Adoption of Intensity-Modulated Radiation Therapy for Breast Cancer in the United States

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Background.—Although intensity modulation of the radiation beam has been shown to lower toxic effects for patients receiving whole-breast irradiation, relatively simple techniques may suffice. It is thus controversial whether such treatment justifies billing for intensity-modulated radiation therapy (IMRT).

Methods.—We used the claims data to determine billing for IMRT from Surveillance, Epidemiology, and End Results—Medicare records from 2001 to 2005 for 26 163 women aged 66 years or older with nonmetastatic breast cancer treated with surgery and radiotherapy. The impact of individual covariates (demographic, health services, tumor, and treatment factors) on cost of treatment was assessed using the Wilcoxon two-sample test. Two-sided multivariable logistic regression was used to identify predictors for IMRT use. Cost of radiation was calculated in 2005 dollars. All statistical tests were two-sided.

Results.—The number of patients with IMRT billing claims increased from 0.9% (49 of 5196) of patients diagnosed in 2001 to 11.2% (564 of 5020) in 2005. In multivariable analysis, IMRT billing was more likely for patients with left-sided tumors (odds ratio [OR] = 1.30, 95% confidence interval [CI] = 1.16 to 1.45), for those residing in a health service area with high radiation oncologist density (OR = 2.32, 95% CI = 1.47 to 3.68), for those treated at freestanding radiation centers (OR = 1.36, 95% CI = 1.20 to 1.53), or for those residing in regions where the Medicare intermediary allowed breast IMRT (OR = 10.87, 95% CI = 9.26 to 12.76, all P < .001). The mean cost of radiation was $7179 without IMRT and $15 230 with IMRT. IMRT adoption contributed to an increase in the mean cost of breast radiation from $6334 in 2001 to $8473 in 2005.

Conclusions.—IMRT billing increased 10-fold from 2001 through 2005, contributing to a 33% increase in the cost of breast radiation. These findings suggest that reimbursement policy and practice setting strongly influenced adoption of IMRT billing for breast cancer.

In the past decade, radiotherapy for breast cancer has evolved from a 2-dimensional (2D) treatment-planning approach based on fluoroscopy to a 3-dimensional (3D) approach that incorporates computed tomography (CT)-based treatment planning. More recently, advanced radiotherapy techniques such as IMRT have been increasingly utilized for adjuvant breast cancer radiotherapy. In the present study, Smith and colleagues evaluated patterns of IMRT implementation for breast radiotherapy in the United States between 2001 and 2005. The authors used the Surveillance, Epidemiology, and End Results—Medicare database and analyzed the records of 26 163 women aged 66 years or older who underwent adjuvant breast radiotherapy for nonmetastatic breast cancer. Between 2001 and 2005, IMRT billing increased significantly, from 0.9% to 11.2% of breast radiotherapy charges, and the cost of IMRT treatment was on average more than double the cost of non-IMRT treatment planning. On multivariate analysis, IMRT billing was higher among women residing in regions of the country where Medicare covered breast IMRT or in regions with a high density of radiation oncologists and among women treated in freestanding centers. Clinical characteristics associated with IMRT billing included left-sided breast cancer and breast conservation surgery.

With the changing health care climate in the United States, high-quality, cost-effective cancer treatments that maximize efficacy while minimizing both acute and late toxicity are becoming increasingly important. Three prospective trials have demonstrated that IMRT improves dose homogeneity and decreases normal tissue toxicity compared with 2D radiotherapy.1-3 It is worth noting that in these trials, the term “IMRT” refers to modulation of dose, whether using a forward-planning 3D treatment technique or an inverse-planning algorithm, which often requires additional time and effort for both the physician and physicist and is associated with specific billing codes that are reimbursed at a higher rate than forward-planning 3D treatment-planning codes. Since it is well recognized that dose modulation decreases early and late toxicity, it is not surprising that Smith and colleagues found an increase over time in IMRT utilization, defined in this study by the IMRT common procedural terminology (CPT) codes. An interesting finding, however, was how IMRT utilization was influenced by the definition of “IMRT” in each geographic region. In some regions of the United States, the local coverage determination rendered by Medicare restricted the definition of IMRT treatment planning to those treatments in which inverse-planning algorithms were used, while in other regions “IMRT” allowed either inverse-planning or forward-planning 3D techniques to satisfy criteria for the IMRT CPT codes. The authors acknowledged that, unfortunately, they were not able to distinguish whether patients were treated with forward-planning or inverse-planning techniques because forward-planning intensity modulation does not have a unique CPT code. The results of the current study demonstrate the significant effect that reimbursement
has on clinical practice and highlight the growing need for consistent definitions of treatment techniques and coverage policies.

In addition to financial costs and reimbursement, it is also important to consider the potential, but unknown, long-term risks of inverse-planning IMRT. While inverse-planning IMRT provides superior high-dose conformity, a greater volume of normal tissue may be exposed to low-dose radiation. Some experts suggest that the widespread use of IMRT in the past decade may result in a 2-fold increase in secondary malignancies, which is particularly worrisome for patients who are expected to have long-term survival.4 There are some clinical situations, however, in which the cost-benefit ratio might favor inverse-planning IMRT. In particular, inverse-planning IMRT may provide superior target coverage of elective nodal regions, particularly the internal mammary nodal chain, while sparing the underlying heart and lung. Additionally, patients in whom the heart and lung lie particularly close to the chest wall may also benefit from inverse-planning IMRT.

Given the current state of the economy, it is reasonable to question how resources are allocated to optimize the quality of care while appropriately controlling health care costs. Smith and colleagues raise several important questions regarding how the radiation oncology community should incorporate more advanced technologies for breast cancer treatment and how the healthcare system, in general, should address variations in the definitions of and reimbursements for such techniques. This article is an important first step in defining and quantifying breast radiotherapy techniques and costs in the United States. It remains to be determined, however, how quality measures such as dose modulation should be reimbursed.

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References

An increased utilisation rate and better compliance to guidelines for primary radiotherapy for breast cancer from 1997 till 2008: A population-based study in The Netherlands


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Only scarce data are available on the utilisation rate of primary radiotherapy (RT) for patients with breast cancer. In this study, we compared the use of primary RT for patients with stages I—III breast cancer in 4 of the 9 Dutch Comprehensive Cancer Centres, focusing specifically on time trends as well as age effects. From the population-based cancer registries, we selected all females diagnosed with breast cancer between 1997 and 2008 (N = 65,966, about 50% of all Dutch breast cancer patients in this period). We observed an overall increase in the use of primary RT for breast cancer patients ranging from 55–61% in 1997 to 58–68% in 2008. This can be explained by a higher rate of breast-conserving surgery (BCS), which was followed by RT in 87—99% of cases, and a reduced rate of total mastectomy (TM) which was followed by RT in 26–47% of cases. Increasing age was associated with a reduced use of RT, especially for those above 75. Finally, we observed a decrease in time of observed regional variances in the use of RT after BCS as well as after TM (for stage III disease). These findings can be attributed to the development and implementation of the Dutch nationwide guidelines for treatment of breast cancer.

Health services research has become an important contributor to the breast cancer literature because of...