Development of an Automated TG-275 Treatment Plan Verification Tool: Integrating Monaco TPS and MOSAIQ OIS Data Comparison

S. Stathakis, A Alexandrian, CW Schneider, E Chorniak
Mary Bird Perkins Cancer Center, Baton Rouge, LA

MARY BIRD PERKINS CANCER CENTER™

2026 JOINT AAPM | COMP MEETING
JULY 19–22 | VANCOUVER, BC

Abstract

Purpose: To develop and implement an automated quality-assurance application for radiation therapy treatment plan verification following AAPM TG-275 guidelines, enabling comprehensive comparison between the Elekta Monaco treatment planning system (TPS) and MOSAIQ oncology information system (OIS).

Methods: A Python application with a graphical user interface extracts treatment parameters directly from Monaco plan files and compares them against matched MOSAIQ database entries, including patient identity, prescription dose/fractionation, beam parameters, isocenter coordinates (mm→cm), gantry/collimator/VMAT angles, field dimensions, beam energy, and SSD. Mismatches are flagged by tolerance with severity categorization (Critical, Major, Info), and MOSAIQ workflow completion is independently verified.

Results: The application successfully automates the manual chart check required by TG-275. Initial testing demonstrated accurate extraction of beam parameters from Monaco plan structures and correct matching with MOSAIQ TxField and TxFieldPoint tables, with discrepancies displayed through color-coded severity indicators. Isocenter comparison required mm-to-cm unit conversion and 3D distance calculation for tolerance verification.

Conclusion: An automated TG-275 verification tool was successfully developed that significantly reduces manual chart-check time while improving consistency and reducing the potential for human error. The modular design allows adaptation to other TPS/OIS combinations.

Introduction

Manual verification of a radiation therapy treatment plan against the record-and-verify system is a cornerstone of the physics chart check called for by AAPM Task Group 275, yet comparing dozens of discrete parameters between the treatment planning system (TPS) and the oncology information system (OIS) by hand is slow and vulnerable to transcription error.

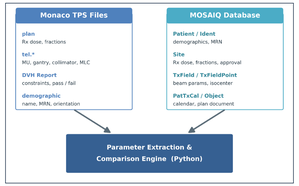
At Mary Bird Perkins Cancer Center, physicists verify every external-beam plan by comparing Elekta Monaco TPS output against MOSAIQ — prescription, beam parameters, isocenter, and DVH constraints — before and during treatment. This project automates that comparison: extracting data directly from Monaco plan files and the MOSAIQ SQL database, applying parameter-specific tolerances, and flagging discrepancies by severity so physicists can focus their attention where it matters most.

Methods and Materials

A Python application with a graphical user interface extracts treatment parameters directly from Monaco plan files and compares them against matched entries in the MOSAIQ database. The tool parses Monaco prescription files, beam parameter (*tel.**) files, and DVH reports, then queries the MOSAIQ SQL database (TxField/TxFieldPoint, Site, Patient/Ident) for the corresponding record (Fig. 1).

Parameters compared include patient identity, prescription dose/fractionation, monitor units, beam energy, gantry/collimator/VMAT angles, isocenter coordinates, field size, and SSD (Table 1). Each is evaluated against a tolerance and assigned a severity level — Critical, Major, or Info — and the tool independently verifies that MOSAIQ workflow milestones and DVH constraints are satisfied (Fig. 2).

Implementation: Built with Python/tkinter; MOSAIQ is accessed read-only via pymssql, and Monaco files are parsed directly from the network share. Results are color-coded (green = match, yellow = within tolerance, red = mismatch) and exported to a PDF report. The modular design allows adaptation to other TPS/OIS combinations.



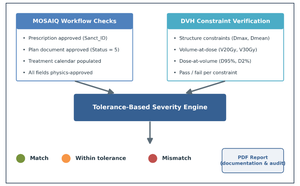


Figure 1. Data sources and system integration — Monaco TPS files and MOSAIQ database inputs, parameter extraction and comparison engine.

Figure 2. Verification workflow — MOSAIQ workflow checks and DVH constraint verification, tolerance-based severity engine, and PDF report.

Table 1. Parameters verified, tolerance thresholds, and assigned severity.

Category	Parameters	Tolerance	Severity
Patient Identity	Name, MRN, DOB, orientation	Exact	CRITICAL
Prescription	Total dose, dose/fraction, # fractions	Exact	CRITICAL
MU / Energy	MU per beam, beam energy (MV)	± 0.1 MU	CRITICAL
Isocenter	X, Y, Z (mm→cm conversion)	± 1.0 mm	CRITICAL
Gantry / Collimator	Static/VMAT start-stop, collimator angle	± 0.5°	MAJOR
Field Size / SSD	X/Y jaw positions, SSD	± 1–5 mm	MAJOR

Results

The application successfully automates the manual chart check required by TG-275. Initial testing demonstrated accurate extraction of beam parameters from Monaco plan structures and correct matching with MOSAIQ TxField and TxFieldPoint tables, with discrepancies displayed through the color-coded severity indicators shown at right. Isocenter comparison required mm-to-cm unit conversion and a 3D distance calculation for tolerance verification.

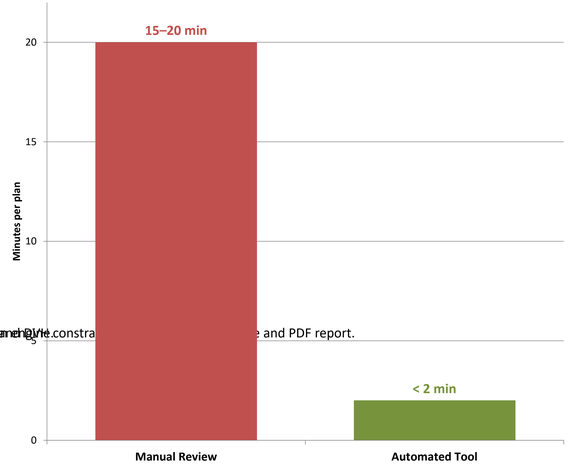


Chart 1. Manual chart-check time before and after automation, per treatment plan.

Key benefits over manual review

- Cuts per-plan verification time from 15–20 min to under 2 min (~90% reduction)
- Eliminates transcription errors between the two systems
- Achieves 100% parameter coverage on every patient, every plan
- Exports a PDF report for documentation and audit

Discussion

Reconciling Monaco and MOSAIQ required resolving unit and precision mismatches rather than a simple field-by-field comparison. Monaco reports isocenter in millimeters and dose in Gy, while MOSAIQ stores centimeters (to one decimal place) and centigray; the tool converts and rounds consistently before comparing, and evaluates isocenter agreement as a 3D vector distance rather than three independent axis checks, since a plan can pass on each axis individually yet still fail a true 3D tolerance.

Assigning severity (Critical/Major/Info) rather than a single pass/fail lets a reviewer triage the handful of discrepancies that actually change dose delivery from the many small, expected differences in a plan — the distinction TG-275 asks reviewers to make manually, here made automatically and consistently every time.

Initial testing has focused on demonstrating accurate parameter extraction and matching; broader validation across additional plan types and a second institution is a natural next step. Because the parser and comparison logic are separated from the Monaco/MOSAIQ-specific data extraction, adapting the tool to other treatment planning or record-and-verify systems mainly involves writing new extraction methods rather than rebuilding the comparison and severity engine.

Conclusions

- Automates the TG-275 manual chart check by directly comparing Monaco TPS and MOSAIQ OIS data
- Cuts per-plan verification time from about 15–20 minutes to under 2 minutes
- Applies tolerance-based, severity-tiered mismatch detection (Critical / Major / Info) across identity, dosimetric, and geometric parameters
- Modular design supports adaptation to other TPS/OIS combinations
- Strengthens patient safety by making the TG-275 chart check consistent and reproducible across every plan

Contact

S. Stathakis, PhD, DABR, FAAPM
Mary Bird Perkins Cancer Center
Email: [add email]
Website: marybird.org
Phone: [add phone]

References

1. Ford E, Conroy L, Dong L, et al. Strategies for effective physics plan and chart review in radiation therapy: Report of AAPM Task Group 275. Med Phys. 2020;47(6):e236–e272.
2. Xia P, Sintay BJ, Colussi VC, et al. Medical Physics Practice Guideline (MPPG) 11.a: Plan and chart review in external beam radiotherapy and brachytherapy. J Appl Clin Med Phys. 2021;22(9):4–19.