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COST ANALYSIS OF CATARACT SURGERY IN TWO EXTRACTION EXTRACAPSULAR CATARACT AND PHACOEMULSIFICATION

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ABSTRACT

A retrospective observational study to compare the cost of cataract surgery between extracapsular cataract extraction (ECCE) and Phacoemulsification (PEA) was conducted at Hospital Raja Perempuan Zainab II, Kota Bharu on May 2013. A total of 30 patients were included in this study. The cost of cataract surgery incurred by hospital up to two months after operation was included. The costs of training, loss of patient's income after discharge and intangible cost were excluded. Results showed that cataract surgery using (PEA) are most costly than using (ECCE) the cost include the calculation of salary of staff, pre & post opt as well as all the equipments involve in both surgery methods.

INTRODUCTION

Cataract is one of the important cause of blindness in Malaysia and worldwide. According to the World Health Organization (WHO), 50 million persons in the world are blind due to cataracts (WHO)[1]. Cataract usually affects people with age of over 65 years. The prevalence of blindness in the world is 0.7% with 0.3% in developed countries and up to 1.4% in less developed countries such as Africa (Dorland's medical dictionary, 2004. [1]. Based on Malaysian National Eye Survey (2007), cataract was found to be the commonest cause of blindness which was 39% [2]. According to World Health Organization (WHO), cataract can be defined as the presence of lens opacity that giving a grey or white appearance to the pupil during eye examination with an oblique light in a darkened area [3].

Based on Dorland's medical dictionary 27th edition (2004), cataract can be defined as opacity of the lens or lens capsule of the eye. Cataract must be treated early because it will eventually lead to blindness if left untreated. There are two types of cataract of surgery that can be performed in order to treat cataract which are phacoemulsification and extracapsular cataract extraction (ECCE) [4]. Phacoemulsification is relatively new method in treating cataract. Phacoemulsification is the extracapsular surgery in which the lens is softened with sound waves and removed through a needle. The posterior capsule remains in the eye. The older method to treat cataract is extracapsular cataract extraction (ECCE). Extracapsular surgery is the surgery in which the lens is removed and the back half of the capsule behind the lens (the posterior capsule) remains in the eyes. Different methods of surgery have their own advantages and disadvantages. Compared to ECCE, PEA requires only a smaller corneal incision and can be performed without needles. Besides that, the time for doing surgery is relatively short which only take a few minutes. Other than that, there is less inflammation occurring after operation. Furthermore, PEA also give a faster visual recovery, lower incidence of postoperative astigmatism, early stabilization of refraction and sustained intraocular pressure control during operation [1]. Compared to PEA, ECCE have more disadvantages and limitations. There are including prolonged surgery time, prone to get inflammation after operation, suture distortion of cornea, prolonged convalescence and restriction to activities. In Malaysia, there are several cataract surgery practice done including phacoemulsification which is about 65.7% and followed by extracapsular cataract extraction which is about 30.1% and intraocular lens implantation which is 98.2% [1]. the large number of cataract surgery performed in Malaysia, there is little knowledge or research regarding the cost or variation in costs between ECCE and PEA [2]. Therefore, we performed this study to analyze and compare the cost of cataract surgery by ECCE and PEA in Ophthalmology Department, Hospital Raja Perempuan Zainab II Kota Bharu. The objectives of this study includes assisting decision making process, carrying out the cost analysis for ECCE and PEA and performing cost effectiveness analysis and comparing between two types of operation.

MATERIALS AND METHODS

This study was a retrospective observational study done on May 2013 at the Ophthalmology Department, Hospital Raja Perempuan Zainab II Kota Bharu. A total of 30 patients were enrolled retrospectively from 11/05/2012 to 25/05/2013 in this study. The total of 20 patients underwent phacoemulsification while the rest of 10 patients underwent extracapsular cataract extraction. The cost perspective for this study was taken from that of Ministry of Health. The inclusion criteria were patients aged 40 years old or older and absence of preexisting ocular co morbidity such as glaucoma, maculopathy0, and difficult papillary dilatation. Besides that, the patients who involved in this study were limited to 2 months' post- operative period. The exclusion criteria were including costs borne by patients (e.g. spectacles), direct non treatment costs (e.g. transport to clinic), indirect costs (e.g. loss of work time), and intangible costs (e.g. pain and anxiety)[3]. Besides that, long term costs and outcomes beyond 2 months were not excluded in this study [5].

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The doctor in charge of this study will used some study tools such as medical record to review the patient' and progression note, interview with the ophthalmologists and nurses and also by using secondary data analysis. The costs of the preoperative and postoperative clinic visits, their admission to the ward, surgical procedures and medicines were calculated and documented. The sampling method is by simple random sampling to the patients who fulfilled the above criteria) [3].

ASSESSMENT OF COSTS

A cost incurred by the hospital (provider) was imputed in the study. The cost incurred by patients such as household costs was excluded in the study. Provider costs were further classified into capital and recurrent costs. These costs were based on the financial year 2013. Besides that, there was also micro costing (every input consumed by the patient during surgery and then its unit cost will be calculated) included in this study. Capital costs for provider included building, furniture and equipment costs. All capital costs were discounted at the rate of 5% per year. The useful life of building was assumed to be 20 years while the useful life of furniture was five years. Life span of equipment was based on article by Asimakis et al) [1]. The total capital costs then further divided by the total number of patients using the facilities to obtain the unit cost. Recurrent cost that included in this study were patient care medications and consumable costs (including pharmaceuticals, hospitalization and surgical consumables such as scalpel, gauze and others) and also staff and overhead costs. The staff and overhead costs which included were administration and supportive services such as laundry, cleaning services, building and equipment maintenance, utilities and telephone. Indirect cost due to loss of income for a working patient after discharge was not included in this study. This because the indirect cost is difficult to assess because patients may continue to work despite medical certification of being unfit for duty especially those who are self-employed. Assessment of intangible cost such as pain, anxiety and ability to interact with and support others were not included in this cost analysis study [1].

DATA ANALYSIS

The data for this study should include the socio demographic data (gender, age, ethnicity) and also costing (provider cost, micro costing, capital cost and recurrent cost). Then, the data collected were analyzed by using Microsoft Excel 2007 in order to calculate the cost of two surgical methods which were phacoemulsification and extracapsular cataract extraction.

FINDINGS

A total of 30 patients were enrolled for analysis. Out of this 10 underwent ECCE and 20underwent phacoemulsification. The mean age in both groups was similar, which was 67.59 years for ECCE and 63.17 years for phacoemulsification. There were more males than females in both groups. [Table 1]. shows the baseline characteristics of patients in the ECCE and phacoemulsification groups. Table 2 shows the comparison of treatment outcomes of ECCE and phacoemulsification. There was no difference in the mean length of stay in the hospital in the two groups; 2.4 days in ECCE group and 2.5 days in the phacoemulsification group. Characteristics of patientSocio-demographic characteristics such as gender, age and ethnicity were shown in the [Table 1]. [3].

Table 1: Patients characteristics

		Number of patients (n)	
		PEA (n)	ECCE (n)
Gender	Male	12	7
	Female	8	3
Age	0-30 years old	0	0
	31-60 years old	4	2
	61 -90 years old	16	8
Ethnic	Malay	19	7
	Chinese	1	2
	Others	0	1

Table 2: Length of stay table

	PEA (days)	ECCE (days)
Average length of stay (ALOS)	2	1

Table 3: Cataract Surgery Cost

	ECCE (RM)		PEA (RM)	
	Cost	%	Cost	%
Capital Cost				
Building	373	23.8	373	18.3
Equipment	284	18.1	442	21.7

Subtotal capital	657	41.9	815	39.9
Recurrent Cost				
A) Staff Cost				
Pre-opt	15	0.9	15	0.7
Opt- day	3	0.2	3	0.1
Intra-opt	201	12.8	168	8.2
Subtotal staff	219	14	186	9.1
B) Non-staff cost				
Items For Pre Op. Assessment	17	1.1	17	0.8
Items for Cataract Operation	383	24.4	731	35.8
Consumables Day Activity	34	2.2	34	1.7
Consumables During Intra Opt	182	11.6	182	8.9
Medication Sub total	76 4.8 692 44.1		76 1040	3.7 51
TOTAL	1568 100		2041	100

The comparison of costs per cataract surgery is shown in [Table 3]. The cost of phacoemulsification, which was RM2041, was slightly more than that for ECCE, which was RM1568 The higher cost of phacoemulsification was attributed to higher equipment and consumable costs. The capital costs for both, ECCE at 657 and phacoemulsification at RM815 respectively. However, as expected the consumable cost for phacoemulsification (RM 1040) 51% was markedly more than that for ECCE 44.1% (RM692). The increased consumable cost contributes to 51 % of the total extra expenditure incurred by phacoemulsification. Based on the table above, there were more male patient compared to women in both ECCE and PEA groups. The mean age for both groups was 67.59 years for ECCE and 63.17 years for PEA [3]. In this study it was found that the average operation time for PEA is 21.8 minutes compared to 43.2 minutes for ECCE. The PEA technique is also less invasive where a smaller incision is required compared to ECCE. Through this small incision, the lens nucleus is phacoemulsified using a low flow/high vacuum machine. In ECCE, the lens nucleus was expressed using bimanual technique [1].

DISCUSSION

The results of this evaluation should be interpreted cautiously. The main weakness was the small sample size for the costing estimate. Though the cost per operation was calculated based on only30 patients (20 patients for PEA and 10 patients for ECCE), it was done through micro- costing where cost for every item or consumable used for the patient was quantified and was not based on budget assumption. Increasing the number of cataract surgeries performed may reduce the overhead cost, though restraints of paramedical staff and shortage of operating time may pose a problem. Besides, more MOH hospitals should perform day care cataract surgery so as to increase the volume of cataract surgery [3]. From the calculations of comparing these two techniques, PEA is costlier. The cost is lightly higher at capital cost because PEA is using more equipment such as Phacomachine and Phaco hand piece. Recurrent cost was calculated based on staff and non-staff cost. The recurrent cost of PEA is higher because the higher expenditure for the cataract operation equipment. The staff cost also different because the during intra operation surgery the time consume by PEA is shorter than ECCE techniques. The result of this study is different from a study by Loo et al in 2004 where the Conventional extra capsular cataract surgery with intraocular lens implant costs RM3442 (USD905.79) and phacoemulsification with intraocular lens implant costs RM4288 (USD 1128.42) [1]. This might be because cost of intraocular lens implant is not included in this study. This result however is comparable to the study done by Rizal et al in 2003 which showed average cost for one ECCE is RM1,664.46 (RM1,233.04 – RM2,377.64) and for PEA is RM1,978.00 (RM1,557.87 – RM RM3,334.50). The result of this study also concurs with study done by Asimakis et al. in 1996 where they found that the hospital costs for ECCE without any complication was ADD 1,000.85 and for PEA was ADD 1,231.00 (ADD 1.00 = RM 2.00). Another study which was conducted in Sweden has shown that the average cost for a cataract surgery performed at the eye clinic was 5,052 SEK (I SEK = RM0.37). The majority of their cases (90%) were performed using the PEA technique. There is a large variation in the cost of cataract surgery in different parts of the world. India shows the lowest cost per cataract in comparison to the USA where the cost per cataract surgery is nearly 20 times that of cataract surgery in the government sector in India. This huge difference in cost comes as no surprise and in fact reflects the economic stability and status of the country concerned. This study has shown that we are almost comparable to that of Australia for PEA cost, whose currency value is almost twice that of Malaysian Ringgit. There was no significant difference between the cost effectiveness of ECCE and

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phacoemulsification [3]. The results should be interpreted taking into account the limitations of the study. The main limitation is the time-frame where cases were followed-up for just two months after operation. PEA will not require any further visits after two months. Patients who had ECCE had to undergo two more visits to remove the sutures. They are also required to be followed-up till six months for refractive error correction. So it is possible then that if the study was extended to about six months, the cost of ECCE might increase and may be higher than the PEA technique. Another limitation is some costs that were not included in this study, for example, the cost of training the ophthalmologist in handling the PEA machine and the cost of patient's productivity loss, after being discharged from the ward. These costs were considered direct cost for the hospital as well as for the patient in the total cost of cataract surgery [1].Furthermore, the samples size in the two groups was imbalanced in its baseline distribution, having more subjects in the ECCE group and there was no randomization of surgical technique in the study subjects [3].

CONCLUSION

In conclusion, ECCE technique is less costly compared to PEA. Cost of equipment are the main reasons for the high unit cost of PEA compared to ECCE. However, in long term, it is likely that PEA cost will be less compared to ECCE [1]. The effectiveness of cataract surgery is also one of the aspects that should be considered in order to determine which technique is more cost effective. The study has also indicated that there is much room for improvement in the cataract surgery services provided by the MOH, with the aim to provide large volume, low cost and yet high quality cataract surgery. Such economic evaluation is a useful tool in the planning and operation of health care programmers, particularly in the public sector.

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