# Seeing the Whole Plan - a Comprehensive, Open-Source Dashboard for External Beam Treatment Plan Review and Quality Assessment

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## ABSTRACT

This work describes the in-house development and implementation of a locally executed, open-source treatment plan review application, PANORAMA, that is integrated directly into a commercial treatment planning system (TPS) and oncology electronic medical record (EMR) via vendor-provided programmatic interfaces.

The objective of this effort was to develop a simple, integrated resource for treatment planners and reviewers to improve standardization and efficiency of external beam treatment plan review in a community hospital setting.

Prospective incorporation of PANORAMA as part of the planning and review process resulted in considerable time-savings for both dosimetrists and physicists and accelerated the adoption of institutionally defined standards.

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## INTRODUCTION

Independent treatment plan review is essential, but comprehensive manual review is time-intensive, repetitive, and sensitive to reviewer variability. Treatment planning discrepancies can span prescription, imaging, structures, beam parameters, dose calculation, and treatment preparation. Early detection by treatment planners can prevent downstream rework and make physics plan review more targeted. Furthermore, open implementation of review tools enables transparent assessments and calculations and facilitates the use of locally relevant clinical rulesets.

## METHODS AND MATERIALS

A standalone C# application, PANORAMA, was implemented using a vendor scripting API[1] for TPS data access and an EMR data access API and is launched from within the TPS. Automated checks for many common planning errors were implemented, as summarized in Table 1. Institutional rulesets and protocol values were developed, were centrally administered within the tool and designed to be selectively displayed according to user role. Additional external plan-corrective scripts were developed to be launched from within the application to address common errors and deviations while limiting the data-contact surface of PANORAMA itself. Use of this tool was made routine as part of institutional workflows: for dosimetrists after plan completion and prior to physics submission, and for physicists during technical review before plan release for physician review, patient-specific QA, and treatment approval. Metrics of application use were evaluated.

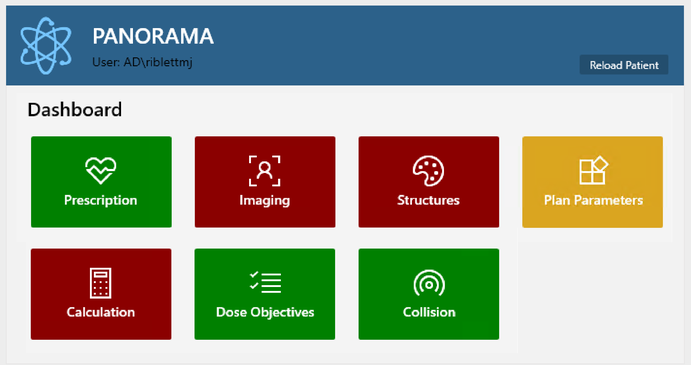
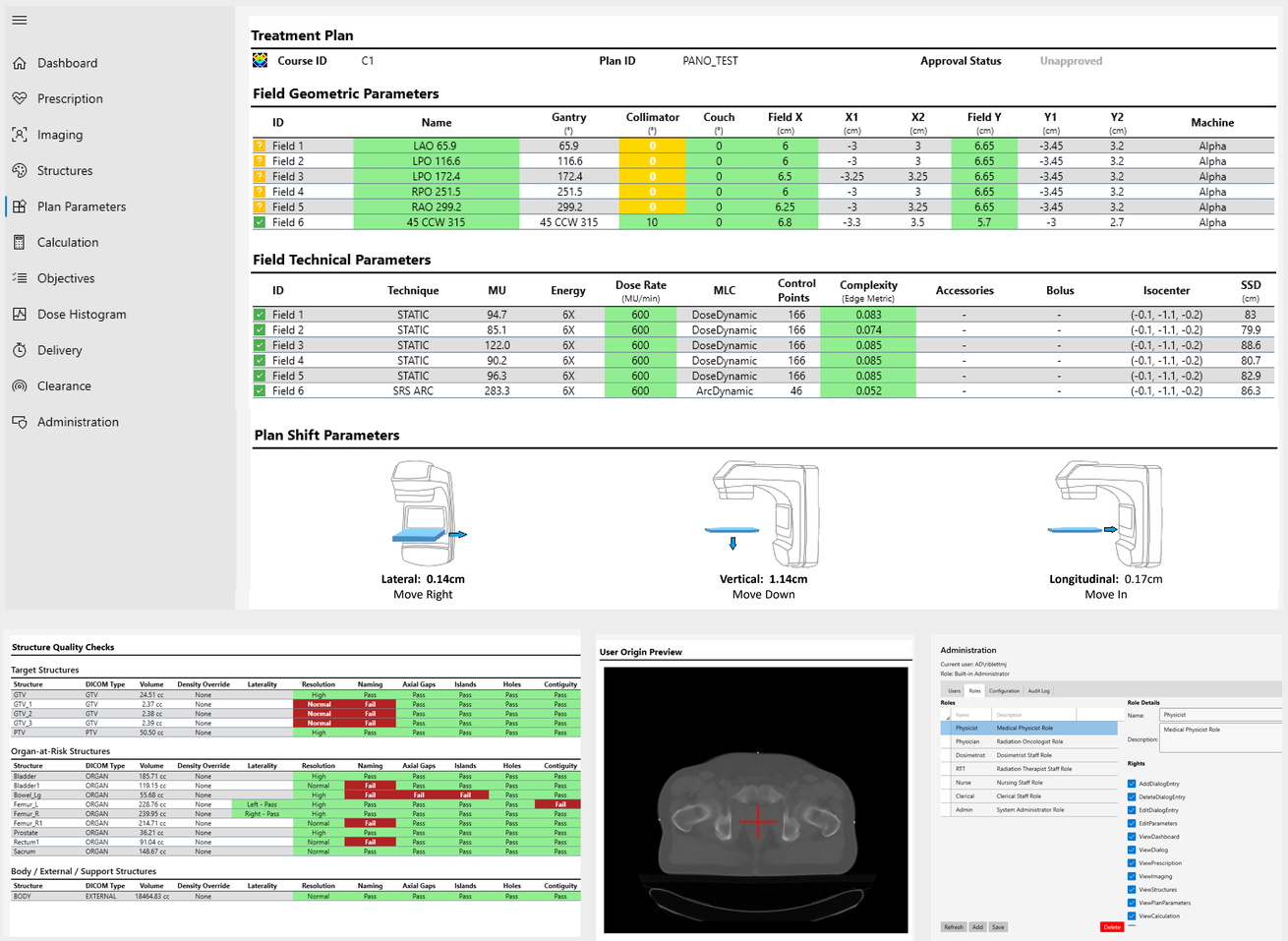



**Figure 1.** Simple, visually telling dashboard for conveying plan status to the clinician.

**Table 1.** Representative set of automated checks and features addressed.

| Category | App Evaluation | Source | Failure or Risk Addressed | App Status |
|---|---|---|---|---|
| Prescription | EMR vs TPS prescription match (target, dose, fractions, technique, energy, bolus) | TPS + EMR | Wrong dose, fractions, technique; documentation mismatch | Implemented |
| Imaging | CT slice thickness, acquisition date, scanner metadata, user origin set | TPS | Incorrect dataset selection; setup and dose calculation risk | Implemented |
| Structures | TG-263 structure naming, laterality | TPS | Wrong structure selection; downstream goal evaluation errors | Implemented |
| Structures | Structure quality (holes/contiguity) | TPS | Dose metric instability; contour integrity concerns | Ongoing |
| Fields | Treatment field geometry (gantry/collimator/couch), isocenter consistency | TPS | Setup errors; nonstandard geometry | Implemented |
| Modulation | Complexity metrics (MU ratios, MU per arc-degree) | TPS | Over-modulation; QA fragility | Implemented |
| Dose calc | Algorithm, grid size, dose calculation settings | TPS | Incorrect algorithm or calculation grid; QA failures | Implemented |
| Constraints | Target/OAR constraints from clinical goals + extended metrics | TPS | Missed constraints; incomplete TPS-native evaluation | Implemented |
| Constraints | EQD2 assessment (when applicable) | TPS | Incomplete evaluation across fractionation schemes | Implemented |
| Collision | Collision clearance checks | TPS | Collision risk; inefficiency during treatment prep | Implemented |
| Automation | Launch corrective tools (e.g., naming correction utility) | TPS + EMR | Time-consuming manual edits; repeated kick-backs | Ongoing |




**Figures 2-5.** Example of check summary for field parameters (*top*), structure sets (*bottom-left*) for an evaluated treatment plan, highlighting checks that pass (green), receive warning (yellow) or fail (red) assessments. Quick visualization of relevant assessments, such as user origin (*bottom center*), provides an expedient means for clinical stakeholder review of non-quantitative checks. Integrated administration of PANORAMA (*bottom-right*) facilitates straightforward management of users, roles, and application configuration.

## RESULTS

From August 2022 to January 2026, over 11,000 plan instances representing more than 3,500 unique courses of treatments were prospectively reviewed using PANORAMA across all external beam techniques. Typical analysis runtime was 20-30 seconds per plan. Surveyed users (n=11; 5 physicists, 6 dosimetrists) estimated a median time savings of 27 minutes per plan review (range 15 to 75 minutes; greatest for complex stereotactic plans) compared with performing a similar-depth manual review; re-review was shortened by referencing prior check results. Usage counts include draft, comparison, revised, and final plan reviews.

At implementation, institutional compliance with TG-263[2] nomenclature was made mandatory for plan approval with adoption accelerated by flagging noncompliance in existing TPS templates. Extended dosimetric assessments in PANORAMA beyond those found natively within the TPS improved compliance with clinical protocol constraints and facilitated rapid performance of cumulative dose evaluations. Planners noted the integrated gantry clearance check as a highly-valued PANORAMA feature to ensure plan deliverability.

## DISCUSSION

PANORAMA is innovative in that it provides transparent, role-configurable automated checks and extends native TPS evaluation capabilities with additional clinically relevant metrics and logic, all while supporting rapid iteration of feature enhancements based on clinical stakeholder feedback. Critically, the application runs locally, is audit-logged, and does not store PHI making it highly-practical for clinical use and IT/IS approval.

To date, incorporation of PANORAMA into clinical workflows has resulted in considerable clinical efficiency gains and cost-savings in its deployed setting: estimated at approximately 0.7-0.75 full-time equivalent (FTE) of planner effort per year for a community hospital-based practice treating 1200-1400 patients per year in a mixed suburban-rural locale.

Active development remains ongoing, including the addition of new quality checks and automation pathways for treatment plan-corrective actions. The open-source nature of PANORAMA's development extends the invitation to other clinicians and researchers to collaborate on future enhancements by providing a core application that can be easily extended or customized for individual use cases, while minimizing the effort and cost barriers to entry.

## CONCLUSIONS

A fast, transparent, open-source plan review application integrated into the TPS supported the prospective review of thousands of plans with substantial user-reported time savings and improved standards compliance, while remaining highly extensible.

## REFERENCES

1. Varian Medical Systems. Eclipse Scripting API Definition and Online Help. Varian Innovation Center Documentation Hub. Accessed July 10, 2026.
2. Mayo CS, Moran JM, Bosch W, et al. American Association of Physicists in Medicine Task Group 263: Standardizing Nomenclatures in Radiation Oncology. Int J Radiat Oncol Biol Phys. 2018;100(4):1057-1066. doi:10.1016/j.ijrobp.2017.12.013.