# Complete Summary

## GUIDELINE TITLE

Post-treatment follow-up of prostate cancer.

## BIBLIOGRAPHIC SOURCE(S)

Kawashima A, Francis IR, Baumgarten DA, Bluth EI, Bush WH Jr, Casalino DD, Curry NS, Israel GM, Jafri SZ, Papanicolaou N, Remer EM, Sandler CM, Spring DB, Fulgham P, Expert Panel on Urologic Imaging. Post-treatment follow-up of prostate cancer. [online publication]. Reston (VA): American College of Radiology (ACR); 2007. 8 p. [60 references]

## GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Kawashima A, Choyke PL, Bluth EI, Bush WH Jr, Casalino DD, Francis IR, Jafri SZ, Kronthal AJ, Older RA, Papanicolaou N, Ramchandani P, Rosenfield AT, Sandler CM, Segal AJ, Tempany CM, Resnick MI, Expert Panel on Urologic Imaging. Post-treatment follow-up of prostate cancer. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 9 p. [50 references]

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

## ** REGULATORY ALERT **

## FDA WARNING/REGULATORY ALERT

**Note from the National Guideline Clearinghouse**: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- May 23, 2007, Gadolinium-based Contrast Agents: The addition of a boxed warning and new warnings about the risk of nephrogenic systemic fibrosis (NSF) to the full prescribing information for all gadolinium-based contrast agents (GBCAs).

## COMPLETE SUMMARY CONTENT

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## SCOPE

### DISEASE/CONDITION(S)

Prostate cancer

### GUIDELINE CATEGORY

Evaluation

### CLINICAL SPECIALTY

Nuclear Medicine
Oncology
Radiology
Urology

### INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

### GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of radiologic procedures for post-treatment follow-up of prostate cancer

### TARGET POPULATION

Patients treated for prostate cancer

### INTERVENTIONS AND PRACTICES CONSIDERED

1. Nuclear imaging (NUC)
    - Bone scan whole body
    - ProstaScint scan
2. Ultrasound

    - Prostate, transrectal
    - Prostate, transabdominal
    - Invasive ultrasound (US)-guided transrectal biopsy of the prostate bed
3. Magnetic resonance imaging (MRI) of the pelvis
4. Computed tomography (CT) of the abdomen and pelvis with contrast
5. Fluorodeoxyglucose positron emission tomography (FDG-PET)/CT of the whole body
6. X-ray
    - Radiographic survey of the whole body
    - Intravenous urography

### MAJOR OUTCOMES CONSIDERED

Utility of radiologic procedures in post-treatment follow-up of prostate cancer

## METHODOLOGY

### METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of recent peer-reviewed medical journals, and the major applicable articles were identified and collected.

### NUMBER OF SOURCE DOCUMENTS

Not stated

### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

### METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

## METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

## DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed for reaching agreement in the formulation of the appropriateness criteria. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty percent agreement is considered a consensus. This modified Delphi technique enables individual, unbiased expression, is economical, easy to understand, and relatively simple to conduct.

If consensus cannot be reached by the Delphi technique, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible. If "No consensus" appears in the rating column, reasons for this decision are added to the comment sections.

## RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

## COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

## METHOD OF GUIDELINE VALIDATION

Internal Peer Review

## DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness.

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

**ACR Appropriateness Criteria®**

**Clinical Condition: Post Treatment Follow-up of Prostate Cancer**

**Variant 1: Status post radical prostatectomy. Rising PSA Level.**

| Radiologic Procedure | Rating | Comments | RRL* |
|---|---|---|---|
| NUC bone scan whole body | 8 | More likely to be helpful if PSA>10. Readily available. Scan to include correlative plain films. If bone scan is positive, no further imaging work-up is necessary. | Med |
| CT abdomen and pelvis with contrast | 7 | For nodal involvement. Not very useful for local recurrence. | High |
| INV US-guided biopsy prostate bed transrectal | 6 | Should be done under ultrasound guidance to confirm recurrence. Local recurrent tumor may be visualized on transrectal ultrasound in only 30% to 50% of cases. | IP |
| MRI pelvis | 6 | Endorectal coil MRI may be useful for evaluating local extension or pelvic nodal involvement. Use of Gadolinium injection is promising in detecting local recurrence. MRI-guided biopsy is not widely available. If bone scan is inconclusive, MRI would be helpful for further characterization. See comments regarding contrast in text under "Anticipated Expectations." | None |
| US prostate transrectal | 4 | Will not show microscopic occurrences. | None |
| NUC ProstaScint Scan | 3 | May be more appropriate if decisions regarding local therapy are being considered. Fusion imaging with CT or MRI has been reported. | High |
| FDG-PET/CT whole body | 3 | PET/CT promising, but data insufficient to warrant routine use. | High |
| US prostate transabdominal | 2 | | None |

| Radiologic Procedure | Rating | Comments | RRL* |
|---|---|---|---|
| X-ray radiographic survey whole body | 1 | | Low |
| X-ray intravenous urography | 1 | If bone scan shows obstruction or elevated creatinine. | Low |
| **Rating Scale: 1=Least appropriate, 9=Most appropriate** | | | ***Relative Radiation Level** |

**Note**: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

**Variant 2: Status post radiation therapy. Rising PSA level.**

| Radiologic Procedure | Rating | Comments | RRL* |
|---|---|---|---|
| NUC bone scan whole body | 8 | Scan to include correlative plain films. | Med |
| CT abdomen and pelvis with contrast | 7 | | High |
| INV US-guided biopsy prostate bed transrectal | 6 | | IP |
| MRI pelvis with contrast | 6 | Use of Gadolinium injection is promising in detecting local recurrence. See comments regarding contrast in text under "Anticipated Expectations." | None |
| US prostate transrectal | 3 | | None |
| NUC ProstaScint Scan | 3 | | High |
| FDG-PET/CT whole body | 3 | | High |
| US prostate transabdominal | 1 | | None |
| X-ray radiographic survey whole body | 1 | | Low |
| X-ray intravenous | 1 | | Low |

| Radiologic Procedure | Rating | Comments | RRL* |
|---|---|---|---|
| urography | | | |
| **Rating Scale: 1=Least appropriate, 9=Most appropriate** | | | ***Relative Radiation Level** |

**Note**: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

**Variant 3: Treatment of metastatic prostate cancer by androgen deprivation therapy (ADT). Rising PSA level.**

| Radiologic Procedure | Rating | Comments | RRL* |
|---|---|---|---|
| NUC bone scan whole body | 8 | Obtain plain films as needed. | Med |
| CT abdomen and pelvis with contrast | 7 | | High |
| MRI pelvis | 6 | See comments regarding contrast in text under "Anticipated Expectations." | None |
| NUC ProstaScint Scan | 2 | | High |
| FDG-PET/CT whole body | 2 | | High |
| US prostate transrectal | 1 | | None |
| INV US-guided biopsy prostate bed transrectal | 1 | | IP |
| X-ray intravenous urography | 1 | May be indicated if bone scan shows obstruction or elevated creatinine. | Low |
| US prostate transabdominal | 1 | | None |
| X-ray radiographic survey whole body | 1 | | Low |
| **Rating Scale: 1=Least appropriate, 9=Most appropriate** | | | ***Relative Radiation Level** |

**Note**: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

**Summary of Literature Review**

In evaluating of patients with recurrent or metastatic prostate cancer, it is important to define the location, size and the extent of local and/or distant tumors. Prostate cancer is treated by four standard methods: radical prostatectomy, radiation therapy, cryosurgical ablation, or androgen deprivation therapy (ADT). The treatment choice is based on the stage of the tumor as well as the histology and grade and is influenced to a certain extent by the preference of the treating physician and the patient. After treatment, patients are followed at periodic intervals with measurement of serum prostate-specific antigen (PSA) levels and digital rectal examination (DRE). However, DRE is frequently unreliable in evaluating local recurrent disease after radical prostatectomy.

PSA is produced by the epithelial cells of the prostate gland and is therefore specific for prostatic tissue. A rise in PSA is detected in the serum when the prostate gland has been disrupted as with prostate cancer, benign prostatic hyperplasia (BPH), or acute prostatitis, or following prostate biopsy. PSA is now widely used as a tumor marker for prostate cancer, both for detection and for monitoring response to therapy. No imaging study is necessary after treatment for clinically localized prostate cancer unless the PSA is elevated, the DRE is abnormal, or the patient has bone pain.

Although PSA alone does not differentiate local from distant disease recurrence, the patterns of PSA rise after local therapy can help to differentiate local from distant failure. Patients with a late biochemical recurrence (>24 months after local treatment), low PSA velocity (change in PSA over time), and/or prolonged PSA doubling time (>6 months) most likely have recurrent local disease. Conversely, patients with a rapid PSA recurrence (<24 months after local treatment), high PSA velocity, or short PSA doubling time (<6 months) are more likely to have distant disease recurrence.

Bone x-rays are not sensitive for detecting metastasis compared with radionuclide bone scans, but they may be helpful in identifying degenerative changes as the cause for a positive bone scan. Chest x-ray is not necessary because lung metastases are only found in late-stage disease after other more common sites are involved by tumor.

Whole-body bone scans are frequently performed for detecting skeletal metastases in patients with rising PSA following treatment. If the bone scan is positive for metastatic disease, no other imaging is indicated. One study suggested that bone scans be done annually in patients without evidence of metastatic disease and in patients with clinical or biochemical indications of recurrent disease. However, since bone scans are rarely positive without symptoms or without abnormal PSA levels, the routine use of this study post treatment is considered unproductive by some investigators. Another study found three patients with bone metastases in a series of 59 patients without suspicious serum PSA levels. A bone scan may be inconclusive since it is a sensitive but not specific examination. Magnetic resonance imaging (MRI) may be helpful in the diagnosis of bone metastasis when other examinations are conflicting, and it can

be used to determine response to hormonal treatment. A comparison of MRI and bone scans showed 818 abnormal vertebrae detected by MRI versus 499 by bone scan in the same group of patients.

**Post Radical Prostatectomy**

Following radical prostatectomy, PSA levels are expected to be undetectable to less than 0.15 ng/ml within several weeks of surgery. Waiting 6-8 weeks after treatment is advisable before assessing the serum PSA value since the half-life of serum PSA is relatively long. Since the PSA is specific for the prostate, detectable PSA levels mean that there is residual prostate tissue. If there is a rise in a previously undetectable or stable postoperative PSA level, a prompt search for persistent, recurrent, or metastatic disease should be pursued. The major objective of the diagnostic imaging studies is to assess patients for the presence of distant metastatic disease or local recurrent disease, each requiring different forms of systemic or local therapy.

*Radionuclide Bone Scintigraphy*

Radionuclide bone scan is traditionally the first examination obtained. If the bone scan is positive for metastatic disease, no further imaging studies are necessary. If the bone scan is inconclusive, further imaging studies are performed, including conventional radiographs, MRI, or computed tomography (CT). However, the level of post-treatment PSA that should prompt a bone scan is uncertain. In a study of patients with biochemical failure following radical prostatectomy, the probability of a positive bone scan was less than 5% with PSA levels between 40 to 45 ng/mL. In another study, bone scan was limited until PSA rose above 30 to 40 ng/mL. Men with PSA doubling times less than 6 months after radical prostatectomy were at increased risk of a positive bone scan (26% vs. 3%) or positive CT (24% vs. 0%) compared to those with longer PSA doubling time.

Based on a survey by the American Urology Association (AUA) on current practice strategies for follow-up after radical prostatectomy, bone scans are recommended only if the patient had symptoms of bone pain, a rapid rise in PSA (PSA velocity), or a significantly elevated PSA value.

*Transrectal Ultrasonography*

The use of imaging in the evaluation of local tumor recurrence is controversial. Transrectal ultrasound (TRUS) with guided biopsy of the vesicourethral anastomosis (VUA) has been the standard imaging approach to document local recurrence. A palpable abnormality is not always a good guide to the location of recurrent or progressive tumor because postoperative fibrosis may mimic tumor. Negative results of ultrasound-guided transrectal biopsy of the VUA, regardless of a palpable mass or indurations, may be inconclusive because of sampling error. The use of biopsy has been questioned in the face of a rising PSA level, since the negative results are unreliable and elevated PSA levels usually precede clinical evidence of local recurrence by one or more years. Repeat TRUS with VUA needle biopsy may be necessary in one-third of cases. The yield for detecting local recurrent tumor with TRUS with needle biopsy rises significantly with serum PSA levels. Only about 25% of men with prostatectomy PSA levels of less than 1 ng/mL have histologic confirmation of local recurrence after biopsy of the prostatic

fossa. None of the patients with PSA levels of 0.5 ng/mL or less who had negative DRE and TRUS have a biopsy-proved local recurrence.

A staging pelvic lymphadenectomy is sometimes done at the time of a radical retropubic prostatectomy; therefore, follow-up of the lymph nodes usually is not necessary in such cases. However, if the biopsy of the VUA is repeatedly negative in the face of a rising PSA level, then pelvic imaging looking for adenopathy with CT or MRI may be indicated.

*Computed Tomography*

CT is not effective for detecting recurrent tumor in the surgical bed. A CT scan can recognize only local recurrences that are greater than or equal to 2 grams. The mean PSA value associated with a positive CT scan after radical prostatectomy was 27.4 ng/mL.

In the evaluation of nodal disease, CT has replaced lymphography and relies on nodal size to detect nodal metastases. Using 1 cm as a cutoff, studies have reported sensitivity between 27% to 75% and specificity between 66% to 100%. By decreasing the size cutoff to 0.7 cm and by sampling suspicious nodes by fine-needle aspiration (FNA), one group of researchers were able to attain a sensitivity of 78% and specificity of 100%. However, this decreased size criteria with concomitant use of FNA has not been widely adopted. CT is useful in detecting bone and visceral metastases, although bone scan and MRI are superior in the diagnosis and follow-up of bone metastases.

*Magnetic Resonance Imaging*

The use of MRI is evolving and has potential to evaluate both local recurrence and distant bony and nodal metastases. MRI utilizing an endorectal coil is used to evaluate local recurrence. In a study by one group of researchers, MRI was positive in men with cancer recurrence only with a concomitant rise in PSA level. In the absence of PSA rise, despite suspicious findings on DRE, the MRI was negative. In another study of 16 patients with rising PSA after radical prostatectomy and negative transrectal ultrasound-guided biopsy, gadolinium-enhanced, dynamic endorectal coil MRI demonstrated nodular enhancing lesions in 13 of 16 patients (84%). In 8 of the 13 patients with positive MRI findings, PSA levels decreased after radiation therapy. Concurrent MRI-directed biopsy of suspicious sites is not available, making histologic correlation and assessment of its true utility difficult.

The accuracy of MRI for staging pelvic lymph nodes by size criteria is similar to that of CT. MRI can be more sensitive and specific in the diagnosis of bone metastases with better spatial and contrast resolution when compared to bone scan. MRI cannot cover the entire skeleton within a reasonable time at a reasonable cost. Therefore, it is only useful when other imaging modality findings are indeterminate. Response of bone metastases to treatment can be more accurately monitored by serial MRI scans.

**Post Radiation Therapy**

Prostate cancer treated with radiation therapy (RT) is monitored differently, since the prostate and the lymph nodes are left in place. Following radiation therapy, the serum PSA level decreases in the majority of the patients during the first year. Surveillance for tumor recurrence in patients post radiation therapy should include a DRE and serial serum PSA levels. The prostate gland becomes atrophic and fibrotic after radiation treatment, making distinction between local recurrent disease and benign irradiated prostatic gland difficult by DRE alone. The American Society of Therapeutic Radiology and Oncology (ASTRO) has defined recurrence following radiation therapy as three consecutive rises in serum PSA following a post-RT PSA nadir. An increasing serum PSA level will prompt radionuclide bone scan. If the bone scan is positive, no further evaluation is necessary. If the bone scan is inconclusive, MRI may be helpful. If the bone scan is negative or inconclusive, TRUS-directed biopsy of the prostate is indicated. MRI may be indicated to depict local recurrence after radiotherapy. In 22 patients with rising PSA after external beam radiation therapy, contrast-enhanced dynamic MRI demonstrated areas of recurrent intraprostatic tumor more accurately and with less interobserver variability than T2-weighted images did. Evaluation for lymph node enlargement is done by either CT or MRI. Both imaging tests are relatively accurate for detecting lymph node enlargement.

**Post Cryosurgery**

Serum PSA should fall to a low level 6 to 8 weeks following cryosurgery and should not rise on successive occasions. Follow-up after cryosurgery should be the same as that after radiotherapy, and it seems reasonable to use similar guidelines to define disease recurrence. It is often difficult to differentiate recurrent tumor from post-cryosurgery changes by means of DRE, TRUS, and MRI.

**Post Androgen Deprivation Therapy**

ADT—using bilateral orchiectomy, luteinizing hormone-releasing hormone analogue, diethylstilbestrol, bilateral orchiectomy and flutamide, and luteinizing hormone-releasing hormone analogue and flutamide—may control prostate cancer for long periods by decreasing the size of the tumor, thus relieving pain and other symptoms in patients with advanced disease. ADT may be added to definitive therapy (radical prostatectomy, radiation therapy, and cryosurgery) in patients with early-stage disease as adjuvant therapy (after definitive therapy) or neoadjuvant therapy (prior to definitive therapy). ADT may have a direct suppressive effect on serum PSA level that is independent of tumor activity. PSA production is under hormonal control, and ADT reduces the cell's ability to produce and secrete PSA. Therefore, serum PSA is not always a reliable marker of disease status in these patients.

In a study by one group of researchers, serial serum PSA measurements after ADT were able to predict response to the treatment. Patients whose serum PSA levels remained elevated for more than three months after treatment had a high risk of disease progression within two years. Serial PSA determinations in combination with radionuclide bone scanning are clinically warranted in these patients with advanced disease as follow-up. In patients with an increasing serum PSA level, the investigation can end if the bone scan is conclusive. CT is also useful in assessing nodal or visceral metastatic disease. If the bone scan and CT

are negative or inconclusive, further investigation for metastasis may be pursued using MRI.

**Summary**

All patients treated for prostate cancer are monitored with serial PSA measurements and DRE. A radionuclide bone scan has traditionally been obtained at one year after treatment regardless of PSA level. This tradition is now being challenged, but bone scans are still commonly obtained after ADT.

A rising PSA level usually prompts a bone scan. If it is positive, no other imaging is indicated. An equivocal bone scan may lead to more refined imaging such as MRI or CT. A negative bone scan requires further investigation such as TRUS-guided biopsy (post local therapy, including prostatectomy, radiation therapy, and cryosurgery) and lymph node evaluation with CT or MRI. Endorectal coil MRI is evolving and provides useful information regarding local recurrence as well as pelvic nodal and bone metastases. Chest x-ray is not necessary because prostatic lung metastasis is only found in late stage disease after other metastatic sites are well established. Bone x-rays are only used to help in identifying degenerative bone changes as a cause for abnormal foci on radionuclide bone scans.

**New Techniques**

*ProstaScint Scan (111 Indium capromab pendetide)*

ProstaScint is a murine monoclonal antibody that targets prostate-specific membrane antigen (PSMA). ProstaScint imaging in the detection of metastases and local recurrence has been reported to have a sensitivity of 49% to 94%, a specificity of 65% to 72%, and an overall accuracy of 63% to 80%. However, there are still questions remaining regarding its optimal use. Further, the scans are challenging to interpret and expensive to perform. It has been reported that the likelihood of a positive scan outcome is enhanced when patients with high PSA levels and high Gleason grade tumors are felt to have a recurrence. Fused SPECT/CT or MRI will improve the specificity of ProstaScint examination in detecting recurrent prostate cancer.

*Positron Emission Tomography with 2-deoxy-2- [F-18] fluoro-D-glucose*

Many foci of metastatic prostate cancer demonstrate increased FDG accumulation, though this uptake is generally low compared to the other cancers. FDG-PET is relatively insensitive in detecting osseous metastases compared to standard bone scintigraphy. Helical CT and FDG-PET scanning may be more helpful than ProstaScint imaging in detecting nodal disease in men with high PSA level after radical prostatectomy. PET/CT can provide information about anatomy and metabolism of the recurrent and metastatic disease.

*Positron Emission Tomography with Newer Radiotracers including [11-C]-acetate, [11-C or 18-F]-choline, and [11-C]-methionine*

PET with 11C acetate and PET with 11C and 18F choline have been reported to detect recurrent disease in patients with high PSA after local treatment. PET with

11C methionine has been reported to be more sensitive than FDG-PET in detecting bone metastases. The efficacy and clinical utility of PET with these new agents are under investigation.

*Magnetic Resonance Spectroscopic Imaging*

MR spectroscopic imaging (MRSI) provides metabolic information from 3-dimensional multiple contiguous volumes (voxels) within the prostate gland. Addition of the metabolic information provided by MRSI to the morphologic information provided by endorectal coil MRI can help discriminate regions of residual tumor from other prostatic tissues and necrosis following radiation therapy, cryosurgery, and hormone therapy. Time-dependent effects of hormone therapy on prostate metabolism are detected on MRSI. However, prostate metabolic profiles associated with prostate cancer can be identifiable on MRSI in patients with PSA levels exceeding 0.20 ng/mL and with 3 months or less of neoadjuvant hormone therapy for locally confined prostate cancer.

*Newer Lymph Nodal Magnetic Resonance Contrast Agent*

MRI following IV administration of lymphotropic superparamagnetic iron oxide nanoparticles has been reported to improve detection of positive lymph nodal metastases from prostate cancer when compared to unenhanced MRI. This MRI contrast agent is investigational and is not commercially available at this time.

**Anticipated Exceptions**

Nephrogenic systemic fibrosis (NSF, also known as nephrogenic fibrosing dermopathy) was first identified in 1997 and has recently generated substantial concern among radiologists, referring doctors and lay people. Until the last few years, gadolinium-based MR contrast agents were widely believed to be almost universally well tolerated, extremely safe and non-nephrotoxic, even when used in patients with impaired renal function. All available experience suggests that these agents remain generally very safe, but recently some patients with renal failure who have been exposed to gadolinium contrast agents (the percentage is unclear) have developed NSF, a syndrome that can be fatal. Further studies are necessary to determine what the exact relationships are between gadolinium-containing contrast agents, their specific components and stoichiometry, patient renal function and NSF. Current theory links the development of NSF to the administration of relatively high doses (e.g., >0.2 mM/kg) and to agents in which the gadolinium is least strongly chelated. The FDA has recently issued a "black box" warning concerning these contrast agents (http://www.fda.gov/cder/drug/InfoSheets/HCP/gcca_200705HCP.pdf).

This warning recommends that, until further information is available, gadolinium contrast agents should not be administered to patients with either acute or significant chronic kidney disease (estimated GFR <30 mL/min/1.73m$^2$), recent liver or kidney transplant or hepato-renal syndrome, unless a risk-benefit assessment suggests that the benefit of administration in the particular patient clearly outweighs the potential risk(s).

**Abbreviations**

- CT, computed tomography
- FDG-PET, fluorodeoxyglucose positron emission tomography
- INV, invasive
- IP, in progress
- Med, medium
- MRI, magnetic resonance imaging
- NUC, nuclear medicine
- PSA, prostate-specific antigen
- US, ultrasound

### CLINICAL ALGORITHM(S)

None available

## EVIDENCE SUPPORTING THE RECOMMENDATIONS

### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

## BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

### POTENTIAL BENEFITS

Selection of appropriate radiologic imaging procedures for post treatment follow-up of prostate cancer

### POTENTIAL HARMS

- The relative radiation level is high for computed tomography (CT) of the abdomen and pelvis with contrast, nuclear medicine (NUC) ProstaScint scan, fluorodeoxyglucose positron emission tomography (FDG-PET/CT) whole body; medium for NUC bone scan whole body; and low for X-ray radiographic survey of the whole body, and X-ray intravenous urography.
- Some patients with renal failure who have been exposed to gadolinium contrast agents (the percentage is unclear) have developed nephrogenic systemic fibrosis, a syndrome that can be fatal. Until further information is available, gadolinium contrast agents should not be administered to patients with either acute or significant chronic kidney disease (estimated GFR <30 mL/min/1.73m$^2$), recent liver or kidney transplant or hepato-renal syndrome, unless a risk-benefit assessment suggests that the benefit of administration in the particular patient clearly outweighs the potential risk(s).

## QUALIFYING STATEMENTS

### QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging

examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

### IMPLEMENTATION TOOLS

Personal Digital Assistant (PDA) Downloads

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better
Living with Illness

### IOM DOMAIN

Effectiveness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Kawashima A, Francis IR, Baumgarten DA, Bluth EI, Bush WH Jr, Casalino DD, Curry NS, Israel GM, Jafri SZ, Papanicolaou N, Remer EM, Sandler CM, Spring DB, Fulgham P, Expert Panel on Urologic Imaging. Post-treatment follow-up of

prostate cancer. [online publication]. Reston (VA): American College of Radiology (ACR); 2007. 8 p. [60 references]

## ADAPTATION

Not applicable: The guideline was not adapted from another source.

## DATE RELEASED

1996 (revised 2007)

## GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

## SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

## GUIDELINE COMMITTEE

Committee on Appropriateness Criteria, Expert Panel on Urologic Imaging

## COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

*Panel Members*: Akira Kawashima, MD; Isaac R. Francis, MD; Deborah A. Baumgarten, MD, MPH; Edward I. Bluth, MD; William H. Bush, Jr., MD; David D. Casalino, MD; Nancy S. Curry, MD; Gary M. Israel, MD; S. Zafar H. Jafri, MD; Nicholas Papanicolaou, MD; Erick M. Remer, MD; Carl M. Sandler, MD; David B. Spring, MD; Pat Fulgham, MD

## FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

## GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Kawashima A, Choyke PL, Bluth EI, Bush WH Jr, Casalino DD, Francis IR, Jafri SZ, Kronthal AJ, Older RA, Papanicolaou N, Ramchandani P, Rosenfield AT, Sandler CM, Segal AJ, Tempany CM, Resnick MI, Expert Panel on Urologic Imaging. Post-treatment follow-up of prostate cancer. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 9 p. [50 references]

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

## GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

ACR Appropriateness Criteria® *Anytime*, *Anywhere*™ (PDA application). Available from the ACR Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

## AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- ACR Appropriateness Criteria®. Background and development. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.
- ACR Appropriateness Criteria®. Relative radiation level information. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

## PATIENT RESOURCES

None available

## NGC STATUS

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