

Cost Effectiveness Analysis of Breast Cancer Patients at Early, Locally Advanced, and Advanced Stage in Saiful Anwar Hospital Malang.

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ABSTRACT

Breast cancer is the most common cause of cancer-related death in women. Breast cancer requires medical treatments at varying costs based on the stage and treatment given. Expensive medical treatment, however, does not necessarily affect the patients' quality of life. Therefore, it is necessary to calculate the cost-effectiveness of the treatment based on the value of quality of life (QALY) of breast cancer patients who have undergone treatment. To determine the total cost incurred for the breast cancer patients at early-stage, locally advanced stage, and advanced stage and to analyze the cost-effectiveness of treatment at each stage based on the quality of life (QALY). Observational analysis of breast cancer patients who underwent examination and treatment at the Surgical Oncology Clinic of Saiful Anwar Regional Public Hospital, Malang. Respondents were divided into 3 study groups based on the stage when the patient first underwent the examination. From each respondent, the total costs incurred by the hospital for the patient were calculated, and each respondent filled out the EQ-5D questionnaire to determine the U-QALY value (converted using the EQ-5D Thailand conversion table). The effectiveness evaluation was done by calculating the Incremental Cost Effectiveness Ratio (ICER) and based on the Threshold (the value of Indonesia's per capita income). Of the total 87 respondents in this study, 10% were early-stage patients, 65% locally advanced stage, and 25% advanced stage. The average U-QALY scores for each group were 0.92, 0.85, and 0.6 consecutively. Cost-effectiveness in the early stage group was categorized to be positive because it did not show an increase in QALY. In the locally advanced stage group, the ICER value in the mastectomy and chemotherapy group was Rp. 24,000,000.00 / 0.3 QALY gained and Rp. 39,000,000.00 / 0.5 QALY gained in the mastectomy, chemotherapy, and radiotherapy groups. In the advanced stage group, the ICER value was Rp. 15,000,000.00 / 0.5 QALY gained in the radiotherapy group. The quality of life of breast cancer patients (measured in QALY value) was strongly influenced by the stage of the disease. The higher the stage, the lower the QALY value. The Cost-Effectiveness in the early stage, locally advanced stage, and advanced stage at Saiful Anwar Hospital was

relatively positive because its value was lower than the threshold value.



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1. INTRODUCTION

The prevalence of breast cancer in women is around 2.1 million incidents per year, which is the highest cause of cancer-related death in women, claiming around 627.000 lives according to 2018 WHO report [1]. In Indonesia, it is the second most common cancer with a prevalence of 12/100.000, and about 80% of them are identified at advanced stage [2], [3].

Treatments of breast cancer aim to eradicate and improve the quality of life or as a palliative, depending on which it is identified. Treatment is determined by cancer stage – BCT, with or without adjuvant therapy, in early-stage breast cancer, neoajuvan chemotherapy / radiotherapy and radical mastectomy with adjuvant chemotherapy at locally-advanced breast cancer, as well as palliative therapy in patients with advanced breast cancer [4].

Several countries, including UK, Netherlands, Germany, Australia, Canada, the USA, and New Zealand, have implemented an economic evaluation system to assess the cost-effectiveness of an intervention by adding costs per quality-adjusted life years (QALYs) obtained. QALYs are the calculation of a patient's health status from the estimated years of patient's life after an intervention each year by putting objective values of 0 and 1 (0 if the patient died within that year and 1 if the patient was healthy). One QALY equals to one year of health. From this calculation, a value is obtained that indicates whether the intervention provides benefits according to the costs incurred.⁶ The system used by these countries aims to determine the cost-effectiveness of the intervention [5], [9], [10].

Breast cancer treatment requires a large amount of money and a fairly long treatment period. Medical treatment at a high cost does not necessarily affect the patient's quality of life [11], [12]. In this era, the total cost for medical treatments for patients in Indonesia are covered by the Indonesia Social Security Administrator for Health, known as BPJS. However, the BPJS is currently limiting the treatment budget given to hospitals. If the reimbursement value exceeds the given budget, the patient's medical expenses will be charged to the hospital.

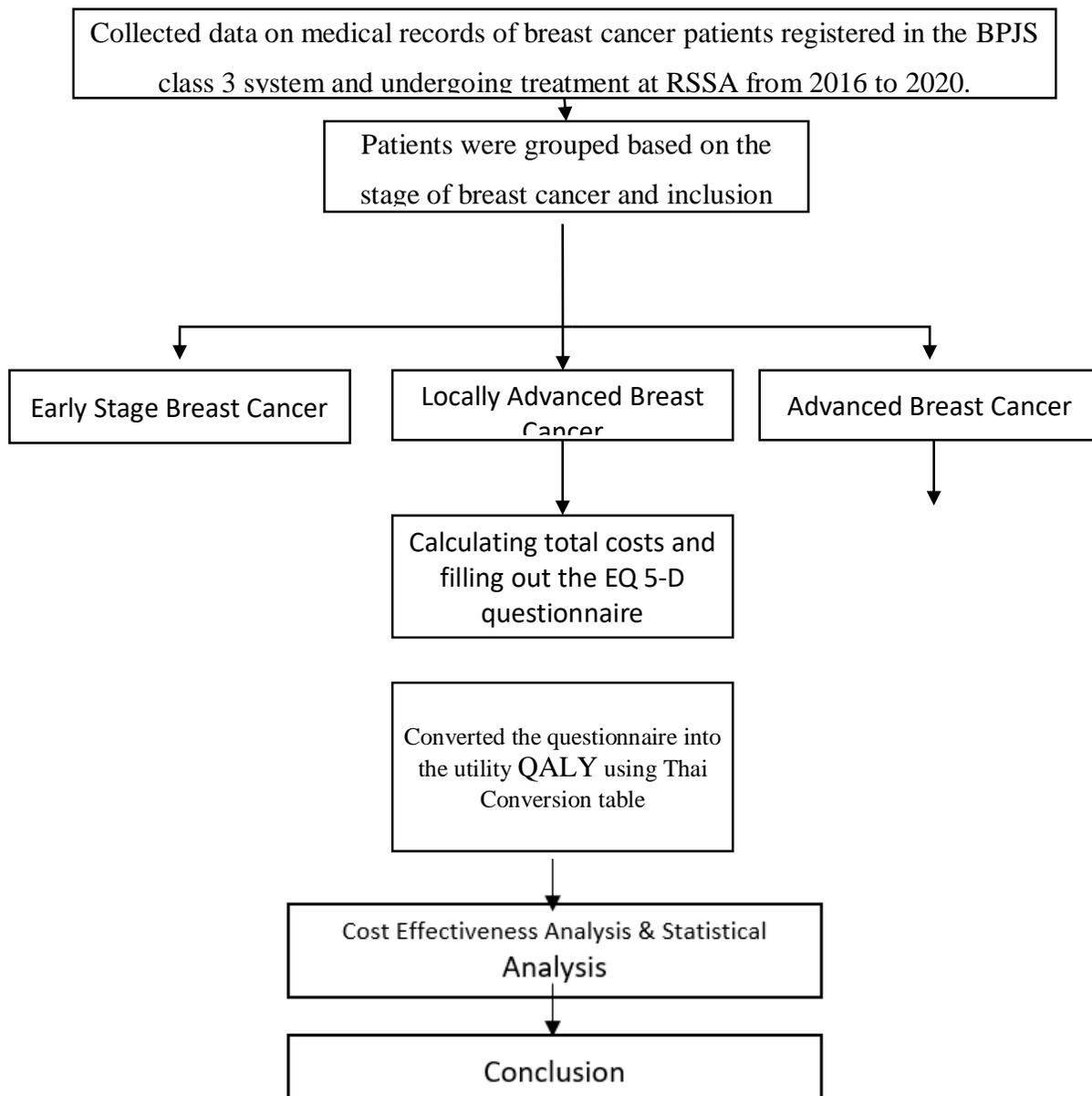
Given the issue, the calculation of the total cost of the management costs for each stage of breast cancer can be taken into consideration for hospital policy. QALYs assessment as an objective assessment of the patients' quality of life needs to be applied to determine the quality of life in breast cancer patients who have received therapy.

2. Research Method

The study design was non-experimental. Data were collected retrospectively on secondary data from medical records and administrative data. The data from the respondents were collected through a cross-sectional manner using the EQ-5D questionnaire. The results from the questionnaire were then converted into utility QALY values using the Thai country conversion table.

The study was conducted at the oncology surgery clinic, medical records and administration sections in Saiful Anwar Malang Hospital from August 2020 to October 2020. The population of the study includes all breast cancer patients with BPJS insurance class 3 having undergone a minimum of 1 year of operative and non-operative management at the hospital. The study samples are the study population that fit the inclusion criteria of consecutive sampling. The research samples were grouped into 3 study groups, namely the early-stage breast cancer, locally advanced breast cancer, and advanced breast cancer groups. The study inclusion criteria included female patients with a primary diagnosis of breast cancer who completed therapy at Dr. Saiful Anwar Malang hospital using the Class III BPJS Health Insurance between 2016 and 2020.

Univariate analysis was used to describe the patients' demographic data and presented descriptively in a table. Pearson correlation analysis was performed on the total medical cost and stage of cancer as well as the patients' quality of life score and cancer stage. The cost-effectiveness analysis was done by placing the Incremental Cost-Effectiveness Ratio (ICER) on the cost-effectiveness diagram, with the Indonesia's per capita income in 2020 being the threshold value. For analysis, this study employed STATA software version 14 and the results of which are presented descriptively and analytically



3. Results**Table 1.** Characteristics of respondents

Characteristics	Group	N	%	P Value
Age at diagnosis	<45	19	21	0.127
	45-55	48	55	
	>55	20	24	
Educational Level	No education	10	11	0.709
	Elementary school	36	42	
	Junior high school	16	18	
	High school	20	23	
	College or higher	5	6	
Employment Category	Housewife	59	68	0.503
	Farmer	9	11	
	Manual Workers	16	18	
	Employees	3	3	
Menarche	<13Yo	54	61	0.597
	≥13Yo	33	39	
Age of Menopause	Not yet	28	32	0.566
	<45Yo	13	15	
	45-55Yo	43	49	
	>55Yo	3	4	
Family History	Positive	10	11.5	0.898
	Negative	77	88.5	
Contraception	No Contraception	27	31	0.374
	Hormonal Pills	23	26	
	Hormonal Injection	28	35	
	IUD	7	8	
Early symptoms	Breast Lump	87	100	0.339
	Pain	0	0	
	Nipple Discharges	0	0	
	Bleeding	0	0	
	Ulcer	0	0	
Symptoms when seeking treatment	Enlarging lump	68	78	0.920
	Pain	11	14	
	Nipple Discharges	3	3	

	Bleeding	3	3	
	Ulcer	2	2	
Alternative medicine	Yes	17	20	0.038
	No	70	80	

Table 1 shows that most of the respondents (68.97%) were in the 45 - 69 years age group. Regarding education and work, 41% of the total respondents only passed primary school education, and 67% worked as housewives. Moreover, about 61% of the respondents had menarche by 13 years old. Most of the respondents experienced menopause in the normal vulnerable age, that is, between 45 years and 55 years. Only a small proportion (11%) of respondents have a family history of breast cancer. Responding to the question about contraceptives, 61% of respondents suggested that they use hormonal contraceptives, either with birth control pills or injections.

All patients studied complained of a lump in the breast as an initial complaint. Lumps that are getting bigger are the main reason respondents seek treatment, where 78% of respondents complained about mass growth in the breast, and 14% of them needed pain relief. Furthermore, 17% of respondents followed alternative therapies before starting medical treatment, which ultimately led to delays in early diagnosis.

Table 2. Characteristics of Respondents based on Histopathology, TNM staging.

Characteristic		N	%
Histopathology	Type		
	Non-invasive Carcinoma	2	2
	Invasive Carcinoma of No Special type	59	68
	Invasive Lobular Carcinoma	22	25
	Special Type Carcinoma	4	5
IHK	Luminal A	39	46
	Luminal B	20	24
	Triple (-)	9	8
	HER2+	19	22
Tumor Size (T)	T1	1	2
	T2	22	25
	T3	24	27
	T4	40	46
Tumor Stage	Metastase		
	Lung	9	40
	Liver	3	14
	Bone	6	28
Stage	Contralateral	4	18
	Early-stage	9	10
	Locally advanced	57	65
	Advanced	21	25

* Tumor Stage Data is taken based on the clinical assessment when the patient undergoes the first examination.

Based on the histopathological assessment, Invasive Carcinoma of No Special type, better known as Invasive

Ductal Carcinoma, has the highest prevalence, which is 68% of the total respondents. From the immunohistochemical results, it is clear that the luminal type was the largest, accounting for 46% of the total respondents. Moreover, 46% of respondents came when the tumor had manifested on the skin or attached to the chest wall. Only 10% of respondents underwent screening at an early stage, and only 40% of the patients at an advanced stage have metastases to the lung.

Table 3. Comparison of the Total Costs and U-QALY Value (Utilities- Quality Adjusted Life Year) with the Respondents at Each Stage.

Stage	N	%	Cost Average	U-QALY Average
Early	9	10	45.166.666	0.92
Locally advanced	57	65	39.868.421	0.85
advanced	21	25	36.000.000	0.60
Total	87	100	40.345.029	0.80

From Table 3, based on ANOVA analysis, it was found that there was a significant difference in the costs between stages ($P = 0.037$, CI: 95%) and also a significant difference in U-QALY values between stages ($P = 0.000$, CI: 95%). Using Pearson's correlation analysis, this study discovered that a significant relationship was found between the mean cost and the stage of cancer with a correlation coefficient of $r = 0.325$ ($P = 0.002$; CI: 95%).

The assessment of the patients' quality of life in economic evaluation was measured in QALY (Quality Adjusted Life Year), which resulted in a total Cost/QALY gained. In other words, it revealed the cost required to add one year of healthy life based on calculations using the utility approach. Moreover, in order to determine the QALY value, the QALY utility value was firstly needed, which in this study was determined using the EQ-5D questionnaire method. The EQ5-DL questionnaire assessed mobility, self-care, daily activities, pain, and anxiety. The sequence of utility values was then converted into the value set EQ-5DL. This study used the Thai value set because Indonesia does not have its own value set [6].

The early-stage group did not experience disturbances in mobility, daily activities, and self-care. However, just over 10% of the respondents complained of mild pain, and 33% respondents had mild anxiety about their illness. The mean uQALY score of the group was 0.9.

Similarly, in the locally advanced stage group, 94% of respondents did not experience disturbances in mobility, daily activities, and self-care. Only 6% of the respondents were found to experience mild or moderate disturbances. This study found that, of all the complaints, 22% of the respondents reported pain, and 47% of respondents were worried about the disease. The mean uQALY score of the group was 0.8. the conversion for the QALY value in this study was multiplied by one year of life.

In the advanced stage group, most of the respondents experienced disruption in each component of the assessment. 43% of respondents in this group experienced disturbances in mobility, undergoing daily activities, and self-care. In this group, however, the most significant disturbance are pain and anxiety as 67%

of the patients complained of pain at the time, and 76% of patients had anxiety. Therefore, the average uQALY score in this group was 0.6.

Table 4. Comparison of the QALY value of each stage based on the Intervention.

Medical Intervention	QALY	QALY gained	Average costs (Rupiahs)	Difference in Intervention Costs (Rupiahs)
Mastectomy	1		16.500.000	
Mastectomy + chemotherapy	1	0	40.500.000	24.000.000
Mastectomy + Chemotherapy + radiotherapy	1	0	55.500.000	39.000.000
Mastectomy	0.5		16.500.000	
Mastectomy + chemotherapy	0.8	0.3	40.500.000	24.000.000
Mastectomy + Chemotherapy + radiotherapy	1	0.5	55.500.000	39.000.000
Chemotherapy	0,5		28.500.000	
Chemotherapy + radiotherapy	1	0.5	43.500.000	15.000.000

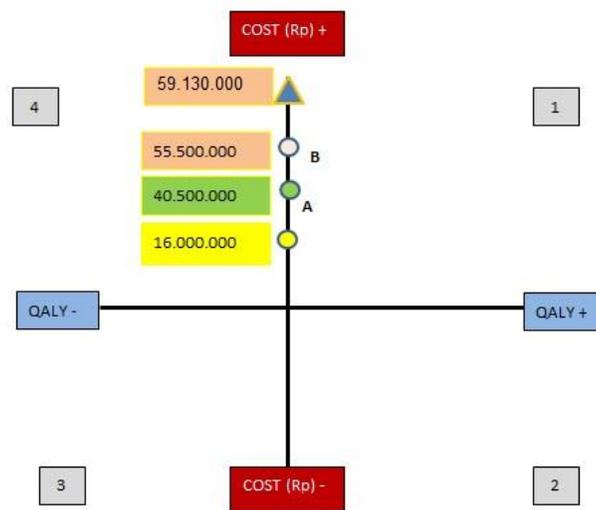
Table 4 shows that the QALY value of each group was obtained based on medical interventions undertaken, including mastectomy, chemotherapy, and radiotherapy. The average cost of each intervention is in line with the number of actions, meaning that more actions resulted in greater cost.

In the early stage study group, there was no difference in QALY scores in both the operative and non-operative groups. In the locally advanced stage group, the highest QALY value (QALY = 1) was identified in the group of respondents having undergone surgery, chemotherapy, and radiotherapy. On the other hand, in the advanced stage group, the highest QALY score was in the group that underwent chemotherapy and radiotherapy. Looking at the group that only underwent chemotherapy intervention, the QALY value had a difference of 0.5.

3.1 Cost-Effectiveness Analysis for Each Group

Cost-effectiveness analysis compares the interventions given to each stage that yield different outcomes. In this case, an analysis of the cost and effect was measured. In this study, the outcome of the CEA uses ICER (Incremental Cost-effectiveness ratio), where ICER is calculated by dividing the difference in total costs (incremental cost) by the difference in the chosen measure of health outcome or effect. The results of the ICER were then compared with the Threshold value to assess whether it has value for money [6].

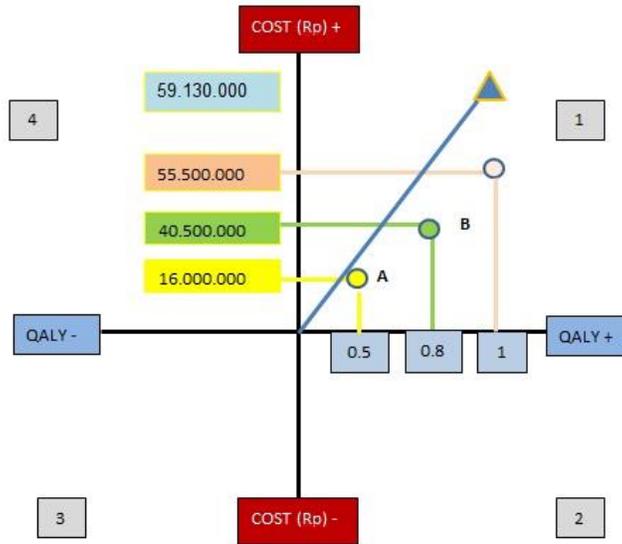
In determining the threshold value, each country has a threshold figure that is used to decide whether the proposed intervention (ICER value) is cost-effective based on the figure. For example, the National Institute for Health and Care Excellence (NICE) in the UK set a Threshold of 20,000-30,000 pounds or the equivalent of Rp. 380,000,000.00 - IDR 570,000,000.00 (with 1 pound equivalent to IDR 19,000). In Thailand, the figure used is 1.2 x GDP per capita, or around 120,000 Thai Baht, equivalent to IDR 55,200,000.00 (with 1 Baht equivalent to IDR 460.00). Indonesia does not have a threshold value; hence, based on the advice from WHO, the threshold figure used in this study was per capita income in Indonesia. To be more detailed, the criteria for very cost-effective are 1xGDP per capita, while the cost-effective is 3xGDP per capita. Indonesia's per capita income in 2020 (data on 1 July 2020) is 4,050 USD, equivalent to IDR 59,130,000.00 (1USD is equivalent to IDR 14,600.00 in July 2020). Therefore, the present study used a value of Rp. 59,130,000.00 as the threshold to determine cost effectiveness [6].



Graph 1. Early-Stage Group Cost Effectiveness Curve

-  : Threshold value
-  : Mastectomy group
-  : Mastectomy + Chemotherapy group
-  : Mastectomy + Chemotherapy + Radiotherapy group
- A : Cost effectiveness of Chemotherapy
- B : Cost effectiveness of Chemotherapy and Radiotherapy

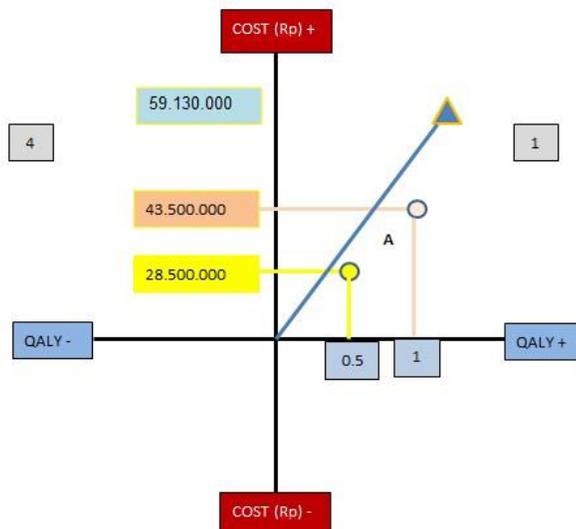
The primary analysis in this study focused on seeing the costs and outcomes of two interventions that will lead to a decision. Graph 1, as shown above, consists of 4 quadrants. From the early-stage group, it is clear that there was no difference in QALY in the group that underwent operative with that having undergone surgery and chemotherapy, as well as that who underwent surgery, chemotherapy, and radiotherapy. All groups of respondents have 1 QALY in 1 year of life, so the additional costs in the early stage group will not affect the patients' quality of life within one year.



Graph 2. Locally Advanced Stage Group Cost Effectiveness Curve

-  : Threshold value
-  : Mastectomy group
-  : Mastectomy + Chemotherapy group
-  : Mastectomy + Chemotherapy + Radiotherapy group
- A : Cost effectiveness of Chemotherapy
- B : Cost effectiveness of Chemotherapy and Radiotherapy

In Graph 2, the ICER values of the locally advanced stage group shown in regions A and B were below the threshold value. Based on the effectiveness quadrant, the actions in this group are in quadrant 1, which shows the costs incurred are in line with the QALY gained.



Graph 3. Advanced Stage Group Cost Effectiveness Curve

-  : Threshold value
-  : Chemotherapy group
-  : Chemotherapy and Radiotherapy group
- A : Cost effectiveness of Radhiotherapy

The Advanced Stage group received the least number of intervention. There are two actions against the advanced stage group: single chemotherapy, or the combination between chemotherapy and radiotherapy. In the advanced stage group, an additional Rp. 15,000,000 is needed to have an increase of 0.5QALY. The ICER in this group was Rp. 15,000,000.00 / 0.5 QALY gained, and the value of additional intervention was still below the threshold value.

4. DISCUSSION

This study collected data from 87 respondents who underwent an examination at the oncology surgical clinic of Saiful Anwar Hospital from August 2020 to October 2020. Information on the respondents' characteristics are summarized in Table 1. Breast cancer stages (early stage, locally advanced, and advanced) are the main categories in this research.

In this study, the total costs incurred at each stage were grouped into six comparison groups:

1. the group of respondents who underwent biopsy, MRM, and chemotherapy with an average total cost of the procedure: Rp. 40,500,000.00
2. The group of respondents who underwent biopsy, MRM, chemotherapy, and radiotherapy with an average total cost of the procedure: Rp. 55,500,000.00
3. The group of respondents who underwent biopsy, MRM and, radiotherapy with an average total cost of the procedure: Rp. 31,500,000.00
4. The group of respondents who underwent biopsy and chemotherapy with an average total cost of the procedure: Rp. 28,500,000.00
5. The group of respondents who underwent biopsy and MRM with an average total cost of the procedure: Rp. 16,500,000.00
6. The group of respondents who underwent biopsy, chemotherapy, and radiotherapy with an average total cost of the procedure: Rp. 43,500,000.00

For every biopsy, the hospital incurred various costs, not only from surgery. The total cost incurred for the biopsy was Rp. 4,500,000.00 (four million five hundred thousand rupiahs) where the cost of the procedure was Rp. 2,700,000.00. (two million seven hundred thousand rupiahs) Other financing components include accommodation for treatment rooms, nutritional intake, drugs/medical devices, funds for tool sterilization, operating sets, anatomical pathology, costs for medical equipment and injection, and fluid. The MRM (modified Radical Mastectomy) surgical procedure was included in the procedure with a total cost of Rp. 12,000,000.00 (twelve million rupiahs).

Radiotherapy procedures costed an average of Rp. 600,000.00 (six hundred thousand rupiahs), and the majority of the patients underwent 25 radiotherapy sessions. On the other hand, chemotherapy procedures costed an average total cost of Rp. 4,000,000.00, where the cost of the drug regimen amounted to Rp. 1,800,000.00 (one million eight hundred thousand rupiahs). This study, however, did not seek total costs based on regimen and dose. Each respondent was assigned to a stage group (early stage, locally advanced, and advanced stage group). The average cost incurred at each stage was the average cost in the first one year of a patient undergoing a series of treatments at the hospital.

In the early stage group, the average cost incurred by the hospital in the first one year of therapy reached IDR 46,166. 666.00 (forty-six million one hundred sixty-six thousand six hundred and sixty-six rupiahs). Chemotherapy costed about Rp. 24,000,000.00 for 6 times of treatment, which took the largest share of the overall sum. This figure, however, varies considerably depending on the type of chemotherapy and the dosage consumed by each patient. The largest average cost incurred by the hospital for respondents in the early stage was Rp. 55,500,000.00 (fifty five million rupiahs), which was allocated for biopsy, MRM (Modified Radical Mastectomy) surgery, chemotherapy, and radiotherapy.

In the locally advanced stage group, the average total cost incurred was slightly lower: Rp. 39,868,421.00 (thirty-nine million eight hundred sixty-eight thousand four hundred and twenty-one rupiahs). Yet, similar to that of the early-stage group, the largest cost incurred within one year was Rp. 55,000,000.00 (fifty five million rupiahs) for the group undergoing MRM surgery, radiotherapy, and chemotherapy, rupiahs. The advanced stage group was the group with the smallest average expenditure, as it spent an average cost of Rp. 36,000,000.00 (Thirty six million rupiahs) for one year. The reason for this is that respondents in this group only underwent chemotherapy and radiotherapy procedures.

The results of this study indicate that the total costs incurred are inversely related to the patient's stage at diagnosis. The results were also inversely proportional to [7] meta-analysis study, in London, England which stated that the higher a person's cancer stage, the higher the total cost for necessary therapies. The study concluded that the average expenses spent for stage II, III, and IV breast cancer were 32%, 95%, and 109% higher than those incurred for stage I because the stage III and IV groups require more prescription of drugs compared to stage I.

The assessment of the patients' quality of life in economic evaluation was measured in QALY (Quality Adjusted Life Year), which resulted in a total Cost/QALY gained. In other words, it revealed the cost required to add one year of healthy life based on calculations using the utility approach. Moreover, in order to determine the QALY value, the QALY utility value was firstly needed, which in this study was determined using the EQ-5D questionnaire method. The EQ5-DL questionnaire assessed mobility, self-care, daily activities, pain, and anxiety. The sequence of utility values was then converted into the value set EQ-5DL. This study used the Thai value set because Indonesia does not have its own value set. The early-stage group did not experience disturbances in mobility, daily activities, and self-care. However, just over 10% of the respondents complained of mild pain, and 33% respondents had mild anxiety about their illness. The mean uQALY score of the group was 0.9.

Similarly, in the locally advanced stage group, 94% of respondents did not experience disturbances in mobility, daily activities, and self-care. Only 6% of the respondents were found to experience mild or moderate disturbances. This study found that, of all the complaints, 22% of the respondents reported pain, and 47% of respondents were worried about the disease. The mean uQALY score of the group was 0.8. the conversion for the QALY value in this study was multiplied by one year of life. In the advanced stage group, most of the respondents experienced disruption in each component of the assessment. About 43% of respondents in this group experienced disturbances in mobility, daily activities, and self-care. In this group, however, the most significant disturbance are pain and anxiety as 67% of the patients complained of pain at the time, and 76% of patients had anxiety. Therefore, the average uQALY score in this group was 0.6.

Of all the stages, the locally advanced stage accounted for the largest percentage of cases (65%). The average total cost incurred by the hospital for each breast cancer patient in the first one year was Rp. 40,345,029.00, while the largest average cost incurred to patients at the early stage reached Rp. 45,166,666.00. From the

Utility QALY, the advanced stage group had the lowest mean U-QALY (0.61) compared to other groups. The present study found that the uQALY value would be inversely proportional to the stage of breast cancer, where the higher the stage of cancer, the lower the person's quality of life in one year of life. This is similar to findings by in that the QALY values of breast cancer patients with stage I, II, III and IV were 0.9; 0.87; 0.84 and 0.23 [8].

In the early stage group, an analysis of the increase in QALY was carried out on three groups having undergone three groups of interventions: those receiving operative intervention, those receiving surgery and chemotherapy, as well as those receiving surgery, chemotherapy and radiotherapy. The average QALY value in these groups did not show an increase as each group had a 1QALY value, thus no QALY Gained value. This situation can be described in a Cost-effectiveness plane. As shown by curve 1, there was an increase in the cost incurred by the early-stage group up to Rp. 24,000,000.00 (twenty four million rupiahs) for the addition of chemotherapy without adding to the QALY value.

Moreover, an additional Rp. 39,000,000.00 (thirty nine million rupiahs) was needed for surgery with chemotherapy and radiotherapy without increasing the QALY value. This could happen because QALY measurements were only carried out in the first one year, meaning that there was no change in this group. With the addition of non-surgical treatment in the early stage group, the patients did not get additional quality of life. This can be investigated further by adding samples to the early-stage group having undergone therapy for more than two years.

Regarding the locally advanced stage group, the components of the assessment were the same as those in the early-stage group in terms of the types of intervention given. In this group, the ICER value was Rp. 24,000,000.00 (twenty four million rupiahs) / 0.3QALY by adding chemotherapy to the operative procedure and Rp. 39,000,000.00 / 0.5QALY for additional chemotherapy and Radiotherapy. This value was based on the cost-effectiveness curve in quadrant 1, the Trade-off quadrant, which means that the exchange rate was balanced between the costs incurred by the hospital and the results achieved. With the addition of chemotherapy, this group was assumed to gain an additional quality life for three months. In addition to chemotherapy and radiotherapy, the group also received an additional five months of quality life. In the advanced stage group, the patients undergoing chemotherapy alone were evaluated for additional radiotherapy measures. The value was Rp. 15,000,000.00 / 0.5QALY, meaning that with the addition of radiotherapy, the patients with advanced breast cancer received an additional quality life for five months. In the early stage group, the ICER value for each group was below the threshold value, meaning that there was no addition of QALY while the amount of money spent mounted. This finding could be investigated further by adding more samples who had undergone therapy for more than one year. In an assessment based on the effectiveness curve, the addition of intervention in the early stage group cannot be considered to be a good value for money because increased costs was not followed by an improvement in the quality of life.

In the locally advanced stage group, with the addition of chemotherapy, the ICER value was Rp. 24,000,000.00 / 0.3QALY, which showed that the hospital added twenty-four million rupiahs for chemotherapy, so each patient would have three to four months of additional quality life. By adding Rp. 39,000,000.00 for chemotherapy and radiotherapy, the ICER value was Rp.39,000,000.00 / 0.5QALY, which indicates that both treatments provided six months of additional quality of life. All ICER values were in quadrant 1 and below the threshold value, proving that these two measures was economically valuable and cost-effective for the hospital.

In the advanced stage group, patients only underwent chemotherapy and radiotherapy procedures. In the

group that underwent single chemotherapy, the QALY value was 0.5, meaning that the therapy contributed an additional 6 months of quality life to each patient. If the hospital provided additional radiotherapy, the ICER value was Rp. 15,000,000.00 / 0.5QALY, which suggests that to add six months of quality life to this group, the hospital requires an additional fund of Rp. 15,000,000.00 for each patient. In this group, the chemotherapy and radiotherapy actions were also in quadrant 1 and below the threshold, which suggests that these intervention are good value for money and cost-effective for the hospital.

5. Conclusions

According to this research result, it could be concluded that:

1 Cost-Effectiveness in the early-stage, locally advanced stage, and advanced stage at Saiful Anwar Hospital was found to be positive because it was lower than the threshold value. Higher stage of breast cancer was followed by a decrease in the patients' QALY value. Cost-effectiveness in the early-stage group cannot be said to be good because no identifiable increase in QALY with additional costs was realized for treatments. Cost-effectiveness in the locally advanced stage group and the advanced stage group, however, was relatively positive since the additional cost was followed by the addition of the QALY value, and the value of the treatment was still below the set threshold value. Therefore, chemotherapy and radiotherapy are recommended for patients with locally advanced and advanced stage breast cancer compared to administering one therapy alone. There was a significant positive relationship between costs incurred and the patients' quality of life.

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