

# 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.

## CPQR and Global Patient Safety Alerts

CPQR is excited announce that we have been invited to join the Global Patient Safety Alerts. The initiative was launched 2011 by the Canadian Patient Safety Institute (CPSI), today part of Healthcare Excellence Canada, with the support of the World Health Organization (WHO) . It is a searchable web-based resource containing patient safety alerts, advisories and recommendations for healthcare providers and organizations.

Currently eight countries and 26 organizations are participating, including 5 from Canada. CPQR will be the only radiation treatment specific organization participating, as most of the participating organizations are health authorities. CPQR's participation in this initiative emphasises its continued commitment to patient safety and quality and partnering with organizations nationally and internationally to maximize our impact on a global scale.

## GETTING TO KNOW CAPCA: WHY THIS PAN-CANADIAN ASSOCIATION IS THE RIGHT FORUM FOR QUALITY IMPROVEMENT

For over twenty years, the Canadian Association of Provincial Cancer Agencies (CAPCA) has provided a forum for leaders of Canada's cancer control systems to discuss and collaboratively address issues that affect the delivery of cancer care here at home.

Knowing that together we are better able to identify common challenges and advance shared solutions, CAPCA's partnership-driven initiatives prioritize the advancement of Canadian cancer planning and delivery and the strengthening of quality, innovation and sustainability of cancer control. Its facilitative, responsive approach encourages learning between jurisdictions and supports the development of best practices informed by the experiences and learning of colleagues from across the country.

As of October 1st, CAPCA's new CPQR Committee will serve as a pan-Canadian radiation treatment network hub and its NSIR-RT Advisory Committee will continue to operate as a subcommittee with the important role of reviewing radiation treatment incident data submitted to NSIR-RT, informing the radiation treatment community of important patterns and trends and making recommendations to minimize or mitigate risk.

We know that radiation treatment quality assurance is strengthened by learning from near and actual incidents that occur during treatment planning and delivery. The level of detail captured through NSIR-RT supports the degree of information and understanding needed to inform quality improvement. With Board members representing cancer control leadership in all 10 provinces and established working relationships with individuals and organizations key to supporting radiation treatment and cancer service planning and delivery, CAPCA is uniquely positioned to analyse local trends and garner support for national quality safety initiatives.

CAPCA is well-versed in convening pan-Canadian perspectives for the betterment of cancer care at a systems and local level. Working with CAPCA's NSIR-RT will support our goal of promoting a community of continuous learning. Get [up to the minute updates](#) on CPQR's transition.

# NSIR-RT Case Study

Working towards improved quality and safety in radiotherapy treatment planning processes

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The benefit of incident learning systems like NSIR-RT is in data-driven improvements to our clinical practice based on our collective experiences. Since its inception in late 2015, just under 5600 events have been submitted to the NSIR-RT database. In this case study, we analyze overall trends in reported incidents, with particular focus on events related to radiotherapy planning and external beam radiotherapy. We will also look at working towards improved planning information to enhance the ability to track incidents during the planning process.

Approximately 65% of events reported in NSIR-RT were patient safety incidents detected after reaching the patient. Near misses (caught before reaching the patient) and actual incidents, shown in Figure 1, were related to external beam radiotherapy at participating Canadian institutions. From the data, we see that about 36% of all events were associated with imaging for treatment planning, contouring and treatment planning, activities that represent a major part of the treatment planning process. This is consistent with the data of ASTRO's RO-ILS system [ASTRO, 2018], which established that 33% of reported events occurred during the processes of treatment planning and pre-treatment review/verification.

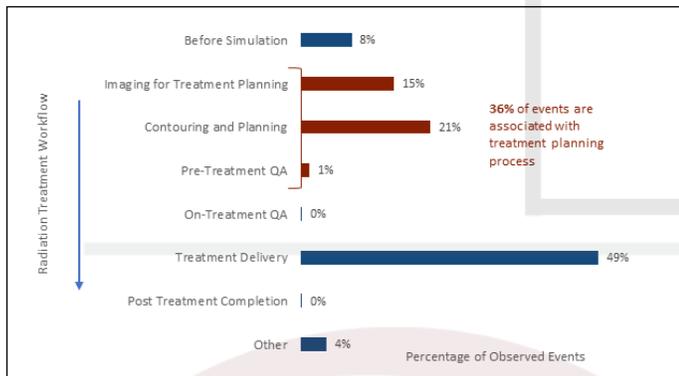


Figure 1. Near misses and Actual Incidents by Workflow

Most of the current treatment planning for external beam photon radiotherapy techniques have similar process design. Broadly, the workflow includes CT image acquisition, import of additional imaging data, target and organ at risk delineation, generation of plan and approval of the completed plan, including detailed records and patient setup instructions to reduce daily variation in setup and treatment. The complex, multifaceted process or treatment planning involves several handoffs among professionals including radiation oncologists, radiation therapists, medical dosimetrists and physicists. While the severity of medical

harm tends to be greater when an incident is related to equipment malfunction [Huq et al. 2016 ], the incidents that relate to the transfer of patient information and knowledge from one clinician or team to another occur at much greater frequency. The latter incident type can have a high potential to result in patient harm at a population level [Huq et al. 2016, Ford et al. 2020]. Given the high proportion of patients treated with external photon beam radiotherapy specifically, in this analysis, we focus on group of techniques consisting of 3D conformal, IMRT, VMAT and SBRT/SRS techniques.

Figure 2 illustrates the relative proportion of radiation therapy technique across the radiotherapy workflow. This analysis excludes the external photon beam radiotherapy techniques that are still considered "special" or less commonly encountered in the daily practice. These excluded techniques are total body irradiation (TBI); total skin electron irradiation (TSEI); and cranio-spinal irradiation (CSI). In addition, simple, emergency treatments, which may not involve a 3D dose distribution calculation on patient CT images, were also excluded. When we consider the 61% proportion events attributed to treatment planning as a whole, the proportion of incidents are a close second to the incidents reported in treatment delivery. Similar proportions of incidents originating in treatment planning suggest that thorough pre-treatment QA is imperative regardless of the planning technique.

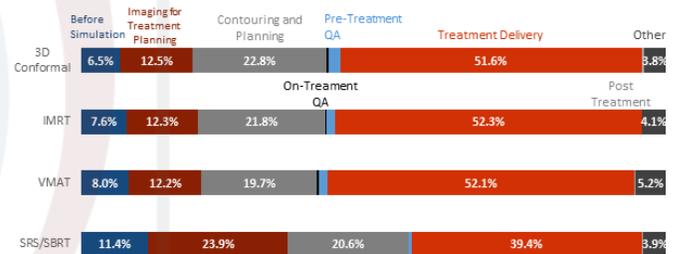


Figure 2: Relative Proportion of Radiation Therapy Technique by Workflow Step

Furthermore, recent trends towards hypofractionation due to COVID-19 pandemic may actually result in greater dosimetric impact of errors that stem from treatment planning.

The highest quality of plan is achieved through critical evaluation and checks of both its clinical and technical aspects. Such checks are recognized as one of the most effective safety barriers for identifying errors and quality gaps. Commonly, chart checks rely heavily on human inspection, but the sensitivity of detecting errors can range substantially [Ford et al, 2020]. Institutional checklists, automation and practice standardization play a key role in improving the quality and safety of radiotherapy [Mayo et al. 2018, CPQR, 2021]. Guidance documents have been put in place to outline professional responsibilities for plan and chart review and propose minimum required checklists [Ford et al. 2020, Xia et al. 2021].

Automation can be used to great effectiveness in plan and chart review, and automation heavily relies on comparison against up-to-date consensus and evidence based institutional practice standards. Site specific guidelines include a comprehensive set of standards including patient positioning, treatment regimens and acceptable deviations in dosimetric and other technical parameters. To that end, there should be effort put into developing institutional clinical protocols and assessment of protocol compliance at the cohort level as part of a robust chart review process [Quirk et al. 2021].

Ultimately, the ability of plan quality to drive the treatment outcome has been reported on clinical protocol level in analysis [Peters et al. 2010] and in meta-analyses of cooperative group trials [Ohri et al. 2013]. As well, the study by Peters et al (2010) shows the impact of protocol compliance and quality in the treatment of advanced head and neck patients, finding that non-compliance has a major adverse impact on tumor control.

### Take-home message

NSIR-RT incident learning system has reported that about 36% of known safety events occur during CT-simulation, treatment planning and pre-treatment review. Controlled use of automated checks (such as scripting) provides a method of systematic review of detailed treatment parameters most frequently encountered well before the patient is set to start treatment. Moreover, semi-automated and automated checks can be executed at several steps in the planning steps to proactively catch potential problems and reduce the amount of re-work. Automated checks can identify problems such as non-deliverable beam angles, deviations from naming conventions, non-compliance with institutional site-specific dose protocols or potential collision issues.

In addition, protocol adherence impacts patient outcomes. We should strive to develop institutional protocols and aim to adhere to protocols with the same integrity as we do with multi-institutional clinical trial protocols. The protocols should describe the entire process for the typical treatment workflow for a disease site and treatment regimen. It should include patient positioning, simulation patient preparation, supplementary imaging, dose prescription, target and region of interest volumes with consensus constraints, treatment planning technique and treatment delivery and verification imaging. When such protocols exist, automated checks can easily be developed to ensure that any omissions are caught by a safety net in the process [Quirk et al. 2021]. Ultimately, patient outcomes can be informed by evaluating and ensuring quality across the radiation medicine program.

## The Canadian voice at IAEA's technical meeting on strengthening safety in radiotherapy

In July, CPQR joined international radiation treatment experts to discuss global advances in patient safety and incident learning. Representing more than 15 countries, participants at the event, hosted by the International Atomic Energy Agency (IAEA) discussed how incident reporting systems contribute to the reduction and prevention of medical errors and the value of collaborating with regulatory authorities to capture a more fulsome picture of reportable events worldwide. A survey of meeting attendees regarding the effectiveness of their country's reporting system will be shared with CPQR and will fuel future collaborative opportunities. Learn more about the [IAEA meeting](#).

# Webinars and online learning opportunities

The Institute for Safe Medication Practices Canada (ISMP Canada) provides high quality, interactive educational programs for healthcare practitioners offered through eLearning and hands on workshops. While not radiotherapy specific, these courses can help advance your skills in areas such as incident investigation, risk assessment and multi-incident analysis. **Get more information** on these educational opportunities.

The European Society for Radiation Oncology (ESTRO) offers several online courses as part of its **Radiation Oncology Safety and Quality Webinar Series**. Offered free of charge, these webinars include topics such as cultivating a culture of safety within your organization and risk mitigation strategies.

NSIR-RT BY THE NUMBERS	
Incidents submitted	5,599
Actual Incidents	3,625
Overall Severity	
None	2,760
Mild	795
Moderate	63
Severe	7

## Case Study References

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