

CASE STUDY COST CALCULATION IN THE MEDICAL DENTAL SERVICES AREA

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Abstract: Based on the finding that dental offices do not apply cost calculation as an instrument of control and regulation of activity, we studied the possibility of applying costing methods for achieving this goal. Thus, we concluded that the GP method meets that requirement. In developing the cost calculation presented hereunder we start with the necessary technological and human resources and we made the specific calculus of the G.P. method. Analyzing the results we concluded that the GP calculation method allows the full and correct price calculation and fair allocation of costs for each category of works of the dental office. Also we concluded that G.P. method can be a useful tool to increase the efficiency of dental office activity because it allows determination of the investments.

JEL classification: M41, M52

Key words: cost, cost calculation

1. INTRODUCTION

Starting from the finding that at the level of medical dental offices the management accounting is not used, in order to use cost as a control and activity adjustment tool, we studied the possibility to apply a cost calculation to achieve the proposed objective.

2. OBJECTIVES

In this respect we reached the conclusion that the G.P. method is the most suitable for this type of activity. We are aiming to present a few essential aspects concerning the conception of this method below. We started from the following assumptions in the elaboration of the cost calculation:

The fixed assets required for the operation of the dental office (which will be found in the cost as amortisement) consists of:

- specialised equipment - patient chair, controlled by standard remote control: 2 turbine terminals, 1 micro-motor terminal, 1 scaling terminal, 2 spray air-water spray terminals (doctor + nurse), water heating, Multi-joined connected arm with locking control for the pneumatic arm, monitor arm, adjustable nurse console equipped with control panel, 2 aspiration systems, one normal and one surgical, Unit internal pipeline

disinfection system, possibility to adjust the pressure and the water for each terminal separately, electronic Control of the water running time into the glass and the sink, Glass mobile spit sink equipped with spit sink washer, dismantable and autoclavable with automatic movement or remote control, Multifunctional Pedal, programmable positions for the chair, adjustable sensor for the scialytic lamp, two-program Italian Reflector with a light intensity of 20000 lux, white, shadowless cold light; Doctor chair, nurse chair; Compressor and acoustic enclosure, dental scaler, endo motor, apex locator, dental medical instruments; non-specialised furniture for the office.

The specific operating space of the office and the utilities required for the operation belong to the company, but must be required by amortisation.

The human resources required for the operation of the office represent directly attributable costs and consist of: one dentist, one nurse.

The medical services provided to the clients taken into account for the substantiation of the costs are:

- dental extraction;
- photopolymerizable obturation;
- vital extirpation;
- vital extirpation;
- ultrasound scaling for the plaque removal.

3. METHODOLOGY

The For the determination of the production cost we used the G.P. method assuming that each of the 5 services provided is a separate product. The technological operations that are performed within each of the 5 types of services are the following: Dental extraction – The treatment includes:

1. Diagnosis based on an examination for the dental extraction;
2. Loco-regional anaesthesia;
3. Tooth extraction;
4. Post-extraction dressing.

Photopolymerizable obturation with high quality composite material (filling in the colour of the tooth) - The treatment includes:

1. Diagnosis based on an examination for the dental obturation;
2. Loco-regional anaesthesia;
3. Removing the damaged dentin and preparing the tooth for obturation;
4. Applying various substances (calcium hydroxide, liner etc), in case of need and according to the size of the cavity;
5. The actual obturation with high quality photopolymerizable composite (with a special ultraviolet light);
5. Polishing and finishing the obturation.

Vital extirpation (root channel treatment or removing the nerve) - The treatment includes:

1. Diagnosis based on an examination for channel treatment;
2. loco-regional anaesthesia;
3. Removing the cavity;
4. Removing the nerve and preparing the channels for channel obturation;
5. Antiseptic dressing.

Root channel obturation - The treatment includes:

1. Preparing the channel (washing with sodium hypochlorite, drying, etc.);

2. Actual root channel obturation;
3. Temporary dressing.

Ultrasound scaling for the plaque removal - The treatment includes:

1. Diagnosis based on an examination;
2. Contact anaesthesia;
3. Ultrasound scaling (special scaler for the removal of the plaque without damaging dental tissues);
4. Professional brushing with fluoride toothpaste.

4. ANALYSES

Starting from the technological operations we proceeded at defining the List of technological operations and indices, situation presented in Table no. 1. In close cooperation with the dentist, we set the list of the hourly indices for each of the technological operations mentioned in order to distribute attributable costs, situation presented in Table no. 2, with the following explanations:

1. the staff wages costs, the related contributions to the budget are indirect expenses;
2. the electricity and water consumption is a direct cost – the technological consumption the dental installation;
3. the consumable costs are set according to the number of patients ;
4. tangible asset depreciation costs are distributed according to the hours of operation of the equipment. For the determination of the base product or of the base item which should be the G.P. –and the determination of the related costs – the benchmark underlying the determination of the equivalence indices related to each operation and each product, we chose the Photopolymerizable obturation, because it cumulates most of the operations. The calculation of the base index is presented in Table 3, the resulted base index (a G.P.) is 0.91. Starting from the level of the base index we determined the hourly equivalence indices for each technological operation (GPs on operations), the situation is presented in Table no. 4. Starting from the level of the GPs set for each operation we calculated the GP on provided services. Within this operation, we took into account the elements underlying the determination of the costs corresponding to each phase (operations) of the technological process and for the determination of the attributable costs and if the distribution criteria.

In order to determine the equivalence indices, we took into account the fact that the Volume of scheduled works (the monthly scheduled quantities q_0) represent the monthly average of the number of works scheduled through the Critical Annual schedule of the Office, the document that substantiates the minimum volume of works to be performed in order to cover the fixed and variable costs.

Name of the works	Average volume of monthly performed works
Dental extraction	20
Photopolymerizable obturation	20
Vital extirpation	30
Root channel obturation	30
Ultrasound scaling for the plaque removal	20

The GP calculation as well as the cost per unit for each service were performed by changing the volume of works executed in conventional units (Q) by means of the equivalence indices. The partially determined equivalence indices (G.P.p) and the volume of the works performed in equivalent units (G.P. Q_e) are presented in Tables no. 5 and no.

6 respectively. The calculation of the processing costs per physical unit of equivalent work performed was determined by weighing the equivalent quantity of each work with the cost per GP unit and then by reference to the quantity of the works performed in physical units (Table no.7). The calculation of the cost per work unit was determined by adding to the processing cost per each physical unit of the unit costs with the raw materials and direct materials spent, by taking over the recorded accounting data – the unit costs for raw materials and direct materials used to obtain the unit cost for each type of work. (Table no. 8). Following the calculations performed using the GP method the following costs were obtained for each category of work:

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It. no.	Name of the work performed	Cost per unit of work
1	Dental extraction	100
2	Photopolymerizable obturation	160
3	Vital extirpation	110
4	Root channel obturation	80
5	Ultrasound scaling for the plaque removal	100

Source: CASE STUDY G.P. METHOD Ph.D. Candidate CONSTANTIN CAMELIA COST CALCULATION IN THE MEDICAL DENTAL SERVICES AREA The University of Craiova

1. List of operations specific to the provided medical dental services. For the determination of the costs we started with the definition of the technological operations that are executed by the dentist within each of the 5 types of medical services provided to the clients, which operations are presented in the Table below

Table no. 1

	Name of the operation	Dental extraction	Photopolymerizable obturation	Vital extirpation	Vital extirpation	Ultrasound scaling for the plaque removal
1	Diagnosis based on an examination for the dental extraction	6	5	4	-	5
2	Loco-regional or contact anaesthesia	4	4	4	-	4
3	tooth extraction	3	-	-	-	-
4	Removing the damaged dentin and preparing the tooth for obturation	-	5	-	-	-
5	Applying various substances (calcium hydroxide, liner etc), in case of need and according to the size of the cavity.	-	4	-	-	-

6	The actual obturation with high quality photopolymerizable composite (with a special ultraviolet light)	-	2	-	4	-
7	Polishing and finishing the obturation	-	5	-	-	-
8	Removing the cavity	-	-	4	-	-
9	Removing the nerve and preparing the channels for channel obturation	-	-	3	-	-
10	Preparing the channel (washing with sodium hypochlorite, drying, etc.);	-	-	-	5	-
11	Ultrasound scaling (special scaler for the removal of the plaque without damaging dental tissues);	-	-	-	-	3
12	Professional brushing with fluoride toothpaste	-	-	-	-	4
13	Antiseptic dressing	6	-	5	5	-

Hourly indices are set separately for each operation. The hourly index represents all the attributable costs scheduled for each operation.

Table no. 2 The determination of hourly indices

Sl. no.	Attributable cost items	Hourly attributable scheduled costs												
		Op1	Op2	Op3	Op4	Op5	Op6	Op7	Op8	Op9	Op10	Op11	Op12	Op13
1	Direct and indirect wages costs	2	2.5	1.5	1.25	1.75	1.25	1.35	1	1.20	1.30	1.10	1.65	1.80
2	Insurance costs, welfare costs and other similar costs	0.55	0.69	0.41	0.34	0.48	0.34	0.37	0.27	0.33	0.36	0.30	0.46	0.50

3	Electricity costs	-	0.40	0.35	0.27	-	0.27	0.30	0.45	0.25	0.38	0.42	0.27	-
4	Tangible assets depreciation costs	0.46	0.30	0.67	0.08	0.40	0.35	0.43	0.37	0.42	0.10	0.15	0.20	0.23
5	Costs of raw materials and consumables	-	0.50	-	-	0.70	0.30	0.60	-	-	0.60	0.45	0.35	0.40

The selection of the base product or of the base item which should be the G.P. and the determination of the related costs. Due to the fact that GP is the benchmark underlying the determination of the equivalence indices related to each operation and each product, we chose the Photopolymerizable obturation, because it cumulates most of the operations.

Table no. 3 Calculation of the base index

It. no.	Operations	Attributable costs on operations	Monthly scheduled production	Attributable hourly scheduled costs on product unit
1	Diagnosis based on an examination	3.01	70	0.04
2	Loco-regional or contact anaesthesia	4.39	70	0.06
3	Tooth extraction	2.93	20	0.15
4	Removing the damaged dentin and preparing the tooth for obturation	1.94	40	0.05
5	Applying various substances (calcium hydroxide, liner etc), in case of need and according to the size of the cavity. .	3.33	40	0.08
6	The actual obturation with high quality photopolymerizable composite (with a special ultraviolet light)	2.51	50	0.05
7	Polishing and finishing the obturation	3.05	40	0.08
8	Removing the cavity	2.09	30	0.07
9	Removing the nerve and preparing the channels for channel obturation	2.2	30	0.07
10	Preparing the channel (washing with sodium hypochlorite, drying, etc.);	2.74	30	0.09
11	Ultrasound scaling (special scaler for the removal of the plaque without damaging dental tissues);	2.42	40	0.06
12	Professional brushing with fluoride toothpaste	2,93	40	0.07
13	Antiseptic dressing	2,93	80	0,04

0.91 Therefore, the base index is 0.91 and will be the equivalent of one GP.

The calculation of the hourly equivalence indices for each operation (GPs on operations)

Table 4

It. no..	Operations	Total attributable costs scheduled on operations	Base index lb =GP (lei)	GPs on operations
1	Diagnosis based on an examination	3.01	0.91	3.31
2	Loco-regional or contact anaesthesia	4.39	0.91	4.82
3	Tooth extraction	2.93	0.91	3.22
4	Removing the damaged dentin and preparing the tooth for obturation	1.94	0.91	2.13
5	Applying various substances (calcium hydroxide, liner etc), in case of need and according to the size of the cavity. .	3.33	0.91	3.66
6	The actual obturation with high quality photopolymerizable composite (with a special ultraviolet light)	2.51	0.91	2.76
7	Polishing and finishing the obturation	3.05	0.91	3.35
8	Removing the cavity	2.09	0.91	2.30
9	Removing the nerve and preparing the channels for channel obturation	2.2	0.91	2.42
10	Preparing the channel (washing with sodium hypochlorite, drying, etc.);	2.74	0.91	3.01
11	Ultrasound scaling (special scaler for the removal of the plaque without damaging dental tissues);	2.42	0.91	2.66
12	Professional brushing with fluoride toothpaste	2.93	0.91	3.22
13	Antiseptic dressing	2.93	0.91	3.22

The calculation of GPs on categories of works. It is made through the determination of the items underlying the costs related to each operation of the technological process, determining the attributable costs and the distribution criteria.

Table 5

It. no..	Name of the product and of the operation	GPs on operations (C0)	Monthly scheduled quantities (q0)	Partial equivalence indices (G.P.p)
1	Dental extraction			
	Diagnosis based on an examination for the dental extraction	3.31	6	0.5517
	loco-regional anaesthesia	4.82	4	1.2050
	tooth extraction	3.22	3	1.0733
	post-extraction dressing	3.22	6	0.5367
	TOTAL GP FOR EXTRACTION			3.3667

2	Photopolymerizable obturation			
	Diagnosis based on an examination for the dental obturation	3.31	5	0.6620
	loco-regional anaesthesia	4.82	4	1.2050
	Removing the damaged dentin and preparing the tooth for obturation	2.13	5	0.4260
	Applying various substances (calcium hydroxide, liner etc), in case of need and according to the size of the cavity	3.66	4	0.9150
	The actual obturation with high quality photopolymerizable composite (with a special ultraviolet light)	2.76	2	1.3800
	Polishing and finishing the obturation	3.35	5	0.6700
	TOTAL GP FOR PHOTOPOLYMERIZABLE OBTURATION			5.258
3	Vital extirpation			
	Diagnosis based on an examination for channel treatment	3.31	4	0.8275
	loco-regional anaesthesia	4.82	4	1.2050
	Removing the cavity	2.30	4	0.5750
	Removing the nerve and preparing the channels for channel obturation	2.42	3	0.8067
	Antiseptic dressing	3.22	5	0.6440
	TOTAL GP FOR EXTIRPATION			4.0582
4	Root channel obturation			
	Preparing the channel (washing with sodium hypochlorite, drying, etc.)	2.76	4	0.6900
	Actual root channel obturation	3.01	5	0.6020
	Temporary dressing	3.22	5	0.6440
	TOTAL GP FOR CHANNEL OBTURATION			1.936
5	Ultrasound scaling for the plaque removal			
	Diagnosis based on an examination	3.31	5	0.6620
	Contact anaesthesia	4.82	4	1.2050
	Ultrasound scaling (special scaler for the removal of the plaque without damaging dental tissues)	2.66	3	0.8867
	Professional brushing with fluoride toothpaste	3.22	4	0.8050

	TOTAL GP FOR ULTRASOUND SCALING			3.5587
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Calculation of the production obtained in conventional units

The GP calculation as well as the cost per unit require, both the homogenization of the production of a period by changing it into physical units (q), in conventional units (Q) by means of the total equivalence indices on product unit.

Table 6

It. no..	Name of the performed works	Volume of works performed during a month	Total no. of GPs per work unit	Volume of works performed in G.P. units (Qe)
1	Dental extraction	20	3.3667	67.33
2	Photopolymerizable obturation	20	5.258	105.16
3	Vital extirpation	30	4.0582	121.75
4	Root channel obturation	30	1.936	58.08
5	Ultrasound scaling for the plaque removal	20	3.5587	71.17
	TOTAL			423.49

The calculation of the processing costs per physical unit of performed work

It is made by weighing the equivalent quantity of each work with the cost per GP unit and then by reference to the quantity of the works performed in physical units.

Table no. 7

It. no..	Name of the performed works	Equivalent quantity (Qe)	Cost per G.P. unit	Total processing costs per work unit	Quantities manufactured during the month (Qi)	Work execution cost (CUpi)
1	Dental extraction	67.33	25.7	1732	20	86.60
2	Photopolymerizable obturation	105.16	25.7	2700	20	135
3	Vital extirpation	121.75	25.7	3129	30	104.3
4	Root channel obturation	58.08	25.7	1493	30	49.77
5	Ultrasound scaling for the plaque removal	71.17	25.7	1829	20	91.45
	TOTAL	423.49	-	10883	-	-

The calculation of the unit cost per work unit

For this the processing cost per each physical unit is added to the unit costs with the raw materials and direct materials spent. By processing the accounting data recorded and the unit costs for raw materials and direct materials used for obtaining the five works executed we obtain the unit cost for each type of work.

Table no. 8

It. no.	Name of the performed works	Raw material and direct material	Total execution costs per work	TOTAL COSTS	Quantities manufactured	Cost per work unit
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		costs				
1	Dental extraction	268	1732	2000	20	100
2	Photopolymerizable obturation	500	2700	3200	20	160
3	Vital extirpation	171	3129	3300	30	110
4	Root channel obturation	907	1493	2400	30	80
5	Ultrasound scaling for the plaque removal	171	1829	2000	20	100
	TOTAL	2017	10883	-	-	-

5. CONCLUSIONS

The G.P. calculation method allows for the correct substantiation of the price of the services provided to the clients by the dental office, providing the sensible distribution of the costs on each category of services. The G.P. method can also be a useful tool for the increase of the efficiency of the office's activity, because it allows for the determination of the break even point in the case of investments, changes in the level of costs or developing (increasing) the portfolio of provided services. In this case, the volume of works scheduled on the 5 categories of services provided to the clients ensures the appropriate coverage of the generated costs and corresponds to the break even point, and any work performed above this level generates profit.

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