

## An Update of Radiation Oncology Quality and Safety Initiatives

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### Objectives

- Review importance of quality and safety in radiation oncology.
- Discuss the role radiation therapists have in maintaining quality and safety in radiation oncology.
- Inform audiences of the resources available from the International Atomic Energy Agency.
- Discuss highlights of recent reports and publications highlighting radiation safety and quality.
- Discuss future trends regarding quality and safety in radiation oncology.

### The Stories

#### The New York Times

THE RADIATION BODY  
Radiation Offers New Cures, and Ways to Do Harm  
By HALT BODDANICH  
Published: January 23, 2010

THE RADIATION BODY  
As Technology Surges, Radiation Safeguards Lag  
By HALT BODDANICH  
Published: January 29, 2010

Radiation Errors Reported in Missouri  
By HALT BODDANICH and FERRICIA K. RUIZ  
Published: February 24, 2010

THE RADIATION BODY  
A Pinpoint Beam Strays Invisibly, Harming Instead of Healing  
By HALT BODDANICH and CHRISTINA HEBBOLD  
Published: December 28, 2010

### The Buzzwords Since 2010

Culture of Safety

PreTreatment QA  
Program Accreditation

Error Reporting

National Clearinghouse

### Key Trends

- Teamwork
- Trust
- Communication
- Error Reporting
- Standard Operating Procedures
- Creating, maintaining and supporting a culture of safety

### Resources Available

- ASTRO Initiatives/Publications
  - Target Safety Initiative
    - Safety White Papers
  - *National Study to Determine the Comfort Level of Radiation Therapists and Medical Dosimetrists to Report Errors*
  - *Safety is No Accident*
- International Atomic Energy Agency Resources
- Health Care Industry Advisory Council Subcommittee on Patient Safety and Quality in Radiation Oncology

### Target Safety

- Goal is to improve patient safety and reducing the chances of medical errors during radiation therapy treatments
  - How?
    - Support the development of a national medical error reposting database and patient safety database for radiation oncology
    - Improve integration of equipment used in radiation treatments
    - Improve practice accreditation – encourage all radiation oncology practices to participate
    - Pass the CARE Act
    - Incorporating quality and safety content into meetings and self-assessment modules

### ASTRO Safety and Quality Publications

- Series of Patient Safety White Papers
  - Quality and Safety Considerations in Intensity Modulated Radiation Therapy
  - Quality and Safety Considerations in Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy
- QUANTEC
  - Users Guide
  - Specific Reports
- Coming soon: *Best Practices*

### Quality and Safety Considerations in Intensity Modulated Radiation Therapy

- Safety concerns
  - Unsafe to deliver IMRT for emergency cases
  - Required components of IMRT program
  - Responsibilities of team members
    - Radiation therapist
      - Before primary treatment:
        - Review treatment plan
        - Check to make sure all pre-treatment quality assurance tasks are complete

### Quality and Safety Considerations in Intensity Modulated Radiation Therapy

- Radiation Therapist responsibilities, cont.
  - Before treatment each day
    - Check prescription to ensure no changes
    - ASRT recommends time out be performed prior to beam on each day, verifying right patient and right isocenter
  - Obtain images and seek approval of images per Standard Operating Procedure
  - Monitor conditions and patients
  - Notify physicist of machine or software problems

### Quality and Safety Considerations in Intensity Modulated Radiation Therapy

- Department environment
  - Currently there are no regulations for training of non-physician staff regarding the application of IMRT
    - It is recommended:
      - 2 radiation therapists per treatment machine for IMRT patients
        - One to focus on the patient, one to focus on the console to verify MLC movement
      - All plans be independently reviewed by 2<sup>nd</sup> physicist or dosimetrist prior to treatment
      - Peer review of treatment volumes and plans by physicians, as well as offering continuing education workshops regarding image segmentation

### Quality and Safety Considerations in Intensity Modulated Radiation Therapy

- Event tracking
- Training and appropriate personnel
  - Training should educate therapists how IMRT is different than static, and what to monitor (ie leaf motion)
- Must have standard operating procedures
  - Guidelines of what should be included are in the document
- Practice accreditation
  - In July of 2011, only 9% of practices were accredited

### Quality and Safety Considerations in Intensity Modulated Radiation Therapy

- Common problems with IMRT and how to handle
  - In table format
- Quality Assurance
  - Pretreatment IMRT
  - Monitoring the QA program
    - Ask yourself – if this change is made to the machine, what impact does that have on patients who are receiving IMRT? Does any patient specific qa need to be completed?

### Quality and Safety Considerations in Intensity Modulated Radiation Therapy

- End to end testing
  - Complete a test patient from start to finish. How did the process work?
- Independent audits
- Checklists
- Collaboration with vendors
- Appendices
  - Example of workflow
  - Safety checklists

### Quality and Safety Considerations in SRS/SBRT

- Safety concerns
- Elements of 'successful' SRS/SBRT QA
  - Program
  - Personnel requirements
    - Radiation therapist
      - Must have ARRT certification, state license as applicable
      - Initial and periodic training with SRS and SBRT
    - Responsibilities – preparing room, patient positioning and immobilization, operating the treatment unit after radiation oncologist and medical physicist have approved the clinical and technical aspects

### Quality and Safety Considerations in SRS/SBRT

- Personnel requirements
  - Staff education, training, job description/responsibilities and staffing
  - Technical requirements
- Acceptance and commissioning
- SRS/SBRT QA – equipment and patient, should be ongoing
  - Time-out
- Appendices
  - Recommendations to guard against failures
  - Examples of quality checklists

### National Study to Determine the Comfort Level of Radiation Therapists and Medical Dosimetrists to Report Errors

- In 2011, 1500 radiation therapists and 528 medical dosimetrists were surveyed to answer that question
- Results were recently published in ASTRO's *Practical Radiation Oncology*

Scope of ASTRO Journals

Table 1. Demographic characteristics of respondents

Demographic	Therapists (n = 1567) n (%)	Dosimetrists (n = 528) n (%)
Gender		
Male	89 (29)	19 (3)
Female	362 (76)	121 (88)
Race		
Caucasian	358 (88)	170 (81)
African American	7 (2)	3 (1)
Hispanic	15 (4)	5 (2)
Asian/Pacific Islander	20 (5)	0 (0)
Age (y)		
Median (range)	42 (23-66)	42 (28-63)
Highest educational level		
Certificate	62 (16)	18 (10)
Associate	121 (34)	43 (22)
Bachelor	149 (45)	101 (54)
Master or doctoral	27 (8)	24 (13)
Years of practice		
Median (range)	12 (2-42)	9 (1-33)
Type of practice		
Academic	132 (41)	66 (28)
Private	102 (30)	107 (45)
Do you have a system in place for reporting errors or near misses?		
Yes	351 (87)	164 (84)
No	46 (12)	32 (16)

Table 2. Perceptions regarding overall communication and comfort in reporting errors

Survey questions	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)
<b>The overall communication between qg and the physicians in my department is good</b>					
Therapists	13 (4)	16 (4)	17 (10)	67 (27)	164 (55)
Dosimetrists	8 (3)	8 (3)	8 (4)	43 (21)	127 (67)
<b>The overall communication between qg and the dosimetrists and physicists in my department is good</b>					
Therapists (with dosimetrists)	14 (4)	9 (3)	20 (8)	78 (22)	230 (66)
Dosimetrists (with physicists)	7 (4)	3 (1)	22 (7)	30 (9)	137 (37)
<b>The overall communication between qg and the administrators in my department is good</b>					
Therapists	33 (8)	36 (10)	66 (18)	67 (27)	136 (38)
Dosimetrists	13 (7)	13 (7)	14 (5)	61 (27)	146 (40)
<b>The overall communication between the radiation therapy/medical dosimetry staff and the administrators in my department is good</b>					
Therapists	14 (4)	23 (6)	46 (13)	118 (33)	402 (44)
Dosimetrists	8 (2)	10 (4)	7 (4)	48 (28)	114 (62)
<b>The overall communication between the radiation therapy and medical dosimetry staff and the dosimetrists and physicists in my department is good</b>					
Therapists (with dosimetrists)	10 (3)	17 (5)	37 (10)	93 (26)	188 (56)
Dosimetrists (with physicists)	8 (3)	8 (3)	10 (4)	33 (18)	131 (71)
<b>The overall communication between the radiation therapy and medical dosimetry staff and the administrators in my department is good</b>					
Therapists	36 (10)	37 (10)	62 (23)	62 (26)	110 (31)
Dosimetrists	13 (7)	13 (7)	36 (20)	66 (30)	67 (38)
<b>I am encouraged to report errors in the clinic</b>					
Therapists	8 (2)	9 (2)	26 (7)	97 (11)	277 (78)
Dosimetrists	8 (3)	1 (1)	11 (4)	18 (8)	166 (82)
<b>I am comfortable reporting errors in the clinic</b>					
Therapists	16 (5)	16 (5)	29 (8)	62 (18)	236 (67)
Dosimetrists	8 (3)	8 (3)	7 (3)	28 (13)	148 (78)

Table 3. Obstacles to error reporting identified by radiation therapists and dosimetrists

Survey questions	Therapists (n = 386) n (%)	Dosimetrists (n = 183) n (%)
<b>Which of the following are major obstacles to reporting errors in your department?</b>		
Poor communication	74 (21)	28 (15)
My personality	12 (3)	7 (4)
Fear of reprimand	102 (26)	14 (8)
Lack of reporting system	28 (8)	18 (11)
Hierarchical structure	63 (16)	24 (13)
Other	128 (37)	27 (15)
<b>Have you been personally reprimanded or had other adverse action taken for reporting an error?</b>		
Yes	66 (16)	9 (5)
No	289 (84)	161 (88)
<b>Have other radiation therapy and medical dosimetry staff at your clinic been reprimanded or had adverse action taken for reporting an error?</b>		
Yes	103 (26)	18 (10)
No	283 (71)	174 (92)
<b>Have other staff at your clinic been reprimanded or had other adverse action taken for reporting an error?</b>		
Yes	84 (18)	38 (21)
No	284 (82)	161 (88)
<b>If a mistake is made, what percent of the time is a national professional organization notified?</b>		
< 25%	9 (2)	1 (1)
25%-50%	22 (7)	23 (13)
50%-75%	67 (18)	22 (12)
> 75%	103 (27)	11 (6)

### What Can We Learn?

- Error reporting systems are necessary for safety and quality in radiation oncology
  - But...we need to encourage a culture that allows error reporting without the fear of reprimand
  - The authors suggest medicine adopt a system like the airlines, whereas the safety of many depends on workers reporting errors promptly

### Safety is No Accident

- A framework for quality radiation oncology and care
- Sponsored by ASTRO
- DEVELOPED AND ENDORSED BY:
  - American Association of Medical Dosimetrists (AAMD)
  - American Association of Physicists in Medicine (AAPM)
  - American Board of Radiology (ABR)
  - American Brachytherapy Society (ABS)
  - American College of Radiology (ACR)
  - American College of Radiation Oncology (ACRO)
  - American Radium Society (ARS)
  - American Society for Radiation Oncology (ASTRO)
  - American Society of Radiologic Technologists (ASRT)
  - Association of Freestanding Radiation Oncology Centers (AFROC)
  - Society of Chairmen of Academic Radiation Oncology Programs (SCAROP)
  - Society for Radiation Oncology Administrators (SROA)

### Safety is No Accident

- Replaces 'The Blue Book'
- Over the past twenty years, radiation therapy technology has advanced.
- In addition, treatment planning and delivery have increased in their complexity.
- The goals of these guidelines are to encourage safety through teamwork and simplifying qa procedures

### Safety is No Accident

- Is divided up into chapters:
  - Process of Care
    - Framework to guarantee appropriateness, quality and safety of all patients
  - Radiation Oncology Team
    - Ensures patients get appropriate, multidisciplinary care
  - Safety
  - Management and Assurance of Quality in Radiation Oncology
    - Similar to the traditional Blue Book



### Pretreatment Quality Assurance

- Independent calculation of MU's
- Treatment verification with electronic portal imaging devices (pre IMRT days)
- Patient specific QA is necessary
- You may also include qa to check accuracy of dose calculations and data transfers

### Radiation Delivery

- After the treatment plan and treatment portal verification is complete, the patient is ready for treatment
- The physician is responsible for the verification and documentation of the accuracy of the treatment delivery related to the initial treatment planning and set-up
- In addition, with IGRT the physician is responsible for the supervision and review of daily images and shifts, as well as motion management

### Radiation Treatment Management

- The overall management of the course of treatment and care for patients
- Requires and includes a minimum of one exam of the patient by the physician each week
  - Many people provide care, but the radiation oncologist must provide a personal evaluation at least once per five fractions

### Follow-Up Evaluation and Care

- Necessary to manage acute and chronic toxicities, as well as monitor patients for tumor relapse
- Can be by physician or nonphysician provider
- Consultation with other members of the radiation therapy team when there are unexpected toxicities is advised
- Outcomes are dependant on training and board certification

### Radiation Oncology Team

- Ensures every patient gets appropriate care
  - Requires a collaborative and multidisciplinary environment
- Primary team includes a radiation oncologist, medical physicist, medical dosimetrist, oncology nurse, and radiation therapist
- Additional staff should be either on site or available by consult

Table 2.1. Roles and Responsibilities of the Radiation Oncology Team

	RADIATION ONCOLOGIST	MEDICAL PHYSICIST	MEDICAL DOSIMETRIST	RADIATION THERAPIST	ONCOLOGY NURSE	PHYSICIAN ASSISTANT
Clinical evaluation	x				x	x
Ongoing psychosocial evaluation	x				x	x
Decision to deliver external radiation therapy (XRT)	x					
Patient +/- family education	x			x	x	x
Interdisciplinary coordination of care	x			x	x	x
Patient positioning and image acquisition	x	x	x	x		
Fusion and registration	x	x	x			
Contouring/segmentation	x	x	x			
Dose-volume constraints	x	x	x			
Dose calculation	x	x	x			
Review of final treatment plan	x	x	x			
Patient-specific QA	x	x	x			
Treatment delivery	x	x	x			
Special procedures (SRS, SBRT, HDR, etc.)	x	x	x			
Monitor accuracy of delivery (ports, dose, etc.)	x	x	x			
Weekly evaluation	x	x	x	x	x	x
Follow-up					x	x
Survivorship	x				x	x
Equipment, software and systems acceptance testing, maintenance and commissioning	x	x	x	x		

### Radiation Oncology Team

- Qualifications
  - Board certified
  - State licensed (when applicable)
- Facilities should have a policy regarding orientation, competency, credentialing and evaluations to ensure continuous quality care
  - Continuing education is necessary because radiation oncology continues to develop and expand

**Table 2.2. Certification and Licensure Requirements**

Profession	Relevant Certifying Body	State Licensure Required?	Information Resources
Radiation Oncologist	ABR	Yes	www.theabr.org
Medical Physicist	ABR ABMP CCPM	In 3 states as of 2011 (FL, NY, TX)	www.theabr.org www.abmpexam.com www.ccpm.ca
Medical Dosimetrist	MDCB	No	www.mdcb.org
Radiation Therapist	ARRT ASRT	Yes (Currently in 35 states)	www.rrt.org www.asrt.org
Nurse Practitioner	AANP ANCC	Yes Yes	www.aanp.org www.ancc.org
Oncology Nurse	ANCC ONCC	Yes	www.nursecredentialing.org www.oncc.org
Clinical Nurse Specialists	ANCC	Yes	www.ancc.org
Physician Assistant	NCCPA	Yes	www.nccpa.net

### Radiation Oncology Team

- Staffing
  - Unique to each facility – depends on patient mix, the type and complexity of treatments offered
  - Also depends on the patient load, number of machines, number of affiliates, teaching and vacation time
  - Impossible to put a hard number on staffing levels!

### Radiation Oncology Team

- Staffing
  - Must have a radiation oncologist on call 24/7
  - Other members of the team must be available to provide urgent treatment off hours
  - The staffing model suggested in this document is based on many studies by many organizations
    - More staff is needed than what the model suggests for research, education and administration
    - More staff is also needed for 'progressive' clinics

**Table 2.3 Minimum Personnel Requirements for Clinical Radiation Therapy**

CATEGORY	STAFFING (See important comments below.)
Chief Radiation Oncologist	One per facility
Chief Medical Physicist	One per facility
Department Manager	One per facility (in some departments this function may be filled by a member of the team)
Medical Dosimetrist*	As needed, approximately one per 250 patients treated annually
Radiation Therapist*	As needed, approximately one per 90 patients treated annually
Brachytherapy Technologist*	As needed, approximately one per 100 brachytherapy patients treated annually
Mold Room Technologist	As needed to provide service
Social Worker/Dietitian	As needed to provide service

\* This number may be higher or lower depending upon the complexity of patients treated by an individual physician or by the complexity of technology.

\*\*It is recommended that a minimum of two qualified individuals be present for any routine external beam patient treatment.

### Safety

- Safe delivery requires coordination of many people with many responsibilities
- Safety and efficiency go hand in hand
  - Insufficiencies lead to problems
  - Increased efficiency is necessary in the changing environment of healthcare
- Processes and workflows need to continually be reassessed
- All members of the team must be open to raising safety concerns and suggesting change

**Table 3.1. Examples of Safety-Related Roles and Challenges - Radiation Oncology Staff**

Team Member	Traditional Role	Evolving Role	Challenges
Physician	<ul style="list-style-type: none"> <li>Relates care</li> <li>Supervisor of staff, sets priorities, directs treatment plan, monitors progress, manages toxicity</li> </ul>	<ul style="list-style-type: none"> <li>Team leader for patient safety</li> <li>Coordination with multidisciplinary team</li> <li>Continual education (e.g., stage, anatomic, biological, etc. with clinical technology)</li> </ul>	<ul style="list-style-type: none"> <li>Requires some autonomy in clinical decision making</li> <li>Requires strong communication skills</li> </ul>
Medical Physicist	<ul style="list-style-type: none"> <li>Assesses risk and efficacy of radiation as prescribed</li> </ul>	<ul style="list-style-type: none"> <li>Increasingly technological, precision to improve patient safety</li> <li>Assess safety of treatment protocols, esp. with patients, protocols, delivery methods, field size, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Role shift to increase emphasis on safety-related work</li> <li>Education in advanced process analysis with the patient safety</li> </ul>
Medical Dosimetrist	<ul style="list-style-type: none"> <li>Treatment planning</li> <li>Plan and QA on</li> </ul>	<ul style="list-style-type: none"> <li>Image verification/management (e.g., beam registration, high resolution)</li> <li>Active involvement in equipment QA</li> </ul>	<ul style="list-style-type: none"> <li>Adequate education in advanced</li> <li>Proper utilization of emerging imaging technologies with</li> </ul>
Radiation Therapist	<ul style="list-style-type: none"> <li>Monitors safe and effective delivery of radiation as prescribed</li> <li>Daily assessment and new patient treatment QA</li> </ul>	<ul style="list-style-type: none"> <li>Assessment of 2-D/3-D images to make decisions concerning patient treatment, motion/alignment</li> </ul>	<ul style="list-style-type: none"> <li>Safe and proper use of additional imaging and treatment delivery systems</li> </ul>
Nurse	<ul style="list-style-type: none"> <li>Works with patient care, education</li> <li>Manages toxicity</li> </ul>	<ul style="list-style-type: none"> <li>Patient pain</li> <li>Active interdisciplinary coordination</li> </ul>	<ul style="list-style-type: none"> <li>Adequate education in advanced technology</li> <li>Knowledge of existing chemotherapy agents</li> </ul>
Registration Specialist	<ul style="list-style-type: none"> <li>Assist physician with patient care</li> </ul>	<ul style="list-style-type: none"> <li>Coordination with multidisciplinary primary team</li> </ul>	<ul style="list-style-type: none"> <li>Legal in regulatory requirements</li> </ul>
Administrative Support	<ul style="list-style-type: none"> <li>Ownership of regulatory compliance</li> </ul>	<ul style="list-style-type: none"> <li>Support patient safety program</li> </ul>	<ul style="list-style-type: none"> <li>Resource allocation</li> </ul>
IT Specialist	<ul style="list-style-type: none"> <li>Backend support</li> </ul>	<ul style="list-style-type: none"> <li>Continuity</li> <li>Medical record analysis</li> <li>Data archiving/recovery</li> </ul>	<ul style="list-style-type: none"> <li>Resource allocation</li> <li>Vendor responsibility</li> </ul>
All Clinical Staff	<ul style="list-style-type: none"> <li>Proper patient identification</li> <li>Insurance</li> </ul>	<ul style="list-style-type: none"> <li>QA/Quality Improvement (QI)</li> <li>Inspected documentation in EMR</li> <li>End-user input</li> <li>Compliance with auditing regulatory requirements</li> </ul>	<ul style="list-style-type: none"> <li>Standardization of work steps</li> <li>Continual education</li> <li>Increased reliance on staff</li> <li>Adequate education with advanced technological advances</li> <li>Education/training for safety culture</li> <li>Minimizing distractions</li> </ul>

Team Member	Radiation Therapist
Traditional Role	<ul style="list-style-type: none"> <li>Provide safe and effective delivery of radiation as prescribed</li> <li>Daily equipment and new patient treatment QA</li> </ul>
Evolving Role	<ul style="list-style-type: none"> <li>Assessment of 2-D/3-D images to make decisions concerning patient treatment/ motion/ alignment</li> </ul>
Challenges	<ul style="list-style-type: none"> <li>Safe and proper use of additional imaging and treatment delivery systems</li> </ul>

- ### Staffing
- Levels and schedules need to be adjusted according to workload
  - Workloads must be realistic
    - Excessive workloads lead to errors, but light workloads are also problematic

- ### Communication/Facilities
- Look at hand-off's and interdependent tasks
  - Departments should have well-defined charting procedures
  - Dosimetry should be centrally located in the facility
  - There should be dedicated physician-dosimetry time
  - Finally, there should be a well defined communication plan

- ### Workflow/Efficiency
- Harried workers are prone to errors
  - Eliminate nonessential tasks
  - Adapt Lean approaches
    - Streamline clinical workflow and alter the work environment when needed
  - Process map tasks
    - Identify wasteful steps
    - Show stressors
    - End result is a streamlined and standardized process

- ### Standardization
- Standardization decreases not only errors, but confusion too
  - Standardization is helpful when many people have their way of doing things
  - It is recommended to have reference or guide sheets
    - Policies and procedures
    - These should be regularly updated, have a review committee and be posted for easy access

### Hierarchy of Effectiveness

- Because just having P&P are not enough, in order to provide safe and quality care, it is recommended to:
  - Use checklists and time outs
    - Focus on the task at hand
    - User must believe in their utility in order for them to be useful
    - They must be a hard stop

### Human Factors Engineering

- Design the workplace to decrease errors
- It has been shown that safety is improved in workplaces that decrease noise, interruptions and clutter
  - This never happens at the treatment console, right?
- Standardize nomenclature, monitor layouts, and shortcuts amongst vendors

### Incorporate QA Tools into the Software

- Planning and Record and Verify
  - Recommended that they are embedded into the software
    - User-designed checklists
    - Time-outs
    - Many others
  - Some of these exist, and many other are in the development stage

### Peer Review

- Prospective peer review is especially important for IGRT and IMRT techniques
  - Physician to physician review
  - Review of target delineation
  - Review of image segmentation prior to planning
  - Chart rounds
- Important for other staff members as well

	Peer Review	Quality Assurance
Physician	<ul style="list-style-type: none"> <li>- Target definition</li> </ul>	<ul style="list-style-type: none"> <li>- Verify appropriate nomenclature and documentation</li> <li>- Verify dose constraints are within policy</li> <li>- Review portal films</li> </ul>
Medical Physicist	<ul style="list-style-type: none"> <li>- Verify machine output</li> </ul>	<ul style="list-style-type: none"> <li>- Verify the correct transfer of data from the planning system to the treatment machine</li> </ul>
Medical Dosimetrist	<ul style="list-style-type: none"> <li>- Assess selection of beam orientation and weighting</li> <li>- Evaluate plan for target coverage and normal tissue exposure</li> </ul>	<ul style="list-style-type: none"> <li>- Verify that prescription matches the treatment plan</li> </ul>
Radiation Therapist**	<ul style="list-style-type: none"> <li>- Double check patient setup accuracy</li> </ul>	<ul style="list-style-type: none"> <li>- Ensure patient-specific procedure time-out</li> </ul>

\* Examples shown are items that might be (somewhat arbitrarily) divided into the peer review and quality assurance.  
 \*\* In addition, two radiation therapists should always be available in the event of emergencies and as a "second set of eyes" to verify information during time-outs for procedures.<sup>10</sup>

### Daily Morning Meetings

- All members of the team should meet daily to review the upcoming clinical day
  - Review all CT patients
  - Review schedule for the day
  - What patients are challenging?
  - What plans need attention?
  - Review treatment census and number of anesthesia cases
  - Raise any concerns, share any announcements
- Anticipate challenges to avoid chaos

### Safety Rounds

- Brief meeting lasting 15-20 minutes with the chairman of the department or a member of the quality and safety committee
- Happens at the worksite
  - Ask about near misses and unsafe conditions

### Routine Announcements

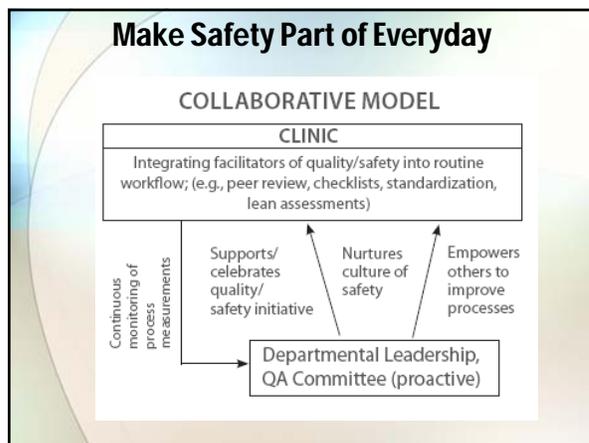
- Regularly report on safety rounds to everyone in the department
- This shows leadership responsiveness and commitment to quality and safety
- Achievements should be acknowledged and celebrated
- Address errors and near misses
  - Near misses should be addressed positively
  - Address near misses with the same rigor as errors

### QA Committee

- A multidisciplinary team which should meet regularly
- Should develop initiatives in regards to patient safety
- Create mechanisms for error and near miss reporting, watch trends, and have processes for implementing change when needed
- Maintain compliance with local, state and national laws
- Complete a root cause analysis when errors do occur
- Disseminate safety information to the department

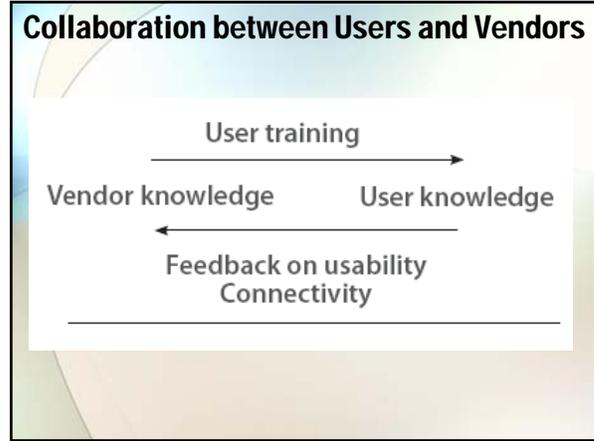
### Credentialing

- Must have institutional policies to ensure staff is trained and credentialed
- How do you ensure staff are qualified?
- Especially difficult with new and advanced technologies



### Collaboration between Users and Vendors

- There are more vendors in radiation oncology, which increases the need for open communication
- Vendors should educate the user for capabilities and limitations of their products
- Users should share their concerns with vendors and work with them to improve their products
  - Users should also report potential and actual problems to vendors



### Involve Others Beyond Radiation Oncology

Radiation Oncology Initiative	Analogous Multidisciplinary Initiative
Pretreatment team discussion	Tumor board
Daily meeting	Regular multidisciplinary meetings to review patients under treatment
Determining unambiguous methods of communication between team members in the radiation oncology EMR	Determining unambiguous methods of communication between multidisciplinary care providers in an oncology-specific or hospital-wide EMR
Safety rounds within radiation oncology	Safety rounds within cancer center
Departmental safety culture	Cancer center or hospital-wide safety culture
Discipline-specific training	Team training

### Management and Assurance of Quality in Radiation Oncology

- Guidelines similar to the traditional blue book
  - Facilities
  - Program requirements
    - Program Accreditation
    - Required capabilities
    - Policy and procedures
  - Radiation safety
    - Accelerator safety
    - Imaging safety

### Management and Assurance of Quality in Radiation Oncology

- Monitoring safety, errors and medical quality
  - Quality and Error Reporting
  - Safety, Morbidity and Mortality Rounds
  - Minimizing time pressures

Process Step	Minimum Process Time Required for Safety
After imaging: Completion of target volumes, definition of plan intent, normal structure volumes; anatomy approved	x days
After anatomy approval: Planning: 3-D CRT Planning: 3-D IMRT, Volumetric Modulated Arc Therapy (VMAT) Planning: 3-D SBRT Planning: SRS	x days x days x days x hours
Plan evaluation and physician approval	x minutes (though xx hours must be allocated to schedule this time)
IMRT QA and analysis	To be completed x hours before treatment
Treatment preparation (transfer from treatment planning system to treatment management system before treatment start)	Allow x hours
Final checks before treatment	x minutes or hours
Treatment setup and delivery (based on complexity)	x minutes

## Management and Assurance of Quality in Radiation Oncology

- Monitoring professional performance
  - All medical specialties should have maintenance for certification (MOC)
  - ASTRO Safety White Paper on Peer Review
- Ongoing monitoring and evaluation of staff qualifications
  - ASTRO Safety White Paper on IMRT
- Equipment and devices
  - Device QA, maintenance, connectivity, etc

## Management and Assurance of Quality in Radiation Oncology

- Patient related quality management
  - General guidelines
    - Patient chart rounds
- Charting and documentation
- Outcome assessment
- Outcome registry

**Table 4.6. General Clinical QA Guidelines**  
This table describes typical quality assurance checks which are commonly used during radiotherapy therapy. These are not a complete list of all checks that are performed. The table describes the timing that is best for the use of each.

Subject	Checks Performed by	Notes	When Performed/Checked
Overall treatment strategy	Radiation Therapist Medical Physicist Radiation Oncologist Medical Director	Review of patient case, clinical course, possible treatment strategies, overall patient treatment strategy to be provided, and review of general treatment strategy	Before patient treatment
Planning objectives	Radiation Therapist Medical Physicist Radiation Oncologist Medical Director	Review of target, target volume, organs at risk, normal tissue limits, other treatment constraints, and plan review of target and normal tissue	Before patient treatment
Approval of volume	Radiation Therapist Medical Physicist Radiation Oncologist Medical Director	Review accuracy and appropriateness of target volume including DVH, CTV, PTV, OAR, and normal tissue limits, and review of target and normal tissue limits, and review of target and normal tissue limits	Initial and during planning process
Treatment prescription accuracy	Radiation Therapist Medical Physicist Radiation Oncologist Medical Director	Verify dose distribution techniques and accuracy of calculations	Before final plan checks
Equipment plan quality	Radiation Therapist Medical Physicist Radiation Oncologist Medical Director	Verify beam delivery, dose calculation accuracy, and responsibility of dosimetry quality. Check machine output for accuracy and compare to other dose rate measurements of plan delivery, accuracy and consistency of treatment	Before final plan checks and patient treatment
Treatment plan approval	Radiation Therapist	Approval of treatment plan	Before final checks and patient treatment
QA calculation	Medical Physicist	Verify accuracy and appropriateness of QA calculations	After plan approval, before patient treatment
Patient specific QA checks	Medical Physicist	Documents for example, MRI or gamma camera specific QA of plan and delivery accuracy	Typically, after final plan approval
Image dose and treatment plan	Medical Physicist	Verify dose information has been compared correctly and distributed accurately from treatment planning system	Recommended at least 1 hour before treatment, as long as possible, and a minimum 30 minutes before patient treatment
Day 1 treatment verification	Radiation Therapist Medical Physicist Radiation Oncologist Medical Director	Specific Day 1 verification methods, including portal imaging, patient ID measurements, etc.	Pre-treatment verification
Daily treatment verification	Radiation Therapist Medical Physicist Radiation Oncologist Medical Director	Standard daily treatment protocol includes patient identification, video verification check, and other verification methods	Each day of each fraction
Weekly QA checks	Medical Physicist	Formal procedures for short checks including but not limited to machine output, etc.	At least once a fraction, preferably before each fraction or daily for the fraction
Final checks	Radiation Therapist Medical Physicist Radiation Oncologist Medical Director	Verify accuracy and completion of the record of the patient treatment course, including the physician's summary	For each patient

- External Beam Quality Assurance
- Table 4.6 summarizes all of the patient specific checks that should be completed for each plan

## IAEA

- International Atomic Energy Agency
  - One goal of the agency is to protect patients
  - Accidental exposure most often occurs when there is a lack of responsibilities defined, and a lack of a culture of safety
    - RPOP – Radiation Protection of Patients
    - SAFRON – Safety in Radiation Oncology

## RPOP – rpop.iaea.org

- Website which offers a variety of information for healthcare professionals and patients
  - Radiotherapy
    - Standards
    - Accident Prevention
    - Information for patients
  - Additional resources
    - Publications
    - Training Materials

## SAFRON – rpop.iaea.org/safron

- Web based system designed to share knowledge about incidents and near incidents
  - Users can post their incidents and near misses to an international database
  - You can track your information as a facility, as well as compare it to those reported internationally
  - Anonymous
  - Supports safe and beneficial use of radiation

### SAFRON

- Steps to using SAFRON
  - Register your facility
  - Submit your incident report
- Once you are using the system, you can collect, store and search information about reported incidents
- The system has the ability to sort incidents by where in the process the incident was discovered, who discovered the error, and how it was discovered
- Not only can you learn from others, but you can use the system to evaluate quality and safety at your facility

### Health Care Industry Advisory Council Subcommittee on Patient Safety and Quality in Radiation Oncology

- Founded by the ASRT Education and Research Foundation
- Meet annually to discuss issues and identify solutions to support radiological technologists and radiation therapists
  - The meeting in 2011 focused on application training processes to improve the quality of radiation therapy treatments
  - Subcommittee was formed

### The Critical Role of the Radiation Therapist in Patient Safety

- Workplace staffing
  - As of February 2012, 15 states do not regulate radiation therapists
  - Accreditation programs address radiation therapist certification and staffing
    - Recommend minimum of 2 therapists per machine regardless of patient volume
      - A 2010 staffing survey found:
        - Most facilities schedule 2 RTTs per linac
        - 41% of facilities schedule 1 RTT per linac 1-8 hrs per day (most were 1 hr instances)
        - 10% of facilities schedule 1 RTT for an entire 8 hr day

### The Critical Role of the Radiation Therapist in Patient Safety

- Workplace staffing – Best Practices
  - All radiation therapists should have ARRT certification in order to practice
  - All sites should staff 2 therapists per machines at all times
- Workplace staffing – Recommendations
  - Support the CARE Bill!
  - Sites should evaluate workflow and staffing to determine whether (and if so when) there are fewer than 2 therapists at a machine and correct as soon as possible

### The Critical Role of the Radiation Therapist in Patient Safety

- Workplace culture
  - The radiation therapist is the gatekeeper of delivery of radiation to a patient
  - In order to promote a culture of safety, it is necessary that radiation therapists are viewed as professionals
  - Radiation therapists must continually promote and practice our profession's standards and ethics
    - Time-outs and double checks

### The Critical Role of the Radiation Therapist in Patient Safety

- Workplace culture
  - Minimizing distractions while delivering treatments
    - Primary distraction is interruptions from other people (physicians, nurses and even fellow therapists)
    - Work together to develop policies, procedures, communication standards or physical barriers if necessary to minimize distractions while the beam is on

### The Critical Role of the Radiation Therapist in Patient Safety

- Workplace culture
  - Remember our existing standards
    - Ethical violation to not report an error when you know one occurs
    - It is in our scope of practice to withhold treatment due to safety concerns
  - Radiation therapists must be able to feel they can report errors without fear of repercussions
  - Error reporting should not be tied to performance evaluation

### The Critical Role of the Radiation Therapist in Patient Safety

- Workplace culture – Best Practices
  - All members of the team should embrace a culture which supports radiation therapist professionalism
  - Radiation therapists should adhere to professional standards and ethics
  - Reporting of errors should be expected and encouraged

### The Critical Role of the Radiation Therapist in Patient Safety

- Workplace culture – Recommendations
  - ASRT and its members should support mandatory error reporting
  - Implement changes to encourage a systematic approach to error and near miss reporting, tracking and correcting
  - Radiation therapists should embrace professionalism through lifelong learning, error reporting and process improvement

### The Critical Role of the Radiation Therapist in Patient Safety

- Skills Assessment
  - Radiation therapists must be prepared with knowledge for new equipment before the equipment is installed
    - This improves the application training at the site at the time of installation
  - Skills of new and temporary staff should be a primary concern for administrators
    - Competency checklists
    - Can also be used for new equipment

### The Critical Role of the Radiation Therapist in Patient Safety

- Skills Assessment
  - ACR and AAPM facilitate peer-to-peer review to share best practices
    - Similar assessment could be used for radiation therapists, which would minimize problems with communication and fear of reprisal among staff
  - Training and continuing education is an ongoing process
    - Post training assessments and competency assessments should be used to identify areas in which staff can learn and grow
    - ARRT's CQR

### The Critical Role of the Radiation Therapist in Patient Safety

- Skills Assessment – Best Practices
  - Preassessments of skills of the radiation therapists should be completed prior to applications training, as well as follow-up assessments
  - Radiation oncology providers should continue peer-to-peer assessment
- Skills Assessment – Recommendations
  - Sites should work with vendors to create pre and post assessment checklists
  - Therapists should use the assessments to identify gaps in skills and opportunities for continued professional development

### **The Critical Role of the Radiation Therapist in Patient Safety**

- Applications Training and Support
  - Challenges are time constraints for training, increased time needed to cover complex modalities and inconsistencies to commitment to training
  - The goal of applications training?
    - Often viewed as an interruption
    - Necessary that staff make time to attend the entire applications training session
      - View as 'safety time'
    - Multivendor training

### **The Critical Role of the Radiation Therapist in Patient Safety**

- Applications Training and Support – Best Practices
  - Facility and vendors should work together to ensure successful implementation and training of new equipment
  - Vendors should cooperate to improve multivendor implementation, training and support
- Applications Training and Support – Recommendations
  - HCIAC will spearhead guidelines for application training
  - HCIAC member companies will conduct multivendor testing prior to release
  - Sites installing equipment should support uninterrupted training of all radiation therapy staff

### **Practice Accreditation**

- **ACR/ASTRO program split in September 2012**
- **Still offered by ACR**
- **ASTRO will be rolling their program for public comments this spring**
  - Beta testing in late 2013
  - Full roll out in 2014