



# Pricing and Phasing of *In Vitro* Fertilization Services in Republic of Macedonia

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## Abstract

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**BACKGROUND:** In vitro fertilization (IVF) services in Republic of Macedonia are mainly provided in private hospitals. The expenses for this service are covered by the health insurance fund (HIF), by issuance of a voucher to the patients. One voucher is for one IVF cycle. Price of the voucher was determined in 2012 and specified protocols for provision of the service were set. Since then, the price was not revised or adjusted.

**AIM:** Objective of this research is to adjust the price for IVF services in the country, based on existing national protocols and in accordance to the realistic costs.

**METHODS:** Data from RE-MEDIKA's electronic system for patients' medical information (BIRPIS) were extracted. Information was related to patients who undergo the procedure covered by the HIF - voucher. For defining direct costs, internal data from the hospital were used and adjusted. For defining indirect costs, data for overhead expenditures of the hospital were adjusted. Description of costs was made in accordance with the national protocol for IVF. Tables (excel spread sheets) used for the calculation are developed by the HIF.

**RESULTS:** The process of IVF was divided in three consecutive phases: Phase 1 – induction, Phase 2 – fertilization, and Phase 3 – embryo transfer (ET). Each phase was priced accordingly. If all three phases are finished and ET is performed, the final full price for one IVF cycle – voucher is about 104,000 Macedonian denars (about 1,700 Euros).

**CONCLUSION:** We suggest introducing of phasing for the IVF process related to payment per phases' finalization, where the next phase follows consequently. This phasing enables the patients to understand the procedures and the progress of the process; enables doctors to follow-up the finalization and successfulness of the procedure; and gives the payer (buyer of the service, HIF) complete overview of the procedure and payment for each phase separately. Thus, success or failure of the entire process in specific phases can be monitored and evaluated.

## Introduction

*In vitro* fertilization (IVF) is a type of assisted reproductive technology used for the treatment of infertility and gestational surrogacy. The first successful IVF was undertaken in 1977, and the first child born out of IVF was in July 1978 (the first baby from glass). In 1980s, first program for infertile patients was developed. In the past 40 years, the program for the treatment of infertility was improved and adjusted to the modern requirements of the population (couples, women, men). Rapid developments in technology and medicine make this procedure nowadays almost a routine one.

In Macedonia, there are about 1500 assisted reproductive procedures per year [1]. The procedure is performed in eight medical institutions and financially covered by the national insurance, health insurance fund (HIF) [2]. The procedure itself

is well defined in terms of specific protocols [3] to be used and followed by medical teams, which are nominated in each institution. For this purpose, HIF has signed contracts with the medical institutions, with specified medical teams for performance of the IVF procedure.

The protocol and the price for IVF (issuance of the voucher) were defined by the HIF in 2012 and have not been revised or adjusted since. One voucher financially covers the entire cycle of IVF, not taking into account if the process was finished (embryo transfer [ET] was made) or partial (only stimulation was performed). Therefore, HIF and the providers follow-up if the final outcome of IVF process was successful or not.

The main objective of this study is to propose phasing of the IVF procedure and new price for the service. The price is calculated in accordance to the real costs and in accordance with prices of the same service in the region.

## Materials and Methods

For calculation of the price of IVF as a complete health service, we used the following protocol:

1. Defining of the objective of the service (services)
2. Defining of the scope of the service (services)
3. Selecting costing methodology
4. Defining data tools/templates
5. Defining sampling criteria and sampling
6. Data sources, collection, and verification
7. Data analysis and validation
8. Calculation.

The objective of this study is to calculate the current price for IVF service and remodel the structure of the price. IVF health service has been defined as a complex one, including three consequently connected phases in its full realization. The following phases were described:

1. Phase 1, the stimulation of follicles' grow and maturation
2. Phase 2, collection of mature follicles and IVF/ ICSI procedure
3. Phase 3, ET.

In accordance to the costing process, we selected bottom-up costing methodology. Templates used for calculation are the ones developed by the HIF, as baseline templates for calculation of costs for health services in hospital settings. Data used were exported from RE-MEDIKA's electronic system for patients' medical information (BIRPIS), which is the hospital's central database. Data extracted were for patients who undergo the procedure covered by the HIF (voucher). Costs were defined as "the actual costs of providing services related to the delivery of health care, including the costs of procedures, therapies, and medications" (National Center on Health Services Research and Health Care Technology). Costs were divided in two major categories: Direct costs and indirect costs. Direct costs were defined as costs that are directly attributable to patient care (medical personnel services, nursing services, drugs, medical supplies, and diagnostic imaging). Indirect costs were costs that are not directly related to patient care (general administration, health records, information technology, physical plant and maintenance, capital expenses, and other regional services). Thus, full costs are presented as direct costs plus indirect costs.

For the purposes of calculation of the costs for IVF, we used the protocol for IVF procedure as a baseline. This protocol is official and developed by the HIF and Ministry of Health as shown in Table 1.

**Table 1: Protocol for IVF (Form 4-1)**

Type of service and medical consumables	Quantity
Application of short-term i.v. anesthesia	1
Echsonographic follicle puncture	1
<i>In vitro</i> /ICSI (including additional processing of the biological material)	1
ET	1

IVF: *In vitro* fertilization, ET: Embryo transfer.

For defining direct costs, we used and adjusted internal data from the hospital. For defining indirect costs, data for overhead expenditures of the hospital were adjusted.

## Results

IVF process is divided in three phases: Phase 1 – induction, Phase 2 – fertilization, and Phase 3 – ET. Prices are calculated for each phase separately.

### Phase 1 (induction)

Phase 1 is the process of stimulation of follicles. According to the protocol, Phase 1 starts with initiation of the stimulation and ends with presentation of mature follicles. The process itself approximately lasts for about 2 weeks. Calculation of the costs for Phase 1 is presented in Table 2.

**Table 2: Calculation of costs for Phase 1**

No.	Description of the procedure	Total (EUR)
1	Ovarian stimulation and monitoring	57,00
2	Folliculometry	26,00
3	Medications (drugs)	715,00
4	Medical consumables	162,00
5	Utility costs	63,00
6	Maintenance costs	5,00
7	Administrative costs (5%)	49,00
	Total	1.077,00

### Phase 2 (fertilization)

Phase 2 starts when it is documented that follicles are mature and well grown. The process starts with collection of grown mature oocytes and their fertilization in the laboratory. With successful fertilization, embryos are cultivated and grow in ideal conditions. This process takes several days. Calculation of costs for Phase 2 is presented in Table 3.

**Table 3: Calculation of costs for Phase 2**

No.	Description of the procedure	TOTAL (EUR)
1	Collection of mature oocytes	52,00
2	Embryological procedure	6
3	Collection and preparation of semen material	17,00
4	Fertilization	26,00
5	Cultivation of the fertilized material	9
6	Embryo grown	45,00
7	Utility costs	187,00
8	Maintenance costs	16,00
9	Laboratory costs	49,00
10	Medical consumables	42,00
	Total	449,00

### Phase 3 (ET)

Phase 3 is the process of ET, where grown embryos are planted in the womb. This procedure takes about 1 h. Calculation of costs for Phase 3 is presented in Table 4.

**Table 4: Calculation of costs for Phase 3**

No.	Description of the procedure	Total (MKD)
1	ET	54,00
2	Ultrasound	9,00
3	Utility costs	33,00
4	Maintenance costs	3,00
5	Medical consumables	49,00
6	Hormonal status analysis	9,00
	Total	157,00

ET: Embryo transfer.

In the final calculation (Table 5), all costs are presented, according to the requirements of the structure of the costs by the national payer HIF.

**Table 5: Final calculation of IVF procedure**

Final calculation for IVF	Amount (in EUR)
Medications (drugs)	715,00
Medical consumables	252,00
Work of personnel	310,00
Utility costs	283,00
Maintenance costs	25,00
Laboratory costs	49,00
Administrative costs (5% in Phase 1)	49,00
Total	1.683,00

## Discussion

The current price of IVF service which is covered by the HIF is 80,000 MKD, about 1300 Euros. The price was set in 2012 and has not been revised since. All direct costs (medications, medical consumables, and work of personnel) have been increased in the past 10 years. Development of new improved medical technologies brought as well increased laboratory costs [4]. Indirect costs are different in each setting, but have shown increase in our data (for 2015–2019). For Phase 1, there is additional administrative cost of 5% of all costs of the same phase which has not been taken into consideration in the previous calculations. This is cost for psychological assessment and legal counseling for the couple before starting of the procedure.

The structure of the costs is presented in Table 6.

**Table 6: Structure of costs for IVF**

Expenditure	Amount (EUR)	Total costs	% of Total costs	% of (1) and (2) costs
Direct costs (1)		1.326,00	78,79	100,00
Medications (drugs)	715		42,48	53,92
Medical consumables	252		14,97	19,00
Work of personnel	310		18,42	23,38
Laboratory costs	49		2,91	3,70
Indirect costs (2)		357,00	21,21	100,00
Utility costs	283		16,82	79,27
Maintenance costs	25		1,49	7,00
Admin costs (5% in Phase 1)	49		2,91	13,73
	Total costs	1.683,00		

The structure of the costs shows that about 79% of all costs are direct and 21% are indirect, and there is no “overpricing” for neither direct or indirect costs. Any additional tariff for adjustment of the price (in form of profit or adjustments to PPP) has not been calculated (4). The price of one voucher covers the entire protocol for IVF. HIF reimburses the hospital where the procedure of IVF was performed the full amount of the voucher. This means that there is no difference if the process of IVF was only initiated, half way done, or finalized. For statistical reasons, HIF obtains only information if the final outcome of the IVF process was successful.

If “phasing” of the procedure is applied, then monitoring of the process can be made. For each IVF procedure, the payer can monitor which process was successfully finalized and in accordance with the success, paid. For partial success, only Phase 1, or Phase 1 + Phase 2 will be covered by the HIF; for finalization of the entire procedure, all three phases will be reimbursed. This will enable better overview and monitoring of the IVF procedure and some savings (by payer and by the hospital) if only part of the procedure was performed.

Proposed new price of IVF is about 104,000 MKD (1,700 Euros), which is increase of 24% of the cost of the voucher: Phase 1 costs 1,077 Euros, Phase 2 costs 449 Euros, and Phase 3 costs 157 Euros. It is evident that the process of stimulation is the most expensive one (medications, laboratory analysis, and folliculometry, monitoring) and the most lasting one. When starting the procedure for IVF, the initiation costs will be covered for each patient.

Regarding the issuance of the voucher and payment for adequate phase, we suggest two solutions. First solution is issuance of one voucher per person, on which medical professionals date, stamp, and sign finalization of each phase. The voucher is to be sent to the HIF for reimbursement on finalization of the entire procedure (partial or full). Second solution is issuance of three different vouchers for each phase (as coupons), signed and stamped separately on finalization of each phase. Either solution enables appropriate monitoring (by payer and provider) and follow-up of IVF procedure (success or failure) for each patient.

## Conclusion

Even though the IVF procedure is being developing through the past 40 years, the protocols which Macedonia uses are rigid and do not enable some specificities which are required for medical treatments for some cases. Furthermore, development of new drugs requires their inclusion or exclusion in individualized approach and protocols. Medical professionals find it quite restrictive for selected cases where IVF procedures are applied.

The protocol defined by the HIF requires some preconditions of women/men/couples to be fulfilled, documentation to be collected, approval from the Committee for IVF to be received (in the form of voucher), and then the procedure can be started. The price of the voucher for one full procedure – cycle has not been revised for 10 years. Calculations of realistic costs for the entire procedure we made (for 2019) shown that adjustment of the voucher's price needs to be done.

Comparing the actual prices with the existing ones in the Region, Europe and USA, there is a strong argument for increasing of the prices [5], [6], [7], [8].

One voucher financially covers the entire procedure of IVF, not taking into account if the process was finished (ET was made) or partial (only stimulation was performed) [9], [10]. Therefore, it is recommended to define three levels for accomplishment (finalization) in IVF procedure, three separate phases. Finalization of each phase leads to the other one consequently. Thus, accomplishment of the process can be followed and noted; partial or full success can be monitored and adequately financed [11], [12].

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