What You Need to Know to Prepare for an Oncology Information System & Treatment Planning System Upgrade: A Risk-Based, Multidisciplinary Workflow

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Introduction

Although existing AAPM and IAEA guidance provide important frameworks for commissioning, verification, and risk-based quality management, there remains no single, consolidated resource that operationally outlines the preparation and day-of-upgrade testing required for major TPS and OIS upgrades.

At our clinic, we completed an upgrade of Eclipse/ARIA platform from V15.6 to V18.0 across three clinical sites. The upgrade encompassed six TrueBeam linacs, two Bravos afterloaders, one Ethos system, three CT simulators, and one PET/CT scanner. In addition, our clinical environment incorporates ancillary systems, including ExacTrac and VisionRT, further increasing the complexity, scope, and interconnectivity of the upgrade process.

Successful implementation of a large-scale OIS-TPS upgrade requires careful preparation, multidisciplinary coordination, and a well-defined testing strategy. Understanding what to prepare, which stakeholders to involve, and which clinical workflows to verify on go-live day is essential to maintain patient safety and minimizing disruptions to clinical operations.

Guided by the risk-based principles of AAPM TG-100 and the verification recommendations outlined in MPPG 5a, this work presents a practical, preparation-focused framework developed and implemented during a recent ARIA/Eclipse v15 to V18 upgrade. The workflow is intended to provide clinics with a structure approach to planning, executing, and validating complex software upgrades while ensuring clinical readiness and continuity of care.

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METHODS AND MATERIALS

Preparation Phase

- Focused on proactive clinical readiness, not day of troubleshooting.
- Conducted prospective risk assessment to identify workflows most sensitive to OIS-TPS changes as shown in figure 1.
- Established early, active collaboration with vendor, institutional IT, departmental administration, radiation therapists, dosimetrists, and medical physics to define expectations, protected downtime, and escalation pathways.

Physics-led Pre-Upgrade Work – Figure 2A

- Verified beam model and defined quantitative acceptance criteria.
- Commissioned new features and algorithms in a specifically designated QA space.
- Selected representative clinical test plans targeting known high-risk areas across treatment sites and modalities.

Day-of-Upgrade Validation – Figure 2B

- Followed a structured, checklist-driven process aligned with MPPG 5.a recommendations.
- Testing priorities:
  - System integrity
  - Dose-calculation consistency
  - End-to-end clinical workflow validation
    - CT simulation → data import
    - Treatment plan creation & optimization
    - Physician and physics approval workflows
    - Data transfer to treatment delivery systems
    - Treatment delivery & data recording
    - Integration with ancillary systems (e.g., imaging, QA)

Figure 1: Process Tree for the OIS & TPS upgrade (left) and New Beam Model (right).

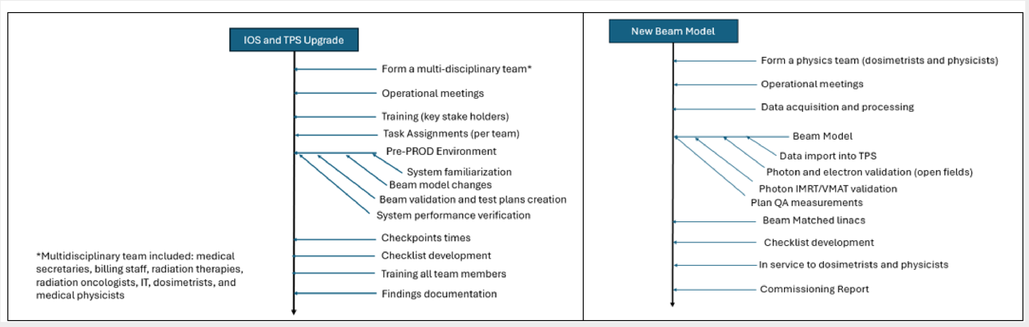
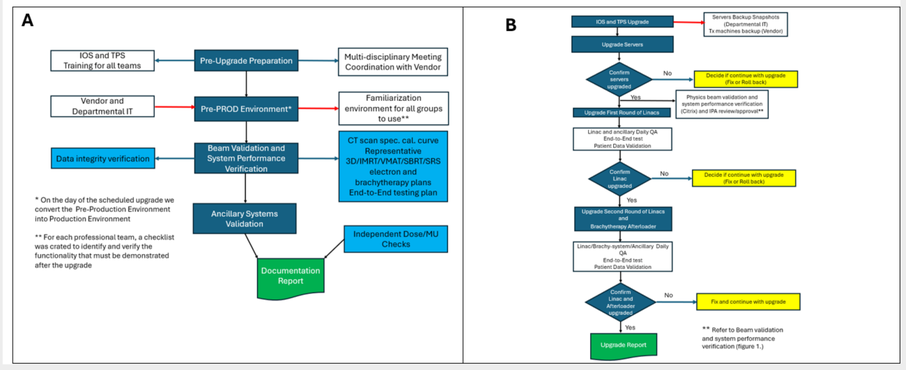


Figure 2A: Workflow for OIS-TPS Pre-Upgrades Preparation.
2B: Day of the upgrade execution, showing stepwise progression and checkpoint times.



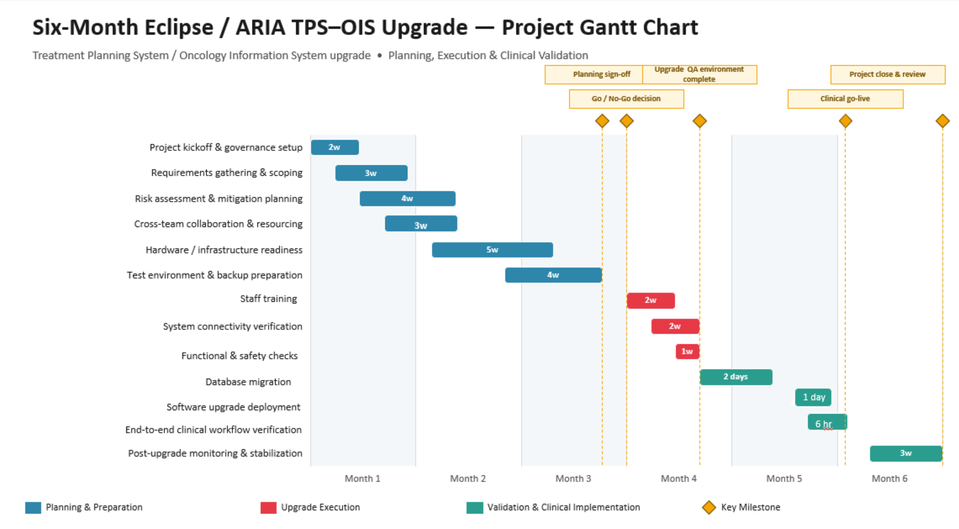
RESULTS AND DISCUSSION

Checklist Validation

- Team-specific checklists were developed and refined during QA-environment testing and staff training.
- Post-upgrade, all checklists confirmed correct operation of critical workflows and system function
- Checklists supported rapid verification of clinical readiness

Acceptance Testing

- All predefined acceptance testing were completed within the planned downtime window.
- No high-risk failure modes were identified during initial validation
- Testing confirmed stable performance of the upgraded OIS-TPS environment



Issued encountered & Resolution

- During the first linac software upgrade, one treatment delivery system failed to record:
  - Dose, fraction count, and treatment images
- Resolution steps:
  - Reverted to previous software version and performed targeted re-testing
  - Repeated upgrade process
    - The second upgrade was successful and full functionality was restored

End-to-End

- Verified
  - Accurate dose calculation and reliable data recording
  - Fully interoperability with treatment delivery and ancillary system

CONCLUSIONS

Delaying the clinical release of the v18 TPS algorithm until after the system upgrade ensured a smooth transition and minimized disruption. Introducing new algorithms through phased clinical releases enable thorough validation at each stage, supporting safe and controlled adoption.

Successful OIS-TPS upgrades are fundamentally won in the preparation phase. A proactive, risk-informed, and multidisciplinary approach transform upgrade from a potential disruptive event into a predictable well-managed clinical transition. This strategy enhances safety, preserve efficiency, and strengthens team confidence across all stages of implementation.

REFERENCES

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3. Commissioning of Radiotherapy Treatment Planning Systems: Testing for Typical External Beam Treatment Techniques (AIEA).

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