

# PAPERS AND SHORT REPORTS

## Recent trends in breast surgery in the United States and United Kingdom

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### Abstract

Data on breast surgery from national samples of patients discharged from hospital in the United States and in England and Wales were reviewed for the years 1970-80. In the United States the rate of breast surgery increased dramatically in 1974 and 1975, but in Britain it remained constant and well below the level in the United States. In both countries the proportion of radical mastectomies declined and the proportion of less extensive procedures rose.

The increase in mastectomy rates in the United States probably resulted from increased public concern about breast cancer and from the promotion of breast screening in the mid-1970s. The costs, morbidity, and early mortality associated with a higher rate of mastectomy are substantial and the advantages unclear.

### Introduction

This report analyses the rates of breast surgery from 1970 to 1980 in the United States and in England and Wales. We undertook the study primarily because of three observations. Firstly, in 1966 the rate of mastectomy in the United States was reported as 71% greater than that in the United Kingdom,<sup>1</sup> despite the fact that women in the two countries have similar mortality from breast cancer.<sup>2</sup> Secondly, from 1973 to 1975 American women were exposed to extensive publicity about breast cancer, and the medical community began aggressive programmes for its detection.<sup>3</sup> Meanwhile breast screening was not generally encouraged in the United Kingdom, because the results of detailed studies of cost and efficacy were pending.<sup>4</sup> Thirdly, in the United Kingdom the extent of surgical

services is determined largely by planners in the National Health Service, who centrally allocate resources each year. Thus the frequency of breast surgery should be less affected by acute changes in public knowledge or expectations in the United Kingdom than in the United States. All these factors led us to hypothesise that heightened interest in finding breast cancer during the mid-1970s had increased the amount of breast surgery performed in the United States but not in the United Kingdom, causing an even greater divergence in the rates of mastectomy.

The principal purposes of our study, therefore, were to determine the trends in the rates of breast surgery for the United States and United Kingdom, to define the age groups affected by any changes in the rates, and to assess the possible consequences of these changes. Our secondary purpose was to compare trends in the type of mastectomy performed in the two countries because reports had shown that British surgeons usually used less extensive procedures for breast cancer than their American counterparts,<sup>1</sup> and because there had been growing support in both countries for alternatives to radical mastectomy.<sup>5</sup>

### Methods

The Hospital Discharge Survey of the National Center for Health Statistics served as the source for data on operations in the United States. It is a stratified probability sample for discharges from short stay, non-federal hospitals. The information collected in the survey comes principally from the face sheet of the medical record and is transcribed on to a study abstract form that recorded up to three operations per admission from 1970 to 1978 and up to four operations in 1979 and 1980. Operations are coded according to the version of the International Classification of Diseases in use at the date of discharge. For the years 1970-8 the eighth revision was in use<sup>6</sup>; for 1979 and 1980 the ninth revision: clinical modification was used.<sup>7</sup> A description of the procedures followed in the Hospital Discharge Survey has been published.<sup>8</sup>

From the National Center for Health Statistics we obtained estimates of the number of breast operations performed each year, regardless of diagnosis, and categorised by type of surgery and by five year age groupings. To analyse time trends in American rates of surgery we aggregated procedures into two groups: complete mastectomy (categories 65.3-65.5 in the eighth revision and 85.4 in the ninth revision); and partial mastectomy or excision of lesion (category 65.2 in the eighth revision, which is also the category in which excisional biopsies are coded). We combined these two categories to determine the aggregate of all mastectomies and excisions. For the years 1979 and 1980 we did not have comparable data for partial

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mastectomies and excisions because of changes in coding procedures, and thus we could not calculate the total number of operations in those years. To present the data we used two age groups: 45-64 and 65 and over. Surgical rates were calculated by using the estimated number of operations for an age group in a given year as the numerator and the United States census's estimate of the number of women in that age group on 1 July of that year as the denominator.<sup>9</sup> To assess changes in the types of mastectomy performed we calculated the proportion of complete mastectomies each year according to whether they were coded as radical mastectomies (International Classification of Disease category 65.5 in the eighth revision and 85.45 in the ninth revision), extended simple and modified radical mastectomies (category 65.4 in the eighth revision and 85.43-85.44 in the ninth revision), or simple mastectomy (category 65.3 in the eighth revision and 85.41-85.42 in the ninth revision).

Standard errors cannot be derived simply for estimates from the Hospital Discharge Survey, but they can be approximated from published tables.<sup>10</sup> In the data presented for all ages of women combined the relative standard errors were in the range 9-12%. The relative standard error for data pertaining to specific age groups was in the range 10-17%. To test whether there was a significant increase in surgical rates in the United States from 1970 to 1975 we used a weighted linear regression analysis in which the surgical rate for a given year was weighted by the reciprocal of the variance (as calculated from the relative standard error) for that particular rate.<sup>11</sup>

Data on surgery among women in England and Wales were obtained for the years 1970-80 from the Hospital Inpatient Enquiry, which is based on 10% sample of discharges from National Health Service hospitals in England and Wales, excluding hospitals and beds designated for psychiatric care.<sup>12</sup> The data are abstracted from records of inpatients, allowing for one operation per discharge, and are coded according to the Office of Population Censuses and Surveys classification of surgical operations.<sup>13</sup> The data were provided as counts of procedures by year and by age groups of 45-64 and 65 and over. These counts of procedures were revised upwards, following instructions from the Hospital Inpatient Enquiry, to allow for under-sampling in the years before 1977. For analysing trends in the type of mastectomy we used the following categories: radical mastectomy (category 384-385), extended simple and modified radical mastectomy (category 383), and simple mastectomy (category 382). For presentation of surgical rates we included categories 382-385 as complete mastectomies and categories 381 and 387 (breast biopsy) as partial mastectomies and excisions. In calculating these rates we used mid-year census estimates for women in England and Wales.<sup>14</sup>

## Results

From 1970 to 1975 the estimated yearly number of complete mastectomies performed on women aged 30 and over in the United States increased from 69 100 to 100 300 (table). A similar increase was also recorded for partial mastectomies and excisions. The most pronounced increase in both types of surgery occurred in 1974 and 1975. In subsequent years the reported number of mastectomies declined but did not reach the level of the earlier 1970s. A similar pattern was seen in the surgical rates (per 100 000 women years), indicating that the increase in numbers of procedures could not be explained solely by growth in the population of women aged over 29 (table). The increase in surgical rates from 1970 to 1975 was significant both for complete mastectomy ( $p < 0.01$ ) and for partial mastectomy or excision ( $p < 0.05$ ).

The age specific rates of complete removal of the breast changed notably among American women aged 45-64 and 65 and over (fig 1), peaking in both groups in 1975. In later years the rates declined gradually in the group aged

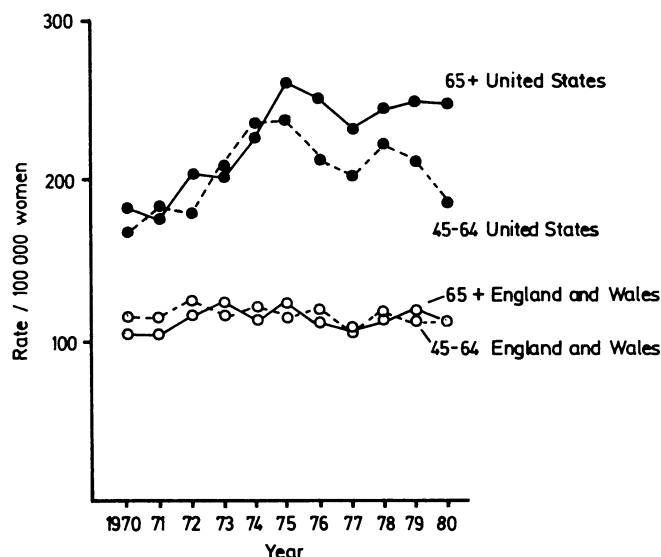


FIG 1—Age specific rates of complete mastectomy among women in England and Wales and the United States in 1970-80.

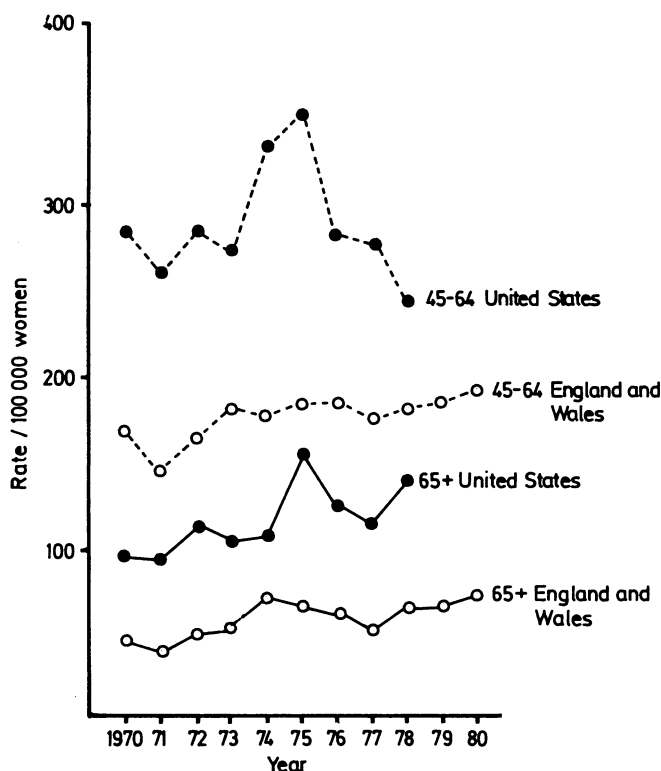


FIG 2—Age specific rates of partial mastectomy and excision among women in England and Wales and the United States in 1970-80. (Data not available for the United States in 1979-80.)

*Estimated numbers and rates (per 100 000 woman years) of procedures for breast surgery in the United States for women age 30 and over*

	Complete mastectomy		Partial mastectomy and biopsy		All procedures	
	No	Rate	No	Rate	No	Rate
1970	69 100	135	133 400	260	202 500	395
1971	73 000	141	123 000	237	196 000	378
1972	80 000	152	141 300	269	221 300	422
1973	85 800	161	142 000	265	227 100	426
1974	100 100	185	160 700	298	260 800	483
1975	100 300	183	174 100	318	274 400	502
1976	99 300	179	141 100	255	240 400	434
1977	98 400	174	138 100	244	236 400	418
1978	102 300	177	130 500	226	232 800	404
1979	99 500	169	*	*	*	*
1980	95 800	158	*	*	*	*

\*Comparable data not available for these years.

45-64 but remained high in the older group. In England and Wales during the 1970s the rate of complete mastectomy remained fairly constant in both age groups (fig 1), and the rates in 1980 were about half those for American women of comparable age.

The rate of partial removal of the breast (including excisions of lesions) in the United States showed an even more pronounced trend (fig 2). The reported number of these procedures peaked abruptly in 1975 in both age groups. In the following years the rate declined rapidly in the women aged 45-64 and less rapidly in the women aged 65 years and older. The rate of partial mastectomy and excision in England and Wales increased from 1970 to 1980, but the increase was gradual and without a peak in 1974-5 (fig 2). These rates too were substantially lower than the ones reported for the United States.

During the study period there was a considerable shift in the type of

procedure used in the United States from complete removal of the breast (fig 3). The radical procedure accounted for 67% of mastectomies in 1970 but only 10% in 1980. The extended simple and modified radical procedures had replaced the radical mastectomy as the favoured procedure by 1975 and accounted for 68% of mastectomies by 1980. The trend for simple mastectomy was one of gradual decline, from 30% of operations in 1970 to 22% in 1980. In England and Wales the trends in the type of mastectomy over time were less dramatic than those in the United States (fig 3). Simple mastectomy remained the most common procedure, accounting for about 70% of operations throughout the period of study. There was a shift, however, away from radical mastectomy in favour of the extended simple and modified radical procedures.

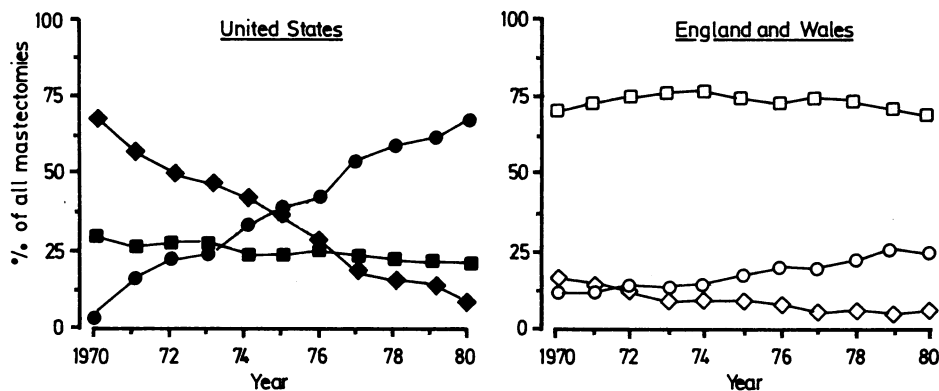


FIG 3—Trends in type of mastectomy in the United States and England and Wales in 1970-80. ■ = Simple. ● = Extended simple and modified radical. ◆ = Radical.

## Discussion

Data from the Hospital Discharge Survey indicate that during the 1970s the rate of mastectomy among American women increased abruptly and then partially declined. From 1970 to 1975 the rate of complete mastectomy increased by 35%, with the most pronounced increase occurring among women aged 65 and over. A smaller increase (22%) occurred in the rate of partial mastectomy and biopsy, with the increase principally affecting those aged under 65. The rates of surgery tended to decline after 1975, although rates of complete mastectomy remained high in the older age group. By contrast, the rates of breast surgery for women in England and Wales remained nearly constant during this period. In both America and England and Wales there was a trend away from radical mastectomy, although simple mastectomy remained the most common procedure in England and Wales whereas the extended simple and modified radical procedures became most common in the United States.

One factor that may have led to the increase in mastectomy rates in the United States was the promotion of breast screening by the medical community. In the early 1970s evidence emerged that screening might reduce mortality from breast cancer,<sup>15</sup> and this resulted in enthusiasm for mammographic screening programmes.<sup>3</sup> Thus more women were diagnosed and treated, particularly for in situ and early stage tumours.<sup>15,16</sup> Indeed, between 1970 and 1975 the recorded incidence of breast cancer increased by 10-20% in several cancer registries in the United States,<sup>17</sup> increases that were surely the result of increased detection rather than a true increase in incidence.<sup>18</sup> Screening programmes also resulted in more breast biopsies; in the United States the largest of the programmes, the Breast Cancer Detection Demonstration Project (sponsored by the National Cancer Institute and the American Cancer Society) generated more than 30 000 recommendations for biopsy after screening over 250 000 women from late 1973 to mid-1976.<sup>19,20</sup> Simultaneously, the federal government supported many other projects designed to increase the use of mammography and teach self examination of the breast.<sup>21</sup> A substantial portion of the increase in surgery can thus be directly attributed to the activities designed to detect breast lumps by governmental and private medical organisations.

A second and possibly more important factor in the rise in the rate of surgery was a change in public attitudes and expectations. In 1974 the media extensively reported the treatment for breast cancer received by Mrs Ford and Mrs Rockefeller, wives of the president and vice president respectively. Subsequent publicity emphasised that early breast cancer could be cured and urged women to examine their breasts for lumps. This type of coverage increased women's enthusiasm for detecting cancer; indeed, some diagnostic clinics were inundated after these news reports.<sup>22</sup> A similar wave of publicity, this time on the testing of stool for occult blood followed President Reagan's surgery for cancer of the colon,<sup>23</sup> and surgical

rates for polypectomy and colonic resection will probably consequently increase in the United States.

After 1975 the rate of complete mastectomy declined, particularly among women aged under 65, possibly because the prevalence of undetected breast cancer had been reduced by the screening activities of the preceding few years. Interestingly, rates of mastectomy did not fall to or below the levels in 1970-1, as might have been expected had screening diminished the pool of undetected cases. This finding and the fact that the reported incidence of breast cancer also rose in 1974-5 and did not subsequently fall below previous levels<sup>18</sup> suggest that the criteria for diagnosis may have been relaxed after 1973 or that the screening activity detected many tumours that would not have progressed to the point of clinical detection. Another factor that may have contributed to the decline in mastectomy rates after 1975 was the diminished enthusiasm for using mammography, with its attendant exposure to radiation, on women aged under 50.<sup>24</sup> Furthermore, improved mammography techniques probably reduced the number of false positive results and the amount of surgery done on women without cancer. Greater use of wedge resection or radiation alone (rather than complete mastectomy) cannot account for the falling rates, because surveys by the American College of Surgeons in 1972, 1976, and 1981 did not show a major shift away from complete mastectomy for women with breast cancer.<sup>25</sup>

Although a substantial rise and fall were recorded in the rate of partial mastectomy and excision in the United States, assessment of these data is complicated by possible changes in the ascertainment of these procedures. For example, in America excisions of lumps in the breast, which were once performed in hospital, are now done in outpatient or short stay facilities, and these procedures may not be counted in the Hospital Discharge Survey. Conversely, the previously common practice of performing both an excisional biopsy and mastectomy (if the frozen section showed cancer) during one anaesthetic resulted in the excision not being counted, but this practice fell into disfavour during the 1970s and surgeons now tend to wait for a report on pathology slides before performing a mastectomy<sup>26</sup>; in these circumstances the excision is probably counted as a separate procedure. Some of the difference in the rates of partial mastectomy or excision between the United States and United Kingdom may be due to differences in counting procedures,

as the Hospital Inpatient Enquiry recorded only one principal operation per hospital discharge while the Hospital Discharge Survey recorded up to three. There are also differences in the coding of breast biopsy in the two surveys, for aspiration biopsies and needle biopsies are generally not included under ICD code 65.2 in the data we present from the American Hospital Discharge Survey but may be included in the Hospital Inpatient Enquiry in code 387. The data on breast excision and partial mastectomy should therefore be interpreted cautiously. We do not, however, know of changes in surgical practice or of counting procedures that might have seriously affected the ascertainment of complete mastectomies.

In the United States and in England and Wales there has been a shift away from radical mastectomy in favour of less extensive surgery. In the United States the modified radical and extended simple mastectomy have become the predominant procedures, a trend that has been noted before in reports based on surveys of surgical practice and on data from the Hospital Discharge Survey.<sup>25,27</sup> In the United Kingdom in 1966 simple mastectomy was performed slightly more commonly than radical mastectomy,<sup>1</sup> and our data indicate that by 1980 the radical procedure had been virtually abandoned. Unlike in the United States, however, there is a clear preference for simple mastectomy rather than the extended simple and modified radical procedures. This may reflect the popularity in Britain of simple mastectomy with postoperative radiation therapy, as advocated by MacWhirter.<sup>28</sup> The modified radical mastectomy provides doctors and patients with more information (from pathological examination of axillary nodes) that may help them predict the course of disease, but it is not clear that this procedure results in a better outcome than simple mastectomy in most patients. British and American surgeons now seem to differ greatly in their assessment of the relative worth of the various types of mastectomy. We expect that this difference may lessen after more evidence emerges from current clinical trials of the efficacy of alternative surgical approaches.<sup>29</sup>

Our data indicate that in the two years 1974 and 1975 over 50 000 more mastectomies were performed in the United States than would be expected from the rates in 1970 and 1971. This estimate is based on data abstracted from the hospital records for only a sample of all discharges, and because of the possible effects of chance and of changes in the sampling methods (the most important occurred between 1971 and 1972) the figure is not entirely reliable. The apparent magnitude of the increase, however, prompted us to consider some of the possible consequences of performing more breast surgery. For instance, there is compelling evidence from carefully run clinical trials that screening for breast cancer prevents deaths from this disease,<sup>15,16,30,31</sup> and some of the additional mastectomies quite probably saved women. It is not clear, however, that there are benefits from breast self examination and screening as practised in the general population, and there was no noticeable fall in breast cancer mortality rates in America after the increased screening and surgical activity in 1974 and 1975.<sup>18</sup> In fact, during the 1970s mortality from breast cancer increased among women aged over 50,<sup>2</sup> although screening is most effective in reducing mortality among this group.<sup>3,15</sup> Furthermore, we are disturbed by the finding that from 1970 to 1975 the mastectomy rate increased by 35%, or about twice the increase reported for the incidence of cancer in the United States during that time.<sup>17,18</sup> These figures indicate that much of the additional surgery may have entailed removal of breasts that did not contain invasive cancer. Conceivably, American patients became more insistent about removal of lumps and breasts with "borderline" disease that surgeons would otherwise not have operated on, or surgeons became more aggressive about operating for breast lumps and pathologists became more likely to diagnose cancer when a lump was not clearly benign. These possibilities are supported by data from Maine, where rates of breast surgery in 1974 and 1975 increased in some areas but not others, leading to the suggestion that physicians in different areas had responded differently to an increased interest in breast lumps.<sup>32</sup> Lastly, data from 1973 and 1975 indicate that the mortality in hospital after complete mastectomy in the United States was 3.5 per 1000 procedures,<sup>33</sup> and, if the figure of 50 000 added mastectomies in 1974-5 is correct, an additional 175 American women may have died

after this procedure. Thus the increase in breast surgery probably prevented some later deaths from cancer but also probably resulted in other, early deaths and unnecessary disfigurement of women without cancer. The available data are not, however, sufficient for us to assess the benefits or harm of the higher rates of surgery in 1974 and 1975.

Differences in the occurrence of breast cancer cannot account for much of the discrepancy in mastectomy rates between the United States and United Kingdom. The mortality from breast cancer in the United States is about 10% lower than that in the United Kingdom.<sup>2</sup> There are no nationwide data on the incidence of breast cancer for either country, but data from regional tumour registries in the late 1960s indicate a 20-30% higher incidence in the United States.<sup>34,35</sup> It is not clear whether the recorded difference in incidence is real or simply a reflection of more aggressive case finding (perhaps detecting small tumours with little potential for progression) and better case registration in the United States. In any event, the difference in incidence is far less than the difference in mastectomy rates for the two countries; the mastectomy rate in the United States in 1980 was 70% higher for women aged 45-64 and 102% higher for women aged 65 and over.

Bunker proposed that variations in the number of surgeons, available resources, and therapeutic approaches were possible explanations for the different rates of mastectomies in the United States and United Kingdom in 1966.<sup>1</sup> The discrepancy in rates has widened since then, and this divergence may be due, at least in part, to differences in how the two medical systems responded to changes in scientific knowledge and public perceptions about the value of detecting breast cancer. In the United Kingdom annual medical expenditure is determined in advance, and the rate of surgery is not prone to abrupt changes. It is doubtful whether resources could be quickly reallocated to support a 35% increase in the mastectomy rate if this were desirable. Furthermore, the National Health Service has not encouraged breast screening (at least not by routine mammography), and this policy will probably not change until community based clinical trials indicate that breast screening technology is worth the cost. In the United States the frequency of a particular operation is generally unbounded by constrained resources. There is a glut of surgeons eager to do more operations, and the costs are nearly always paid by medical insurance schemes. The average charge for a stay in hospital for mastectomy in the United States in the mid-1970s was roughly \$2000,<sup>36</sup> and the estimated hospital costs of the additional 50 000 mastectomies in 1974 and 1975 were thus about \$100 million, not including doctors' fees and rehabilitation expenses. One would hope that these costs (and the immediate morbidity and mortality of more surgery) might eventually be offset by the benefits of earlier treatment. It seems clear, however, that the surgical rates did not rise in the United States as a result of a planned policy, in which the expected gains were carefully weighed against the known costs and hazards. Rather, they seem to have grown because a portion of the medical community advocated breast screening and because "newsworthy" events focused public attention on this disease. In England and Wales the rate of mastectomy was held constant at a lower level than in the United States, and it is difficult to show that British women fared less well as a result.

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## Quality of life after myocardial infarction: effect of long term metoprolol on mortality and morbidity

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### Abstract

A double blind randomised study of 154 patients with myocardial infarction assigned to metoprolol (100 mg twice daily) and 147 assigned to placebo compared the effects of treatment in relation to health state over three years. Health state was evaluated by a new method based on the average number of days spent in each of seven mutually exclusive categories of health. The scale took into account death, history of serious complications, functional state, and side effects of treatment.

Of the maximum attainable 1095 days alive during the three years patients given metoprolol attained 992 days and those given placebo 964 days. During the period alive the metoprolol treated group spent an average of 278 days in an optimal functional state as compared with 176 days for the placebo treated group. This included 221 and 156 days respectively in a completely asymptomatic state (that is, without either cardiac symptoms or side effects of treatment). The time spent with a serious non-fatal complication was shortened by 56 days in the metoprolol group. The overall differences between the groups were statistically significant ( $p=0.03$ ).

Aside from bringing an improved quality of life after myocardial infarction, metoprolol may add up to one month to life expectancy for three years of treatment.

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### Introduction

Clinical trials have shown the benefits of  $\beta$  adrenoceptor blockade after acute myocardial infarction.<sup>1-4</sup> Nevertheless, the possibilities of negative side effects and the cost of treatment have led to doubts about the widespread use of these drugs. In clinical trials total mortality on the one hand and various non-fatal events, including side effects, on the other have been reported as separate entities for the groups compared. Hence it is difficult to determine exactly what effect the treatment has had on the quality of life and course of the disease as compared with placebo.

In clinical decision analysis the concept of life expectancy is used to express the value (utility) of the options considered.<sup>5</sup> Quality adjustment of life expectancy has been proposed to take morbidity and wellbeing into account.<sup>6</sup> We have applied these concepts to data from the Stockholm metoprolol trial, which was designed to evaluate the effect of long term metoprolol treatment on mortality and morbidity after acute myocardial infarction.<sup>4</sup>

### Patients and methods

Full details of the study have been reported elsewhere.<sup>4</sup> Briefly, patients under 70 surviving an acute myocardial infarction, in sinus rhythm and without bundle branch block, and without contraindications to  $\beta$  adrenoceptor blockade were included. Myocardial infarction was diagnosed if the patient had at least two of the following: severe chest pain lasting more than 15 minutes; a typical enzyme pattern; typical changes in the electrocardiogram.

Between May 1976 and December 1980, 301 patients (66% of the total population under 70 living in the hospital catchment area who had survived myocardial infarction) were entered into the study. All gave verbal informed consent. One to two weeks after the acute event—that is, in the phase after treatment in the coronary care unit—patients were stratified according to type of ventricular arrhythmias, size of infarct (estimated enzymatically), and age.<sup>4</sup> Thereafter they were allocated to double blind treatment with metoprolol 100 mg twice daily ( $n=154$ ) or matching placebo ( $n=147$ ) for three years. The protocol was approved by the local ethical committee.