



Reducing Near Miss Gantry Collisions from Reaching Treatment

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Background

In radiation oncology, gantry collisions have the potential to cause significant patient harm and result in a Serious Safety Event (SSE). In 2023, our division identified an increase in near-miss gantry collisions. Although no patients were injured, several cases required replanning, leading to delays in care. These events highlighted opportunities to improve our processes and proactively mitigate risk, prompting a focused quality improvement effort to enhance patient safety, reduce treatment disruptions, and prevent future collisions.

Aim

To identify factors contributing to an increased trend in near miss gantry collisions and develop an effective mitigation program.

Methods

Collision-based safety reports from January 2023 to January 2024 were evaluated by a multidisciplinary team at a single, large comprehensive cancer center. The team composed of therapists, dosimetrists, physicists, and radiation oncologists identified contributing factors including 1) suboptimal immobilization device construction and patient positioning, 2) inconsistent practices for identifying and preventing potential collisions during planning and plan review (Fig. 2), 3) use of suboptimal imaging angles, 4) misunderstandings regarding the limitations of collision alert systems at the console (Fig. 4), and 5) ineffective team communication. Mitigation strategies included formalizing maximum patient and immobilization dimensions (Fig. 1), establishing standardized documentation practices, and developing guidelines for evaluating and responding to potential collisions during planning and plan reviews. Additionally, a treatment planning system script was developed to identify optimal imaging angles based on isocenter location and patient orientation (Fig. 3). Finally, time out policies and treatment safety checks were reinforced. These strategies were documented in a standard operating procedure (SOP), and a mandatory educational module with an associated quiz was developed for therapists, dosimetrists, and physicists.

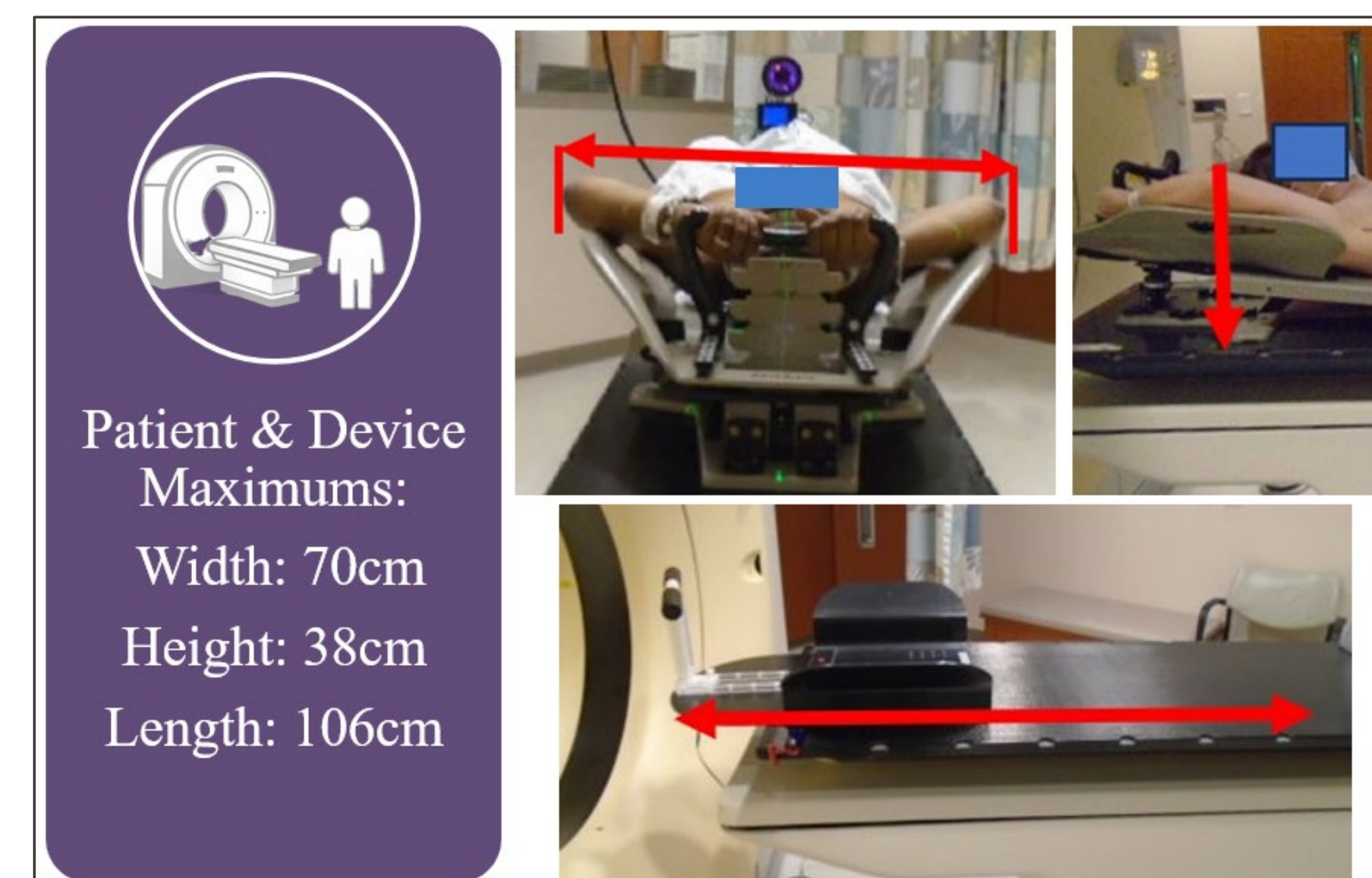


Figure 1. Simulation team was provided with patient setup dimensions that would clear the machine.

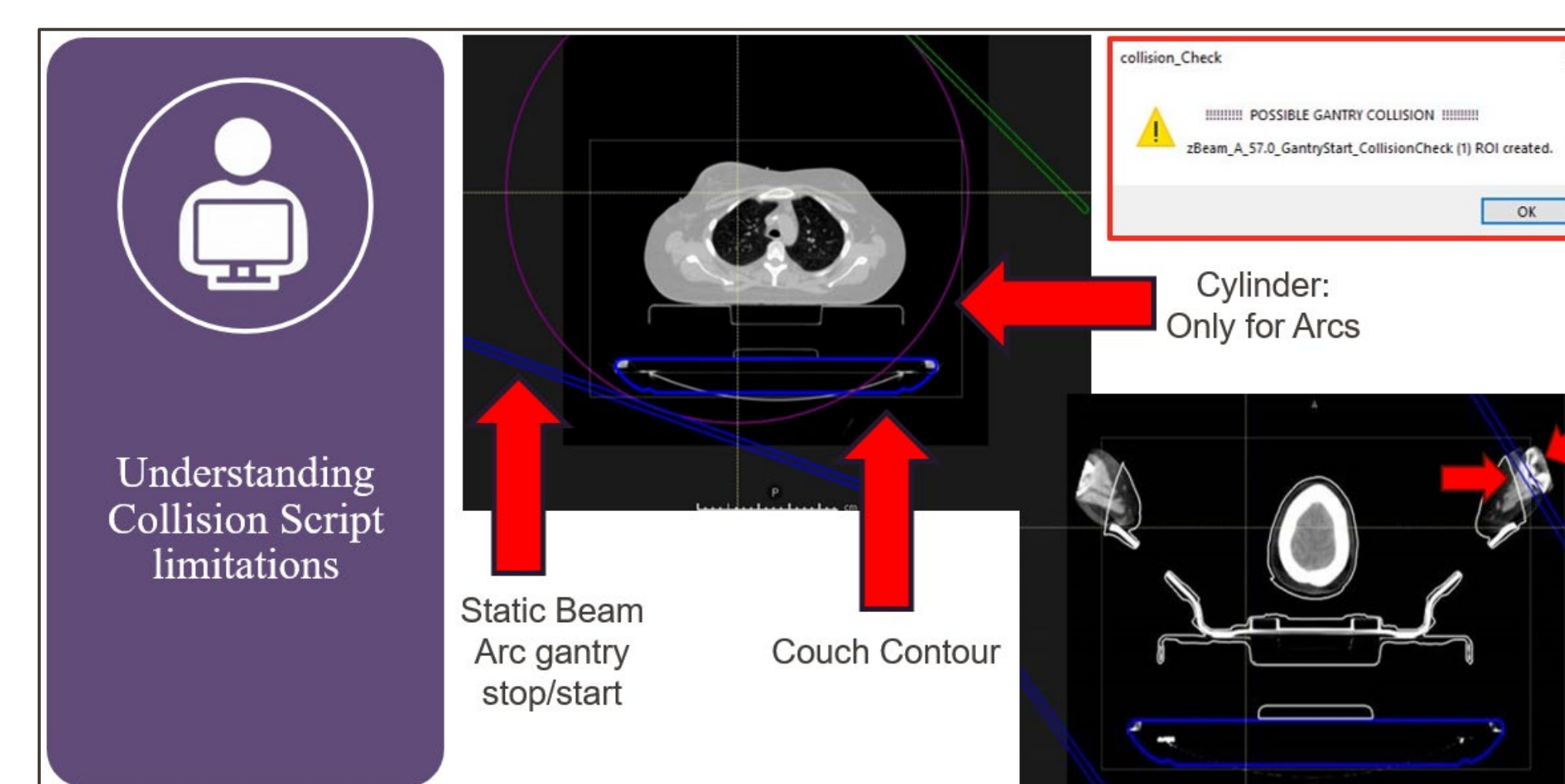


Figure 2. Education provided to dosimetry and physics regarding the collision script limitations which relies on a correct external contour and visual inspection of the arc path. Warning only populates when gantry head in blue or green crosses the external or couch.

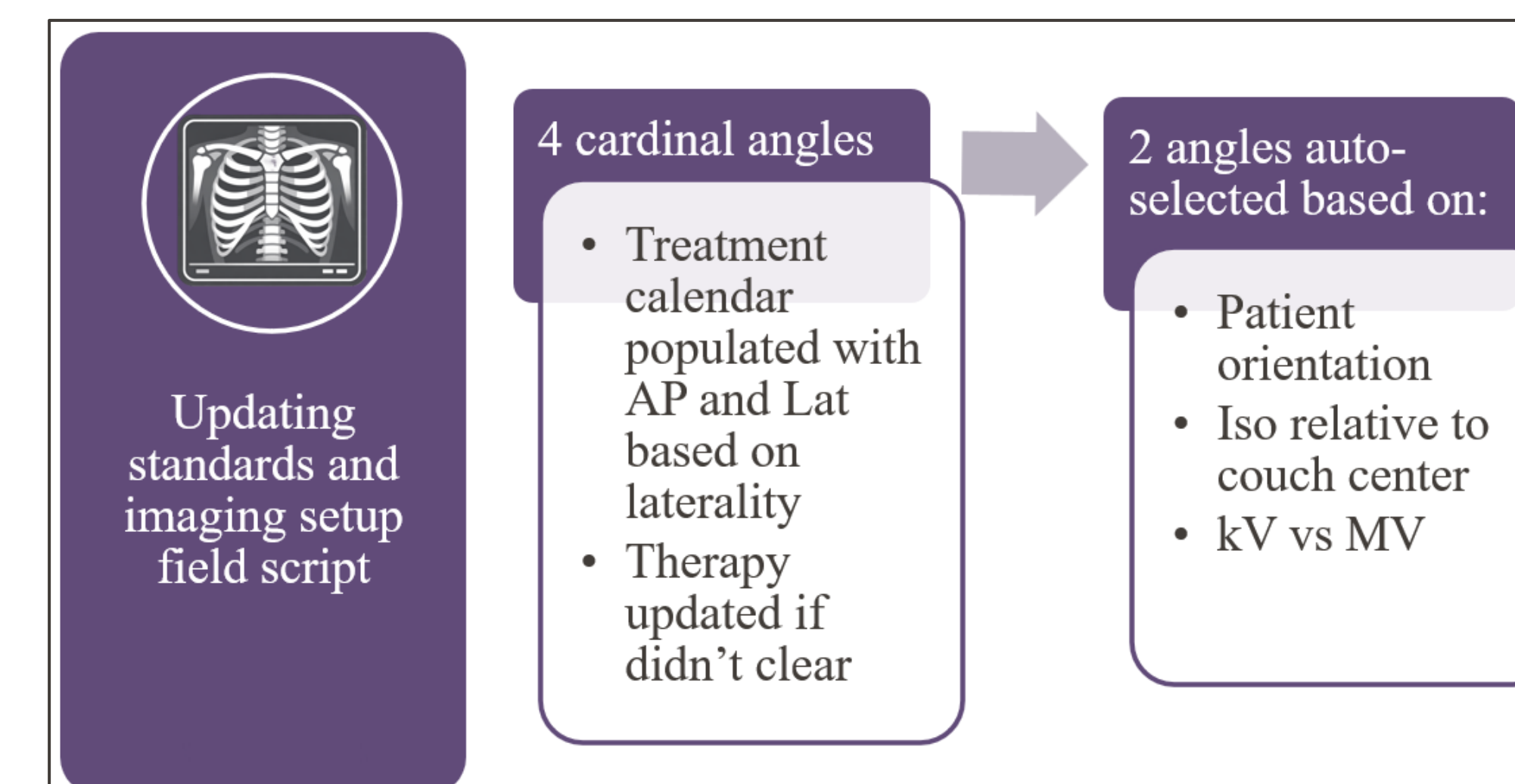


Figure 3. Imaging setup script was developed to provide the two best cardinal angles providing the least risk of collision.

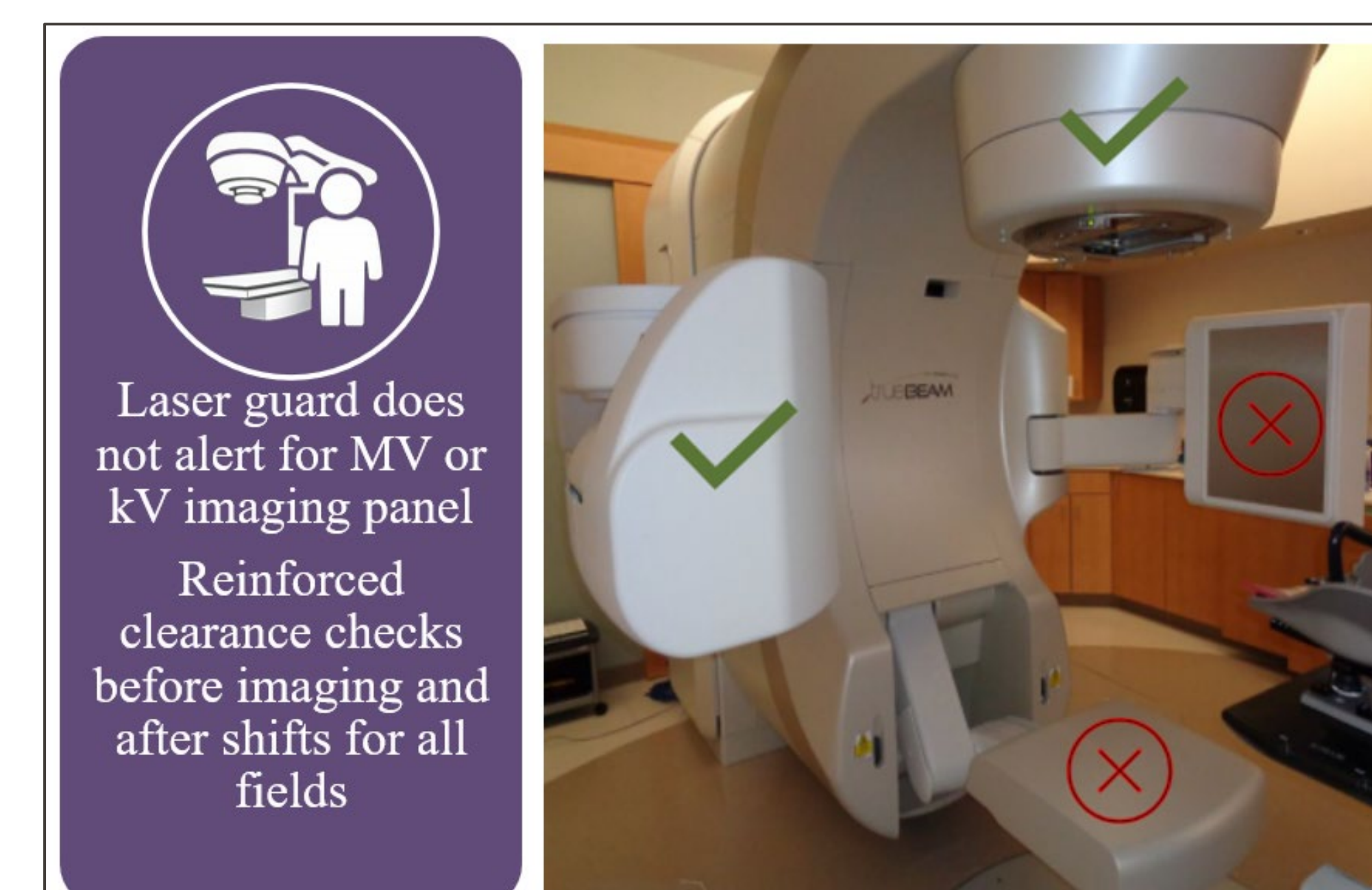


Figure 4. Education course highlighted location of laser guard sensors and reminded teams that clearance checks needed to be done twice: before imaging and after applying shifts.

Results

In June 2023, the 6-month rolling-average was two near-miss gantry collisions per month. Following implementation of the mitigation strategies in 2024 and as of December 2025, there has been a 41% reduction in collision events observed (Fig. 5). Ongoing evaluation identified an increase in the rolling rate in October 2025. Further review revealed that the educational module was not distributed to new staff. As a result, orientation checklists were updated to include this mandatory training.

Conclusions

The development and implementation of tools to predict and avoid gantry collisions, combined with on-going team education and standardized communication practices, can reduce the likelihood of gantry collision events and the potential for patient harm.

Near Miss Gantry Collision Trend Over 3 Years

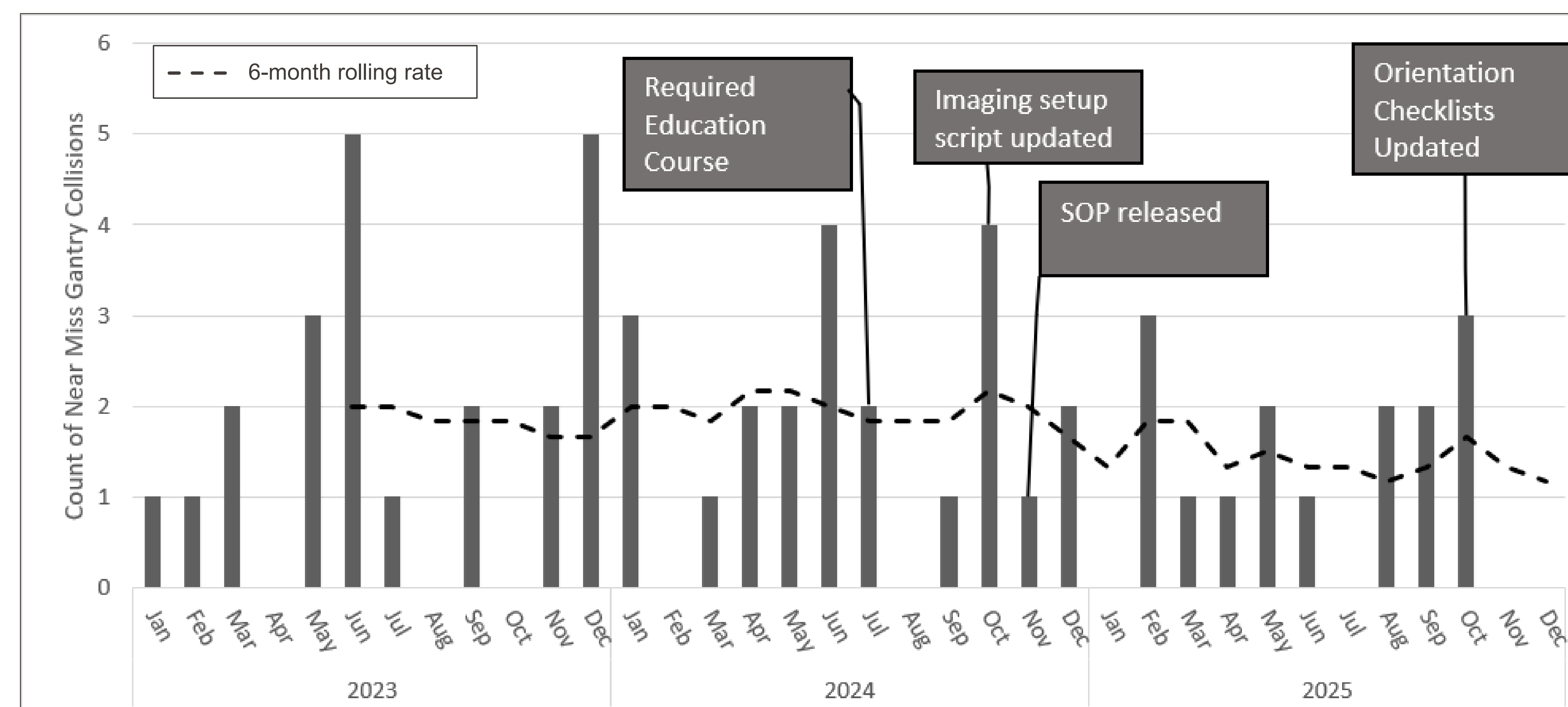


Figure 5. The count of near miss gantry collisions over the course of 3 years and the blacked dashed line is the 6-month rolling rate, showing a steady decline with the exception of October 2025 in which orientation checklists were updated to include gantry collision prevention training.