

CLINICAL INVESTIGATION

Prostate

AMERICAN BRACHYTHERAPY SOCIETY RECOMMENDATIONS FOR
REPORTING MORBIDITY AFTER PROSTATE BRACHYTHERAPY

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Purpose: To standardize the reporting of brachytherapy-related prostate morbidity to guide ongoing clinical practice and future investigations.

Methods: Members of the American Brachytherapy Society (ABS) with expertise in prostate brachytherapy performed a literature review and, guided by their clinical experience, formulated specific recommendations for reporting on morbidity related to prostate brachytherapy.

Results: The ABS recommends using validated, patient-administered health-related quality-of-life instruments for the determination of baseline and follow-up data regarding bowel, urinary, and sexual function. Both actuarial and crude incidences should be reported, along with the temporal resolution of specific complications, and correlated with the doses to the normal tissues. The International Prostate Symptom Score is recommended to assess urinary morbidity, and any dysuria, gross hematuria, urinary retention, incontinence, or medication use should be quantified. Likewise, the “Sexual Health Inventory for Men,” which includes the specific erectile questions of the International Index of Erectile Function, is the preferred instrument for reporting sexual function, and the loss of sexual desire, incidence of hematospermia, painful orgasm (orgasmalgia), altered orgasm intensity, decreased ejaculatory volume, use of erectile aids, and use of hormones for androgen deprivation should be quantified. The ABS recommends adoption of the Radiation Therapy Oncology Group/European Organization for Research and Treatment of Cancer acute and late radiation morbidity scoring scheme for reporting rectal morbidity and noting the incidence of rectal steroid, laser, or antidiarrheal use.

Conclusion: It is important to focus on health-related quality-of-life issues in the treatment of prostate cancer, because the control rates are very similar between appropriate treatment modalities. The ABS recommends using the International Prostate Symptom Score, International Index of Erectile Function, and Radiation Therapy Oncology Group toxicity grading criteria for the determination of urinary, sexual, and bowel function, respectively. Additional parameters for reporting urinary, rectal, and sexual morbidities are presented. These morbidities should be correlated with the doses to the normal tissues. Some of these specific recommendations may be modified if and when new data become available. © 2002 Elsevier Science Inc.

Prostate, Brachytherapy, Quality of life, Morbidity, Toxicity.

INTRODUCTION

With similar high rates of biochemical control for early-stage prostate cancer achievable with various local treatment modalities, health-related quality-of-life (HRQOL) issues have assumed increased importance in selecting the appropriate therapy for prostate cancer. Prostate brachytherapy can result in some specific urinary, rectal, and sexual morbidities (1–23). The severity and duration of these morbidities can vary from patient to patient. There is no standard method of reporting these morbidities, although multiple validated, HRQOL instruments are available for measuring outcomes regarding overall urinary, bowel, and

sexual function (24–27). At the May 2001 Annual American Brachytherapy Society (ABS) meeting, it was noted that the existing acute and late toxicity grading criteria are not specific enough to describe accurately the incidence of morbidity after prostate brachytherapy. Although the ABS has previously published recommendations for clinical prostate brachytherapy and dosimetry (28, 29), such recommendations do not exist for the reporting of prostate brachytherapy-related morbidity. To standardize the prostate brachytherapy morbidity criteria, the ABS formed a panel to issue clinical guidelines for reporting brachytherapy-related prostate morbidity. Rather than developing new morbidity

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reporting criteria, the panel used the existing morbidity scales commonly used by clinicians and added appropriate items to better capture the symptoms specific to implants. These recommendations are presented principally to guide those interested in reporting the results of prostate brachytherapy clinical trials.

METHODS AND MATERIALS

Members of the ABS with expertise in prostate brachytherapy performed a literature review and, guided by their clinical experience, formulated specific recommendations for reporting on brachytherapy-related prostate morbidity. These recommendations were made by consensus opinion and were supported by published data whenever possible. In addition, members of the ABS Board of Directors and selected radiation oncologists and urologists reviewed the recommendations to provide a broader representative view, and further revisions were made as indicated. The areas addressed by the panel included the following: quality-of-life measurements, urinary morbidity, sexual morbidity, and rectal morbidity.

The definition of the consensus levels was similar to that used in previous ABS reports (30). The ABS consensus levels for the reporting of brachytherapy-related prostate morbidity were as follows:

- Level 1: Uniform panel consensus based on strong published literature that the recommendation is appropriate
- Level 2: Recommendation based on suggestive evidence, including nonpublished clinical experience, without major disagreement among the panel members
- Level 3: Paucity of data and/or major disagreement among panel members regarding the recommendation

RESULTS

The results of the panel deliberation and the ABS recommendations are given in the following sections. Unless specifically noted, these recommendations generally fall within the Level 2 consensus.

Quality-of-life measurements after prostate brachytherapy

The primary goal in the treatment of patients with cancer traditionally has been to maximize the probability and duration of survival. Refinements in surgical techniques, radiation delivery, and chemotherapy regimens have led to improvements in the treatment of cancer with prolongation of survival. A variety of treatment modalities are available for prostate cancer that provide similar survival benefits. Hence, both patients and physicians are focusing on HRQOL issues, because the control rates are very similar among appropriate prostate cancer treatment modalities.

Although survival after treatment for prostate cancer is generally easy to measure, the measurement of HRQOL is more problematic. Contemporary definitions of HRQOL are based on the World Health Organization categorization of

health as a “state of complete physical, mental, and social well-being and not merely the absence of disease” (31). It is important to emphasize that HRQOL end points reflect the perceptions of health and ability to function as reported by patients.

HRQOL research applies the principles of psychometric test theory, a discipline with which many clinicians are unfamiliar. Data are collected with HRQOL questionnaires (instruments) that, if possible, should be completed by the patients themselves. These instruments generally consist of a number of questions (items) that are organized into scales. Each scale is designed to measure a different aspect (domain) of HRQOL. HRQOL instruments may contain several dozen items addressing a number of domains. HRQOL instruments are generally categorized as generic or disease specific. Generic HRQOL instruments measure overall well-being by addressing the level of function in the physical, emotional, and social domains. Examples of generic HRQOL instruments include the Rand Medical Outcomes Study 36-item Health Survey (SF-36) (32) and the Sickness Impact Profile (SIP) (33). Disease-specific HRQOL instruments focus on those domains that may be more clinically relevant for the population under study. Disease-specific HRQOL tools have been developed for patients with cancer, acquired immunodeficiency syndrome, and a host of other conditions. A number of reliable, valid instruments to measure prostate cancer-specific HRQOL in men with early-stage prostate cancer are available. Examples include the Functional Assessment of Cancer Therapy-Prostate (FACT-P) (34, 35), the University of California, Los Angeles, Prostate Cancer Index (26), the Expanded Prostate Cancer Instrument Composite (EPIC) instrument from the University of Michigan (36), and the prostate cancer module of the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire–Core 30 (QLQ-C30) (37).

Several analyses using validated HRQOL instruments in men treated with prostate brachytherapy have been published to date (2, 7, 35, 38). For example, Joly *et al.* (38) retrospectively compared prostate cancer patients treated with a combination of external beam radiotherapy (EBRT) and prostate brachytherapy with age-matched controls without cancer in a retrospective study. Patients treated with combined EBRT and prostate brachytherapy were more likely to have urinary incontinence and to be inactive sexually than patients who had received no treatment.

The ABS recommends the use of validated, patient-administered HRQOL instruments for the determination of baseline and follow-up bowel, urinary, and sexual function when available. Both actuarial and crude incidences should be reported, along with the temporal resolution of the specific complications (Consensus Level 1).

Unfortunately, none of the available HRQOL instruments were specifically designed for prostate brachytherapy. The ABS panel reviewed the literature on urinary, rectal, and

sexual function after brachytherapy and made the following recommendations for brachytherapy-specific morbidity.

Assessment of urinary function after brachytherapy

Brachytherapy-related urinary symptoms tend to be more pronounced than those following EBRT (19, 22). Higher doses and prolonged radiation exposure are presumably responsible for the longer duration and higher intensity of urinary irritation and obstructive symptoms. Furthermore, current HRQOL questionnaires do not routinely address the late exacerbation of irritative voiding symptoms sometimes seen with prostate brachytherapy. Physical factors, including prostate volume, transition zone volume, and differences in seed and dose distribution within prostate, may affect brachytherapy-related urinary morbidity more than they affect morbidity related to EBRT (23).

The International Prostate Symptom Score was originally developed to describe symptoms of benign prostatic hyperplasia (24) and has been commonly used to report urinary morbidity after brachytherapy (39–42). The uniqueness of brachytherapy-related morbidities has complicated reporting. Both the IPPS and the original Radiation Therapy Oncology Group (RTOG) acute and late morbidity grading criteria (43, 44) are not specific enough to give an accurate account of the incidence of side effects, because they fail to address symptoms such as dysuria, hematuria, incontinence, and retention.

α-Blockers have been shown to offer dramatic relief from radiation-related symptoms (41); however, their use is highly dependent on the prescribing policy of the physician (40, 41), making comparison of morbidity reporting problematic. This large degree of subjectivity, and the potential for patient and physician bias, has made the use of α-blockers a source of confusion when interpreting postimplant urinary morbidity. Currently, no scale adequately summarizes or controls for the use of α-blockers.

The ABS recommends that the International Prostate Symptom Score (Appendix 1) be used in reporting urinary morbidity (Consensus Level 1). Additionally, dysuria, gross hematuria, urinary retention, incontinence, and medication use should be quantified and reported as in Tables 1 and 2.

Assessment of sexual function after brachytherapy

The National Institutes of Health Consensus Conference defined erectile dysfunction (ED) as “the inability to attain and/or maintain penile erection sufficient for satisfactory sexual performance” and recommended the development of reliable methods for assessing the symptoms of ED and for evaluating treatment outcomes (45). Permanent prostate brachytherapy with or without supplemental EBRT has resulted in ED in 6–61% of cases (3, 4, 10–14, 16–20, 22), with expected continued deterioration due to the normal aging process and late radiation effects (46).

Potency after prostate brachytherapy has been assessed by patient-administered questionnaires and physician interviews. Stock *et al.* (16, 17) formulated a four-tiered system

Table 1. Additional toxicity criteria for prostate brachytherapy

Patient name_____	Date of visit_____	
Months postimplant_____		
Urinary function		
Dysuria	Yes*	No
Gross hematuria	Yes*	No
Urinary retention	Yes*	No
Urinary incontinence	Yes*	No
Use of α -blockers	Yes	No
Use of antispasmodic agents	Yes	No
Use of urinary analgesic agents	Yes	No
Sexual function		
Loss of sexual desire	Yes	No
Hematospermia	Yes	No
Orgasmalgia	Yes	No
Decreased intensity of orgasms	Yes	No
Decreased ejaculate	Yes	No
Use of erectile aids	Yes	No
Use of hormones for androgen deprivation	Yes	No
Bowel function		
Use of rectal steroids	Yes	No
Use of laser or formalin	Yes	No
Use of antidiarrheal agents (Imodium, Lomotil)	Yes	No

* These can be quantified in Table 2 using the National Cancer Institute Common Toxicity Criteria (55).

in which erectile function was graded on a 0–3 scale (0 = no erections; 1 = ability to have erections, but insufficient for vaginal penetration; 2 = erectile function sufficient for vaginal penetration, but suboptimal; and 3 = normal erectile function). In contrast, Merrick *et al.* (10) used the specific erectile questions of the International Index of Erectile Function (25, 27) by either physician telephone interview or patient self-administration (10, 11). Other brachytherapy reports have not used patient questionnaires and have defined potency by either subjective physician interpretation of erections sufficient for vaginal penetration (3, 4, 12, 19, 20) or without any defined criteria (14, 18).

Following permanent prostate brachytherapy, wide ranges of ED have been reported and may be a result of differences in patient follow-up, varying definitions of ED, or the mode of data collection (3, 4, 10–12, 14, 16–20, 22). It is also apparent that with longer follow-up, the ultimate rate of potency preservation continues to decline. Litwin *et al.* (47) reported that physician ratings of patient symptoms do not correlate well with patient self-assessment of quality of life. For all evaluated parameters, physicians underestimated the patient’s symptoms. Patient self-reporting remains the preferred means of data collection. In HRQOL outcome studies, information should be obtained by direct patient surveys for valid and reliable quality-of-life data (47). To date, only one brachytherapy study has exclusively used a validated patient-administered quality-of-life instrument (10).

The etiology of ED after definitive local treatment for carcinoma of the prostate gland represents multifactorial processes, including neurogenic compromise, vascular in-

Table 2. Quantification of urinary toxicity using the National Cancer Institute common toxicity criteria (55)

Adverse event	0	1	2	3	4
Dysuria	None	Mild symptoms requiring no intervention	Symptoms relieved with therapy	Symptoms not relieved despite therapy	—
Gross hematuria	None	Microscopic only	Intermittent gross, no clots	Persistent gross bleeding or clots; may require catheterization or transfusion	Open surgery or necrosis or deep bladder ulceration
Urinary retention	Normal	Hesitancy or dribbling but no significant residual urine; retention occurring during immediate postoperative period	Hesitancy requiring medication or occasional catheterization (<4 times/wk) or requiring indwelling catheter beyond immediate postoperative period but for <6 wk	Requiring frequent catheterization (>4 times/wk) or indwelling catheter for >6 wk or requiring urologic intervention (e.g., TURP, suprapubic tube, urethrotomy)	Bladder rupture
Urinary incontinence	None	With coughing, sneezing, etc.	Spontaneous, some control	No control (in the absence of fistula)	—

Abbreviation: TURP = transurethral resection of the prostate.

sufficiency, local trauma, and psychogenic causes (48). DiBiase *et al.* (49) suggested that impotence after prostate brachytherapy may be secondary to excessive irradiation of the neurovascular bundle. In contrast, Merrick *et al.* (11, 50) reported on the absence of a relationship between the radiation dose to the neurovascular bundle and the development of postbrachytherapy-induced ED. Clinical studies have shown that the radiation dose to the bulb of the penis directly correlates with posttreatment ED for both EBRT and brachytherapy (51, 52). Although Merrick *et al.* (10) reported no correlation between the dose of radiation delivered to the prostate gland in patients with and without brachytherapy-induced ED, Stock *et al.* (16) reported that the dose was predictive for brachytherapy-induced ED. Other investigators have found that the addition of supplemental EBRT to prostate brachytherapy resulted in a deleterious effect on potency preservation (10, 12).

Preimplant potency is strongly correlated with the ultimate preservation of potency (10, 16). Reports are conflicting regarding the role of patient age in predicting posttreatment ED (10, 12, 16). In a recent study, a history of diabetes mellitus was implicated in the development of brachytherapy-induced ED (10). Although Potters *et al.* (12) reported that the use of neoadjuvant hormonal manipulation predicted for posttreatment ED, two other studies failed to reveal a relationship between the two events (10, 16). Most patients with brachytherapy-induced ED respond favorably to sildenafil citrate (Viagra) (53). Including sildenafil-treated patients, the 6-year actuarial rate of potency preservation was 92% (10). Unfortunately, neither the International Index of Erectile Function nor any of the other validated quality-of-life instruments specifically addresses the sexual symptomatology of prostate brachytherapy. Hematospermia, painful orgasm (orgasmalgia), and alterations

in the intensity of orgasm have been reported (11) and were of limited duration for most patients.

The ABS recommends that the specific erectile questions of the International Index of Erectile Function (known as the "Sexual Health Inventory For Men" [Appendix 2]) be used in reporting sexual function without any mechanical or pharmacologic aid (Consensus Level 1). Additionally, loss of sexual desire, hematospermia, painful orgasm, decrease in ejaculatory volume, alterations in the intensity of orgasm, use of erectile aids, and use of hormones for androgen deprivation should be quantified and reported, as in Table 1.

Assessment of rectal function after brachytherapy

Rectal morbidity can occur after prostate brachytherapy (1, 2, 5, 6–9, 13, 15, 19, 21). Acute rectal morbidity may include diarrhea, constipation, rectal urgency, tenesmus, and rectal bleeding. Late radiation injury can manifest as rectal bleeding, ulceration, fistula formation, fecal incontinence, and necrosis. Rectal injury usually occurs within 24 months of prostate brachytherapy and is rare ≥ 5 years after prostate brachytherapy (8, 9, 15). Most late rectal morbidity manifests as rectal bleeding, which is usually mild and resolves spontaneously (54). Rectal morbidity has been measured using the RTOG/EORTC late radiation morbidity scoring scheme for the small/large intestine (55), the specific rectal questions of the UCLA Prostate Cancer Index (26), or the Cancer Rehabilitation Evaluation System Short Form (56). Some data suggest a dose–response for rectal injury (15, 19). It has been demonstrated that as men age, up to one-third *without* prostate cancer experience some degree of rectal dysfunction (57). Multiple variables, including prostate dose, rectal dose, and EBRT dose, may affect the development of complications. There is conflicting litera-

ture correlating rectal morbidity with the dose and volume of rectum treated (8, 15, 19, 37,). Although not documented, dose-volume histogram (DVH) analysis (15, 37, 38) may well prove to be valuable.

Although no single instrument is currently accepted for reporting rectal morbidity, the ABS recommends the RTOG/EORTC acute and late radiation morbidity scoring scheme (also called National Cancer Institute Common Toxicity Criteria) as being the most appropriate for reporting rectal morbidity after prostate brachytherapy (Appendix 3) (55). The incidence of rectal steroid, laser, or antidiarrheal use should be reported as in Table 1.

Factors affecting HRQOL

Litwin *et al.* (47) reported that physician ratings of patient symptoms do not correlate well with patient self-assessment of quality of life. For all evaluated parameters, physicians underestimated the patient's symptoms. Using validated HRQOL, baseline determination of bowel, urinary, and sexual function is mandatory to determine treatment-related changes (26).

It is evident that the patient's subjective response to the symptoms related to therapy and cancer is at the heart of HRQOL instruments. The cartoon comparison is between a patient who is completely incontinent after surgery but reports an excellent HRQOL and a patient with a constellation of minor urinary symptoms who reports poor HRQOL after radiotherapy. Hence, the patient's expectations and subjective factors play an important part in determining their HRQOL. Quality-of-life outcomes must therefore be interpreted with great care, and it may be prudent to have a health care professional review the answers with the patient. Although issues such as excessive water drinking, caffeine use, and so forth may temporarily influence the patient's symptoms, these confounding issues are addressed by averaging the responses within 1 month as instructed in the questionnaire in Appendix 1. HRQOL is of greatest value when examined serially and quantified in large groups of subjects.

The HRQOL changes with time and adjustment. After treatment, patients tend to remember their baseline HRQOL functions as being better than they had actually been ("recall bias") (58). Complications are time dependent; hence, complication rates are meaningless unless the length of follow-up is considered. Serial posttreatment assessment of HRQOL at predetermined intervals is essential to detect subtle changes and to determine the actuarial complication rates. Furthermore, the longer a patient has to adjust, the less likely the symptoms will affect HRQOL.

The ABS (Consensus Level 1) therefore recommends the following:

1. *Data should be collected by patient-administered validated HRQOL instruments, whenever available.*
2. *Actuarial and crude incidence of specific complications should be reported along with their temporal resolution.*

3. *The number of patients at risk of developing a particular complication at a certain point in time should be reported.*

DISCUSSION

None of the validated HRQOL instruments specifically address the symptomatology of prostate brachytherapy, which includes dysuria, gross hematuria, incontinence, rectal bleeding, increased stool frequency, hematospermia, orgasmalgia, decreased intensity of orgasm, and decreased ejaculate. Rather than developing new morbidity reporting criteria, the ABS used the existing morbidity scales commonly used by urologists and radiation oncologists and added appropriate items to better capture the symptoms specific to implants. The refinement of existing HRQOL instruments is needed to assess the actual treatment-related HRQOL changes further. It is recognized that these recommendations will be used principally by those interested in reporting the results of prostate brachytherapy clinical trials. However, it is hoped that the continued evaluation of prostate brachytherapy HRQOL issues may result in improvement in treatment techniques, and ultimately improved quality-of-life outcomes.

Correlation of morbidity with dosimetry

Morbidity is intimately related to the dose to normal tissues. It is therefore important to report dosimetric data (including DVH) of normal tissues and correlate with morbidity. It is currently unclear which dosimetric data set is predictive of toxicity because of the paucity of data. However, these questions can only be answered if the dosimetric data are obtained prospectively. There is no standard method of obtaining and reporting normal tissue doses.

Hence, for urethral doses, the ABS suggests obtaining doses at the center of the urethra at 0.5-cm intervals from the base to apex of the prostate and reporting the maximal and mean urethral doses (29).

In addition, a DVH of the urethra should be performed, and the percentage of the prostate volume receiving 100%, 150%, and 200% of the prescribed dose (i.e., V_{100} , V_{150} , V_{200}) should be reported. These reported doses should then be prospectively correlated with morbidity.

To evaluate rectal morbidity, the ABS suggests performing postimplant CT-based DVH analysis for the rectum.

One such method has been published by Snyder *et al.* (15). The rectal volume is outlined from 1 cm above the seminal vesicles to 1 cm below the prostatic apex. Both the inner and outer wall of the rectum are drawn to define the rectal volume. The inner wall of the rectum can be defined by the edge of the lumen, taking care to exclude any feces. If the lumen is absent, the inner wall is approximated based on the diameter of the outer wall and the thickness of the rectal wall in abutting slices. A DVH is then generated. The absolute volume of the rectum in cubic centimeters covered

by the prescription dose and 50% of the prescription dose is reported and correlated with rectal morbidity (15).

Although the exact etiology of brachytherapy-induced ED is not known, the ABS suggests that radiation doses to the neurovascular bundles and bulb of the penis be prospectively evaluated (49, 51, 52) in an attempt to answer this question.

The neurovascular bundles are not identifiable on CT. A two-dimensional geometric model has been formulated that places the neurovascular bundles approximately 2 mm from the capsule in the posterolateral aspect of the prostate gland (49, 50). To date, two studies, including a prospective randomized study, have failed to reveal a relationship between the radiation dose to the neurovascular bundle and brachytherapy-induced ED (11, 50). The radiation dose to the bulb of the penis, however, has been implicated in the development of both EBRT and brachytherapy-induced ED, and the radiographic localization of the bulb of the penis has been described by Merrick *et al.* (52). Incrocci *et al.* have recently published an extensive review of sexual (dys)function after radiotherapy for prostate cancer (59). It is hoped

that prospective clinical correlation may help to elucidate further the etiology of brachytherapy-induced ED.

CONCLUSION

It is very important to focus on HRQOL issues in the treatment of prostate cancer, because the control rates of the varying treatment modalities are very similar. The ABS recommends using the International Prostate Symptom Score, International Index of Erectile Function, and RTOG toxicity grading criteria for the determination of urinary, sexual, and bowel function, respectively. The ABS has presented additional parameters for reporting urinary, rectal, and sexual morbidities after prostate brachytherapy that can be easily administered at baseline and during follow-up appointments. The use of this modified grading scale will enable better comparison and standardization of patient morbidity in various institutions. It should be noted that this is a constantly evolving field and that the recommendations are subject to modification as new data become available.

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Appendix 1. International Prostate Symptom Score

Patient's name	Date of birth					Date completed	
Question	Not at all	Less than 1 time in 5	Less than half the time	About half the time	More than half the time	Almost always	Your score
1. Incomplete emptying: Over the past month, how often have you had a sensation of not emptying your bladder completely after you finished urinating?	0	1	2	3	4	5	
2. Frequency: Over the past month, how often have you had to urinate again less than 2 hours after you finished urinating?	0	1	2	3	4	5	
3. Intermittency: Over the past month, how often have you found you stopped and started again several times when you urinated?	0	1	2	3	4	5	
4. Urgency: Over the past month, how often have you found it difficult to postpone urination?	0	1	2	3	4	5	
5. Weak stream: Over the past month, how often have you had a weak urinary stream?	0	1	2	3	4	5	
6. Straining: Over the past month, how often have you had to push or strain to begin urination?	0	1	2	3	4	5	
	None	1 time	2 times	3 times	4 times	5 times/more	Your score
7. Nocturia: Over the past month, how many times did you most typically get up to urinate from the time you went to bed at night until the time you got up in the morning?	0	1	2	3	4	5	
Quality of life due to urinary symptoms	Delighted	Pleased	Mostly satisfied	Equally satisfied and dissatisfied	Mostly dissatisfied	Unhappy	Terrible
If you were to spend the rest of your life with your urinary condition just the way it is now, how would you feel about that?	0	1	2	3	4	5	6
Total score_____							

Appendix 2: Sexual Health Inventory for Men

Patient instructions

Sexual health is an important part of an individual's overall physical and emotional well-being. Erectile dysfunction, also known as impotence, is one type of very common medical condition affecting sexual health. Fortunately, there are many different treatment options for erectile dysfunction. This questionnaire is designed to help you and your doctor identify whether you may be experiencing erectile dysfunction. If you are, you may choose to discuss treatment options with your doctor.

Each question has several possible responses. Circle the number of the response that **best describes** your own situation. Please be sure that you select one and only one response for **each question**.

During the past 6 months:

1. How do you rate your confidence that you could get and keep an erection?

Very low	Low	Moderate	High	Very high
1	2	3	4	5
2. When you had erections with sexual stimulation, how often were your erections hard enough for penetration (entering your partner)?

No sexual activity	Almost never or never	A few times (much less than half the time)	Sometimes (about half the time)	Most times (much more than half the time)	Almost always or always
0	1	2	3	4	5
3. During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?

Did not attempt intercourse	Almost never or never	A few times (much less than half the time)	Sometimes (about half the time)	Most times (much more than half the time)	Almost always or always
0	1	2	3	4	5
4. During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?

Did not attempt intercourse	Extremely difficult	Very difficult	Difficult	Slightly difficult	Not difficult
0	1	2	3	4	5
5. When you attempted sexual intercourse, how often was it satisfactory to you?

Did not attempt intercourse	Almost never or never	A few times (much less than half the time)	Sometimes (about half the time)	Most times (much more than half the time)	Almost always or always
0	1	2	3	4	5

Score _____

Add the numbers corresponding to questions 1–5. If your score is 21 or less, you may want to speak with your doctor.

Appendix 3. RTOG/EORTC late radiation morbidity scoring scheme for reporting rectal morbidity (55)

Grade	Adverse event
0	No change from baseline
1	Mild diarrhea; mild cramping; bowel movement 5 times daily; slight rectal discharge or bleeding
2	Moderate diarrhea and colic; bowel movements >5 times daily; excessive rectal mucus or intermittent bleeding
3	Obstruction or bleeding, requiring surgery
4	Necrosis/perforation/fistula

Abbreviation: RTOG/EORTC = Radiation Therapy Oncology Group/European Organization for Research and Treatment of Cancer.