Hands On Workshop
Simulated Error Training for
Physics Plan Reviews

University of Colorado
Anschutz Medical Campus

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Hands-On Workshop: Simulated Error Training for the Physics Plan Review

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Presentations
10:30 AM Introduction to Simulated Error Training - L Schubert, Presenting Author
10:50 AM Overview of the WGPE Simulation Data Sets - P Johnson, Presenting Author
11:10 AM Hands On Session – Cases 1 & 2 - G Kim, Presenting Author
11:50 AM Hands On Session – Cases 3 & 4 - J Faught, Presenting Author
Introduction to Simulated Error Training

University of Colorado Anschutz Medical Campus
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Conflict of Interest Disclosure

I have no conflicts of interest related to this presentation
Learning Objectives for this Presentation

- Introduce the concept of simulated error training
- Present educational techniques on which simulated error training is based
- Describe early uses of simulated error plans in our field
- Identify applications to develop, assess, and improve physics plan reviews

What is Simulated Error Training?

- Method to practice error detection in situations where the occurrence of error is low
- Well suited for physics plan reviews
What is Simulated Error Training?

- What does it mean to be good at performing a physics plan review?
- You catch errors
- Experience in catching rare, potentially hazardous errors

Why Can it be Hard to Catch Errors?

- Physics plan reviews, needles in a haystack
- Complexities in the planning process
- Errors, potential to cause mistreatment, plan quality, documentation compliance
- Subtle to detect, surprising manifestations
- How do we know we can catch these errors?
Development of Simulated Error Training

- AAPM WGPE developing
- Simulate real treatment plans with known errors embedded
- Based on AAPM TG-275

Simple Concept of Simulated Error Training

- How to use the simulated error plans
- Perform physics plan reviews
- Assess performance

Interest in Simulated Error Training

- Survey of Program Directors of CAMPEP-accredited therapy physics residency programs
- Determine the current state of residency training in physics plan reviews
- Most common training methods in use
  - Observe staff physicists performing plan reviews (96%)
  - Perform supervised plan reviews (93%) (either for training or clinical practice)
  - Use a checklist (80%)


Interest in Simulated Error Training

- Simulation plans with embedded errors to train residents
  - Currently using: 19%
  - Would use: 71%
- Largest difference out of all of the training methods presented
- High interest for residency programs
Challenges to Implementation

- Resource intensive
  - Anonymize patients
  - Re-create plans
  - Embed errors
  - Re-export and write up the chart documents
  - Updates and maintenance

- Pool resources as a group

Education Basis for Simulated Error Training
What is the Basis of Simulated Error Training?

- Based on educational techniques
- Simulation-based education
  - Aviation, military fields
  - Medical education
- Deliberate practice
  - Method of improving performance
  - Applies to any field, in and out of the workplace

Simulation-Based Education in Medicine

- Simulates real-life scenarios in a low risk environment
- Allows one to acquire and practice clinical skills without using real patients
- Training and assessment
- Examples in medicine
  - Simulation centers in medical schools
  - Physical exams, code response, IV placements
  - IV placements, cardiac arrest response
Simulation-Based Education in Radiation Oncology

➧ Use in the radiation oncology field
  ▪ Training for emergency on-call treatments
  ▪ Communication and interpersonal skills
  ▪ Radiation oncologist plan reviews

➧ Embedded errors can potentially happen in real life

➧ Ability to assess and improve performance without risk to the patient

Deliberate Practice

➧ Technique to improve performance – reach expertise

➧ Different than just practicing

➧ Structured with feedback

➧ Identify weaknesses and course-correct

➧ Simulated error training – multiple mock data sets with answer keys

Mazur, et. al "Improving Radiation Oncology Providers’ Workload and Performance: Can Simulation-Based Training Help?" PRO 2017
Brown, et. al "Multidisciplinary Medical Simulation: A Novel Educational Approach To Preparing Radiation Oncology Residents for Oncologic Emergent On-Call Treatments" IJROBP 2014
Ju, et. al "Assessing Interpersonal and Communication Skills in Radiation Oncology Residents: A Pilot Standardized Patient Program" IJROBP 2011
Early Experience with Simulated Error Plans

Measure Error Detection Rate of Practicing Physicists

- Gopan et. al published early experience
- Aimed to prospectively measure detection rate
- 8 physicists performed reviews on 6 plans with embedded errors
- Errors were detected in 67% of reviews [58-75% CI]
- Range from more easily caught (planned dose) to not well caught (incorrect CT dataset)
- First to quantify the error detection rate of physics plan reviews
Facilitate Education and Measure In-House Checklist

- Mayo Arizona simulated error plan suite
  - to facilitate education of new staff and residents
  - to measure the efficacy of an in-house electronic checklist
- 20 simulated error plans were created (21 errors embedded)
- 9 physicists reviewed over a 5 week period
- Useful to inform guidelines for physics plan reviews and further develop checklist

<table>
<thead>
<tr>
<th>Error Category</th>
<th>Group Detection Rate</th>
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<tbody>
<tr>
<td>Bolus Correct</td>
<td>88.89%</td>
</tr>
<tr>
<td>Contours Correct</td>
<td>100.00%</td>
</tr>
<tr>
<td>Planning Approach</td>
<td>100.00%</td>
</tr>
<tr>
<td>Rx Dose/Fx</td>
<td>88.89%</td>
</tr>
<tr>
<td>Rx Location</td>
<td>77.78%</td>
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<tr>
<td>SPC Correct</td>
<td>88.89%</td>
</tr>
<tr>
<td>SPC Contours Present (ADT)</td>
<td>100.00%</td>
</tr>
<tr>
<td>SPC Contains All Info</td>
<td>100.00%</td>
</tr>
<tr>
<td>Plan Approval/Document Correct</td>
<td>66.67%</td>
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<tr>
<td>Field Notes</td>
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<tr>
<td>Bone Density</td>
<td>88.89%</td>
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<tr>
<td>Date Info</td>
<td>77.78%</td>
</tr>
<tr>
<td>Incident Shift</td>
<td>100.00%</td>
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<tr>
<td>DRR Quality</td>
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<td>Proper Tolerance Table Selected</td>
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<td>Table Coordinates the Same for All Fields</td>
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<tr>
<td>RefPoint Equals Rx Dose</td>
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<tr>
<td>Secondary Dose Matches Rx</td>
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<tr>
<td>Total Dose Correct</td>
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<tr>
<td>Correct Number of Sessions</td>
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<tr>
<td>Imaging Matches Orders</td>
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</tr>
<tr>
<td>Average</td>
<td>88.36%</td>
</tr>
</tbody>
</table>

Residency Training Curriculum

- University of Colorado – primary tool for resident training curriculum
- 5 simulated error plans (23 embedded errors)
- Goal: fundamental skills to develop a method
- Focus on ways to enhance robustness
- Need to adapt according to changes in technology and processes
- Skills to perform a plan review in current clinic
- Create, evaluate, adapt plan review to any clinic
Deliberate Practice with Resident Training

- Mechanics of how to perform a check
- Discuss what they caught or didn’t catch
- Ways of viewing plans to detect errors
- Formulate personal best practices maximizing detection ability

Simulated Error Plans for Additional Resident Training

- Simulated error plans for decision making skills about what to do after errors are detected
- Spectrum of issues that can be found
- Spectrum of possible responses
- Real world examples to discuss
- Decision-making framework
Impact of Simulated Error Plans in Resident Training

- Put new skills to the test
- Motivating for residents
- Engaging

How Can Simulated Error Training Be Used in My Clinic?
How Can Simulated Error Training Be Used in My Clinic?

- Various uses from early experiences
  - Robustness of current plan review practices
  - Efficacy of new tools
  - Foundation of training curriculum

- Audience
  - Residents
  - New and existing staff physicists

Training and Competency Assessment

- Initial training
  - Residents: develop and fine-tune their method
  - New staff physicists: differences in software and equipment

- Ongoing training
  - New programs added, changing equipment/software vendors, significant software updates
  - Practice accreditation needs

- Competency assessment – initial and ongoing
  - Method to objectively assess
Conclusions

- Being developed by AAPM WGPE
- Training tool based on established educational techniques
- Early experiences
- Several potential applications

Thank you!