

# Time-driven Activity based Costing Method for Calculating Unused Capacity of Endoscopy Services: A Case Study of XYZ Hospital

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**Keywords:** Hospital, Time-Driven Activity based Costing, Cost Analysis, Unused Capacity, Indirect Cost, Endoscopy.

**Abstract:** Competition in the healthcare industry and the growth of Endoscopy services prompted XYZ Hospital to evaluate the cost of its services. Management of quality and cost control are key to success in applying value-based healthcare strategy. The purpose of this case study is to demonstrate how Time-Driven Activity Based Costing (TDABC) method is applied in Endoscopy unit of XYZ Hospital by understanding the service processes and the indirect cost allocation using time as the main cost driver so that unused capacity can be identified, and capacity-based income statement can be prepared for better cost control. This is a descriptive case study with qualitative and quantitative approaches through cost analysis in the Endoscopy unit. Data collection based on XYZ Hospital database from January to December 2017 and the results of interviews and a direct observation conducted in October and November 2018. The result of this case study concludes that TDABC enables detail and accurate cost and profitability analysis of endoscopy services where indirect costs are allocated according to the actual usage of resources. Therefore, the efficiency indicator for cost control can be clearly defined and more measurable by showing the unused capacity of each resource group in the capacity-based income statement.

## 1 INTRODUCTION

The hospital industry is trying hard to run its business process efficiently by always stressing on quality control, cost control, and patient safety. With the purpose of cost control implementation, hospital needs to do cost analysis with appropriate cost method for all its services. Result of cost analysis will be used for the decision maker in making policies about efficiency program, pricing, and business development strategy. (Porter, Michael E.; Lee, 2013)

The number of hospitals in Indonesia has increased by around 1,000 hospitals since 2011 until 2017. The growth of hospitals per year reached 13.3% in 2011 to 2014 and then weakened to around 4.4% per year in 2014 until 2017. In 2017, 63% of the total 2,724 hospitals in Indonesia were private hospitals. (Britton, Koseki, & Dutta, 2018)

Since January 1<sup>st</sup>, 2014, Indonesia healthcare industry has been transforming by the implementation of *Jaminan Kesehatan Nasional (JKN)* conducted by *Badan Penyelenggara Jaminan Kesehatan (BPJS)*. Until 2017, member of *BPJS* is estimated around 175 million people. However, most of the tariff assigned by *BPJS* (INA CBGs) are far

below the economic price of private hospital operations. This gap between the regular tariff of the hospital and the tariff assigned by *BPJS* put the healthcare industry in a big challenge. (Thabrany, 2017).

The hospital business is basically a capital and labor intensive and carrying out business as well as social functions. This condition requires operational management to balance its profitability, service quality and socio-economic conditions of the community.

A systematic review of literature conducted by Keel et al. in 2017 shows that nowadays the healthcare industry is eagerly applying value-based healthcare strategy. The hospital's ability to understand the cost of care and calculate it appropriately will enable the hospital in evaluating its health outcomes and cost for better value delivery. The study also shows that Time-Driven Activity Based Costing (TDABC) is a cost accounting system that applicable in the hospital industry and can help the hospital in managing cost efficiently. (Keel, Savage, Rafiq, & Mazzocato, 2017)

XYZ Hospital is type B hospital which is accommodated by outpatient and inpatient facilities

with 355 beds and operated total by 1.400 employees. The number of endoscopy procedures has been growing about 15% in 2017 (873 procedures) from 2016.

XYZ Hospital has been struggling in estimating cost per service care and valuating hospital profitability. Cost calculation in XYZ Hospital is carried out by traditional cost accounting method which allocates hospital overhead cost by its service volume. This cost allocation method creates flat cost allocation for each service or procedure, therefore, some services are overcosted or undercosted.

The implementation of *Time-Driven Activity-Based Costing* (TDABC) in healthcare has been growing and has shown its strengths. TABCD simply use time as the main cost driver, replacing many cost drivers in Activity-Based Costing method. TDABC delivers a powerful method for cost analysis because it provides more accurate cost method than the traditional method and simpler than Activity-based costing (Demeere et al.; 2009)

## 2 METHODOLOGY

This study is a single-case (holistic) design type. This is a descriptive case study with a qualitative and quantitative approach through cost and profitability analysis in the Endoscopy unit. This study illustrates the application of cost calculation of Endoscopy procedures in the Endoscopy unit of XYZ Hospital using Time-Driven Activity Based Costing method. (Yin, 2013).

Data collection were from primary and secondary data. Primary data were collected from the interview result. Interviews were conducted in October and November 2018 for a Head of Endoscopic Unit, one internal medicine physicians and two nurses in Endoscopic unit. Secondary data were collected from accounting and transaction reports (billing report) of January – December 2017 and also standard operating procedures of the endoscopic unit.

### 2.1 Framework of TDABC Steps

In this study, the steps of applying the TDABC method was adopted from a pilot study on the implementation of TDABC at the Metro Health's Outpatient Clinic (Clark & Sopariwala, 2017), and are complemented by the studies conducted by (Campanale, Cinquini, & Tenucci, 2014) and (Keel et al., 2017).

The steps of applying the TDABC method at the XYZ Hospital are as follows:

1. Mapping The Process of Endoscopy Procedures
2. Identifying Cost of Resource Group (Cost of Capacity Supplied)
3. Determining Practical Capacity of Resource Group (Minutes)
4. Calculating Cost of Resource Group per Minute (Capacity Cost Rate)
5. Determining The Numbers of Procedures
6. Obtaining Time Estimation of Each Procedure
7. Calculating Total Time Usage and Cost for Each Resource Group
8. Determining Unused Capacity Costs and Creating Capacity-Based Income Statement.

The process mapping shows what resources (who) are used to carry out activities during certain times and its frequencies (how). At this stage, the resource group is identified.

The process stages of endoscopy procedures were generated from the hospital's standard operating procedures of the endoscopy unit and the interview results.

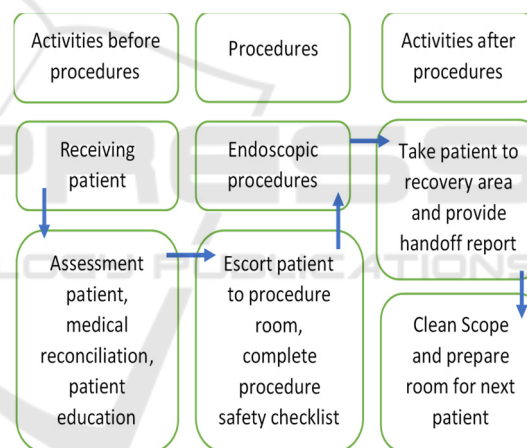


Figure 1: The main activities for endoscopic procedures.

In identifying cost of capacity supplied, the direct and indirect costs are determined into each group of resources used. Direct and indirect cost data are obtained from accounting reports.

Practical capacity is obtained by identifying the capacity of the resource group used such as employee work hours, hours of machine/tool usage. The practical capacity does not include breaks or downtime. The number of hours of effective work (practical capacity) is set in minutes.

The amount of capacity cost rate is determined by dividing the cost of capacity supplied with practical capacity, the formula can be seen in equation (1). At this stage, capacity cost rates are calculated for each resource group. (Kaplan & Anderson, 2007).

$$\text{Capacity cost rate} = \frac{\text{Cost of capacity supplied}}{\text{Practical capacity of resources supplied}} \quad (1)$$

The number of frequency of activities (endoscopy procedures) is attained from transaction data in the hospital information system.

Time estimation of each endoscopic procedure can be identified from interviews with key parties (physicians, nurses, etc.) The time estimates gained from the interviews can be validated through direct observation of Endoscopic procedures

The actual total time (minutes) used by each activity (endoscopic procedure) is the result of the time estimation of procedure multiplied by the volume of procedure. While the total cost used for all endoscopic procedures is obtained by multiplying the total estimated time of each procedures with the cost per minute (the capacity cost rate).

The total cost is the sum of the costs of each procedure. If the total cost of all procedures is smaller than the cost of capacity supplied, then the difference is the cost for unused capacity. By knowing the unused capacity costs of each resource group per procedure, a Capacity-Based Income Statement can be prepared.

### 3 RESULTS AND DISCUSSION

#### 3.1 The Implementation of TDABC

##### 3.1.1 The Process of Endoscopic Procedures

The service process in Endoscopy unit of XYZ Hospital is carried out in 3 stages, namely pre-procedure, intra procedure and post procedure. From service process mapping (figure 2), it can be identified resource used in each service activities which are personnel (physicians, nurses), room, equipment, supplies (drugs).

Stages	Activity	Personnel	Equipment	Room	Direct Cost
Pre Procedure	Assessment patient, medical reconciliation, patient education	Physicians, Nurses		Endoscopy Room	Drugs, other supplies, physicians & nurse's fee
	Procedures safety checklist, patient observation, equipment preparation, patient's data, physicians collaboration	Physicians, Nurses			
	Premedication & sedation	Physicians, Nurses	Medical Equipment		
Intra Procedure	Endoscopy Procedures	Physicians, Nurses	Medical Equipment	Endoscopy Room	Drugs, other supplies, physicians & nurse's fee
Post Procedure	Physicians : prepare patient's data image and handoff report. Nurse 1: observe patient response. Nurse 2: Clean scope. Prepare room for next patient	Physicians, Nurses			
		Nurse			

Figure 2: The main activities for endoscopic procedures.

#### 3.1.2 Cost of Capacity Supplied

After resource groups (personnel, room, equipment, supplies) are identified, the next step is to identify each cost of capacity supplied of resource groups for each endoscopy procedure. This step group costs into direct costs, indirect costs and not allocated costs.

Table 1: Cost of Capacity Supplied of Resource Group.

No	Description (In Million Rupiah)	Total Expenses	Indirect cost (In Million Rupiah)				Direct Cost	Not Allocated
			Personnel	Room	Equip.	Total Allocated		
			a	b	c	d=a+b+c		
1	Physicians & Nurses's fee	1.295					1.295	
2	Personnel's Salary	342	342			342		
3	Supplies (drugs)	465					465	
4	Maintenance (electricity, water, building, laundry, sterilization)	72		72		72		
5	Office Departemen Expenses	155						155
6	Other supplies (office stationary)	15						15
7	Medical Equipment (maintenance, depreciation, replacement cost)	636			636	636		
8	Building Depreciation	9		9		9		
<b>Total Expenses</b>		<b>2.990</b>	<b>342</b>	<b>82</b>	<b>636</b>	<b>1.060</b>	<b>1.759</b>	<b>171</b>

In Table 1, as income statement report of 2017, the total direct cost consisting of physician and nurse fee, drugs and other medical supplies expenses is Rp.1.759 million. Total indirect cost amount to Rp.1.060 million consisting of personnel expenses (salary etc.) Rp. 342 million, room expenses (electricity, maintenance, etc.) Rp. 82 million, medical equipment expenses (depreciation, maintenance, etc.) Rp. 636 million. Not allocated cost which consists of office department and other supplies expenses amount to Rp. 171 million.

Office department expenses are not directly related to procedure activities, while other supplies expenses are difficult to trace as direct costs for each endoscopy procedure. Hence, these costs are included in the not allocated cost group which will be presented separately in capacity-based income statement. So that costs can be analyzed in more detail and accurately. (Sopariwala, 2017)

#### 3.1.3 Practical Capacity

Determining the practical capacity of a resource group is based on the effective working hours of the personnel because room and medical equipment can only function when there are nurses operating.

The number of working hours in 2017 is 291 days (1.790 hours). The total effective working hours per year for 1 nurse is 1.790 working hours – (12 day off

x 7 hours/day) – (45 training hours) – (10 minutes briefing x 291 days) – (1 meeting hour x 52 week) – (1-hour meeting x 12 months) = 1.536 hours per person /year. The total practical capacity of personnel for 3 nurses is 276.420 minutes per year. (Table 2).

The practical capacity of the endoscopy room with 2 bed for procedures and 1 bed for emergency is 184.280 minutes per year (Table 3)

Table 2: Practical Capacity of Personnel.

Resource Groups	Hours/ Year	Minutes/ Year	Hours/ Person/ Day	Minutes/ Person/ Day
Personnel (3 nurses)	4.607	276.420	5,3	317

Table 3: Practical Capacity of Room.

Resource Groups	Hours/ Year	Minutes/ Year	Hours/ Bed/ Day	Minutes/ Person/ Day
Room (2 bed)	3.071	184.280	5,3	317

While, the practical capacity per year of medical equipment is 2.027.080 minutes obtained from the sum of practical capacity of each medical equipment (Table. 4). Practical capacity of each type of equipment is calculated by the quantity of equipment multiply by minutes per day of practical capacity for 291 days.

### 3.1.4 Capacity Cost Rate

Calculation of the capacity cost rate per minute of each resource group (Table 5) is done by dividing the cost of capacity supplied by practical capacity per year for each resource group (personnel, room, equipment).

Table 4: Practical Capacity of Equipment.

Equipment	Quantity	Practical Capacity (per day)		Practical Capacity (per year) (Minutes)
		Hours	Minutes	
		a	b	
1 Patient Bed	2	5,3	317	184.280
2 Patient Monitor	2	5,3	317	184.280
3 Patient Trolley	2	5,3	317	184.280
4 Sterilization Trolley	2	5,3	317	184.280
5 Video scope Set	2	5,3	317	184.280
6 Medical Image Station	2	5,3	317	184.280
7 Suction Pump	1	5,3	317	92.140
8 Gastrovideoscope	2	5,3	317	184.280
9 Colonvideoscope	2	5,3	317	184.280
10 Bronchovideoscope	1	5,3	317	92.140
11 Electronic Surgical Unit	1	5,3	317	92.140
12 Duodenovideoscope	1	5,3	317	92.140
13 Anesthesia Machine	1	5,3	317	92.140
14 Flushing Aid (used all together per procedure)	4	5,3	317	92.140
<b>Total (Minutes)</b>				<b>2.027.080</b>

Table 5: Capacity Cost Rate of Resource Groups.

Resource Group	Cost of Capacity Supplied (million Rp)	Practical Capacity per Year (minutes)	Capacity Cost Rate per Minute (million Rp)
	(a)	(b)	(c=a/b)
Personnel	342	276.420	0,001239
Room	82	184.280	0,000443
Equipment	636	2.027.080	0,000314

Table 6: Capacity Cost Rate of Equipment.

	Resource Group Medical Equipments	Cost of Capacity Supplied (million Rp)	Practical Capacity per Year (minutes)	Capacity Cost Rate per Minute (million Rp)
1	Patient Bed	5	184.280	0,000029
2	Patient Monitor	13	184.280	0,000070
3	Patient Trolley	6	184.280	0,000032
4	Sterilization Trolley	3	184.280	0,000018
5	Video scope Set	116	184.280	0,000628
6	Medical Image Station	9	184.280	0,000050
7	Suction Pump	3	92.140	0,000036
8	Gastrovideoscope	121	184.280	0,000657
9	Colonvideoscope	109	184.280	0,000592
10	Bronchovideoscope	23	92.140	0,000249
11	Electronic Surgical Unit	133	92.140	0,001442
12	Duodenovideoscope	39	92.140	0,000420
13	Anesthesia Machine	39	92.140	0,000427
14	Flushing Aid	16	92.140	0,000176
	<b>Total</b>	<b>636</b>	<b>2.027.080</b>	<b>0,000314</b>

Moreover, the breakdown of the cost of each type of equipment is described in Table 6. Cost of capacity supplied of each type of equipment is generated from medical equipment expenses (depreciation, maintenance, etc.).

### 3.1.5 Frequency of Procedures

After knowing the capacity cost rate for each resource group, the next step is to determine the frequency of each endoscopy procedure.

It can be seen in Table 7, there are 3 types of Endoscopy procedures namely Gastroscopy, Colonoscopy and Bronchoscopy. There are also types of procedures based on a combined variation of 2 types of procedures and 3 types of procedures taken in one episode.

### 3.1.6 Time Estimation of Each Procedures

Time estimation for Endoscopy procedures are shown in table 7. The purpose of determining the time estimation (minutes) of resource used in each endoscopy procedure is to become a basis for indirect cost allocation using the TDABC method. Time

(minutes) is the main cost driver in determining the indirect cost allocation to each procedure.

Table 7: Time Estimation.

Endoscopy Procedures	Number of Frequency	Time Estimation per Procedures (Minutes)		
		Personnel	Room	Equipment
<b>I Gastroscopy</b>				
1 Gastroscopy without Biopsy	43	90	60	360
2 Gastroscopy with Biopsy	501	93	62	376
3 Ligation of Esophageal Varices	22	105	70	440
4 Gastric Polypectomy	3	300	100	760
<b>II Kolonoskopi</b>				
1 Colonoscopy without Biopsy	60	125	83	544
2 Colonoscopy with Biopsy	92	128	85	560
3 Colon Polypectomy	7	330	110	850
4 Rectosigmoidoscopy without Biopsy	1	98	65	400
5 Rectosigmoidoscopy with Biopsy	11	101	67	416
<b>III Bronkoskopi</b>				
1 Bronchoscopy without Biopsy	22	390	130	1.030
2 Bronchoscopy with Biopsy	19	420	140	1.120
<b>IV Combination 2 Procedures</b>				
1 Gastroscopy without Biopsy & Gastric Polypectomy	1	405	135	1.015
2 Gastroscopy without Biopsy & Ligation of Esophageal Varices	8	210	105	670
3 Gastroscopy with Biopsy & Ligation of Esophageal Varices	1	214	107	686
4 Gastroscopy without Biopsy & Colonoscopy without Biopsy	2	276	138	962
5 Gastroscopy with Biopsy & Colonoscopy with Biopsy	28	284	142	998
6 Gastroscopy with Biopsy & Colonoscopy without Biopsy	33	280	140	980
7 Gastroscopy without Biopsy & Rectosigmoidoscopy with Biopsy	1	244	122	818
8 Gastroscopy with Biopsy & Rectosigmoidoscopy with Biopsy	1	248	124	836
9 Gastroscopy with Biopsy & Rectosigmoidoscopy without Biopsy	2	244	122	818
10 Colonoscopy without Biopsy & Colon Polypectomy	7	504	168	1.312
11 Colonoscopy with Biopsy & Colon Polypectomy	4	510	170	1.330
12 Colonoscopy without Biopsy & Hemorrhoid Ligation with Scope	1	290	145	920
13 Bronchoscopy without Biopsy & Gastroscopy with Biopsy	1	561	187	1.403
<b>V Combination 3 Procedures</b>				
1 Gastroscopy with BiopsyC & olonoscopy without Biopsy & Colon Polypectomy	2	645	215	1.805
<b>Grand Total</b>	<b>873</b>	<b>7.093</b>	<b>2.992</b>	<b>21.409</b>

The use of personnel and room resource has begun since the patient admission process when there is interaction with nurses and physicians as well as the use of room and bed. The use of medical equipment begins when the medical equipment is prepared for procedures.

The use of personnel resource is influenced by the number of personnel need in carrying out a procedure. Some procedures can be carried out simultaneously with 3 nurses so that some procedures use 1,5 nurses per procedure. Total personnel time is the total time spent by all nurses.

Table 8: Time Usage of Resource Groups (minutes).

Endoscopy Procedures	Total Time Usage (Minutes)		
	Personnel	Room	Equipment
<b>I Gastroscopy</b>			
1 Gastroscopy without Biopsy	3.870	2.580	15.480
2 Gastroscopy with Biopsy	46.593	31.062	188.376
3 Ligation of Esophageal Varices	2.310	1.540	9.680
4 Gastric Polypectomy	900	300	2.280
<b>II Kolonoskopi</b>			
1 Colonoscopy without Biopsy	7.470	4.980	32.640
2 Colonoscopy with Biopsy	11.730	7.820	51.520
3 Colon Polypectomy	2.310	770	5.950
4 Rectosigmoidoscopy without Biopsy	98	65	400
5 Rectosigmoidoscopy with Biopsy	1.106	737	4.576
<b>III Bronkoskopi</b>			
1 Bronchoscopy without Biopsy	8.580	2.860	22.660
2 Bronchoscopy with Biopsy	7.980	2.660	21.280
<b>IV Combination 2 Procedures</b>			
1 Gastroscopy without Biopsy & Gastric Polypectomy	405	135	1.015
2 Gastroscopy without Biopsy & Ligation of Esophageal Varices	1.680	840	5.360
3 Gastroscopy with Biopsy & Ligation of Esophageal Varices	214	107	686
4 Gastroscopy without Biopsy & Colonoscopy without Biopsy	552	276	1.924
5 Gastroscopy with Biopsy & Colonoscopy with Biopsy	7.952	3.976	27.944
6 Gastroscopy with Biopsy & Colonoscopy without Biopsy	9.240	4.620	32.340
7 Gastroscopy without Biopsy & Rectosigmoidoscopy with Biopsy	244	122	818
8 Gastroscopy with Biopsy & Rectosigmoidoscopy with Biopsy	248	124	836
9 Gastroscopy with Biopsy & Rectosigmoidoscopy without Biopsy	488	244	1.636
10 Colonoscopy without Biopsy & Colon Polypectomy	3.528	1.176	9.184
11 Colonoscopy with Biopsy & Colon Polypectomy	2.040	680	5.320
12 Colonoscopy without Biopsy & Hemorrhoid Ligation with Scope	290	145	920
13 Bronchoscopy without Biopsy & Gastroscopy with Biopsy	561	187	1.403
<b>V Combination 3 Procedures</b>			
1 Gastroscopy with BiopsyC & olonoscopy without Biopsy & Colon Polypectomy	1.290	430	3.610
<b>Grand Total</b>	<b>121.678</b>	<b>68.436</b>	<b>447.838</b>

### 3.1.7 Total Time Usage and Cost for Each Resource Group

The total time spent for personnel, rooms and medical equipment is gained from time estimation multiply by frequency of procedures. The total time of resource used is 121.678 minutes. The use of a room is 68.436 minutes, and the overall use of medical equipment is 447.838 minutes. (Table 8.)

After the time usage of personnel, room and equipment is defined, then the next step is calculating the total cost of each resource group.

Table 9: Cost of Resource Groups (Million Rp).

Endoscopy Procedures	Total Cost of Resource Usage (million Rp)		
	Personnel	Room	Equipment
<b>I Gastroscopy</b>			
1 Gastroscopy without Biopsy	4,79	1,14	2,79
2 Gastroscopy with Biopsy	57,72	13,77	34,06
3 Ligation of Esophageal Varices	2,86	0,68	1,76
4 Gastric Polypectomy	1,11	0,13	0,72
<b>II Kolonoskopi</b>			
1 Colonoscopy without Biopsy	9,25	2,21	5,75
2 Colonoscopy with Biopsy	14,53	3,47	9,08
3 Colon Polypectomy	2,86	0,34	1,85
4 Rectosigmoidoscopy without Biopsy	0,12	0,03	0,07
5 Rectosigmoidoscopy with Biopsy	1,37	0,33	0,80
<b>III Bronkoskopi</b>			
1 Bronchoscopy without Biopsy	10,63	1,27	3,80
2 Bronchoscopy with Biopsy	9,89	1,18	3,58
<b>IV Combination 2 Procedures</b>			
1 Gastroscopy without Biopsy & Gastric Polypectomy	0,50	0,06	0,32
2 Gastroscopy without Biopsy & Ligation of Esophageal Varices	2,08	0,37	0,98
3 Gastroscopy with Biopsy & Ligation of Esophageal Varices	0,27	0,05	0,13
4 Gastroscopy without Biopsy & Colonoscopy without Biopsy	0,68	0,12	0,43
5 Gastroscopy with Biopsy & Colonoscopy with Biopsy	9,85	1,76	6,26
6 Gastroscopy with Biopsy & Colonoscopy without Biopsy	11,45	2,05	7,24
7 Gastroscopy without Biopsy & Rectosigmoidoscopy with Biopsy	0,30	0,05	0,18
8 Gastroscopy with Biopsy & Rectosigmoidoscopy with Biopsy	0,31	0,05	0,19
9 Gastroscopy with Biopsy & Rectosigmoidoscopy without Biopsy	0,60	0,11	0,36
10 Colonoscopy without Biopsy & Colon Polypectomy	4,37	0,52	2,85
11 Colonoscopy with Biopsy & Colon Polypectomy	2,53	0,30	1,65
12 Colonoscopy without Biopsy & Hemorrhoid Ligation with Scope	0,36	0,06	0,16
13 Bronchoscopy without Biopsy & Gastroscopy with Biopsy	0,69	0,08	0,23
<b>V Combination 3 Procedures</b>			
1 Gastroscopy with Biopsy & Colonoscopy without Biopsy & Colon Polypectomy	1,60	0,19	1,23
<b>Grand Total</b>	<b>150,73</b>	<b>30,34</b>	<b>86,49</b>

The actual cost of the use of a resource group (personnel, room dan equipment) for all procedures in 2017 is shown in Table 9. In total, the cost of personnel usage is Rp.150,73, - million, room usage is Rp.30,34, - million, and overall usage of medical equipment is Rp.86,49, - million.

Table 10 shows the sample of calculating cost of each type of equipment for each procedure (gastroscopy).

### 3.1.8 Unused Capacity Costs and Capacity-based Income

One of the main advantages of the TDABC method is that TDABC is able to describe the idle capacity or

unused capacity of available resources for each service product/cost object. (Kaplan & Anderson, 2007).

Table 10: Cost of Each Type of Equipment.

Endoscopy Procedures	Equipment Usage per Procedure (Minutes)		Equipment Usage per Procedure (million Rp)	
	Patient Bed	Gastro video-scope	Patient Bed	Gastro video-scope
<b>Equipment Cost Rate / Minute</b>			<b>0,000029</b>	<b>0,000657</b>
<b>I Gastroscopy</b>				
1 Gastroscopy without Biopsy	60	40	0,001756	0,026298
2 Gastroscopy with Biopsy	62	42	0,001814	0,027613
3 Ligation of Esophageal Varices	70	50	0,002048	0,032873
4 Gastric Polypectomy	100	80	0,002926	0,052596

As in table 11, the value of unused capacity of personnel is 56%, there are 154.742 minutes a year or 2.95 hours per day per person. The cost of unused personnel capacity is Rp. 191,68 million.

While the value of unused capacity for room is 63%. In table 12, with the capacity of 2 beds, there are 115,854 minutes per year or 3,3 hours per day that the beds are not used. The amount of unused capacity is Rp.51,35,- million.

Table 11: Unused Capacity of Personnel.

Resource Group Personnel	Resource Rate per Minute (million Rp)	Capacity Usage (Minutes)	Cost (million Rp)
Used Capacity	1.239	121.678	150,73
Unused Capacity		154.742	191,68
Total		276.420	342,41
		56%	56%

Table 12: Unused Capacity of Room.

Resource Group Room	Resource Rate per Minute (million Rp)	Capacity Usage (Minutes)	Cost (million Rp)
Used Capacity	443	68.436	30,34
Unused Capacity		115.844	51,35
Total		184.280	81,69
		63%	63%

The unused capacity of medical equipment shows varying values according to their utility. As in table 13 and table 14, Unused capacity of medical equipment reaches Rp. 549,49 million, - with an average of 79% of unused capacity. This high unused capacity is also affected because there are medical devices that are only used for a certain procedure, such as Gastroscope for Gastroscopy, Colonoscope for Colonoscopy, Electronic Surgical Units for Polypectomy, Bronchovideoscope and Anesthetic for Bronchoscopy.

Table 13: Unused Capacity of Equipment (Minutes).

	Resource Group Equipment	Equipment (Minutes)			
		Used Capacity	Unused Capacity	Total	Idle Capacity
1	Patient Bed	68.436	115.844	184.280	63%
2	Patient Monitor	49.126	135.154	184.280	73%
3	Patient Trolley	49.126	135.154	184.280	73%
4	Sterilization Trolley	49.126	135.154	184.280	73%
5	Video scope Set	49.126	135.154	184.280	73%
6	Medical Image Station	49.126	135.154	184.280	73%
7	Suction Pump	49.126	43.014	92.140	47%
8	Gastrovideoscope	31.906	152.374	184.280	83%
9	Colonvideoscope	19.605	164.675	184.280	89%
10	Bronchovideoscope	4.637	87.503	92.140	95%
11	Electronic Surgical Unit	2.841	89.299	92.140	97%
12	Duodenovideoscope	-	92.140	92.140	100%
13	Anesthesia Machine	4.637	87.503	92.140	95%
14	Cleaning Equipment	21.020	71.120	92.140	77%
	<b>Total</b>	<b>447.838</b>	<b>1.579.242</b>	<b>2.027.080</b>	<b>79%</b>

Also, there is a medical device (Gastrovideoscope) that requires backup with consideration of the high volume of use of the tool and the length of time needed to repair the device if damage occurs. A backup tool is provided to reduce the risk of service that is hampered due to damaged medical devices. The more medical devices that are owned means the higher the cost of available capacity (capacity cost supplied) so that at the same utilization level will increase the unused capacity cost of the tool.

Table 14: Unused Capacity of Equipment (million Rp).

	Resource Group Equipment	Equipment (million Rp.)			
		Used Capacity	Unused Capacity	Total	Unused Capacity
1	Bed Pasien	2,00	3,39	5,39	63%
2	Patient Monitor	3,43	9,43	12,85	73%
3	Patient Trolley	1,57	4,31	5,88	73%
4	Trolley Bahan Steril	0,88	2,42	3,30	73%
5	Set Video scope	30,87	84,93	115,80	73%
6	Medical Image Station	2,45	6,74	9,19	73%
7	Suction Pump	1,78	1,56	3,35	47%
8	Gastrovideoscope	20,98	100,18	121,16	83%
9	Colonvideoscope	11,60	97,45	109,05	89%
10	Bronchovideoscope	1,15	21,76	22,91	95%
11	Electronic Surgical Unit	4,10	128,73	132,82	97%
12	Duodenovideoscope	-	38,72	38,72	100%
13	Mesin Anastesi	1,98	37,34	39,32	95%
14	Pembersih alat	3,71	12,54	16,25	77%
	<b>Total</b>	<b>86,49</b>	<b>549,49</b>	<b>635,99</b>	<b>79%</b>

Endoscopic procedures consist of pre, intra and post stages. The post stage takes quite a long time because it is necessary to observe the patient's condition by the nurse to ensure the patient has fully recovered when exit the Endoscopy room. At that stage, even though the procedure process (use of medical devices) is complete, the room facilities are still used until the patient recovers.

The capacity-based income statement shows in figure 3 that the operating income is Rp.1.464,88, -

million or 40% of total income. However, the idle capacity reaches an amount of Rp.792,53, - million (22% of total revenue). If the idle capacity is calculated, then the net income becomes Rp. 672,35 million, or 18.4% of total revenue. Unused capacity takes a portion of 26.5% of the total cost (Rp.2.990,12 million, -) which consists of direct costs, indirect cost (used capacity), not allocated cost and idle capacity cost.

By creating a capacity-based income statement, the target improvement plan can be clearer and more measurable. This idle capacity information can be used as a performance indicator for management to improve performance.

CAPACITY BASED INCOME STATEMENT	
Revenue	3.662,47
Less : Expenses	
Direct Cost	1.759,29
Indirect Cost (Used Capacity)	
Personnel	150,73
Room	30,34
Equipment	86,49
	267,56
Not Allocated Cost	
Office Departement & Other Supplies	170,74
Total Cost	2.197,59
<b>Operating Income</b>	<b>1.464,88</b>
Less : Idle Capacity Cost	
Personnel	191,68
Room	51,35
Equipment	549,49
	792,53
<b>Net Income</b>	<b>672,35</b>

Figure 3: Capacity Based Income Statement.

#### 4 CONCLUSIONS

By using TDABC, the cost of endoscopic procedures can be calculated in more detail per type of procedures. It also enables the calculation of various services. Calculation of costs can be done for the total cost, per group of resources (personnel, facilities and room, medical equipment) and per type of procedures.

TDABC allocates indirect costs to each resource group in accordance with the actual usage of resources, so that unused capacity (idle capacity) can be presented separately. Information on the amount of unused capacity in the form of time (minutes) and costs (rupiahs) then can be used as a clearer and more measurable management indicator in order to improve performance through efficiency measures.

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