# Breast Imaging: Economic Issues and Challenges

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## ABSTRACT

*Mammography practice has changed dramatically in recent years. Breast imaging facilities are facing declining reimbursement rates, strict federal regulations, medicolegal pressures, and increasing patient and provider expectations. As a result, it is difficult for many facilities to provide high quality mammography services without losing money. Today, breast imaging involves several technologies besides standard film-screen mammography, including ultrasonography, stereotactic core biopsy, and ultrasound-guided core biopsy. As newer technologies, such as breast magnetic resonance imaging, digital mammography, and computer-assisted diagnosis, become an integral part of breast imaging practice, administrators and physicians will face new economic and practice challenges. This article will discuss the economic factors currently affecting mammography practice, including Medicare reimbursement, the role of various technologies, and screening cost issues.*

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## MEDICARE REIMBURSEMENT

### Resource-Based Relative Value System

Medicare's physician reimbursement system has a substantial impact on mammography facilities nationwide. Because Medicare is the largest payer for radiology services in the United States, its payment rates have a tremendous influence on the financial solvency of breast imaging facilities. In addition, Medicare policy changes can cause a "ripple effect," because these policies frequently influence the reimbursement practices of other primary insurance carriers.[1] According to one study in 1997, approximately one third of private insurers used Medicare's reimbursement plan as a method to pay for services for non-Medicare patients and another 40% were considering its adoption.[2]

To reduce Medicare spending, the Health Care Financing Administration (HCFA) established a new method for physician payment in 1992. This system, called the resource-based relative value system (RBRVS), was phased in over a 4-year period. The Medicare Fee Schedule (MFS), a national listing of payment rates for most physician services, was established under the new system. This system was developed from studies performed by Hsaio and his colleagues at Harvard School of Public Health in the 1980s. Hsaio et al[3,4] developed a series of "relative values" for the services performed by physicians, based on an existing standard coding scheme, called Current Procedural Terminology (CPT) codes, which describe 7,000 procedures that physicians might perform.

Under the old system, interventional and diagnostic procedures were reimbursed at a higher rate than primary care visits and patient consultations. To decrease the disparities in reimbursement among the specialties, Hsaio's group distinguished between invasive (interventional) and cognitive (evaluation and management) procedures.[5] Under Hsaio's proposal, Medicare expenditures were expected to increase by 56% for cognitive services and decrease by 42% for invasive procedures. On the basis of study simulations, Medicare fees for radiological imaging were expected to decrease by 30%. Other procedure-based specialties, such as pathology and surgery, also expected to see a decrease in reimbursement rates. In contrast, primary care specialties, such as family practice and internal medicine, expected a 35–65% increase in payment rates.[6]

The new payment system (RBRVS) is considered "resource-based," because the payment for a service is determined from the resources needed to provide that service. The resources necessary for providing each physician service are divided into three components: physician work, practice expenses, and liability costs. For each service, each of these components is characterized by a numerical value representing its "relative" contribution to the cost of delivering that service. These numerical values are called relative value units (RVUs). Relative value units determine

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*Different technologies, such as film-screen mammography, digital mammography, breast magnetic resonance imaging, and core biopsy, pose different economic and practice challenges for physicians in the field of breast imaging.*

*Medicare's reimbursement plans have a tremendous impact on healthcare facilities in the United States.*

*Administrators face important challenges in providing quality breast imaging services without losing money.*

*Screening mammography is cost-effective for women who are in their 40s.*

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the fee, which is derived by multiplying the sum of the RVUs by a special conversion factor. This conversion factor is a single national monetary value, which is updated annually by HCFA.[7] The update calculation is determined from changes in fees for all physician services, changes in the number of Medicare enrollees, and growth in the gross national product. The 2001 conversion factor is $38.26, which represents a 4.5% increase from 2000 ($36.61).[8]

The physician work component, which accounts for approximately 54% of the total relative value of a service, is determined by several factors, including the time required to perform the service, mental effort and judgment, required technical skill, and stress due to the potential risk to the patient. The malpractice component is currently determined from historical charges and accounts for less than 5% of the total relative value of a service. HCFA is currently reviewing malpractice premium data from 1996 to 1998, to calculate the 2001 malpractice RVUs.[9]

The practice expense component, representing 41% of the total relative value for a service, was initially determined from historical Medicare charges from 1991. In 1999, a new resource-based method of determining the practice expense RVUs ( PERVUs) was implemented. This method incorporates actual practice expense data for specialties, derived from survey data from 1995 to 1997. There are two levels for each procedure code: facility PERVUs and nonfacility PERVUs. The facility PERVU is used for physician services performed in a Medicare-licensed facility, such as an ambulatory surgery center, skilled nursing home, or hospital outpatient department. Nonfacility PERVUs are used for services performed in a physician's office, a patient's home, or any setting that is not a Medicare-licensed facility. This new method of determining PERVUs is currently being phased in over 3 years, with 25% of the payment determined from the new methodology in 1999, 50% in 2000, 75% in 2001, and full implementation in 2002.[9]

HCFA depends on recommendations from the American Medical Association Specialty Relative Value System Update Committee (RUC) to update the physician work component of the RVU scale each year. Most of RUC's 28 members are appointed by national specialty societies. The American College of Radiology has one representative on RUC. HCFA utilizes information from RUC to conduct a comprehensive review of all RVUs once every 5 years. In the past, RUC recommendations have greatly influenced HCFA's decisions when updating RVUs. From 1993 to 1998, HCFA's acceptance rate for annual RUC recommendations was over 90%.[10]

### *The Hospital Outpatient Prospective Payment System*

To control rising patient expenditures, Congress mandated reforms for outpatient fees under the Balanced Budget Act of 1997. The Hospital Outpatient Prospective Payment System (HOPPS) was implemented in August, 2000 to reduce Medicare beneficiaries' outpatient payments to hospitals. This system freezes coinsurance amounts at a value equal to 20% of the current median of hospital charges for all codes in a given Ambulatory Payment Classification (APC). Eventually, under HOPPS, the copayment amount will equal 20% of the total Medicare fee.[11]

The Hospital Outpatient Prospective Payment System was also established to simplify the physician payment system and encourage hospital efficiency in providing outpatient services. Under HOPPS, the APC system was created to group similar outpatient procedures under one reimbursement code. This code includes all of the incidental costs related to the procedure, such as anesthesia or sedation, routine drugs, recovery room, and supplies. Currently, all contrast agent costs are "packaged" into the APC code. Under the APC system, several thousand CPT codes related to outpatient services are divided into almost 600 procedural groups or APCs. Each APC group contains clinically similar procedures, which are supposed to represent a comparable use of resources. Under the Balanced Budget Refinement Act of 1999, Congress mandated that the median cost of the most expensive procedure within an APC should not be more than twice the median cost of the least expensive procedure in the same APC.

On the basis of analyses of Medicare claims data from hospitals in 1996 and each hospital's cost:charge ratio, every APC has been assigned a "relative weight." This weight is multiplied by a conversion factor to determine a national payment rate for each APC. This rate is then wage-adjusted to determine a local payment rate. All of the procedures in a given APC are reimbursed at the same rate. With the assistance of an expert panel, HCFA will review APCs annually.[11]

**"The physician work component, which accounts for approximately 54% of the total relative value of service, is determined by several factors, including the time required to perform the service, mental effort and judgment, required technical skill, and stress due to the potential risk to the patient."**

**"Low reimbursement rates for screening and diagnostic mammography have limited the ability of many mammography facilities to provide high-quality services while maintaining a profit."**

APCs currently apply only to the fees payable to the hospital. All physician and nonphysician services continue to be reimbursed under the standard Medicare Fee Schedule (MFS). For example, if a radiologist performs a wire-needle localization procedure, the physician will still be reimbursed based on the RVUs for the professional component in the MFS, regardless of the type of facility where the procedure was performed. However, the reimbursement rate for the technical component will depend on where the procedure was performed. If the procedure was performed in an APC-eligible facility, the facility would be reimbursed based on the appropriate APC code, rather than the standard RVU system.[11]

HOPPS affects hospitals that participate in the Medicare program, with few exceptions. Indian Health Service, certified Critical Access Hospitals, the ten National Cancer Institute certified cancer centers, and certain Maryland hospitals are exempt. Small rural hospitals (<100 beds) are exempt until the year 2004. Under HOPPS, providers must be either a "department of a provider" or a "provider-based entity." The "department of a provider" refers to a facility or a physician office created or acquired by a hospital to provide the same services as the hospital. The department is under the administrative, financial, and ownership control of the hospital. A "provider-based entity" is a provider created or acquired by a hospital to provide a different service from the hospital. This entity is under the ownership, administrative, and financial control of the hospital.[12]

Under the APC system, each physician service has a status indicator. The "T," "S," and "X" status indicators are commonly encountered for breast-related procedures.[8,11] When there are multiple codes for the same procedure with "T" status indicators, reimbursement is discounted. In other words, the code with the highest reimbursement will be paid in full, while the other related codes will be discounted by 50%.[11] For example, before HOPPS, if a breast biopsy was performed with wire-needle localization guidance, the biopsy procedure (CPT code 19125) and the placement of the wire (CPT code 19290) were billed separately. The facility received 100% reimbursement based on the associated RVUs in the MFS. Under HOPPS, these two procedures are grouped in the same APC (#0028). The reimbursement rate for this APC is $613.52. The facility will receive the full fee of $613.52 for the biopsy, but will only receive 50% or $306.76 for the placement of the wire.

Procedures with "S" status indicators are always reimbursed for the full amount. For example, a facility will receive full reimbursement ($34.72) for a unilateral diagnostic mammogram, even if this procedure was performed more than once during the same patient encounter. Of note, CPT code 19103 for core biopsy with vacuum assistance is currently associated with a "T" status indicator. However, this procedure will be assigned an "S" status in the year 2001.

Procedures assigned an "X" status are ancillary procedures, which are reimbursed in full. Specimen radiography after a wire-guided excisional biopsy is an example.

The long-term effects of HOPPS are difficult to determine for several reasons: 1) the APC payment schedule continues to evolve; 2) the PERVU component of the MFS remains in transition and has not yet been fully implemented; and 3) the impact will vary among departments and specialties.

## *BREAST IMAGING PRACTICE ISSUES*

### *Overview*

There are several factors that affect the economics of breast imaging practice today. Low reimbursement rates for screening and diagnostic mammography have limited the ability of many mammography facilities to provide high-quality services while maintaining a profit. Although mammography reimbursement rates remain low, the US government's expenditures on screening and diagnostic mammography continue to rise. In 1997, Medicare paid $270 million for breast cancer screening and diagnosis. In 2001, Medicare expenditures are estimated to reach $432 million.[13]

Patient and provider expectations have influenced the practice of mammography. Today, the radiologist is a more active participant in the care of breast patients, which goes beyond interpreting the mammogram. The radiologist performs biopsies, communicates directly with the patient, and participates in multidisciplinary conferences. There is a growing demand for online reporting of diagnostic and screening mammography results. Today, fewer breast surgeries are performed before a diagnostic mammography work-up, and in many cases before an image-guided biopsy. As a result, there is more pressure to

expedite diagnostic work-ups and core biopsy procedures. Providing online readings, same-day diagnostic work-ups, and expedited biopsies are services which are greatly appreciated by patients and clinicians. However, this type of service requires additional staffing, can increase costs, and may add stress for busy personnel.[14]

Administrative requirements for mammography exceed those of other imaging examinations. The Mammography Quality Standards Act (MQSA), which was enacted in 1992, set national standards for mammography personnel, quality control procedures, equipment, and patient communication. There are numerous costs associated with compliance with MQSA regulations,[15] such as:

1) Purchasing and updating equipment to remain in compliance with MQSA
2) Continuing education for radiologists, physicists, and radiological technologists
3) Maintaining records for personnel, quality control, equipment, and consumer complaints
4) Providing mandatory written notification of results to mammography patients
5) Auditing patient outcomes and radiologists' recommendations in reports
6) Performing regular quality control tests and annual physicist surveys
7) Maintaining accreditation (all mammography facilities must be accredited by a US Food and Drug Administration-approved accrediting body once every 3 years)
8) Paying MQSA inspection fees: $1,549 for one facility and one unit, and $204 for each additional unit.

In addition to these costs, some states require annual on-site inspections with separate regulations and fees.

What are the consequences of these financial pressures? First, it is difficult to increase staffing and obtain better equipment to serve a growing patient population, because of declining revenues. Second, employee morale can be affected, especially when employees are short-staffed and overworked. When salaries, which may be derived from RVUs and income generation, do not match the level of effort and stress of breast imagers and technologists, morale can decline further. Third, inadequate resources, declining morale, and insufficient staffing can stifle innovation and research. Fourth, inadequate revenues have led to a reduction in the number of breast imaging fellowships. As a result, it has been difficult to attract and train new specialists. There is a widespread shortage of radiologists and technologists who specialize in mammography.[13,16] Finally, the quality of patient care can be adversely affected. Some facilities face huge backlogs of patients awaiting mammography and breast ultrasound studies. When patients have to wait weeks or even months for diagnostic and screening studies, unnecessary anxiety and delays in cancer diagnosis are inevitable.

### *Screening and Diagnostic Mammography*

The payment rate for mammography varies in the private sector, depending on the payer and the degree of managed care penetration in a geographic area. Screening mammography reimbursement ranges from $42 to $150, but in most areas of the country, the payment rate is in the $60 to $70 range.[17] Often, state reimbursement rates are even lower than Medicare and private payer rates.[18]

Unlike other radiology procedures, screening mammography services for Medicare beneficiaries are not reimbursed under the RBRVS or HOPPS. Screening mammography rates are currently set by Congress under a special statutory rule until January 1, 2002. Like other medical procedures, RVUs for screening will be included in the MFS.[19] Under Medicare, hospitals use a two-tiered billing system, which splits the cost of mammography between a technical fee (which covers the costs of the machine, film, technologist, and other operational expenses) and a professional fee. The apportionment is 32% for the professional component and 68% for the technical component. This payment rate is updated annually. The 2000 statutory cap for a screening mammogram was $66.81 for the global procedure: $21.70 for the professional component and $45.11 for the technical component.[21] Congress has increased the rate for screening mammography by only 7% since 1996.[16]

In reality, most APC-eligible breast imaging centers are unlikely to reap financial benefits under HOPPS. Under the new APC system, the technical fee ($34.72) for a diagnostic mammogram is greatly reduced, although diagnostic mammography typically uses more technical resources than a screening study. In APC-eligible facilities, the reimbursement for the technical component for a diagnostic mammogram is 26% less than the technical reimbursement

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for a screening mammogram or even for a specimen radiograph.[11]

### Breast Biopsy

Interventional procedures, especially core biopsies, are a routine part of most breast imaging practices in the United States. On the basis of Medicare claims data, the number of stereotactic core biopsies performed by radiologists increased from approximately 8,000 in 1994 to over 30,000 in 1997. Although radiologists perform more than 80% of imaging guided stereotactic core biopsies, surgeons perform a significant percentage of these procedures.[20] As more surgeons develop expertise in stereotactic core biopsy, radiologists may perform these biopsies less frequently in the future. In some facilities, surgeons and radiologists share these procedures, often with the surgeon performing the technical aspects of the procedure and the radiologist supervising the imaging and quality control. In the MFS, the technical component and the interpretation component have separate RVUs and are billed separately.

**"The higher reimbursement for nonfacilities provides a financial incentive to perform more procedures in the office setting rather than in a hospital."**

On November 1, 2000, HCFA published three new codes for image-guided breast core biopsies.[8] For the first time, HCFA differentiated between standard image-guided core biopsies and core biopsies performed with vacuum assistance. These new codes are 19102 for image-guided core biopsies, 19103 for image-guided core biopsies with vacuum assistance, and 19295 for percutaneous placement of a clip. The higher reimbursement for nonfacilities provides a financial incentive to perform more procedures in the office setting rather than in a hospital.

### Digital Mammography

Digital mammography is a promising new technology for screening and the diagnostic work-up of patients. Several benefits are anticipated. This technology is expected to improve the ability to evaluate dense breast tissue at a reduced radiation dose. In addition, the ability to manipulate images on the monitor may facilitate the detection of lesions. Digital mammography is also expected to reduce storage space and facilitate the transmission of mammograms between facilities. However, despite a number of promising benefits, the cost of widespread implementation of this new technology warrants consideration.

The largest expenditure for a breast imaging facility, will be the purchase of the digital technology. A film-screen mammography unit typically costs $75,000, In contrast, a digital unit currently costs $500,000. According to Hiatt et al,[21] it would take 3.1 years for a facility to "break even" after the purchase of a digital unit if 15 examinations were performed per day with the new unit. Hiatt and colleagues reached these estimates after discussions with hospital personnel and industry representatives. Hiatt estimated the cost of converting one film-screen unit to digital mammography to be $102,000 and that during the fourth year after conversion to digital mammography, $16,943 would be saved per unit. According to Hiatt, savings would occur because of reduced spending on film purchases, processing supplies, and storage.

In December, 2000, Congress passed a law setting Medicare reimbursement for diagnostic studies performed with digital mammography at a rate 150% higher than the current rate for a diagnostic mammogram performed with standard film-screen mammography. In other words, the reimbursement will be approximately $120 for a digital study. For technologies that convert standard film images to digital format, an additional payment of $15 is authorized.[19]

## COSTS AND BENEFITS OF SCREENING MAMMOGRAPHY

### Overview

Randomized clinical trials have shown that screening mammography is capable of reducing deaths from breast cancer among women ages 40 years and older by 30–45%.[22-25] On the basis of clinical and scientific evidence, medical organizations, including the American Cancer Society (ACS), American Medical Association (AMA), and American College of Radiology (ACR), now recommend annual screening mammography for all women beginning at age 40.[22,26,27] However, screening policies differ from screening guidelines—screening reimbursement policies of health maintenance organizations, insurance carriers, and Medicare must cover economic as well as medical considerations.

To determine whether the cost of mammography is reasonable, one could ask: How does the cost-effectiveness of screening mammography compare with those of other commonly accepted healthcare interventions?[23] What would be the impact on Medicare and all other national healthcare expenditures if all women were to adhere to ACS screening mammography guidelines?

### *Cost-Effectiveness of Screening Mammography*

Women who are screened will, on average, live longer than their counterparts who are not screened. Screening mammography will detect most, but not all, breast cancers. Breast cancers detected at screening mammography represent a spectrum of stages and grades of malignancy. For some cancers, downstaging through screening will not make any difference in survival. However, other cancers will be detected at a sufficiently earlier stage to reduce the number of breast cancer deaths from that observed in a comparable unscreened population. Benefits from screening can be described in terms of years of life expectancy saved among women with breast cancer whose lives are prolonged through early detection. Years of life expectancy gained through screening can be calculated from the percent reduction of breast cancer deaths observed in screening trials.

Most women in the randomized clinical trials were screened every 2 years with older mammography techniques. It is estimated that if those women had been screened annually with current techniques, reduction of breast cancer deaths would have been even greater than the 30–45% that was observed.[28-30] Years of life expectancy saved through annual screening can be estimated through mathematical modeling of trial data. The estimated number of years of life expectancy gained among women screened annually can then be compared with the total cost for all women screened. This calculation will provide the cost per year of life expectancy gained. Because younger women have a longer normal life expectancy, a breast cancer detected in a younger woman will save more years of life expectancy than detection of the same stage breast cancer in an older woman. However, screening a population of younger women will save fewer years of life expectancy than screening the same size of population of older women, due to their lower breast cancer incidence.

Many investigators have calculated the years of life expectancy gained through screening mammography. Their estimates for cost-effectiveness have varied due to different assumptions for benefits and costs, as well as different methods of calculation. Many of these studies, such as one published by Salzmann et al in 1997,[31] are no longer valid because benefits, particularly those for women ages 40–49 years, are now known to be much higher than previously believed.

A more recent study by Rosenquist and Lindfors[32] estimated that annual screening mammography beginning at age 40 years and continuing until age 79 years would cost $18,800 per year of life expectancy saved. They assume that annual screening would reduce breast cancer deaths by 36% for cancers detected in women ages 40–49 years and 45% for cancers detected in women ages 50–79 years. Assumed costs include: mammography, $64; core biopsy, $850; excisional biopsy of a nonpalpable lesion, $2,800; excisional biopsy of a palpable lesion, $2,400; and definitive treatment for breast cancer, $6,100. These estimates for the cost-effectiveness of screening mammography are in the range of other commonly accepted interventions (Tables 1A and 1B).[28,33] The cost per year of life gained from annual screening mammography, though higher than that for colorectal cancer screening, is in the same general range as screenings for cervical cancer and osteoporosis, and much lower than that for uses of automobile seatbelts and air bags.

### *Effect of Screening Policies on National Healthcare Expenditures*

Although the cost per year of life gained for screening mammography is less than that for renal dialysis or heart transplants, these interventions are needed for only a very small fraction of the population. Because screening mammography is advised for all women age 40 and older, its total program cost will be substantially greater. There are 56.5 million US women ages 40–79 years.[34] If every one of these women obtained an annual screening mammogram at $66, the current Medicare reimbursement rate, the total cost would come to $3.731 billion per year! However, the total annual cost for all US healthcare expenditures is even more staggering, at over $1 trillion per year.[35] Therefore, even if every woman aged 40–79 adhered to the ACS Screening Mammography Guidelines, the total cost would be only 0.3% of all the national healthcare expenditures.

There are currently 19,136,000 women aged 65–89 years in the US.[34] If all of these women were screened every year at $66 per mammogram, the annual cost would be $1.263 billion. However, this would represent only 0.5% of all Medicare expenditures, which are $230 billion per year.[35]

**"...even if every woman aged 40–79 adhered to the ACS Screening Mammography Guidelines, the total cost would be only 0.3% of all the national healthcare expenditures."**

**TABLE 1. 2001 MEDICARE PAYMENT RATES BY CPT CODE FOR SELECTED BREAST IMAGING PROCEDURES**

A. Supervision and Interpretation Codes (S & I)

| | | Facilities* | | Nonfacilities | | APC System | |
|---|---|---|---|---|---|---|---|
| CPT Code | Description | RVU | Payment ($) | RVU | Payment ($) | Code | Payment ($) |
| 76098 | Specimen radiography | .68 | 26.02 | .68 | 26.02 | 0260 | 39.18 |
| 76645 | Breast sonography | 1.89 | 72.31 | 1.89 | 72.31 | 0265 | 58.03 |
| 76090 | Unilateral diagnostic mammography | 1.91 | 73.08 | 1.91 | 73.08 | 0271 | 34.72 |
| 76091 | Bilateral diagnostic mammography | 2.33 | 89.15 | 2.33 | 89.15 | 0271 | 34.72 |
| 76096 | Wire-needle localization | 2.18 | 83.41 | 2.18 | 83.41 | 0263 | 83.32 |
| 76942 | Ultrasound-guided biopsy | 2.58 | 98.71 | 2.58 | 98.71 | 0268 | 110.60 |
| 76086 | Galactography | 3.27 | 125.11 | 3.27 | 125.11 | 0263 | 83.32 |
| 76095 | Stereotactic core biopsy | 9.8 | 374.95 | 9.8 | 374.95 | 0264 | 189.96 |
| 76093 | Magnetic resonance, unilateral | 20.53 | 785.48 | 20.53 | 785.48 | 0284 | 397.76 |

B. Procedure or Technical Codes

| | | Facilities | | Nonfacilities | | APC System | |
|---|---|---|---|---|---|---|---|
| CPT Code | Description | RVU | Payment ($) | RVU | Payment ($) | Code | Payment ($) |
| 19102 | Image-guided biopsy (stereotactic or ultrasound) | 2.81 | 107.51 | 6.66 | 254.81 | 0005 | 268.32 |
| 19103 | Vacuum-assisted biopsy | 3.31 | 126.64 | 13.28 | 508.09 | 0974 | 409.17 |
| 19290 | Wire-needle localization | 1.79 | 68.49 | 5.09 | 194.74 | 0028 | 613.52 |
| 19030 | Injection for breast x-ray (galactogram) | 2.14 | 81.88 | 9.68 | 370.36 | N/A | |
| 19295 | Clip placement | 0.95 | 36.35 | 2.62 | 100.24 | 0971 | 76.88 |

Note: The 2001 conversion factor used to calculate the payment amounts was $38.26.

*"Facility" refers to services performed in a Medicare-licensed facility. "Nonfacility" refers to services performed in a physician's office.

CPT=Current Procedural Terminology; RVU=relative value unit; APC=Ambulatory Payment Classification.

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### *Incremental Costs and Benefits from Screening Women Ages 40–49 Years*

Another area of economic concern has been the incremental cost and benefit for screening women ages 40–49 years. Suppose a health maintenance organization that already offers screening for women ages 50–79 years were to add coverage for women ages 40–49 years. What would be the additional cost and how much additional benefit would result? For the sake of generalization, let us assume that this health maintenance organization is not only representative of the US population, but actually includes the entire US female population. With the addition of these younger women, the screening program would serve 56,523,000 women. Among these women, 38% are ages 40–49 years, and 62% are ages 50–79 years.[34] However, the annual number of new breast cancer cases for younger women would be disproportionately lower due to their lower breast cancer incidence. Specifically, 22% of new breast cancer cases would occur among women ages 40–49 years and 78% would be found in women ages 50–79 years.

On the basis of the assumptions of Rosenquist and Lindfors[32], years of life expectancy gained per individual breast cancer patient can be calculated with the method described by Feig and Ehrlich.[36] This number will be higher for younger women. As a result of adding women ages 40–49 to a national screening program that was already

screening women ages 50–79 years, the total number of years of life expectancy gained for all women will increase by 41%. Although this is less than the increases of 60% in population size and cost, it is high enough to provide economic justification for screening guidelines that are already supported by medical evidence. Screening women ages 40–49 years makes economic sense. Further details of the calculations contained in the costs and benefits section of this article may be found in an article previously published by the authors.[16]

## *CONCLUSION*

Marked increases in national healthcare costs, along with governmental coverage of healthcare costs for the elderly under Medicare, have resulted in increased government regulation of medical reimbursement rates. Private insurers and health maintenance organizations now provide reimbursements that are frequently the same as or lower than those of Medicare. Reimbursement rates for mammography have been particularly restricted. Although screening mammography appears to be as cost-effective as other commonly accepted medical interventions, some third-party payers have been reluctant to reimburse screening mammography due to its perceived effect on overall healthcare costs. However, an objective analysis shows that inclusion of coverage for screening mammography, even beginning at age 40 years, has only a slight effect on total healthcare costs. Adequate reimbursement for screening mammography supports an effort that will provide substantial reduction in deaths from breast cancer.

Today, a growing number of women are getting mammograms on a regular basis. There are several reasons for the recent increase in demand for mammography services: 1) mammography has received a tremendous amount of publicity in the lay community in recent years; 2) the expansion of mammography screening guidelines to include women in their 40s has increased the number of eligible women for screening mammography; and 3) the number of elderly is increasing, so there are more women seeking mammography. Despite the increasing demand, economic factors may adversely affect access to mammography services. Because of mammography's status as a "loss leader," many radiology administrators are reluctant to expand their services to meet the community's growing demands. Instead, at many facilities, patients are waiting longer to receive screening and diagnostic studies, due to inadequate staffing for the patient volume.[16] A two-tiered system is gradually developing. On the upper tier are those women who can afford to pay a higher fee for their mammograms at a facility with shorter waiting periods and better staffing. The remainder of women may have to wait longer for an appointment, even if they are symptomatic.

To maintain access to quality mammography services, providers and payers have roles to play. For payers, increasing reimbursement rates to adequately cover the cost of providing screening and diagnostic services is essential. Radiologists and radiology administrators must work diligently to find innovative ways to improve efficiency while maintaining staff morale. Providers should limit patient referrals for costly online diagnostic services to women with clinical symptoms, implants, or biopsy-proven breast disease. Online results, which are provided at the end of the work-up by the radiologist, slow patient throughput and require more staffing without reimbursement to cover these additional costs.[14] When women are referred for a diagnostic study that could have been performed as a screening study, the waiting time for patients who truly need diagnostic services is increased. Finally, there

**TABLE 2. MEDIAN COST PER LIFE-YEAR SAVED FOR ANNUAL MAMMOGRAPHIC SCREENING OF WOMEN AGES 40–79 YEARS, AND OTHER SELECTED TYPES OF LIFESAVING INTERVENTIONS***

| Intervention | Median Cost ($)/Life-year saved |
|---|---|
| Colorectal screening | 3,000 |
| Cholesterol screening | 6,000 |
| Cervical cancer screening | 12,000 |
| Anti-hypertensive drugs | 15,000 |
| Osteoporosis screening | 18,000 |
| Mammography, screening | 18,800 |
| Coronary artery bypass surgery | 26,000 |
| Automobile seatbelts and air bags | 32,000 |
| Hormone replacement therapy | 42,000 |
| Renal dialysis | 46,000 |
| Heart transplant | 54,000 |
| Cholesterol treatment | 154,000 |

Note: An approximate 36% mortality reduction for cancers detected at ages 40–49 and a 45% mortality reduction for cancers detected at ages 50–79 is assumed based on estimates from the Falun Committee[28]

*Data on non-mammographic interventions from Tengs et al.[33]

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**"Providers should limit patient referrals for costly online diagnostic services to women with clinical symptoms, implants, or biopsy-proven breast disease."**

are advantages to batch reading, which is the process of reading multiple screening mammograms in one sitting at a dedicated time. Batch reading provides an opportunity for double reading. Double reading, in which two radiologists independently review each case, likely increases the cancer detection rate.[37,36] Reading films in an atmosphere that is not rushed is extremely important. Therefore, patients should be informed that while online screening results may seem more appealing, batch reading results may be better for the patient.

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