Supplementary

Appendix 1

Stereotactic body radiotherapy (SBRT) for oligometastatic prostate cancer (OMPC)

Hospital: Name:

1. In what kind of institution are you currently working? ( )
   ① Primary- ② Secondary- ③ Tertiary health care hospital
2. How long have you been working as a radiation oncologist after residency? ( )
   ① <5 years ② 5–9 years ③ 10–19 years ④ ≥20 years
3. Is there a multidisciplinary team (MDT) approach for patients with prostate cancer in your institution? ( )
   ① Yes: Move to question 3-1. ② No: Move to question 4.
   3-1) Is the MDT meeting regularly performed? ( )
   ① Yes ② No
   3-2) How often do you have the MDT meetings? ( )
   ① Every week ② Every month ③ About 2–3 times a month ④ Every other month
   ⑤ Every 3 months ⑥ Every 4 months ⑦ Others (Please specify) _____
4. Is there a radiation oncologist as a specialist for urology in your institution? ( )
   ① Yes ② No. We work together regardless of the disease site. ③ No. I work alone.
5. How many prostate cancer patients do you treat with RT for a cure in the past year? ( )
   ① ≤5 cases ② 6–10 cases ③ 11–30 cases ④ 31–50 cases
   ⑤ 51–100 cases ⑥ 101–300 cases
6. What is your definition of oligometastases? ( )
   ① Number of lesions/number of organs (Please specify) ____/____
   ② Low-volume of metastatic disease according to the CHAARTED trial
7. Which imaging study do you consider to evaluate disease extent and metastases? ( ) (Please select all that apply)
   ① Prostate MRI ② Bone scan ③ CT scan of abdomen and/or thorax
   ④ Spine MRI ⑤ FDG PET-CT ⑥ Choline- or PSMA PET-CT
   ⑦ Others (Please specify) _____
8. How many OMPC patients were referred for radical-intent RT in the past year? ( )
   ① No case ② ≤5 cases ③ 6–10 cases ④ 11–20 cases ⑤ ≥21 cases
9. What target volume do you treat for oligometastatic prostate cancer? ( )
   ① No case ② No RT ③ Prostate only ④ Up to 1–2 metastatic lesions only
   ⑤ Up to 3 metastatic lesions only ⑥ Up to 4–5 metastatic lesions only
   ⑦ Prostate and up to 1–2 metastatic lesions ⑧ Prostate and up to 3 metastatic lesions
   ⑨ Prostate and up to 4–5 metastatic lesions ⑩ Others (Please specify) _____
10. When do you apply RT for initially diagnosed OMPC patients? ( )
    ① No case ② Concurrent with androgen deprivation therapy (ADT): Start RT within 1 month after ADT.
    ③ Neoadjuvant ADT 2–8 months: at___months
    ④ As soon as possible, because patients are consulted for RT ≥ 6 months after ADT
    ⑤ Others (Please specify) _____
11. Do you have an experience with SBRT to treat cancer patients? ( )
    ① Yes: Move to question 12. ② No: End the survey and thank you for your time.
12. What is your definition of SBRT? ( )
    ① ( ) Gy/fx, regardless of the number of fractions
    ② Above ( ) Gy and below ( ) fractions
13. Approximately, what percentage of OMPC patients, who were referred for RT, is treated with SBRT in the past year?
    13-1-1) What is the application rate of SBRT for the primary lesion (prostate)? ( )

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① No case ② No use of SBRT: application of conventional fraction (1.8–2 Gy/fx)
③ No use of SBRT: application of hypofractionation (>2 Gy/fx)
④ No use of SBRT: application of various fractionation scheme on case-by-case
⑤ 1%–9% ⑥ 10%–40% ⑦ 41%–60% ⑧ 61%–99% ⑨ 100%

13-1-2) What fractionation scheme do you most commonly utilize? (Gy/ fx's)

13-2-1) What is the application rate of SBRT for oligometastatic lesions? ( )
① No case ② No use of SBRT: application of conventional fraction (1.8-2 Gy/fx)
③ No use of SBRT: application of hypofractionation (>2 Gy/fx)
④ No use of SBRT: application of various fractionation scheme case by case
⑤ 1%–9% ⑥ 10%–40% ⑦ 41%–60% ⑧ 61%–99% ⑨ 100%

13-2-2) What fractionation scheme do you most commonly utilize?
(Gy/ fx's) to spine metastases
(Gy/ fx's) to other bone metastases
(Gy/ fx's) to lymph node metastases
(Gy/ fx's) to other metastases (Please specify the site)

14. What are reasons why it is difficult to use SBRT for OMPC patients? ( ) Please select all that apply.
① N/A: Always use SBRT. ② The lack of special equipment
③ The lack of experience with using SBRT ④ The lack of appropriate patients for SBRT
⑤ Transfer of appropriate patients for SBRT to a larger hospital ⑥ Preference for other fractionation scheme
⑦ Insurance problems ⑧ Others (Please specify)
15. The National Health Insurance Service in Korea has approved SBRT in cases of RT regimens using ≤4 fractions applied to lesions within the body. Is it appropriate to limit the number of fractions? ( )
① Yes ② No: It is necessary to increase the number of fractions to .
16. What treatment machine do you use for SBRT to a primary lesion (prostate)? ( ) Please select all that apply.
① No RT ② CyberKnife ③ RapidArc (Varian) ④ TomoTherapy
⑤ Clinac iX (Varian) ⑥ TrueBeam (Varian) ⑦ Novalis (Varian) ⑧ VMAT (Elekta)
⑨ ViewRay™ ⑩ Proton ⑪Others (Please specify) _____
17. Do you use an immobilization tool for SBRT to the primary lesion (prostate)? ( )
① No use ② Yes: Use an endorectal balloon.
③ Yes: Use rectal spacer. ④ Others (Please specify) _____
18. What treatment machine do you use for SBRT to the oligometastatic lesions? ( ) Please select all that apply.
① No RT ② CyberKnife ③ RapidArc (Varian) ④ TomoTherapy
⑤ Clinac iX (Varian) ⑥ TrueBeam (Varian) ⑦ Novalis (Varian) ⑧ VMAT (Elekta)
⑨ ViewRay™ ⑩ Proton ⑪Others (Please specify) _____
19. What target localization methods do you prefer for SBRT? ( )
① Orthogonal MV localization images ② Orthogonal KV radiographs ③ Fluoroscopy
④ KV or MV cone beam CT ⑤ MRI ⑥ Others (Please specify) __
20. In what order do you apply the image registration during SBRT? ( )
① Image → Correction → Treat
② Image → Correction → Treat → Image after Tx
③ Image → Correction → Treat → Image during Tx → Treat
④ Image → Correction → Treat → Image during Tx → Treat → Image after Tx
⑤ Image → Correction → Image → Treat
⑥ Image → Correction → Image → Treat → Image after Tx
⑦ Image → Correction → Image → Treat → Image during Tx → Treat
⑧ Image → Correction → Image → Treat → Image during Tx → Treat → Image after Tx

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- Thank you for your time -

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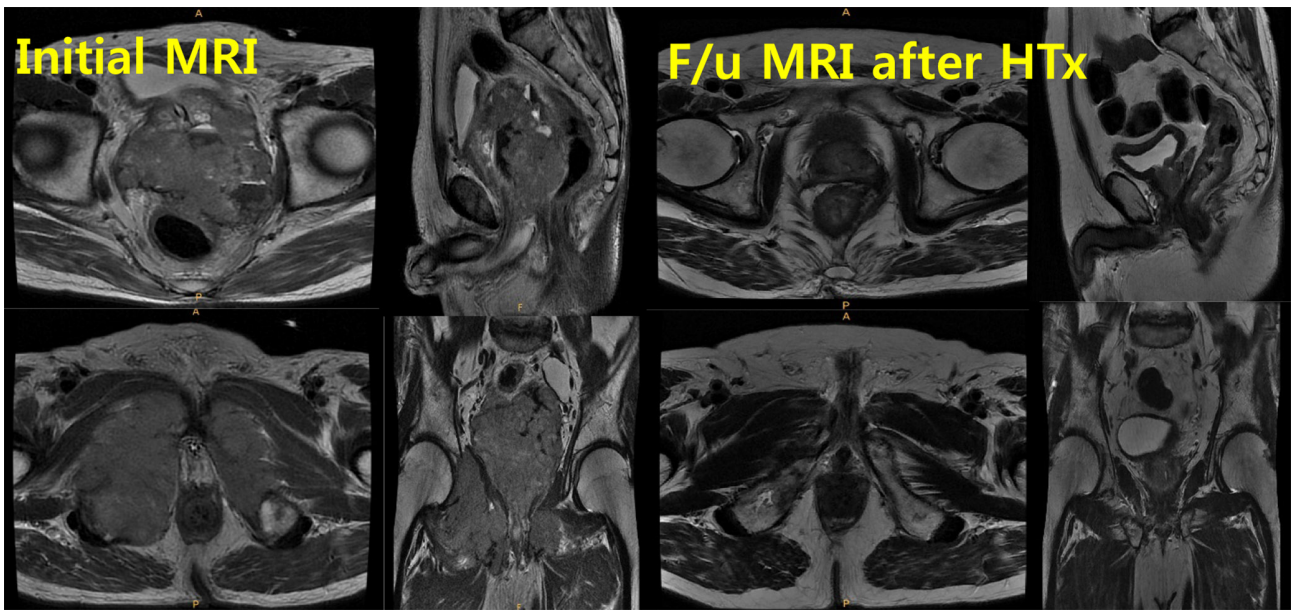
Appendix 2

This patterns-of-care survey is composed of three clinical scenarios related to the experience in the clinical setting. Please select your current practice for each case.

Hospital: Name:

Case 1.

A 69-year-old male patient was initially diagnosed with prostate cancer with two pelvic bone metastases (Eastern Cooperative Oncology Group [ECOG] 1, Gleason score [G/S] = 4+4, cT4N0M1, initial prostate-specific antigen [PSA] >1,000 ng/mL, and metastases at the right acetabulum and pubic bone). He received androgen deprivation therapy (ADT) for 1 year. The PSA level decreased to <0.03 ng/mL at 6 months after ADT and was maintained. Subsequently, he was referred for radiotherapy (RT). He had no symptoms of bone metastases.



1-1. Does this case correspond with oligometastatic prostate cancer (OMPC)? ( ) Do you agree with the delivery of a high dose in this case? ( )
① Yes ② No

1-2. Do you have experience with RT to treat prostate cancer patients with limited metastases within the pelvis similar to this? ( )
① Yes ② No

1-3. When do you initiate RT? ( )
① As soon as possible: Move to question 1-4. ② No RT: Move to Case 2.

1-4. What target volume do you treat for this case? ( )
① Prostate only ② Whole pelvis including regional lymph node (LN) chains and pelvic bone metastases
③ Prostate and pelvic bone metastases ④ Pelvic bone metastases ⑤ Others (Please specify)

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1-5. What technique and fractionation scheme do you apply? ( )

Technique type:

① 2D ② 3DCRT ③ IMRT ④ IMRT-SIB ⑤ SBRT

A. Prostate: Technique ( ), Fractionation scheme: (Gy/ fx's)

B. Bone metastases: Technique ( ), Fractionation scheme: (Gy/ fx's)

C. Whole pelvis: Technique ( ), Fractionation scheme: (Gy/ fx's)

→ Followed by prostate boost: Technique ( ), Fractionation scheme: (Gy/ fx's)

D. Comment:

1-6. What are the reasons why you are not using SBRT for this case? ( ) Can select up to two answers.

① Application of whole pelvic RT including elective LN chains ② Preference for other fractionation scheme

③ The lack of special equipment ④ The lack of experience with the use of SBRT

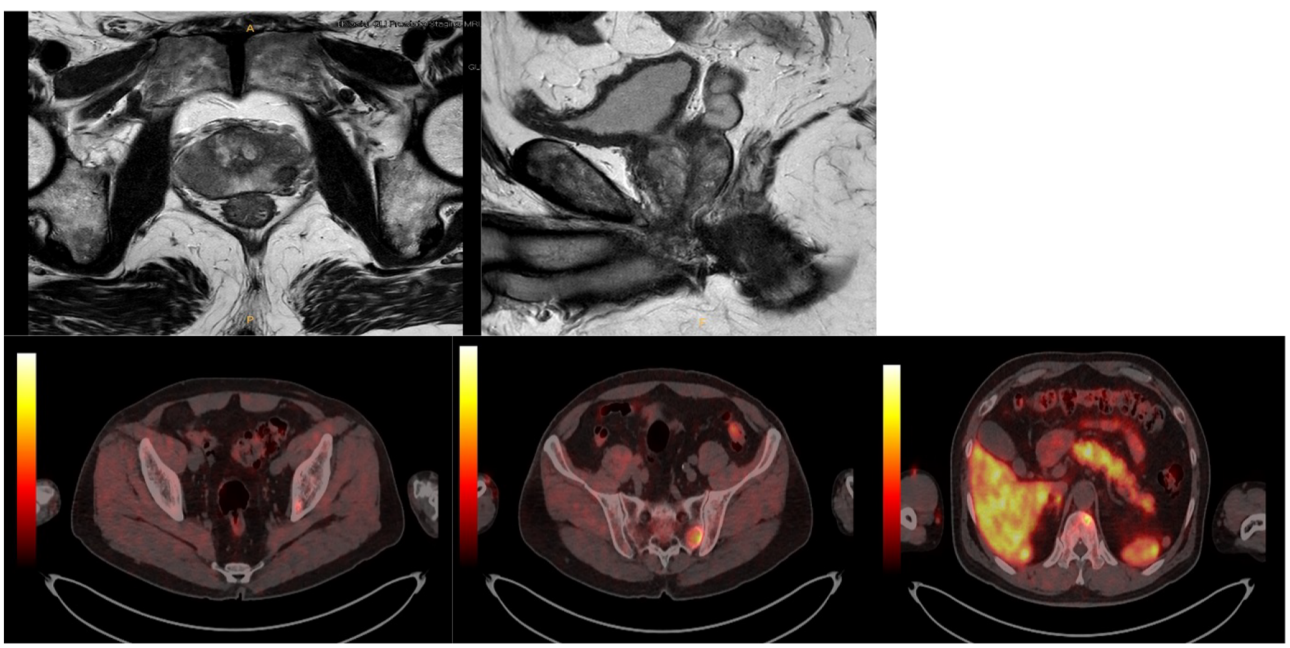
⑤ Insurance problems: limited fractions (≤4)

⑥ Application of other fractionation scheme with generous margin including involved bone metastases

⑦ Others (Please specify)

Case 2.

A 64-year-old male patient was initially diagnosed with prostate cancer with three bone metastases (ECOG 0, G/S = 4+4, cT2N0M1, initial PSA 162.88 ng/mL, metastases in the left acetabulum, left sacral alar, and 11th thoracic [T11] spine). He received 1 cycle of ADT, and the level of PSA decreased to 41.40 ng/mL at 1 month after ADT. Subsequently, he was referred for RT. He had no symptoms of bone metastases.



2-1. Does this case correspond to OMPC? ( ) Do you agree with the delivery of a high dose in this case? ( )

① Yes ② No

2-2. Do you have experience with RT to treat prostate cancer patients with limited bone metastases like this? ( )

① Yes ② No

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2-3. When do you initiate RT? ( )

① As soon as possible: Move to question 2-4.

② Beginning after ( ) months to receive additional ADT as a neoadjuvant aim: Move to question 2-4.

③ No RT: Move to Case 3.

2-4. What target volume do you treat for this case? ( )

① Prostate only ② Whole pelvis including regional LN chains and 2 pelvic bone metastases

③ Prostate and 2 pelvic bone metastases ④ Prostate and 3 bone metastases

⑤ Whole pelvis, including regional LN chains and 2 pelvic bone metastases, and T11 spine metastases

⑥ 3 bone metastases ⑦ Others (Please specify)

2-5. What technique and fractionation scheme do you apply? ( )

Technique type:

① 2D ② 3DCRT ③ IMRT ④ IMRT-SIB ⑤ SBRT

A. Prostate: Technique ( ), Fractionation scheme: (Gy/ fx's)

B. Bone metastases

- Left acetabulum: Technique ( ), Fractionation scheme: (Gy/ fx's)
- Left sacral alar: Technique ( ), Fractionation scheme: (Gy/ fx's)
- T11 spine: Technique ( ), Fractionation scheme: (Gy/ fx's)

C. Whole pelvis: Technique ( ), Fractionation scheme: (Gy/ fx's)

→ Followed by prostate boost: Technique ( ), Fractionation scheme: (Gy/ fx's)

D. Comment:

2-6. What are the reasons why you are not using SBRT for this case? ( ) Can select up to 2 answers.

① Application of whole pelvic RT including elective LN chains ② Preference for other fractionation scheme

③ The lack of special equipment ④ The lack of experience with the use of SBRT

⑤ Insurance problems: limited fractions (≤4)

⑥ Insurance problems: excess of those covered by medical insurance because the RT site is classified as cervical spine/T spine/ lumbar spine/ sacrum.

⑦ Application of other fractionation scheme with generous margin including the involved bone metastases

⑧ Others (Please specify)

2-7. In what order do you apply RT if you treat both primary lesion and metastatic lesions? ( )

① Simultaneous treatment including 3 bone metastases in a day

② Simultaneous treatment: Treat 1 site per day in case of bone metastases.

③ Sequential treatment: Treat all bone metastases in a day after the completion of RT for the primary lesion.

④ Sequential treatment: Sequentially treat 1 site per day in case of bone metastases after the completion of RT for primary lesion.

⑤ Time interval of > 1 month between RT of primary lesion and RT of bone metastases

⑥ Others (Please specify)

Case 3.

A 65-year-old male patient was initially diagnosed with prostate cancer with pelvic LN metastases (ECOG 1, G/S = 5+4, cT3N1M0, initial PSA of 161 ng/mL). He was treated with ADT for 4 years. The level of PSA decreased to 0.19 ng/mL but rebounded to 1.20 ng/mL, and laparoscopic radical prostatectomy was done. Additional ADT was undergone for 3 years. The level of PSA decreased to 0.16 ng/mL but rebounded to 1.08 ng/mL, and a salvage RT to prostate bed with 70 Gy/35 fx's was done. Duo to the continuous increase in the level of PSA, he received 4 cycles of docetaxel plus prednisone, but this treatment was discontinued due to the occurrence of neutropenia. The level of PSA at follow-up was 7.89 ng/mL, and single spine metastases at the T12 was detected on bone scan. Subsequently, he was referred for RT. He had no symptoms of bone metastases.

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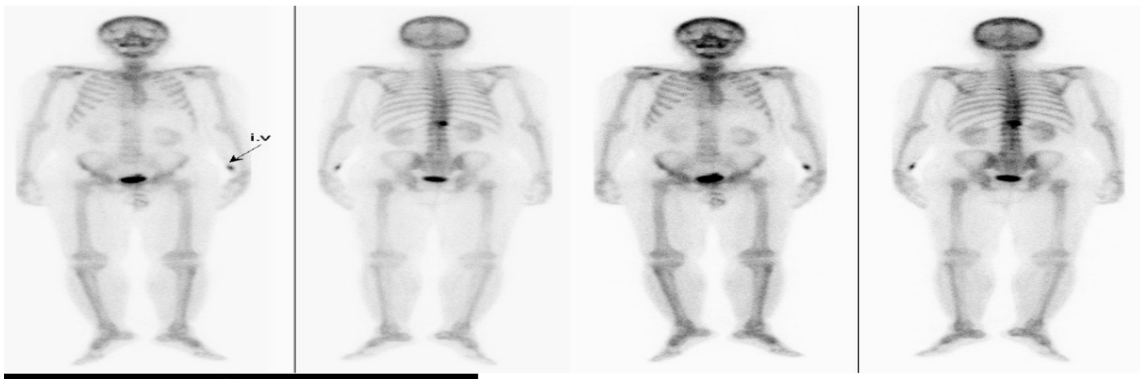
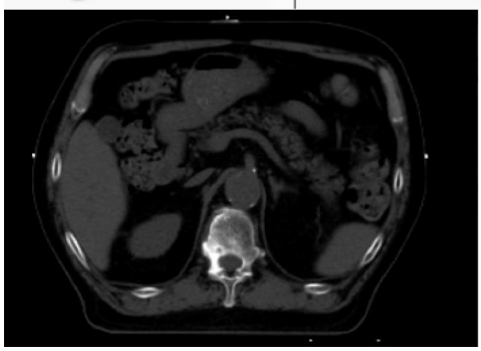


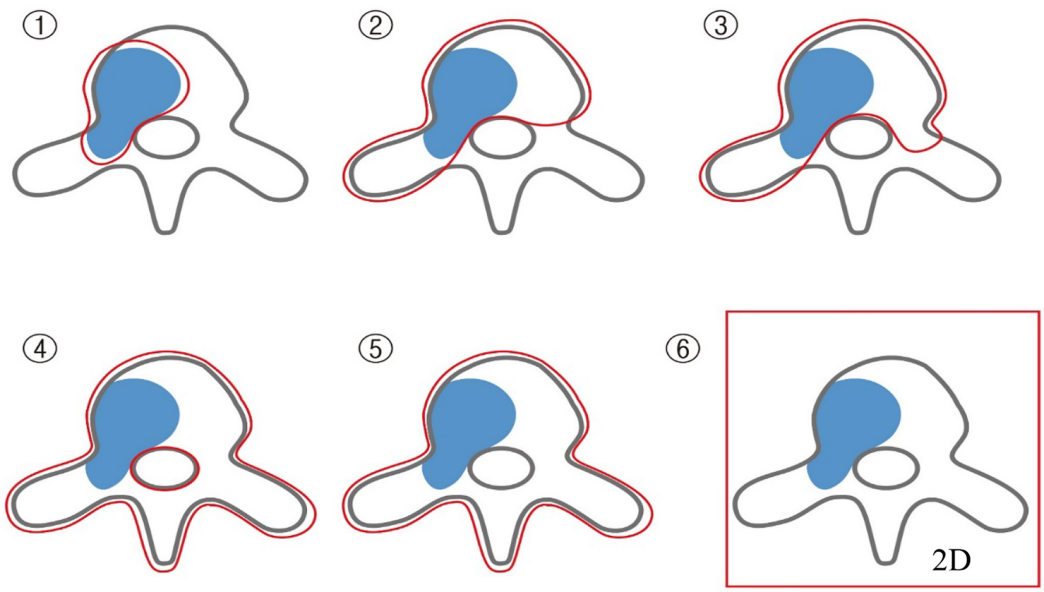


3-1. Does this case correspond to OMPC? ( ) Do you agree with the delivery of a high dose in this case? ( )
① Yes ② No

3-2. Do you have experience with RT to treat prostate cancer patients with solitary metastases similar to this? ( )
① Yes ② No

3-3. When do you initiate RT? ( )
① As soon as possible: Move to question 3-4. ② No RT: End the survey and thank you for your time.

3-4. What target volume do you treat for this case? ( )



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3-5. What technique and fractionation scheme do you apply? ( )

Technique type ( ):

① 2D ② 3DCRT ③ IMRT ④ IMRT-SIB ⑤ SBRT

Fractionation scheme: (Gy/ fx's)

3-6. What are the reasons why you do not use SBRT for this case? ( ) Can select up to 2 answers.

① Preference for other fractionation scheme ② The lack of special equipment

③ The lack of experience with the use of SBRT ④ Insurance problems: limited fractions (≤4)

⑤ Application of other fractionation scheme with generous margin including involved bone metastases

⑥ Others (Please specify)

- Thank you for your time -

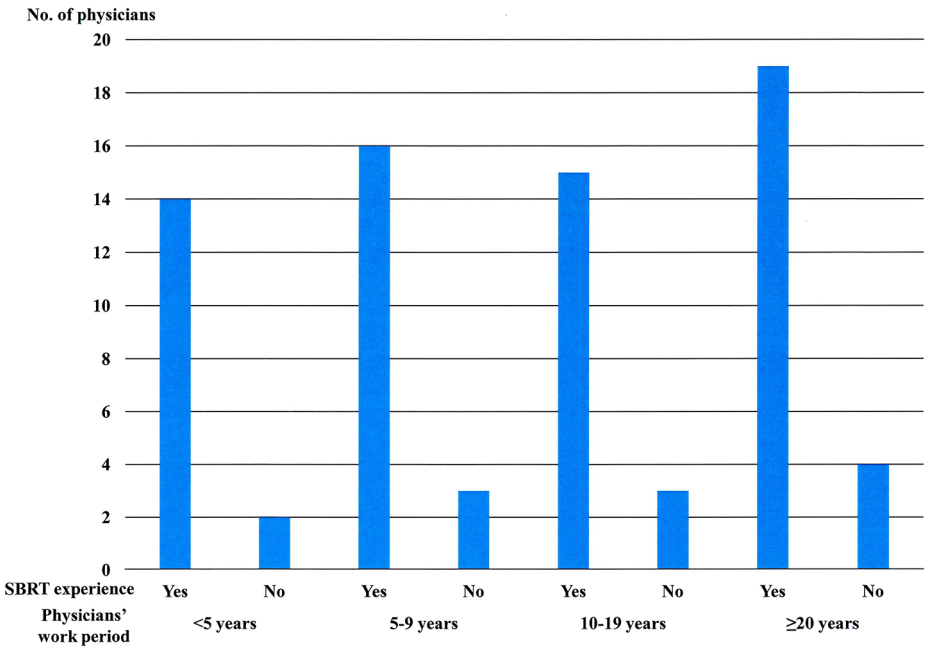

Figure S1 Stereotactic body radiotherapy (SBRT) experience according to physicians' work period.

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