

Editorial

Looking Backward and Forward: Learning From and Updating the ASTRO Safety White Papers 10 Years Later

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Quality and safety processes have been an integral part of radiation therapy (RT) since the beginning of therapeutic radiation delivery to patients for malignant and non-malignant conditions. As treatment planning and delivery became increasingly complex, the potential risks and safety events that could affect patients increased as well. When a series of articles was published in 2010 describing several RT errors that led to patient harm, radiation oncology professionals and vendor representatives met at The American Association of Physicists in Medicine (AAPM) – American Society for Radiation Oncology (ASTRO) Safety in Radiation Therapy – A Call to Action meeting in Miami.¹ Several initiatives were launched by ASTRO, AAPM, and other professional organizations to develop standards and resources to aid in minimizing the risk of errors and maximizing the dissemination of best practices. ASTRO's Target Safely campaign included an interdisciplinary effort to develop guidance focused on patient safety, which included the publication "Safety Is No Accident." This comprehensive guide for facilities addressed requirements for structure, personnel, and technical processes to facilitate the safe delivery of RT and develop the first series of ASTRO Safety White Papers. These documents stood out for their attention to

interdisciplinary considerations in the process of caring for patients receiving RT.

The Safety White Papers, initiated through ASTRO's Multidisciplinary Quality Assurance (QA) Subcommittee, were written collaboratively by physicians, medical physicists, radiation therapists, and dosimetrists. The goal was to provide guidance for procedures and considerations for the safe delivery of RT in specific areas of clinical practice. The first generation of these publications included Safety White Papers on intensity modulated RT (IMRT) in 2011, stereotactic radiosurgery (SRS)/stereotactic body RT (SBRT) in 2012, and image guided RT (IGRT) in 2013. These 3 documents were updated in 2022 and published in 3 recent issues of *Practical Radiation Oncology*.²⁻⁴

Since their development, the Safety White Papers have encouraged and guided the development of best practices for these modalities. The recommendations have been a critical component of multiple initiatives to refine and standardize processes and quality management efforts across radiation oncology to reduce the risk of safety events. For example, the Safety White Papers are a resource for ASTRO's Accreditation Program for Excellence (APEX). APEX accreditation is increasingly being sought by facilities as a tool for quality management, with over 200 facilities currently accredited and another 200 in progress.

Much progress has been made in the realm of radiation oncology quality and safety since the initial Safety White Papers were released (Figure 1). AAPM's TG-100 report formalized the integration of prospective risk analysis methods into systematic and case-based quality management programs.⁵ The RO-ILS: Radiation Oncology Incident Learning System was developed as a tool to collect, evaluate, and mitigate a spectrum of unintended events from operational inefficiencies to radiation mistreatments. RO-ILS supports both institutional and national incident learning to share knowledge while simultaneously promoting a positive safety culture. Sponsorship

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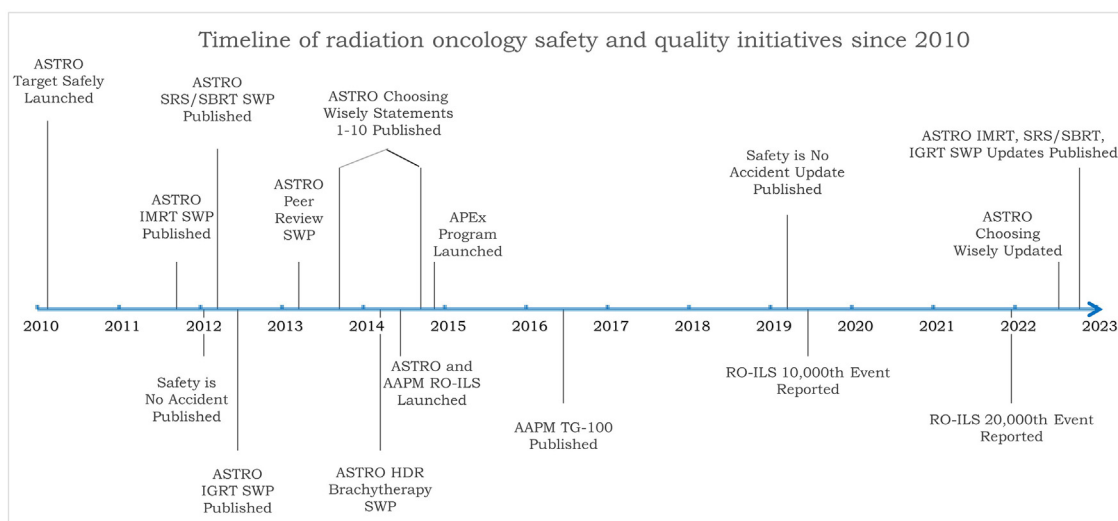


Figure 1 Timeline of radiation oncology safety and quality initiatives since 2010. *Abbreviations:* AAPM = American Association of Physicists in Medicine; APEX = Accreditation Program for Excellence; ASTRO = American Society for Radiation Oncology; HDR = high-dose-rate; IGRT = image guided radiation therapy; IMRT = intensity modulated radiation therapy; RO-ILS = Radiation Oncology Incident Learning System; SBRT = stereotactic body radiation therapy; SRS = stereotactic radiosurgery; SWP = safety white paper; TG = task group.

by ASTRO and AAPM and support from sister societies and vendors enables practices in the United States to participate in the program for free. Since its launch in 2014, over 800 facilities have enrolled and over 25,000 events have been reported to help make RT safer. In addition to these initiatives, existing efforts such as the Integrating Healthcare Enterprise-Radiation Oncology, created in 2004, have continued work to streamline communication and improve efficiency between the various electronic health records and medical devices used to plan and deliver RT.⁶ Finally, an update to “Safety Is No Accident” was published in 2019 to formalize integration of the previously mentioned initiatives into daily practice.⁷ These initiatives complement each other with the goal of maximizing patient safety through standardization of processes, data-based and structured analysis of quality events, reliable interoperability of key devices/software, and encouraging a culture of safety. Consequently, these resources, programs, and approaches have been referenced or incorporated in the recent Safety White Paper updates.

The field of radiation oncology should be proud of the advances in patient safety since 2010. Our efforts in developing both national accreditation standards and national safety reporting systems are similar to what has been achieved in anesthesiology, which launched its national event reporting system in 2008. A commitment to safety is foundational to our field’s approach to patient care both now and into the future as evidenced by continued upward trends in academic investigations aiming to maximize RT patient safety, continuous growth of RO-ILS safety event reporting, and the expansion of APEX accreditation across sites (Figures 2-4). There has been a sustained commitment

of partner organizations and vendors toward quality improvement through sponsorship and support for the RO-ILS program. There will continue to be a need to collaborate with vendors to improve systems for patient safety, and RO-ILS has been providing a mechanism for shared learning through reported events. ASTRO, along with other national organizations such as AAPM, American Society of Radiologic Technologists, and American Association of Medical Dosimetrists, have continued to include patient safety and quality improvement in their meeting programs.

The Multidisciplinary QA Subcommittee chose to update these Safety White Papers at this time for several reasons. In addition to the advancements in quality and safety, the hardware and software used in the areas of IMRT, IGRT, and SRS/SBRT have also evolved in the decade since the first series of Safety White Papers were published. Some gaps in guidance and training have been addressed. There are also indications that further improvements are needed to established guidance, for example, pass rates for external validation of machine outputs continue to increase but still have substantial room for improvement.⁸ The goal of the Safety White Papers is to reflect contemporary best practices.

Similar to the period of significant advancements in technology before the Target Safely campaign, we are currently in an era of implementation of numerous new treatment planning and delivery approaches. These include the integration of machine learning into all aspects of treatment planning, the growth of magnetic resonance imaging-guided linear accelerators, expansion of more complex and multimodality imaging for setup and verification, and the integration of computed tomography— and magnetic resonance imaging-guided

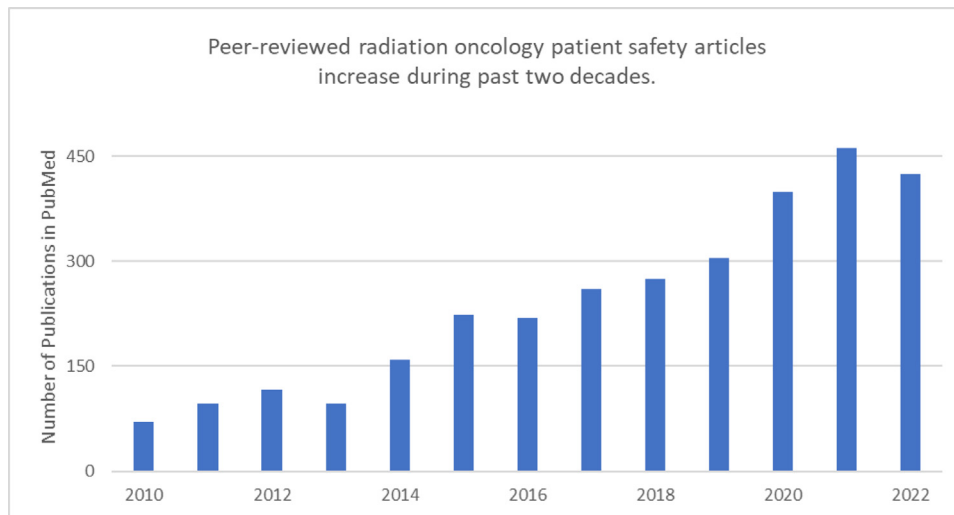


Figure 2 Peer-reviewed radiation oncology patient safety articles increase during past two decades.

adaptive treatments.^{9,10} These technologies bring with them new processes, new training requirements, and device/software complexities that likely have similar and unique potential for safety events. Furthermore, the pandemic has accelerated the shift toward new workflows that allow for remote or hybrid workspaces. Although these offer new opportunities for professionals to support patients at multiple locations, work/life balance, and some associated efficiencies, they also pose safety risks related to communication in treatment planning and delivery processes. Importantly, the potential risks of all of the previously mentioned evolving phenomena are magnified by the increasing use of moderately and ultrahypofractionated RT regimens for many treatments.

The wealth of new technologies, including artificial intelligence, advanced imaging, adaptive therapy, protons and particle therapy, and radiopharmaceuticals, will transform our ability to deliver more effective cancer care. However, we must learn from past experiences and remain vigilant in ensuring that staff are adequately trained to use these technologies and understand their potential failure modes and that they are provided opportunities to design, implement, and maintain safer processes. These advancements require more, not less, resources devoted toward quality and safety efforts and a continued team approach. Yet, in addition to forging paths through these new frontiers of RT planning and delivery, ongoing effort is required to continue to advance quality and safety in the

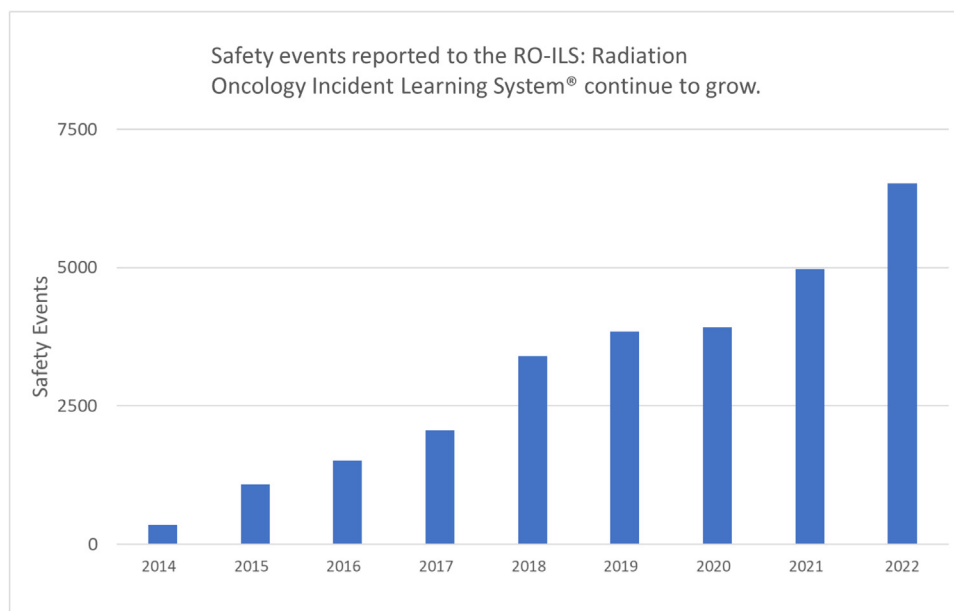


Figure 3 Safety events reported to the RO-ILS Radiation Oncology Incident Learning System (R) continue to grow.

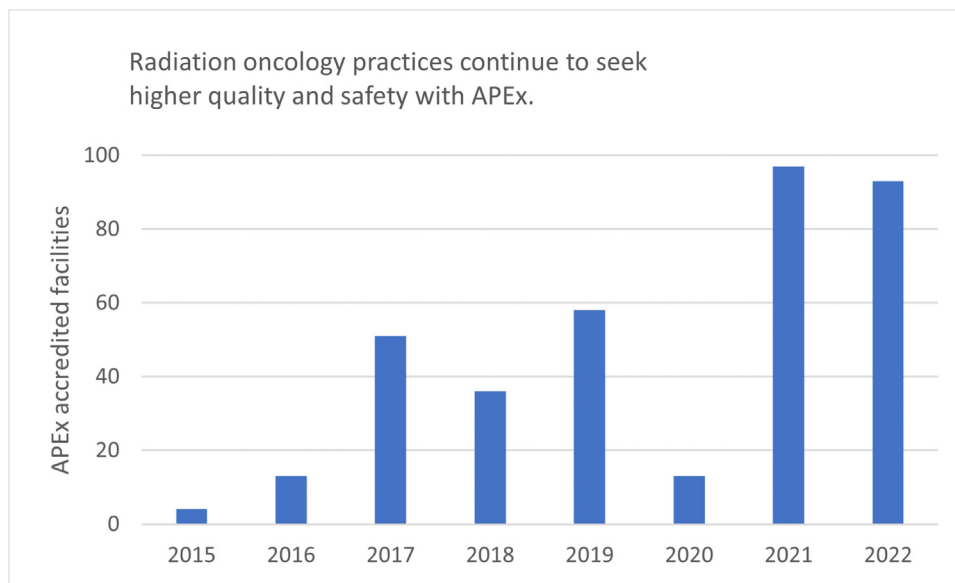


Figure 4 Radiation oncology practices continue to seek higher quality and safety with APEX.

delivery of IMRT, IGRT, and SRS/SBRT. Safety White Paper content and recommendations should reflect the contemporary best practices and continue to play a critical role in quality and safety in radiation oncology in an ever-changing clinical environment. ASTRO is committed to maintaining and updating existing Safety White Papers and creating new documents on advanced technologies to promote safe RT for every patient.

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