Overall Equipment Effectivenes (OEE) to Determine the Effectiveness of Dental Chair Unit in Mother and Child Hospital at Surabaya

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Abstract

Investing in a Dental Chair Unit is an investment that requires a large amount of funds for the hospital, therefore the utilization of a Dental Chair Unit tool is a concern for hospitals. The importance of Dental Chair Unit utilization leads hospital to calculate the effectiveness of Dental Chair Unit devices using the Overall Effectiveness Equipment (OEE) method. OEE measures the effectiveness of the tool based on the availability ratio, performance ratio and quality ratio. The aimed of this study was to analyze the effectiveness of Dental Chair Unit in Mother and Child Hospital using the OEE method. This research was conducted at the dental clinic of Mother and Child Hospital on February 2019. This study was a descriptive study that was to calculate the OEE from a Dental Chair Unit then analyze the causes of the effectiveness of the tools obtained. The results of the calculation of OEE Dental Chair Unit device in aMother and Child Hospital at Surabaya are 18,7%, far below the standard of 85%. The cause of the low OEE value is the low value of the Performance ratio that is far below the standard 85%. The low performance ratio of Dental Chair Unit tools in mother and child hospital is caused by the small number of patients who come to the dental clinic, so a little also uses the Dental Chair Unit. It is because of the competition with general hospital that surround this hospital. Another factor that cause of low OEE ratio is patient's didn't know the importance of dental health for mother and children.

Keywords: *OEE, Dental Chair Unit, Effectiveness of Tools, Hospital.*

Introduction

The hospital business now faces very high demands. With increasing competition, hospitals are forced to increase effectiveness and cost efficiency to survive in competition. While the high value of buying medical devices need an increase in tool effectiveness so as not to experience losses in investing. Overall Equipment Effectiveness or abbreviated as OEE is a way to measure the performance of a production machine. Measuring Performance with OEE (Overall Equipment Effectiveness) consists of three main components in the tool, namely Availability (Engine Availability Time), Performance (Number of units produced) and Quality (Quality produced). The OEE calculation results are in the form of Percentage (%)[1].OEE value measurement is the efforts to improve manufacturing processes on production lines[2]. The initial stages of measuring OEE are carried out in several stages, including; availability measurement, performance measurement and quality measurement[3]. This OEE stage can be explained as follows:

Measuring Availability Ratio: Avaibility ratio is a ratio that describes the use of time available for the operation of machinery or equipment. Comparison of operating time with loading time, where the operating time is obtained from a reduction in loading time with the time of equipment downtime. Operating time is the

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length of time the equipment is operating. Loading time is the time available for production (per period)[4]. The formula used for measuring the Availbility ratio is:

$$A = \frac{operating\ time}{loading\ time} \times 100\%$$

$$A = \frac{loading\ time - downtime}{loading\ time} \times 100\%$$

Measuring Performance Ratio: Engine performance is a ratio that describes the ability of the engine and equipment to produce the product. This ratio is the result of the net operating rate and operating speed rate. The net operating rate is the product that is produced during the operating time. operating speed rate is the ideal cycle time per actual cycle time[5]. formula used for measuring this ratio are as follows:

Performance Efficiency = Net Operating Rate x Operating Speed Rate

$$P = \frac{process\ amount\ x\ actual\ cycle\ time}{operation\ time} \ x \ \frac{ideal\ cycle\ time}{actual\ cycle\ time} \text{ x } 100\%$$

$$P = \frac{process\ amount\ x\ ideal\ cycle\ time}{operation\ time} \text{ x } 100\%$$

Measuring Quality Ratio: Product quality is a ratio that describes the ability of equipment to produce products that comply with quality standards. The formula used for measuring this ratio is as follows:

$$Q = \frac{process\ product - deffect\ product}{process\ product} \text{ x } 100\%$$

Measuring Overall Equipment Effectiveness (OEE): Overall Equipment Effectiveness (OEE) is obtained by multiplying the main ratio, this is done to determine the effectiveness of machine use[6]. The OEE value can be known by the formula.

OEE (%) = Availability Ratio (%) x Performance Ratio (%) x Quality Ratio (%)

OEE analysis obtained from the calculation of availability, production effectiveness and level of quality compared to the ideal index standard, are:

1. Availability ≥ 90%
2. Performance Effectiveness ≥ 95%
3. Quality Level ≥ 99%
4. Overall effectiveness of equipment and machinery (OEE) ≥ 85%

   (OEE Ideal: (0.90 x 0.95 x 0.99) x 100% = 85%)

Method

The study was conducted on Mother and Child Hospital at Surabaya using a descriptive method approach. Descriptive method aims to describe something — usually a characteristic or a function. The data used in this study are primary and secondary data. Primary data in this study was obtained through discussion and observation of the production process in Mother and Child Hospital at Surabaya during January 2019. Secondary data is data obtained from the radiology unit. Secondary data used to obtain an overview of the process of each stage of the process. This secondary data is needed in addition to analyzing the model.

Result

Measurement

Availability Ratio (A)

Total running time: 10 hours x 6 days x 4 weeks = 240 Hours

Downtime of equipment: 20 Hours

Availability (A) = (240-20)/240 x 100%= 91,7%

Performance Ratio (P) calculation:

Ideal cycle time per patient: 0.5 hours.

Number of patients treated : 98

Operation Time : 240 hours

Performance Rate (PE) = 0.5 x 98/240 x 100% = 20,4%

Quality Ratio (Q)

Number of good patient treated at Dental Chair unit = 98

Number of patient treated at Dental Chair Unit = 98

Quality ratio = 98/98 x 100% = 100%

OEE = A X PE X Q = 91,7% x 20,4% x 100% = 18,7%

The result of dental chair unit OEE is 18,7%.

Discussion

Based on the results of calculations that have been made, the average OEE value for January 2019 is 18.7%. This value is still far from the value of the ideal standard of OEE, which is 85%[7]. In the OEE category, the OEE value below 65% is not acceptable, because it causes significant economic losses and very low competitiveness of the company[8]. The value that greatly affects the low OEE is the value of the efficiency of

the performance ratio, because the value does not meet the standards of Japan Institute of Plant Maintenance (JIPM).

Judging from the performance efficiency, the OEE value does not meet the standard because the usage target is not achieved. The low use of Dental Chair Unit tools in mother and child hospital is caused by the small number of patients who come to the dental clinic, so a little also uses the Dental Chair Unit. The low number of patient visits is caused by the position of the maternal and child hospital which is adjacent to a public hospital that has been existing longer. This makes the market share of competition come to the dental clinic. Another reason is that this hospital has not joined BPJS (Universal coverage governance insurance at Indonesia), thus limiting the segment of patients who come to the hospital.

Another reason for the low rate of performance ratio is the patient's low knowledge about the importance of maintaining dental health for mothers and children. There are still many patients who come to the dentist only when they have a toothache. And there are still many parents who consider children's dental health not important because the child's milk teeth will be replaced by permanent teeth. Not only patient knowledge, knowledge of Obsgyn doctors and pediatricians is also still low about the importance of maintaining dental health in pregnant women and children. So the number of referrals from obstetric clinics and children's clinics is still very low.

Conclusions and Recommendations

The results of OEE's calculation of the Dental Chair Unit in a Mother and Child Surabaya are still low at 18.7% far below the standard of 85%. The cause of the low number of OEE tools for Dental Chair Units is a performance ratio of only 20.4%. The cause of the low performance ratio of the Dental Chair Unit is the low number of patients who come to the dental clinic so that the use of a dental chair unit is low. The advice given to this problem is to increase marketing to potential patients. Providing education to Surabaya residents about the importance of maintaining dental health for mothers and children, to increase the number of patient visits to the dental clinic. Education was also given by other specialist doctors to increase the internal referral rate to the dental clinic. Strengthen collaboration with clinics around hospitals to provide patient referrals to hospitals.

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