EUROPEAN JOURNAL OF CANCER 45 (2009) 1987–1991

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Health care costs for treatment of disseminated breast cancer

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ARTICLE INFO

Article history:
Received 18 December 2008
Received in revised form 17 March 2009
Accepted 23 March 2009
Available online 22 April 2009

Keywords:
Costs
Breast cancer
Sweden
Metastatic

ABSTRACT

The rapid development of the care makes it important to have relevant cost information for cost-effectiveness assessments. The aim of this study is to estimate the health care cost of a disseminated breast cancer relapse in Sweden.

A retrospective cohort study of women with disseminated breast cancer in Sweden was done. The individual case records were reviewed and all data concerning treatments, hospitalisation, examinations and palliative care were collected.

The study included 53 patients with a total mean cost of €93,700 (95% Confidence Interval (CI): €78,500–€109,600). Drugs and hospitalisations were the largest single cost sources. HER2-positive patients had slightly higher mean costs (€123,300), while triple negative patients had slightly lower mean costs (€70,600).

The current costs for patients with disseminated breast cancer are considerably higher than those previously shown, which may have important consequences for economic evaluations of interventions aimed at reducing the risk of disseminated breast cancer.

1. Introduction

Breast cancer is one of the most common types of cancers and also one of the most costly. The total yearly cost of breast cancer in Sweden, for example, was estimated at €320 million in year 2002. Direct health care cost constituted about 30% of these costs, while the most important cost driver was production losses caused by premature mortality, constituting 36% of the total costs.[1] About 20–25% of women with breast cancer develop disseminated disease and this phase of the disease is a very resource intensive and costly phase.[2]

The relatively new introduction of aromatase inhibitors, taxanes and trastuzumab in the adjuvant treatment of breast cancer has urged the need for health economic assessments of cost effectiveness. In these analyses, the net cost of the intervention is obtained by subtracting the disease costs avoided by prevented relapses (i.e. locoregional or disseminated relapses) from the costs of the preventive intervention. Disseminated disease is the most common relapse in breast cancer and a highly health care resource consuming event. Screening programmes are, besides adjuvant therapies, another good example where the value of the interventions is highly dependant on the potential cost savings that can be made from avoiding cases of disseminated disease. Reliable information about the cost of treating disseminated breast cancer is therefore important for analyses of cost effectiveness of all interventions aiming at preventing relapses.

The available information on the cost of breast cancer is, however, scarce in most countries. The mean cost of disseminated breast cancer has been estimated at £12,502 (€16,700) in a UK study from 2004,[3] at 36,340 CAD (€24,200) in a Canadian study from 1999[4] and at $60,000 (€40,600) in US study from 2000.[5] A previous study from Sweden estimated the annual health care cost at 89,000 SEK (€9600).[2] The Swedish

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0959-8049/$ - see front matter
doi:10.1016/j.ejca.2009.03.023

study also estimated the annual informal care and indirect costs at about 207,000 SEK (€22,200), i.e. 70% of the total societal cost.

There is a rapid development of the care of breast cancer patients, which means that it is important to have up-to-date information on the cost of the disease as estimates made several years ago may not be reliable reflections of the current care and costs. It is therefore important to provide further information on the cost of this disease and the aim of this study is to estimate the health care cost of disseminated breast cancer in Swedish patients.

2. Materials and methods

A cohort of breast cancer patients treated in Uppsala County, Sweden, who had died during year 2005 or 2006, was included in the study. Patients were identified by the hospital patient administration system and also the regional oncology breast cancer register.

To be included, patient must have been diagnosed with disseminated breast cancer and must be an inhabitant of Uppsala County during the treatment period. Disseminated breast cancer included patients with distant metastasis, but excluded patients with locally/regionally advanced disease only. Further, the treatments must have been given at the hospitals in Uppsala or Enköping. Patients with multiple tumour disease, patients with incomplete journal information and also a few very old multidisease patients for whom no treatment of their breast cancer was offered were excluded.

Data were collected retrospectively from the date of diagnosis of disseminated disease and until death. A Health care perspective was adopted, where all inpatient, outpatient and hospice care resource use identified from patient case records were collected. Resource use was divided into type of care, i.e. chemotherapy, endocrine treatment, bisphosphonate treatment, other drug treatment, radiation, diagnostic examination, pathology, surgery, policlinic visits, hospital admission, palliative home care, hospice care and other care. Hospital admissions and hospice stay was calculated in days. Additional information about status of primary tumour, adjuvant treatments, site of metastases, relapses and survival time was also collected.

Unit costs for the resource use were estimated in €, 2006 year price (€1 = 9.2 SEK). Unit costs information was obtained from Akademiska hospital in Uppsala. The cost of administrating chemotherapy was based on a detailed calculation model of the amount of work and resources involved in administrating different types of chemotherapies, based on a previous study carried out at the hospital. In this model, the total cost of administration was based on the information on staff time used during treatment, antiemetic treatments used and cost of preparing chemotherapy.[6] Unit costs of admissions were based on the total cost of running the oncology department, divided by the number of admission-days per year. In these calculations, costs of diagnostic examinations and chemotherapy were excluded since they were estimated separately. Cost of surgery was based on information about anaesthetic time, surgery time and type of operation (level of complexity). Table 1 presents a selection of unit costs.

Table 1 – Selection of unit costs.

Resource	Unit cost
CT thorax	225
CT brain-neck	262
CT brain	169
MRT brain	337
Pulmonary X-ray	89
Hospital admissions	569
Physician visits	216
Histology biopsy	295
Hospice care (per day)	543
Surgery, P-A-C	1196
Surgery, Picc-line	402
Home care (per day)	233
Radiation (1–5 fractions)	1911
Radiation (5–10 fractions)	3896
Radiation (10–20 fractions)	4337
1 Course of FEC treatment (800 mg, 80 mg, 800 mg)	556
1 Course of Docetaxel treatment (130 mg)	1463
1 Course of Trastuzumab treatment (450 mg)	2271
1 Combination course of Docetaxel + Trastuzumab	3554

Patients are divided into three different subgroups depending on the receptor contents of the primary breast cancer tumour, estrogen positive, HER2-positive and triple negative, to highlight the costs of different treatment strategies. Mean and median values are presented and confidence intervals around the mean estimate were estimated using the Bootstrap resampling method.

3. Results

3.1. *Study population*

The identification of patients resulted in a gross cohort of 98 patients who had died during the time period. After exclusion of patient according to the criteria used, 53 patients were included in the final cohort. The reasons for exclusion were the following: partly treated outside Uppsala County (22), more than one malignant disease (12), no treatment offered (8) and incomplete case records (3). Of the 53 included patients 16 had a primary disseminated disease. The mean age at diagnosis was 59 years (ranged from 32 to 88 years) and mean age at death was 61 years.

The primary tumour was estrogen positive (ER-pos) in 60% of the patients and was HER-2 positive in 25%. Bone was in general the most common site of metastases (Table 2), although brain metastases were most common within the HER-2 positive subgroup. A total of 77% of the HER-2 positive tumours spread to the brain.

3.2. *Survival*

The survival time varied from 1.6 to 114 months. Mean and median survival times were 26.4 and 18.9 months. Median survival for stages I–IV at presentation was: 42.5, 18.5, 18.8 and 14.7 months, respectively. Survival was hence similar for stages II–IV, but considerably longer for tumours in stage I at presentation.

Table 2 – Characteristics of the study population (n = 53).

Age at diagnoses of distant metastases	
Mean	59
Median	59
Range	30–83
Age at time of death	
Mean	61
Median	62
Range	32–88
Tumour subtype %	
ER pos/HER-2 neg	49
HER-2 pos	25
ER neg/PR neg/HER-2 neg	26
Tumour stage at primary diagnoses %	
Stage I	21
Stage II	34
Stage III	15
Stage IV	30
Site of metastases %	
Bone	85
Liver	62
Lung	58
Brain	38
Abdomen	21
Soft tissue	38
Survival (months)	
Median	18.9
Mean	26.4
Min	1.6
Max	114

3.3. *Resource use and costs*

Analysis of medical interventions received showed that 32% had undergone some kind of surgery apart from central venous catheter operations. Most patients underwent chemotherapy and 68% received taxanes at least once. Most patients with skeletal metastases were treated with bisphosphonates (Table 3).

The total mean cost in the study population was €93,700 (95% Confidence Interval (CI): €78,500–€109,600), ranging from €9000 to €228,000. Distribution of costs, presented in Fig. 1, shows that drug costs and hospitalisations were the largest single cost sources, constituting 36% and 22% of total costs, respectively.

Table 3 – Distribution of interventions and palliative care within the study population.

Intervention/care	% of patients
Surgery (excluding central venous catheter)	32
Welfare officer consult	60
Chemotherapy	91
Trastuzumab	21
Taxane	68
Radiotherapy	72
Hormonal treatment	60
Bisphosphonate	79
	Mean number of days
Hospitalisations	36
Hospice care	17
Palliative home care	20

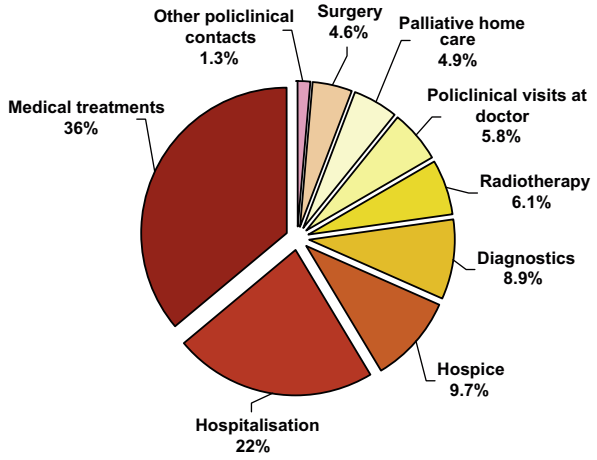

Fig. 1 – Distribution of costs.

The total costs differed among the three tumour subgroups where the HER-2 positive tumours were the most costly (Table 4). The costs were also analysed depending on the age at diagnosis of disseminated disease. Patients aged ⩽59 and ⩾60 had mean costs of €104,000 and €82,500, respectively. There was a trend towards a correlation between survival time and total cost, and mean costs per day are therefore also presented in Table 4. Patients with a disseminated disease at presentation had slightly higher mean cost, but the number of patients was too low to draw any conclusion about any such potential difference.

4. Discussion

This study presents the health care cost of disseminated breast cancer in Swedish patients. The mean cost was €93,700, which is considerably higher than the previously available estimates. We believe that there may be two main reasons for this difference. Firstly, the care for patients with breast cancer and the treatments used are changing and improving over time which means that the cost of the disease likely is increasing as new and costly treatments are becoming more commonly used.[7] Secondly, this study was based on a detailed analysis of actual patient data, which means that we may have been able to collect more detailed information on resource use than some of the previous studies. However, making a reliable and relevant estimate of the cost of disseminated breast cancer is in general a complicated task, where different methodological approaches are associated with various biases and uncertainties. For example, many of the previously available studies are often to some degree based on expert opinions. This type of expert information may give better information of current care and resource use than retrospective patient data, but is also associated with uncertainties as it is based on the opinions rather than actual data.

Our study and the approach chosen are also associated with limitations and uncertainties. Estimating reliable unit cost data is, for example, a complex issue and although we

Table 4 – Cost results in tumour subgroups.

	Total mean cost	Mean survival (months)	Mean cost per day
ER neg/PR neg/HER-2 neg (n = 14)	70,600 ($CI_{95\%}$ 46,700–102,100)	17.0	137
ER pos (n = 32)	94,600 ($CI_{95\%}$ 75,500–116,100)	32.0	97
HER-2 pos (n = 13)	123,300 ($CI_{95\%}$ 92,600–156,000)	19.4	208
All patients (n = 53)	93,700 ($CI_{95\%}$ 78,500–109,600)	26.4	116

have applied a detailed approach in making these estimates, they are still associated with some degree of uncertainty. We also excluded a few categories of patients, e.g. old patients in end stages of other concomitant diseases, where a disseminated breast cancer more or less accidentally was diagnosed. These patients do not likely receive extensive breast cancer treatments and are consequently inexpensive patients. Thus, excluding these patients may have resulted in a slight higher mean costs than those we would have obtained if they were included. However, the age and co-morbidities of these patients would not make them targets for interventions like screening or adjuvant treatments, and we excluded them since our aim with this study was to provide information useful for assessing the cost effectiveness of such interventions.

The analyses indicted that patients with HER-2 positive tumours have higher than average costs. This potential difference is likely due to more costly therapy, in particularly trastuzumab and lapatinib, and also more expensive radiotherapy. No correlation between age and costs could be found. Both these observations should, however, be interpreted with care since the study was not designed to demonstrate difference between sub-populations which means that the patient sample was too small to show any such statistically significant differences.

We limited our study to the health care cost of the disease. A previous Swedish study estimated that health care cost constituted only about 30% of the total societal cost of metastatic breast cancer.[2] However, making reliable estimates of the total societal cost of the disease is complicated. In particularly, information about informal care and indirect costs is difficult to be collected reliably since they are often based on the information provided by patients. Identifying patients and asking them for information may have problems with selection bias, since it may be difficult to identify and include patients with end-stage diseases.

Although the cost of diseases varies between countries and the transferability of such information between countries therefore may be questionable, the distribution of costs and resource use may have less inter-country variations. A previous analysis of the uptake of new cancer drugs, indicated that Sweden is slightly below the European average in regards to the speed of uptake of new cancer drugs.[7] The finding that the cost is considerably higher than the previous estimates in Sweden as well as in other countries is however interesting across countries since it indicates that all countries could benefit from making new estimations of the cost of disseminated breast cancer.

Our result that showed a health care cost of disseminated breast cancer two to six times higher than what was earlier estimated gives an indication that previous cost-effectiveness analyses of different strategies for preventing disseminated relapse in breast cancer have, in different degrees, shown too high costs. The exact impact of this is not clear as sensitivity analyses in previous economic evaluations of adjuvant therapies have not stretched to such high cost assumptions.[8,9] Although different adjuvant therapies reduce the risk of disseminated disease in various degrees, an absolute reduction in risk between 5% and 10% would correspond to a cost-offset between about €5000 and €10,000 per treated patient. Hence, decisions made based on these previous analyses could potentially lead to inoptimal use of treatments or prevention strategies aiming for cure of breast cancer.

5. Conclusions

In conclusion, this study has applied a detailed approach to provide an up-to-date estimate of the health care cost of treating disseminated breast cancer in Sweden. The mean cost calculated was considerably higher than the previous estimates, which may have important consequences for the economic evaluations of interventions aimed at reducing the risk of disseminated breast cancer. The analyses of the cost effectiveness of adjuvant treatments and preventive interventions and the current criteria for using them may therefore benefit from re-evaluations in light of the findings in this study.

6. Conflict of interest statement

None declared.

Acknowledgements

The study was funded by a grant from Novartis Sweden. The sponsor had no influence on the study design, execution or publication of the results, except the opportunity to comment on the manuscript before submission. Jonas Lundkvist started his appointment at Novartis after completion of the study.

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