Incident Analysis

The Radiation Oncology Incident Learning System (ROILS) was launched in 2014 with the intent to promote safer care in radiation oncology by means of non-punitive, shared learning.\(^1\) Ezzell et al\(^2\) examined the cases that had been reported to the ROILS system, as of 2016, that they considered critical, meaning that the events had potential critical clinical impact. Of the 396 critical cases identified, 100 involved erroneous plans that were sent to the physician for approval. Of these, 29 directly involved a miscommunication of intended prescription or fractionation scheme. The subsequent analysis will examine one such case reported to the ROILS system, the error pathway involved, and potential actions for future prevention.

In the case reported, the dosimetrist took a verbal order to create a plan to 3600 cGy and entered the prescription into the patient’s electronic medical record (EMR). The physician intended that the patient be treated 300 cGy for 12 fractions to a total of 3600 cGy, but the dosimetrist created the plan for 180 cGy for 20 fractions to a total of 3600 cGy. The physician approved the plan and it was sent to the treatment unit. The patient was seen for an under-treatment visit during their second week of radiation therapy and the physician was surprised by the lack of tumor regression after 9 fractions. After checking the EMR, the physician noted that the patient’s daily dose was not in multiples of 300 cGy.

In the chain of events that took place, there were a few points along the pathway that contributed to the occurrence of the error. The first item of contention involved the prescription order. Though best practice, dictated by organizations such as the American College of Radiology (ACR) and the American Society for Radiation Oncology (ASTRO), is to have a written prescription at the start of planning, this is commonly not the case.\(^2\) In the case reported, the dosimetrist took a prescription order for the total dose only. This is the first major point that contributed to the error in this case. Recent changes in radiation oncology has led to an increase in the ambiguity of prescriptions.\(^3\) As an example, hypofractionation is becoming increasingly common in the field. Fractionation patterns of 180 cGy and 200 cGy to curative doses, and 300 cGy times 10 for palliative cases, have historically been the norm, but it is not uncommon to now see higher daily doses such as 266 cGy or 1000 cGy. There has also been a rise in the use of
fractionation schemes where 300 cGy is utilized curatively, as in the prostate scheme of 60 Gy in 20 fractions.\textsuperscript{4}

The second major point of error contribution occurred with the physician. Multiple accrediting bodies state that all prescriptions should be signed or electronically approved by a radiation oncologist before the start of a patient’s radiation therapy treatments.\textsuperscript{3,5} In this case, we are only given that the dosimetrist entered the prescription into the record. The case does not state whether the physician approved this prescription. The lack of physician approval of the prescription is certainly a contribution to error if that is the case. If the prescription was approved, there is still an error contributing factor present. The physician signed off on the incorrect fractionation scheme twice, in both the prescription and in the patient’s treatment plan.

The ACR-ASTRO recommends in their practice parameters for radiation oncology that a radiation therapy prescription contain the target, technique, energy, dose per fraction, number of fractions, total dose, and reference to imaging.\textsuperscript{5} Though it is best practice to have a written prescription before planning, it is not always feasible to wait on the physicians to input this information before starting a plan. When given the verbal prescription, rather than confirming the daily dose, the dosimetrist assumed that it would be a standard 180 cGy per day. It has been shown that we tend to more readily accept information that confirms what we already believe.\textsuperscript{3} This is called confirmation bias. An easy trap for confirmation bias in radiation oncology is standard fractionation versus non-standard fractionation. One way to help prevent this error from occurring in the future would be to always verify daily dose and number of fractions. If the order is given, via any platform other than a standard prescription, to generate a plan to 3600 cGy, verify with the physician that 3600 cGy means 180 cGy for 20 fractions. The physician could then confirm that the statement is correct or, conversely, state that it is instead 300 cGy for 12 fractions.

It is recommended by the American Association of Physics in Medicine (AAPM) that a physicist perform a check of plans before they are implemented on the treatment machine.\textsuperscript{6} One of the things often verified during this check is that the prescription and the treatment plan match. If the department already has a physics check in place, a potential way to help prevent this error from reaching the patient in the future would be to mandate that the physician be responsible for inputting prescriptions into the EMR. This puts the responsibility for thinking through the prescription into the physician’s hands, rather than having the physician just signing
off on the document. This increases the likelihood that the prescription is written as the physician intended and gives more opportunity for the error to be caught before it ever reaches the patient. The physician or dosimetrist may notice the discrepancy, but if not, the non-matching plan and prescription will have to get through both physics and the radiation therapists before it is delivered.

The ROILS platform was implemented to improve the quality of care in radiation oncology by allowing the analysis of errors that occur across the country. A recommendation that is highly supported by ROILS analysis is the standardization of the prescription process, as it has been shown that there is a high potential for error to occur. As exhibited in the case report discussed, ambiguity in prescription orders and non-standardized prescription review by the physician, led to a patient being treated with an incorrect fractionation scheme. Via the analysis of this case, and others like it, recommendations can be given to decrease future error, and make radiation oncology safer.
References


