PARTNER
Iridium Kankernetwerk
Wilrijk, Belgium

CHALLENGE
Uncovering Errors with an
In-Vivo Dosimetry Program

SOLUTION
SunCHECK™ Patient

As a busy department providing ~5,600 radiation therapy treatments per year across four locations, Iridium Kankernetwerk sought to optimize its QA program through standardization and automation. A key objective was to develop an In-Vivo Monitoring program that would increase patient safety over the treatment course and meet evolving requirements for radiation treatments.

Their solution of choice: SunCHECK™ Patient.

WHY SunCHECK Patient?

SunCHECK Patient provides 2D and 3D measurement-based analysis for Pre-Treatment QA and In-Vivo Monitoring. Fully automated, it generates results from EPID and/or log files*.

The department appreciated SunCHECK Patient's ability to simplify and homogenize Pre-Treatment QA of complex plans, and to serve as a major improvement over In-Vivo diodes.

GETTING STARTED WITH SunCHECK Patient

Iridium Kankernetwerk put careful preparatory work into its clinical and operational workflow, dosimetric templates, and tolerances before implementing SunCHECK Patient:

- Deploying dosimetric templates to match Radiation Oncologist protocols
- Developing clinical implementation procedures
- Training relevant staff — physicists, dosimetrists, radiation oncologists and therapists

With preparation and training complete, they began clinical use of SunCHECK Patient on two linacs, ultimately implementing on all 10 of their delivery systems within five months.

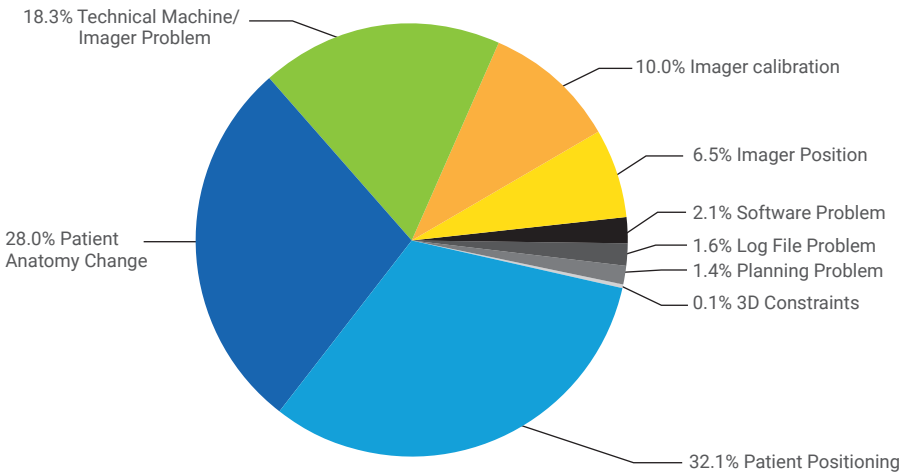
**Array-based option available with ArcCHECK® integration*

INFLUENCING PATIENT SAFETY

In its first two years using SunCHECK Patient, the department detected failures in 7% of 56,542 fractions analyzed. Of the treatments fractions where transit EPID dosimetry was performed (43%), 16% and 15% of fractions failed in the first and second year, respectively. In Year 1, these fractions were compared using relative analysis. In Year 2, absolute verification was introduced, allowing comparison of images to calculated data for enhanced error detection.

Causes of failed fractions included patient positioning, imager problems, patient anatomy changes, and more.*

Failed Fractions Causes: Year 2



7% of treatment fractions using SunCHECK Patient were determined to be failures

Gaining insights into treatment failures allowed the department to investigate and take corrective action.

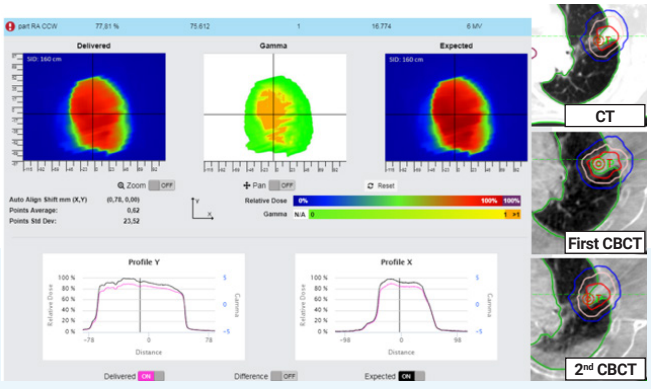
"We believe in-vivo monitoring based on log-files only is not sufficient for patient QA, especially if not also combined with CBCT images."

Evy Bossuyt, Medical Physicist,
Iridium Kankernetwerk

**Failures defined as results outside expected range of tolerance levels, as input into SunCHECK*

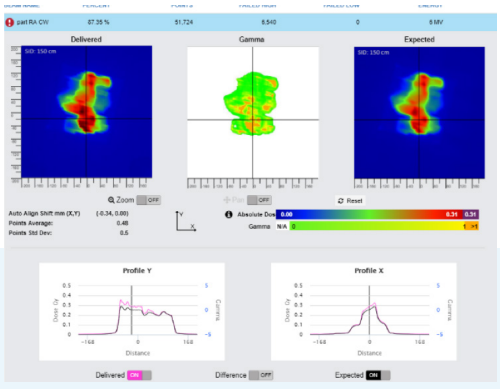
CORRECTING UNCOVERED ERRORS

Following are examples of errors and corrective actions taken by the Iridium Kankernetwerk team for infections, tumor shrinkage affecting OAR doses, misalignments, weight loss, equipment issues, intra-treatment positioning errors, and planning issues.



Error Uncovered: Dose difference caused by lung filling from pneumonia

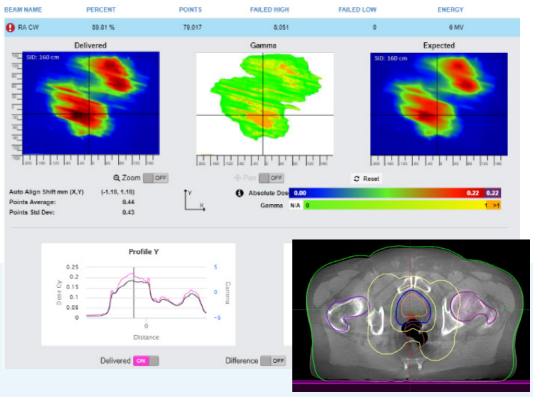
Corrective Action: Treatment with antibiotics



Error Uncovered: Dose difference due to weight loss

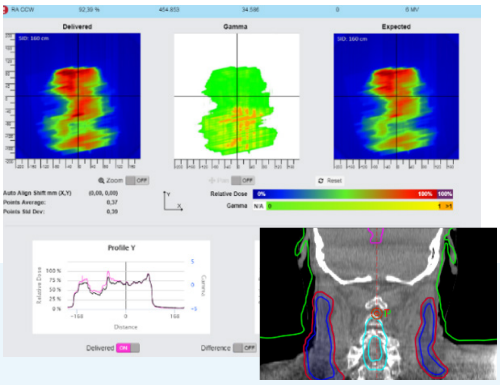
Corrective Action: New plan created on a new CT

SUN NUCLEAR corporation



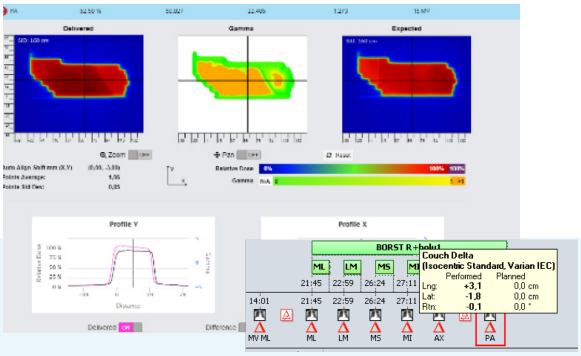
Error Uncovered: Dose difference due to inconsistent bladder and/or rectal filling

Corrective Action: Instructed patient on better preparation and diet information



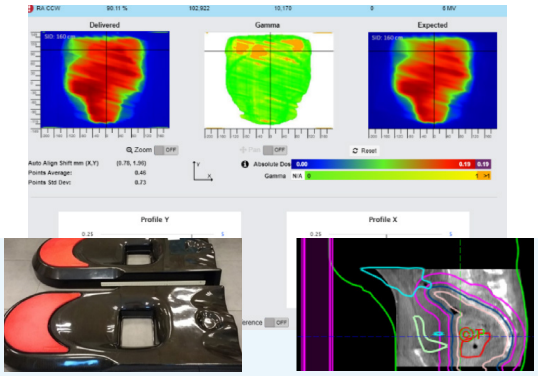
Error Uncovered: Dose difference result of shoulders being positioned too low, potentially resulting in too much spinal cord dose.

Corrective Action: Realigned patient in mask and put extra indicators on mask



Error Uncovered: Couch shifted to avoid linac collision, but couch was not returned to correct position

Corrective Action: Patient received an extra treatment of this field the following day



Error Uncovered: Belly boards were inconsistently labelled and therefore indexed differently in CT Simulation vs. Treatment Room

Corrective Action: Alerted manufacturer and stopped using erroneously labeled board

LONG-TERM PROCESS CHANGES

Beyond one-time corrective actions, the department implemented operational and workflow changes based on their findings using SunCHECK Patient, including:

- Updating breast treatment protocols to include extra imaging
- Implementing a follow-up protocol with dietitians for all rectum, stomach, and esophagus patients
- Discontinuing In-Vivo Dosimetry with diodes, except for total body irradiation treatments where the EPID cannot be used

In addition to detecting errors, the department saw immediate reductions in workload and time required for essential QA tasks, to be detailed in a forthcoming study assessing efficiency gains from the entire SunCHECK Platform.