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Research Article

Using Time-Driven Activity-Based Costing (TDABC) for Better Pricing of Different Chemotherapy Procedures in Medical Oncology

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ABSTRACT

Introduction: Adequate pricing of medical procedures is increasingly becoming a major issue in health insurance reforms and a tool for financial regulation and governance.

However, the price set for chemotherapy in the public sector (300 Moroccan dirhams set since 2006), without taking into account the real cost and the nature of the protocol administered, does not ensure fair reimbursement and negatively impacts the performance of oncology centers.

Objectives: This study aims to present in a practical way the main stages of application of the TDABC method on medical oncology and its capacity to measure the variation in the costs of the different procedures carried out. this will thus contribute to setting adequate prices and fair reimbursement for oncology centers.

Methods: We applied the TDABC method as a cost calculation approach that aims to ensure adequate pricing of the different chemotherapy procedures performed in medical oncology. The process maps were developed by direct observation of the activities carried out in one regional oncology center over a period of 3 months. The financial data on the costs of the different resource groups concern the expenses incurred during the year 2022.

Results: The result of the study shows the adaptability of the TDABC method to the context of medical oncology. To illustrate the approach to calculating the cost of activities and the total cost of a procedure, we present the example of the results associated with the anthracycline chemotherapy procedure. The costs of the other procedures require modifying the time parameters required to perform the tasks and the activity of each of the chemotherapy procedures.

Conclusions: The methodology developed can be exploited and generalized in several oncology centers to ensure adequate billing and equitable reimbursement by health insurance organizations in Morocco.

This study suggests and opens up prospects for exploring and applying the TDABC method in the management of oncology care in low- and middle-income countries. The approach adopted could be useful to managers and researchers in carrying out studies on the cost of health care in general, and in oncology in particular.

Keywords: TDABC, cost, price, oncology, chemotherapy

INTRODUCTION

The cost attributed to the care of cancer patients increasingly represents a significant part of the financial burden of health systems. It is therefore of crucial importance to improve the financial performance of oncology centers and to define approaches to better manage this complex environment, guided by cost constraints and high standards of quality of care.

Thus, costing systems are tools that allow health institutions to manage this complex environment and thus understand the composition of the costs of different services and benefits provided to patients. However, traditional costing systems do not accurately measure costs at the patient level. In this regard, the ABC activity-based costing method has been tested on the one hand with a view to comparing results with those obtained by traditional costing systems. On the other hand, for a better allocation of indirect costs [1].

However, attempts to develop and sustain ABC have proven difficult. Indeed, the difficulty of applying the ABC method to an entire institution is linked to the cumbersome nature of its implementation and the cost of the necessary information [2].

In this sense, Kaplan and Porter [3] presented the TDABC as an alternative model, which takes into account the complexity of care to accurately determine the cost of different services; they thus presented a seven-step approach for the implementation of the TDABC in healthcare institutions as a solution to the cost crisis, and associated it with the Value-Base Healthcare program.

In this wake, several studies have shown the applicability of the TDABC method in the healthcare sector. TDABC is considered a less complex method and provides more accurate cost data than the ABC method [4] [5].

According to Kaplan [6], one of the founders of this method, the application of TDABC offers many opportunities to healthcare managers, namely improving efficiency, optimizing resource use, optimizing care throughout the pathway, planning resource capacity and budgeting.

In oncology, cost analysis with the TDABC method has attracted increasing interest from researchers given the importance of resources mobilized in the management of cancer patients. Indeed, the analysis of the literature allows us to distinguish three issues related to the application of TDABC in oncology and which have an effect on the creation of value, namely [7] [8] :

• Cost reduction by optimizing the care pathway and the resources used

• Increased health outcomes and quality of care by improving patient access in the best conditions and reducing their waiting time

• Better financing of oncology centers and adequate reimbursements by aligning pricing to cost

It is in this last perspective that this study is part of.

OBJECTIVES

This research addresses an issue that continues to be debated in the management literature. It concerns the use of an activity-based costing approach as a response to the absence of a formal costing system, particularly in low-income countries, and as a solution for determining the cost of certain complex and costly services such as chemotherapy, which represents the primary therapeutic modality for treating cancer.

Thus, the objective of this research is to present the accounting approach and the practical steps for applying the TDABC in medical oncology in order to determine the costs of the different chemotherapy procedures performed in medical oncology. This will subsequently allow more reasonable pricing bases to be established and thus set adequate reimbursement amounts by the health insurance management organizations in Morocco.

METHODS

To implement the TDABC method in medical oncology, we followed the model recommended by Kaplan and Porter [3] and described by Keel et al. [5] which represents 7 Steps of implementation of the TDABC method in healthcare services (Figure 1).

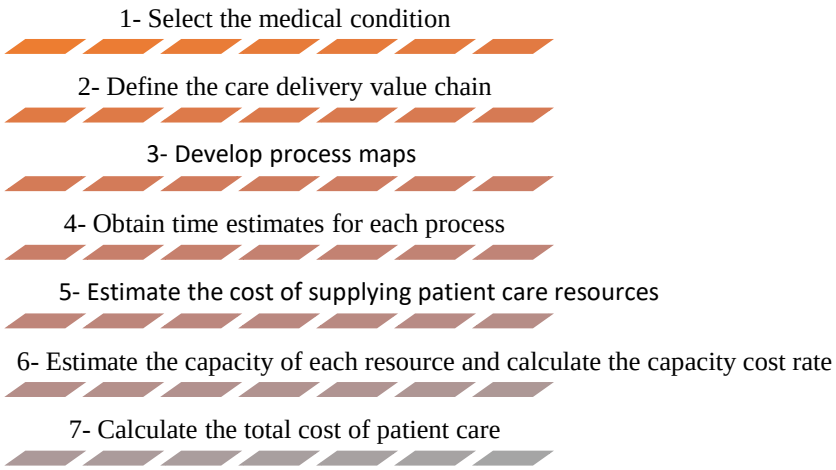

Figure 1 Steps of implementation of the TDABC method in healthcare services

Process maps were developed by direct observation of the activities carried out in one regional oncology center over a period of 3 months. The time taken to complete the tasks corresponds to the average time following twenty observations carried out. The financial data on the costs of the different resource groups concern the expenses incurred in the year 2022. The capacity cost rate (CCR) of each resource is calculated by determining the costs per unit of time:

Capacity cost rate = expenses attributable to the resource / resource capacity available in hours or minutes.

To calculate the unit cost of practical capacity Kaplan and Anderson [2] consider that practical capacity is equal to 80% of theoretical capacity. In Morocco, the statutory working time, set at 37.5 hours per week, in the civil service. The annual working time is determined as follows:

- number of working weeks: 48 (52-4 week of leave)
- annual number per hour of work: 48*37.5= 1800 h = 108000mn
- Deduction of practical capacity = 86400

The practical cost capacity of the different resource groups is presented as follows (Table 1):

Table 1 Practical cost capacity of different resource groups

Resource Group	Annual overall cost [a]	Number of minutes worked [b]	Number of minutes of work after deduction of practical capacity [c]= [b]* 80%	The unit cost of practical capacity in min [a]/[c]
Oncologist [12]	3.286.656 dh	1.296.000 min	1036,800 min	3.17 dh/min
Pharmacist [1]	254.880	108,000 min	86,400 min	2.95 dh/min
Nurse [18]	2,566,080 dh	1,944,000 min	1.555.200min	1.65 dh/min
Pharmacy technician	577,152 dh	432,000 min	345,600 min	1.67 dh/min
Nursing Assistant [8]	525.312dh	864,000 min	691,200 min	0.76 dh/min
Billing Agent [2]	169.344dh	216,000 min	172,800 min	0.98 dh/min
Hostess [4]	248.832dh	432,000 min	345,600 min	0.72 dh/min
Overhead Cost	2,670,196 dh	10,269,984 min	-	0.26 dh/min

RESULTS

The result of the study shows the adaptability of the TDABC method to the context of medical oncology. The cost analysis with TDABC highlighted the difference in terms of cost between the different chemotherapy procedures performed. The differences observed are mainly related to the duration of the preparation and administration of the chemotherapy protocol. We will limit ourselves to presenting the results associated with the anthracyclines

chemotherapy procedure (AC60). The costs of the other procedures require modifying the time parameters required to perform the tasks and activities of each chemotherapy protocol.

The total cost of a chemotherapy procedure without medication requires taking into consideration all the resources (direct and indirect costs), excluding chemotherapy drugs which are billed independently because they differ from one patient to another (nature of the drug, biological result and dosage of the drug). Generally, the information system-billing module charges drugs in a simple and direct manner to the invoice. Indeed, the reimbursement of health insurance in Morocco takes into consideration separately the procedure and the chemotherapy drug used.

The total cost of chemotherapy procedure (Table 4) is thus the sum of total cost of activities (Table 2) and the total cost of consumables used in the preparation and administration of the chemotherapy protocol (Table 3). Total cost of activities, which represents the sum of the costs of the different tasks. The cost of a task corresponds to the multiplication of the unit cost of the practical capacity of the resource group multiplied by the number of minutes to perform each task of the process map.

Table 2: Cost of tasks and activities

Activities and tasks	Resources	Unit cost of practical capacity [a]	Number of mn [b]	Cost of tasks [c]= [a]*[b]	Total cost of activities
[Y1] medical consultation and protocol validation					
Y1-1 Patient reception	Receptionist	0,72	5	3,6	
Y1-2 Patient registration	Billing agent	0,98	6	5,88	98,24
Y1-3 Medical consultation	Oncologist	3,17	21	66,57	
Y1-4 Protocol validation	Oncologist	3,17	7	22,19	
[Y2] Preparation of the chemotherapy product					
Y2-1 Verification of the protocol and preparation sheet	Pharmacist	2,95	12	35,4	64,39
Y2-2 Invoicing of the drug [SIH]	Billing Agent	0,98	2	1,96	
Y2-3 Preparation of the drug	Pharmacy Technician	1,67	13	21,71	
Y2-4 Release and transmission of the product	Nursing Assistant	0,76	7	5,32	
[Y3] Administration of the prescribed protocol					
Y3-1 installation of the patient	Nursing Assistant	0,76	6	4,56	126,66
Y3-2 Setting up an IV line	Nurse	1,65	14	23,1	
Y3-3 Administration of the chemotherapy product and monitoring of the treatment	Nurse	1,65	60	99	
Y3-4 Medical intervention [if necessary]	Oncologist				
[Y4] Preparation of the discharge note and allocation of other costs					
Y1-1 Preparation of the discharge note	Oncologist	3,17	5	15,85	
Y1-2 Validation of the invoicing	Billing Agent	0,98	4	3,92	61,89
Y1-2 Patient's passage in the oncology center [allocation of other costs]	Overhead	0,26	162	42,12	
			total	**351,18**	**351,18**

Table 3: Total cost of consumables used in the preparation and administration of the protocole

Consumables used in the AC(60) protocol:	Total cost
- Hubert g22 needle - 3-Way tap - Tubing with film - 10ml Syringe - Methyl prednisolone 120 - Onset 8mg cp - Glucose serum 5% 500ml -Salted serum 0.9% 250ml - Glucose serum 5% 100ml - Seringue 20ml - Surgical gloves NO.7 - Atarax 25 mg -Seringue 5ml -Compresse 10X10	116,77 dh

Table 4: Total cost of an act of chemotherapy

Total cost of activities (Table 2)	Cost of medical consumables used (Table 3)	Total cost of the act of chemotherapy (Case of AC60)
351,18 dh	116.77 dh	467,95 dh

DISCUSSION

This study is the first in Morocco to use the TDABC in medical oncology, and one of the few on an internal scale. The aim of implementing the TDABC method in oncology is to take into account the difference between chemotherapy protocols in order to ensure adequate pricing of oncology procedures and to ensure adequate and equitable reimbursement, thereby guaranteeing the financial prosperity of oncology centers.

In this regard, we have developed a methodology to illustrate the applicability of the TDABC method in medical oncology. The proposed model presents the accounting approach and describes the activities involved as well as the resources mobilized in the patient care process in public sector medical oncology structures. There are generally no major differences in terms of patient care processes in public sector oncology structures. However, it could be adapted and used in private sector centers and even in centers belonging to other organizations.

The results of this study show the adaptability of the TDABC method to the context of Moroccan oncology centers, in order to ensure adequate pricing of the various chemotherapy protocols.

In Morocco, according to our knowledge, only one study has been carried out to estimate the real cost of medical acts performed in medical oncology [1]. This study uses a top-down approach to allocate costs and determine an average cost for chemotherapy acts. The approach used can be considered more or less easy compared with the TDABC method, which uses a bottom-up approach. However, it does not take into account variations in the costs of different procedures, notably the time needed to carry out different protocols and the resources used. In addition, the TDABC method allows a better allocation of indirect costs by taking into consideration the duration of patient care. Indeed, indirect costs represent a significant part of healthcare costs, particularly energy costs [9].

Other studies have used the prices set by the National Health Insurance Agency and health (ANAM)as part of cost-of-illness medical-economic evaluations to value different resources and estimate the cost of cancer treatment, including chemotherapy [10]. However, the use of these prices does not reflect actual costs, since prices are set through negotiations between ANAM and health insurance management organizations [11].

In addition, internationally, TDABC is rarely applied in medical oncology. Most studies have focused on radiotherapy [7]. Although certain studies have applied the TDABC to calculate the full cost of a care trajectory, including chemotherapy. Admittedly, they determined an average chemotherapy cost without taking into account protocol variability. The example of the study by [12], who found that the cost of chemotherapy for breast cancer is $382 per visit. The cost obtained is 9 times higher than that found in this study. However, the result can be interpreted by the cost of resources mobilized in patient care in the United States. In other studies [13], the results do not distinguish between the cost of the chemotherapy procedure and the chemotherapy drug, whereas the cost of the latter can vary significantly depending on the dosage and nature of the drug.

The method can also be generalized to other national and international oncology centers. Thus, research perspectives will focus on the generalization of the study in other oncology centers.

Finally, some countries that are lagging behind in the development of costing systems can take advantage of this methodology, mainly to carry out cost studies and set appropriate tariffs, rather than limiting themselves to tariff negotiations and the price applied in other countries.

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