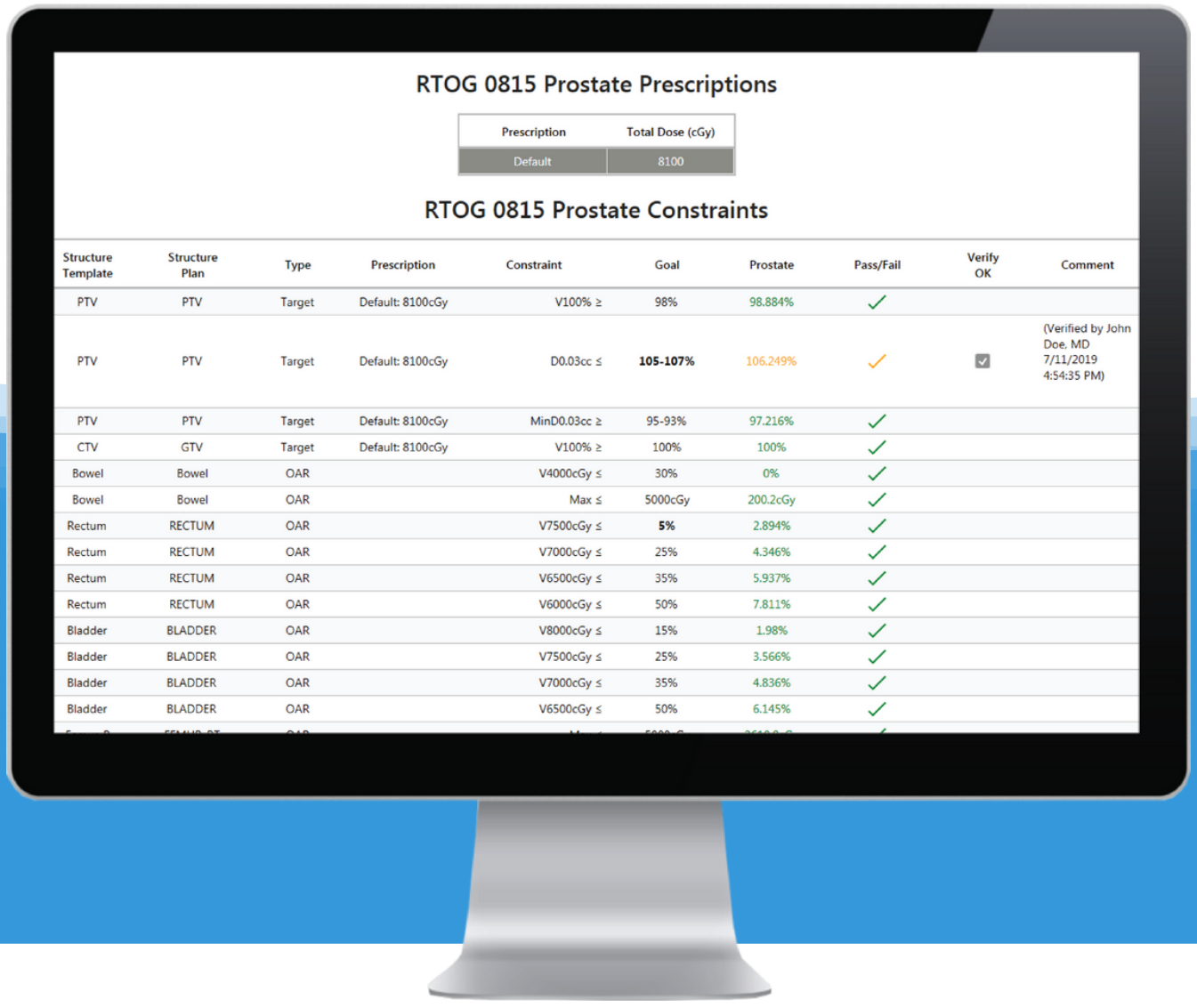
ClearCheck

ONE-CLICK PLAN EVALUATION SOFTWARE



RTOG 0815 Prostate Prescriptions

Prescription	Total Dose (cGy)
Default	8100

RTOG 0815 Prostate Constraints

Structure Template	Structure Plan	Type	Prescription	Constraint	Goal	Prostate	Pass/Fail	Verify OK	Comment
PTV	PTV	Target	Default: 8100cGy	V100% ≥	98%	98.884%	✓		
PTV	PTV	Target	Default: 8100cGy	D0.03cc ≤	**105-107%**	106.249%	✓	☑	(Verified by John Doe, MD 7/11/2019 4:54:35 PM)
PTV	PTV	Target	Default: 8100cGy	MinD0.03cc ≥	95-93%	97.216%	✓		
CTV	GTV	Target	Default: 8100cGy	V100% ≥	100%	100%	✓		
Bowel	Bowel	OAR		V4000cGy ≤	30%	0%	✓		
Bowel	Bowel	OAR		Max ≤	5000cGy	200.2cGy	✓		
Rectum	RECTUM	OAR		V7500cGy ≤	**5%**	2.894%	✓		
Rectum	RECTUM	OAR		V7000cGy ≤	25%	4.346%	✓		
Rectum	RECTUM	OAR		V6500cGy ≤	35%	5.937%	✓		
Rectum	RECTUM	OAR		V6000cGy ≤	50%	7.811%	✓		
Bladder	BLADDER	OAR		V8000cGy ≤	15%	1.98%	✓		
Bladder	BLADDER	OAR		V7500cGy ≤	25%	3.566%	✓		
Bladder	BLADDER	OAR		V7000cGy ≤	35%	4.836%	✓		
Bladder	BLADDER	OAR		V6500cGy ≤	50%	6.145%	✓		

Intelligent Automation in Radiation Oncology

RAD formation

One-click plan evaluation. Seamlessly integrated.

ClearCheck is an automated one-click plan evaluation software that provides in-depth plan checks, quick plan comparisons, and instant documentation. ClearCheck integrates with the Eclipse treatment planning system to simplify plan evaluation and reporting.

The recently published TG-275 report outlines a number of physics plan and chart review recommendations, dozens of which are automated by ClearCheck, greatly facilitating task group report implementation.

For clinicians. By clinicians.

Plan evaluation is a complex process, and it's becoming more complex as radiation techniques advance. ClearCheck was developed by treatment planners to automate plan evaluation and increase workflow efficiency while maintaining the highest quality of patient care.

Save time, save money, and get patients to treatment faster.

ClearCheck

Get instantaneous plan evaluation results.

</>

Dose Constraints

Structure Checks

Plan Checks

Rx

Prescription Checks

Collision Checks

One-Click Reporting

ClearCalc Integration

Direct Print to Aria

TG-275. Simplified.

Incident reports from the Radiation Oncologiy Incident Learning System (RO-ILS) indicate that most events or errors in the treatment process occur during the planning phase. Provide safer, higher quality physics plan review by automating a number of the recommendations provided by TG-275.

Dose Constraints

- Volume constraint
- Min volume constraint
- Min volume spared
- Dose spillage outside structure
- Conformity index
- Paddick conformity index
- Gradient index
- Min, max, and mean constraint
- Hot spot outside structure
- EQD2 and BED dose calculation

RTOG 0815 Prostate Constraints

Priority	Structure Template	Structure Plan	Type	Prescription	Constraint	Goal	Prostate	Pass/Fail	Verify OK	Comment
1	PTV	PTV	Target	Default: 8100cGy	V100% ≥	98%	98.884%	✓		
2	PTV	PTV	Target	Default: 8100cGy	D0.03cc ≤	**105-107%**	106.249%	✓	☑	(Verified by John Doe, MD 7/11/2019 4:54:35 PM)
3	PTV	PTV	Target	Default: 8100cGy	MinD0.03cc ≥	95-93%	97.216%	✓		
4	CTV	GTV	Target	Default: 8100cGy	V100% ≥	100%	100%	✓		
5	Bowel	Bowel	OAR		V4000cGy ≤	30%	0%	✓		
6	Bowel	Bowel	OAR		Max ≤	5000cGy	200.2cGy	✓		
7	Rectum	RECTUM	OAR		V7500cGy ≤	**5%**	2.894%	✓		
8	Rectum	RECTUM	OAR		V7000cGy ≤	25%	4.346%	✓		
9	Rectum	RECTUM	OAR		V6500cGy ≤	35%	5.937%	✓		
10	Rectum	RECTUM	OAR		V6000cGy ≤	50%	7.811%	✓		
11	Bladder	BLADDER	OAR		V8000cGy ≤	15%	1.98%	✓		
12	Bladder	BLADDER	OAR		V7500cGy ≤	25%	3.566%	✓		
13	Bladder	BLADDER	OAR		V7000cGy ≤	35%	4.836%	✓		
14	Bladder	BLADDER	OAR		V6500cGy ≤	50%	6.145%	✓		
15	Femur_R	FEMUR_RT	OAR		Max ≤	5000cGy	3610.8cGy	✓		

- ✓ Seamless access to DVH data and plan checks in Eclipse
- ✓ Custom templates for physicians, treatment sites, prescription doses, & more
- ✓ Pre-built common protocol constraints

Plan Checks

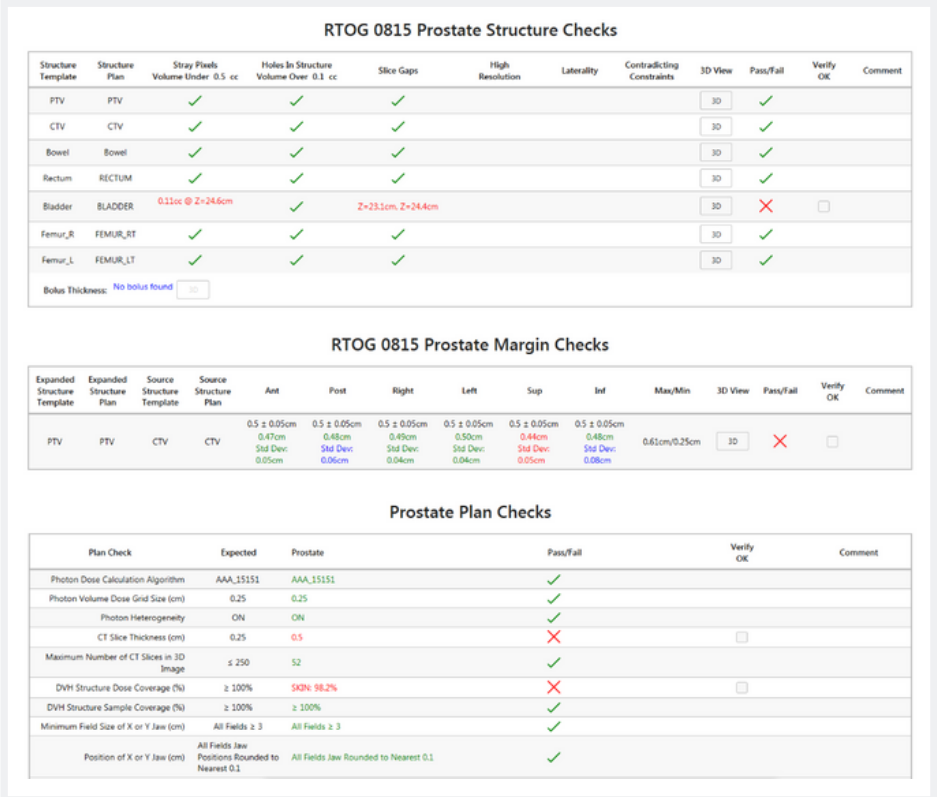
- Calculation algorithm checks
- Dose grid size checks
- Photon heterogeneity
- CT checks
- Treatment couch checks
- Structure dose and sampling coverage
- Leaf motion calculator (LMC) checks
- Gantry, collimator, & table angle
- Isocenter checks
- Empty coordinates
- Structure HU override
- Bolus linked
- Nomenclature checks
- Custom checklist items
- & more

Structure Checks

- Stray pixels
- Holes
- Slice gaps
- Laterality
- Contradicting constraints
- Expansions and structure nesting

Treat Prep Checks

- Portal dosimetry results
- Plan scheduling
- Tolerance table assigned
- QA course complete
- Plan and fields configured for treatment



RTOG 0815 Prostate Structure Checks

Structure Template	Structure Plan	Stray Pixels Volume Under 0.5 cc	Holes In Structure Volume Over 0.1 cc	Slice Gaps	High Resolution	Laterality	Contradicting Constraints	3D View	Pass/Fail	Verify OK	Comment
PTV	PTV	✓	✓	✓				3D	✓		
CTV	CTV	✓	✓	✓				3D	✓		
Bowel	Bowel	✓	✓	✓				3D	✓		
Rectum	RECTUM	✓	✓	✓				3D	✓		
Bladder	BLADDER	0.11cc @ Z=24.6cm	✓	Z=23.1cm, Z=24.4cm				3D	✗	☐	
Femur_R	FEMUR_RT	✓	✓	✓				3D	✓		
Femur_L	FEMUR_LT	✓	✓	✓				3D	✓		

Bolus Thickness: No bolus found

RTOG 0815 Prostate Margin Checks

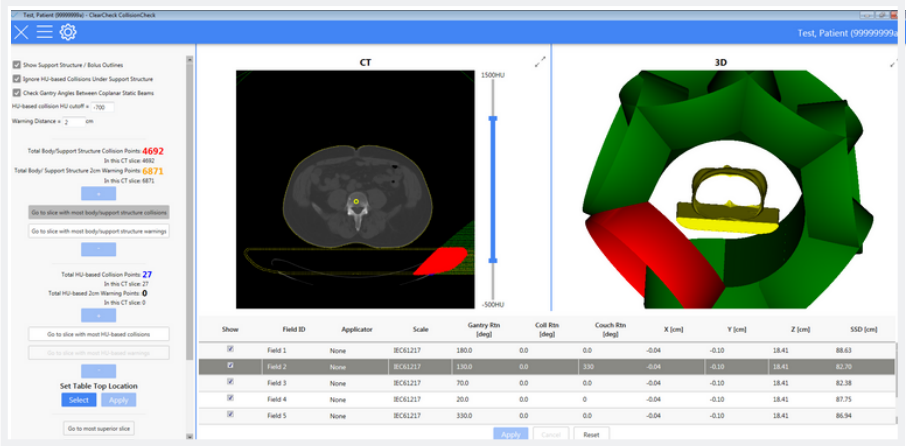
Expanded Structure Template	Expanded Structure Plan	Source Structure Template	Source Structure Plan	Ant	Post	Right	Left	Sup	Inf	Max/Min	3D View	Pass/Fail	Verify OK	Comment
PTV	PTV	CTV	CTV	0.5 ± 0.05cm 0.47cm Std Dev: 0.05cm	0.5 ± 0.05cm 0.48cm Std Dev: 0.06cm	0.5 ± 0.05cm 0.49cm Std Dev: 0.04cm	0.5 ± 0.05cm 0.50cm Std Dev: 0.04cm	0.5 ± 0.05cm 0.44cm Std Dev: 0.05cm	0.5 ± 0.05cm 0.48cm Std Dev: 0.06cm	0.61cm/0.25cm	3D	✗	☐	

Prostate Plan Checks

Plan Check	Expected	Prostate	Pass/Fail	Verify OK	Comment
Photon Dose Calculation Algorithm	AAA_15151	AAA_15151	✓		
Photon Volume Dose Grid Size (cm)	0.25	0.25	✓		
Photon Heterogeneity	ON	ON	✓		
CT Slice Thickness (cm)	0.25	0.5	✗	☐	
Maximum Number of CT Slices in 3D Image	≤ 250	52	✓		
DVH Structure Dose Coverage (%)	≥ 100%	SKIN: 98.2%	✗	☐	
DVH Structure Sample Coverage (%)	≥ 100%	≥ 100%	✓		
Minimum Field Size of X or Y Jaw (cm)	All Fields ≥ 3	All Fields ≥ 3	✓		
Position of X or Y Jaw (cm)	All Fields Jaw Positions Rounded to Nearest 0.1	All Fields Jaw Rounded to Nearest 0.1	✓		

Collision Checks

Predict collisions with customizable linac gantry head, electron cones, and SRS cones. Detect and avoid collisions with the OBI, external body contours, support structures, and specified CT HU values.



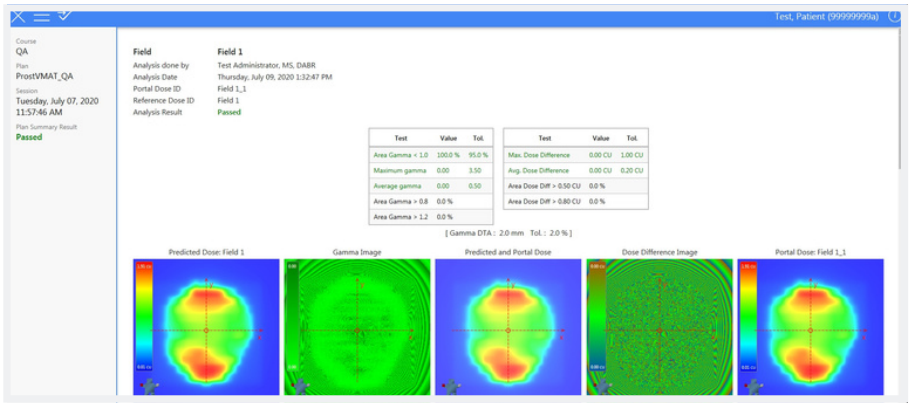
One-Click Printing

In one simple click, print plan or plan sum documentation. Quickly generate documentation to support IMRT planning charges and comply with the ACR–ASTRO Practice Parameter for IMRT. Automatically print the final PDF plan to ARIA documents.

New!

Portal Dosimetry Integration

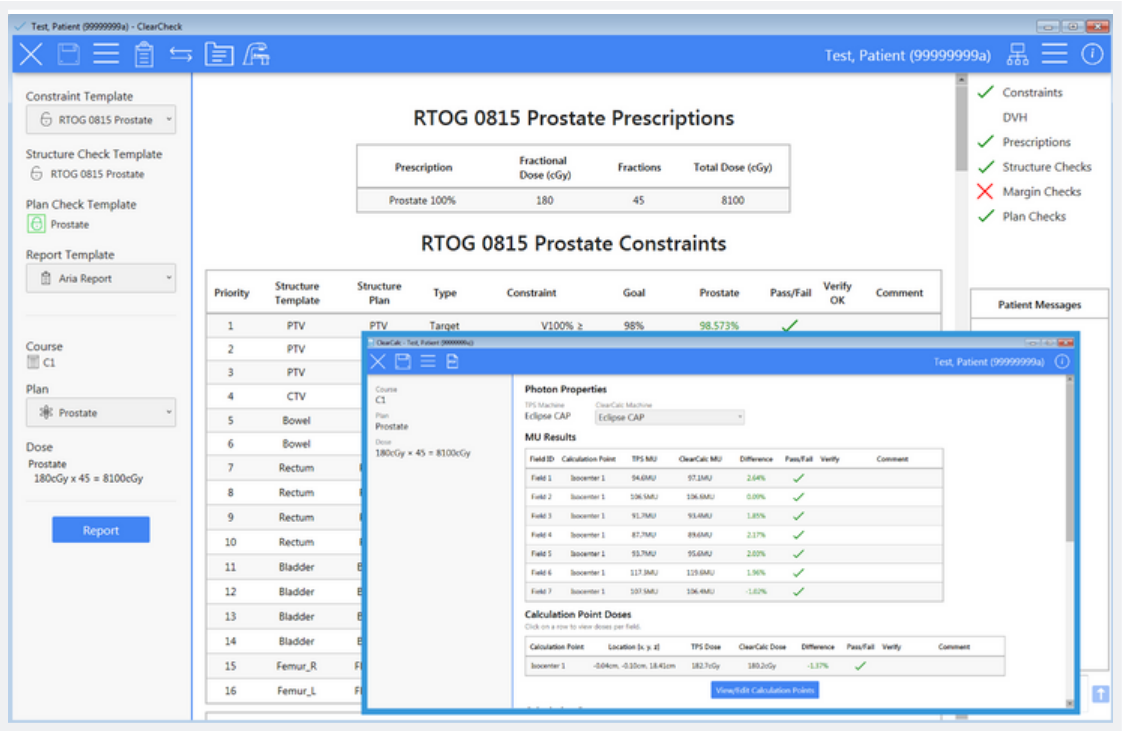
With easy access from the menu bar, view Eclipse Portal Dosimetry verification plan analysis results within ClearCheck and send results directly to the ClearCheck report for quick and easy documentation.



New!

ClearCalc Integration

Integration with ClearCalc takes treatment plan evaluation and reporting to the next level. The independent calculation software automatically validates plan calculation accuracy from within ClearCheck, delivering reliable results that integrate seamlessly into the final plan report.



New!

ClearCheck API

Flip the script: customize your plan evaluation and reporting with the new ClearCheck API. Launch and run portions of ClearCheck to complement your department's own scripts, exportable to CSV, JSON or PDF file.

Karmanos Cancer Institute Implements ClearCheck for Plan Evaluation and Dose Constraints

Jay Burmeister, Geoff Baran, Todd Bossenberger, Ahmad Hammoud,
Harriet Jaenisch, Justin Kamp, Brian Loughery, Kathryn Masi, Michael Dominello.

Barbara Karmanos Cancer Institute at Wayne State University, Detroit, MI

Purpose

To verify the quality and safety of a radiotherapy treatment plan, it is essential to assure that dose constraints are met for individual structures. This is especially important within the inverse planning process.

Structure constraints defined for a variety of treatment site-specific target and normal tissue structures have previously been evaluated at our center via manual measurement from calculated dose statistics within the treatment planning system. This process is time consuming and prone to manual errors.

Materials & Methods

ClearCheck was implemented to automate this process. Eight treatment planners retrospectively defined and evaluated plan constraints for a total of 64 patients representing 10 distinct organ sites.

The manual and automated processes were timed to evaluate efficiency.

The accuracy of ClearCheck was then evaluated through the assessment of 861 structure constraints for these 64 patients.

Results

No constraint deviations were observed when using the automated system. A total of 18/861 (2.1%) of the manually reported constraints differed by more than 1% from results from the automated system & TPS. Some were clinically relevant deviations, with 7 (0.8%) of them greater than 10%. Deviation frequencies are seen below in Table 1.

% Deviation	Number
<1	832
1-3	11
4-6	5
7-9	6
10-20	1
>20	6

Table 1: Constraint deviations and frequency

Karmanos Cancer Institute Implements ClearCheck

Treatment Site	Automated	Manual	Time Savings
Head&Neck	1.9	4.6	2.7
Lung	1.8	4.3	2.5
Lung SBRT	2.3	8.6	6.3
Brain	2.6	4.2	1.6
Esophagus	1.6	6.2	4.6
Pancreas	1.9	4.6	2.7
Prost+SV/PLN	1.5	6.6	5.1
Anal Ca	2.0	6.5	4.5

Table 2: Automated and manual constraint evaluation times in minutes

Mean time for definition, evaluation, and documentation of these constraints was 6.2 and 1.9 minutes for manual and automated processes, respectively. Table 2 shows average times and time savings using the automated system by treatment site.

Due to increased evaluation simplicity and efficiency, ClearCheck led to a >30% increase in the number of constraints evaluated per plan. It also allows simple evaluation of complex metrics without additional planning requirements, such as the creation of structure contours from isodose surfaces to evaluate common plan quality indices.

Conclusion

Automated structure constraint definition, evaluation, and documentation results in greater accuracy and safety, reducing the rate of clinically relevant errors (>10% deviation) in plan metric reporting from 0.8% to 0% in this study of over 800 structure constraints. Two stray contours were also identified by the automated system which could have had a substantial impact on plan quality.

Automation of this process facilitated an increase in the number of constraints evaluated in each plan while simultaneously saving an average of 4.3 minutes per plan optimization.

"The ability to evaluate all planning goals simultaneously during plan creation results in more efficient plan optimization and realization of planning goals."

Reduce time spent planning treatments.

132 minutes

Average time to evaluate/document a plan **without** ClearCheck

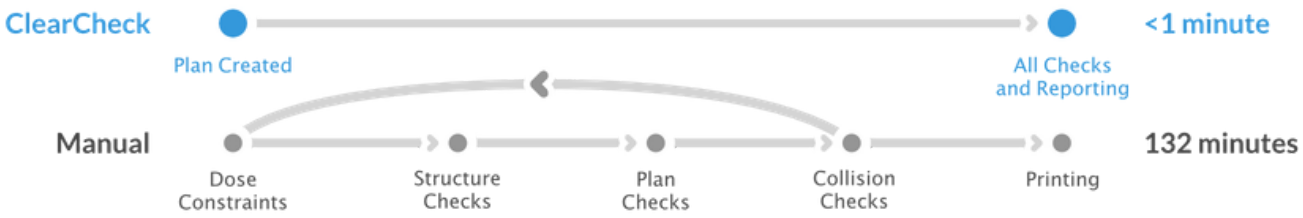
132

Minutes saved per plan, on average

<1 minute

Average time to evaluate/document a plan **with** ClearCheck

Automate treatment planning evaluation and reporting.



With ClearCheck, clinical standardization is a reality. Its automated dose constraint evaluation, plan checks, and reporting can save over 2 hours per patient plan.

"ClearCheck enhances the efficiency of treatment planning by instantly displaying all dose constraints of interest through customizable templates. ClearCheck's automation decreases confusion arising from numerous structures or non-intuitive dosevolume constraints and allows simultaneous cross-comparison of multiple constraints."

– Department of Radiation Oncology, Thomas Jefferson University Hospital

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