

## Breast Cancer Stage Cost Analysis in a Managed Care Population

*Based on a presentation by Kenneth L. McDonough, MD, MS*

### **Presentation Summary**

A sample managed care plan provides the framework for examining data on breast cancer, employing a naturalistic setting as opposed to the randomized control trial model. Breast cancer costs are analyzed by disease stage, which is broken down further by treatment phase. This approach compares the costs of those

with treated disease to a control group, essentially performing a case mix adjustment for comorbidities. Such an approach encompasses the claims database characteristics, defines the breast cancer stages and treatment phases, and describes the criteria used for the control group, as well as the methodology utilized in the case mix adjustment.

Noting that the presentation by Dr. Mullins had dealt with economic data from a larger perspective, Kenneth L. McDonough, MD, MS, Vice President and Medical Director for the Disease Management Group at Zeneca Pharmaceuticals in Wilmington, Delaware, provided contrast using data from a sample managed care plan. The objective is to examine direct breast cancer costs by stage, with treatment phase subsets. Next, breast cancer costs are compared with those of a control group employing a case mix adjustment for comorbidities.

Dr. McDonough noted that because there were representatives of many different health plans present, their respective plans probably had different types of reimbursement structures, models, and networks, which would lead to varying results.

“The approach I’m going to take uses a medical services claims database, defines the breast cancer stages and treatment phases, describes the criteria for identifying a relevant control group, and explains the procedure used for the case mix adjustment,” he explained.

### **Importance of Defining Stages**

“Defining the stages is very important,” Dr. McDonough said, “especially when you are dealing with claims data. For example, in my model stage I breast cancer is diagnosed. Treatment involves a surgical lumpectomy but no mastectomy or chemotherapy, and there is no lymphatic spread or metastasis within 6 months of diagnosis.

“In model stage II,” he continued, “there is a diagnosis of breast cancer followed by a nonradical mastectomy

but no radical mastectomy or chemotherapy before surgery and no lymphatic spread beyond the axilla or metastasis within 6 months of diagnosis. Model stage III involves a diagnosis of breast cancer and a radical mastectomy but no metastasis within 6 months of diagnosis.

"Finally, model stage IV involves a diagnosis of breast cancer and metastasis that occurs within 6 months of diagnosis," he concluded.

### Three Phases of Treatment

Dr. McDonough explained that there are 3 treatment phases for breast cancer, noting that the initial treatment phase encompasses the 2 months before and the 6 months after the initial diagnosis or the first surgery, which is preceded by a 1-year clean period without any breast cancer codes.

The terminal treatment phase is the 6-month period before disenrollment or the filing of the last claim without a clean period. The phase between the initial and the terminal treatment phase is known as the continuing phase.

In performing his cost analysis, Dr. McDonough explained that for every breast cancer patient he randomly selected 4 members from among all the female members of the same age group who did not have a breast cancer diagnosis to form a control group.

To establish the case mix adjustment, Dr. McDonough profiled the top 10 disease states that were not sequelae of breast cancer for both the breast cancer and the control groups. He then compared these comorbidities and used the percentage difference to adjust the incremental cost of breast cancer beyond that of the control group.

Noting that earlier presentations had dealt with the breast cancer phases in a clinical setting and from a broader perspective, Dr. McDonough proposed to deal with them in a claims database framework for a case

study of 1 managed care plan. "I defined the initial phase as preceded by 1 year without any breast cancer codes," he explained. "It gave me some confidence that these patients were in the plan for a whole year without a breast cancer claim; therefore, they should not have had preexisting breast cancer. If a claim comes in after that, it should be a new diagnosis of breast cancer."

Dr. McDonough explained that if he had gone to a 2-year or 3-year clean period, he would not have had much data to report, so he chose a 1-year clean period without breast cancer as his operating definition. In examining the initial breast cancer diagnostic code, he looked at the period 2 months before the code for prediagnostic testing and the period 6 months afterward.

"I had problems with terminal cancer, because there is no marker for mortality in a claims database other than disenrollment, and death is not the only reason for disenrollment," Dr. McDonough said.

### High Initial and Terminal Costs

"My data show that initial and terminal costs are both high, with continuing costs in the middle," Dr. McDonough said. He believed there was some dilution in the determination of terminal claims based on multiple possible causes for disenrollments. "I tend to believe that the terminal phase in my data is too low, which might explain some of the differences between Dr. Mullins' findings and my own." Every patient (7000) in Dr. McDonough's analysis had breast cancer codes, while the control group was 4 age-matched controls to each breast cancer patient, employing a random algorithm to select the 4.

Dr. McDonough reported 1594 stage I patients in the initial, continuing, or terminal treatment phases. "They weren't all in each phase," he explained, "because in a 5-year database it is unlikely that one could iden-

tify patients who get diagnosed and die within a 5-year period.”

“Even some stage IV patients survive beyond 5 years with the treatments that are now available,” Dr. McDonough said “As a result, you can’t look at both the initial stage and the terminal phase in the same patients.” Therefore, he divided the patients into 2 groups and used 1 group to look at the initial phase and the other to look at the terminal phase.

“I took patients who had a 1-year clean period, for whom I was relatively confident that this was their initial diagnosis, used them for the initial period, and then took the preexisting cancer patients who did not have a 1-year clean period and used them for the terminal phase of the algorithm; the continuing phase comprised both groups.”

**Costs by Phase**

Stage I patients involved cost of about \$6645 for the initial phase, \$11,873 for the continuing phase, and \$4114 for the terminal phase, Dr. McDonough said. “Although this may seem like an inverse relationship to what was discussed this morning, once the costs are divided by months, it converts to \$831 for the initial phase per month, \$437 for the continuing phase per month, and \$686 for the terminal phase per month, which is consistent with what was shown earlier.

“The total cost for a stage I patient was about \$22,632,” he continued, “whereas for stage II, the figures went up to \$12,115 for the initial phase, \$17,804 for the continuing phase over a 22-month period, and \$7124 for the terminal phase.” On a percentage basis, Dr. McDonough noted that the costs were similar to stage I on a per-month basis, rising to \$1514, \$809, and \$1187 for a total of \$37,044 for stage II. For stage III, the costs were \$1459 per month for the

initial phase, \$848 per month for the continuing phase, and \$1683 per month for the terminal phase, for a total of \$41,817.

The last stage (Table), stage IV, was the most costly at \$57,730. Dr. McDonough said he believed he was not capturing all the costs, because of some costs that might not be included as a result of carveouts or capitation. “Basically, I looked for all the breast cancer costs I could find for these patients as well as related claims and compared them with the control group,” Dr. McDonough said. The result is an approximate \$21,728 difference between the 2 groups over a period of up to 4 years.

“When I say a 4-year period, remember there was a 1-year clean period on the initial diagnosis on a 5-year database,” he explained, noting that these were 3- to 4-year average treatment costs for all stages combined. He conceded that the cost could be less for some patients who came into the plan within the last few years, had a 1-year clean period, and then were only in the plan for 6 months or so before the data analysis ended. Data from these patients could dilute the figures.

Dr. McDonough said the top 10 diseases for the breast cancer group and the control group, presented on an average cost per patient basis, totaled \$970 per patient for comorbidities for the breast cancer group.

**Table 1.** Cost of Stage IV Breast Cancer

Number of Patients	Phase	Patients in Phase	Average Length (months)	Average Cost	Cost/Month
1055	Initial	402	8.0	\$17,278	\$2159
	Continuing	1047	20.7	26,014	1254
	Terminal	294	6.0	14,440	2407

He emphasized that these expenses were not for breast cancer but for comorbidities; this compares with \$876 for the control group, which is a difference of \$94 or an approximate 10% difference in cost.

#### **Comorbidity Costs Contained**

"These figures are reassuring," Dr. McDonough said, "because they show that breast cancer patients aren't generally experiencing higher costs on unrelated comorbidities, but there is slightly more expense for some comorbidities in patients with breast cancer, perhaps due to having a life-threatening illness."

"Claims staging is not the same as clinical staging," Dr. McDonough said. "For example, the size of the tumor affects the clinical stage, so large tumors that haven't spread to the axillary nodes at all can be stage IIs. It should be known that massive tumors can be stage III without lymphatic spread."

The difference between an incidence population and a prevalence population is that prevalence refers to how many patients have a disease at any point in time, whereas incidence refers to how many new cases are reported. "We wanted to do an incidence analysis to assess treatment costs in the initial phase," Dr. McDonough said, "but it's not as critical to do that in a terminal phase analysis so we looked at a prevalence population. That is why I divided the initial and terminal phases into clean and nonclean periods."

#### **Cancer Costs and ICD-9 Codes**

"We examined a managed care claims database with a 2.2 million total membership containing 1.15 million women (52%), whose median age was 35 years. Of the 1.15 million women, 18,000 (1.6%) had claims suggesting that they had breast cancer over the time period studied. Another 39,000 women (3.4%) with-

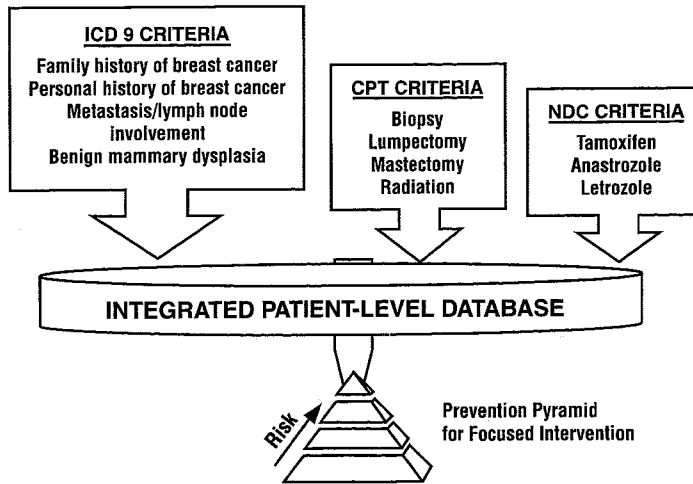
out any claims evidence of breast cancer had claims suggesting that they had high risk factors for developing breast cancer. Of the remaining women without any claims evidence of breast cancer, 210,000 (18.3%) had claims for other breast disorders that were not suggestive of any high risk factors for developing breast cancer and 883,000 (76.7%) had no claims for any breast disorders.

"In looking at the incidence of breast cancer based on the demographics of this plan, I predicted about 1250 new breast cancers would occur annually, which would be an incidence population," Dr. McDonough explained. In his prevalence algorithm there were 18,000 women in the plan who had breast cancer codes—not patients at risk but women with breast cancer diagnostic markers, such as ICD-9 codes, CPT codes, or NDC drug codes. According to Dr. McDonough, the average age of those breast cancer patients was approximately 60 years compared with an average age of 50 for patients with Gail model or other risk markers.

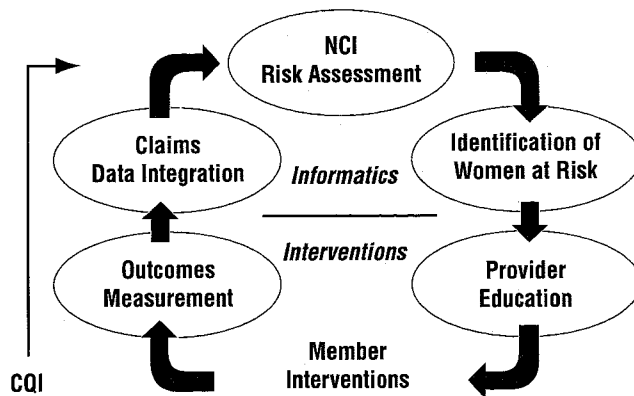
"To extend the algorithm and some of the assumptions to model the cost implications, I excluded all the women younger than age 35, because the Food and Drug Administration (FDA) does not indicate the use of tamoxifen for women without breast cancer in that age group, even if they have a 5-year risk above 1.67%," Dr. McDonough said. "So, 37,250 of the women at risk were over the age of 35, or 3.2% of the women in the plan. For breast cancer patients, I eliminated the ones who were estrogen receptor-negative, leaving the two thirds who were estrogen receptor-positive. This reduced the total of 18,000 to 11,785, or 1% of the women in the plan."

"When I added carcinomas in situ, the total became 49,085 women, including the 37,250 women, who I assumed would be found to be at high

**Figure 1.** Breast Cancer Risk Management Program: Identification Algorithm Summary



**Figure 2.** Breast Cancer Risk Management Program: Program Components



CQI = Component Quality Improvement; NCI = National Cancer Institute

risk if they completed the National Cancer Institute (NCI) risk assessment. If 50% of them completed the risk assessment, I focused on a 5-year risk assessment level that would be about 3% or more, a level that is higher than the FDA figure of 1.67% but is compatible with the average risk in the NCI study.

"In other words," Dr. McDonough continued, "many women who joined the study were at higher risk than 1.67%, so the average risk ended up being about 3%. The number of patients is now down to 8215 at high risk, that's of the original group of 37,250," Dr. McDonough said. "If you add the estrogen receptor-positive patients, it would mean that about 20,050 women in this 2.2-million member plan would be candidates for tamoxifen."

#### Five-Year Savings Estimate

"If we assume that about a quarter of these patients are put on tamoxifen, based on compliance and other factors, the annual cost of the drug for these 5650 women for an average of 5 years would be \$1.9 million," Dr. McDonough said. The 5-year savings of breast cancer, using the cost data mentioned earlier, would be about \$2.1 million per year averaged over a 5-year period. This would make the net savings about \$200,000 per year averaged

over a 5-year period, or about \$1 million in savings for 5 years.

Noting that such a figure represents the cost of the drug versus the savings from the reduced incidence of breast cancer, Dr. McDonough added that it did not take into account any other administrative procedures, such as educating physicians or encouraging patients to be more compliant.

"If you implemented a breast cancer risk-management program," Dr. McDonough said, "your budget would have to spend less than this \$1 million over a 5-year period to break even."

So basically, Dr. McDonough said, "you could take a claims data analysis; establish an algorithm; have patients complete risk assessments with their physicians; identify those who are at risk; educate providers about the appropriate use of tamoxifen therapy in women at high risk; emphasize the importance of compliance—that is, the drug doesn't work if you don't take it; measure outcomes for quality improvement purposes for preventive health; and incorporate whatever was learned into the cycle the next time around." (Figures 1 and 2)

"Admittedly, there are a lot of extensions of cost stage analysis," Dr. McDonough said, "but that is where the exercise took me, and I wanted to let you see what you could do with such an analysis if you wanted to."