

Cost effectiveness in implant dentistry

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_Introduction

Today, about 65% of Italian dentists are practising implantology. In Italy alone, over a million implants are placed every year. A survey commissioned by the Italian Society of Osseointegrated Implantology on implant perception among the Italian population found that 68% of the respondents would request an implant should the need for an artificial tooth arise. One Italian out of three has undergone oral implant surgery. It follows that osseointegrated implants will be offered by a growing number of professionals and be placed in an ever-larger population in the future.¹

It should also be noted that the economic crisis has severely affected even the dental field, and the repercussions of this phenomenon have been reported by newspapers, professional associations and the Ministry of Health in Italy. The Osservasalute report, an overview of health in Italy (compiled by the National Observatory on Health Status in the Italian Regions, based at the Università Cattolica del Sacro Cuore's campus in Rome), reported in 2010 that Italians are being forced to save and that

both the food and dental industries will suffer as a result.²

Past president of the Italian National Association of Dentists (ANDI) Dr Roberto Callioni analysed the consequences of the economic crisis and future prospects at a conference held under the auspices of the Ministry of Health on 29 March 2011. He stated that, according to a survey by ANDI in 2010, 30% of Italian dentists have less work because of the crisis.³

However, he also observed an increase in offerings owing to the extension of retirement age and the number of graduates, and a decline in demand related to the decrease in purchasing power, a decline in birth rate and a decrease in the DMFT index.³

In addition, dentists have to compete against low-cost dental offers and dental tourism to some locations in Eastern Europe (as was the case in the 1990s with regard to the Netherlands). The increase in offerings and the reduction in demand have resulted in the average practitioner having

“The dentist? A mechanic who changed parts of your car, but, not being technical, you never know if you’re rubbing or not.”

Photo: Dmitriy Shironosov

higher costs and lower revenues, also owing to the instability of supply and demand. Oral implantology is affected, as are other disciplines of dentistry, by the current socio-economic situation. Yet, the sense is that of a greater demand by the public and a need for the dentist to offer treatment at a lower cost.

In Italy, there are more than 300 different implant systems (probably not an accurate estimate, considering the difficulty in recording copies of copies). These systems usually have the certification necessary for the market, but only a small proportion of them are supported by scientific evidence, based on studies appropriately designed and conducted by independent research institutions, attesting to their clinical performance, especially in the long term and with the proper follow-up. These are the considerations that, together with the lack of reference measure for quality, led the Italian Society of Osseointegrated Implantology to organise the quality forum in implantology, held in Verona from 15–17 November 2008, in which a large number of experts analysed the various aspects of quality in implantology.

The selection of an implant system suited to the demands of the professional is strongly felt to optimise costs when trying to increase profits where possible without interfering with the quality delivered. As written by Pierluigi La Porta in the context of the forum of quality in implantology:⁴

The professional liability requires that the professional has all the factors of production under his control by deploying useful tools to measure the quality of his works, the results that follow and the tools used to achieve performance. Moreover, the information asymmetry that characterizes the doctor-patient relationship is known in the health field, making patients entrust themselves to the professionals' decisions in order to solve their health problem. This assignment essentially denotes the inability of the patient to decide what is really best to do in that situation, even if he is well informed. His expectations are related to the solution of the problem, but he rarely pays attention to the way it is resolved or the instruments used, so the professional is solely responsible. The case law indicates the responsibility of the doctor to “act like a good father” when he is

Procedure	1 fixture + 1 crown in porcelain
Protocol	Delayed-load cemented solution
Implant system	xxx
Cost of the practice 1 h surgery	€ 130
Cost of the practice 1 h prosthetic	€ 80
Cost of 1 h other activities (consultation, check ...)	€ 70

Table 1 _ Cost analysis for various procedures.

the one to decide for his patient. So be sure that the quality of his performance becomes a must of his action. When professionals begin to question the quality of their performance, then you are facing a true and profound cultural change.

To these considerations, one might add: why would a patient choose to seek treatment in a dental centre?

"The dentist? A mechanic who changed parts of your car but, not being technical, you never know if you're rubbing or not."

This is how one interviewee responded to the request by the well-known psychologist and professor of marketing and communication Alberto Crescentini to describe the figure of the dentist.⁵ The average patient finds it difficult to evaluate the quality of a medical service from a technical point of view because he simply does not have the skills. It is our duty not to betray him, and act according to the science and our knowledge. Bearing this all in mind, we should determine the possible savings in the management of implants and whether buying an implant at a lower cost will result in cost effectiveness. To quote Charles Darwin:

Table 2 _ Average price of a cheap implant system in the market, showing variable costs.

Item	Cost
Fixture	€ 95
Insertion	225:10 (Drills/Number of uses)
Cover screw	€ 28
Surgical screwdriver	€ 54
Transfer	€ 45
Analogue	€ 27
Titanium abutment	€ 55
Prosthetic screwdriver	€ 31 + € 181 (DIN Raquet)
Individual impression tray	€ 30
Prosthesis (single ceramic crown)	€ 250
Total	€ 568

"It is not the strongest species that survive, nor the most intelligent, but the ones most responsive to change."⁶

In the literature, there are various articles about implant placement techniques, biomaterials and loading protocols, but there is only very little information about cost analysis in relation to implant-prosthetic procedures.

Questions regarding the cost of implant placement and the amount a dentist can earn by placing fixtures tend not to be discussed at congresses, as if in fact the one and only important aspect is the finalisation of the case. In a country like Italy, where dentistry is largely private, the economic aspects are fundamental for the acceptance of the treatment plan by the patient. Even in ethical terms, if the dentist believes that his implant is really the most appropriate solution for that particular case, prohibitive costs could deprive the patient of that possible solution or push him towards other choices, both operational (other restorative solutions) and logistic (low-cost dentist or travel to a dentist abroad).



Photo: Pakh nyushcha

As observed earlier, there are over 300 different types of implants in Italy. Conventionally, these are divided into classes based on various aspects, one of which is purchase price. We could argue, however, that all implants are osseointegrated in the end and that implants that are more expensive are simply more advertised, but in essence they are the same as others. In Italy, many "homemade" and low-cost implant systems are available on the market whose traceability is practically absent in the literature and whose manufacturers are not able to guarantee long-term reliability.⁷ If we evaluate the sales data of the leading implant-producing companies, eight to ten leading companies hold 90% of the existing market share. As a logical consequence, the remaining 10%, amounting to approximately 100,000/150,000 units, can be divided among the remaining 300 or more companies on the market. What can the average number of implants sold by each of these be (despite what their dealers tell dentists)? Are they supported by case studies or

Table 3 Fixed costs relating to implant placement in a private practice.

Radiation Protection
Verification of the electrical system
Waste disposal
Insurance
Additional fees (phone, electricity, etc.)

other scientific literature? We should not forget that the intervention of implantation entails placing a foreign object, even if this is made of titanium, into the mouth of a patient, hopefully for life, and with undeniable biological effects. In order to do this in a verified and ethically correct way, I believe that the operator should ask questions and go beyond just checking the CE marking, much as he would do in the case of a drug prescription. Who would recommend taking an antibiotic available on the market a few years ago and tested on an insufficient number of patients?

Cost considerations

After these considerations, procedural and ethical, I turn to what may be the cost items for the realisation of an implant-prosthetic restoration. This assessment does not come from the perspective of a marketing expert or an economic expert, but from the pure and simple perspective of a daily operator who must evaluate which elements actually affect daily clinical practice.

It takes into consideration the variable costs and fixed costs. Variable costs change more or less in



proportion to changes in the production volume (the insertion of two implants and two crowns costs more than that of only one; paying an assistant for two hours costs less than paying him for eight hours). Fixed costs are defined costs that are not derived from the production volume. Fixed costs in dentistry are all the costs linked with the activity of the practice, such as those related to radiation protection, verification of the electrical system, sterilisation, waste disposal, insurance policy, building rental/payments and utilities in general.

The fixed costs are taken into account for any type of service rendered by the practice (Table 1). It is generally believed that a cheaper implant system is needed to save costs (Table 2) regarding implant treatment. From an analysis of the variable costs, it is evident that the costs of the storeroom and of the implant components are significant.

If an implant system entails many surgical steps, requires the use of many drills, has different platforms depending on the diameter of the neck, requires a surgical screwdriver and a prosthetic screwdriver or if different healing abutments are required for each implant placed, the final cost will change significantly, together with an increased risk of errors and inaccuracies (Tables 3 & 4). In particular, if the implant system offers different diameters, each requiring a different healing abutment, a different transfer and a different analogue, the amount of material to be kept in stock will be much higher, considering the prosthetic solution for every case. In terms of the healing abutment, stocking different heights and diameters according to each size available (at least four for the major implant systems) requires dozens of healing abutments even if only a few implants are placed. All this also inevitably leads to mistakes, organisational miscommunication, etc.

If the cover screw and the healing abutment came together with the implant, and therefore already included in the package (and price), things would be much more ergonomic. There would no longer be a need to stock other material or to re-use titanium healing abutments with the inevitable associated risk of inducing peri-implantitis during uncovering.

Costs related to sterile conditions

In a study on the success rates of osseointegration for implants placed under sterile versus clean conditions, Scharf and Tarnow found that the difference in the success rates was not statistically significant.⁸ Sterile surgery took place in an operating room setting and followed a strict sterile protocol.

Clean surgery took place in a clinic setting with the critical factor that nothing touched the surface of the implant until it contacted the prepared bone site. The results indicate that implant surgery performed under both sterile and clean conditions can achieve the same high rate of clinical osseointegration. This means that, while it is therefore not essential to incur the costs related to absolute sterile conditions (Table 5), dentists should not undertake surgery without taking adequate precautions in this regard. The modest savings achieved with regard to the total cost of the intervention could lead to a significant increase in the risk of failure.

We have to consider that an insufficiently tested implant system may lead to trivial errors (difficulty in taking an accurate impression, tightening the components, rotation or loosening of the prosthetic components), resulting in an inevitable loss of time, which in turn affects the cost and delivery. What sense does it make to save € 50 on the cost of the implant system when you have to spend as much or more in buying components separately or in seeing the patient several times owing to these trivial errors (considering the hourly rate given above)?

Also, if failure is always a factor to be taken into consideration, it follows that dentists must seek to eliminate predictable and avoidable failures, which are those for which the dentist is partly responsible (the aforementioned poor management of sterility, improper surgical planning, and an incorrect or adequate surgical sequence). Predictable and avoidable failure may not only result in easily quantifiable economic damage, but also lead to important and less easily quantifiable damage in terms of the reputation and credibility of the practice, which could affect the patient's confidence in the dentist and his willingness to promote the practice.

Conclusion

In conclusion, we should consider the following with regard to cost management in implantsurgery:

- _paying particular attention to the significant costs;
- _simplification and streamlining of clinical and extra-clinical procedures;
- _identification of alternative treatments with a different cost-benefit analysis; and
- _a schedule for reduction or elimination of errors and significant associated costs.

All this will contribute towards a better understanding, and in a more responsible and ethical way, of when it is really necessary to try a new implant system and by what criteria its actual reliability can

Cost of fixture
Cover screw
Surgical kit
Drills
Surgical screwdriver
Transfer
Analogue
Titanium abutment
Prosthetic screwdriver (if required)
Individual impression tray
Prosthesis (crown, bridge, etc.)

Table 4_Fixed costs of the fixture.

Sterility kit	Cost
High-sterility kit (mod. Brånemark)	€ 80
Medium-sterility kit	€ 40
Minimal-sterility kit	€ 25

Table 5_Cost of sterility.

be evaluated. What is the true effect of the price of the implant on the total cost for the practice? We should not be misled in selecting an item that does not appear to be of primary importance in terms of absolute cost. A final consideration is the cost in terms of the practice's reputation, for example in the case of an avoidable failure.

In the light of these considerations, by selecting protocols and materials more rigorously and by giving greater consideration to ethics in our evaluations, we will be able to achieve a real reduction in cost in areas that do not involve interference in the final quality of our work output. We should attempt to save money in areas that affect the final result, with important consequences for us, for our professionalism and for patients who gave us their trust and confidence when entrusting their health to us. Do we have the right to betray their trust, or do we rather have the duty to preserve and respect it?

Editorial note: A complete list of references is available from the publisher.

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