PARTNER

Clatterbridge Cancer Centre
Liverpool, England
  • Two Facilities
  • 10 Linacs
  • 30+ Medical Physicsts

CHALLENGE

Better triage for most at-risk patients and a more efficient Machine QA workflow

SOLUTION

SunCHECK™ Platform for Quality Management

Upon review of their Patient QA and Machine QA workflows, the Clatterbridge Cancer Centre determined they could bolster patient safety and gain efficiency by automating processes with the SunCHECK Quality Management Platform.

THE CHALLENGE

Clatterbridge was looking to improve Patient QA workflow with first-fraction validation for every patient and in-vivo treatment validation to monitor minor anatomical changes between fractions. For SABR cases, where there are a low number of fractions with increased opportunity for error, the Centre wanted a more robust QA and monitoring solution.

Simultaneously, on the Machine side of their workflow, Clatterbridge understood that removing subjectivity and manual analysis from its image-based Machine QA would enable efficiency and standardization among staff and machines throughout its network. Automating the workflow would also assist with daily, monthly and annual QA for compliance with IPEM Report 81.*

THE SOLUTION

The Centre chose the SunCHECK Quality Management Platform to enhance its Patient and Machine QA workflows across staff and locations.

Within the Platform, SunCHECK Patient encompasses all parts of Patient QA including:

  • Secondary checks
  • Phantomless pre-treatment QA
  • In-vivo monitoring

SunCHECK Machine addresses critical Machine QA needs, including:

  • Template-driven daily, monthly & annual QA
  • Automated imaging, MLC and VMAT QA
  • Data trending

*Guiding UK report for radiotherapy, similar to AAPM TG-142 report

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Patient QA Goals Addressed:

- Providing More Robust QA for SABR Patients
- Validating the First Fraction for Each Patient
- Using In-Vivo Monitoring to Track Anatomical Changes between Fractions

MORE ROBUST PATIENT QA FOR HIGH RISK CASES

In implementing SunCHECK Patient, the Centre was interested in validating that the first fraction prescribed for its highest risk patients, particularly those requiring stereotactic ablative body radiotherapy (SABR), is correct.

"With SABR patients, where there are only three to five fractions, you have less room for error. In addition, there's a high degree of machine modulation and dose per fraction, which together add up to a greater risk of error. That amount of risk warrants increased QA and more robust monitoring," notes Robert Biggar, M.Sc., Principal Clinical Scientist at Clatterbridge.

These risks were a significant factor in deciding to implement SunCHECK. Now with SunCHECK Patient, the Centre can see if what was actually delivered to the patient in the first fraction matches the predicted transit dose, providing an additional layer of QA for patient safety.

EASING THE PROCESS TO MONITOR WEIGHT LOSS

Another goal with SunCHECK Patient is to streamline workflows for the tracking of anatomical changes, especially weight loss.

The Centre uses a 'help desk' triage system to handle issues that arise. When staff identify a head and neck case where the patient has lost ~1.5 cm on the axial CBCT, they create a task in the TPS to do a root cause assessment.

The Physicist first performs a manual subtraction from the original plan to determine tissue lost, and if a recalculation is required. This process takes approximately 20 minutes of Physicist time per patient. From this step, 1 in 5 weight loss cases are deemed to require a new CT, which involves bringing the Radiation Oncologist back in for planning consultation.

With SunCHECK Patient, Clatterbridge can set its baseline as the first fraction, and track subsequent fractions against that baseline. After some sensitivity testing with the software, the Centre has also defined a threshold that matches its current manual process.

According to Suzanne Wong, Ph.D., Senior Clinical Scientist, the Centre hopes to implement this new process with automation related to a weight loss threshold. With this change, the team will review weight loss issues only when a flag arises, enabling a more objective approach and better triage of critical cases requiring immediate intervention.
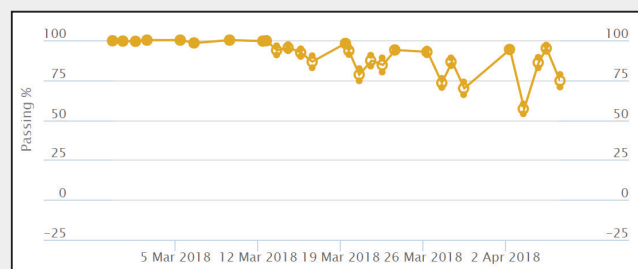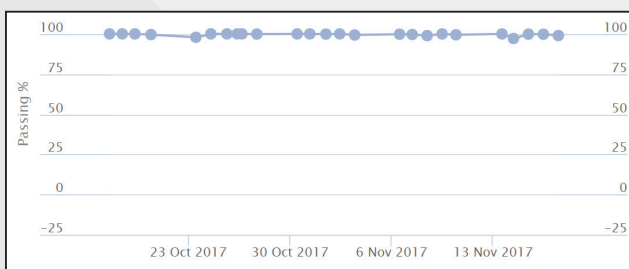
▶ *PerFRACTION Fraction n 2D gamma analysis (4%, 2mm) passing rates for an example H&N patient showing no weight loss (left) and another exhibiting clinically significant weight loss (right). Images have been compared to a baseline captured at patient's Fraction 1.*

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"Weight loss issues occupy much of this team's time that could be spent on other patients or research. Ideally our work should be more than simply assessment with minimal intervention. Automation frees us up to focus our expertise on the cases that really need it."

Robert Biggar, M.Sc., Principal Clinical Scientist,
Clatterbridge Cancer Centre

MANUAL WEIGHT-LOSS ASSESSMENT

Identify potential weight-loss reassessments

Create TPS task

Perform manual subtraction ~20 minutes per patient

Send cases requiring reassessment (~1 in 5) to Radiation Oncologist

TRIAGING WEIGHT-LOSS ASSESSMENT WITH SunCHECK PATIENT

Set up weight-loss baseline parameters

Automatically track each fraction from the baseline

Flag appears once threshold is met or exceeded

Send cases requiring reassessment (~1 in 5) to Radiation Oncologist

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Machine QA Goals Addressed:

- Removing Subjectivity and Manual Analysis from Image-Based QA
- Gaining Efficiency and Consistency Among Staff and Machines
- Using Machine Trending to Predict MLC Failure

IMMEDIATE ADVANTAGES FOR MACHINE QA

As a new SunCHECK user, the Centre began with three machines and immediately noticed very good agreement with previous QA results. Common measurements, now automated, resulted in significant time savings. Improvement in the analysis of visual tasks were immediately felt as well.

"A lot of the analysis we do on things like CatPHANs, picket fences, and VMAT QA, was being done manually — manually drawing on regions of interest and entering in results. Getting rid of that process with SunCHECK Machine resulted in huge time-savings from the start," notes Greg Martin, M.Sc., Senior Clinical Scientist at Clatterbridge.

The Centre found that they were able to perform more in-depth analysis, with results available near instantaneously -- resulting in improved efficiency and quality of QA performed. Next, they performed sensitivity testing, deliberately inputting erroneous performance metrics in certain tasks to compare the results to their previous manual results. Again, the Centre found SunCHECK Machine was as sensitive as their previous processes.

With confidence established, the Centre began a staged implementation of SunCHECK Machine — rolling out tasks with the most potential for efficiency gains first. The Centre then gradually continued to transition all tasks to SunCHECK Machine.

"What makes SunCHECK different or new compared to what we're used to, is the ability to automate processes where the level of automation previously was non-existent."

Robert Biggar, M.Sc.,
Principal Clinical Scientist,
Clatterbridge Cancer Centre

AN UNEXPECTED BENEFIT FROM TRENDING ANALYSIS

Clatterbridge uses SunCHECK Machine picket fence analysis to highlight consistently poorly performing MLC leaves on older linacs. Through the SunCHECK Machine trending analysis, they can observe the failure of these MLCs.

This newfound insight enabled the Centre's in-house engineers to use the SunCHECK Machine picket fence analysis to aid in scheduling preventative maintenance. Taking a proactive approach allows them to fix the leaves at a more convenient time, in an effort to reduce machine downtime during the clinical day.
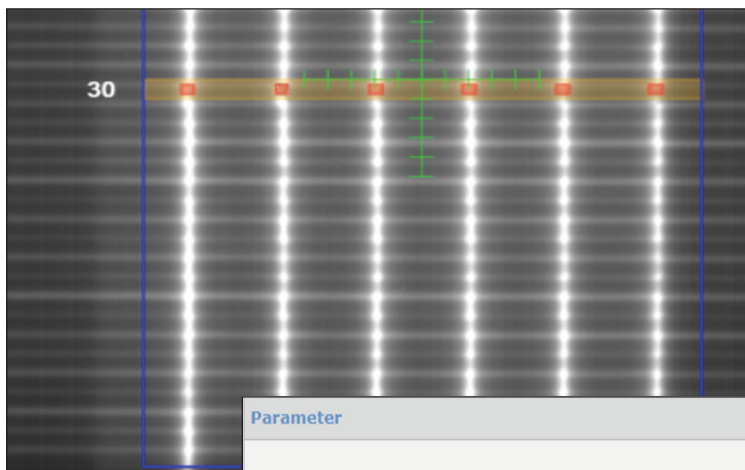
Parameter		Measurement	Baseline
Maximum leaf gap position error (mm)	📊	-0.53	-0.50

▶ *Automated Picket Fence test supports improved uptime through proactive scheduling of preventative maintenance*

"We try to get our downtime under two percent. In reality, like most centers, we're likely closer to five percent. With efficiencies gained from SunCHECK Machine and proactive understanding of potential machine failures, we can reduce machine failures and increase uptime."

***Greg Martin, M.Sc.,
Senior Clinical Scientist,***
Clatterbridge Cancer Centre

MOVING FORWARD

When Clatterbridge Cancer Centre opens its third site, the SunCHECK Platform will become the Quality Management hub of the three locations.

Since SunCHECK is web-based and does not require a local installation, the Clatterbridge team anticipates an easy set up of the new site. In addition, the efficiencies and automations the Centre has already gained with the SunCHECK Platform will innately transfer to the new facility.

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