RO-ILS®

RADIATION ONCOLOGY
INCIDENT LEARNING SYSTEM

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CLARITY PSO
A Patient Safety Organization

RO-ILS THEMED REPORT:

PEER REVIEW

PATIENT SAFETY WORK PRODUCT

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INTRODUCTION

Clinical peer review is essential to safe and high quality care for patients and provides a learning opportunity for clinicians. It is distinct from standard quality assurance (QA) processes, which seek to review objective information and confirm accuracy of information compared to previous documentation or set expectations. For example, during pretreatment chart checks, physicists confirm that the prescription dose matches the plan, verify the isocenter and corroborate field parameters in the oncology information system (OIS) against those in the plan. Another standard QA process is therapist pre-treatment chart checks. Among a variety of checks, the therapist confirms treatment devices are clearly documented and available at the machine and that the number of planned fractions equals the number of scheduled appointments. In comparison, peer review often addresses more subjective items and typically includes multiple and/or different staff. For example, target definition or dose selection are peer reviewed with an interdisciplinary group of staff, as there may be varying opinions on the optimal treatment pathway for the patient. Additionally, peer review is a time for staff to learn from their colleagues and improve the quality of their work. For this reason, it is important that in addition to interdisciplinary peer review between the radiation oncology team, each discipline also conducts their own intradisciplinary peer review (i.e., physicist to physicist, therapist to therapist). By having a second staff member not previously involved in the work provide another check, peer review is being performed. It can also be a time to catch errors missed during QA or upstream processes such as physician approval of plans. A final aspect of peer review can include a higher level, "big picture" look at processes and practices. This can promote awareness and provide a structured opportunity to suggest improvements to workflows and review adherence to guidelines. There are numerous ways that peer review is conducted, all of which require rigorous involvement and oversight to ensure efficacy.

INEFFECTIVE PEER REVIEW

Case 1: Overlap of Prior Radiation.

A patient with a history of prior radiation was prescribed treatment to a potentially overlapping field with 600 cGy x 5 fractions for a total dose of 3000 cGy. Although the history of prior radiation was documented in the patient's note, the patient had a long medical history and the attending radiation oncologist forgot about the prior radiation and approved the plan without a composite plan being generated. Peer review was completed by another radiation oncologist who was not aware of the prior radiation treatment and agreed that the plan was appropriate for delivery. After the patient had received one fraction, the attending of record remembered that the patient had received prior radiation and contacted the physicist, requesting a composite plan of the two treatments. A composite plan was generated and reviewed by the attending radiation oncologist at that time. The combined doses to the spinal cord and bowel exceeded tolerance. Treatment was discontinued after one fraction.

In an era where cancer patients are living longer, re-irradiation is becoming ever more common. Therefore, accounting for previous radiation is all the more crucial. In this case, the history of previous radiation therapy was documented in the patient's oncologic history; but given the patient's extensive history, it was not separately communicated to the peer review physician or the dosimetrist. The three P's – pregnancy, pacemaker and prior radiation status – should be documented not only as part of the patient's medical record but also as part of the simulation order or planning directive to ensure that all staff is alerted to the patient's specific circumstances. Nevertheless, all members of the radiation team should check for documentation of the three P's in the medical record to ensure that these are not missed, and consideration should be given to incorporating independent verification of the three P's by someone other than the physician. Some institutions ask about the three P's at the time of consult, as well as at the time of simulation. Such redundancy enhances the safety of this check. Given the significant clinical impact on the patient, it may be prudent to also consider incorporating prior radiation into the standard peer review check for all patients.

Case 2: Patient's Prescription Mismatched Trial Protocol.
The treatment intent for a patient enrolled on clinical trial was written correctly in the planning directive to coincide with the trial dose. However, the prescription within the electronic health record (EHR) was not congruent with this intent. This patient's case went through a peer review conference where the conflicting dose between the planning directive and EHR prescription was noted; however, the plan contours were still pushed through for planning to begin. The planner utilized the incorrect prescription to plan treatment and the inconsistent dose information was not noted again until an independent physics check. This late discovery required the treatment to be replanned.

This case represents a situation where an error was caught in a peer review scenario; however, the prescription was not updated to reflect the feedback. The practice has a feedback process in place, but this event eluded that process. Per this practice's policy, the structure set should not have been approved for planning to begin until after the feedback from peer review was addressed. It would be helpful to make comments from peer review available to additional stakeholders who have a vested interest (e.g., physicists, therapists) or to make changes to incorrect documentation in real time. Additionally, if the attending radiation oncologist is not present and receives feedback after the fact, it may be helpful to require the physician to respond to confirm the feedback loop has been closed.

Another method for mitigation in a similar scenario would be to allocate and train one or more specialized dosimetrists for each open clinical trial. Their role would require prior knowledge of the trial's requirements and plan all the identified cases accordingly. This specialization would enhance their ability to single out instances with incorrect prescriptions or other variants in protocol. This strategy would likely be most beneficial where there is a larger volume of trial patients, such that dosimetry staff would be familiar with ongoing trial requirements. Alternatively, if specialization is not feasible, staff should make sure that the trial protocol is provided to the planning dosimetrist for any trial patient.

UNSPECIFIED/INADQUATE PEER REVIEW

Case 3: Insufficient Contouring of the Esophagus.
A patient was to be treated with IMRT to the right breast and nodes; however, the superior four slices of the esophagus were not contoured, resulting in unintended dose deposition in the unsegmented esophagus and clinical esophagitis. The event was not discovered until the patient reported symptoms, at which time a review of the contours and plan was done, and the error was uncovered.

Organ-at-risk (OAR) contouring errors are difficult to catch with standard QA processes, which is why peer review can be extremely helpful. In particular, prospective peer review of segmentation allows for input from other clinicians prior to the time-consuming planning process. Practices are more likely to make improvements to contours if identified earlier in the process, whereas only more major revisions are completed post-planning given the added resources and time required to replan a case.[i] For this case, the practice did not specify their peer review processes, but rigorous peer review could have caught this error. Multiple components are required to ascertain the quality and acceptability of a radiation plan, highlighting the need for a process to ensure that all plan aspects are properly assessed prior to treatment delivery.

Whether an attending radiation oncologist is conducting standard review prior to approving a plan or another individual/group is reviewing a plan, the simple acronym CB-CHOP can be utilized for a systematic approach for plan evaluation.[ii] CB-CHOP stands for contours, beams, coverage, heterogeneity, organs at risk and prescription. Per this approach, when a treatment plan is ready for evaluation or review, the contours (the delineated target volumes and OARs) should first be reviewed. It is important to ensure that all appropriate OARs are accounted for and contoured correctly. The reviewer may discover that an OAR was forgotten, incompletely contoured or that the isodose lines fall into an OAR initially thought not to be at risk. Templated

OARs within the treatment planning system (TPS) for specific disease sites may help ensure that the appropriate OARs are contoured. ASTRO's consensus statement provides recommendations for standardizing normal tissue contours for each anatomical site for definitive cases and can guide the development of templates OARs.[iii] However, this may not solve the problem of incomplete or incorrect OAR contours. A checklist for the dosimetrist can help remind staff to confirm that all appropriate OARs are accounted for prior to handing it off. Technology may also help assist with identifying these types of errors by flagging contour volumes that are outliers (e.g., an undercontoured spinal cord below the minimum volume) or contours that are discontiguous.

Case 4: Incorrect Documentation of Prescription.

The radiation oncologist's intent was to treat with 800 cGy x 3 fractions for a total of 2400 cGy. However, the physician entered and approved 2 fractions instead of the intended 3 fractions and the total dose remained the same at 2400 cGy (the dose per fraction was automatically adjusted to 1200 cGy). The plan was generated by the physicist and approved by the physician according to the entered prescription. Since the plan matched the approved prescription, the plan was approved by a second physicist. The radiation oncologist realized the prescription was entered incorrectly when the patient was receiving their first fraction. The patient received 1200 cGy instead of the intended 800 cGy for the first fraction of treatment.

There were likely several missed opportunities to question this patient's prescription. The practice did not specify peer review when describing this case, but implementing prospective physician-to-physician or interdisciplinary peer review for cases where a high dose is being delivered per fraction would have been helpful in this case. If the treating radiation oncologist had presented this case to their colleague(s), the error may have been discovered. Whether the physician had stated their intent and the colleagues noticed the different planned prescription or whether the physician had verbally communicated the planned prescription and noticed the discrepancy themselves, peer review may have likely caught this error. It is important to note that standard QA processes (i.e., physicist pre-treatment chart check) would not necessarily have caught this error, as the plan matched the approved prescription, further highlighting the importance of peer review and case discussion.

This case also highlights the need for a systematic, step-by-step process to ensure that all plan aspects are properly assessed prior to approval. The radiation oncologist has the final responsibility for determining a plan's suitability; it is therefore important to be thorough with a consistent approach to plan evaluation. Before approving a plan, the radiation oncologist should ensure that the prescribed dose and the calculated plan match the intent, which should also be documented prior to the initiation of treatment planning. The prescription may have been entered incorrectly (as in this case) or a dosimetrist may have mistakenly entered the prescription while generating the plan. Before approval, the radiation oncologist should verify that the dose per fraction, number of fractions and total dose are correct and written in a standardized format.[iv] The treatment details should also be specified, including the treatment site, type of radiation, energy, delivery method and delivery schedule.

Lastly, this event demonstrates the importance of documentation, asking for clarification when warranted and establishing a safety culture in which questioning is encouraged and staff feel comfortable to do so. If "1200 cGy x 2 fractions" is not a routinely utilized treatment regimen at the practice, it is prudent to double check the intended fractionation scheme with the radiation oncologist.

SUCCESSFUL PEER REVIEW

Case 5: Incomplete Target Contoured.

A dosimetrist-to-dosimetrist peer review revealed the liver was not contoured on a case where the target was abutting this organ. While delineating the liver, the dosimetrist also questioned whether the GTV had been drawn to completion. They reached out to the radiation oncologist and, after review, it appeared the target had been delineated using the Maximum Intensity Projection (MIP) instead of each phased imaged to create the volume. This error was caught and addressed prior to the initiation of treatment.

This error was caught in the planning stage during a peer review between two dosimetrists. Intradisciplinary reviews may not be common but, as exemplified in this case, can improve quality, and minimize errors that reach the patient. Given the variability in contouring and plan quality[v], the value of this type of peer review cannot be overstated. ASTRO's Accreditation Program for Excellence® (APEx) acknowledges its importance with a dedicated evidence indicator (EI); EI 13.1 requires practices to implement an intradisciplinary peer review process for each discipline.[vi] Unfortunately, it is one of the lowest performing requirements, in particular for medical physicists, radiation therapists and dosimetrists.[vii] According to APEx documentation, there are multiple activities that would qualify as a peer-to-peer evaluation, even in the setting of a single dosimetrist environment. There are contouring and planning educational programs provided by ASTRO, AAMD and vendors that offer dosimetrists and physicians an opportunity to test their knowledge, learn hands-on and receive feedback.

This error may also have been apparent if the plan had contained a standardized list of normal tissues. This would have brought visibility to the fact that the nearby organ had no dose statistics reported, inevitably leading the planner to evaluate the structure. This type of templated structure set can be built within most TPSs, or supplemental scripts could be written to check for this type of error. The practice could start to build disease site templates to help prevent this kind of variance from occurring again.

It is prudent to recognize that this error was caught before reaching the patient. The dosimetrist peer review process not only identified the missing OAR but also the incorrect target delineation. This practice appears to have a culture that reinforces safety. It is reassuring to see that the dosimetrist felt secure enough with the physician to halt the planning process and request a review of the target.

MITIGATION STRATEGIES AND SOLUTIONS

Strategy #1: Prospective Peer Review

Focusing on peer review earlier in the treatment planning workflow is important when optimizing the efficacy of peer review. By addressing target volumes, organs at risk, dose prescription and dose constraints up front, prospective peer review can help avoid the resource inefficiencies, pressures and mistakes associated with urgent replanning. Additionally, it avoids or minimizes the delivery of any suboptimal therapy. This is especially important with increasing use of high dose per fraction regimens. Understanding that it may not be feasible to prospectively peer review all cases due to time and resource constraints, incorporating earlier peer review may begin by triaging patients based on urgency to start treatment and the use of hypofractionation. The Centers for Medicare and Medicaid Services has acknowledged the importance of timely peer review in the Radiation Oncology Alternative Payment Model. It includes a requirement that peer review be performed and documented for 50% of new patients in the first year of the program. The RO Model states that peer review should preferably occur before starting treatment, but in all cases before 25% of the total prescribed dose has been delivered and within two weeks of starting treatment.

Strategy #2: Staff Engagement and Safety Culture

A supportive, nonhierarchical environment creates a culture in which all staff members feel safe to raise concerns about potential errors without fearing punitive measures. Departmental leadership should emphasize the importance of peer review and encourage others to actively engage in quality and safety initiatives. Otherwise, a major possible pitfall is that peer review becomes an activity that needs to be checked off a to-do list and staff are distracted and/or uninterested. It is important that the spirit of peer review be imbedded in the process. Otherwise, it can give a false sense of security. To combat this and ensure staff engagement and accuracy during peer review, departments should consider making peer review activities succinct (but more frequent) to keep people's attention.[viii] Additionally, presenting more complex and/or hypofractionated cases first at peer review conferences would ensure that these cases are prioritized. Acknowledging staff who are actively engaged in improvements can also help encourage others to actively participate in the peer review process.

Strategy #3: Inter- and Intra-disciplinary Peer Review

Practices should implement interdisciplinary peer reviews where multiple professions within the radiation oncology department (i.e., radiation oncologists, physicists, dosimetrist, therapists, nurses, research coordinators) come together to evaluate patient plans. This diverse group serves to evaluate the plan of care for the patient in a comprehensive manner. This could be helpful in identifying inefficiencies in the process or highlighting concerns that should be addressed with varying perspectives and expertise. While communicating with other disciplines serves to increase patient safety, practices should also make advances toward implementing intradisciplinary reviews. Assessments from colleagues within your own profession provide more vocation-specific feedback, may identify errors and lead to efficiencies by pointing out useful tips and tricks. To assist with this, ASTRO developed a free Peer-to-Peer Match program to help connect interested individuals to peer review one another's cases.[ix] It is a user-driven, online tool hosted on ROhub that allows enrolled participants to search for other interested individuals. Participants communicate outside the platform using their own communication vehicles to evaluate patient cases and treatment plans. This service may help radiation oncologists in small or rural practices establish a relationship for ongoing, one-on-one peer review. Whether it is in the inter- or intra-disciplinary setting, peer review should be considered a learning opportunity for its participants.

Strategy #4: Systematic Approach to Peer Review

Evaluating a radiation plan is an essential task for those involved with plan generation. With more modern and advanced radiation techniques, this task becomes more complex and difficult to do. Systematic approaches and/or checklists minimize mistakes by ensuring that all the right steps have been completed in order and avoids reliance on memory. One common systematic approach for plan evaluation is described by the acronym CB-CHOP, which stands for contours, beams, coverage, heterogeneity, organs at risk and prescription. Following this approach will help eliminate radiation errors and reduce patient harm. Practices should consider utilizing their RO-ILS data to track and identify the most common and most severe errors and add those elements to the peer review checklist.

Strategy #5: Comprehensive Plan and Workflow for Addressing Feedback

Practices should implement a workflow where feedback from peer review is acknowledged, at the least, and acted on as needed. The process needs to be steadfast even with the absence of the attending physician at the time of peer review and should outline the steps taken post-review to ensure the staff involved with the desired change are notified. For example, some practices utilize an electronic whiteboard to track issues identified during peer review and ensure the necessary changes are made before the plan proceeds in the process of care.[x] It is important to have the comments documented so that others within the process are aware of the evaluation and what mitigation steps were taken to address the peer assessment.

CONCLUSION

Dr. Atul Gawande wrote in The Checklist Manifesto, "Know-how and sophistication have increased remarkably across almost all our realms of endeavor, and as a result so has our struggle to deliver on them….Avoidable failures are common and persistent, not to mention demoralizing and frustrating, across many fields—from medicine to finance, business to government. And the reason is increasingly evident: the volume and complexity of what we know has exceeded our individual ability to deliver its benefits correctly, safely or reliably. Knowledge has both saved us and burdened us."[xi] Practices must continuously work to ensure that the peer review includes the right people reviewing the most impactful information at the opportune step(s) in the process of care to better staff performance and better patient care.

REFERENCES

[i] Brunskill K, Nguyen TK, Boldt RG et al. Does Peer Review of Radiation Plans Affect Clinical Care? A Systematic Review of the Literature. *Int J Radiat Oncol Biol Phys*. 2017;97(1):27-34.

[ii] Dean M, Jimenez R, Mellon E, et al. CB-CHOP: A simple acronym for evaluating a radiation treatment plan. *Appl Rad Oncol*. 2017;6(4):28-30.

[iii] Wright JL, Yom SS, Awan MJ, et al. Standardizing Normal Tissue Contouring for Radiation Therapy Treatment Planning: An ASTRO Consensus Paper. *Pract Radiat Oncol.* 2019;9(2):65-72.

[iv] Evans SB, Fraass BA, Berner P, et al. Standardizing dose prescriptions: An ASTRO white paper. *Pract Radiat Oncol.* 2016. 6(6):e369-e381.

[v] Li XA, Tai A, Arthur DW, et al. Variability of target and normal structure delineation for breast cancer radiotherapy: an RTOG multi-institutional and multi-observer Study. *Int J Radiat Oncol Biol Phys.* 2019;73(3):944-951.

[vi] American Society for Radiation Oncology. APEx® Program Standards. 2020. https://www.astro.org/ASTRO/media/ASTRO/Daily%20Practice/PDFs/ProgramStandards.pdf

[vii] American Society for Radiation Oncology. APEx® In Review: Five Years of Dedication to Quality Improvement. 2019. https://www.astro.org/ASTRO/media/ASTRO/Daily%20Practice/PDFs/APEx_19AnnualReport.pdf

[viii] Talcott WJ, Lincoln H, Kelly JR, et al. A Blinded, Prospective Study of Error Detection During Physician Chart Rounds in Radiation Oncology. *Pract Radiat Oncol.* 2020;10(5):312-320.

[ix] American Society for Radiation Oncology. Peer-to-Peer Match Program. 2020. https://www.astro.org/Patient-Care-and-Research/ROhub/Peer-to-Peer-Program

[x] Kapur A, Goode G, Riehl C, et al. Incident Learning and Failure-Mode-and-Effects-Analysis Guided Safety Initiatives in Radiation Medicine. *Front Oncol.* 2013;3:305.

[xi] Gawande, Atul. *The Checklist Manifesto: How to Get Things Right*. New York: Metropolitan Books, 2010.