

What we have learned from RO-ILS Part 2: After the patient is on the table

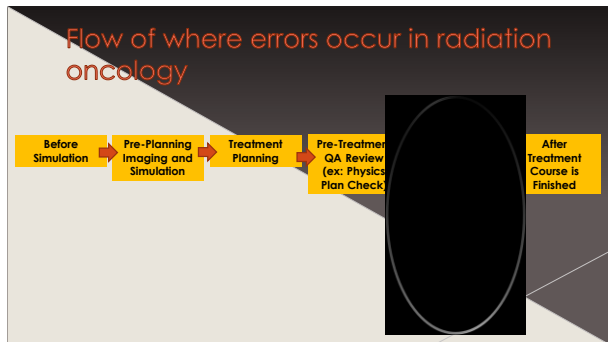
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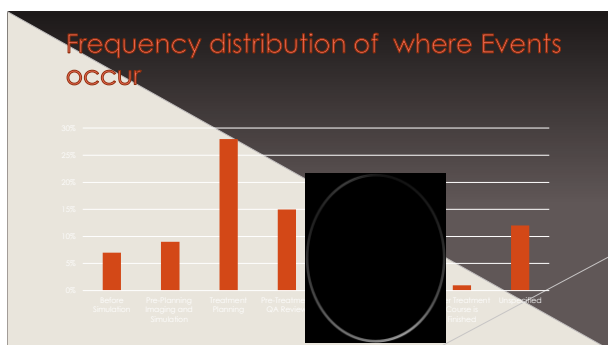
Conflict of interest statement

- Current member of the Radiation Oncology Healthcare Advisory Council

What have we learned?

- Common pathways
- Case examples
- Mitigation strategies
- Common threads for ongoing analysis





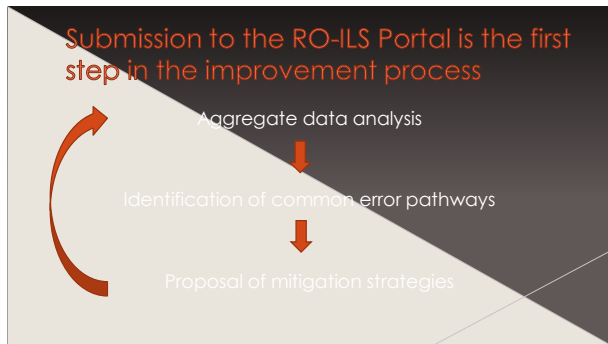
For every ONE critical incident

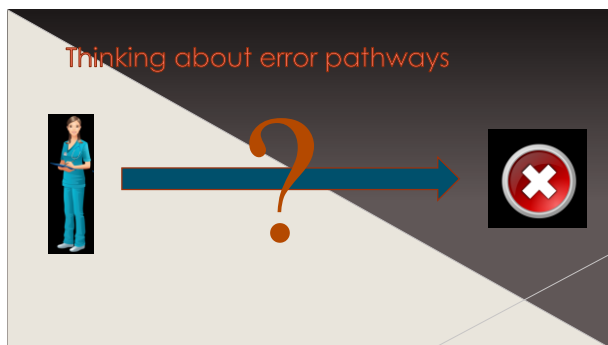
It is expected that

600

minor incidents have occurred

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- Categorizing the data
- Incident reports commonly fall into one of the following buckets:
- Imaging
 - Shifts
 - Target selection
 - Communication
 - Haste
 - Changes
 - Motion management
 - Prior treatments
 - Treatment Planning
 - Other

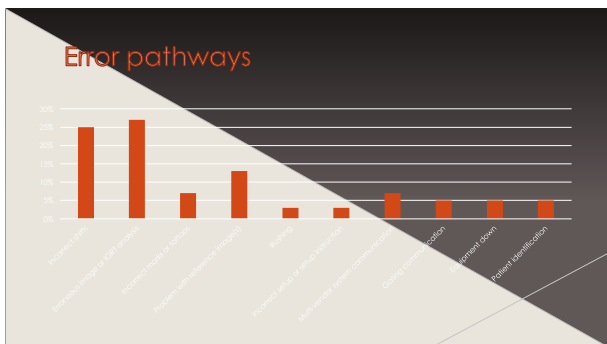
Common error pathways

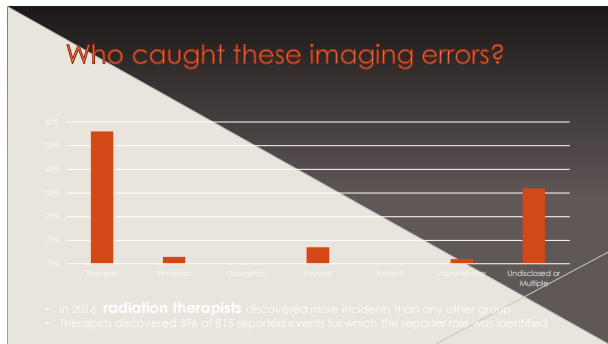
- Patient misidentification
- Incorrect setup
- Problem with reference images
- Lack of IGRT instruction – how to align
- Erroneous IGRT analysis
- Gating error
- Shift error – instruction or implementation
- Equipment down
- Communication
- Rushing

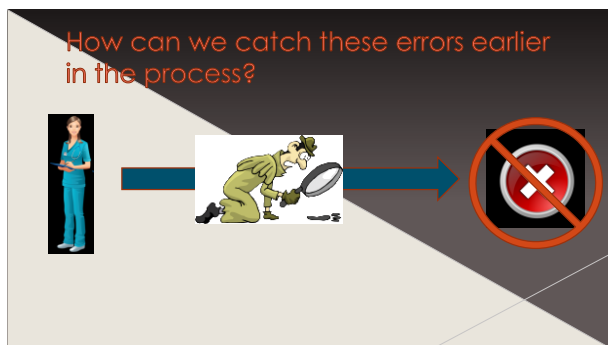


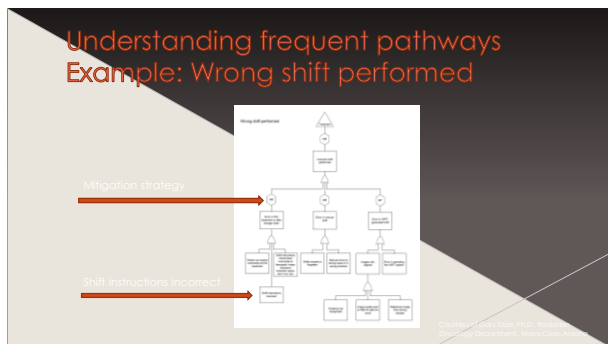
Imaging Errors and Shift Errors

- As of Q3 2016, 2,144 events had been submitted to RO-ILS
- 396 of those events had been given a severity score of 3.5 or higher
 - severity score 1 – no potential or real harm
 - severity score 2 – mild potential or real harm
 - severity score 3 – moderate potential or real harm
 - severity score 4 – severe potential or real harm
 - severity score 5 – critical potential or real harm
- 60 of those 396 (15%) involved imaging errors during treatment
- 51 of those 396 (13%) involved shift errors during treatment











Mitigation Strategies

- Redundant checks/approvals of new patient marks following shifts
- Graphical illustration of shifts
- Minimization of hand-entered shift instruction
 - > There is greater risk when shifts are driven by hand-typed setup notes
 - > Planned shifts should be transferred to localization data fields within the R&V system
- Automated vertebral body identification

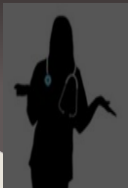


Common Error Pathways - IGRT



Case example – wrong DRRs

- A patient was being treated with a routine course of radiation therapy. Image guided setups were used daily with orthogonal DRRs.
- During the planning process, the dosimetrist had moved the isocenter in order to improve the dose distribution. Unfortunately, the exported DRRs were from an original plan which had a different isocenter.
- Planning DRRs and port films were matched daily, and the patient completed his treatment.
- The incorrect DRRs and geometric treatment miss were found through a routine post-completion review of the patient's EMR.



Mitigation Strategies

- Redundant checks of the planned and imaging isocenter
 - Physicist QA
 - Therapist QA
- Resist autopilot – employ critical thinking with IGRT analysis



More IGRT errors and mitigations

- Poor quality reference image(s)
 - Image quality review for visibility, use technique protocols
- Challenging anatomy
 - Take special care with extremities and vertebral bodies, utilize CT protocols, training, and clearly identified landmarks
- Omission of IGRT
 - Review documented instruction and compliance regularly, also utilize treatment calendars
- Accidental keystrokes during the fusion/shift process
 - Shifts beyond a certain size should require additional verification. A review of reference images should be included
- Erroneous IGRT analysis
 - Ensure clear communication from MD regarding what proper alignment should be based on and include with regular QA checks



Common error pathways - Shifts



Case Example- shift documentation

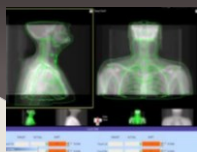
- An SBRT lung patient underwent a verification simulation on the linear accelerator the day before he was to begin his therapy. It was determined that a 0.3 cm anterior shift was required and that was hand-written on a standard documentation worksheet.
- Per standard procedure, the shift was then transcribed in to the record and verify system but was entered as 3.0 cm.
- The following day, the patient was set up and shifted 3.0 cm anterior. Fortunately, the error was caught on imaging and the patient was ultimately treated in the correct position.

Mitigation Strategies

- Automated shift calculations and documentation
- Redundant checks/read back of any manual shift documentation
- Re-imaging policy for shifts beyond a certain magnitude

More shift errors and mitigations


- Miscommunication from dosimetry
 - Robust QA and communication
 - Multiple treatment sites
 - Previously treated patients
- Incorrect association of the isocenter in the R&V system
 - Ensure correct isocenter association between the plan and image
 - Utilize checklists
- Confusion due to a feet first or prone patient position
 - Pre-prepare position identification in the simulation and planning software
 - Consider 3D diagrams to graphically communicate shifts
 - Incorporate orientation into time-out procedures
- Lacking understanding of how the IGRT software uses and displays shifts
 - System training is important. Understand if automated shift boxes are "sticky" (from day to day) when checked



Contributing Factors

The common threads: Technology


- Technological advancement both protects and contributes to incidents
 - > Increased level of automation
 - > New safety features
 - > Increased complexity
- The need to stay current with advancing technology is matched with by the need for information sharing around resultant events



Contributing Factors

The common threads: Rushing


- The domino effect – rushing to start a patient after simulation
 - > WHY? Physician contending → Planning → QA → Treatment
 - > MITIGATION: Define expectations, communicate, and schedule smartly
- Machine schedule – running behind
 - > WHY? Machine down, sick patients, patient volume, you name it!
 - > MITIGATION: Do not schedule unrealistically, communicate delays, look for systematic improvements



Contributing Factors

The common threads: Communication


- Standardization is key
 - > Prescriptions and directives
 - > Treatment plan documentation
 - > Clinical treatment notes and documentation
 - > Patient setup instruction
- We rely on teamwork
 - > Therapy teams sometimes divide and conquer but there is a delicate balance
 - > Minimize disruption and hand-offs in workflows (in all areas)



Contributing Factors

The common threads: Focus

- ◉ We are all only human... *but...*
 - > There is a time and a place.
 - > Radiation console areas should be protected spaces
 - > Team discussions about disruptions and a focused environment should be hosted periodically and as needed
 - > A forum for communication should exist so that anonymous/protected messages can be sent to leadership when this issue needs to be readdressed



Macroscopic lessons learned from RO-ILS

- ◉ Most issues are not unique to one organization or clinical team
- ◉ Systematic solutions can be very effective at reducing errors
 - > Automation
 - > Checklists
- ◉ RO-ILS reports allow for the identification of common error pathways and will pave the way for mitigation strategy recommendations



The value of information sharing

- ◉ Regular feedback is a key part of incident learning
 - > From in-house safety incidents
 - > From external reported events
- ◉ We've all been there...
 - > A non-punitive incident learning environment is key
 - > Information sharing should be encouraged and commended



