SGRT BIG BENEFITS BETTER WORKFLOWS

SURFACE GUIDED RADIATION THERAPY
SGRT COMMUNITY

Step-by-Step Guide to Commissioning SGRT

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Step-By-Step Guide to Commissioning SGRT

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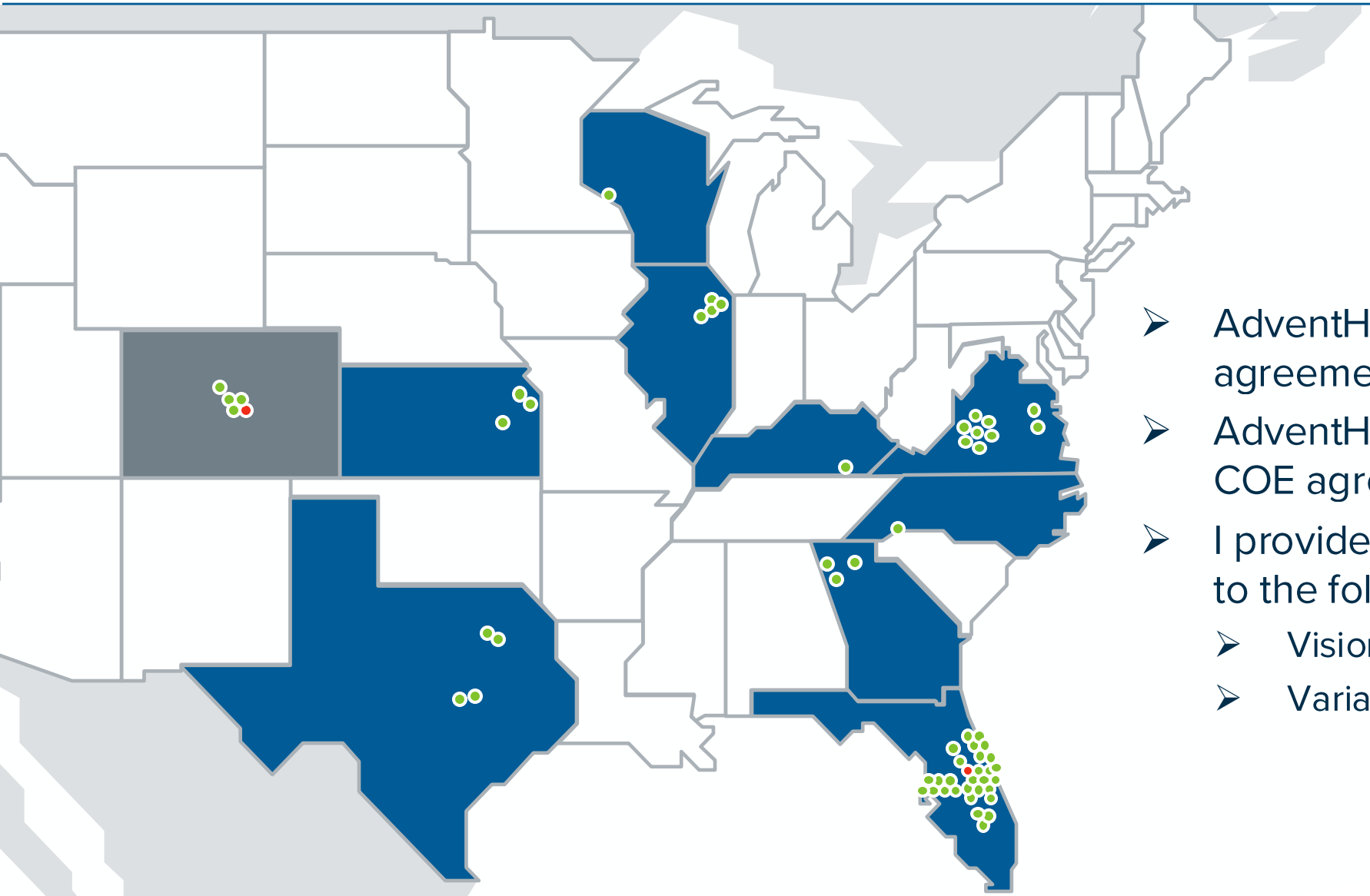
Disclosures



- AdventHealth – Parker has a PSA agreement with Vision RT.
- AdventHealth – Celebration has a COE agreement with Vision RT.
- I provide physics consultation services to the following vendors
  - Vision RT
  - Varian Medical Systems

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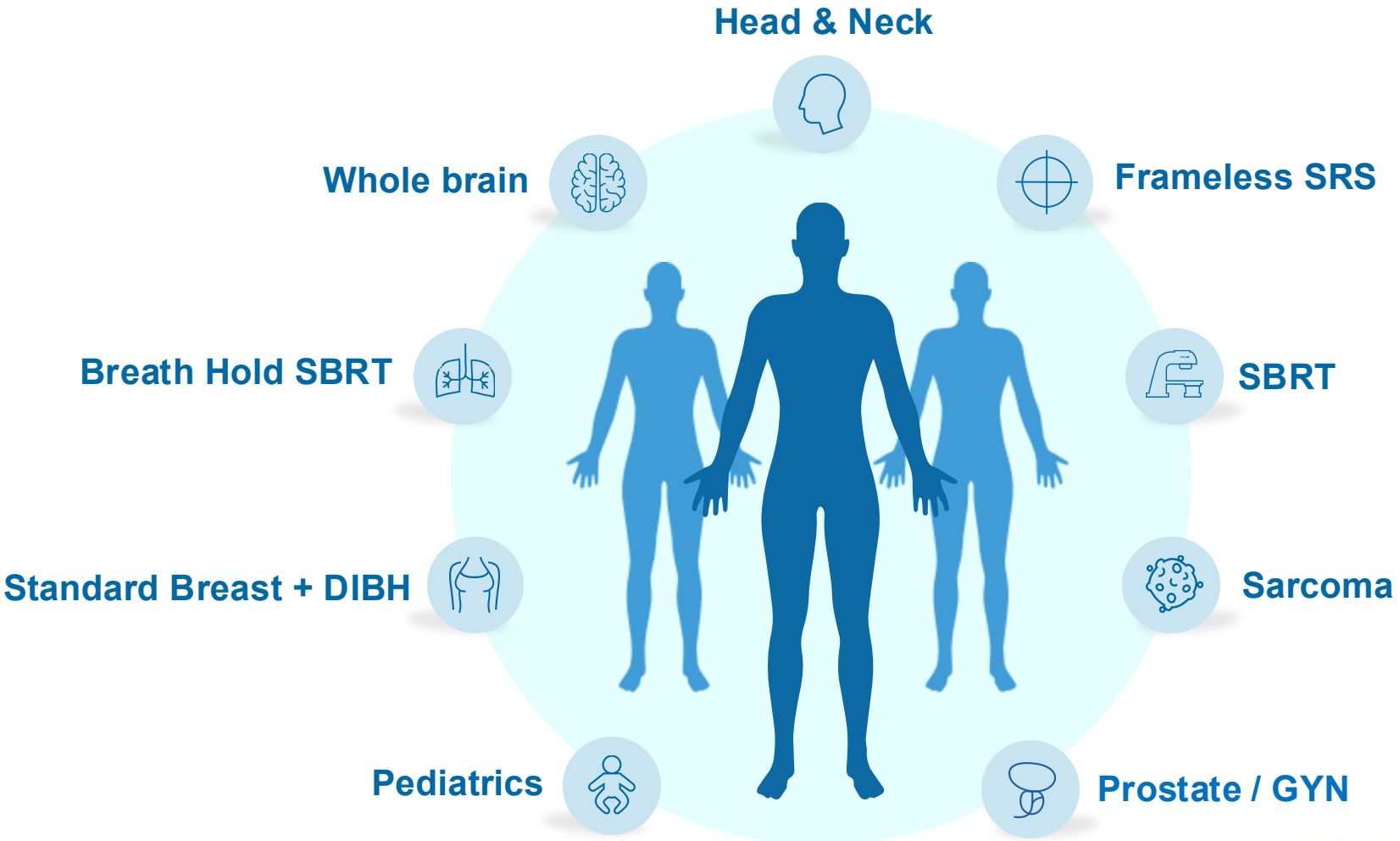
SGRT Applications: Every Patient Every Fraction



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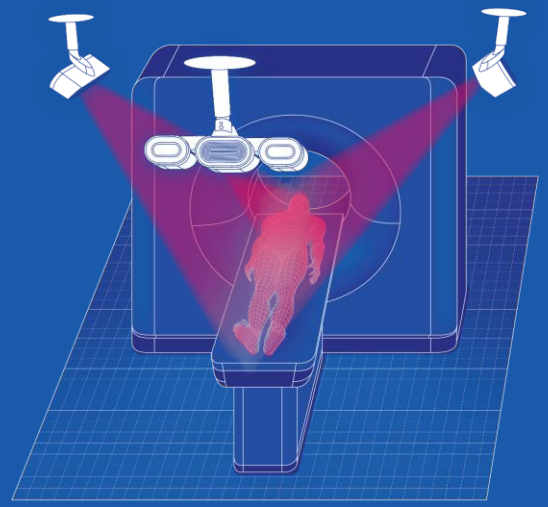
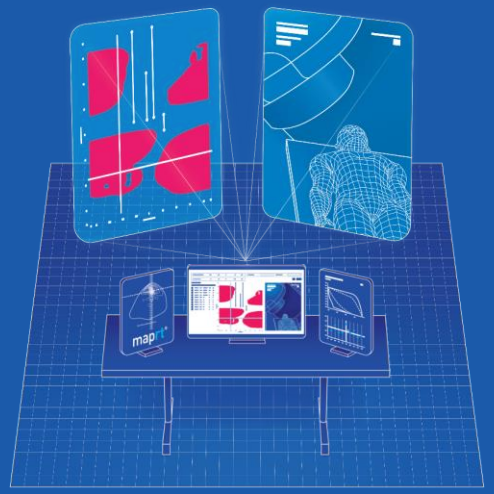
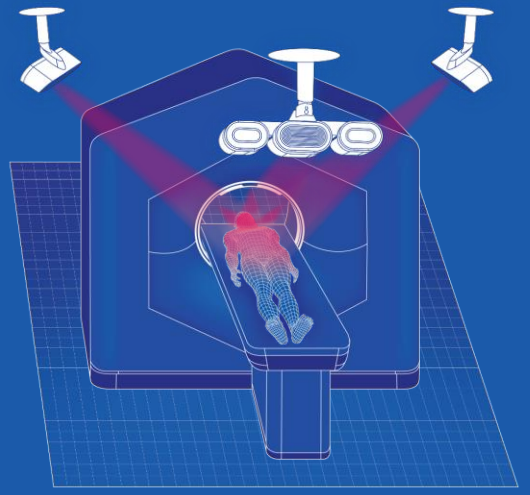
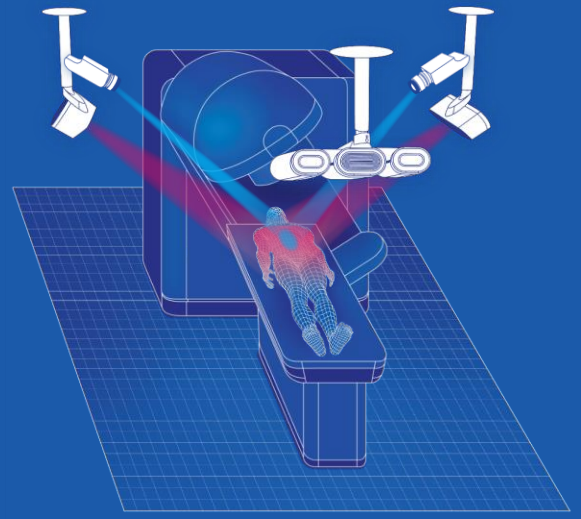
AdventHealth's SGRT Portfolio

SGRT Use of surface guidance to help improve the safety, effectiveness and efficiency of the *entire* radiation therapy workflow

SIM	PLAN	TREAT	DOSE
			
4D AND BREATH HOLD CT	CLEARANCE MAPPING	MOTION MANAGEMENT	DOSE VISUALIZATION
simrt™	maprt®	alignrt® *InBore*™	alignrt® dosert™ Powered by BeamSite®

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Given Objectives

Share a step-by-step commissioning process with people who do not yet have SGRT or who are in the process of implementing SGRT.

AI: Show me someone excited to see something new

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Given Objectives

Keep this simple to show how easy it is.

AI: Show me someone surprised how easy something is

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Given Objectives

Don’t overwhelm them!

AI: Show me someone surprised and excited but not overwhelmed

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Given Objectives

If you could create a basic protocol / checklist / cheat sheet to leave with them, that would be great!

AI: Show me someone excited to receive something

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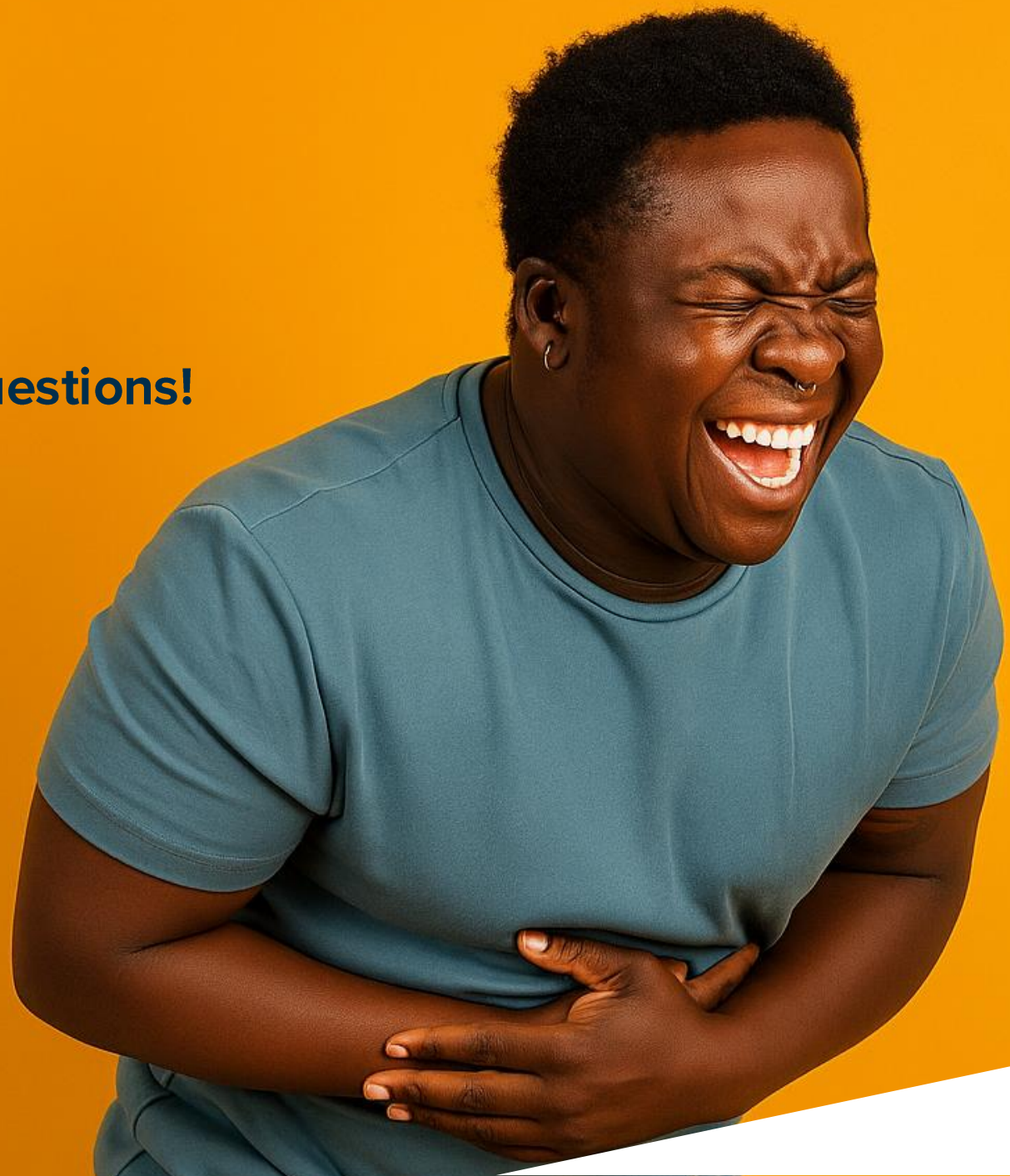
Given Objectives

You have 20 minutes…GO!

Oh…and leave time for questions!



AI: Show me someone who must deliver the attached talk in 20 minutes

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How do I plan to do all that?

Summarize clinically relevant guidelines on Surface Guided Radiation Therapy (SGRT) program implementation

Review Preinstallation and Project Management consideration for success (often overlooked).

Summarize commissioning and ongoing quality assurance (QA) requirements for SGRT systems.

Provide Preinstallation, Commissioning, and ongoing Performance Evaluation steps that can lead to successful SGRT program.

❑ **Items marked like this can be viewed as a checklist items.**

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Guidelines: TG-302

Purpose:

Provide standardized recommendations for the safe and effective clinical implementation of Surface Guided Radiation Therapy (SGRT).

Key Components and Recommendations :

- **Commissioning and QA**: Define performance checks, calibration frequency, and tolerances.
- **Workflow Integration**: Establish SGRT roles in setup, monitoring, and gating.
- **Clinical Applications**: Head & neck, breast, SRS/SBRT, DIBH, and motion management.
- **Documentation & Training**: Ensure consistent staff competency and protocol adherence.
- **Primary Goal**: Enhance patient safety, accuracy, and efficiency through evidence-based SGRT practices.

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AAPM SCIENTIFIC REPORT

MEDICAL PHYSICS

AAPM task group report 302: Surface-guided radiotherapy

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Abstract

The clinical use of surface imaging has increased dramatically, with demonstrated utility for initial patient positioning, real-time motion monitoring, and beam gating in a variety of anatomical sites. The Therapy Physics Subcommittee and the Imaging for Treatment Verification Working Group of the American Association of Physicists in Medicine commissioned Task Group 302 to review the current clinical uses of surface imaging and emerging clinical applications. The specific charge of this task group was to provide technical guidelines for clinical indications of use for general positioning, breast deep-inspiration breath hold treatment, and frameless stereotactic radiosurgery. Additionally, the task group was charged with providing commissioning and on-going quality assurance (QA) requirements for surface-guided radiation therapy (SGRT) as part of a comprehensive QA program including risk assessment. Workflow considerations for other anatomic sites and for computed tomography simulation, including motion management, are also discussed. Finally, developing clinical applications, such as stereotactic body radiotherapy (SBRT) or proton radiotherapy, are presented. The recommendations made in this report, which are summarized at the end of the report, are applicable to all video-based SGRT systems available at the time of writing.

KEYWORDS
deep inspiration breath hold, frameless radiosurgery, risk assessment, surface guided radiotherapy

The 1 mm translational and 0.5° rotational accuracy are the key acceptance and commissioning targets.

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Guidelines: ESTRO-ACROP

Purpose:

The ESTRO-ACROP guideline on surface guided radiation therapy (SGRT) was developed to provide expert recommendations for the safe and effective implementation, commissioning, procurement, and clinical application of SGRT systems across radiation oncology practice.

Key Components and Recommendations:

- **Acceptance testing and Commissioning**: using end-to-end tests that verify SGRT accuracy versus standard imaging and treatment isocenter localization
- **Clearly Define Roles**: Radiation therapists, medical physicists, and physicians for SGRT operation, training, troubleshooting, and oversight.
- **Workflows**: Implement workflows for patient setup, motion management, and tracking specific to treatment site and technique.
- **Primary Goal**: Integrate SGRT QA into routine practice

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Guidelines

ESTRO-ACROP guideline on surface guided radiation therapy

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ABSTRACT

Surface guidance systems enable patient positioning and motion monitoring without using ionising radiation. Surface Guided Radiation Therapy (SGRT) has therefore been widely adopted in radiation therapy in recent years, but guidelines on workflows and specific quality assurance (QA) are lacking. This ESTRO-ACROP guideline aims to give recommendations concerning SGRT roles and responsibilities and highlights common challenges and potential errors. Comprehensive guidelines for procurement, acceptance, commissioning, and QA of SGRT systems installed on computed tomography (CT) simulators, C-arm linacs, closed-bore linacs, and particle therapy treatment systems are presented that will help move to a consensus among SGRT users and facilitate a safe and efficient implementation and clinical application of SGRT.

Surface Guided Radiation Therapy (SGRT) is a relatively recent technology that was added to existing image guidance systems. SGRT typically uses visible structured light, stereo-vision systems, time-of-flight systems, or laser scanners to image the surface of a patient with high temporal and spatial resolution without additional radiation dose [1,2].

Generally, the systems employ multiple cameras and through the principle of triangulation, they can reconstruct a three-dimensional representation of the patient's surface (referred to as surface) that is related to the treatment coordinate system and, in some systems, also calculate the treatment isocentre location within that surface. The surface is updated in real-time by the system during patient setup and treatment delivery. For setup this can improve accuracy and workflow. During delivery any inconsistencies between the surface ('live' surface) and the reference surface can be detected in real-time [3]. The reference surface is based on the computed tomography (CT) scan acquired for treatment planning or a surface image obtained earlier with the SGRT system.

The main technical advantages of SGRT systems are that they use non-ionizing radiation and that they offer near real-time monitoring with a large field-of-view (FOV) compared to other in-room imaging systems, with additional possibilities of introducing tattoo-free and open-mask or mask-free workflows. The visual information provided by SGRT is intuitive and may increase patient safety [4]. One limitation of surface-based systems is that they only image the patient's external surface and the correlation to the internal anatomy remains uncertain. Additionally, the patient's skin needs to be exposed, which can provide challenges in terms of privacy and comfort, but also in the presence of fixation devices such as masks.

Abbreviations: 2D, 2-dimensional; 3D, 3-dimensional; 4D, 4-dimensional; 4DCT, respiratory-correlated computed tomography; 6DoF, six degrees of freedom; CBCT, cone beam computed tomography; CT, computed tomography; DIBH, deep inspiration breath hold; FB, free-breathing; FMEA, Failure modes and effects analysis; FOV, field-of-view; IGRT, Image-guided radiotherapy; kV, kilovoltage; MDT, multidisciplinary team; MPE, Medical Physics Expert; MV, megavoltage; OIS, oncology information system; QA, quality assurance; R&V, record and verify; RO, Radiation Oncologist; ROI, region-of-interest; RT, radiation therapy; RTT, radiation therapist; SBRT, stereotactic body radiation therapy; SGRT, Surface Guided Radiation Therapy; SOP, standard operating procedure; SRS, stereotactic radiosurgery.

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0167-8140/

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Guidelines: Preinstallation and Project Management

Site Survey and Preparation:

- ❑ Confirm treatment/simulation room dimensions meet manufacturer specifications for camera placement and patient positioning.
- ❑ Ensure clear ceiling space for camera/mount installation (no obstructions such as lights/vents in installation zones).
- ❑ Verify wall, ceiling, and floor surfaces are suitable for secure equipment mounting.
- ❑ Assess ambient light exposure; limit direct sunlight and reflections that may affect camera operation
- ❑ Review and mark exact locations for all ceiling/wall camera pods, calibration fixtures, and monitors per vendor's schematic layouts.
- ❑ Validate sightlines from camera pods to treatment couch and to patient positioning area—no persistent obstructions.

Power and Network Infrastructure:

- ❑ Check availability of grounded electrical outlets and UPS backup for all system components.
- ❑ Verify local IT infrastructure supports required wired/wireless connectivity for system operation and integration with oncology information systems.
- ❑ Ensure secure cable routing paths between cameras, control unit, and workstations.

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Guidelines: Preinstallation and Project Management

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Guidelines: Preinstallation and Project Management

Environmental Controls:

- ❑ Confirm HVAC maintains operating temperature and humidity within vendor-specified limits and HVAC locations within the ceiling are appropriate.
- ❑ Ensure the area is free from dust, excessive vibrations, or chemical vapors

Radiation and Imaging Integration:

- ❑ Verify compatibility with treatment machine isocenter and couch movement (ensure sufficient clearance and alignment capability).
- ❑ Check for physical space to mount real-time coaching or feedback devices (e.g., display monitors).

Staff and Documentation:

- ❑ Ensure installation team (vendor and facility technical staff) are scheduled and aware of environment preparation needs.
- ❑ Ensure all equipment shipping documents, vendor installation guides, and site acceptance criteria are reviewed and available.
- ❑ Gather contact information for vendor technical support.
- ❑ **Ensure all project teams (i.e. the vendor, physics team, network IT, construction…etc.) meet to ensure timelines and responsibilities are understood.**

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Guidelines: Phases of SGRT Commissioning

Acceptance:

It is important to keep in mind that acceptance tests demonstrate only that the equipment is working as per the vendor specification and that any third-party connectivity is functional.

Vendor IPA testing is generally very superficial and often not sufficient even for acceptance level standards.

Commissioning:

Includes measuring the system accuracy, determining system limitations, and developing operating procedures and QA schedules.

Some of these tests will be completed as part of the acceptance test with the vendor; however, in most cases, the acceptance test is at the discretion of the vendor and may not satisfy all clinical recommended quality assurance

Performance Evaluation:

Validation of software and analysis tools under as many clinically relevant conditions as possible

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Guidelines: Clinical Implementation

01

Commissioning

This includes measuring the system accuracy, **determining system limitations,** and developing operating procedures and QA schedules.

02

Performance Validation

An assessment of the performance of the system under various clinically relevant conditions and **is an ongoing process**

Examples (DIBH SBRT, SRS in BOS and High Neck…etc)

“Can the system be safely and effectively used?”

- Perform end-to-end testing of complete workflows.
- Conduct staff training and competency validation.
- Develop standard operating procedures (SOPs) for each treatment site.
- Begin clinical use under supervision, followed by periodic QA and peer review.

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Commissioning: High-Level (KISS)

Purpose

Establish a baseline reference confirming that the SGRT system performs within specifications and integrates correctly with all treatment systems prior to clinical use.

Core Objectives

- ❑ Verify hardware calibration (cameras, pods, and geometry)
- ❑ Confirm software registration accuracy and coordinate system integrity
- ❑ Validate integration with linac, imaging, and couch control systems
- ❑ Assess workflow reproducibility for typical clinical scenarios
- ❑ Establish baseline performance metrics for future QA comparisons

Documentation Essentials

- ❑ Test matrix: scope, equipment, expected tolerance, result
- ❑ Photographic or screenshot records for each test
- ❑ Integration checklist (couch, beam hold, DICOM connectivity)
- ❑ Reference baseline file archived for longitudinal QA

Commissioning Philosophy

- Commissioning ≠ simple acceptance — it's a comprehensive end-to-end validation.
- All tests should be traceable, repeatable, and documented.
- Use independent measurements (e.g., imaging isocenter) wherever possible.
- Include static and dynamic tests (patient setup, motion tracking, couch motion).
- Follow TG-302 performance benchmarks (**≤1 mm, ≤0.5°**) as commissioning tolerances.

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Daily QA: High-Level (KISS)

Purpose

Establish a baseline reference confirming that the SGRT system performs within specifications and integrates correctly with all treatment systems prior to clinical use.

Core Objectives

- ✓ **Verify hardware calibration (cameras, pods, and geometry)**
- ✓ **Confirm software registration accuracy and coordinate system integrity**
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- ✓ **Follow TG-302 performance benchmarks (≤1 mm, ≤0.5°) as commissioning tolerances.**

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Stepwise SGRT E2E commissioning report template

Project Details

- ❑ Institution/Facility Name
- ❑ SGRT System/Model
- ❑ LINAC/Imaging System
- ❑ Commissioning Date(s)
- ❑ Personnel and Roles

1. Preparation and Documentation

- ❑ Review and approve clinical commissioning protocol and acceptance criteria
- ❑ Obtain manufacturer manuals and AAPM TG-302/ESTRO-ACROP guidelines
- ❑ Verify QA phantom(s) acquisition and readiness
- ❑ Record make/model/serials for all equipment used

2. System Installation and Initial Calibration

- ❑ Inspect camera alignment, calibration plates/tools, and hardware connectivity
- ❑ Complete manufacturer-recommended calibration (thermal, geometric, etc.)
- ❑ Verify network/software integration with LINAC and record systems

3. Phantom Imaging and Treatment Planning

- ❑ Scan geometric / anthropomorphic / dynamic phantom(s) using planning CT
- ❑ Generate clinical treatment plans (IMRT, VMAT, DIBH/gated, SRS/SBRT as applicable)
- ❑ Save/print plans and export to LINAC/SRGRT system

4. Setup and Spatial Localization Accuracy

- ❑ Register phantom using SGRT reference workflow—define ROIs
- ❑ Confirm initial alignment with room lasers
- ❑ Record SGRT-indicated translational/rotational offsets
- ❑ Acquire kV/MV and/or CBCT images for isocenter congruence check
- ❑ Compare SGRT vs. image-guided setup, document deviations (mm/deg)
- ❑ Repeat with multiple set-ups for reproducibility (≥3 runs)

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Stepwise SGRT E2E commissioning report template

5. Dosimetric Accuracy (End-to-End)

- ❑ Position phantom accurately using SGRT workflow
- ❑ Deliver treatment as per clinical plan
- ❑ Measure delivered dose with embedded detectors/film
- ❑ Compare measured dose to TPS predictions
- ❑ Document point dose (% deviation) and gamma analysis pass rate

6. Dynamic and Motion Management (if applicable)

- ❑ Test gating/beam-hold with dynamic phantom (simulate respiratory traces)
- ❑ Record SGRT gating accuracy and latency (ms)
- ❑ Verify correct response to intentional motion errors

7. Quality Assurance Procedures

- ❑ Perform daily system checks (plate positioning, system readiness)
- ❑ Establish monthly/annual QA routines per TG-302
- ❑ Document pass/fail and values for each routine check

8. Analysis, Documentation, and Sign-off

- ❑ Tabulate all spatial, dosimetric, and repeatability data
- ❑ List and address any non-conformance/corrective action
- ❑ Attach screenshots/plots/data output as supporting evidence
- ❑ Obtain signatures from responsible physicist(s) and team

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Stepwise SGRT E2E commissioning report template

5. Dosimetric Accuracy (End-to-End)

- ❑ Position phantom accurately using SGRT workflow
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Controversial Opinion: This is optional

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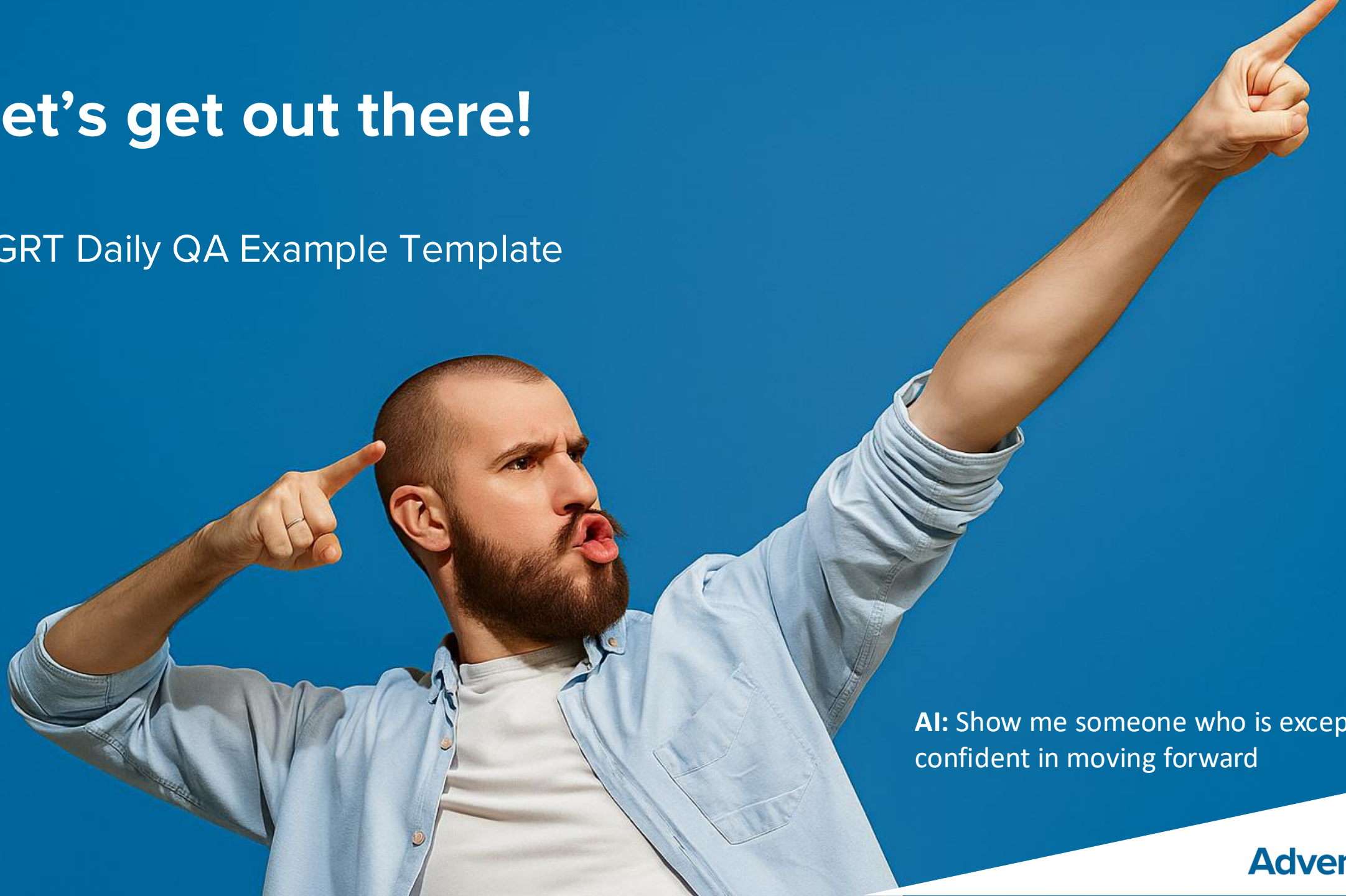
Let’s get out there!

SGRT Daily QA Example Template



AI: Show me someone who is exceptionally confident in moving forward

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Daily QA Phantom CT Scanning (Example)

- ❑ Setup the **Vision RT MV Calibration Cube** (the cube) on your CT couch using the 45-degree rotated orientation in the supplied base plate
  - Use your calibrated lasers or a couch index bar to eliminate any yaw angular deviations in the setup
- ❑ Level the cube using the base plate so that it has as little roll and pitch as possible.
  - You can use the Bull's eye spirit level embedded in the base plate or an external high precision digital level or inclinometer to remove these angular deviations.

NOTE: If you do not have the Vision RT MV Calibration Cube you can use another vendors cube phantom (there are many others often used for TG-142 morning QA like the Standard Imaging MIMI cube shown below).

If you choose to use another vendor's cube phantom be sure to mark the diagonals in the 45-degree rotated geometry and indicate the direction of the gantry (if the phantom does not already provide such markings) so that the therapists can reproduce the scanned geometry during setup. If the alternate phantom does not provide leveling capability, you should take care to remove as much rotational uncertainty from the setup prior to scanning the phantom while maintaining ease of setup for the therapists performing the daily QA procedure.

- ❑ Once the cube is set up properly, zero your couch as required by your CT vendor and move the cube into the bore in preparation to scan it.
- ❑ Scan the cube using an SRS or other thin slice CT protocol (1.0mm – 1.5mm slice thickness)
- ❑ Once the scan is complete push the CT dataset to your TPS for preparation of the Daily QA plans.

Daily QA Phantom Treatment Plan Creation

- ❑ Import the CT dataset of the cube into your treatment planning system (TPS) making sure that the Patient Name is a clear indication that this is a QA patient used during Daily QA (i.e. DailyQA^SGRT…etc.) and has all required fields for use in both your OIS and the AlignRT systems (i.e. First Name, Last Name, MRN, Birth Date…etc.).
- ❑ If your TPS allows for zeroing of the coordinate system by moving of the ***User Origin*** (e.g. Varian Eclipse) or the DICOM origin it is suggested that the **x=0, y=0, z=0** location be defined at the center of the central sphere of the phantom (sphere 3 below).

NOTE: If you are using another vendor's TG-142 compatible cube phantom place x=0, y=0, z=0 at the central feature of the phantom (usually marked with a BB or other high-density marker that can be seen on CT.

- ❑ Contour the **Body / External** structure in the TPS using your standard clinical process making sure the entire cube is included in the **Body / External** structure.

NOTE: If you do not use an automated detection algorithm to construct a **Body / External** structure in routine clinical practice you should use an automated detection algorithm like HU thresholding for the QA plans to achieve best results.

DO NOT MANUALLY CONTOUR THE BODY / EXTERNAL STRUCTURE

- ❑ It is not required to have more than the **Body / External** structure defined in the Daily QA plans however if you wish to incorporate additional TG-147 checks into your **Surface Guided Radiation Therapy (SGRT)** Daily QA process you may add additional structures, contours, points or support structures while contouring the CT dataset to help in these checks.

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Daily QA Phantom Plan Creation (Example)

- ❑ Create a treatment plan with at least 1 treatment field (and 1 CBCT imaging field if your system requires imaging fields to be included in the treatment plan) centered on the central sphere of the cube phantom. If your TPS allows you to zero the coordinates at this location, as instructed in step 2 of this section, the isocenter coordinate should be (**x=0, y=0, z=0**)

  NOTE: You can incorporate additional TG-142 checks into your SGRT Daily QA for efficiency gains. These checks may require additional fields to be placed in the plan to capture specific data.

  - You may use different or a combination of approaches to locate the isocenter in the center of the central sphere
    - If visible in the CT dataset, you can use the external markings on the cube to localize isocenter placement in the sup/inf, left/right, and ant/post orientations
    - If you have accurately contoured the central sphere, you can move the isocenter to the center of the central sphere contour if your TPS provides this functionality.
    - If your TPS allows you to zero the coordinates at this location, as instructed in step 2 of this section, you can override the coordinates for the field isocenter by typing in the values **x=0, y=0, z=0**
  - Additional daily checks can be added to the SGRT Daily QA but may require additional fields to be placed in the plan.
- ❑ Name the plan something that will help the person performing the Daily QA checks to identify where the isocenter is located (i.e. Central Iso, Centered, Coincidence…etc.)
- ❑ Create a second plan with a field located at a known offset from the first plan in all three translational degrees of freedom (i.e. 0.5cm in the “x” direction, -1.0cm in the “y” direction, and 1.5cm in the “z” direction)

Daily QA Phantom Plan Creation (Example)

NOTE: The magnitude of the offsets are not important but should be unique for ease of identification and small enough to avoid having to enter the room to apply them (i.e. keep shifts below machine tolerances that prevent auto motions from outside the room).

The offsets do not need to result in the field being aligned to another sphere or other internal landmark of the cube. The offset location only needs to be different from the central isocenter location setup in the first plan from section 5 above.

- ❑ Name the second plan something that will help the person performing the Daily QA checks to identify where the isocenter is located (i.e. Offset Iso, Shifted, Offset…etc.)
- ❑ When both the Central plan (plan 1) and the Offset plan (plan 2) are completed, finish preparing the plans for delivery on the treatment machine.

Depending on your TPS requirements and how you wish to deliver the plans (i.e. DICOM RT mode, Machine QA mode, through an OIS like Aria or Mosaiq…etc.) this may require:

- Entering Rx dose and fractionation information
- Setting a primary reference point
- Dose calculation to get valid Mus
- Scheduling treatment sessions
- Approving the plan
- Etc.

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Daily QA Phantom Plan Creation (Example)

- ❑ Export both plans to AlignRT for use during the SGRT Daily QA process
- ❑ Prepare plans for delivery on the treatment machine
    - Schedule treatment or QA sessions in your OIS

      CAUTION: This can result in large patient files for Daily QA patients who are run through the OIS and may result in the need for regular clean-up efforts to delete old treatment session information and imaging data to prevent slow downs as the amount of data increases day after day.

    - Export the DICOM RT files to a network location (i.e. the I:\ drive for Varian systems) so that team members can load them in file mode (Varian linacs)

      If your Physics team or FSE team has access to the local drive of a Varian TrueBeam loading the DICOM RT files locally on the machine for running through Machine QA mode will decrease load times and store results on the I:\ drive for additional processing.

Daily QA AlignRT Phantom Preparation (Example)

- ❑ Launch the AlignRT application and log in as a user that has the proper rights to prepare patients for treatment
- ❑ Select the **Patients Browser** tile on the **Home** screen to gain access to the Patient Browser screen.
- ❑ Find you SGRT Daily QA Patient in the list of patients and select the patient revealing the Preparation button.
- ❑ Complete the import and preparation of both plans from the Daily QA Phantom Treatment Plan Preparation section above for the Daily QA patient by importing at minimum the **Body / External** structure for each plan and using one of the protocols from the dropdown.
    - Select the same protocol for both plans
    - The protocol selected will apply the configured tolerances to the surface during Daily QA so select the protocol you wish to use (i.e. Intracranial SRS for tighter tolerances than Chest for example).
        - Tolerances can be changed later if you decide to make them tighter.

Note: If you are unclear as to how to complete the preparation process for a patient plan consult the AlignRT User's Guide.

- ❑ Order the plans in the left panel by dragging them above or below the other to control the order in which they appear during treatment (i.e. Daily QA) delivery.
- ❑ Set the Offset plan's surface type to Setup Surface Only
- ❑ Set the Coincidence / Central plan's surface type to Treat with Beam Control

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Daily QA AlignRT Phantom Preparation (Example)

- ❑ Create an ROI on the Offset plan surface that spans the top face of the cube and continues down about half the height of the cube on all four faces.
    - Because there can be some artifacts on the corners of the cube remove the corners of the cube from the ROI.
- ❑ Copy the ROI from the Offset plan to the Coincidence / Central Plan
    - Right click on the ROI in the tree and select Copy from the drop-down menu.
    - Right click on the surface for the Coincidence plan and select the Paste option to paste the ROI from the Offset plan onto the surface for the Coincidence plan.
- ❑ Save your work and close the patient

SGRT Daily QA with AlignRT (Example)

The following procedure outlines a series of tests that can be completed during the SGRT Daily QA process. Combining the process below with output and other tests as outlined by TG-142 or state regulations would comprise a total morning QA procedure for a clinic with SGRT capabilities. The tests outline below assume you have completed the steps above and have the plans outlined both in AlignRT and available to load on your treatment machine.

Purpose:

Verify complete system interoperability and clinical workflow integrity across all components — SGRT, imaging, couch and beam delivery.

End-To-End Test Setup:

- Perform initial setup using reference surface.
- Verify alignment via kV imaging or CBCT.
- Deliver simulated beam sequence with motion/gating active.
- Record all delta values, beam-hold events, and log timestamps.

SGRT Daily QA with AlignRT (Example)

Performance Validation:

- SGRT–Isocenter - Agreement ≤ 1 mm (TG-302 geometric benchmark)
- Beam-Hold Reliability - 100% of expected holds (Functionality)
- Workflow Reproducibility - Agreement ≤ 1 mm / 0.5° (TG-302 recommendation)
- Data Consistency - No mismatch or error in comparison to DICOM
- Connectivity - Functional and/or ≤ 1 mm (TG-302 geometric benchmark)

Relative Camera Pod Position Test

Perform the AlignRT Daily QA using the calibration plate per the recommended Vision RT workflow. This test is required prior to system use and will detect any relative pod motion since the last plate calibration was performed.

The default passing threshold is configured in the system during installation. Clear guidelines for action should be determined if the test exceeds a institutional thresholds, for example, notification of physics if the RMS value exceeds 0.5mm for more than 3 consecutive days is recommended for institutions using SGRT for SRS delivery on a regular basis.

RMS values should be recorded in the institution's Daily QA recording system for review by the physicist.

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SGRT Daily QA with AlignRT (Example)

Laser Stability and Software Functionality / Connectivity Test (Couch Move)

The following test uses the Couch Move functionality of AlignRT and either the MMI interface of a Varian Linac or the Response interface of the Elekta Linac to move the couch to an unbiased start position for QA. In doing so the user will check the following items

- Machine interface / Data Transfer – Patient / Plan / Isocenter (TG-302 Monthly and Annual)
    - Functional
- The stability of the room lasers localization (TG-142 Daily QA Check Table I) (TG-302 Monthly)
    - Non-IMRT: < 2 mm
    - IMRT: < 1.5 mm
    - SRS/SBRT: < 1 mm
- Distance Indicator (ODI) at isocenter (TG-142 Daily QA Check Table I)
    - Non-IMRT, IMRT, SRS/SBRT: < 2 mm
- Static Localization (TG-302 ≤ 2 mm)
    - ≤ 1 mm / 0.5°
- Dynamic Localization (TG-302 ≤ 2 mm)
    - ≤ 1 mm / 0.5°

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SGRT Daily QA with AlignRT (Example)

Testing Procedure

- ❑ Log into AlignRT using a standard user profile (i.e. not a QA user) so that the Couch Move functionality is available.
- ❑ Load the Offset plan for the SGRT Daily QA patient on the treatment machine and verify the following software functionality
  - The patient is automatically loaded on the AlignRT system
  - The proper isocenter is selected in AlignRT system
- ❑ Enter the room and using the room lasers align the Daily QA Phantom (either the Vision RT MV Calibration Cube or another vendor's phantom that has been put through the preparatory steps outlined earlier in the document) to the Central / Coincident plan isocenter location (e.g. center of ball 3 in the Vision RT MV Calibration Cube).
- ❑ Start monitoring the phantom using Align RT system
- ❑ Record the AlignRT delta values in the institution's Daily QA recording system for review by the physicist.
  - Shifts should match the shifts between the Central plan isocenter and the Offset plan isocenter with discrepancies showing stability of the room laser system. The magnitude of the discrepancies between the AlignRT shifts and expected shifts should be below the tolerances for lasers based on the types of treatments performed.
- ❑ From the AlignRT software send the AlignRT deltas to the linac using the Couch Move functionality.
- ❑ From the linac console apply the transferred AlignRT deltas to the phantom and verify the AlignRT deltas update as the phantom moves into position.

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SGRT Daily QA with AlignRT (Example)

- ❑ Record any residual AlignRT delta values in the institution's Daily QA recording system for review by the physicist.
  - Residual AlignRT shifts should be ≤ 1 mm / 0.5°
- ❑ Record the ODI reading to the top of the phantom at the new position in the institution's Daily QA recording system for review by the physicist.
  - ODI should match the expected SSD for the AP field in the Offset plan to within 2mm
- ❑ Close the Offset plan on both AlignRT and the treatment machine
- ❑ Log out of AlignRT in preparation for the next set of tests.
- ❑ Do not remove the phantom from the couch our move the couch from the final position in preparation for further testing.

Additional tests and procedures to be entered below following the same template…

…etc.

Summary

- SGRT Commissioning is a multi-phase process involving preinstallation planning, acceptance testing, commissioning, and ongoing QA.
- Preinstallation requires thorough site surveys, infrastructure checks, and coordination across teams.
- Commissioning goes beyond vendor acceptance—it's a comprehensive validation of system accuracy, integration, and workflow reproducibility.
- Guidelines from TG-302 and ESTRO-ACROP provide essential benchmarks (≤1 mm, ≤0.5°) and emphasize clinical safety, documentation, and staff training.
- Daily QA ensures continued system performance, with tests for isocenter agreement, beam-hold reliability, and camera pod stability.
- A step-by-step checklist supports consistent implementation and helps new users adopt SGRT confidently.

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Thank You!

- Special Thanks to the AdventHealth Physics team.

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