Improving Patient Safety through Standardized, Automated Quality Management for Standard & SRS Treatments

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Comprehensive, Independent Quality Management Solutions

Patient Safety Starts Here®

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A Trusted Partner for Patient Safety
Hospitals and clinics worldwide choose Sun Nuclear.

WORLD-CLASS SUPPORT

130+ Countries with Sun Nuclear Solutions

CONTINUING EDUCATION

>90% of U.S. Cancer Treatment Centers Use Sun Nuclear Solutions

IN-DEPTH TRAINING

5,000+ Worldwide Cancer Treatment Facilities Use Sun Nuclear Solutions

1 Worldwide Market Leader in Radiation Oncology Quality Assurance
The Right Partner for Your Needs
Nearly 40 Years of Service to the Field

300 Associates Worldwide
- 25% of Staff in Customer Support
- 30% of Staff in Research & Development
- 50%+ Medical Physicists

4 Headquarters Facilities
- Melbourne, Florida – Global HQ & Training Center
- Madison, Wisconsin – Diagnostic QA HQ
- Hamburg, Germany – Sun Nuclear GmbH
- Breda, the Netherlands – SunServices™ Center - EMEA

State-of-the-art Manufacturing Facility, with Linac Testing Capabilities
ISO 13485:2016 certified QMS

Independence.
It’s the essence of everything we do.

Unrelenting
for safer, more effective treatments.
Independent Quality Management empowers clinical physicists to be guardians of Patient Safety, and to efficiently fulfill complex safety requirements.

Unbiased
for truth in data and analysis.

Unencumbered
to stay focused on catching errors.
In an expanding universe of imaging and treatment variables, Independent Quality Management detects and prevents clinically relevant errors – ensuring safety is never taken for granted.

“A critical aspect of a QA program is independence; that is, the QA procedures conducted to assure the quality and accuracy of the product or process must be independent of the product or process itself.”

It’s about time.

- Countless new RT modalities and techniques have been introduced in the last 30 years
- Independent QA tools have kept pace, but have arrived as separate packages and solutions
- With demands for increased patient throughput, improved quality of care and reduced operational costs, every minute counts

**SunCHECK™** provides flexible workflow automation for fully integrated and independent QA.

Globally, nearly 119 million treatment fractions were treated in 2012. By 2035, that number is expected to jump to at least 204 million per year.

_Lancet Oncology Commission, September 2015_
Integrated.
Independent.

• **Integrated QA** provides optimal workflow efficiency & standardization

• **Independent QA** provides unbiased assurance systemic & random issues will be caught

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**SunCHECK™**
Independent QA. Your Way.

- One Database for Radiation Therapy QA
- Speed and Efficiency through Automation
- Access from Anywhere
- Seamless Clinical Integration

- Physics and Dosimetric Plan Checks
- Secondary Checks
- Phantomless and Array-Based Pre-Treatment QA
- In-Vivo Monitoring

- Daily, Monthly, Annual QA
- Measurement Device Connectivity
- Imaging, VMAT, MLC QA
SunCHECK™ Quality Management Platform

SunCHECK standardizes Quality Management for all patients and machines, regardless of vendor or modality – a solution similar to your EMR and Oncology Information System

Single Platform form Machine and Patient QA: SunCHECK™

- Machine
  - Comprehensive TG142
  - Daily/Monthly/Annual
  - Includes Imaging
  - SNC Machine includes:
    - TG142 Imaging & MLC QA
    - VMAT QA

- Patient
  - PlanCHECK™
    - Physician DVH Protocols
    - Automated DVH Checks
    - Initial Physics Checks
  - DoseCHECK™
    - 3D Secondary Checks
  - PerFRACTION™
    - Pre-Treatment QA
    - In-Vivo QA
One Solution for Radiation Therapy QA: **SunCHECK™ Platform**

**Clinical Overview:**
- Complete, Comprehensive view of Patient and Machine QA
- User/permissions-based views and operation
- Single, browser-based application to access all functions and data
- Worklist-oriented dashboard
Independent Patient QA in a Single Workflow: **SunCHECK™ Patient**

Platform  
Patient  
Machine  

**Workflow to match your clinic:**
- Assure plan quality and validate performance vs. intent
- Calculated vs. planned dose calculations with 3D analysis
- Phantomless and Array-based Pre-Treatment QA analysis of plan deliverability
- Automatically analyze and verify patient setup, first fraction and ongoing fractions

Complete Machine QA in a Single Application: **SunCHECK™ Machine**

Platform  
Patient  
Machine  

**Streamlined Machine QA:**
- Daily, Monthly and Annual QA
- Pre-set templates provided by modality and support for QA protocols
- Direct Device connectivity
- Automated Imaging, MLC and VMAT QA analysis
SunCHECK Machine

ESTRO 2021, Time Savings

- PO-1720 SunCHECK Machine, an automated QA software solution: A centres 5 year experience evaluation, G. Martin1, K. Fogarty2,1, D. Egleston1, L. Howard1, M. Gilmore1, 1The Clatterbridge Cancer Centre, Medical Physics, Liverpool, United Kingdom; 2St. Lukes Radiation Oncology, Network, Medical Physics, Dublin, Ireland

- **Purpose or Objective:** Evaluate the key stages of the SunCHECK Machine implementation.....with 9 linacs and time saving quantification.

- **Time saved:** The time taken to complete QA measurements and analysis using legacy and SunCHECK Machine was compared (details in table).

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<table>
<thead>
<tr>
<th>SunCHECK Machine Requirement</th>
<th>Time saved per test</th>
<th>Time saved annually per test, per linac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly Picket Neat/SM-4SL/LS</td>
<td>7 mins</td>
<td>316 mins</td>
</tr>
<tr>
<td>Monthly TV and Blade positions</td>
<td>13 mins</td>
<td>156 mins</td>
</tr>
<tr>
<td>Monthly Treatment and Simulation</td>
<td>12 mins</td>
<td>42 mins</td>
</tr>
<tr>
<td>Monthly Field Quality</td>
<td>10 mins</td>
<td>42 mins</td>
</tr>
<tr>
<td>Monthly CTCT M1 and other</td>
<td>10 mins</td>
<td>100 mins</td>
</tr>
<tr>
<td>Three monthly Radiation Field size MCT and jaw</td>
<td>3 mins</td>
<td>100 mins</td>
</tr>
<tr>
<td>Six monthly Radiation field size</td>
<td>15 mins</td>
<td>150 mins</td>
</tr>
<tr>
<td>Annual Flatness/Symmetry (all gantry angles)</td>
<td>15 mins</td>
<td>50 mins</td>
</tr>
<tr>
<td>Field size at extended SSD</td>
<td>15 mins</td>
<td>15 mins</td>
</tr>
<tr>
<td>TOTAL</td>
<td>230 mins</td>
<td>170 mins</td>
</tr>
</tbody>
</table>

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**Why SunCHECK™**

- **Automate Workflows**
  - Automated Data Collection
  - Automated Analysis & Results
  - Automated Alerts & Notifications

- **Improve Efficiency**
  - More Time for High-Value Tasks
  - Network Wide Access
  - Direct Device Control & Analysis

- **Increase Standardization**
  - Standardized Patient QA Across All Prisma & Machine Types
  - Standardize Data, Analysis & Workflows
  - Identify Variability Between Sites, Staff, Linacs and More

- **Centralize Data & Management**
  - One Repository for all Data
  - Simplified Deployment
  - Easy Maintenance

- **Ensure Compliance**
  - Enable Accreditation via Auditing & Reporting
  - Apply Pre-Defined Protocols & Machine Tests
  - Satisfy Industry & Internal Requirements

- **Optimize Operations**
  - Reduce Risk with Confidence
  - Identify Variations Between Linacs & Staff
  - Predict & Prevent Downtime
Clinical Examples

Quality Management Applied: SunCHECK™ Results

- Continuous Improvement
- 56,000 delivery fractions
- Completely automated analysis
- 4,000 actionable errors discovered
- Corrective actions implemented

Iridium Kankernetwerk 2-Year Experience
A “How To” Guide on in vivo QA – AMARA Principle

• For in-vivo measurements we want to use an AMARA-principle: we want to detect errors, but only As Many As Reasonably Achievable, taking into account economic and societal factors.
  - Economic factors include costs of in-vivo systems and time spent on measuring and analyzing results
  - Societal factors include patient comfort - extending an imager during treatment is easier than using detectors for in vivo

• An AMARA-principle could be based on a few pillars:
  - Know the sensitivity, strengths and weaknesses of the system
  - Try to keep the number of false positives as low as possible and to automate their detection
  - Regularly evaluate tolerance levels, especially after introducing software or hardware changes e.g., tolerance levels could be made tighter when there is a software upgrade in which shifted imager positions can be taken into account or when the Clinacs are replaced by TrueBeams.

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<table>
<thead>
<tr>
<th>Clinical guidelines from 2-year, 56,000+ fraction experience</th>
<th>Gamma Criteria per Body Site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normalization (Local/Global)</td>
</tr>
<tr>
<td>Breast</td>
<td>Local</td>
</tr>
<tr>
<td>Whole Brain Radiotherapy</td>
<td>Local</td>
</tr>
<tr>
<td>Palliative treatments</td>
<td>Local</td>
</tr>
<tr>
<td>H&amp;N and Brain</td>
<td>Global</td>
</tr>
<tr>
<td>Rectum</td>
<td>Global</td>
</tr>
<tr>
<td>Other treatment sites with mask</td>
<td>Global</td>
</tr>
<tr>
<td>Other treatment sites without mask (including lung, pelvis, abdomen,...)</td>
<td>Global</td>
</tr>
<tr>
<td>Stereotactic 3mm</td>
<td>Local</td>
</tr>
<tr>
<td>Stereotactic 2mm</td>
<td>Local</td>
</tr>
<tr>
<td>Stereotactic 3mm</td>
<td>Local</td>
</tr>
</tbody>
</table>
Pass Rates & Cause of Failure

- % Anatomy Change Patient
- % Positioning Patient
- % Planning Problem
- % False Positives
- % Number Passed

Note: There were considerably more False Positives on the clinic’s older linac

Actions Taken

- **Tolerances Adjusted**
  Mainly extremities
- **No Action**
  Random error or not clinically important
- **Patient Preparation**
  Bladder/rectal filling
- **Plan Adjustment**
  Adaptive planning
- **Extra Imaging**
  To assist Therapists in proper alignment
- **New Measurement**
  Unsure of cause, event unlikely to recur, etc.
**Head & Neck Weight Loss Study**

**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 parameter from the baseline
- Flag appears once threshold is met or exceeded
- Send cases requiring reassessment (~1 in 5) to Radiation Oncologist

*Weight loss issues occupy much of this team’s time that could be spent on other patients or research. Ideally our work would 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*
Patient-Specific QA: “Field of View”

There are hazards to focusing on only one type of error, and selecting a QA method based on that narrow focus.

By broadening intended scope, other QA methods clearly become more appropriate.

And clinically actionable.

SRS MapCHECK™
StereoPHAN™ & MultiMet-WL Cube
**StereoPHAN™ Platform Key Developments**

**SRS MapCHECK™**  
*Released May 2018*  
Unmatched detector resolution for *filmless* SRS/SBRT QA

**MultiMet-WL Cube**  
*Released September 2019*  
Assures targeting accuracy for *off-axis* SRS targets

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**SRS MapCHECK™**

- Small-field digital alternative to film for SRS and SBRT QA and end-to-end testing
  - Array Size: 7.7 x 7.7cm
  - Detectors: 1,013
  - Active Detector Area (mm): 0.48 x 0.48
    - Volume 0.007 mm³
  - Detector spacing: 2.47 mm
    - 5 Diodes in 5 mm cone
  - No film needed
    - Significant time-savings
SRS MapCHECK™ // SNC Patient v8.3

- Supported by SNC Patient software, as part of end-to-end solution
- Software corrections for well-known diode response characteristics:
  - Angular Dependence → meets TG 218 requirements
  - Field size
  - Temperature
  - Dose rate

Released September 2019:
SNC Patient v8.3

Enhanced capabilities to support:
- CyberKnife®
- Varian HyperArc™
- Vertex delivery beams for Varian/Elekta

SNC Patient v8.4 // Additional Functionality

- Enhanced SRS MapCHECK support:
  - QA Setup Tool
  - Improved Multi-Met set up
    - Preview dose on SRS MC before delivery
    - Provides complete guidance for positioning of SRS MC for off isocenter workflows
  - Off-axis workflow
  - Halcyon Support
  - 10x/FFF Support (including >45deg)
SNC Patient v8.5 // Additional Functionality

- CyberKnife® Machine QA with SRS MapCHECK®
  - MLC QA Garden Fence Test
  - Iris Beam QA Test
  - Daily Targeting Accuracy QA Test
  - MLC and Fixed Cone Beam QA
- Expanded Support
  - SRS MapCHECK®
    - Varian Medical Systems® Ethos™ Therapy and Accuray®
    - TomoTherapy® and Radixact™ System Support*
  - ArcCHECK®
    - Varian Medical Systems® Halcyon™ System and Ethos™ Therapy, Accuray® Radixact™ Support*
- New Data Security Features
  - User log in, Event Tracking, Windows recommended installation

*Does not include Synchrony for CyberKnife or Tomotherapy

CyberKnife® Machine QA with SRS MapCHECK®

MLC QA

- Measure offsets from expected for 52 leaves at each of the 5 positions
- Apply Bayouth Test criteria
  - Total mean offset
  - % Passing for all offsets
  - # Offsets > Max
  - # Offsets per leaf
- View pass/fail and histogram of results
- Customize error thresholds
- Print report of analysis results
Streamline Your Workflow

Recent SRS MapCHECK webinars and publications

Independent QA: catching, understanding and correcting errors before radiotherapy begin

"Independent QA not only ensures delivery of intended therapeutic dose, it drives continuous improvement in patient safety by rooting out systematic machine and workflow errors"
Imaging Accuracy – Spatial Accuracy and Fusion

SNC StereoPHAN with CT/MRI insert
- Simple qualitative assessment of spatial accuracy
- Test of image registration tools
- Small structure(s) for targeting in end-to-end tests
CIRS Cranial SRS Distortion Phantom

Cranial SRS Phantom to characterize your MRI distortion for your SRS program

What’s New in SRS QA...
MultiMet-WL Cube // Released September 2019

- New StereoPHAN insert
- Off-axis W/L test
- Quantifies accuracy out to 7cm off-axis
  - 0.1mm precision
- Automated Analysis Software Included
- Integration into SunCHECK Machine – Future

MultiMet-WL Cube // Design

Six targets enable quantifying the margin of error up to 7 cm off-axis
MultiMet-WL Cube // Test Execution

- Off-axis target accuracy
- RT Plan provided
- Automated multi-target results

Register today: qasympiosum.com

QADS begins in 2 weeks – Register now to save your spot!
Thank You,

Questions?