

# NSIR-RT BULLETIN

Welcome to the electronic bulletin for the National System for Incident Reporting - Radiation Treatment (NSIR-RT). This Bulletin supports continuous learning from incident data through the presentation of data trends and case studies. It will also provide system users with information on program developments and enhancements.

## NSIR-RT CASE STUDY

### Highlights

#### Planned updates to NSIR-RT Minimum Data Set

The NSIR-RT Advisory Committee is planning a scheduled review and update to the system's Minimum Data Set. If you are a user and have suggestions for changes to the taxonomy please submit feedback! Stay tuned for more information in the next issue!

#### Building International

**Partnerships** CPQR works collaboratively with international partners to support and augment incident learning around the globe. CPQR and CIHI recently shared details of the NSIR-RT Minimum Data Set (MDS) with the American Society for Radiation Oncology (ASTRO) to support their review of data elements in their Radiation Oncology - Incident Learning System (RO-ILS). Partnerships like this help contribute to improved alignment across incident reporting systems and contribute to the safe delivery of therapy for patients. Interested in learning more about the NSIR-RT MDS? [Contact us.](#)

### Learning from Incidents in the use of MRI in the RT Environment

The increasing use of magnetic resonance imaging (MRI) in radiation therapy (RT) applications has led to a corresponding increase in the number of dedicated MRI systems deployed in RT departments. This trend is no longer limited to large academic centres. MRI systems are increasingly utilized in the RT environment, bringing new quality and safety issues to radiation oncology. This introduces a need for new training, as RT professionals including physicians, physicists, and radiation therapists have not historically been trained to work with MRI and professional certification and/or licensing requirements are not yet mature.

Issues surrounding patient safety and screening, staff safety, workflows all require careful consideration and for the RT context. This is particularly true in scheduling pressure for treatment simulation in interventional nature of MRI for

### Review of Incident Data

The reporting of MR incidents is relatively new and trends were not yet identifiable in the NSIR-RT database. We highlight several specific reported incidents, as they illustrate certain features of high-quality practice in MRI, some specific to RT. The first incident of interest relates to well-known issue of ferromagnetic objects in the MRI environment. An institution reported a ferromagnetic object ending up in the bore with the patient, during an interventional MRI simulation for brachytherapy. The patient had been transferred from the treatment suite to the MRI suite for imaging, and a small ferromagnetic instrument was left among the sheets used in the transfer. The patient did not suffer injury, and the object was quickly identified and removed.

This incident serves as a reminder that MRI-specific safety checklists need to be followed whenever patients are transferred to MRI from other areas of intervention, even if the patient has been screened already prior to the intervention.

The second incident highlights the importance of daily system checks and warm-up. An MR-guided brachytherapy procedure had to be aborted after preparations including general anesthesia were already underway, when the MRI system failed to produce images. Despite efforts including a complete power down and a call to vendor service, the MRI system fault could not be cleared. The procedure was canceled, and the patient transferred to recovery. Subsequently, basic daily equipment tests were developed, scheduled, and recorded as with other morning machine tests.

The importance of checklists also applies to the use of appropriate accessories. Two incidents in MRI-guided brachytherapy with CT-based planning are good examples of this issue in relation to the use of CT- and MRI-visible applicator markers. In the first example, the CT simulation was completed using the MRI-visible markers, rather than the CT markers, and a second CT scan had to be acquired. In the second, a pelvic MRI was performed with the CT markers in place (instead of the MRI markers) such that the MR images were rejected and not used for treatment planning.

Image quality assurance is an important part of the MRI workflow. During CT+MRI-based treatment planning for a brain lesion, the physician's contour was observed to include regions with heterogeneous gadolinium contrast-enhancement within the lesion. Upon inspection of the complete image set, the planning team suspected the presence of a motion artifact in the images, including a lesion "feature" that was in fact a motion artifact and had been included within the contour. The patient was brought back for a second MRI simulation, which confirmed that the first simulation was indeed corrupted by motion. A procedure for quality assurance of MR images was subsequently developed and integrated into the MRI simulation workflow.

In the final incident of interest, it was observed that distortion correction methods were being applied inconsistently to MR images for planning. As with many MRI systems, this system featured options for 2D and 3D image distortion corrections. When the inconsistency was noticed, the immediate impact was a delay in the treatment of one patient. The report also triggered the subsequent review of > 80 prior cases, which revealed <5% dose variations when comparing plans based on images with 2D versus 3D corrections. There is growing consensus that 3D corrections should be used when available as they result in smaller residual distortion (Weygand et al. 2016), and this is especially important for MRI used in external beam planning. 2D multi-slices scans, however, are limited to 2D corrections. Careful consideration must be given to options for distortion correction when establishing imaging procedures within RT planning workflows.

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## Recommendations

The above-mentioned incidents highlight the need for a consistent standard for quality control when it comes to the use of MR in the RT process. As part of its suite of Technical Quality Control (TQC) guidelines, CPQR and the Canadian Organization of Medical Physicists (COMP) have convened a working group to provide guidance on MRI quality control a draft of which can be accessed here. Specifically, the MRI TQC guidelines can be applied to address the incidents mentioned above including the following recommendations.

1. Adopt safety policies specific to MRI and introduce methods of practice that address safety issues (Expert Panel on MR Safety, 2013).
2. Develop a set of daily system checks and warm-up for MRI systems (ACR, 2015; CPQR, 2019).
3. Develop image quality control for MR simulation procedures, to ensure that image artifacts do not propagate as errors in the treatment workflow. (CPQR, 2019).
4. Use of checklists, especially in clinically complex procedures such as MR-guided brachytherapy, to ensure patient safety and correct use of equipment. In addition to integrating the above into their standard operating procedures, RT teams should seek advice on safety and quality from diagnostic imaging colleagues as appropriate.

### Case Study References

American College of Radiology (ACR) (2015), Magnetic Resonance Imaging Quality Control Manual

Canadian Partnership for Quality Radiotherapy (2019), Technical Quality Control Guidelines for Magnetic Resonance Imaging for Radiation Treatment Planning, under review, 2019

Expert Panel on MR Safety, et al. (2013), ACR guidance document on MR safe practices: 2013. J Magn Reson Imaging. 37(3):501-30. doi: 10.1002/jmri.24011

Weygand et al. (2016) Critical Review: Spatial Precision in Magnetic Resonance Imaging-Guided Radiation Therapy: The Role of Geometric Distortion. Int J Radiation Oncol Biol Phys, 95(4):1304-1316. doi: 10.1016/j.ijrobp.2016.02.059

### NSIR-RT Data: By the Numbers

**Incident Submitted:** 3,761

**Actual Incidents:** 2,293

**Severity:** None (1,784), Mild (463),  
Moderate (40), Severe (6)

## NSIR-RT 101: How to write a good incident description

Sharing information to help others learn from incidents is the fundamental idea behind NSIR-RT. Part of that information is the text description – or story – that provides the context enabling us to interpret and relate to the codified information. The text description is a critical component of the data submitted and, therefore, correct and complete descriptions communicate the story best.

But what makes a good story? A succinct tale with all the relevant details is essential as missing details can lead a reader to an incorrect assumption. Read the following three text descriptions about the same event:

<b>Description 1</b>	Imaged x 2 due to human error.
<b>Description 2</b>	Imaged x 2. After first image it was discovered after dosing call back check that incorrect patient was loaded at the console.
<b>Description 3</b>	At 10:45 am Mrs. XX was loaded at the treatment console. A decision was made to treat Ms. XY, same site and diagnosis and similar name. At 11:00 am staff did not load Ms. XY record at the treatment console. Ms. XY was imaged on the left medial tangent field for insufficient anterior coverage. Staff were doing call back check after imaging prior to beam initiation (11:12 am) it was discovered the incorrect patient demographics were loaded into the radiation oncology information system. Staff loaded Ms. XY's record at the console and reimaged her medial field. After a root cause analysis, the program's policy was changed such that call back check is required prior to imaging.

While each description informs us that unnecessary imaging occurred, based on the first story a reader may assume the incident could be related to a number of factors – setup, shift positioning etc. The second description gives additional context, but lacks detail regarding the sequence of events leading to the incorrect patient demographics, software error etc. Reviewing the additional details provided in the third description tells us that the sequence of events, the reason behind the incorrect patient demographics and the solution put forth by the program.

While there is no perfect formula for writing a story, answering a few simple questions may help guide you:

1. What happened? Include details about time and sequence if relevant.
2. Who was involved? Consider the patient, family members and other staff who may have played a part.
3. Where did the events occur? This is particularly relevant if an effort was initiated in an area outside where it was caught or where it affected the patient.

A review of submitted incidents found that text fields tend to be more detailed when the degree of harm is more severe. This is not surprising since more investigative attention is usually given to an incident that causes serious harm. However similar sets of circumstances can also produce different harm outcomes. For this reason, near miss and no harm events can provide excellent learning opportunities, making fuller descriptions even more important.

### **Calling all NSIR-RT Users**

Do you have suggested changes to the NSIR-RT Minimum Dataset (MDS)? The NSIR-RT Advisory Committee will be conducting a review of the MDS in the coming months so please submit your suggestions to [CIHI](#) today!