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Units of Labor input of Orthopedists during Consultation for Implants. Fixed Restorations

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Abstract. Implant-supported fixed restorations are widely used in practice with the aim of prosthetic rehabilitation of edentulous patients; however, in Ukraine, the aforementioned methods are currently not completely lawful due to the absence of departmental standards of time needed for orthopedists to manufacture such types of dentures.

In prosthetic dentistry, labor inputs are determined based on the average standard working time for professionals that not always correspond to the actual time expenditures which must be taken into consideration when determining the appropriate units of labor input.

The objective of the research was to determine the units of labor input of orthopedists to manufacture implant-supported fixed restorations.

Materials and methods. The object of the research involved clinical processes of manufacturing implant-supported fixed restorations. The units of labor input were determined based on the average time standards obtained in the result of timing measurements of clinical processes of providing appropriate care.

The conversion of the obtained time standards (TS) to the units of labor input (ULI) was performed according to the formula:

$$ULI = \frac{Tts}{\text{where T1uli.}},$$

Results and discussion. Clinical processes of manufacturing 69 single implant-supported restorations by 15 orthopedists were studied. There were manufactured 13 crowns with screw-retained solid abutments, 21 crowns with screw-retained abutments, 17 single abutments, 18 screw-retained crowns with burn-out plastic abutments or abutments with a platform for attaching and pressing.

In addition, the work of 18 orthopedists who manufactured 30 implant-supported bridges including 8 prosthetic dentures with screw-retained solid abutments, 10 prosthetic dentures with screw-retained abutments, 12 screw-retained dentures with burn-out plastic abutments or abutments with a platform for attaching and pressing was investigated and timed.

The results of the research showed that the initial values of the labor input indicators when manufacturing single implant-supported fixed restorations were within the range of 1.5-1.5 ULI (the average values) and 3.3-3.5 ULI (the actual values) depending on the prosthetic construction. When manufacturing implant-supported bridges, the indicators were as follows: the average values – 2.1-2.3 ULI, the actual values – 3.6-3.9 ULI depending on the prosthetic construction as well.

Conclusions. The results obtained due to timing measurements of clinical processes of manufacturing implant-supported fixed restorations, their analysis as well as the calculations of the standard time showed that the units of labor input of orthopedists determined on the basis of the average time standards did not coincide with the units of labor input of manufacturing these prostheses determined on the basis of the actual time standards.

Keywords. Units of labor input, implants, fixed restorations.

Problem statement and analysis of the recent research

The use of dental implants in daily practice of an orthopedist provides an opportunity to partially solve the problem of the need for orthopedic care in Ukraine which constitutes 58.0-84.9% depending on medical-geographical observation regions [1, 2, 3].

Unfortunately, such methods of prosthetic rehabilitation are currently not completely lawful in our country being not approved by the appropriate Orders of the Ministry of Health of Ukraine that does not permit to implement such methods of treatment, especially in public health facilities [4, 5].

The presence of departmental standards of time needed for orthopedists to carry out some orthopedic manipulations with the aim of objective determination of their labor inputs is one of the mandatory conditions dental implantology needs to become lawful in our country [6].

Implant-supported fixed restorations are the most common types of prosthetic rehabilitation using dental implants. They differ in the methods of implant fixation - cement fixation and screw retention as well as in the type of the material - cobalt-chromium alloy, metal ceramics, metal composite, metal plastic, ceramics, plastic [7, 8, 9, 10].

In prosthetic dentistry, labor inputs are determined based on the average standard working time for professionals that not always correspond to the actual time expenditures which must be taken into consideration when determining the appropriate units of labor input (ULI) [11, 12].

The objective of the research was to determine the ULI of orthopedists to manufacture implant-supported fixed restorations.

Materials and methods

The object of the research involved clinical processes of manufacturing implant-supported fixed restorations.

The subject of the research involved the structure, sequence, duration as well as the extent of clinical stages of providing appropriate orthopedic care.

The methods of the research included:

- analytical method – to determine the structure and nature of labor input of an orthopedist when manufacturing implant-supported fixed restorations;
- timing – to determine the total duration of the respective clinical stages of manufacturing implant-supported fixed restorations;
- mathematical method – to determine the value of the ULI of orthopedists when manufacturing implant-supported fixed restorations;
- statistical method – to process the results of the research.

In Ukraine, to determine the ULI of orthopedists when manufacturing implant-supported fixed restorations, the method of determining labor inputs in prosthetic dentistry modified by V.A. Labunets (1999) and approved by the Ministry of Health of Ukraine is used [13]. According to it, the ULI are determined based on the average time standards obtained in the result of timing measurements of clinical processes of providing appropriate care. The conversion of the obtained time standards (TS) to the ULI is performed according to the formula:

$$ULI = \frac{Tst}{T1uli.},$$

Where:

ULI – the value of the units of labor input expressed in absolute numbers;

Tst – the value of time standard in minutes;

T1uli – the value of time 1 ULI in minutes.

The values of Tst and T1uli should be presented in the uniform units of measurements.

The value of T1uli is chosen conventionally; it is equivalent to the objective amount of time needed to manufacture a master model. In our case, it equaled to 60 minutes, that was the time needed to manufacture one conventional swaged crown.

Results and discussion

Timing measurements of clinical stages of manufacturing implant-supported fixed restorations by orthopedists were performed at the dental care institutions of various forms of ownership in Odesa, Kyiv, Mykolaiv, Cherkasy, Simferopol, Ivano-Frankivsk and Dnipro during the period 2010-2016.

Clinical processes of manufacturing 69 single implant-supported restorations by 15 orthopedists were studied. There were manufactured 13 crowns with screw-retained solid abutments, 21 crowns with screw-retained abutments, 17 single abutments, 18 screw-retained crowns with burn-out plastic abutments or abutments with a platform for attaching and pressing.

In addition, the work of 18 orthopedists who manufactured 30 implant-supported bridges including 8 prosthetic dentures with screw-retained solid abutments, 10 prosthetic dentures with screw-retained abutments, 12 screw-retained dentures with burn-out plastic abutments or abutments with a platform for attaching and pressing was investigated and timed.

The obtained results were recorded in a specially developed "Chart of timing measurements" and indexed in accordance with the approved method of establishing labor inputs in prosthetic dentistry for constant time expenditures (Tc) which do not depend on the prosthetic construction and the number of prostheses as well as for changeable recurrent time expenditures (Tcr) which completely depend on the aforementioned factors. The sum of this indicators was the time standard being determined using the unified formula:

TS = Tc + N Ч Tcr, where

TS - time standard needed by a professional to manufacture a prosthetic restoration;

Tc - constant time expenditures;

Tcr - changeable recurrent time expenditures;

N – the number of prosthetic restorations of the same construction.

The official method of establishing labor inputs in prosthetic dentistry involves the determination of the ULI of orthopedists based on the average TS of their work. The calculation of labor inputs based on the average TS as well as the actual indicators of the duration of clinical processes was presented through the example of the process of manufacturing from 1 to 8 individual abutments for one patient.

According to the obtained data, when manufacturing an individual abutment with plastic preform, constant time expenditures of an orthopedist constituted 127.23 min, while changeable recurrent time expenditures were 14.77 min. Thus, the values of the standard time for manufacturing the required number of individual abutments for one patient were as follows:

TS for manufacturing an individual abutment = Tc + the number of abutments × Tcr

TS for manufacturing 1 individual abutment = 127.23 min + 1 abutment × 14.77 min = 142.0 min (the average TS for 1 abutment – 142.0 min);

TS for manufacturing 2 individual abutments = 127.23 min + 2 abutments × 156.77 min = 156.77 min (the average TS for 1 abutment – 78.3 min);

TS for manufacturing 3 individual abutments = 127.23 min + 3 abutments × 14.77 min = 171.54 min (the average TS for 1 abutment – 57.18 min);

TS for manufacturing 4 individual abutments = 127.23 min + 4 abutments × 14.77 min = 186.31 min (the average TS for 1 abutment – 46.6 min);

TS for manufacturing 5 individual abutments = 127.23 min + 5 abutments × 14.77 = 201.08 min (the average TS for 1 abutment – 40.21 min);

TS for manufacturing 6 individual abutments = 127.23 min + 6 abutments × 14.77 min = 215.85 min (the average TS for 1 abutment – 36.0 min);

TS for manufacturing 7 individual abutments = 127.23 min + 7 abutments × 14.77 min = 230.62 min (the average TS for 1 abutment – 33.0 min);

TS for manufacturing 8 individual abutments = 127.23 min + 8 abutments × 14.77 min = 245.39 min (the average TS for 1 abutment – 30.7 min)

Then, according to the official method, there was calculated the weighted arithmetic mean which was considered as the average TS for manufacturing an individual abutment: (142.0 min + 78.3 min + 57.18 min + 46.6 min + 40.21 min + 36.0 min + 33.0 min + 30.7 min) ÷ 8 = 463.99 min ÷ 8 = 58.0 min.

Table 1. Duration of manufacturing individual abutments by an orthopedist according to the average and actual time standards

No	Type of dental prostheses	Conventional number of prosthetic restorations in one patient	Average time standard (minutes)	Actual time standard (minutes)
1	Individual abutment	1	58.0	142.00
		2	116.0	156.77
		3	174.0	171.54
		4	232.0	186.31
		5	290.0	201.08
		6	348.0	215.85
		7	406.0	230.62
		8	464.0	245.39
	Stage of change		58.0	14.77

However, when calculating time standards of orthopedists' work according to this average index we have found that they did not correspond to the actual time expenditures; the average TS were lower than the actual data or equaled to them when manufacturing 1-3 abutments while they significantly exceeded them when manufacturing 4-8 abutments (Table 1).

Similar situation was observed when manufacturing all the other types of implant-supported fixed restorations. Thus, the calculations of the ULI indicators when manufacturing the aforementioned types of prostheses by orthopedists based on the average and actual indicators produced the following results (Table 2, 3).

Table 2. ULI of an orthopedist when manufacturing single implant-supported restorations according to the average and actual time standards

No	Type of dental prostheses	Conventional number of prosthetic restorations in one patient	Conventional average time standard (ULI)	Actual time standard (ULI)
1	Cemented crown with screw-retained solid abutment	1	1.5	3.3
		2	3.0	3.8
		3	4.5	4.3
		4	6.0	4.8
		5	7.5	5.3
		6	9.0	5.8
		7	10.5	6.3
		8	12.0	6.8
	Stage of change		1.5	0.5
2	Cemented crown with screw-retained abutment	1	1.6	3.5
		2	3.2	4.1
		3	4.8	4.7
		4	6.4	5.3
		5	8.0	5.9
		6	9.6	6.5
		7	11.2	7.1
		8	12.8	7.8
	Stage of change		1.6	0.6
3	Screw-retained crown with burn-out plastic abutment or abutment with a platform for attaching and pressing	1	1.6	3.5
		2	3.2	4.2
		3	4.8	4.9
		4	6.4	5.5
		5	8.0	6.2
		6	9.6	6.8
		7	11.2	7.5
		8	12.8	8.1
	Stage of change		1.6	0.65

Table 3. ULI of an orthopedist when manufacturing implant-supported bridges according to the average and actual time standards

No	Type of dental prostheses	Number of prosthetic bridge abutments	Conventional average time standard (ULI)	Actual time standard (ULI)
1	Cemented bridge with screw-retained solid abutments	2	2.1	3.6
		3	3.2	4.0
		4	4.3	4.4
		5	5.4	4.8
		6	6.5	5.2
		7	7.6	5.6
		8	8.7	6.0
	Stage of change (for an abutment)		1.1	0.4
2	Cemented bridge with screw-retained abutments	2	2.5	3.9
		3	3.7	4.4
		4	4.9	4.9
		5	6.1	5.4
		6	7.3	5.9
		7	8.5	6.4
		8	9.7	6.9
	Stage of change (for an abutment)		1.2	0.5
3	Temporary implant-supported cemented bridge	2	2.1	3.4
		3	3.1	3.8
		4	4.1	4.2
		5	5.2	4.6
		6	6.2	5.0
		7	7.2	5.4
		8	8.3	5.8
	Stage of change (for an abutment)		1.0	0.4
4	Screw-retained bridge with burn-out plastic abutments or abutments with a platform for attaching and pressing	2	2.3	3.8
		3	3.5	4.3
		4	4.7	4.8
		5	5.9	5.3
		6	7.1	5.8
		7	8.3	6.3
		8	9.5	6.8
	Stage of change (for an abutment)		1.2	0.5

When determining time standards for manufacturing single fixed restorations the restorations themselves are considered, while when determining time standards for manufacturing bridge prostheses the number of prosthetic abutments are taken into account since labor inputs of orthopedists when working with prosthetic pontic are insignificant and they can my easily distributed to manufacture prosthetic abutments.

An important indicator for determining the labor inputs of manufacturing implant-supported fixed restorations is the "stage of change" – a certain value of the difference of standard indicators of the process when changing the amount (not the quality) of the input data. In our case, when determining the average ULI, it equaled to the average indicator of labor inputs of manufacturing one prosthetic restoration and when determining the ULI using the actual TS, it equaled to the labor equivalent of changeable recurrent time expenditures of an orthopedist to manufacture implant-supported fixed restorations.

Conclusions

The results obtained due to timing measurements of clinical processes of manufacturing implant-supported fixed restorations, their analysis as well as the calculations of the standard time showed that the ULI of orthopedists determined on the basis of the average TS did not coincide with the ULI of manufacturing these prostheses determined on the basis of the actual TS.

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