

Time Driven Activity Based Costing in Outpatient Logistics

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Abstract

Healthcare Industry is one of the most important sectors nowadays, which providing goods and services to patients with curative, preventive, rehabilitative, and palliative care. There are patients flow, medicine flow, material flow and information flow in this supply chain. Patients service level and cost expense increasing are important issues to take into consideration. Outpatient department is the main department requires more attention in term of patient logistics activity and process management. Based on this, the study focuses on patient logistics activity and cost analysis of each activity in a clinic in the outpatient department of the case study hospital. The crucial purpose is to analyze activity, determine resource use, estimate time processing in each activity, and calculate the unit cost of each patient activity in an outpatient clinic. Time Driven Activity Based Costing is used as a solution tool. The results might serve the clinic administrator for cost controlling system and process management and obtain a guideline for choosing the appropriated costing system for the hospital.

Keywords

Time Driven Activity based costing, Outpatient clinic, Outpatient logistics activities, Costing system.

1. Introduction

Healthcare cost has increased dramatically due to the aging population and more sophisticated treatment. Forty-two percent of total spending in the hospital is logistics cost (Henning, 1980). Healthcare cost in the United States reaches \$4.8 trillion by 2021 according to the Centers for Medicare and Medicaid service. Furthermore, logistics cost leads to significant increasing healthcare cost. Meanwhile, all patients expect to get high-quality care with lower cost (Abel-smith & Mossialos 1994, Salman & Figueras 1997). In addition, poor collaboration and information sharing, lack of knowledge exchanging of healthcare supply chain, standard data limitation, insufficient of IT integration between hospital and its supplier lead to increase cost in healthcare supply chain, poor good quality, the dissatisfaction of client inpatient logistics.

Therefore, more researcher and healthcare organization focus on this issue. Recently, the healthcare industry has started to invest in more appropriated cost system management. The study of Stapleton et al. (2004), shown that Activities based costing (ABC) is considered as a tool to determine the real cost of marketing and logistics

activities and how ABC provides managers with considerable insights into how various products, territories, and customers play major roles in logistics and marketing activities and, consequently, drive total costs.

Nevertheless, ABC systems are not free of criticisms and limitations according to Kaplan & Anderson (2004). To overcome the limitation of ABC, Time-Driven Activities Based Costing (TDABC) was created to address the difficulties by an implementation of ABC models and use duration drivers instead of transaction drivers which can be easily revised when conditions change (Everaert & Bruggeman 2007, Hedman et al. 2013, Hoozée & Bruggeman 2010). TDABC framework is developed to study the cost in Outpatient Clinics Logistics. Therefore, Time Driven Activity Based Costing (TDABC) was created to solve the costing system problem. This research develops a framework of TDABC to calculate the cost of Outpatient Logistics flow in a hospital.

2. Literature Review

The Healthcare supply chain management is typically a very complex and fragmented process which involves obtaining resources, managing supplies, and delivering goods and services to providers and patients. To complete the process, physical goods and information about medical products and services usually go through a number of independent stakeholders, including manufacturers, insurance companies, hospitals, providers, group purchasing organizations, and several regulatory agencies. The hospital plays one of important role in the healthcare supply chain. There are two main departments in the hospital, the Inpatient Department and Outpatient department. The most common Outpatient clinics are general medicine, surgery, orthopedics, pediatrics, obstetrics-gynecology, psychiatry, dentistry, ophthalmology, allergy center, endocrinology & nutrition center, emergency center, and ENT (ear, nose, and throat) (Hing et al. 2010). Therefore, there is more challenge in the healthcare supply chain because of its complex supply chain. In addition, advanced technology, automation, and computerization are the main characteristics of the current business environment. The highly advanced nature of manufacturing and service organizations tend to change the structure of businesses from labor intensive to capital intensive. The capital-intensive workforce has increased the fixed costs, marketing, and administrative costs. These changing costs have decreased the reliability of direct labor hour which is an allocation base for many firms. Therefore, traditional cost systems cause distortions in the allocation of overhead costs and a new cost allocation system is needed to provide better cost information. As a result, Activity Based Costing became a new approach to business life. Hospital is more interested in the ABC costing system. Suneel (1996), express that ABC provides a structured approach to activities analysis, costing services, reducing cost, improving quality, it supports the skill of employers from the different functional area of the hospital, helps generate ideas and innovative solution to the problem at hand. The main logic of the ABC system is that activities consume resources and products consume activities.

According to this, the establishing and designing of ABC system requires the following steps such as identify the major activities performed by the organization, identify cost drivers which most closely influence the cost of an activity and have a direct indication of how the activity demands cost, create a cost pool for each activity and assign costs to cost pools and calculate a cost driver rate. Finally, assign costs to products using the demand for each activity as shown in figure 1.

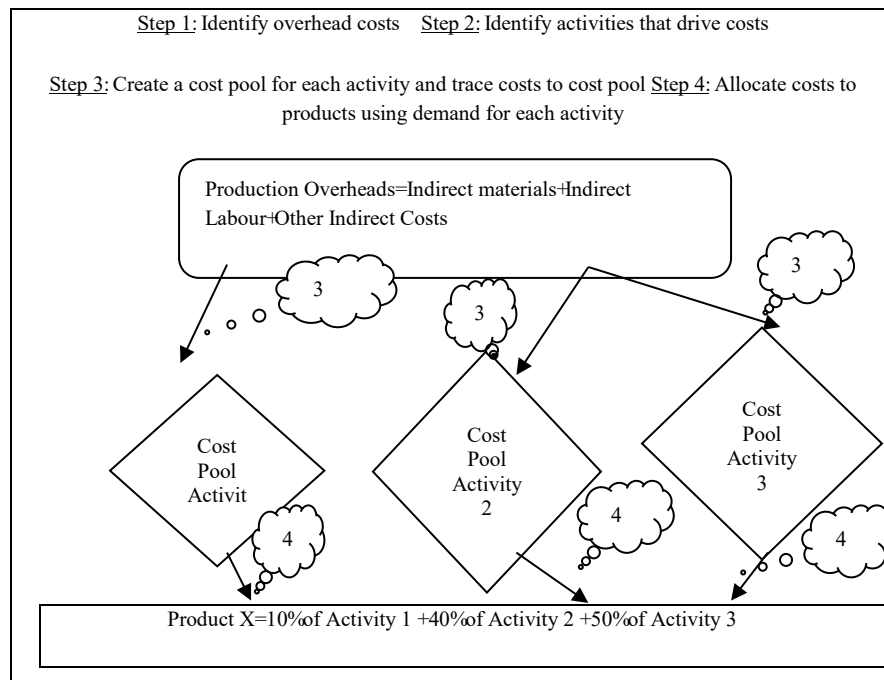


Figure 1. establishing and designing of ABC system (Weetman 2006)

Even though ABC has more advantage, ABC still face the limitation according to Kaplan & Anderson 2004, in order to build a traditional ABC model, you need to survey employee to estimate the percentage of time they spend (or expect to spend) on the different activities and then assign the expense resource according to average percentage you get from survey. While this approach works well in a limited setting; difficulties arise when you try to roll this approach out on a large scale for use on an ongoing basis. However, this approach was recently revised and Time-Driven Activity-Based Costing, which is a more valuable tool to assist managers in cost allocation decisions. TDABC can be developed quickly as estimated of only two parameters required which are the unit cost of supplying capacity and the time required to perform each activity. The illustrated step of TDABC is shown the Panel B in table 1.

Table 1. Activity-based costing versus time-driven activity-based costing

Panel A: ABC	
Step 1	Identify the different overhead activities
Step 2	Assign the overhead costs to the different activities using a resource driver
Step 3	Identify the activity driver for each activity
Step 4	Determine the activity driver rate by dividing the total activity costs by the practical volume of the activity driver
Step 5	Multiply the activity driver rate by the activity driver consumption to trace costs to orders, products or customers
Panel B: TDABC	
Step 1	Identify the various resource groups (departments)
Step 2	Estimate the total cost of each resource group
Step 3	Estimate the practical capacity of each resource group (e.g. available working hours, excluding vacation, meeting and training hours)
Step 4	Calculate the unit cost of each resource group by dividing the total cost of the resource group by the practical capacity
Step 5	Determine the time estimation for each event, based upon the time equation for the activity and the characteristics of the event
Step 6	Multiply the unit cost of each resource group by the time estimate for the event

Source: Everaet et al 2008

3. Methodology

3.1. Research setting and data collecting process

The outpatient clinic we studied, is situated in Bangkok. For this study, we collected data in medicine clinic. This clinic was chosen based on multiple criteria. First, this clinic was characterized as the most outpatient visit among other outpatient clinics in the hospital. Secondly, we chose this clinic as its service comprises of the patient without Special treatment and patient with Special treatment. Patient without Special treatment is defined as the patient that enter the clinic to get the consultation from a physician and exit the clinic after checking the document for the next appointment or further treatment. The patient with Special treatment need to go further to receive the treatment service like wound dressing, suture, minor operation, changing tube, etc. Special treatment unit sometime serves as ER because this department have no Emergency room. But when patient have more complication or crisis symptoms which Special treatment is not capable of treating the patient, they will transfer to ER.

Based on the difference between these clinic services, we created two cost object, the activity cost of the patient without Special treatment and the patient with Special treatment. To provide the full-service process (i.e. before diagnosis processing, diagnosis processing and after diagnosis processing), four type of organization member were involved: the physician, the nurse, the practical nurse, and the clerk. While the clinic employs the clerk for execution of the administrative task, physician for consultation service, nurse and practical nurse for before and after diagnosis processing. Furthermore, we did not include the physician into the total clinic's labor cost as hospital system not charge service cost for the regular clinic. The activity data were collected through direct observation, multiple interviews with the head nurse, nurses, and outpatient process management experts. Cost data were obtained from outpatient clinic and hospital system. In order to derive the time equation for the time-driven ABC model, we need to estimate the time that requires to perform each activity. For that purpose, we observe the time of each activity by stopwatch every new patient that comes to clinics through each activity until the required sample size was obtained (400 sample size). It takes one week to observe the data from 7 August 2018 until 11 August 2018. After collecting

all the data, Time-driven activity-based costing was developed for patient activity without Special treatment and patient activity with Special treatment.

3.2. Time driven ABC model development

The hospital traditional costing system is so complicated and have more problem in tracking the cost of resource usage with the demand of the patient. Hence, ABC is one of the best costing systems which can control the cost and help improving balancing between resource and demand. Even though, it still has a limitation. So, in this study, the new update ABC model, TDABC was developed and the step in developing and implementing are presented below.

Step 1: Identify the outpatient logistics activity in medicine department in hospital

In this research, the case study is based on the outpatient flow in the medicine clinics. First, the patients arrive at the OPD. Before going to particular clinics, they need to go through some other OPD facilities. Regardless of any arrival types need to go to Triage first. The triage is performed to observe the patients' critical level. All patients must then register for their clinics. The registration counters are classified into two categories: appointment patient (Lab, X-ray, and clinical appointment patients) registration, and non-appointment patient (new patient) patient registration. After the registration, only appointment patients will be screened in front of their clinics and meet with their doctor. After the patients are done with their doctors, they go to submit their prescriptions to the pharmacist assistants. The pharmacist assistants will key-in all items (drugs) and calculate all the fees including, medicine fee. Next, the patients go to pay their fee at the cashier counters. Finally, they pick up the medicine from the pharmacists and leave the hospital (Hoeur 2016).

Step 2: Identify the resource group of outpatient clinics service

First, we identified the groups of resources (e.g., surgeons, nurses, etc.) that perform activities for outpatient in hospital. The cost of resources supplied to an operating department consists of several elements. There are 4 basic resources in clinical such as: Nurse, Machine, Medical material and secretary cost (Demeree 2009) includes labor cost, cost of a secretary's room, office material cost, other secretary costs (each department employs secretaries for the execution of administrative tasks).

In this study, the researcher scope to analyze cost in view of provider perspective and classify cost by input which divides into two groups: capital cost and Recurrent Cost (operating cost).

Step 3: Estimate the total cost of each resource group

The total cost of each resource can be calculated by equation 1: Total cost of each resource = $\sum_{i=1} q_i \times r_i$ (1)

Let r resource used (resource cost) and q the quantity of resource used

In this study, there are 2 main resources: capital cost and recurrent cost

Capacity cost consists of building cost and equipment cost.

1. Building cost was calculated by multiply the average construction cost by the floor area of the clinic. To determine the depreciation cost of building in FY 2017, several values need to be calculated as following:

- Depreciation cost per year can be calculated by divide lifespan by the purchased cost.
- Depreciation rate can be calculated by divide 100% by the number of year in the asset life
- Residual value or salvage value can be calculated by equation 2: Salvage value = $P(1-i)^y$ (2)

Which P is the purchase cost, i is the depreciation rate and y is the lifespan of equipment

- Annual cost can be determined by multiply the current value of the asset by depreciation rate

2. Equipment cost can be calculated by the same formula of depreciation of building.

Recurrent cost consists of labor cost, material cost, and public utility cost. These costs can be calculated by equation 1.

Step 4: Estimate the Practical Capacity of each resource group

Practical capacity can be assumed as a specified percentage, 80 or 85 percent, of theoretical capacity (Kaplan & Anderson 2004). That is, if an employee can normally work forty hours per week, the practical capacity could be assumed to be thirty-two hours per week, allowing 20 percent of personnel time for breaks, arrival and departure, training, meetings, and employee chitchat that is unrelated to direct work performed. For machines, an allowance of 15 to 20 percent can be made for downtime due to maintenance, repair, and scheduling fluctuations.

The theory capacity can be calculated by the equation 3:

Theory capacity in minute = working hour per day*working day in a week*number of week in a year*number of minute in an hour (3)

Step 5: Calculate the capacity cost rate/cost per time unit

The capacity cost rate of each resource can be calculate by equation 4 (Kaplan & Anderson 2007):

Capacity cost rate =Cost of capacity supplied ÷ Practical capacity of resources supplied (4)

Step 6: Determine the time estimation for each event, based upon the time equation for the activity and character of event

Time equation can be developed through direct observation and multiple interviews with employee/manager (Demeree 2009). Based on the study of The general time equation needed by the event E of the activity A with p of possibility is given by:

$$T_{E,A} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_p X_p \quad (5)$$

$T_{E,A}$ time require for executing the event E in term of activity A

β_0 Constant amount of time for activity A

β_1 time consume per unit of time driver 1

X_1 time driver 1

X_p time driver p

p number of driver need to run for activity A

Step 7: Calculate the total cost per patient/transaction

Total cost per patient can be calculate by equation 6: Total Cost =total time used *cost per time unit (6)

4. Results and Discussions

4.1. Time Driven Activity based costing model development

4.1.1. Activity analysis

To construct an appropriated time equation, three main activities were identified which possibly extended by several optional depending on the different clinic service of the patient without Special treatment and patient with Special treatment. On the first arrival of a patient, the patient needs to take the weight and height check in front of the clinic. This process is assisted by clerk. Secondly, the patient needs to submit the appointment card to a nurse. After checking the appointment card, the nurse will inform the patient about the number of the examination room. Thirdly, Patient will be measured the vital sign that shows the heart rate, blood pressure and body temperature of the patient and then they wait to meet with the doctor. Next, the patient meets with the doctor for consultation and gets diagnosis and treatment from doctor and doctor will assess the condition of the patient and decides whether the patient requires further services from another service. Next, the document of the patient will be checked by a nurse after meeting with the doctor. In case of patient need further treatment at Special treatment procedure, they will meet with the doctor at

Special treatment unit and then leave the hospital. The outpatient logistics activities were illustrated in the flowchart as shown in figure 4.2.

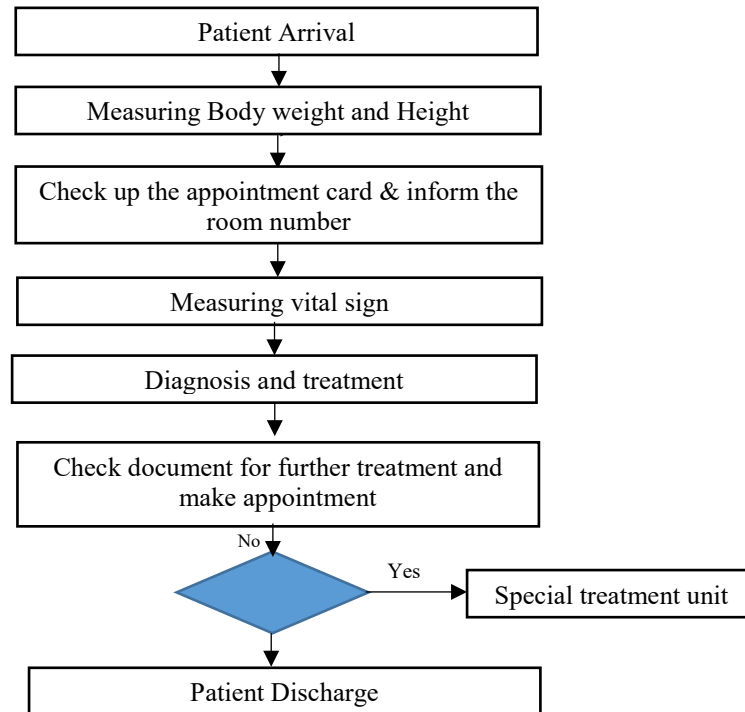


Figure 4.2. Outpatient logistics flow in the hospital

4.1.2. Resource group identification of OPD clinic

There are two main resource groups including capital cost and recurrent cost. The capital cost consists of building cost, depreciation cost of equipment, the recurrent cost was composed of Labor cost, Material cost (Office and household supply cost, and cost of drug and medical supply), other costs (public utility cost and maintenance/repairing cost).

4.1.3. Total cost of each resource

The resource used in the OPD clinic is classified into two main group: Capacity cost and recurrent cost. Capacity cost consists of building cost and equipment cost and recurrent cost consist of material cost (labor cost, drug, and medical supply cost) and public utility cost (water supply cost, electricity cost, and maintenance cost). The total cost of each activity is summarized in table 1.

Table 1. Total cost of each resource in without Special treatment and with Special treatment unit (baht/year)

Location	Capital cost		Recurrent cost						
	Building cost	Equipment cost	RN	LPN	Clerk	Material cost		Public utilities cost	
						Office material cost	Medicine & medical supply cost	Water supply cost	Electricity cost
Without Special treatment	1,756,677.89	445,583.43	2,936,640	8,109,636	3,224,448	634,883.79	166,726.68	32,127.16	315,884.61
Special Treatment Unit	351,335.58	126,910.52	2,569,560	1,071,084		166,726.68	90,557.68	7754.83	63,176.92

4.1.4. Practical capacity of each resource group

We assume the practical capacity of working time is 85% of theory capacity. The service time of medicine clinic started from 7 AM until 4 PM and SDSI service starts from 6 AM until 7 PM. So, the theory capacity per year of each service can be determined as following:

- (1) Theory capacity of without special treatment = $8 \times 5 \times 52 \times 60 = 124800$ min/year
- (2) Theory capacity of Special treatment = $12 \times 5 \times 52 \times 60 = 187200$ min/year

Therefore, practical capacity of Without special treatment = $85\% \times 124800 = 106080$ min/year and practical capacity of special treatment = $85\% \times 187200 = 159120$ min/year.

4.1.5. Capacity cost rate

Capacity cost rate is determined by divide the total resource cost by practical capacity. So we can get, the unit cost of each resource group as shown in table 2.

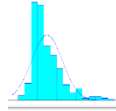
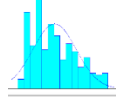
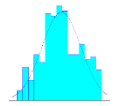
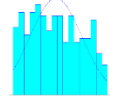
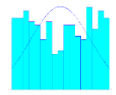
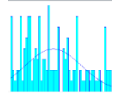
Table 2. The unit cost of each resource of without special treatment and Special treatment
(baht/minute/year)

Location Unit cost	Without Special treatment	Special treatment
Depreciation of Building	7.62	2.21
Depreciation of equipment	4.2	0.8
Registered Nurse	1.73	1.15
Practical Nurse	0.96	0.96
Clerk	1.69	
Office & household supply cost	5.98	0.14
Drug & medical supply cost	1.57	0.71
Water supply cost	0.3	0.05
Electricity cost	2.98	0.4

4.1.6. Time equation for each patient logistics activity in OPD clinic

Activity time will be estimated by collecting the time observation of each activity in the outpatient clinic. Onsite observation is conducted, firstly, to collect more data related to the time need to process each activity of outpatient Medicine clinic in the hospital. Observation time data will be analyzed by the input analyzer of Arena software for fitting distribution and to estimate the time data. Data is summarized in table 3.

Table 3. Service time of each patient activity time

Process	Number of sample	Histogram	Mathematic Expression	Test Statistic		P-value		MSE	IQR/ Q ₃	Service time
				Chi Square	KS	Chi Square	KS			
Measure Body Weight (A1)	300		NORM (0.199, 0.088)	90.3	0.145	< 0.005	< 0.01	0.03		M=0.2
Look up appointment card (A2)	300		NORM (0.302, 0.123)	89	0.076	< 0.05	0.065	0.02		M=0.3
Record vital sign (A3)	300		NORM (0.4, 0.0978)	35.3	0.035	< 0.005	> 0.15	0.01		M=0.4
Meet doctor (A4)	300		NORM (10.2, 4.95)	72.1	0.106	< 0.005	< 0.01	0.01	8.3	Q ₃ =8.3
Check document (A5)	300		NORM (4, 0.607)	112	0.085	< 0.005	0.025	0.01		M=4
Special treatment (A6)	150		NORM (27.3, 15.1)	39.2		< 0.005		0.01	24.75	Q ₃ =24.75

4.1.7. Total cost of each OPD clinic logistics activity

Total cost of each activity was calculated by multiply the unit of each resource cost by its activity time. The total cost of patient in medicine clinic without Special treatment and with Special treatment show in the table 4 and table 5.

Table 4. Total activity cost of patient without Special treatment (baht/year/patient)

		Capital cost		Recurrent cost							Total cost
Activity	Time			RN cost	LPN cost	Clerk cost	Material cost		Public utilities cost		
		Building cost	Equipment cost				Office material cost	Medicine & medical supply cost	Water supply cost	Electricity cost	
A1	0.2	1.52	0.84	0.35	0.19	0.34	1.20		0.06	0.60	5.09
A2	0.3	2.29	1.26	0.52	0.29	0.51	1.79		0.09	0.89	7.64
A3	0.4	3.05	1.68	0.69	0.38	0.68	2.39		0.12	1.19	10.18
A4	8.3	63.25	34.86	14.36	7.97	14.03	49.63	13.03	2.49	24.73	224.35
A5	4	30.48	16.80	6.92	3.84	6.76	23.92		1.2	11.92	101.84
Sub total		100.58	55.44	22.84	12.67	22.31		13.03			349.10

Table 5. Total activity cost of patient with Special treatment

		Capital cost		Recurrent cost							Total cost
Activity	Time			RN cost	LPN cost	Clerk cost	Material cost		Public utilities cost		
		Building cost	Equipment cost				Office material cost	Medicine & medical supply cost	Water supply cost	Electricity cost	
A1	0.2	1.52	0.84	0.35	0.19	0.34	1.20		0.06	0.60	5.09
A2	0.3	2.29	1.26	0.52	0.29	0.51	1.79		0.09	0.89	7.64
A3	0.4	3.05	1.68	0.69	0.38	0.68	2.39		0.12	1.19	10.18
A4	8.3	63.25	34.86	14.36	7.97	14.03	49.63	13.03	2.49	24.73	224.35
A5	4	30.48	16.80	6.92	3.84	6.76	23.92		1.2	11.92	101.84
A6	24.75	54.70	19.80	28.46	23.76		3.47	17.57	1.24	9.90	158.90
Sub total	37.95	155.28	75.24	51.30	36.43	22.31	82.41	30.60	5.20	49.24	508.00

4.3. Discussion

The data shows that each activity significantly differs depending on the characteristics of patient activity and the activity cost increase with the larger quantity of resource used and longer time of each activity. Therefore, to reduce the activity cost, the outpatient clinics need to be considered how to the management of each activity time, especially, the meeting doctor processing and Special treatment that take longer time than other activity in the clinics.

In order to reduce the time of each process, the clinics should develop processes for advanced beneficiary notices (ABN) to be present during patient registration. So that patient can understand the whole process of the clinic and no need to ask the clinic staffs during the clinics' activity. The physician should be educated on how to check the electric medical record of the patient which will reduce the time of consultation. Moreover, the clinic should work with the Information Technology system (IT) to adjust computer printing and scanning focus which minimize the verification time and It can minimize the error risk of pulling wrong patient paperwork. As the material cost in the clinics can be reduced by improving the process of purchasing, reducing inventory cost, decrease the turnover rate, etc. In addition, some recurrent cost can be reduced such as electricity, the staff can reduce this cost by reducing the electricity cost, for example, turning off the computer and equipment in the afternoon, turning off the air conditioner before the work finished, and buying the save energy electric instrument.

4.3. Data Analysis

4.3.1. Activity Analysis

In this part, the activity analysis was the most efficiency and effectiveness indicators in the time driven activity-based costing. The time spent on each activity not include the waiting time of patient in the clinics. This study indicated that the total estimated time spent in all activities not over one hour (37.95 minutes). The time of meeting doctor and SDSI time processing take longer time than other activities because the doctor needs time to check the patient medical record and diagnose the patient. Additionally, the patient will ask more question in this process than other processes as this process is more important for them.

4.3.2. Total cost and activity cost of outpatient clinics

4.3.2.1. Total cost of patient activity without Special treatment

The result of the study shows that the building cost is the biggest portion (28.81 %) compare with the other recurrent cost. The second and third proportion of resource cost is the office and household material cost and the equipment cost which take 22.63% and 15.88% of the total cost, respectively. The high cost of this resource which is resulted from this resource is the main function of the clinic service. The office material cost is regularly change with the volum of patient. As mention before, the medicine clinic is the clinic which have the most patient visit comparable with other clinic in the outpation department. Therefore, the increasing of patient lead to the rise of office material cost which is used in each activity to provicde service to each patient.

4.3.2.2. Total cost of patient activity with Special treatment

In this case, the patient needs to do the further process to Special treatment as the doctor recommends after using medicine clinic service. The results of this study indicate that the total cost of this service (349.10 baht) is the larger proportion than the total cost of patient activity without Special treatment (508.00 baht). Because of one more activity need to be added, so service time increase and lead to more resource cost are consumed. The result of this patient service show the similar result with the patient activity without special treatment. The biggest proportion is the building cost which consume 30.57% of total cost. The second and third portion are the office and household material cost and the equipment cost which take 16.22% and 14.81% of the total cost, respectively.

To summarize of comparison between these two patient activities, the results imply that the timing and resource are directly proportional.

4.3.2.3. Activity cost of outpatient medicine clinics in the hospital

The result in the study indicated that meeting doctor activity, Special treatment and check document activity was the first, second and third highest costing activity, which was consumed 44.16%, 31.28% and 20.05% of the total cost respectively. The fourth costing activities are recorded vital sign activity which consumed 2.00% of total cost. And the last one is looking up appointment card and measure body weight activity was consumed 1.50% and 1.00% of total cost respectively.

4.4. Research benefit and Limitation

In this study, the TDABC information can help the department head and healthcare manger's understanding of the difference clinic activity and the resource cost of each clinic activity. As such, the clinic management can determine the strategic change that increased the value and effectiveness of the current and future outpatient clinic. This study model is appropriated for further studies in the hospital or another industry that never use Time driven activities based costing system. Time-driven activities based costing in this study does not only impact to the cost but also include performance measurement. Activity time, activity cost and performance data provide information for hospital management to determine the effectiveness and efficiency of service, facilitating elimination of non-value added activities and improve service.

Even though this study model has more advantage, but it still faces limitation. This study focus only in one OPD clinics in the hospital. Some data need to be estimated from the total cost of hospital, so the resource cost cannot be estimated for specific location of activity. Some resource data lost track of record. Moreover, time data can be estimated by observe clinic only one week. One more, this study can analyze only the front activity which process directly with the patient and back activity is exclude from the study as the author cannot observe the time data of this activity and it take time. The waiting time and non-value-added activity are excluded from this study.

5. Conclusion

As the growth of the healthcare industry and more competition in the healthcare environment, the hospital needs to develop the efficient costing system to provide financial feedback. Time Driven Activity-based costing become the alternative tool for administrators to use for efficiency non-human resource and human resource management and to improve service quality. In this research, we try to explain the Time driven Activity-based costing development in an OPD clinic in the hospital. The TDABC seem to be faster model adaptability in the real world operates. In this study, it was found that medicine clinic in the hospital was identified into 6 activities such as body weight, look up appointment card, record vital sign, meet with the doctor in the treatment room, check document after meeting with the doctor and need to further to Special treatment. The activity was classified in two 2 groups of patient, the first group was called "Without Special treatment" that no need to further to treatment after meeting with the doctor in the clinic and the second group was called "With Special treatment " which the patient needs to further to treatment. Based on the result of table 4 and 5, the unit cost for the patient without procedure and patient with the procedure range from 3.96 to 155.28 baht/year/patient. The total cost of patient activity without procedure and with procedure are 349.10 baht/year/patient and 508.00 baht/year/patient respectively. It shows the influence of usage of activity, the resource used and time increasing between these two service cost. These result indicated that administrator should concern with

the real cost driver such as material cost, especially, the time spent in each activity which is the cost driver for resource cost and the activity which consumed the highest cost. In this study, the TDABC information clearly improved the department head and healthcare manager's understanding of the difference clinic activity. As such, the clinic management can determine the strategic change that increased the value and effectiveness of the current and future outpatient clinic.

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