

Guide for hospitals, surgeons and cost-benefit analysis experts concerning the costs and benefits of eye surgery

Summary

Refraction errors are the main cause of vision problems globally, affecting productivity and, in general, the quality of life of patients. The most widespread solution is to wear eyeglasses (even this solution remains unavailable for some social categories that do not have the financial potential to pay for ophthalmological consultations or for eyeglasses). A common alternative to wearing glasses is wearing contact lenses. Typical contact lenses and eyeglasses do not alter the refractive power of the eye and do not produce permanent effects on vision, but contribute to the correct focusing of light during wear (by their own refractive power). For patients looking for permanent-effect therapies, corneal refractive surgery is the main option. Generally, this is recommended for people aged 21-40. Currently, in developed countries, the most popular methods of corneal refractive surgery are Femto LASIK and Trans PRK. Patients appreciate the Femto LASIK method due to rapid gain of optimal vision, but also due to reduced post operative pain and discomfort. The Trans PRK method is appreciated by patients due to lower costs, but also due to the absence of the risk of flap loosening or flap infections (the Trans PRK method does not involve any flaps).

For children and young people under the age of 21 there is the option of orthokeratology (wearing the night lens), which, although it does not permanently correct the refractive errors, contributes to the reduction of their progression and allows for avoidance of wearing glasses or lenses during daytime. For people aged 21-40 years with severe refraction errors or reduced corneal thickness, for whom refractive surgery is not an effective option, there is a choice of PIOL intraocular implants (with the preservation of their own lens). For people over the age of 40 who experience accommodation or cataract problems, there is the alternative of IOL implants (replacing the lens with an artificial lens). Patients with malignant myopia are advised to avoid intense physical effort and medical treatment. The drug therapy consists of vasodilators and vitamins, in order to improve the circulation of blood at the retinal level. The decision on the therapeutic solution must be taken by the patient and physician based on the severity of the refractive error, the general health status of the patient, the personal characteristics of the patient, the cost of the various options, the associated risks, the duration of the produced effects, the impact on the quality of life. Inevitably, locally available medical technologies, the skills of the physician and patient information are relevant factors in decision making.

Public hospitals in Romania or Serbia do not have the necessary infrastructure to perform corneal refractive surgery. Exception is made at this moment by the Municipal Emergency Clinical Hospital Timișoara, which was endowed with state-of-the-art equipment through a project with non-reimbursable financing (the RECALT project, code RORS 11, financed by the European Union through the Interreg IPA CBC Romania-Serbia Program). A small number of private ophthalmic clinics in the region have facilities for corneal refractive surgery, but

these facilities have technologies of older generations. Increasing interest for corneal refractive surgery in other parts of the world, as well as increasing purchasing power of the population in the region fuel an increase in regional interest in this type of service. On these grounds, investments in corneal refractive surgery become necessary for both private clinics and public hospitals. At the same time, the specific technology is costly, the necessary investments being high. The public and private hospitals in the region will be placed in a position to attract important funding sources. Implicitly, performing feasibility studies will be required to substantiate the capital allocation decision, regardless of where it originates.

This guide is intended to set guidelines for configuring investments in corneal refractive surgery and analyzing their financial and socio-economic feasibility. Planning and implementing an investment in corneal refractive surgery will require collaboration between the administrative staff of the public or private organization promoting the investment, the ophthalmological team set to exploit the facilities, the team of architects and design engineers charged with designing new hospital buildings, the team of economists charged with the financial planning and the feasibility analysis.

Under these conditions, Chapter 2 is intended for designers and economists, having the role of explaining the importance of refraction in vision formation, the types of refractive errors and their manifestation. This information is known to medical specialists (representatives of the medical unit that promotes the investment), but not to experts charged with the technical and financial design of the investment. Understanding refractive errors and their impact on patients' quality of life is an essential premise in delivering the cost-benefit analysis.

Chapter 3 presents the treatment solutions available to correct refractive errors. These solutions can be a factor in evaluating the feasibility of investing in corneal refractive surgery (in an incremental approach).

Chapter 4 provides information on how to set up investments in corneal refractive surgery. In this respect, it describes the specific operating cycle of corneal refractive surgery and the necessary resources. Based on the resource requirements, an investment budget is built up and information is provided on the design of the investment implementation chart. The methodology is highlighted on the basis of a case study focused on the creation of medical facilities for corneal refractive surgery using the Femto-Lasik and Trans-PRK methods.

Chapter 5 is intended to explain the principles for financial planning. The basic planning assumptions are presented and the main revenues and expenditures generated in the planned operating activity are identified. Determinants are determined for each type of income and expense and the principles for determining the profitability threshold are presented.

Chapter 6 presents the methodology for calculating and interpreting the main indicators specific to the financial feasibility analysis of investments.

Chapter 7 is about identifying the social costs and benefits associated with corneal refractive surgery. The willingness of the population to pay is proposed as a basis for quantifying social

benefits. The methodology for calculating and interpreting indicators specific to the economic feasibility analysis is presented.

The net present value of such an investment can be estimated as follows:

$$NPV = \sum_{i=1}^m I_i + \sum_{j=1}^n NOCF_j \times \frac{1}{(1+d)^j} + \sum_{j=1}^n NSB_j \times \frac{1}{(1+d)^j} + FRV \times \frac{1}{(1+d)^n} + SRV \times \frac{1}{(1+d)^n}$$

Investments (I_i)

The investments in this field would consist in most cases in purchases of medical equipment and construction works for the rehabilitation of the operating rooms. The calculation of the net present value of the investment (NPV) requires the estimation of the yearly payments for such investments (i = the investment year, m = the duration of the implementation period, in years). The value of the total investment will be estimated under the form of investment budgets (which, in Romania, will follow the structure imposed by order 906/2016). The schedule of the investment payments will be influenced by both technical and financial parameters.

Net operating cash-flows ($NOCF_j$)

The exploitation of the investments in the field of refractive surgery will generate additional financial flows for the healthcare unit. In the private sector, each surgical procedure (together with the preliminary consultations and the follow-up) will involve a fee, paid by the patient and, possibly, by the Health Social Security. The operating cash inflows obtained in this manner should cover both monetary and non-monetary costs of the services and allow at the same time for obtaining a surplus. Thus, the investment could be recovered (more specifically, the capital invested) and a certain financial return could be generated. In the public sector, the Health Social Security might cover the monetary cost of the services, with no perspective of covering the non-monetary costs (like depreciation) or generating a positive financial return. For both private and public sectors, the main operating outflows would consist of wages, medical supplies, utilities and possibly rents. Generally, the wage payments in the private sector will be higher.

Discount ratio (d)

The same discount ratio was considered for the treatment of both financial and non-financial effects of the investment. Different discount ratios could also be employed (the European Commission recommends it in some cases). The discount rate should reflect the expectations of the stakeholders, in terms of financial (and possibly non-financial) returns.

The socio-economic lifespan of the investment

The socio-economic lifespan of the investment represents the period in which the investment is expected to generate net socio-economic benefits. In the field of refractive surgery, the socio-economic life-span of an investment in surgical equipment could be expected to be of approx. 8 years. With the socio-economic lifespan of the investment being relatively short, the explicit forecasting period of the operating activity (n) should cover it entirely. However, if the explicit

forecasting period of the operating activity (n) does not cover the socio-economic lifespan of the investment entirely (the investment might also include construction works, with longer socio-economic lifespan), a financial residual value (FRV) as well as a social residual value (SRV) should be estimated for the end of the explicit forecasting period of the operating activity (n).

Net social benefits (NSB_j)

For patients with refractive errors, wearing glasses or wearing contact lenses might represent alternatives to eye surgery. The disabilities will differ from one type of refractive error to the other (Myopia, Hyperopia, Astigmatism, Presbyopia) as well as in function of the gravity of the error. The effects of the pathology on the patient's life might vary significantly (from a small discomfort to the inability to perform basic activities). The treatment options will vary as well, as some conditions might be treated by wearing glasses or contact lenses, while others will demand for immediate surgical intervention. As such, the costs of eye surgery, the costs of the alternative treatments, the risks, the impact on the quality of life of the patient will differ.

It was estimated that 95 percent of those who undergo the Fempto Lasik procedure achieve a visual acuity of 20/40, while 85 percent returned to 20/20 vision. Lasik takes a few months in total to adjust vision, but once the eyes adjust, the results are permanent. Follow-up laser eye surgery might still be required as the eyesight changes slightly with age.

The recovery after the surgical procedure is quick, most patients returning to their normal lifestyle and schedule within as little as 24 hours. Patients experience significant savings each year because they do not need to update their eyeglass and contact lens prescription. Not needing to wear eye glasses or contact lens has an important effect on the quality of life of the patient.

At the same time, the Fempto Lasik surgical procedure can involve social costs. The first cost perceived by the patient is the fee for the surgical procedure (if the patient pays the fee himself). In addition, the procedure will negatively affect the quality of life of the patient on the short – run, as it involves stress, missing from work during the preparatory consultations and during surgery, discomfort for a few days following the procedure. Changes made to the cornea through the Fempto Lasik surgical procedure are permanent, which is why possible errors can have an important negative effect. In some cases (estimated to aprox. 1%), the patients can suffer a worsening of the eyesight problem.

The value of the net socio-economic benefits of refractive surgery is under these circumstances one of the most important parameters of the feasibility analysis. The net socio-economic benefits of a specific investment will be proportional to the number of patients treated, as well as to the net socio-economic benefits / individual. While the estimation of the number of patients treated does not pose special difficulties, the analysts need benchmarks for the net socio-economic benefits / individual. Such a benchmark will be influenced by many socio-economic factors, which is why its value is expected to be different for each region.

In the attempt to estimate a benchmark for the net socio-economic benefits of refractive surgery / individual over the Romania-Serbia cross-border region, the following parameters were taken into consideration:

- the cost of performing a surgical procedure with the Fempto Lasik technology;
- the prices for such surgical procedures in other regions;
- the willingness to pay of the local population.

Chapter 8 highlights the basic principles of the sensitivity analysis associated with the economic feasibility of investments. The presented information has the role of facilitating the understanding by the decision makers of the risks associated with the investments and the ways in which their materialization affects the results obtained.