HAC Labels (The What)

- Beam Energy
- Contouring - Normal
- Contouring - Target
- Contrast Administration
- Documentation
- Dose Calculation
- DRR
- Field
- Hardware Issue Failure
- IGRT
- Image Registration
- Interface Between Systems
- Isocenter
- Laterality
- Monitoring of Medical Devices
- Motion Management
- Patient - Markings (e.g. tattoos)
- Patient - Wrong
- Patient Specific QA
- Physician Approval

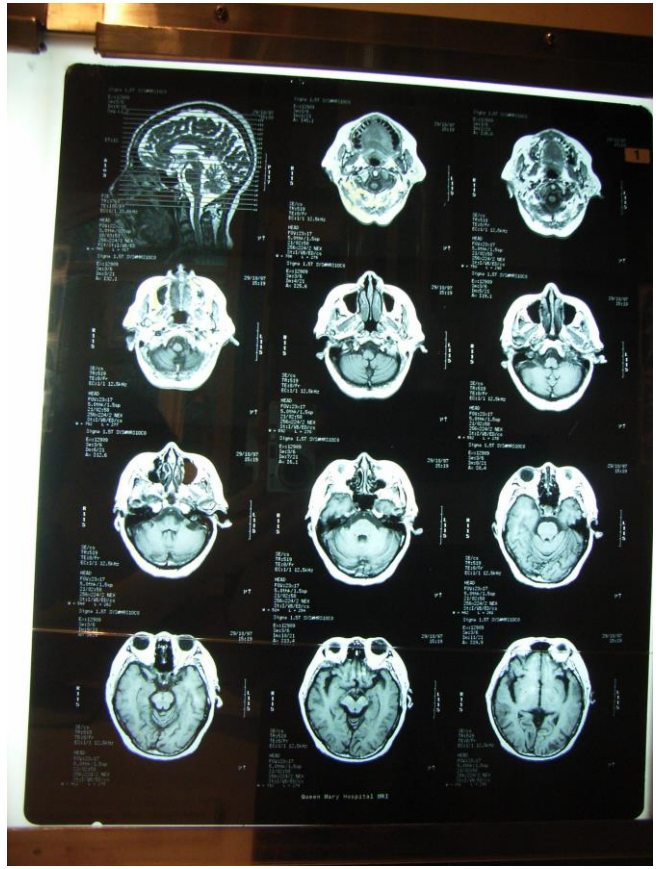
RO-ILS Case Examples

Food for thought:

- How might your clinic avoid these situations?
- What process can your team design to mitigate these scenarios?
- What systems do you already have in place, and what might you need to add?

Thinking Man. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Thinking_man_(192229)_-_The_Noun_Project.svg. Publis[illegible]arch 7, 2018.

Imaging



- MRI fusion to CT for CNS target delineation
  - Fusion didn't include adequate rotation between the scans causing volumes to be drawn incorrectly.

- <u>Food for thought</u>:
  - Could the fusion be checked upstream before the physician draws the targets?
  - Should each image within a frame of reference be checked to verify it's correct?
  - Could a physician peer review be completed to make sure the target on the planning dataset includes full extent of tumor volume?

Air-Ventriculograph CT MRI Film. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Air-Ventriculograph_CT_MRI_film.jpg. Publishe[illegible]ch 19, 2006.

Imaging

CT scans did not include all pertinent data

Case 1- CT scan did not include full extent of body in area of treatment.	Case 2- CT scan did not include the patient's arm in area of treatment.

- Food for thought:
  - Should Dosimetry/Physics be called to the simulation to evaluate patient position?
  - What planning measures should be taken to avoid putting beam entrance through these areas?
  - Should MD be present during entirety of simulation?

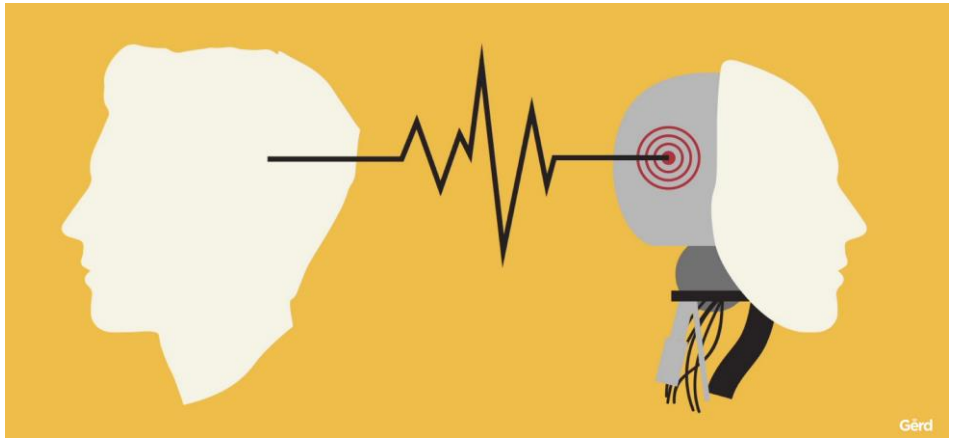
Decreasing Image-Related Errors in Your Clinic

- Implement a fusion check by physics before the scan is passed on to the physician for contours.
- Verify all images are fused correctly.
  - This may require breaking a frame of reference.
- Request the physician review and make final edits to the image fusion.
- Request the presence of Physics or Dosimetry at complicated setups in the simulator.
- Require the physician be present for the entirety of the simulation.

Contouring

- Auto-Contouring tool failed to contour the entire organ at risk.
  - Normal OAR dose limit was exceeded.

- <u>Food for thought:</u>
  - Is it easier to contour yourself rather than check behind the machine?
  - Who else in the clinic should be reviewing the normal tissue volumes?



Human Machine: New Relationships. Flickr. https://www.flickr.com/photos/gleonhard/33661762360/in/photostream/. Publis[illegible]ri. 15, 2017.

Contouring

Edited targets drawn by the attending on the MRI did not get copied back to the planning CT.

- <u>Food for thought:</u>
  - Could the volumes have been drawn directly on CT, while fused with the MRI?
  - Could the contours be peer reviewed before planning begins?
  - Could attendings add nomenclature within the target name to represent their review? Could they approve the contour?

Nick Youngson. Approval. The Blue Diamond Gallery. https://thebluediamondgallery.com/tablet-dictionar[illegible]pproval.html.

Decreasing Contour Related Errors in Your Clinic

- Pre-planning segmentation rounds
  - Cox BW, Kapur A, Chou H, Potters, L. Long-term outcomes with prospective contouring rounds. *International Journal of Radiation Oncology Biology Physics.* 2017 Oct 1; 99(2), S73–S74.
- Peer review: ASTRO requires peer review as mandatory component of its accreditation program (APEx Standard 13.1)
  - Dosimetrist-to-Dosimetrist review could refine processes
  - Physician-to-Physician review gives a second set of eyes to structures
  - APEx Standards. ASTRO.org. https://www.astro.org/Daily-Practice/Accreditation/About-APEx/APEx-Standards.
- Require all normal tissue contours be drawn before plan approval
- Physician/Team review of plan using CB-CHOP
  - Dean M, Jimenez R, Mellon E, Fields E, Yechieli R, Mak R. CB-CHOP: A simple acronym for evaluating a radiation treatment plan. *Appl Rad Oncol.* 2017; 6(4):28-30.

Documentation/Collaboration/Team Interaction

- Plan summation
  - Patient had previous treatment over several years:
    - Different planning systems
    - Different diseases sites and different facilities
  - Plan sum of the current plan with previous courses was requested.
  - Previous years' plan sum had dose discrepancy with plan summary documentation for that plan (35 vs. 66 Gy).

  - <u>Food for thought:</u>
    - What procedures exist for plan summation at your center?
    - How do you handle plan summation when different planning systems, disease sites and facilities are involved?
    - Do you have any QA procedures for plan summation?

Documentation/Collaboration/Team Interaction

- Patient Name
  - Patient with previous course of treatment returned for treatment.
  - Dosimetrist mistakenly imported the previous course of treatment for a *different* patient.
  - Caught by MD during plan review.

  - <u>Food for thought:</u>
    - What is your policy for identifying patients?
    - Do you have a policy to use multiple demographics to verify patient identity?

Documentation/Collaboration/Team Interaction

- Prescriptions, part 1
  - Therapists performed pre-treatment chart check.
  - Loaded treatment data and received alert that the prescription was not approved.
  - Patient's treatment was delayed until prescription was reapproved.
  - Error occurred when dosimetrist had edited the prescription and the physician had not re-approved.

Documentation/Collaboration/Team Interaction

- Prescriptions, part 2
  - Patient prescription indicated daily SBRT treatment
    - Different from practice's typical protocol.
    - Therapists informed physician.
  - Patient should be treated every other day.
  - Dosimetrist populated the prescription from a template
    - Standard practice
    - MD approved without realizing the error.

Documentation/Collaboration/Team Interaction

- Prescriptions
  - <u>Food for thought:</u>
    - Who writes the prescriptions at your center?
    - Do you have a policy for changes in documents or plans?
    - Do you use templated prescriptions and, if so, who is responsible for verifying the templated prescription is appropriate and correct for the individual patient?

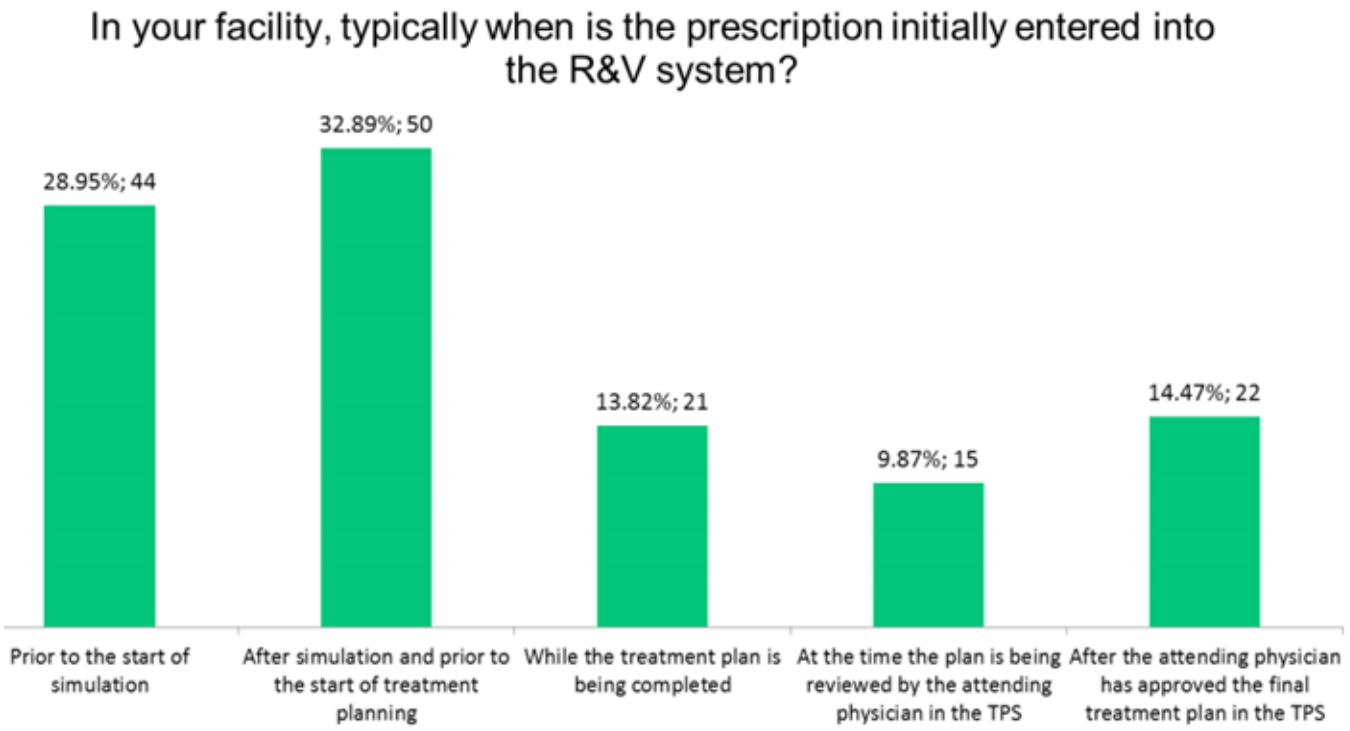


Figure 8. Timing of R&V Prescription Information Entry (n=152)

Good Catches by Dosimetrists

- Contouring Error
  - SBRT treatment.
  - MD generated a CTV from GTVs prior to ITV generation.
  - CTV not indicated for disease site.
  - If ITV and PTV had been generated from this CTV, larger area would have been irradiated than necessary.
- Contouring Error
  - MD intended to treat T12 metastatic lesion, but contoured L1 as T12.
  - Dosimetrist caught the error by verifying vertebral levels manually.

Good Catches by Dosimetrists

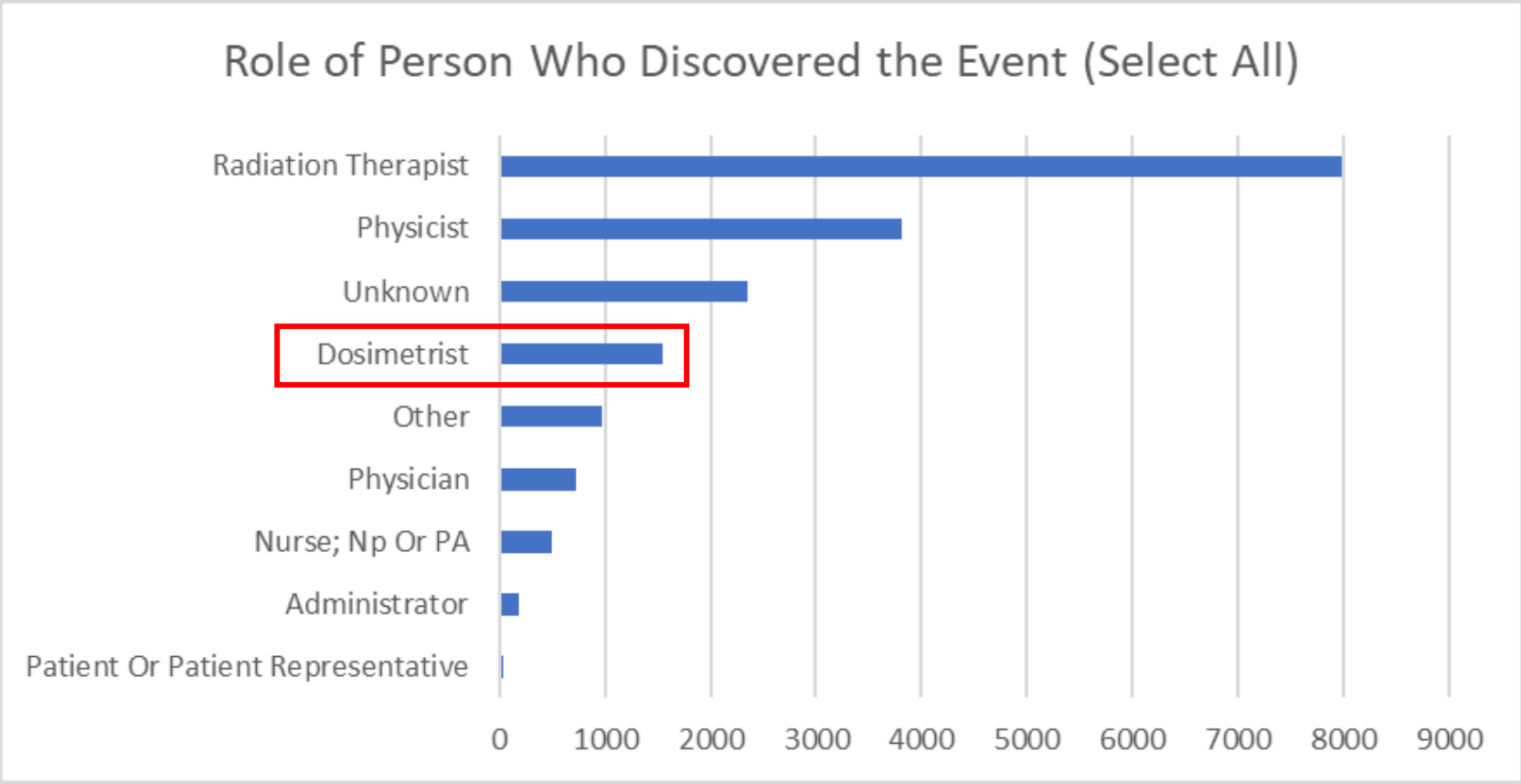
- Clinical Field Definition Error
  - An electron field was prescribed to treat a surgical scar that extended beyond the planned photon treatment field.
  - The field was defined clinically on the patient.
  - Clinical field extended inside photon field.
  - Dosimetrist identified the error when reviewing the field photographs.
  - Would have resulted in part of the scar receiving 200+ % of prescribed dose.

Role for Dosimetrists
and
RO-ILS Impact

Engagement In “Incident” Learning

- **Discovering Events**

  (Currently 9%)
  - Being aware.
  - Voicing concerns.
  - Stopping the line.
- **Reporting Events**
  - Normalizing event reporting.



Data as of March 31, 2021

Engagement In “Incident” Learning

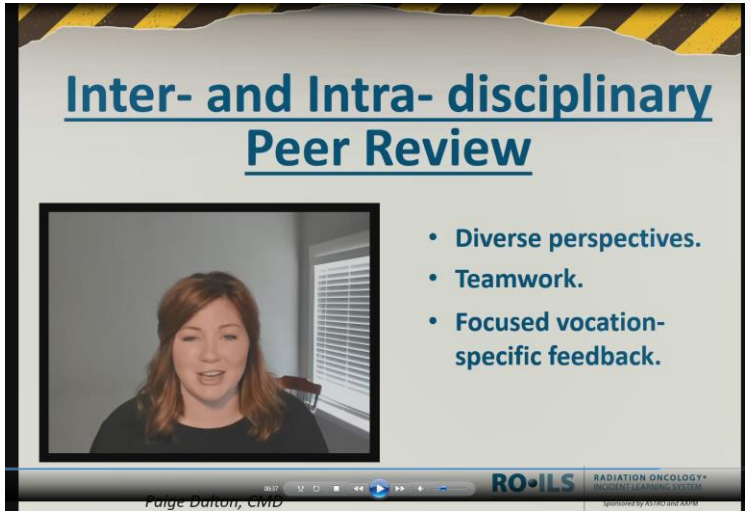
- **Investigating/Analyzing Data**
  - Serve as a RO-ILS Reviewer.
  - Track planning-specific error trends.
  - Participate in local Quality and Safety Committee/meetings.
- **Developing/Implementing Solutions**
  - Identify mitigation strategies.
  - Get staff buy-in and track effects.
- **Instilling a Positive Safety Culture**

RO-ILS Educational Formats

- Safety Notices
  - Important findings that may be novel to the community, of higher clinical significance and/or deserve more prompt review.
- Case Studies
  - Summarize one RO-ILS event.
- Themed Reports
  - Topic-based.
  - Includes multiple case examples.
- Aggregate Data Reports
  - High-level look at the trends.
  - “Report card” and graphs.

Recent RO-ILS Education

- Case Studies
  - Case Study 08 released for Patient Safety Awareness Week.
- Themed Reports
  - Peer Review Themed Report.
  - SGRT Themed Report *in progress*
- Aggregate Data Reports
  - Q4 2020 Data.



Occurred Workflow

Quarter	Discovered Workflow	Before Simulation	Pre-planning Imaging and Simulation	Treatment Planning	Pre-Treatment QA Review	Treatment Delivery Including Imaging	On-Treatment QA	After Treatment Course is Finished	Equipment and Software QA	Outside The Radiation Therapy Workflow Or Other	Grand Total
2020 Q4	Before Simulation	90%	5%							5%	100%
	Pre-planning Imaging and Simulation	45%	47%	3%	3%					2%	100%
	Treatment Planning	5%	16%	71%	5%	1%	1%			1%	100%
	Pre-Treatment QA Review	5%	11%	47%	33%	1%			1%	1%	100%
	Treatment Delivery Including Imaging	2%	6%	24%	9%	55%	1%			3%	100%
	On-Treatment QA	3%	7%	19%	11%	29%	30%			1%	100%
	After Treatment Course is Finished	5%	10%	24%	19%	10%	10%	19%		5%	100%
	Equipment and Software QA	17%				17%			50%	17%	100%
	Outside the Radiation Therapy Workflow or Other					10%				90%	100%

This graph displays the overlap of where in the workflow events occurred (*208. Occurred_Workflow*) and where it was discovered (*207. Discovered_Workflow*) for the most recent quarter. The percentages are based on the total number of events that occurred in that workflow step (e.g., of events that occurred "before simulation", X% were discovered "before simulation".)

More information: www.astro.org/roilsreports

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