Published in final edited form as:

Int J Radiat Oncol Biol Phys. 2012 February 1; 82(2): . doi:10.1016/j.ijrobp.2011.04.003.

Physician beliefs and practices for adjuvant and salvage radiation therapy after prostatectomy

Timothy N. Showalter¹, Nitin Ohri¹, Kris A. Teti¹, Kathleen A. Foley^{2,*}, Scott W. Keith³, Edouard J. Trabulsi⁴, Costas D. Lallas⁴, Adam P. Dicker¹, Jean Hoffman-Censits⁵, Laura T. Pizzi⁶, and Leonard G. Gomella⁴

¹Department of Radiation Oncology, Jefferson Medical College, Kimmel Cancer Center, Thomas Jefferson University, Philadelphia, PA

²Doris N. Grandon Center for Health Economics and Outcomes Research, Jefferson School of Population Health, Thomas Jefferson University, Philadelphia, PA

³Division of Biostatistics, Department of Pharmacology and Experimental Therapeutics, Jefferson Medical College, Thomas Jefferson University, Philadelphia, PA

⁴Department of Urology, Jefferson Medical College and Kimmel Cancer Center, Thomas Jefferson University, Philadelphia, PA

⁵Department of Medical Oncology, Jefferson Medical College and Kimmel Cancer Center, Thomas Jefferson University, Philadelphia, PA

⁶School of Pharmacy, Thomas Jefferson University, Philadelphia, PA

Abstract

PURPOSE—Despite results of randomized trials that support adjuvant radiation therapy (RT) after radical prostatectomy (RP) for prostate cancer with adverse pathologic features (APF), many clinicians favor selective use of salvage RT. This survey was conducted to evaluate the beliefs and practices of radiation oncologists (RO) and urologists (U) regarding RT after RP.

METHODS AND MATERIALS—We designed a web-based survey of post-RP RT beliefs and policies. Survey invitations were e-mailed to a list of 926 RO and 591 U. APF were defined as extracapsular extension, seminal vesicle invasion, or positive surgical margin. Differences between U and RO in adjuvant RT recommendations were evaluated by comparative statistics. Multivariate analyses were performed to evaluate factors predictive of adjuvant RT recommendation.

RESULTS—Analyzable surveys were completed by 218 RO and 92 U (overall 20% response rate). Adjuvant RT was recommended based on APF by 68% of respondents (78% RO, 44% U, p

© 2011 Elsevier Inc. All rights reserved.

Corresponding Author: Timothy N. Showalter, MD, Department of Radiation Oncology, Bodine Center for Cancer Treatment, Thomas Jefferson University, 111 S. 11th Street, Philadelphia, PA 19107, Phone: 215-955-6702, Fax: 215-955-0412, timothy.showalter@jeffersonhospital.org.

*Current Affiliation: Director, Strategic Consulting, Thomson Reuters Healthcare

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Prior Presentation: This work was presented in part at the 2011 Genitourinary Cancers Symposium in Orlando, Florida, February 18th, 2011.

Conflicts of Interest Notification: The authors have no conflicts of interest or financial disclosures to report.

<0.001). U were less likely than RO to agree that adjuvant RT improves survival and/or biochemical control ($p < 0.0001$). PSA thresholds for salvage RT were higher among U than RO ($p < 0.001$). Predicted rates of erectile dysfunction due to RT were higher among U than RO ($p < 0.001$). On multivariate analysis, respondent specialty was the only predictor of adjuvant RT recommendations.

CONCLUSIONS—U are less likely than RO to recommend adjuvant RT. Future research efforts should focus on defining the toxicities of post-RP RT and on identifying the subgroups of patients who will benefit from adjuvant, versus selective salvage, RT.

Keywords

adjuvant radiation therapy; prostate cancer; prostatectomy; urologist; radiation oncologist

INTRODUCTION

There were an estimated 217,730 new cases of prostate cancer (PC) in the United States in 2010.(1) An estimated one-third of newly diagnosed men with PC will undergo radical prostatectomy (RP),(2,3) and 1 in 5 of these patients will experience PC recurrence.(4) Rates of recurrence are higher, 40–60%, among patients with adverse pathological risk factors (APF).(5) Therefore, adjuvant radiation therapy (ART), given soon after RP and in the absence of a rise in prostate specific antigen (PSA), has been evaluated for patients with APF in the RP specimen. In 3 prospective, randomized trials, ART improved biochemical progression free survival (6–8) and overall survival (9) compared to observation among patients with one or more APF: extracapsular extension (ECE), (6–8) seminal vesicle invasion (SVI), (6–8) or positive surgical margin (PSM).(7,8)

A recent analysis of treatment patterns in the United States revealed that less than 20% of qualifying patients receive ART,(10–12) and the utilization of ART did not increase significantly after the results of the randomized trials were presented. Instead, many clinicians have adopted a policy of selective salvage radiation therapy (SRT), following patients closely after RP with regular PSA testing and offering SRT only for a rising PSA. The predominant reasons for favoring selective SRT over ART for patients with APF after RP include perceived toxicity of RT, risk of over-treatment with ART, and perceived equivalent effectiveness of SRT and ART.(13)

In order to evaluate the current beliefs and practices of PC specialists regarding ART and SRT after RP, we conducted a national web-based survey of United States urologists (U) and radiation oncologists (RO). We hypothesized that, compared to RO, U are less likely to recommend ART, use a higher threshold PSA level to recommend SRT, and estimate higher rates of RT-related toxicities.

METHODS

Participants

This study was performed with approval from the Thomas Jefferson University Institutional Review Board. RO participants were selected from the American Society for Radiation Oncology (ASTRO) membership directory (accessed July 2010), and only those members with a stated specialty in genitourinary cancers were included. A total of 926 RO were identified. U participants included all members of the Society for Urologic Oncology (SUO) with a valid email address. A total of 591 U were identified.

Survey Distribution

The survey invitation was sent as an e-mail, containing a brief introductory message and a link to the web-based instrument. In accordance with the SUO policy for electronic surveys, one email invitation was sent to each potential participant, without reminder, to limit message burden. No honorarium was offered, but participants were invited to include their e-mail address for an advanced report of the survey results. One response was allowed per participant. The link to the survey was closed two weeks after the e-mail invitation.

Survey Instrument

The investigators, including U and RO, designed the survey instrument. The survey was loaded onto an on-line survey service (www.surveymonkey.com). After administering the survey to 5 initial participants, the survey was revised into final form. The survey consisted of 34 questions with multiple choice questions and free text entries, requiring approximately 10 minutes to complete. Portions of the instrument, pertaining to details of experience in RP and surgical consideration and to details regarding technical aspects of RT, were limited to only U or only RO, respectively. Survey domains included: specialty, practice environment, PSA threshold for SRT, beliefs regarding effectiveness of ART, selection criteria for ART, timing of ART, estimated impact of RT on toxicity rates, and details of surgical and RT technique.

Statistical Analyses

Data were analyzed using statistical software (MATLAB; The Mathworks, Inc., Natick, MA). Only surveys that were completed beyond the first page were included in the analysis. Differences between U and RO were evaluated by chi square test, Fisher exact test, and t-test statistics, as appropriate. In addition, a backwards stepwise multivariate logistic regression was performed to identify factors predictive of ART utilization based on APF alone. Variables tested were: physician specialty, practice type (academic v. private), time in practice, and perceived toxicity of ART with regards to urinary incontinence, erectile dysfunction, and bladder neck contracture. Additionally, interaction terms were tested where appropriate (*e.g.*, perceived urinary toxicity among urologists).

RESULTS

Survey responses were received from 9/1/2010 through 9/14/2010, when the survey collector was closed. Survey invitations were sent to 926 RO, and responses were received from 231 RO (25% response rate). After excluding surveys incomplete beyond the first page, there were 218 analyzable surveys from RO (24% of all RO invitees). Survey invitations were emailed to 591 U, 174 of the messages were opened, 101 U started the survey, and there were 92 analyzable surveys. The U response rate represents 16% of the initial SUO email distribution and 53% of U who opened the message. In total, there were 310 analyzable responses from 1517 email invitations (20% response rate).

Demographics

Physicians in academic practice comprised 79% of U and 32% of RO respondents (Table 1). Among urologists who completed the survey, the annual numbers of prostatectomies performed per practice were more than 500 (15%), 401–500 (4%), 301–400 (13%), 201–300 (18%), 101–200 (24%), 61–100 (13%), and less than 60 (12%). The annual numbers of prostatectomies performed per urologist were more than 100 (18%), 61–100 (27%), 21–60 (27%), 10–20 (15%), and less than 10 (12%). The percentage of cases performed with laparoscopic and/or robotic assistance ranged from 0–100%, with an average of 57% ($\pm 42\%$); laparoscopic and/or robotic assistance is used in 80–100% of cases by 48% of U

respondents. U report estimated positive margin rates of 5%–10% (47%), 15–20% (47%), and 25–30% of cases (5%). U report meeting with pathologists to review prostatectomy specimens: always or almost always (37% of respondents), sometimes (43% of respondents), or infrequently/never (21%)

ART Beliefs and Practices

ART was recommended based on APF alone by 68% of all respondents (78% RO, 44% U), while 3% report “never” using ART (2% RO, 7% U) (Table 2). When asked the effect of ART on outcomes, most respondents (66%) replied “improves survival” (71% RO, 63% U) or “improves biochemical control but not survival” (29% of all respondents, 29% RO, 30% U). The timing of ART is generally greater than 4 months after RP for 69% of respondents, with most (59%) recommending ART between 5 and 6 months after surgery.

SRT Practices

Reported PSA thresholds for SRT were: “any detectable” in 32% (36% RO, 23% U), 0.2–0.3 ng/mL in 45% (50% RO, 36% U), 0.4–0.5 ng/mL in 15% (9% RO, 30% U), 0.6–0.8 ng/mL in 5% (3% RO, 10% U), or higher in 1% of respondents (1% RO, 1% U). PSA thresholds were significantly higher among U than RO ($p < 0.001$).

Radiation Oncology Details

Most RO (87%) use intensity-modulated RT (IMRT) or tomotherapy, while the remainder use three-dimensional conformal RT (3DCRT) (9%), arc-based RT (4%), or proton beam therapy (1 respondent, 0.4%). ART doses were: 64.0–66.6 Gy for 42%, 68.0–68.4 Gy for 24%, 70.0 Gy or higher in 29%, and less than 64.0 Gy for only a minority (4%) of RO respondents. Standard doses for SRT were: 70.0 Gy or higher for the majority (55%) of RO, and 64.0–66.6 Gy (22%) or 68.0–68.4 Gy (22%), but never less than 64.0 Gy, for the remaining respondents. Regarding image-guidance strategies, 43% use cone beam computed tomography (CT) or CT-on-rails, 32% use daily planar imaging with (16%) or without (16%) localization based on surgical clips, 15% use weekly port films, and 4% use ultrasound. Endorectal balloons are used “sometimes” or “always” by 9% of RO for post-RP RT. When asked the size of margin used to generate the planning target volume (PTV) from the clinical target volume (CTV), responses were: more than 1.0 cm in 1%, 1.0 cm in 11%, 8–9 mm in 11%, 6–7 mm in 14%, 4–5 mm in 20%, 3 mm in 3%, and “variable” in 39% of RO. When a variable CTV-to-PTV margin is used, the posterior margin is more than 1.0 cm in 0%, 1.0 cm in 2%, 8–9 mm in 3%, 6–7 mm in 21%, 4–5 mm in 37%, and 3 mm or less in 24% of RO.

Perceptions of Toxicity

When asked how often RT affects recovery of erectile dysfunction (ED) to what extent, average estimate by U for “complete halt/major effect” was 69% for ED, compared to 47% by RO (Table 3). Among respondents who estimated bladder neck contracture (BNC) rates after RP alone ($n=229$), estimates were: 0–5% by 48%, 6–10% by 31%, 11–15% by 14%, and >15% by 6% of U and RO participants. Estimated BNC rates after RP and RT were: 0–5% by 17%, 6–10% by 33%, 11–15% by 24%, and >15% by 25% of respondents. When asked how many cystoscopies are required when BNC occurs, U who completed the question ($n=79$) answered: 1 (51%), 2 (30%), 3 or more (8%), or “Not Sure” (10%).

Comparison of U versus RO

U were less likely than RO to agree that ART improves overall survival or leads to durable biochemical control ($p < 0.0001$). The proportion of U who report using an ART at least sometimes in their practice was smaller than, but not significantly different from, the

proportion of RO who use ART ($p = 0.07$). U were less likely than RO to recommend ART based on APF (ECE, SVI or PSM) alone ($p < 0.001$), but U are more likely to make a decision for ART based on APF and Gleason Score ($p < 0.0001$). U are less likely than RO to recommend ART for PSM ($p < 0.001$) (Table 2). The perceived rates of RT-related complications are higher among U than RO for ED ($p < 0.001$), but not for BNC ($p = 0.76$) or urinary incontinence ($p = 0.5$) (Table 3).

Predictors of ART Recommendations

On multivariate analysis, responder specialty (RO versus U) was associated with likelihood of recommending ART based on APF alone (Odds ratio = 4.93, 95% CI = [2.70–8.99]), as was perceived effects of postoperative radiotherapy on BNC (Odds ratio = 2.20, 95% CI = [1.16–4.20]). Other factors, including practice setting (academic vs. private) or cooperative group trial participation were not associated with ART recommendation. When RO responses were analyzed separately, the belief that postoperative radiation has no/mild effect (v. moderate/severe effect) on BNC was the only predictor of ART recommendation based on APF on multivariate analysis (Odds ratio = 3.09, 95% CI = [1.40–6.80]). No predictors of ART use were identified among the U cohort.

DISCUSSION

We conducted a survey of prostate cancer specialists throughout the United States. We identified significant discordance between the beliefs and practices of U versus RO regarding ART and SRT after RP. U are less likely than RO to believe that ART improves overall survival or biochemical control, or to recommend ART based on APF. This is the first study to identify differences between U and RO for self-described ART practices. These results are not surprising, however, based on recent reports that demonstrate low rates of ART utilization for qualifying patients.(10,11) The fact that ART use has not increased since the publication of randomized trials supporting ART(10) suggests clinicians have not embraced ART for patients with APF in the RP specimen.

Instead of offering ART to patients with APF after RP, many clinicians perform frequent PSA testing and recommend selective SRT when PSA levels rise above a threshold value. The rationale for an approach that favors selective SRT is based primarily upon the effectiveness of SRT, concerns about overtreatment with ART, and the toxicity of RT after RP.(13) These concerns may account for the reluctance of U in the current study to recommend ART based on APF alone. In the current study, U were less likely than RO to recommend ART based upon the presence of PSM after RP. Although it is not clear which subgroups benefit most from ART compared to SRT, an analysis of the European Organisation for Research and Treatment of Cancer (EORTC) trial of ART versus observation suggests that surgical margin status is the primary determinant of benefit from ART.(14)

U were more likely to consider Gleason Score in their recommendation for ART in our survey. Although Gleason Score has not been validated as a predictor of benefit from ART, there are preliminary data to support this rationale. In the updated report of the Southwest Oncology Group (SWOG) trial of ART versus observation, subset analyses suggested that patients with Gleason score 7–10 tumors may receive a larger metastasis-free survival benefit from ART than patient with Gleason scores 6.(9) Gleason score 8–10 has been associated with increased risk of recurrence following RP,(15) as well as increased risk of distant metastasis after RP and ART or SRT.(16) PSA levels may also predict the improvement in biochemical control achieved by ART. In the German randomized trial of ART versus observation, a preoperative PSA level ≥ 10 ng/mL was associated with increased impact of ART on biochemical progression-free survival.(6) Gleason score and

PSA level may help refine decisions for ART versus SRT and should be evaluated in future trials.

A primary criticism of ART is the exposure of a large number of patients whose prostate cancer may never recur to the potential toxicities of ART.(13) Based on the existing literature, it remains unclear how common or severe the toxicities of post-RP RT are, reflected in the range of responses observed in this survey. In the SWOG trial, which included conventional RT techniques, urethral stricture was significantly more common in the group that received ART (17.8%) than in the group that was observed after RT (9.5%). (8) Complete urinary incontinence was also more common among patients in the SWOG trial who received ART after RO (6.5% versus 2.8%, $p = 0.11$).(8) However, an interim analysis of the EORTC study did not show an increased risk of urinary incontinence with ART.(17) The German ART trial is the only reported randomized trial of ART versus observation to require three-dimensional RT planning. Two of 194 patients in the ART arm, compared to 1 patient in the observation arm, developed urethral stricture.(6) In a 2007 multi-institutional review of the late toxicities of 959 men who received ART or SRT, the rates of late grade 3 genitourinary and gastrointestinal toxicities were 1% and 0.4%, respectively.(18)

Although the German trial and the multi-institutional review, which included patients treated in the era of 3DCRT,(6,18) may suggest that late toxicity rates are lower with contemporary RT techniques than with conventional planning, further prospective data are needed to better define the true risks of RT. It is also not clear what the impact of ART timing is on rates of ED and urinary incontinence. ART was delivered 3–4 months after surgery in the randomized trials,(6–8) but it has been suggested that ART soon after RP may slow or stop recovery of sexual function and urinary continence.(13) Respondents in this survey most commonly recommended that ART be delivered 5–6 months after RP. Since it is not known whether there is any benefit to immediate, early ART versus delayed ART, it seems prudent to postpone RT until after recovery of urinary continence and/or erectile function.

This study is limited by the focus on physician preferences, which may not reflect directly the real-world utilization of ART. Interestingly, although the responses of U suggest partial utilization of ART, the observed recommendation rates for ART based on APF alone (32–59%) exceed the utilization rate (20%) reported in a recent analysis of the Surveillance Epidemiology and End Results (SEER) database.(10) The SEER database may significantly underestimate RT use for some disease sites.(19) The SEER database records the first course of treatment,(10) but the survey responses regarding common practices regarding timing of ART (5–6 months or longer after RP) suggest that ART may be delivered frequently after the initial treatment course. On the other hand, a recently-published analysis of a large prostate cancer registry suggests a real trend toward the undertreatment of high risk prostate cancer.(20) The discrepancy between survey responses in this study and the 20% utilization rate in the SEER report may lend further support to this observation regarding treatment choices in high-risk prostate cancer. The number of responses may have been increased by reminder messages or honoraria, which were not included in the study. Finally, the respondents in this survey include a disproportionate number of academic physicians, which may not represent accurately the profile of clinicians who provide prostate cancer care in the United States.

The majority of RO (87%) report using IMRT or tomotherapy routinely for ART or SRT after RP. The prevalence of IMRT is surprising, as there are no prospective data that compare clinical results of IMRT to 3DCRT for post-RP treatment. Comparative analyses of IMRT versus 3DCRT in this setting are limited to dosimetric studies that suggest a potential role for IMRT to reduce late GI toxicity.(21,22) Early results of non-randomized

experiences with post-RP IMRT are available.(23–25) Image-guided RT (IGRT) techniques that provide volumetric imaging have also been integrated into post-RP RT practice, with 42% of RO using cone beam CT or CT-on-rails, perhaps mirroring the overall trend towards the increased use of IGRT in radiation oncology.(26,27) The responses of RO regarding the technical aspects of ART and SRT highlight the urgent need to evaluate the clinical benefits and value of IMRT, IGRT, and dose-escalation through well-designed, prospective trials. Higher direct medical costs are associated with IMRT, IGRT, and dose-escalation, so it will be important to demonstrate through research the value of these higher technology/higher expense practices.

In conclusion, this national survey of prostate cancer specialists highlights the controversy between ART versus SRT for patients with APF after RP and identifies differences between U and RO in their beliefs and practices regarding this topic. Additional research should focus on better defining the real-world toxicities of post-RP RT and on identifying those subgroups of lower-risk patients for whom ART may be safely omitted and higher-risk patients for whom ART improves prostate cancer outcomes compared to observation with selective SRT. Epidemiological research using large, observational cohorts may provide useful data regarding complications after ART and may suggest predictive factors in addition to APF for use in decision-making for ART. These findings could then be incorporated into the design of prospective clinical trials that use a risk-adapted approach to evaluate ART versus selective SRT among patients with APF. It is hoped that the results of prospective, randomized trials of ART versus SRT will provide consensus among U and RO for decisions in this setting.

Acknowledgments

The authors wish to thank the Society for Urologic Oncology for supporting this work by sending survey invitations to its membership directory.

Funding: This work was supported in part by the Kimmel Cancer Center NIH Cancer Center Core grant P30CA56036.

REFERENCES

1. Jemal A, Siegel R, Xu J, et al. Cancer statistics, 2010. *CA Cancer J Clin.* 2010; 60:277–300. [PubMed: 20610543]
2. Penson DF, Chan JM. Urologic Diseases in America Project. Prostate cancer. *J Urol.* 2007; 177:2020–2029. [PubMed: 17509282]
3. Swanson GP, Riggs MW, Earle JD, et al. Long-term follow-up of radical retropubic prostatectomy for prostate cancer. *European Urology.* 2002; 42:212–216. [PubMed: 12234504]
4. Han M, Partin AW, Pound CR, et al. Long-term biochemical disease-free and cancer-specific survival following anatomic radical retropubic prostatectomy. The 15-year Johns Hopkins experience. *Urol Clin North Am.* 2001; 28:555–565. [PubMed: 11590814]
5. Swanson GP, Riggs M, Hermans M. Pathologic findings at radical prostatectomy: Risk factors for failure and death. *Urol Oncol.* 2007; 25:110–114. [PubMed: 17349524]
6. Wiegel T, Bottke D, Steiner U, et al. Phase III postoperative adjuvant radiotherapy after radical prostatectomy compared with radical prostatectomy alone in pT3 prostate cancer with postoperative undetectable prostate-specific antigen: ARO 96-02/AUO AP 09/95. *J Clin Oncol.* 2009; 27:2924–2930. [PubMed: 19433689]
7. Bolla M, van Poppel H, Collette L, et al. Postoperative radiotherapy after radical prostatectomy: a randomised controlled trial (EORTC trial 22911). *Lancet.* 2005; 366:572–578. [PubMed: 16099293]
8. Thompson IM Jr, Tangen CM, Paradelo J, et al. Adjuvant radiotherapy for pathologically advanced prostate cancer: a randomized clinical trial. *JAMA.* 2006; 296:2329–2335. [PubMed: 17105795]

9. Thompson IM, Tangen CM, Paradelo J, et al. Adjuvant radiotherapy for pathological T3N0M0 prostate cancer significantly reduces risk of metastases and improves survival: long-term followup of a randomized clinical trial. *J Urol*. 2009; 181:956–962. [PubMed: 19167731]
10. Hoffman KE, Nguyen PL, Chen MH, et al. Recommendations for postprostatectomy radiation therapy in the United States before and after the presentation of randomized trial. *J Urol*. 2011; 185:116–120. [PubMed: 21074194]
11. Ghia AJ, Shrieve DC, Tward JD. Adjuvant radiotherapy use and patterns of care analysis for margin-positive prostate adenocarcinoma with extracapsular extension: Postprostatectomy adjuvant radiotherapy: A SEER analysis. *Urology*. 2010; 76:1169–1174. [PubMed: 20709371]
12. Schreiber D, Rineer J, Yu JB, et al. Analysis of pathologic extent of disease for clinically localized prostate cancer after radical prostatectomy and subsequent use of adjuvant radiation in a national cohort. *Cancer*. 2010; 116:5757–5766. [PubMed: 20737571]
13. Nielsen ME, Trock BJ, Walsh PC. Salvage or adjuvant radiation therapy: counseling patients on the benefits. *J Natl Compr Canc Netw*. 2010; 8:228–237. [PubMed: 20141679]
14. Van der Kwast TH, Bolla M, Van Poppel H, et al. Identification of patients with prostate cancer who benefit from immediate postoperative radiotherapy: EORTC 22911. *J Clin Oncol*. 2007; 25:4178–4186. [PubMed: 17878474]
15. Trock BJ, Han M, Freedland SJ, et al. Prostate cancer-specific survival following salvage radiotherapy vs observation in men with biochemical recurrence after radical prostatectomy. *JAMA*. 2008; 299:2760–2769. [PubMed: 18560003]
16. Trabulsi EJ, Valicenti RK, Hanlon AL, et al. A multi-institutional matched-control analysis of adjuvant and salvage postoperative radiation therapy for pT3-4N0 prostate cancer. *Urology*. 2008; 72:1298–1302. [PubMed: 18672274]
17. Van Cangh PJ, Richard F, Lorge F, et al. Adjuvant radiation therapy does not cause urinary incontinence after radical prostatectomy: results of a prospective randomized study. *J Urol*. 1998; 159:164–166. [PubMed: 9400462]
18. Feng M, Hanlon AL, Pisansky TM, et al. Predictive factors for late genitourinary and gastrointestinal toxicity in patients with prostate cancer treated with adjuvant or salvage radiotherapy. *Int J Radiat Oncol Biol Phys*. 2007; 68:1417–1423. [PubMed: 17418972]
19. Yu JB, Gross CP, Wilson LD, et al. NCI SEER public-use data: Applications and limitations in oncology research. *Oncology*. 2009; 23:288–295. [PubMed: 19418830]
20. Cooperberg MR, Broering JM, Carroll PR. Time trends and local variation in primary treatment of localized prostate cancer. *J Clin Oncol*. 2010; 28:1117–1123. [PubMed: 20124165]
21. Koontz BF, Das S, Temple K, et al. Dosimetric and radiobiologic comparison of 3D conformal versus intensity modulated planning techniques for prostate bed radiotherapy. *Medical Dosimetry*. 2009; 34:256–260. [PubMed: 19647638]
22. Harrison A, Studenski M, Harvey A, et al. Potential for dose-escalation in the postprostatectomy setting with intensity-modulated radiation therapy: a dosimetric study using EORTC consensus guidelines for target volume contours. *Practical Radiation Oncology*. 2011 In press.
23. De Meerleer G, Fonteyne V, Meersschout S, et al. Salvage intensity-modulated radiotherapy for rising PSA after radical prostatectomy. *Radiother Oncol*. 2008; 89:205–213. [PubMed: 18771809]
24. Nath SK, Sandhu AP, Rose BS, et al. Toxicity analysis of postoperative image-guided intensity-modulated radiotherapy for prostate cancer. *Int J Radiat Oncol Biol Phys*. 2010; 78:435–441. [PubMed: 19939580]
25. Ost P, Fonteyne V, Villeirs G, et al. Adjuvant high-dose intensity-modulated radiotherapy after radical prostatectomy for prostate cancer: Clinical results in 104 patients. *Eur Urol*. 2009; 56:669–677. [PubMed: 19501453]
26. Dawson LA, Jaffray DA. Advances in image-guided radiation therapy. *J Clin Oncol*. 2007; 25:938–946. [PubMed: 17350942]
27. Verellen D, De Ridder M, Linthout N, et al. Innovations in image-guided radiotherapy. *Nat Rev Cancer*. 2007; 7:949–960. [PubMed: 18034185]

Table 1

Characteristics of respondents (n=310) whose answers were included in the survey analysis.

Characteristics	Number of Respondents		
	Radiation Oncologists (n = 218)	Urologists (n = 92)	All (n = 310)
Academic	69 (32%)	73 (79%)	142 (46%)
Small Private Practice	67 (31%)	5 (5%)	72 (23%)
Large Private Practice	78 (36%)	13 (14%)	91 (29%)
“Other” Practice Setting	4 (2%)	1 (1%)	5 (2%)
0–5 years in practice	51 (23%)	27 (29%)	78 (25%)
6–10 years in practice	39 (18%)	14 (15%)	53 (17%)
11–15 years in practice	32 (15%)	13 (14%)	45 (15%)
15–20 years in practice	39 (18%)	12 (13%)	51 (16%)
21+ years in practice	57 (26%)	26 (28%)	83 (27%)
Enrolls patients in cooperative group trials	116 (53%)	68 (74%)	184 (59%)
0 patients per year on clinical trials	51 (23%)	27 (29%)	77 (25%)
1–5 patients per year on clinical trials	39 (18%)	14 (15%)	98 (32%)
6–10 patients per year on clinical trials	32 (15%)	13 (14%)	65 (21%)
11–20 patients per year on clinical trials	39 (18%)	12 (13%)	35 (11%)
>20 patients per year on clinical trials	57 (26%)	26 (28%)	35 (11%)

Table 2

Responses by urologists and radiation oncologists regarding recommendations for adjuvant radiation therapy based on the presence of adverse pathological features in the prostatectomy specimen. ART = adjuvant radiation therapy, GS = Gleason Score, ECE = extracapsular extension, SVI = seminal vesicle invasion. *p* values are for comparison of radiation oncologists and urologists, using the Chi-squared test or 2-sided Fisher Exact test,

	Radiation Oncologists	Urologists	All	<i>p</i> value
Would use ART based on APF alone	166 (78%)	39 (44%)	205 (68%)	<0.001
Would use ART based on APF and GS/PSA	28 (13%)	31 (35%)	59 (20%)	
Would use ART if PSA detectable	15 (7%)	12 (14%)	27 (9%)	
Would never use ART	4 (2%)	6 (7%)	10 (3%)	
Would offer ART for ECE, only	150/213 (70%)	28/88 (32%)	178/301 (59%)	<0.001
Would offer ART for SVI, only	162/213 (76%)	52/88 (59%)	214/301 (71%)	0.005
Would offer ART for Positive Margin, only	193/213 (91%)	42/88 (48%)	235/301 (78%)	<0.001
Would offer ART for GS 8–10, only	26/213 (12%)	14/88 (16%)	40/301 (13%)	0.455
Would offer ART for GS 8–10 & ECE	156/213 (73%)	39/87 (45%)	195/300 (65%)	<0.001
Would offer ART for GS 8–10 & SVI	160/213 (75%)	48/87 (55%)	208/300 (69%)	0.001
Would offer ART for GS 8–10 & Positive Margin	197/213 (92%)	64/87 (73%)	261/300 (80%)	<0.001
Longest interval to ART 0–4 months	59 (28%)	28 (38%)	87 (31%)	0.358
Longest interval to ART 5–9 months	126 (60%)	36 (49%)	162 (57%)	
Longest interval to ART > 10 months	26 (12%)	10 (14%)	36 (13%)	

Table 3

Responses by urologists and radiation oncologists regarding estimated impact of radiation therapy on toxicity rates after radical prostatectomy. PORT = postoperative radiation therapy (adjuvant or salvage), BNC = bladder neck contracture. *p* values are for comparison of radiation oncologists and urologists, using the 2-sided Fisher Exact test

	Radiation Oncologists	Urologists	All	<i>p</i> value
Believe PORT has no/minor effect on urinary continence recovery for >50% of patients	116 (71%)	48 (63%)	164 (69%)	0.233
Believe PORT has major/total effect on urinary continence recovery for >50% of patients	47 (29%)	28 (37%)	75 (31%)	
Believe PORT has no/minor effect on sexual function recovery for >50% of patients	96 (59%)	20 (25%)	116 (48%)	<0.001
Believe PORT has major/total effect on sexual function recovery for >50% of patients	67 (41%)	59 (75%)	126 (52%)	
Believe PORT has no/mild effect on incidence of BNC	126 (72%)	59 (75%)	185 (73%)	0.761
Believe PORT has mod/severe effect on incidence of BNC	48 (28%)	20 (25%)	68 (27%)	