

Using Incident Learning Metrics to Evaluate the Effectiveness of APEx Accreditation

Sarah Han-Oh, PhD¹; Mario Duhon, CMD¹; Leslie Bell, CMD¹; Ellen Huang, PhD¹; Annette Souranis, R.T.(T)¹; Roberta Anderson, D.N.P¹; Pradeep Thomas, MBA, DrPHc¹; Jean L Wright, MD²; Akila N. Viswanathan, MD, MPH¹; Xun Jia, PhD¹; Amol Narang, MD¹; Aditya Halthore, MD¹

¹Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins Medicine, ²Department of Radiation Oncology, University of North Carolina, Chapel Hill, NC

INTRODUCTION

ASTRO APEx accreditation promotes radiation oncology safety and quality through nationally recognized standards. Since its launch in 2014, over 400 facilities have achieved accreditation [1], yet quantitative evidence of its effectiveness remains limited.

AIM

To quantify the impact of APEx accreditation using 10 years of longitudinal incident learning system (ILS) data across pre-accreditation, initial accreditation, and re-accreditation cycles

METHODS

- Academic comprehensive cancer center first received full accreditation in May 2017 and again in October 2022, on first attempts.
- A retrospective longitudinal analysis was conducted using 2,940 ILS events collected from 2015 to quantify the impact of initial accreditation and re-accreditation relative to the pre-accreditation period.
- The ILS events were mapped to 55 APEx evidence indicators (EIs) and grouped into 3 accreditation cycles (C1-C3), as shown in Figure 1.
- Incident Event Rate (IER) per 1,000 patients was calculated for each cycle (lower values indicate fewer incidents and better safety performance).
- Paired t-tests were used to compare IERs between cycles, with statistical significance defined as $p < 0.05$.

CONTACT

Sarah Han-Oh, PhD DABR
Johns Hopkins University School of Medicine
401 North Broadway, Baltimore, MD 21231
yhanoh1@jhmi.edu
443-823-5031

RESULTS

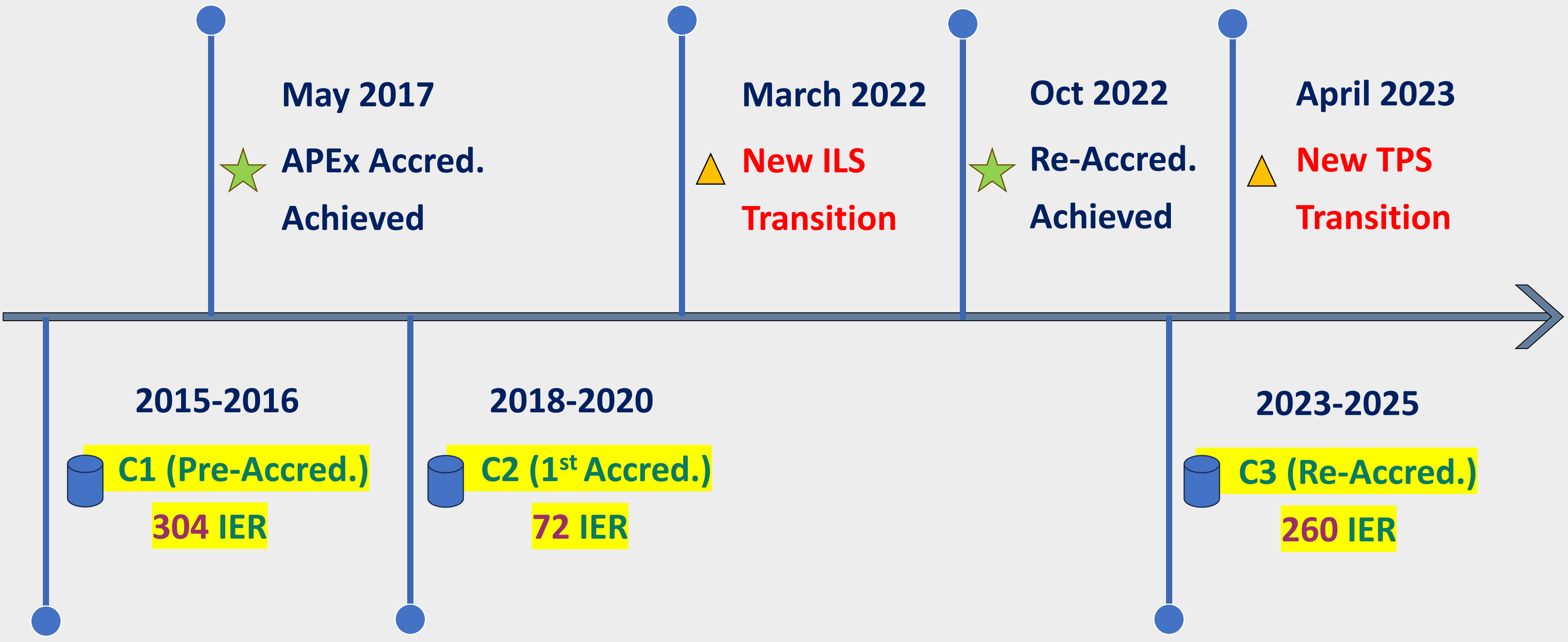


Figure 1. Study timeline showing four key milestone activities (top row) and three cycles of ILS data collection (bottom row).

- APEx survey scores in May 2017 and Oct 2022: 90–100% across all domains, meeting the APEx full accreditation requirements.
- Overall Trends (Figure 2):** IER decreased significantly during C2 (after 1st accreditation) but rebounded during C3 (re-accreditation cycle), producing a U-shape trend.
 - 1st Accreditation Impact (C1→C2):** 76% reduction (IER = 304→72.0; $p=0.021$)
 - Re-accreditation Impact (C2→C3):** 261% increase (IER = 72.0→260; $p=0.033$), driven by EI 3.3 (Standard operating procedure, in short SOP; 214% increase)
 - Sustained Benefit (C1→C3):** 14.5% reduction ($p=0.582$, not significant), but when excluding EI 3.3 (SOP), 51% sustained reduction from C1 (IER = 213→105 excluding EI 3.3; $p=0.038$).
- EI-Level Trends:** Table 1 summarizes top 8 most frequent EIs (99% of the total events in C1) across accreditation cycles.

DISCUSSION

- Key Findings:**
 - APEx accreditation achieved significant initial incident reduction (76%) and sustained long-term improvement (51% when excluding EI 3.3).
- C3 rebound, largely driven by increased SOP-related events, may reflect a combination of the following causes:
 - Increased reporting culture by new ILS platform implementation with staff training (March 2022).
 - New treatment planning system installation with new treatment planning SOP (April 2023).
- Limitations:**
 - Single-institution study
 - No severity weighting—all incidents weighted equally regardless of safety severity.
 - Major system changes (ILS platform, TPS) were not time-adjusted in C3 analysis, potentially confounding C3 event rates.
- Clinical Implications:**
 - Sustained commitment required: benefits diminish without continuous monitoring and reinforcement.
 - ILS platforms are valuable tools for tracking accreditation effectiveness.
 - Re-accreditation cycles should include targeted review of high-incident EIs identified between surveys.
- Future Directions:**
 - Multi-institutional validation studies
 - Prioritize severity-weighted outcome analyses for ILS events
 - Incorporate reporting culture effects into analysis

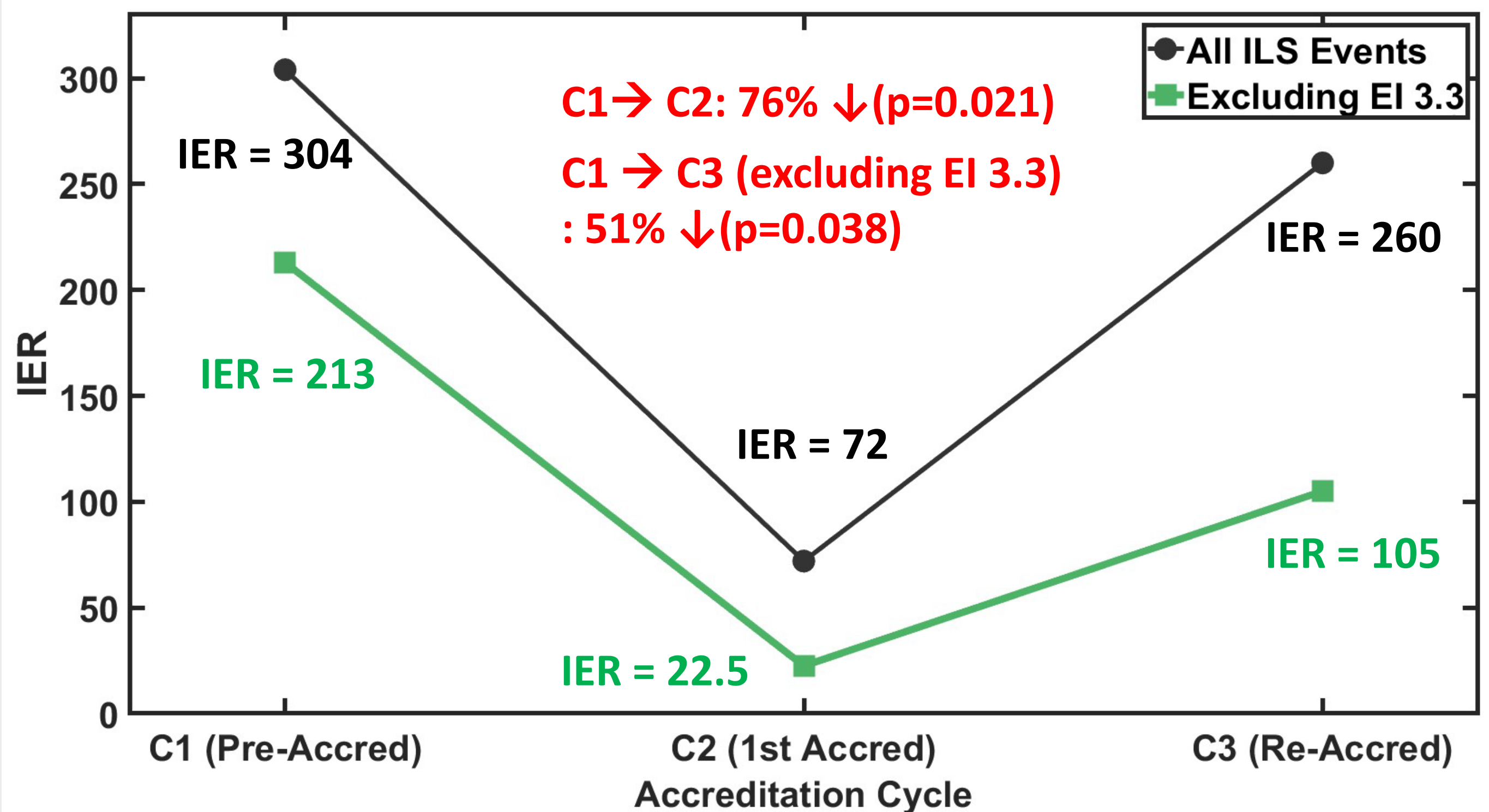


Figure 2. Overall IER by accreditation cycle. Solid line shows all events with U-shape pattern. Green line (excluding EI 3.3) demonstrates sustained 51% reduction from pre-accreditation baseline.

Table 1. Top 8 most frequent EIs in C1 by accreditation cycle. The three EIs showing the greatest improvement were highlighted in bold:

- 1st: Informed consent** (98.1% ↓ C1→C2 and 75.8% ↓ from C1 → C3)
- 2nd: Patient timeout** (89.9% ↓ C1→C2 and 78.3% ↓ from C1 → C3)
- 3rd: Simulation directive** (98.1% ↓ C1→C2 and 58.1% ↓ from C1 → C3)

APEx EI	C1 IER	C2 IER	C3 IER	Trend
14.1 Informed consent	88.5	0.18	21.4	Major improvements in C2 and partial regression in C3
3.2 Patient timeout	28.3	2.86	6.15	
2.1 Simulation directive	66.9	1.25	32.2	
2.2 Treatment planning directive	9.52	3.75	16.9	Worsening in C3
3.3 SOP	91.4	49.5	155	
2.3 Radiation prescription	8.65	4.82	8.38	Consistently well-maintained regardless of APEx
2.4 Treatment plan	4.90	5.36	9.50	
3.4 Patient-specific treatment plan checks	2.88	3.04	2.61	

CONCLUSIONS

- Our study using longitudinal ILS analysis provides an objective method to evaluate accreditation effectiveness, identify areas requiring ongoing attention, and support continuous improvement in radiation oncology safety and quality.
- This method offers evidence-based guidance for institutions seeking to evaluate their accreditation programs, ensure successful implementation, and strengthen long-term quality and safety outcomes.
- The findings can help the ASTRO APEx committee understand how its standards and evidence indicators affect clinical operations, providing real world feedback that may inform future program enhancements.

REFERENCES

[1] American Society for Radiation Oncology. Accreditation Program for Excellence (APEx). Available at: <https://www.astro.org/practice-support/accreditation>. Accessed July 13, 2026.