Getting Better …

Report Card on RO-ILS
March, 2016

Gary A. Ezzell, Ph.D.
Mayo Clinic Arizona

Getting better: Learning from each other

- RO-ILS: Radiation Oncology Incident Learning System®
- ASTRO initiative, AAPM co-sponsors
- Run through Clarity PSO
  - "PSO" = Patient Safety Organization
  - Web-based, no IT support needed
  - No charge to users; but need to sign contract
  - Data is protected by law

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Design

- Report form jointly designed by ASTRO, AAPM, Clarity
- Can serve as a facility's only Incident Learning System (ILS)
- Two-step reporting process
  - Initial report by front-line user (brief)
  - Additional data added after internal review

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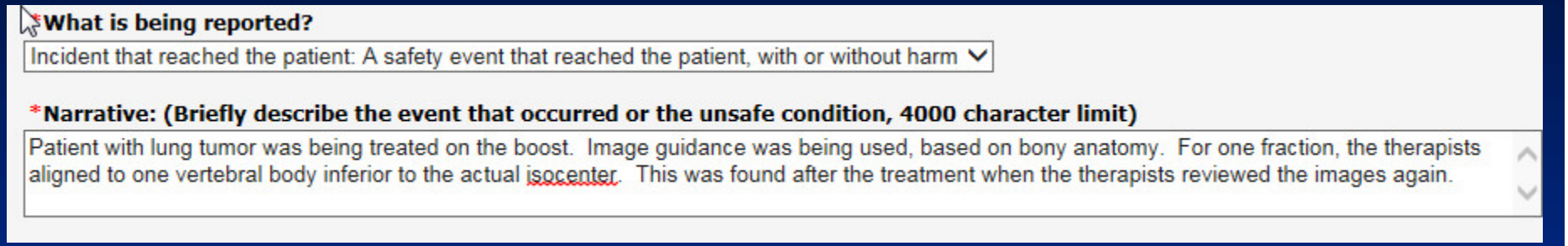
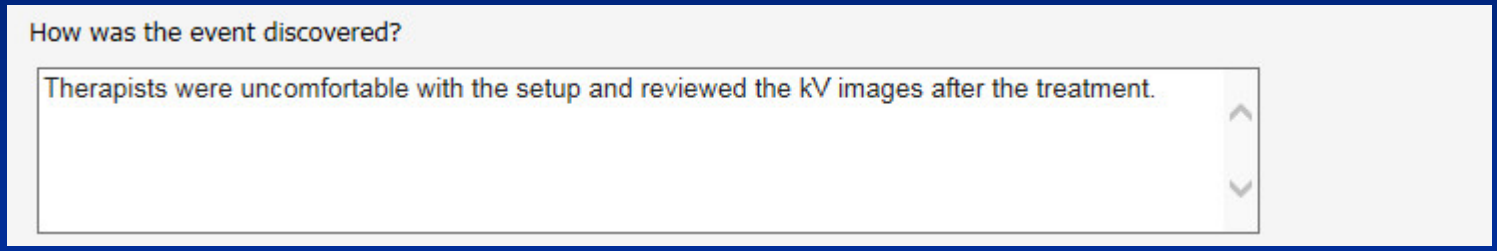
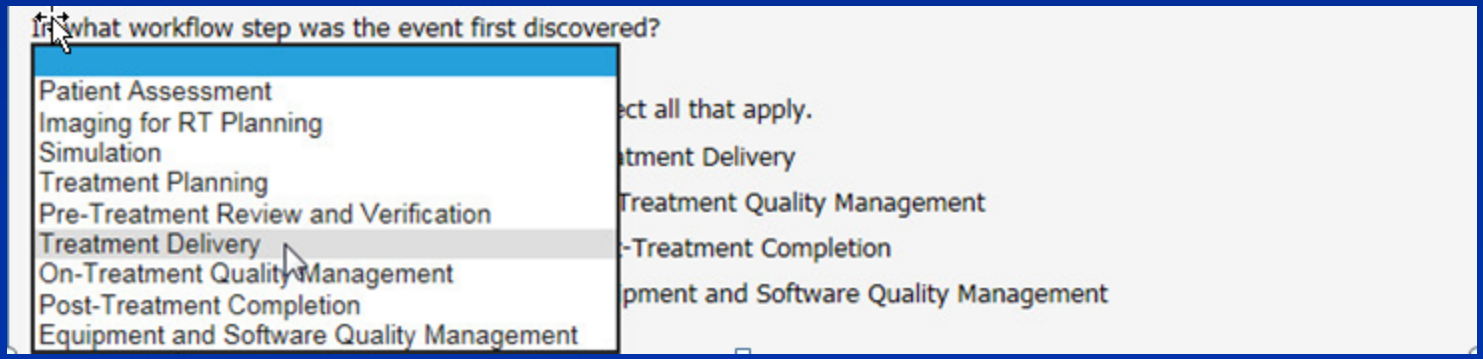
Report includes narrative descriptions and data elements that can be selected and compiled for analysis

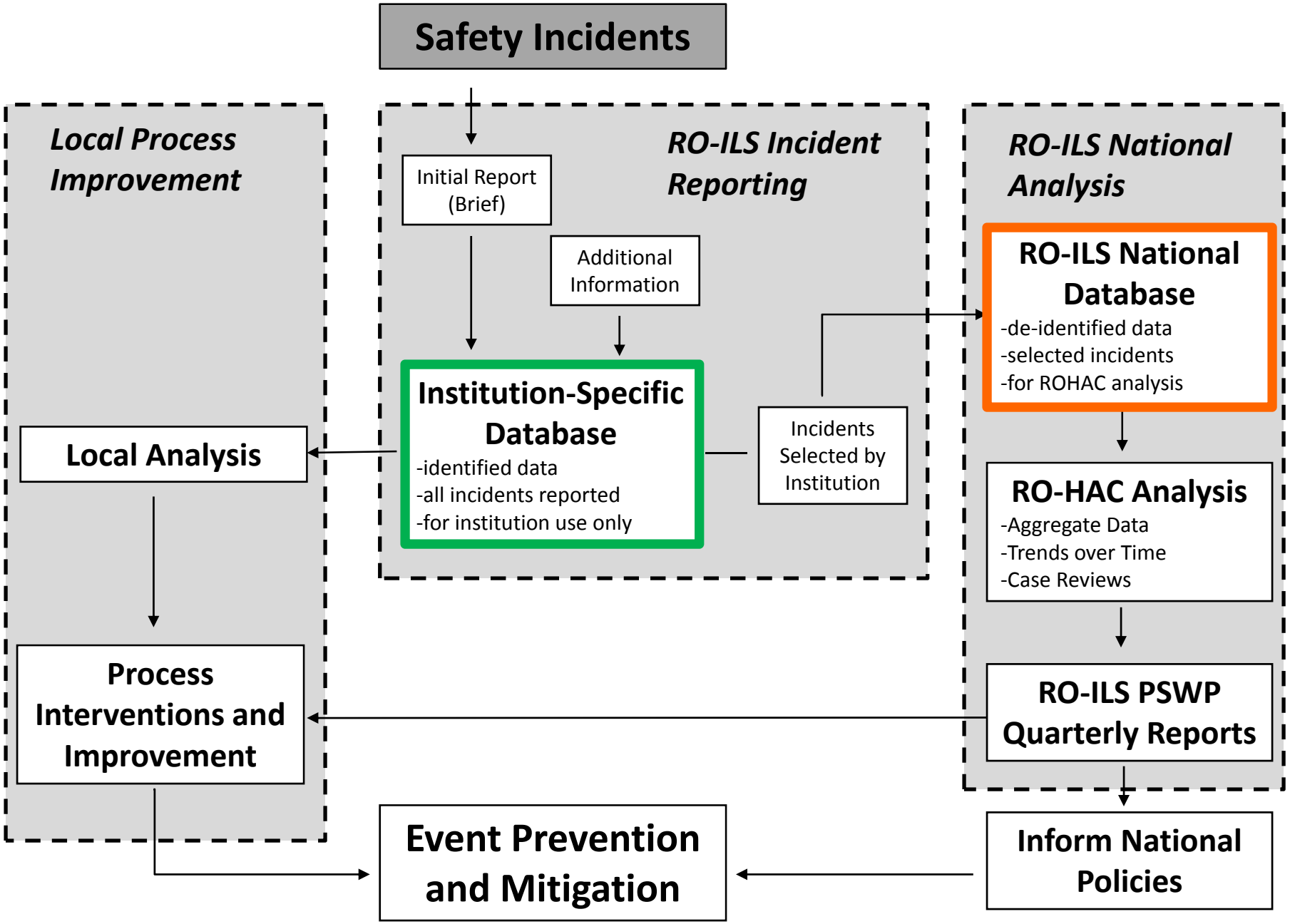






How is the information used?

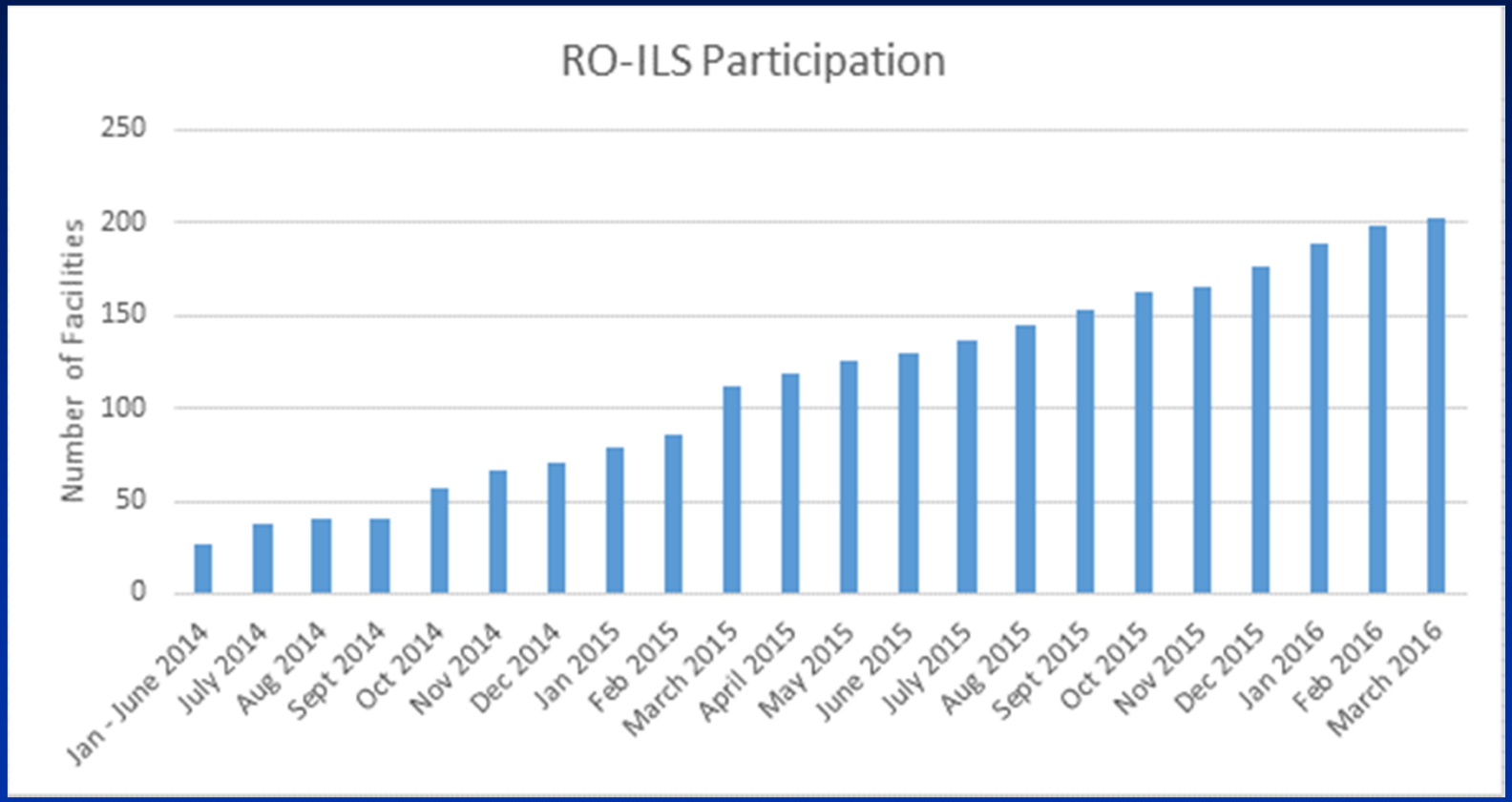
- All reports are reviewed by team of 8 RadOnc professionals – MDs, Physicists, etc.
  - Radiation Oncology Health Advisory Council (RO-HAC)
- Reports summarizing the most useful findings are done quarterly and transmitted to users


Safety Incidents
Local Process Improvement
RO-ILS Incident Reporting
RO-ILS National Analysis
Initial Report (Brief)
Additional Information
Institution-Specific Database
-identified data
-all incidents reported
-for institution use only
Incidents Selected by Institution
RO-ILS National Database
-de-identified data
-selected incidents
-for ROHAC analysis
Local Analysis
RO-HAC Analysis
-Aggregate Data
-Trends over Time
-Case Reviews
Process Interventions and Improvement
RO-ILS PSWP Quarterly Reports
Event Prevention and Mitigation
Inform National Policies

RO-ILS Status as of March 2, 2016

- Signed contracts: 98 practices representing 203 facilities
- 36 pending representing 67 facilities
- 2542 reports entered
- 1514 reports uploaded to national
- 6 Quarterly Reports sent to users
  - Go to astro.org/roils and click on “Reports”

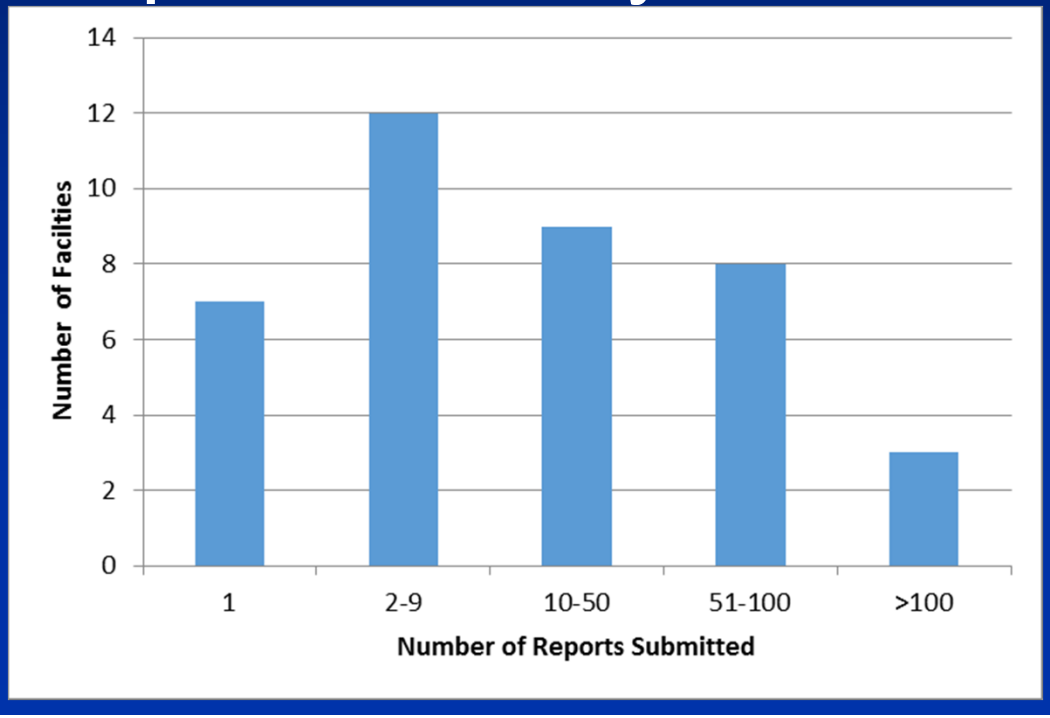
Growth curve



How is it being used?

- Some users report a few safety events
- Some use it as a comprehensive practice improvement system

Data uploaded to national through Q4, 2015



What have we seen that is *interesting*?

- RO-HAC ranks events on a 1-5 scale, judging potential clinical significance
- Looking at 232 events ranked 4 or 5 out of 1296 (18%) through Q4, 2015

Reached the patient	(R)	123	53%
Near miss	(N)	105	45%
Unsafe condition	(U)	4	2%

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How caught	All	R	N or U
Physicist review	30	11	19
RTT review	34	9	25
IGRT	13	2	11
Dosimetrist review	2	0	2
Chart Rounds	3	3	0
Daily QA device	2	2	0
In vivo dosimetry	1	1	0

How missed	All	R	N or U
Physicist missed	74	32	42
IGRT failed to catch or caused	9	9	0

Physicist check missed 74/104 potential catches

Keywords	All	R	N or U
Rx, plan mismatch	43	18	25
Shifts	31	13	18
Plan quality	26	12	14
Communication	19	14	5
Human data transfer	14	14	0
Gating	12	10	2
Laterality	11	1	10
Previous treatment	10	5	5
Emergent treatment	5	3	2
Haste	2	1	1

Keywords	All	R	N or U
Rx, plan mismatch	44	18	26
Shifts	30	13	17
Plan quality	26	12	14
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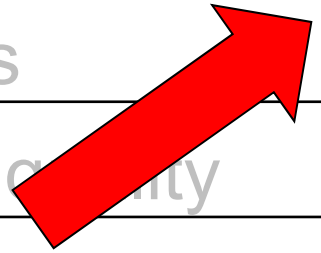

Failure mode: Approved Plan ≠ Intent

Approved plan not equal to intent	**23**
MD gave incorrect instruction	4
Plan did not match Rx; unrecognized	12
Planner wrote the Rx for MD to approve	7

MD gave incorrect instruction

- “SBRT” prescribed 4 Gy x 4 instead of intended 12 Gy x 4
  - Planner and checker did not question
  - Found at weekly physics check
- “SBRT” prescribed 5 Gy x 6 instead of intended 6 Gy x 5
  - Questioned by plan checker

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Plan did not match Rx; unrecognized at time of approval

- 12 cases; 7 reached the patient
  - 3: targets not planned
    - 2 not found by physics checker
  - 8: dose/fraction mis-match
    - 7 not found by physics checker
    - 3 found by RTT

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How can we prevent this?
Can this be automated?

Planner wrote the Rx for MD approval

- 3 cases in which this was specifically called out; 3 others in which it is implied
  - 5 involve dose/fraction
    - 6 Gy/fx intended > 2 Gy/fx
    - 2.67 > 1.8, 2.4 > 2; 2 > 2.2; 1.8 > 2
  - Supraclavicular field included in breast treatment in error

“12 in 2”

The patient was to receive radiation therapy to his right shoulder for his painful bone metastasis. The dosimetrist received a verbal order from the Radiation Oncologist for a dose of "12 in 2".
The dosimetrist wrote the written directive for 6 treatments of 200 cGy each for a total of 1200 cGy.
The written directive was then approved by the Radiation Oncologist. The plan should have been 2 treatments of 600 cGy each for a total of 1200 cGy.
Found at chart rounds. The patient had already received 2 fractions at 200 cGy each.
The Radiation Oncologist decided to give him one additional treatment of 600 cGy and finish his course of treatment.

Planner wrote the Rx

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  - 5 involve dose/fraction
    - 6 Gy intended > 2 Gy;
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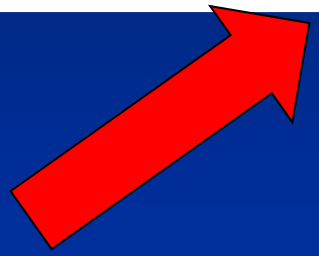

CBCT Issues

2015 Q3

CASE 1: INCORRECT VERTEBRAL BODY TREATED

A patient was being treated with a fractionated dose of 4.0 gray (Gy) for 5 fractions for the palliation of bone metastasis in the thoracic-lumbar (T-L) spine. The incorrect vertebral body was treated for 2 of the 5 fractions. Cone-beam computed tomography (CT) was used to perform the alignment. The automatic image alignment algorithm locked onto the incorrect vertebral body, thus resulting in a large shift of the patient. The incident was discovered on the third fraction when the treating radiation therapists noted the discrepancy.

2015 Q2

Event: The following event description (slightly edited for clarity) illustrates incorrect isocenter situations that can occur. A patient's thigh treatment position was off by 5 cm superior-inferior (sup-inf) for 1 fraction. This was discovered during the weekly physics review as the physicist reviewed the limitations of the CBCT for extremities. The attending physician was notified that CBCT was not valid for sup-inf positioning of the thigh treatment region, and orthogonal images were suggested for the remainder of the patient's treatments.

Recommendations …

- *Policies and procedures* should be clear regarding the actions to take when large shifts are indicated from image-guided radiation therapy (IGRT) imaging. In this case, the shift was 3 cm and was indicative of a problem. Some centers have adopted policies that require a secondary verification of patient setup when the shifts are larger than a specified amount.

- *Use a cone-beam CT setting that captures a larger extent of anatomy where appropriate.* This may aid in reducing confusion. One vendor supplies a "topogram" to specify the superior-inferior extent of the scan. Another vendor has predefined settings ranging up to 26 cm in this dimension.

- Other centers have begun using *kilovoltage (kV) or megavoltage (MV) planar images to verify alignment* in addition to cone-beam CT. These planar images can show a larger extent of anatomy and reduce the likelihood of aligning to a wrong vertebral body.

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30 shift events

- 9 had shift values transcribed incorrectly
- 4 had shift directions transcribed incorrectly
- 6 were caught by physics
- 13 were missed by physics
- 13 reached the patient

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Laterality errors

- Most are documentation slips: the correct side is being treated but the wrong side is written
- Not all: Good catch!
  - “Patient's case was reviewed in weekly Peer Review Radiosurgery/SBRT conference. After reviewing the diagnositc images, it appears that the target was delineated on the wrong side.”

Where are errors happening?
Where are they being detected?

	Happened	Detected
Patient Assessment	2	0
Imaging for Planning	5	3
Treatment Planning	135	16
Pre-treatment Review and Verification	2	46
Treatment Delivery	76	104
On-Treatment Quality Management	1	52
Post-treatment Completion	0	8
Equipment and Software Quality Management	11	3

Lessons about RO-ILS

- Patterns can direct attention
  - Failure modes
  - Safety barriers that worked or didn't
  - Opportunities for improvement
- You have to study the narratives to get useful information

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Issues so far …

- Many reports are too sparse to be useful to outsiders
  - "Patient was treated 3.0 cm to the right of the planned isocenter for one fraction."
  - No indication of how, why
- As more reports come in, harder for 8 people to do the reviews

Improvements on the way

- Data elements are being condensed and clarified
- Inter-rater reliability study has been done
  - 12 fictional events reviewed by 67 people
  - Analysis currently underway

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Improvements on the way

- AAPM WG is working on a User Guide to help explain …
  - What is needed in a narrative
  - How to classify events

"Shift instructions were incorrect: 0.9 cm anterior instead of posterior. Found at initial IGRT and corrected" *Near-miss or Reached the patient?*

"Rx and sim order for right leg, but sim and plan done for left. Left was correct, documentation was wrong" *Near-miss or Unsafe condition?*

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Improvements on the way

- Slide set template created for local quarterly report discussions
  - *Could this happen here?*
- Mapping process is being developed so that existing systems can send selected events to RO-ILS

How to begin

- Go to astro.org/roils
  - Download the Participation Guide
  - Review the helpful FAQs
  - Questions? Email roils@astro.org

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Let's do some SAMs and then ask …

- How could RO-ILS be helpful to you?
- What do you want to see from the system?

RO-ILS …

20% 1. Requires purchasing software

20% 2. Requires a contract to be signed

20% 3. Requires AAPM membership

20% 4. Directly connects to your EMR

20% 5. Requires an annual fee

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Hoopes, et al. RO-ILS: Radiation Oncology Incident Learning System: A report from the first year of experience. PRO (2015) 5, 312-318

RO-ILS went live in June, 2014. By February, 2016, the number of reports entered was

20%	1. 10 - 50
20%	2. 100 - 250
20%	3. 500 - 750
20%	4. 750 - 1000
20%	5. > 1000

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RO-ILS Quarterly Reports on ASTRO website:
https://www.astro.org/Clinical-Practice/Patient-Safety/ROILS/Index.aspx

The workflow step most commonly identified as the source of the reported event is

20%	1. Imaging for planning
20%	2. Imaging and Simulation
20%	3. Treatment Planning
20%	4. Pre-treatment QA Review
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What do you want from RO-ILS?

- How could RO-ILS be helpful to you?
- What do you want to see from the system?