RO-ILS®

RADIATION ONCOLOGY
INCIDENT LEARNING SYSTEM

Sponsored by ASTRO and AAPM

CLARITY PSO

A Patient Safety Organization

RO-ILS THEMED REPORT:

RUSHING

PATIENT SAFETY WORK PRODUCT

CLARITY PSO,
a Division of Clarity Group, Inc.
8601 W Bryn Mawr Ave • Suite 110 • Chicago, IL 60631
T: 773.864.8280 • F: 773.864.8281
www.claritypso.com

TABLE OF CONTENTS

INTRODUCTION

Rushing is considered a major factor for increasing the risk of making an error.[1,2] This report examines RO-ILS: Radiation Oncology Incident Learning System® trends and events related to rushing and scheduling reported to the program from 2014 through 2023. Relevant events were identified by the Radiation Oncology Healthcare Advisory Council (RO-HAC) through two mechanisms: structured data elements and a key word search of free text fields. If the user or RO-HAC reviewer selected one of the following options, the event was deemed relevant for this report:

- [User] Problem Type = Delay/issue in workflow or error in RT scheduling
- [User] Contributing Factor = Compressed time scale, rushing
- RO-HAC Contributing Factor = Rushing

This search strategy resulted in 2,287 events being identified, which the RO-HAC considered to be a potentially underrepresentation of the extent of rushing events submitted to the RO-ILS database. Therefore, a keyword search of the free text was used to identify additional events. This included: Rush, Delay, Late, Last minute, Time, Timeline, Quick, Hurry, Hurried, Haste, Expedite, Delay, or Scheduling. Scheduling was included because a change in schedule or scheduling issues often force rushed adjustments in workflow.

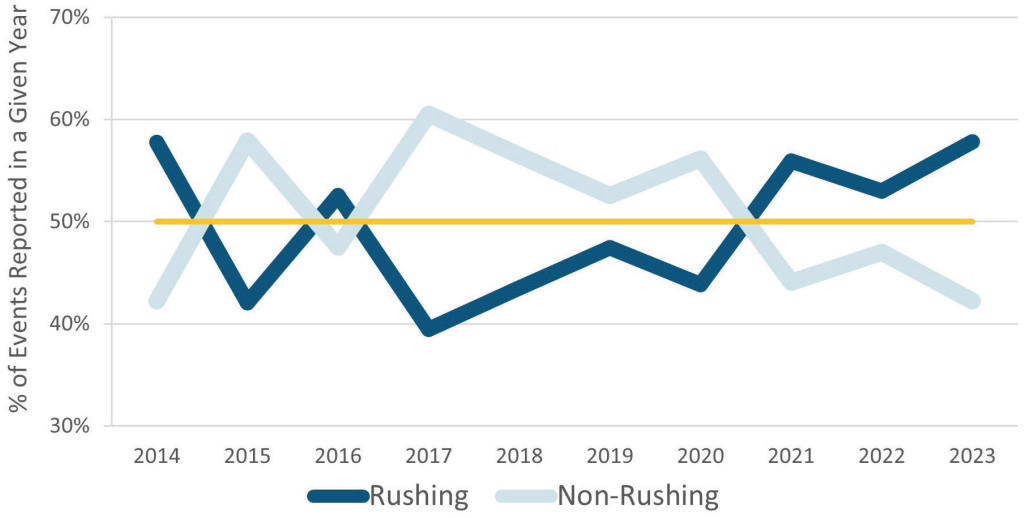
An additional 14,851 events were identified using the key word search of free text fields, resulting in a total of 17,675 unique events analyzed in the rushing dataset. Given the RO-ILS database is comprised of approximately 35,000 events, this represents a near even split between rushing and non-rushing events and as a result this report contains many comparisons between these two datasets.

The voluntary nature of error reporting presents a challenge. The structured data elements search yielded a relatively low (10%) proportion of the total events used in this data cohort. Limitations of the structured data elements search is that problem type is a newer data element, user contributing factors is optional, and not all events are assigned for RO-HAC review. With an abstract concept such as rushing, a more creative and generalized method was needed to cast a wider net and identify potentially relevant information. While the free-text search identified many events, use of adjectives such as "quick" and "last-minute" may have also captured events without an obvious issue of staff haste. Although both search techniques were beneficial, it is important to appreciate the findings from this diverse dataset, while acknowledging the limitations of any safety analysis, and the difficulty of drawing definitive conclusions.

OVERVIEW

The issue of rushing is an ongoing challenge in radiation therapy. **Figure 1** shows the percentage of rushing vs. non-rushing events reported each year to the RO-ILS database.

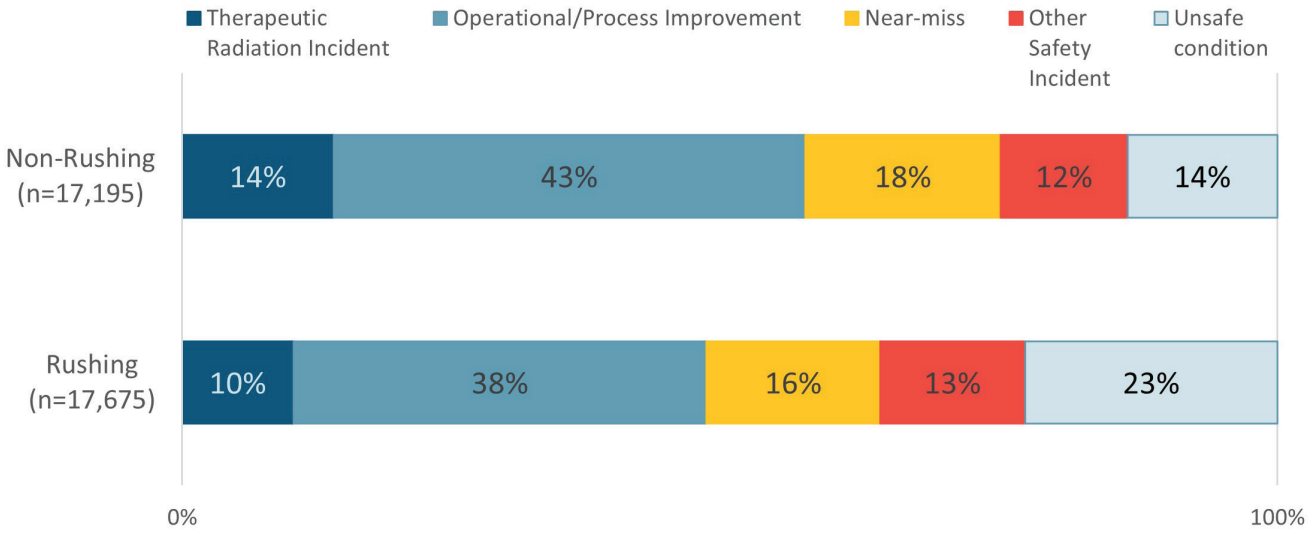
Figure 1: Relative Increase in Number of Rushing Events Reported to RO-ILS since 2020.



The total number of events reported to RO-ILS each year has increased over time, lowering the statistical uncertainty in recent years. Nevertheless, the increase in rushing events in the last three years may still be a statistical anomaly or a sustained trend. If a pattern of reporting rushed events has indeed formed since 2020, the potential causes could be related to a multitude of factors such as the COVID-19 pandemic, unmet staffing needs, consolidation of practices (e.g., an increase in staff traveling between facilities) and therefore competing physician priorities, or perhaps changes in clinical practices (e.g., online adaptive treatments) that require revising timelines.

For every event reported, the user determines the classification which can generally be grouped into one of the following: the error reached the patient (incident), the error almost reached the patient (near miss), and other issues that can create a safety error (unsafe condition, operational/process improvement). **Figure 2** shows the event classifications for rushing events compared to non-rushing events.

Figure 2: Unsafe Conditions Comprise a Larger Percent of Rushing than Non-rushing Events.

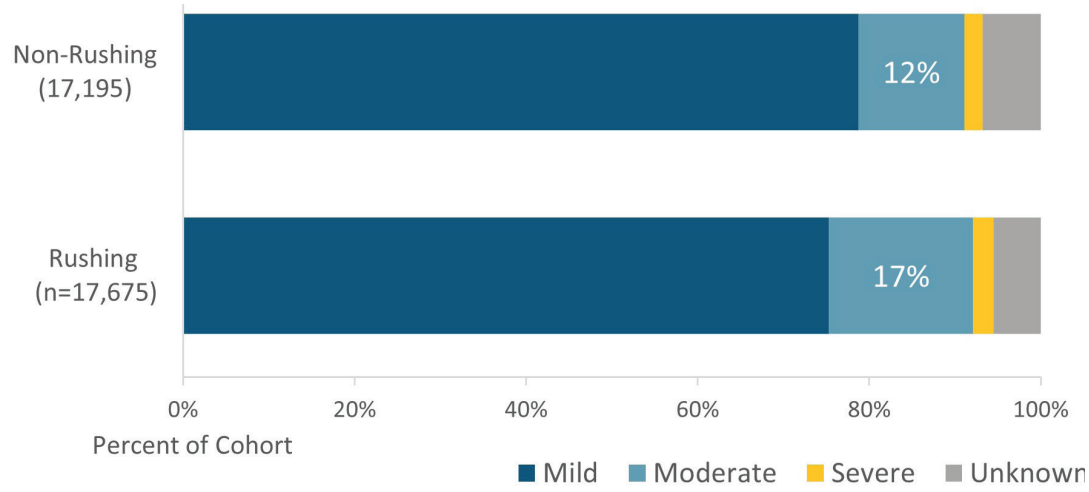


The concept of rushing in incident learning data is two-fold, as the safety concern of rushing could be entered into RO-ILS as the "event" itself (i.e., an unsafe condition) for the increased risk of an error being introduced into the process. Alternatively, rushing could be seen as one of potentially many contributing factors that resulted in a clinical error (e.g., near miss or incident). Based on the first "type" of rushing, the overrepresentation of unsafe conditions in the rushing dataset is not surprising. This suggests RO-ILS users are documenting instances where the environment is not conducive to safe practice, such as being asked to complete tasks in shorter timeframes than is reasonable. By acknowledging and tracking these safety issues, staff can use the data to analyze the causes and work to identify mitigation strategies. Figure 2 also shows an underrepresentation of therapeutic radiation incidents in the rushing dataset. This could be interpreted as a positive safety finding as it may indicate that rushing is not driving errors (the second "type" of rushing event) that reach the patient. These findings may suggest that the aims of the RO-ILS program to minimize error pathways through education on mitigation and best-practice strategies may have worked as intended.

SEVERITY

The severity of rushing events can range from a minor inconvenience to drastic clinical patient impact. RO-ILS users must rate every event's significance as mild, moderate or severe. While potentially biased, their perspective leverages knowledge of their system, constraints and other details that may not always be written in the event report. For events with a component of "rushing," RO-ILS users were more likely to indicate the event represented a moderate patient safety concern, as opposed to their "non-rushing" counterparts (**Figure 3**).

Figure 3: Users Rated More Rushing Events as Moderately Significant.



Case 1: Compressed Timeline due to Clinical Trial Participation

The treatment team was notified late regarding the dose level randomization of a patient for clinical trial participation. The patient was prescribed 7 boost fractions. The protocol plan was approved and pushed out of dosimetry at 1:30 p.m., reviewed by physics, and the patient was treated at 3:30 p.m. After the single fraction was given, it was discovered that the approved and delivered boost plan was for 14 fractions instead of the prescribed 7 fractions. The plan was modified, and the team delivered the missing dose for that fraction. The subsequent 6 fractions were delivered as intended. The team also noted that this event occurred just as attending physicians were returning from an annual conference meeting and there was a spike in the number of cases needing to start. The following phrases were used to describe this incident: "spike in plan pushes," "slammed with cases," "cases rushed," "late notification" and "rushed planning."

For this event, multiple steps were rushed from planning and chart checking to coordination of care processes. Inadequate staffing also contributed and created a situation with high potential for error. As a preventative action, facilities can consider deliberate, redundant staffing before and after periods of anticipated reductions in staffing. These additional resources allow the workload to be better shared and offer staff more time to complete their work. In this event, the research/protocol staff played a unique role and enhanced communication channels could have benefited the team. An intentional focus on high-quality handoff communications can be particularly valuable during periods surrounding staff absences and rushing.

TOPICS OF CONCERN

To understand the crux of the error, RO-HAC examined multiple data points. The RO-ILS Problem Type was introduced in 2019 as a required, structured data element. For the rushing dataset, 28% of the events were unanswered (prior to data element adoption) and another 38% are ill-defined because the user selected "other" from the list of options (**Figure 4**). Since "delay/ issue in workflow or error in RT scheduling" was one of the search criteria for identifying rushing events, only 24% of events (n=4,192) had a specific problem type that could be further correlated (**Table 1**).

Figure 4: Problem Type (n=17,675)

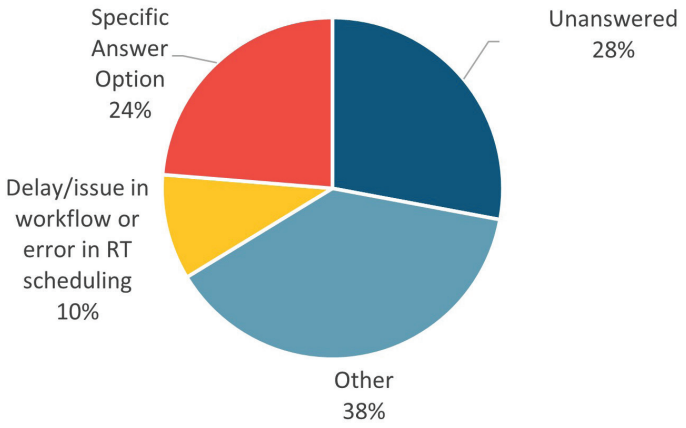


Table 1: Percentage of Events with a Problem Type and Difference between Rushing and Non-Rushing Events (*Top 5 Problem Types in the Rushing Cohort)

Problem Type Answer Options	% Rushing (n=4,192)	% Non-Rushing (n=5,511)	% Difference	Findings
*Coordination with other health care providers inadequate	13%	9%	3.5%	**More** Prevalent in Rushing Events
Access to timely care (insurance, transportation etc.)	5%	2%	2.9%	
Laterality incorrect	4%	1%	2.3%	
Hardware/software malfunction or product improvement/ enhancement	5%	4%	1.5%	
Treatment undeliverable: plan (dosimetrically acceptable) but not physically deliverable	6%	5%	1.3%	
*Treatment accessories: incorrect, missing, mislabeled, misused or damaged	11%	11%	0.7%	
Patient incorrect	2%	2%	0.3%	
*Patient position, setup point, treatment isocenter, or shift change incorrect	13%	13%	0.2%	
Treatment undeliverable: hardware/software unavailable	0%	0%	-0.2%	**Less** Prevalent in Rushing Events
Treatment plan isodose distribution unacceptable	3%	4%	-0.4%	
Planning margins incorrect	1%	2%	-0.5%	
Target or OAR contours incorrect or omitted	4%	5%	-0.7%	
Treatment not delivered: personnel/ hardware/software failure (inactive)	3%	4%	-1.1%	
*Imaging: excess, inadequate, not matching physician intent	7%	9%	-1.4%	
*Prescription, dose, fractionation incorrect or not matching physician intent	7%	9%	-2.0%	
Fall, patient injury, or acute medical event	6%	13%	-6.7%	

The top two problem types overrepresented in the rushing compared to non-rushing dataset are related to processes outside of the direct radiation therapy workflow: "*coordination with other health care providers inadequate*" and "*access to timely care issue.*" This may suggest that workflow processes built around simulation to treatment are more robust than those which require coordination outside of radiation oncology. With the evolution toward more multi-specialty cancer care, radiation oncology must collaborate with multiple disciplines within or outside their facility. The challenge is to create efficient workflows that provide sufficient communication and adequate time for each provider/stakeholder to complete their necessary responsibilities.

Given the frequency of care coordination events in the rushing dataset, and relatively large difference compared to non-rushing situations, these 537 events were further analyzed. A word cloud with frequently used terms was generated; the most prominent concept was chemotherapy, appearing more than 85 times. **Table 2** provides examples of how these concepts from the rushing care coordination dataset intersects with the radiation therapy workflow.

Table 2: Overlap of Care Coordination Issues and Rushing Events (n=537)

Noteworthy Topics	Examples of Issues in Workflow
Chemotherapy/Infusion/ Injection/Oncology	Planning workflow: Compressed timescale to try to meet deadline.
	Therapy workflow: Patient is late for daily appointment, causing compressed timescale at treatment and pressure for therapists to remain on schedule.
Consent	No consent at simulation requiring extra time and focus be directed at locating the physician as opposed to setting up the patient correctly.
Pacemaker	Pacemaker not documented and not accounted for during initial planning and therefore requiring an urgent replan.
Authorization/Protocol	Delay in necessary information (e.g., insurance approval or clinical trial involvement) may compress radiation therapy timeline.

When reviewing events, RO-HAC members select label(s) from a predetermined list. Excluding major workflow steps labels (e.g., planning, treatment, simulation), the top ten labels for rushing events are listed in **Table 3**.

Table 3: Top 10 RO-HAC Labels of Rushing Events (n=8,140)

RO-HAC Labels	# Events	%
Documentation	2427	30%
Scheduling	1659	20%
Physics/Therapist Pretreatment Chart Check	982	12%
Setup/positioning	907	11%
Other	757	9%
Software Issue/Failure	735	9%
Treatment Device	620	8%
IGRT	613	8%
Hardware Issue/Failure	580	7%
QA	477	6%

Documentation ranks as a top issue for all safety events. When rushing is a factor, the time required for extensive, accurate documentation is cut short and the documentation process may no longer be an aid but a potential source of risk. Documentation requirements are generally increasing, and accuracy can impact insurance disputes, cross coverage, remote clinic coverage, and many additional aspects of the workflow. In a rushed environment, written records and clarity of communication become an even more complicated task. A safety culture that protects staff time within a process to ensure adequate documentation output is imperative to prevent errors.

The third most frequently used label for rushing events is *physicist and therapist pretreatment chart checks*. If upstream steps in the process are delayed or extended, essential pretreatment chart checks completed by physicists and therapists can be shortchanged or compressed to maintain the predetermined patient schedule. While all parts of the process are important, pretreatment checks require significant time to complete and are known to be of high value in preemptively identifying and mitigating potential errors. It is important to recognize that while rushing cannot only *lead to* or *cause* an error, it can also lead to *missing* an opportunity to catch a mistake that could be prevented. Valuable pretreatment checks performed by physicists and therapists require sufficient time to bear the expertise and insight possessed by these team members. Processes should be engrained within the treatment workflow to protect the time required to perform these essential safety checks.

Case 2: Quality Checkpoint Occurs Late in Process

Patient was simulated with a 3-day turnaround from simulation to treatment start. Plan was ready for approval at end of day 1 but was not approved by the physician until the end of day 2. QA was performed that night and the remaining physics check happened late on day 3 (1 hour before start time). Physics plan check found multiple issues that required adjustments to the structure set requiring replanning.

In this case, the physics team's involvement was delayed until the very end of a rushed process. Typically, treatment planning steps are ordered such that dosimetrists complete treatment planning, have the plan approved by the physician, and then complete the associated documentation prior to sending to physics for final "second" check. This approach ensures that the physicist's second check reviews the complete and finalized treatment plan, but also forces this critical check to the very end of the process, where it is vulnerable to being "short-changed," as noted in Case 2. It is imperative that owners of upstream processes appreciate this fact, and protect the time required for these important safety checks by either completing their respective steps in the allotted time or renegotiating the planned start time for the patient.

A comparison of rushing and non-rushing events identified which RO-HAC labels had at least a one percent difference between the two cohorts (**Table 4**).

Table 4: Percentage of Events with a RO-HAC Label and Difference between Rushing and Non-Rushing Events

RO-HAC Labels	Rushing %	Non-Rushing %	Difference	Findings
Scheduling	20.4%	2.6%	17.8%	**MORE** Prevalent in Rushing Events
Timeout	3.5%	2.1%	1.4%	
DRR	3.1%	4.6%	-1.4%	**LESS** Prevalent in Rushing Events
Physician Approval	4.8%	6.3%	-1.6%	
Contouring - Target	3.9%	5.6%	-1.6%	
IGRT	7.5%	9.2%	-1.7%	
Setup/positioning	11.1%	13.0%	-1.8%	
Documentation	29.8%	35.4%	-5.6%	

Scheduling relates closely to rushing because it can drive a compressed time scale. Physicians must be deliberate when qualifying a patient case as "urgent" and use this designation only when truly needed. Most cases should fit the facility's predefined timelines so physicians must be extremely mindful of which cases require expedited scheduling from consultation to treatment. Scheduling also correlates with coordinating care with other health care providers (a top problem type, see Table 1) as trying to meet multiple timelines for the patient is challenging as demonstrated in Table 2.

The timeout label is also overrepresented in rushing events. When a patient presents late for their scheduled appointment, whether from their own doing or for other clinical reasons, the therapists have less time to treat the patient but are expected to remain on schedule for the rest of the day. Although the timeout is widely recognized as a paramount safety procedure, it might be omitted to expedite treatment or be performed incompletely, as noted in RO-ILS Case Study 17.[3] The schedule must be built with insulated time to account for both safety and extraneous circumstances. This should be considered when developing treatment procedures and allotting the time required to treat a patient safely while maintaining an acceptable balance for the schedule.

TREATMENT TECHNIQUES

When comparing frequency of treatment techniques within the *rushing and non-rushing datasets*, there was minimal difference in distribution. However, an analysis of rushing vs non-rushing *within a technique* identified some interesting results (Table 5). Some of the techniques more prone to rushing are brachytherapy with sealed sources (HDR, LDR), radiopharmaceutical therapy and intraoperative treatments. Brachytherapy and intraoperative techniques are characterized by compressed timescales determined by the procedure such as anesthesia or conscious sedation which add additional time constraints.

Table 5: Percentage of Treatment Technique Events Categorized as Rushing and Non-Rushing
(*Top 5 Techniques in the Rushing Cohort)

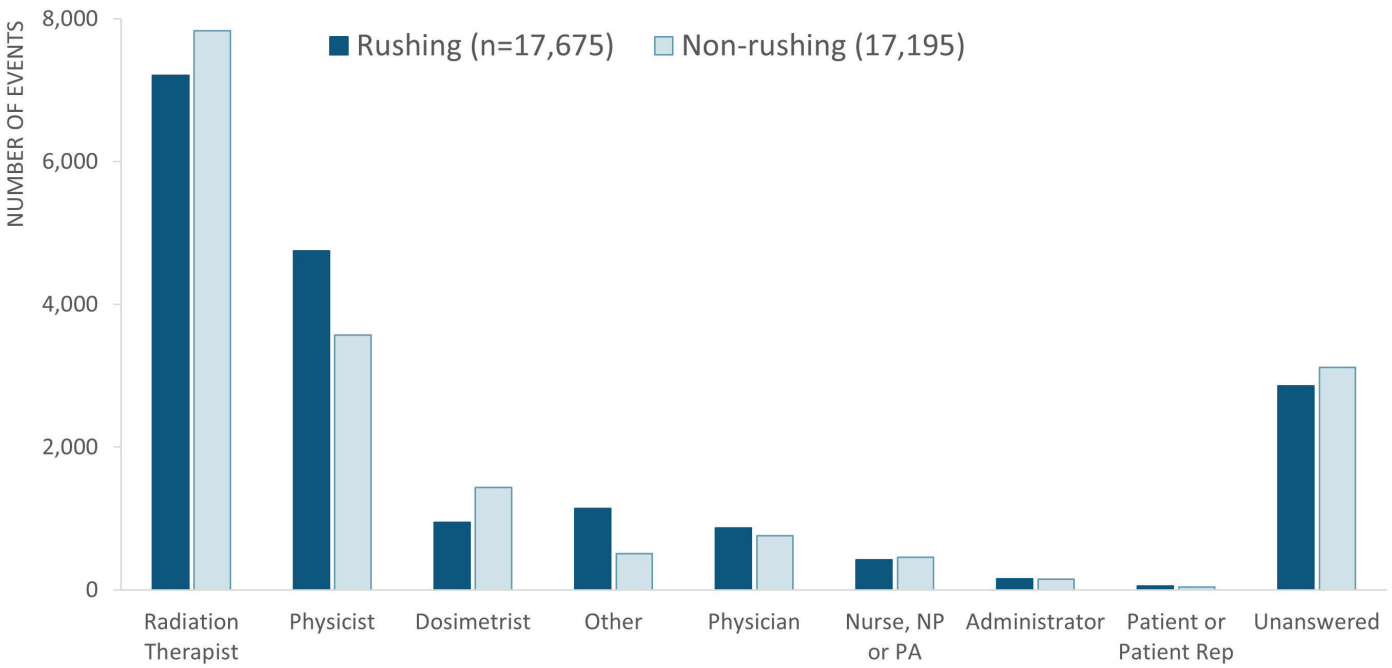
Techniques (n-value)	Rushing	Non-Rushing	% Difference	Findings
TBI (182)	73%	27%	46%	Rushing Events Represented in **MORE** Techniques-specific Events
Radiopharmaceuticals (79)	62%	38%	24%	
LDR (78)	60%	40%	21%	
Intraoperative (17)	59%	41%	18%	
HDR (731)	57%	43%	15%	
*SRS/SBRT (4,199)	56%	44%	12%	
*Not Applicable (3,435)	56%	44%	12%	
Other (1,683)	52%	48%	4%	
*Electrons (1,787)	52%	48%	4%	
*IMRT/VMAT (12,621)	51%	49%	3%	
*3D (9,490)	49%	51%	-2%	Rushing Events Represented in **LESS** Techniques-specific Events
Particles (1,339)	44%	56%	-13%	
Unanswered (1,142)	44%	56%	-13%	
2D (784)	42%	58%	-15%	
kV x-rays (367)	38%	62%	-25%	

The inclusion of total body irradiation (TBI) and SRS/SBRT in this group raises some concerns. Transplants requiring TBI necessitate extensive planning and typically have the treatment schedule and prescription doses determined well in advance. Given the decreasing use of TBI and its status as an uncommon procedure, one possible explanation for the increase in rushing could be the lack of well-established and practiced processes compared to procedures like IMRT/VMAT. Additionally, SRS/SBRT procedures are not typically performed on emergent or urgent patients. Without further analysis or root cause analyses data, it is challenging to definitively identify the causes of rushing. A forthcoming RO-ILS themed report will delve into infrequent treatment techniques, potentially providing more insights through subsequent analysis.

DISCOVERER

An optional RO-ILS data element asks users who identified the error. Physicists are overrepresented as discoverers of events involving rushing, while dosimetrists and therapists are underrepresented (**Figure 5**).

Figure 5: Physicists Identify More Rushing than Non-Rushing Events.

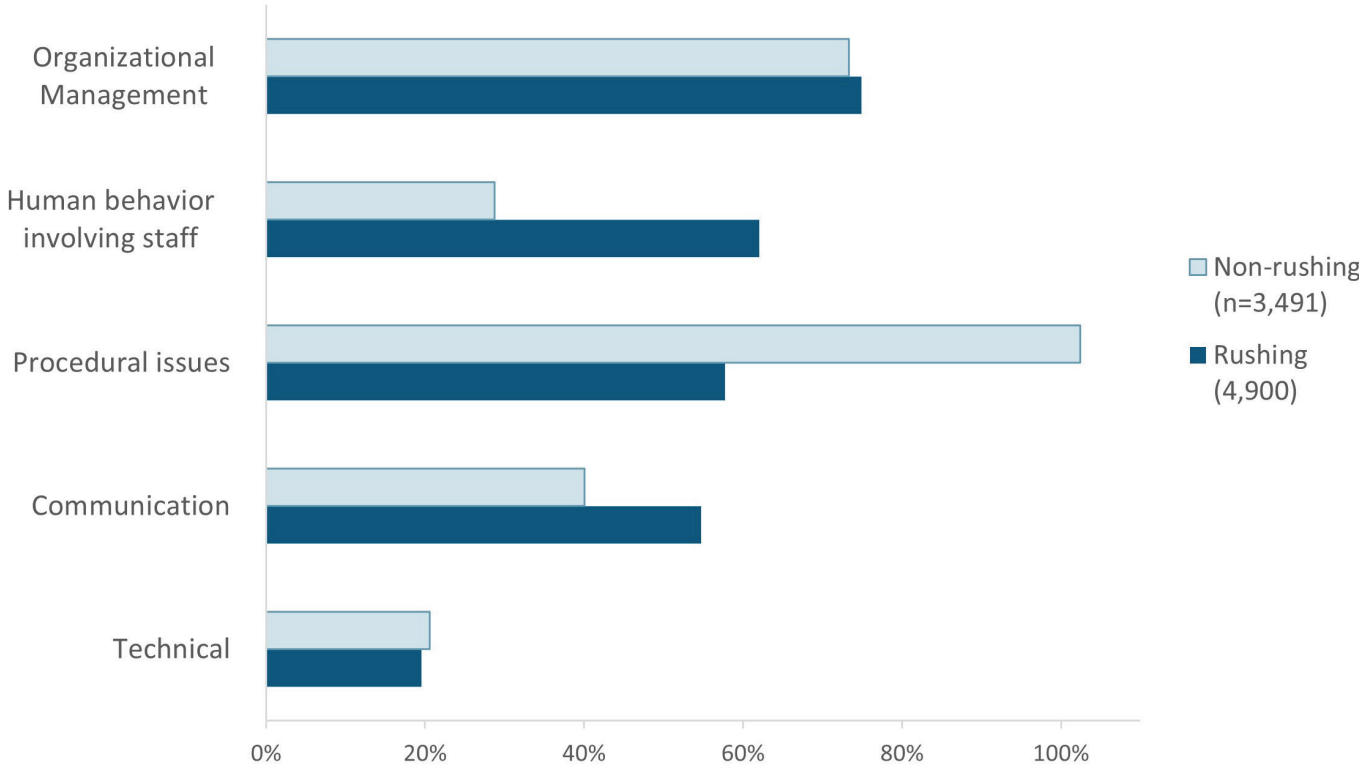


Since therapists typically work toward the end of the treatment delivery process, they might be blinded to underlying root causes of the error causing the near miss or incident. Dosimetrists' work is situated more toward the beginning of the treatment delivery process; however, events causing a compressed timeline leading to rushing often originate during the treatment planning phase. For example, delayed imaging studies needed for contouring, late contours, or insurance authorization for IMRT/VMAT may all cause planning time to be shortened. Because there is a strong preference for treatment starts to remain unchanged, any delays that occur before plan review and approval results in reduced time for the physics chart review. Therefore, physicists are often very aware of higher risks of errors being missed because of rushing.

CONTRIBUTING FACTORS

For the RO-ILS user, contributing factors are optional and organized into categories (and sometimes subcategories). Almost 30% of rushing events have associated contributing factors compared to 20% of non-rushing events. **Figure 6** shows the percentage of rushing and non-rushing events with contributing factors in that category.

Figure 6: Contributing Factor Categories



Within the "human behavior involving staff" category is the answer option "compressed time scale, rushing," a search criterion used to identify rushing events which partially explains the category's overrepresentation in the rushing dataset. Even when this answer option is removed from the analysis, 50% of rushing events have other contributing factors in this category compared to 28% of non-rushing events.

Communication-related contributing factors were also more pronounced in rushing events. When trying to complete tasks quickly, process breakdowns and slips in judgment are more likely to occur. Similar to what was revealed in the review of documentation and rushing, when there is an increased need for communication when pressed for time, it can often be missing.

Table 6 displays the top ten contributing factors (the answer options selected by users) for the rushing events.

Table 6: Top 10 User Contributing Factors for Rushing Events (n=4,900)

Category	Answer Option	%
Organizational Management	Policy not followed	32%
Communication	Poor, incomplete, unclear, or missing [Communication]	20%
Human behavior involving staff	Slip causing physical error (failure in performance of highly developed skills as intended or maintained)	17%
Communication	Written documentation in EMR incorrect/ incomplete/absent	12%
Communication	Inadequate communication patterns designed	12%
Procedural issues	Expectation bias (e.g., expecting to observe a certain effect and therefore being biased toward seeing it)	11%
Human behavior involving staff	Failure to follow through	9%
Procedural issues	Distraction and loss of attention	8%
Organizational Management	Policy inadequate	7%
Technical	Poor human factors engineering	7%

"Policy not followed" is the leading contributing factor in both rushed and non-rushed events. In the hierarchy of error prevention, policies are rated lower than most other prevention techniques because humans must remember the policy's content and act accordingly. In rushing situations, the effectiveness of policies is expected to be reduced because the focus is on "getting things done." When put under unrealistic time constraints, staff may take unintentional or deliberate shortcuts. Circumventing steps could include not doing a double check on a machine parameter, omitting a checklist item or forgetting a timeout. Given findings regarding a correlation between policy not followed and rushing, additional analysis tried to identify what policies may be most vulnerable to rushing. Based on a word cloud of free text fields, noteworthy concepts that appeared in almost 1,600 rushing events related to "policy not followed" are:

- Imaging/scans
- Checks (e.g., chart check, second check)
- Documentations (e.g., consent, directive, pacemaker)
- Tables/couch and gantry
- Set-up (e.g., shift, isocenter, mask)
- Prescription

Case 3: Incorrect Site Caught at Timeout

A patient had been previously treated in the facility with radiation to the T-spine and had now returned for whole brain radiation. The patient had received several treatments to the whole brain plan when there was a staff change. Therapists unfamiliar with the patient were rushing to start treatment so they quickly brought up the first plan that was available for treatment. The T-spine plan had untreated fractions and had not been closed out by physics. The therapists pulled up the old T-spine plan for treatment, but they caught the mistake when they performed a timeout before starting treatment. They proceeded to pull up the correct treatment for the whole brain and treat the patient correctly. They let physics know that the policy had not been followed to close plans and requested that physics close out the old course of unfinished radiation.

This event is a good example of how multiple holes in the swiss cheese (e.g., rushing, policy not followed) can easily line up to enable an error to reach the patient. A timeout is a critical step in the process that cannot and should not be hurried as it is the final opportunity to catch a potentially gross mistake. This case again exemplifies the importance of documentation as a form of communication. The top three contributing factors overrepresented in a rushing event are related to communication (**Table 7**).

Table 7: User Contributing Factor Prevalence
(*Top 10 Contributing factors for Rushing Cohort)

User Answer Option	Rushing (4,900)	Non-Rushing (3,491)	% Difference	Findings
*Inadequate communication patterns designed	12%	5%	6%	**MORE** Prevalent in Rushing Events
Lack of timeliness of communication	7%	2%	4%	
*Poor, incomplete, unclear or missing communication	20%	16%	4%	
Inadequate human resources	4%	2%	2%	
Inadequate search to interpret the nature of the developing problem	5%	3%	2%	
Poor human factors engineering	7.2%	6%	1%	
Other equipment/hardware failure (non-software/IT)	2%	3%	-1%	**LESS** Prevalent in Rushing Events
Networking (IT) or Software problems	3%	4%	-1%	
*Distraction and loss of attention	8%	9%	-1%	
*Written documentation in EMR incorrect/incomplete/absent	12%	13%	-1%	
*Policy not followed	32%	38%	-6%	

Second to communication, staff shortages are more correlated with rushing than non-rushing events. With reduced staffing, performance slips (the third most common contribution factor, see Table 6) might unfortunately become more prevalent as fewer staff have to cover the same or increasing patient numbers.

Case 4: Workflow Challenges with Previous Radiation

A patient was simulated for treatment to two different sites. The patient previously had EBRT and HDR at an outside facility. Dosimetry and physics began working on planning and summation of outside records to inform the current treatment course. Plans needed several iterations, requiring communication back-and-forth with the physician, and physicists were required to use a secondary software program to summate doses on each iteration. After two weeks of dosimetry, physics and physician coordination, a plan was finally reached late in the day on the day before the patient would start treatment. This required staff to work extra hours to prepare and QA this patient's plan. When physics performed the final check, they discovered that once imported into the secondary software, the sum plan showed a large overlap of high dose in the bowel. With this new information, the physician requested that the patient be treated day one with the prepared plan and a revised plan be created to decrease this high dose.

This event represents the type of challenging cases many clinical staff experience in the workplace. It demonstrates complex planning, software prowess on secondary systems, and the gravity of timely scrutiny during plan evolution. These three aspects yield a process fraught with hastened communications, planning and decision making due to a timetable set at the time of simulation. A collaborative team of skilled experts along with well-designed processes and reasonable expectations will help staff best address varying clinical cases.

MITIGATION STRATEGIES

1. **Establish reasonable timeline**
   Facilities should assess where and how rushing is introduced into the workflow. After assessing the origin of rushing, adjustments to standard or specialized timelines may be necessary. For example, it may be helpful for radiation oncology facilities to provide longer simulation-to-start timeframes for a complex case (e.g., patient with prior radiation therapy). It is essential in a culture of safety that any individual be empowered to request additional resources and time to complete their portion accurately.
2. **Identify protected time**
   Protecting time for critical steps in the process is a necessity. One option is to implement a "no-fly policy," an interlock system mandating that workflow processes must adhere to designated timelines, with treatment start dates rescheduled if deadlines are not met. More than a decade ago, a practice published an editorial discussing the challenges in their department and the system they adopted to effect a positive change.[4]
3. **Prepare for rushing and adapt**
   If an anticipated rush is known to occur at a certain time, then consider what adjustments may be possible to counteract the likely impending unsafe conditions. For example, if there is rushing leading up to a major conference, consider having more staff available in the week leading up to it and the one after. Also consider adjustment of patient loads and start times (e.g., "batching of cases") as another way to manage workload to promote patient safety. Analyzing rushing trends across the span of a day might identify times of day when therapists should be given more time between treating patients.
4. **Evaluate and promote reasonable staffing levels**
   Staff workload on either end of the spectrum can increase the risk of error. Staff without enough responsibility may be left disengaged and without sufficient work needed to retain and sharpen skills. Conversely, expecting staff to accomplish more than is reasonable will set up even the most experienced staff to fail. With patients as the ultimate benefactor of this work, it is important that radiation oncology clinical teams are staffed appropriately to promote the highest quality and safest treatment possible.

REFERENCES

1. Walker GV, Johnsons J, Edwards T, et al. Factors associated with radiation therapy incidents in a large academic institution. *Pract Radiat Oncol*. 2015 Jan-Feb;5(1):21-7.
2. Dominello MM, Paximadis P, Zaki M, et al. Ten-year trends in safe radiation therapy delivery and results of a radiation therapy quality assurance intervention. *Pract Radiat Oncol*. 2015 Nov-Dec;5(6):e665-71.
3. RO-ILS Case Study 17. Make Time for Timeouts! Shortcutting your timeout can shortchange your patient. https://www.astro.org/ASTRO/media/ASTRO/Patient%20Care%20and%20Research/PDFs/ROILS_Case17.pdf. Published 2023. Accessed May 31, 2024.
4. Potters L, Kapur A. Implementation of a "No Fly" safety culture in a multicenter radiation medicine department. *Pract Radiat Oncol*. 2012 Jan-Mar;2(1):18-26.