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BREAST CANCER
(First of Three Parts)

JAY R. HARRIS, M.D., MARC E. LIPPMAN, M.D.,
UMBERTO VERONESI, M.D., and
WALTER WILLETT, M.D., DR. P.H.

Breast cancer is a major public health problem of
great interest and importance to physicians in
a variety of specialties. Since this topic was last re-
viewed in the Journal, the incidence of the disease has
increased dramatically, heightening concern among
physicians and women in general. In addition, long-
term results are now available from clinical trials initi-
ated in the 1970s and 1980s to evaluate the usefulness
of early detection with mammography and physical
examination, breast-conserving treatment with lim-
ited breast surgery and irradiation, and adjuvant sys-
temic therapy with hormonal therapy and chemo-
therapy. Furthermore, in the light of newly gained
knowledge, new strategies for addressing this problem
have been proposed.

In this review, we describe the recent trends in
incidence and mortality and the epidemiologic features
that may be responsible for the rise in incidence.
We summarize the evidence evaluating the strategies
for diagnosis and therapy initiated in the 1970s and
1980s, including their benefits and costs. Finally,
we describe the prospects for prevention and for
more specific treatments based on evolving biologic
knowledge.

TRENDS IN INCIDENCE AND MORTALITY

Breast cancer is a major affliction of women in afflu-
ent countries. On the basis of incidence rates for 1983
through 1987 and mortality rates for 1987 in the Unit-
ed States, 12 percent of all women will be given a
diagnosis of breast cancer and 3.5 percent will die of
the disease. The impact of breast cancer is magnified
because women are at risk from their middle to later
years. The incidence rates increase rapidly during the
fourth decade and become substantial before the age
of 50, thus creating a long-lasting source of concern
for women and a need for vigilance. After menopause,
the incidence rates continue to increase with age, but
less dramatically than before. Breast cancer is the
leading cause of death among American women who
are 40 to 55 years of age. In less affluent parts of the
world and in the Far East, the same pattern of in-
crease with age is seen, but the absolute rates are
much lower at each age. In Japan, for example, the
overall incidence of breast cancer has been only about
one fifth that in the United States.

The rates of breast cancer have been steadily in-
creasing in the United States since formal tracking of
cases through registries began in the 1930s (Fig. 1).
Between 1940 and 1982, the age-standardized inci-
dence rose by an average of 1.2 percent per year in
Connecticut, which has the oldest cancer registry in
continuous operation. Improvements in the thor-
oughness of the registry, whose coverage became vir-
tually complete in the early 1970s, are unlikely to
account for more than 25 percent of the increase that
occurred before 1982. Between 1982 and 1986, the
incidence in the United States rose more sharply, at
4 percent per year. The time trends seen in Connecti-
cut appear to reflect the experience in other parts of
the United States, for which only recent data are avail-
able. Increases have occurred among all age groups
since 1935, although the magnitude of the increase has
been greatest among older women. Age-adjusted inci-
dence rates of breast cancer have increased in parallel
among black and white women in the United States
since 1975; rates among postmenopausal black women
remain about 15 percent lower than those among post-
menopausal white women, but the rates among pre-
menopausal black women are now slightly higher than
those among white women. As in the United States,
long-term increases in the incidence of breast cancer
are being observed worldwide, in both industrialized
and developing countries.

The age-adjusted mortality rates for breast cancer,
in contrast to the incidence rates, have been remark-
ably stable in the United States (Fig. 1). However,
the time trends appear to vary depending on the age at
diagnosis; since 1950 mortality rates have increased
by about 15 percent among women over the age of 55
and declined by about the same amount among those
younger than 45. The declining mortality among
younger women appears to be best characterized as
applying to women born after about 1935 in Connecti-
cut and after about 1950 nationwide. Since 1975 the
mortality rates among black women have increased
substantially and are now slightly higher than those
for white women. The relative constancy of the over-
all mortality rate, despite increases in incidence, could
be the result of more complete reporting of incident
cases, increases in a more benign form of disease, ear-
lier detection, or advances in treatment. These factors,
all of which appear to be contributing to the divergence of incidence and mortality, are discussed subsequently.

Whether the increase in the incidence of breast cancer has been the result of more widespread use of screening mammography has been examined in several analyses. The initiation of a screening program will temporarily increase the incidence by advancing the time of diagnosis, as was noted nationally in 1974 through 1976 (Fig. 1). If screening is not repeated, a deficit of incident cases will ensue; if screening is performed regularly, a new steady-state incidence will be achieved at a rate close to that which will occur without screening. The number of breast cancers diagnosed in screening programs that would not eventually be recognized clinically appears to be small; there is minimal underdetection of breast cancer in autopsy series, so no excess incidence in a 10-year period was seen in a randomized screening trial, and little increase was seen among women undergoing mammography for routine screening in a national program for the detection of breast cancer. In an Oregon prepaid health plan, only 9 percent of cases diagnosed in 1985 were initially detected by screening mammography, and it was estimated that screening could account for no more than 5 percent of incident cases. However, most of the increase between 1960 and 1985 was accounted for by tumors with estrogen receptors, suggesting a hormonal influence and the possibility that the increase may be due to a more benign form of breast cancer. In the United States as a whole, the annual rate of screening mammography among women over the age of 50 years did not appear to exceed 15 percent in 1984. Because screening causes at most a transient rise in incidence and because its use was not widespread at least through the early 1980s, it can explain little of the long-term increase in the incidence of breast cancer.

The upsurge in the incidence of breast cancer that began in the early 1980s is almost entirely due to an increase in tumors measuring less than 2 cm in diameter; the incidence rate of tumors measuring 2 cm or more has not changed appreciably. In addition, the proportion of cases diagnosed while the tumor is in situ or localized increased substantially, after having been stable during the 1970s. These findings as well as an improved two-year survival rate are compatible with the concomitant substantial increase in the use of screening mammography. To the extent that the recent acceleration in the incidence of breast cancer represents the transient rise expected in the early stages of a screening program, it will eventually result in the prevention of deaths due to breast cancer during this decade. However, the incidence of larger tumors and those with regional or distant metastases at diagnosis has not decreased, which would be expected if a screening program was implemented and the true incidence was constant. This indicates that the underlying long-term increase in the incidence of breast cancer has continued through the 1980s and suggests that no major decline in mortality rates should be expected in the near future. Stable mortality rates in the face of an apparent true increase in incidence suggest that the earlier detection of cases in more recent years, and possible improvements in treatment, have improved survival sufficiently to offset the rising incidence.

Although the very recent surge may be due largely to the increased use of mammographic screening, the much larger increase over the past half century appears to be real. Breast cancer is clearly continuing to increase, especially among postmenopausal women, and will require even greater attention on the part of researchers and clinicians. In particular, specific factors that explain the long-term increase should be sought.

**RISK FACTORS**

Large variations in the rates of breast cancer among countries and over time within countries and large increases in the rates of breast cancer among populations migrating from nations with a low incidence to those with a high incidence indicate the existence of major nongenetic determinants of breast cancer and the potential for prevention. The elucidation of specific risk factors for breast cancer is important to understand the observed variation among and within countries, to identify women who could benefit from intensified surveillance or prophylactic treatment, to select subjects for participation in intervention studies, and to modify factors that will ultimately reduce risk.

The strength of a risk factor is typically indicated by its relative risk—the incidence among persons possessing a characteristic in question divided by the incidence among otherwise similar persons without the characteristic. The relation of a risk factor to the disease, however, can be complex for a number of reasons. Many risk factors are measured as continuous variables (for example, the age at which breast cancer was diagnosed in a relative and the ages of women at
menarche, the birth of the first child, and menopause), and their relative risks can be quite arbitrary, depending on the segments along the continuum that are compared. To evaluate the potential causes of breast cancer and the reasons for the international differences, comparisons of extremes are often of interest, such as an age of 11 years at menarche as compared with an age of 16 years. From a clinical perspective, however, the group with the highest risk on the basis of any particular factor is usually of primary interest; the relative risk for this group as compared with that for the rest of the population will typically be much smaller than when it is compared with the group with the lowest risk. Furthermore, the risk for an individual woman cannot be determined by multiplying the relative risk by the average risk for the population because the general population includes persons with and without the risk factor. In addition, the occurrence of an elevated risk in association with a given factor does not necessarily imply causation; however, this information may still be useful for prediction.

A number of variables that predict the occurrence of breast cancer and their typical relative risks are described briefly in Table 1. As can be appreciated, the established risk factors for breast cancer — a family history of breast cancer, early menarche, late age at childbirth, late age at menopause, history of benign breast disease, and exposure to ionizing radiation — are generally associated with only weak or moderate elevations in risk. The exceptions occur in uncommon subgroups of these variables; for example, a family history of breast cancer at a young age or a family history of bilateral disease.

A family history of breast cancer, particularly when the diagnosis was made in the mother or a sister at a young age, can be an important risk factor for breast cancer. As compared with the risk among women having no first-degree relatives with breast cancer, overall the relative risk is on the order of 1.5 to 2 for women who have one first-degree relative with breast cancer and may be as high as 4 to 6 for those with two affected first-degree relatives. The risks are heightened if the cancer was bilateral. For a woman with a sister who had bilateral breast cancer before the age of 50, the lifetime cumulative risk of breast cancer appears to be greater than 50 percent, and it is even higher if the sister was affected before the age of 40. The excess relative risk declines with the age of the relative at the time of diagnosis. For a woman whose mother had unilateral breast cancer after the age of 60, the excess relative risk is only about 40 percent greater than that associated with having no first-degree relatives with breast cancer (Nurses' Health Study: unpublished data). An intensive search for DNA markers of familial risk is ongoing and will be described later.

Early menarche is a well-established but weak risk factor. The relative risk is approximately 1.2 for women in whom menarche occurred before the age of 12 as compared with women in whom it occurred at the age of at least 14. However, this variable may account for a substantial part of the international differences, because the contrasts are more substantial; in China the average age at menarche is 17 years as compared with 12.8 years in the United States.

Nulliparity and a late age at first birth both increase the lifetime incidence of breast cancer. The risk of breast cancer among women who have their first child after the age of 30 is about twice as high as that among those who have their first child before the age of 20.

### Table 1. Established and Probable Risk Factors for Breast Cancer.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Comparison Category</th>
<th>Risk Category</th>
<th>Typical Relative Risk</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family history of breast cancer</td>
<td>No 1st-degree relatives affected</td>
<td>Mother affected before the age of 60</td>
<td>2.0</td>
<td>Nurses' Health Study*</td>
</tr>
<tr>
<td>Age at menopause</td>
<td>45-54 yr</td>
<td>Before 55 yr</td>
<td>1.5</td>
<td>White</td>
</tr>
<tr>
<td>Obesity</td>
<td>10th percentile</td>
<td>90th percentile: Age, 30-49 yr</td>
<td>0.8</td>
<td>Tretiak</td>
</tr>
<tr>
<td>Height</td>
<td>10th percentile</td>
<td>90th percentile: Age, 30-49 yr</td>
<td>0.8</td>
<td>Tretiak</td>
</tr>
<tr>
<td>Oral contraceptive use</td>
<td>Never used</td>
<td>Current use</td>
<td>1.5</td>
<td>Tretiak</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>Nondrinker</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Unpublished prospective data were obtained from Graham Colditz (personal communication).
†Relative risks may be higher for women given a diagnosis of breast cancer before the age of 40.
women who have their first child after the age of 35 have a slightly higher risk than nulliparous women. An earlier age at the birth of a second child further reduces the risk of breast cancer. After an adjustment for the ages of the women at the births of their children, the number of births has at most a small influence on the risk of breast cancer. Although pregnancy before the age of 30 reduces the lifetime risk of breast cancer, recent evidence suggests a more complex pattern of a transiently increased risk relative to that for a nulliparous woman that lasts for one to two decades, followed by a risk that is lower than that for a nulliparous woman later in life.

A late age at menopause increases the risk of breast cancer; the incidence is doubled among women with natural menopause after the age of 55 as compared with those in whom it occurs before the age of 45. In the extreme, women with bilateral oophorectomy before the age of 35 had one third the risk of women with natural menopause in studies conducted before hormone-replacement therapy became standard practice.

A history of benign breast disease has long been known to increase the risk of breast cancer slightly. However, the term "benign breast disease" covers a heterogeneous group of histopathologic entities and needs to be defined specifically. As compared with women without a history of breast biopsy or aspiration, women who have lesions with any proliferative epithelial changes have twice the risk of breast cancer and those with atypical hyperplasia about four times the risk. Lesions without proliferative changes are associated with little or no excess risk. Four to 10 percent of benign biopsy specimens show atypical hyperplasia.

Exposure to ionizing radiation, particularly between puberty and the age of 30, can substantially increase the risk of breast cancer. However, exposure to clinically important levels is rare.

Obesity is not an important risk factor for breast cancer, and among premenopausal women it is actually associated with a reduced incidence. Among postmenopausal women, it has a weak but clinically unimportant positive association with the incidence of breast cancer, but it has a stronger association with mortality from breast cancer, due in part to delayed diagnosis among more obese women and to a worse prognosis that is independent of the stage of cancer.

Other features have been associated with breast cancer, but they are not as firmly established as those noted above. Tallness is associated with an increased risk of breast cancer internationally and in numerous case-control and cohort studies. The use of oral contraceptives appears to increase the risk of breast cancer by about 50 percent, but the excess risk drops rapidly after the drug is stopped, suggesting a late-stage tumor-promoting effect. However, issues related to their use early in reproductive life remain unsettled; in several recent case-control studies among women younger than 45 years, the use of oral contraceptives for more than a few years was associated with increases in risk irrespective of when they were used. The use of postmenopausal estrogen supplements appears to increase the risk of breast cancer by about 40 percent among women who are actively taking them, with little increase among those who are no longer taking them. This increased risk among current users appears to be concentrated among older women, who also tend to take them for longer periods. Combining progesterone with estrogen replacement, which reduces the risk of endometrial cancer, does not appear to decrease the incidence of breast cancer, and may add to it. Alcohol consumption, even at the level of about one drink per day, has been associated with a moderate increase in risk in most, but not all, case-control and cohort studies. As for the more traditionally recognized risk factors described previously, the magnitude of associations between these less well-established variables and the risk of breast cancer is not strong.

Other potential risk factors have been studied, but the findings have been inconclusive. The fat composition of the diet has been thought to influence the risk of breast cancer, in part because of the large differences in rates between countries. However, only weak or nonexistent associations have been seen in case-control and cohort studies. In animals, mammary tumors appear to be more strongly promoted by linoleic acid (the primary dietary polyunsaturated fat) and inhibited by n-3 marine oils; however, there is little evidence that these fats are related to breast cancer in humans. An inverse relation between breast cancer and the total intake of vitamin A has been observed in some studies, but the validity of this finding is far from resolved. Lactation has been found to reduce the risk among premenopausal women in some studies but not in other large investigations. Participation in varsity athletics was associated with reduced risk in one study, but not in another.

To convey the effect of various risk factors in combination, Gail and colleagues have compiled detailed tables of estimates of the cumulative incidence of breast cancer among women at specific ages and according to the number of first-degree relatives with breast cancer, age at menarche, age at first live birth, and number of biopsies for benign breast disease. For example, the cumulative 30-year incidence of breast cancer for a 50-year-old woman would be approximately 20 percent if she had her menarche at the age of 11 years, had two first-degree relatives with breast cancer, and delivered her first child after the age of 30. If she had no first-degree relatives with breast cancer, her risk would be approximately 9 percent.

The accumulated data on risk factors for breast cancer suggest several biologic mechanisms. Genetic factors clearly contribute, and a search is now in progress for DNA mutations associated with this increased risk. Estrogenic stimulation increases the risk; the elevated risk among users of estrogen supplements supports this mechanism most directly, and the effects of age at menarche and menopause, obesity among post...
menopausal women, and the therapeutic effect of tamoxifen therapy are also likely to be mediated by this mechanism. Studies of endogenous estrogen levels in relation to the risk of breast cancer are currently inconclusive because of the possibility that the levels may be influenced by the disease in case-control studies, the limited size of prospective studies, and the poor reproducibility of many serum hormone assays. Another mechanism is suggested by the moxifen therapy are also a mechanism. Studies of endogenous estrogen levels in relation to the risk of breast cancer are currently in

should have little further increase.

from pregnancy-induced differentiation of breast stem cells. Finally, restriction of food intake early in life, which profoundly reduces the incidence of mammary tumors in animals, may also be relevant to humans. This relation is reflected in the positive association between height and the risk of breast cancer, and may underlie many of the differences in the rates among countries.

Can the established risk factors for breast cancer account for the substantial increase in the incidence of breast cancer over the past 40 years? The age at menarche has declined from an average of about 17 years two centuries ago to an average of 12.8 years, but it has been stable in the United States since the 1940s. Adult height has increased substantially over the past 150 years in the United States, but it also tended to stabilize sometime about 1940 among the middle and upper classes. Thus, to the extent that the improvements in childhood nutrition reflected by the age at menarche and ultimate height adversely influence the risk of breast cancer, cohorts of women born before about 1940 will continue to have successively higher age-specific rates, but those born after this time should have little further increase.

Changes in the age at which women bear children explain little of the long-term increases in breast cancer, although recent delays in the time of first pregnancies could increase future rates by about 9 percent. Widespread use of estrogen-replacement therapy has almost certainly contributed to the higher incidence among postmenopausal women. Some have claimed that increased fat consumption is a probable explanation for the rise in incidence, but this assertion is based on data for fat production rather than intake; fat intake has actually been declining in the United States for the past 40 years.

Increased alcohol consumption by younger women may have contributed appreciably if the observed association with incidence is causal; alcohol consumption at the age of 18 was three times higher among Nurses' Health Study participants born between 1960 and 1964 than among those born 40 years earlier (unpublished data). Although an increase in the incidence of breast cancer would have been expected on the basis of changes in known and suspected risk factors, whether these factors can quantitatively account for the observed increase remains unclear.

The known risk factors for breast cancer do not collectively allow the identification of a small high-risk group that accounts for a large proportion of women with the disease. For example, in the Nurses' Health Study, women in whom menarche occurred before the age of 11, who had their first child after the age of 35, who had a history of benign breast disease, or who had a history of breast cancer in a first-degree relative composed 41 percent of the population and together had only a 54 percent greater incidence of breast cancer than did the remaining women (unpublished data). Furthermore, the excess incidence in the study population accounted for by these variables was only 18 percent. A small group of women, those with a mother or sister who has had bilateral breast cancer at a young age or multiple first-degree relatives with breast cancer at a young age, may have cumulative lifetime risks of 30 percent or more. These women warrant particularly careful follow-up by physicians experienced in breast disease, but they account for a small fraction of all breast cancers. Unfortunately, even women without identifiable risk factors have an appreciable lifetime risk of breast cancer (approximately 6 percent through the age of 80), and they will benefit from regular screening for breast cancer.

From the standpoint of identifying risk factors to prevent breast cancer, our knowledge is even more disappointing. It is either impossible or culturally unacceptable to modify some of the clearly established risk factors. Although great strides have been made in the identification of lifestyle variables that are risk factors for cardiovascular disease and some forms of cancer, this paradigm may not necessarily apply to breast cancer. The search for modifiable risk factors has not been exhausted and must continue. However, to the extent that the high incidence of breast cancer in affluent countries is the result of rapid growth and early maturation of children resulting from historically unprecedented nutritional abundance and the control of infectious disease, the lifestyle changes needed to reduce the risk of breast cancer substantially may not be feasible. If this is the case, prevention may depend on artificial manipulation of hormones and growth regulators that underlie the known risk predictors, such as a woman's age at the birth of her first child and at menopause.

**Screening**

One potentially important strategy in reducing the mortality from breast cancer is earlier detection. Earlier diagnosis is hypothesized to result in treatment before the tumor metastasizes and thus to avert death due to the disease. The main methods for earlier detection of breast cancer have been mammography and physical examination performed by a trained health professional. Other potential methods of screening, such as self-examination of the breasts, have not yet been demonstrated to be of value, and some methods, such as thermography and CT scanning, have been shown not to be of value. The ability of mammography to detect cancers well before they are apparent on physical examination has been indisputably established. The usefulness of mammography in recent years has been enhanced by technical advances.
that provide increased visualization of the breast parenchyma (and reduce exposure to radiation), improvements in film quality and processing, refined techniques of imaging (compression, reduction in the size of the focal spot, magnification, and the ancillary use of ultrasonography), better guidelines for the diagnosis of cancer, and greater availability of well-trained mammographers. As illustrated in Figure 2, these newer techniques detect a large percentage of cancers that are 2 cm in diameter or smaller with uninvolved axillary nodes or that are noninvasive (referred to as ductal carcinoma in situ).

The ability to detect cancers at a very early stage does not, however, ensure that mortality will be reduced. Screening might simply detect lethal cancers sooner (lead-time bias), cancers that are growing more slowly and are less likely to be lethal (length-time bias), or tumors with questionable malignant potential (overdiagnosis bias). Furthermore, women who participate in screening may have a different risk of breast cancer than women who do not participate (selection bias). Randomized trials to assess accurately the effect of screening on breast-cancer mortality eliminate these sources of bias. These trials listed in Table 2, are not simple to summarize because of variations in study design, the technical level of the mammography, the degree to which women in the screening group and controls were actually screened, and the length of follow-up. Overall, however, screening appears to reduce mortality from breast cancer by about 25 percent. Some have argued that this is likely to be a conservative estimate, especially when state-of-the-art mammography is used, since all these studies have some limitations that would tend to reduce the observed benefit.

The finding that screening reduces mortality from breast cancer has important implications regarding the natural history of the disease. Some evidence suggests that metastases occur very early in the course of the disease and that breast cancer should be considered a systemic disease from its onset. However, the reduction in mortality produced by screening provides compelling evidence that early diagnosis and treatment of breast cancer can avert the onset of metastas-
thus, breast cancer can metastasize later during its clinical evolution and should not be considered a systemic disease in all patients.

The randomized trials provide an overall estimate of the effect of screening, but they leave several important issues unresolved. One issue is the effect of screening in different age groups. These studies were not designed to address this matter, so an analysis of subgroups according to age may be misleading. However, in these studies the beneficial effects of screening are fairly consistently restricted to women between the ages of 50 and 69. Because breast cancer is less common among younger women, larger studies may be needed to demonstrate the effectiveness of screening in women who are younger than 50 years. Some have also argued that a longer follow-up is necessary to demonstrate the effectiveness of screening in women between the ages of 40 and 49. However, mammographic imaging is less sensitive in younger women than in older women, and the subclinical phase of the disease is estimated to be shorter. Preliminary results from the Canadian trial in women between the ages of 40 and 49 show increased mortality among those who were screened as compared with women of the same age who were not screened. This report has already resulted in considerable controversy, including questions about the technical quality of the mammography used in the study. At this time, there is no firm evidence that screening either reduces or increases mortality from breast cancer in women between the ages of 40 and 49, although it can be argued that only in recent years has the sensitivity of mammography been adequate to detect small lesions in this age group reliably. Additional follow-up in the current trials and perhaps additional trials in this age group with optimal mammographic equipment, technique, and interpretation will be necessary to resolve this controversy.

For women between the ages of 50 and 69, the reduction in breast-cancer mortality is observed more consistently and is in the range of 30 to 40 percent. These studies provide little information about the value of mammography in women who are 70 or older. In addition, the available studies assessed neither the optimal periodicity of screening nor the relative effects of mammography and physical examination in reducing breast-cancer mortality. These issues are being addressed directly in a second generation of trials, including the Canadian studies mentioned previously.

The screening trials have helped to determine the resources and expenses necessary for an effective screening program. To achieve maximal results for mammographic screening, quality control of both the images obtained and the reading of these images must be maintained. This requires the efforts of well-trained and experienced radiology technicians, physicists, and mammographers at many steps along the way. Training and experience are also important for health professionals involved in physical examination of the breast. In addition, with the use of guidelines currently accepted in the United States, the probability that a nonpalpable suspicious finding on mammography is cancerous is 20 to 30 percent; thus, screening will result in a considerable number of negative biopsy results. To complicate matters, there is not yet a consensus among physicians and patients in the United States regarding the optimal positive predictive value of such biopsies; some have argued that a biopsy should be performed when the chance of finding cancer is 10 percent. The expense of any screening program will be highly dependent on the proportion of positive biopsy specimens.

The financial costs of screening in relation to the benefit can be estimated. For women between the ages of 40 and 75, approximately 100 of 10,000 (or 1 percent) will die of breast cancer over a 10-year period.
should have an annual physical examination, that screening may be useful in making a rational decision about screening. A number of countries have adopted national screening programs. In 1987, the general population, and it would be reasonable to assume that they would be twice as likely to benefit from screening. Such women are also more likely to comply with a screening program. Many experts, however, believe that if mammography is to be performed in women younger than 50, it should be performed annually, because of the shorter preclinical phase in these women. For women who are 50 or older, the use of mammography every two years has been shown to be effective.

The use of screening as a public health policy is associated with additional considerations and economic implications. A number of countries have adopted national screening programs. In 1987, the United Kingdom recommended a policy of single-view mammography performed every three years in all women between 50 and 64 years of age. In 1988, Canada recommended that mammography be performed every two years in women between 50 and 69 years of age. Similar policies have been instituted in Sweden, Finland, the Netherlands, and Australia. At this time, the United States is not actively considering a national program.

Although screening with mammography and physical examination is far from a satisfactory solution to the problem of breast cancer, the benefit should not be minimized. A reduction in mortality from breast cancer in the range of 25 percent is a major achievement, and continuing efforts to increase the effectiveness of screening and to reduce costs are likely to improve the cost–benefit ratio. Further research is required to define the optimal mode (mammography, physical examination, or both) and frequency of screening for women in various age groups.

REFERENCES


IMAGES IN CLINICAL MEDICINE

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