



**QARC Questionnaire for Stereotactic Radiosurgery (SRS)  
with a Linear Accelerator**

Return the completed form to: Quality Assurance Review Center  
272 West Exchange Street  
Suite 101  
Providence, RI 02903-1025

This questionnaire, with the requested information, must be submitted to QARC before patients can be placed on a stereotactic protocol. The data will be used by QARC in the review and verification of protocol treatments.

Check the applicable boxes and write in the requested information. Wherever it says "Describe", you may submit a published paper, an internal report, the vendor's descriptive literature, or provide a short description. Use additional pages, if necessary.

Please complete a sample RS-1 patient dosimetry summary form for a non-protocol patient treated in your institution.

If you have questions, please call the QARC Protocol Dosimetrist at 401-454-4301 or fax 401-454-4683 or email [Physics@QARC.org](mailto:Physics@QARC.org).

**I. General**

Institution \_\_\_\_\_

Physicist who can answer questions about dosimetry, quality assurance, and dose calculations for stereotactic irradiation:

Name \_\_\_\_\_ Telephone \_\_\_\_\_

Address \_\_\_\_\_ Fax \_\_\_\_\_

\_\_\_\_\_

Email \_\_\_\_\_

Will you treat pediatric patients? Yes  No

If yes, will you routinely anesthetize pediatric patients during the radiosurgery procedure?

Yes  No

If yes, please include a letter documenting the method of anesthesia that will be employed during the procedure.

How long has your institution been performing SRS? \_\_\_\_\_

Number of SRS cases treated at your institution in the past six months \_\_\_\_\_

**II. Equipment**

A. Treatment unit used for stereotactic irradiation:

Manufacturer, model \_\_\_\_\_

Nominal beam energy \_\_\_\_\_ MV. Source- isocenter distance \_\_\_\_\_ cm.

Variation of isocenter over the range of gantry angles and couch rotations employed is \_\_\_\_\_ mm.  
Describe how this is determined (e.g. "beam spots"). How frequently is this determined?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The calibration of this unit is routinely verified by the RPC (mailed TLD's) Yes  No   
Most recent date: \_\_\_\_\_

B. Head-frame

Commercial system, manufacturer, model: \_\_\_\_\_  
\_\_\_\_\_

System not commercially available. Describe: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

C. Fixation system (i.e., head-frame to isocenter or treatment couch, if applicable)

Commercial system, manufacturer: \_\_\_\_\_

System not commercially available. Describe: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

D. Treatment planning system

Commercial system, manufacturer, model: \_\_\_\_\_

System not commercially available. Who developed it? \_\_\_\_\_

Describe the procedure used to define the target volume in three dimensions (using CT, MRI, or other).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Can your system accommodate more than one isocenter? Yes  No   
If yes, how many? \_\_\_\_\_

Can the system provide isodoses in three orthogonal planes? Yes  No

Can the system generate dose-volume histograms for target volume? Yes  No   
for volumes of interest? Yes  No

Can the system perform image fusion? Yes  No

Is image fusion routinely used for your SRS treatments? Yes  No

What image set is routinely used for definition of target volumes and normal tissues?

CT  MR  Fused (i. e. both)

What image set is routinely used for dose calculation? CT  MR

### III. Data for dose calculations

#### A. Beam monitor units (MU)

For this accelerator, 1 MU = \_\_\_\_\_ cGy...

... to  water or  muscle, at \_\_\_\_\_ cm distance from the nominal source (s)  
(distance = SSD + depth), at \_\_\_\_\_ cm depth in water with \_\_\_\_\_ cm X \_\_\_\_\_ cm field size.

Calibration protocol used is: TG 51  TG 21  SCRAD  NORDIC   
 Other \_\_\_\_\_

If this does not completely describe your calibration, add information separately.

#### B. Beam data

1. Collimator field size is defined at:  100 cm  other \_\_\_\_\_ cm

2. Collimator sizes available: Circular \_\_\_\_\_ cm \_\_\_\_\_ cm  
\_\_\_\_\_ cm \_\_\_\_\_ cm  
\_\_\_\_\_ cm \_\_\_\_\_ cm

Describe any non-circular collimators: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. The standard field for relative output factors is \_\_\_\_\_  
at \_\_\_\_\_ cm distance  
at \_\_\_\_\_ cm depth

4. Relative output factors for the different collimators were measured:  
with a \_\_\_\_\_ detector at \_\_\_\_\_ depth  
in  water  other \_\_\_\_\_

5. Depth dose dependences of dose for the different collimators were measured with a \_\_\_\_\_ detector.

6. Depth dose dependence of dose was measured for

each collimator or

list if not all:

\_\_\_\_\_  
\_\_\_\_\_

7. Profiles of the beams were measured with a \_\_\_\_\_ detector

in  water  other \_\_\_\_\_

for each collimator or list \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

8. Submit an isodose distribution (in color) for a single stationary beam for a typical collimator used for stereotactic irradiation. Normalize to 100% at 5 cm depth. Please state SSD and field size on the submission.

#### IV. Dose Calculations

A. Calculation of dose when the prescription point is at isocenter, for a stationary beam

If we were to use a single stationary beam, we would calculate the dose  $D(d,s)$  at isocenter (depth  $d$ , field size  $s$ , determined by the collimator) for a monitor setting.

using the relation  $D(d,s) = \text{TPR}(d,s) \text{OF}(s)$  where the  $\text{TPR} = 1$  at depth  $d_{\text{ref}} =$  \_\_\_\_\_ cm for all collimators, and  $\text{OF} = D(d_{\text{ref}},s)$  is the output factor;

using the relation  $D(d,s) = \text{TMR}(d,s) \text{OF}(s)$  with  $\text{TMR} = 1$  at the depth of maximum dose  $d_m =$  \_\_\_\_\_ cm, which varies with the collimator, and  $\text{OF} = D(d_m,s)$ ;

using another calculation technique. In this case describe your method. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

relying on our commercially available treatment planning system to calculate the monitor units; Name of program \_\_\_\_\_, version \_\_\_\_\_.

B. Calculation of doses off-axis

For stereotactic irradiation, we calculate the dose at a distance  $r$  from the central axis by

multiplying the central-axis value with  $\text{OAR}(d,s,r)$ , which is

measured in water for each collimator, at one depth

measured in water for each collimator, at multiple depths

- measured in water for some, but not all, collimators, at one depth
- measured in water for some, but not all, collimators, at multiple depths

other method (describe separately).

C. Arc Techniques

When calculating the monitor units to be delivered in an arc,

- we use the same approach as in IV.A but with
  - the average depth
    - averaged every \_\_\_\_\_ degrees of arc
  - the average TPR, TMR etc.;
    - averaged every \_\_\_\_\_ degrees of arc

we use another method (describe separately).

V. **Quality Assurance**

A. Techniques to verify mechanical accuracy (couch, gantry, collimator, head frame, etc.)

Before every treatment

Describe: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Periodically (indicate frequency)

Describe: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

B. Techniques to verify the treatment dose

Describe: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

C. Techniques to verify the dose distribution

Describe: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



## QARC Questionnaire for Stereotactic Radiosurgery (SRS) with a Gamma Knife

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If yes, will you routinely anesthetize pediatric patients during the radiosurgery procedure?

Yes  No

If yes, please include a letter documenting the method of anesthesia that will be employed during the procedure.

How long has your institution been performing SRS? \_\_\_\_\_

Number of SRS cases treated at your institution in the past six months: \_\_\_\_\_



**III. Dose Calculations**

A. Please describe the calibration procedure used for this unit when new sources are installed.

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B. What routine calibration checks do you perform? \_\_\_\_\_

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C. How frequently? \_\_\_\_\_

**IV. Quality Assurance**

A. Techniques to verify patient position

Describe: \_\_\_\_\_

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B. Techniques to verify source "ON/OFF" accuracy

Describe: \_\_\_\_\_

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C. Techniques to verify the dose distribution

Frequency:    Annually                       Periodically

Describe: \_\_\_\_\_

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D. When the Co-60 source is changed, what QA procedures do you follow, in addition to the calibration procedure described in IIIA?

Describe: \_\_\_\_\_

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E. How do you verify the dose? \_\_\_\_\_

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