

# Delayed Diagnosis in Breast Cancer Patients: a Case Study of National Health Insurance in Taiwan

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## Background

Breast cancer is the most prevalent cancer in women around the world, and it has been the leading incidence of cancer in Taiwanese females for 25 years [1]. From 2004, the Department of Health has provided free breast mammograms once every two years for women aged between 50 and 69 years old, but only 12 % of all eligible women take advantage of this screening service [2]. In comparison with other developed countries, Taiwanese women have lower awareness of the danger of breast cancer [2]; approximately 85 to 96 % of patients discovered the symptoms for breast cancer by themselves, not via breast screening [3-5].

A review of literature on delay in diagnosis finds that most studies are concerned with the delays caused by the referral system between general practices and hospitals. But contrarily, due to the implementation of the National Health Insurance system, the medical environment allows patients in Taiwan high accessibility to medical care, and people have the freedom to choose their preferred hospitals; thus delays caused by general practices or referral processes do not happen in Taiwan. The results of this study are anticipated to provide the government and medical organizations with references for developing policies to reduce the delay in the diagnosis of breast cancer, and to assist breast cancer patients in early detection and treatment.

## Objective

Aims of this study, to understand the current conditions of delayed diagnosis in cases of breast cancer in Taiwan, to predict the crucial factors influencing the delay in diagnosis of breast cancer.

## Methods

### Subjects

The research subjects were breast cancer patients of two medical centers in central Taiwan. Face-to-face interviews were conducted in clinics and breast-cancer patients' associations during July 26th 2007 and July 31st 2008 with structured questionnaires; 615 questionnaires were retrieved, 600 of which were effective.

### Data collection

The survey contents included basic personal information (age, educational level, marital status, occupation, and economic status), factors delaying the diagnosis (level of the hospital first visited, number of hospitals the patients visited before breast cancer diagnosis, items inspected on the first visit), and number of days of delayed diagnosis (defined as time elapsed between the first visit for breast cancer-related symptoms and the time of diagnosis) [5-10]. The number of days of delay in diagnosis was reported by the patients from memory.

The questionnaire was designed and developed cooperatively, and its validity was evaluated by seven medical experts specializing in breast cancer. This study plan was validated by the Institute Review of Board of China Medical University Hospital (DMR96-IRB-78).

### Statistical analysis

Collected data were analyzed using a t-test and ANOVA. Finally, multiple regression analysis was used to predict the factors influencing the delay in the diagnosis of breast cancer in patients.

## Results

Of the 600 breast cancer patients recruited in this study, their average age when the symptoms were discovered was 48 years old.

The first hospitals visited were medical centers for 54.7 % of the subjects, and were regional hospitals for 20.6 % of the subjects; most of the subjects (355 patients, 61 %) visited only one hospital before diagnosis were given, and 30.4% visited two hospitals; in the first clinical visit, 363 (63.9 %) subjects received a mammogram, 415 subjects received a breast ultrasound, and 21 subjects received a magnetic resonance imaging (MRI) scan. The average delay in diagnosis was approximately 28 days: 407 (90.4%) subjects had a delay in diagnosis of less than 30 days, and 43 (9.6 %) subjects experienced a delay of more than one month (Table 1).

Table 2 indicates the correlation between diagnosis delay factors and the delay in diagnosis, the correlation between the hospital level of the patient's first visit and the delay in diagnosis was significant ( $p = 0.011$ ): the average delay in diagnosis for patients who visited clinics was the longest (76 days), and was the shortest for patients who visited medical centers (19 days). The correlation between the number of hospitals visited before diagnosis and the delay in diagnosis was significant ( $p < 0.001$ ): the more hospitals that were visited before correct diagnosis was given, the longer the delay in diagnosis; patients who visited three hospitals before correct diagnosis had an average delay in diagnosis as long as 142 days, and patients who visited four or more hospitals had an even longer delay in diagnosis on average (187 days). Patients who underwent an MRI as the only examination in their first hospital visit were significantly correlated with a delay in diagnosis ( $p < 0.001$ ); patients who received only an MRI experienced an average diagnosis delay of 8 days; patients who received a mammogram and a breast ultrasound did not show a significant correlation with delay in diagnosis ( $p > 0.05$ ), and their average delay in diagnosis was 22 days and 28 days, respectively (Table 2).

Results of multiple regression analysis show that the variations on delay in diagnosis between patients who visited three and four or more hospitals were significant ( $p < 0.001$ ). In comparison to patients who visited only one hospital (the reference group), the delay in diagnosis of patients who visited three hospitals was approximately 148 days longer, and the delay in diagnosis of patients who visited four or more hospitals was approximately 214 days. Patients whose first hospital visited was a clinic had a longer delay in diagnosis as compared to patients whose first hospital visited was a medical center (reference group) of approximately 18 days (Table 4).

## Conclusion

The length of delay in diagnosis for breast cancer is shorter in comparison to European countries and to the United States; the results also show effectiveness in some of the preventive health care of National Health Insurance. This study also finds that the higher the level of the hospital first visited, the shorter the delay in diagnosis; and the more hospitals visited before a breast cancer diagnosis, the longer the delay in diagnosis. Therefore, this study suggests that when a clinic or small hospital discovers that a patient is suspicious of having the symptoms of breast cancer, the hospital should take the initiative of transferring the patient to a larger hospital for further examination. This would prevent the repetitive use of medical services and subsequently shorten the delay in diagnosis.

**Table 1. Descriptive analysis of patients' diagnostic factors (N=600)**

Variables	n	%
Level of medical service at first visit		
Medical center	321	54.7
Regional hospital	121	20.6
District hospital	95	16.2
Local clinic	44	7.5
Others	6	1.0
Number of hospitals visited before diagnosis		
1	355	61.0
2	177	30.4
3	44	7.6
≥4	6	1.0
Mammography on the first visit		
No	205	36.1
Yes	363	63.9
Breast ultrasound on the first visit		
No	153	26.9
Yes	415	73.1
MRI on the first visit		
No	547	96.3
Yes	21	3.7
Length of delay in diagnosis (days)		
≤30	407	90.4
31-90	16	3.6
91-180	8	1.8
≤181	19	4.2
Mean of delay in diagnosis = 27.8±88.0 days		

**Table 2. Correlation between patient characteristics, various factors and delay in diagnosis**

Variables	Delay in diagnosis (days)				
	n	Mean	SD	F-value	P-value
Age at first detected symptom (y)					
≤44	151	38	103	1.25	0.292
45-49	99	26	93		
50-54	74	31	103		
≥55	114	17	47		
Education level					
Elementary or lower	117	20	66	0.59	0.557
Secondary school	194	31	98		
College or higher	135	29	90		
Marital status					
Single	40	31	117	1.66	0.175
Married	338	27	76		
Divorced/Separated	21	67	202		
Widowed	50	17	59		
Average family monthly income (TWD <sup>a</sup> )					
≤25,000	50	23	57	0.31	0.816
25,001-45,000	87	32	98		
45,001-85,000	136	29	93		
>85,000	65	39	111		
Level of medical service at first visit					
Medical center	245	19	58	3.32	0.011
Regional hospital	93	28	89		
District hospital	75	35	105		
Local clinic	33	76	178		
Others	4	9	8		
Number of hospitals visited before diagnosis					
1	288	14	45	27.57	<0.001
2	126	27	68		
3	30	142	237		
≥4	4	187	206		
Mammography on the first visit					
No	143	41	127	1.63	0.106
Yes	296	22	62		
Breast ultrasound on the first visit					
No	106	29	94	0.09	0.932
Yes	333	28	88		
MRI on the first visit					
No	425	29	90	4.51	<0.001
Yes	14	8	5		

**Table 3. Important predictors in delayed diagnosis with adjusted model**

Variables	β	Std err	95% CI		P-value
			Lower	Upper	
Age at first detected symptom (y)					
≤44 (ref)					
45-49	-19.63	13.08	-45.37	6.11	0.134
50-54	0.14	14.27	-27.95	28.23	0.992
≥55	-12.33	14.70	-41.26	16.60	0.402
Education level					
Elementary or lower (ref)					
Secondary school	4.84	14.60	-23.90	33.58	0.740
College or higher	-3.54	15.99	-35.01	27.94	0.825
Marital status					
Single (ref)					
Married	-9.40	17.24	-43.32	24.52	0.586
Divorced/Separated	37.70	28.14	-17.69	93.08	0.181
Widowed	-15.55	25.65	-66.04	34.93	0.545
Average family monthly income (TWD <sup>a</sup> )					
≤25,000 (ref)					
25,001-45,000	9.16	16.49	-23.29	41.61	0.579
45,001-85,000	13.14	15.74	-17.84	44.12	0.404
>85,000	16.95	18.59	-19.62	53.53	0.362
Level of medical service at first visit					
Medical center (ref)					
Regional hospital	-1.33	12.50	-25.93	23.27	0.915
District hospital	6.13	14.45	-22.31	34.57	0.672
Local clinic	18.19	19.81	-20.79	57.17	0.359
Others	1.38	44.47	-86.13	88.89	0.975
Number of hospitals visited before diagnosis					
1 (ref)					
2	1.41	11.23	-20.69	23.52	0.900
3	148.24	19.79	109.29	187.19	<0.001
≥4	214.16	51.08	113.64	314.68	<0.001
Mammography on the first visit					
No (ref)					
Yes	-6.08	12.04	-29.79	17.62	0.614
Breast ultrasound on the first visit					
No (ref)					
Yes	9.11	12.77	-16.02	34.23	0.476
MRI on the first visit					
No (ref)					
Yes	-5.94	31.54	-68.00	56.13	0.851
Note: n=320; Adj R <sup>2</sup> =0.206; F-value=4.929; p<0.0001					

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