



Adequacy of the Italian National Tariff for Orthognathic Surgery: A Cost Analysis Using the Activity Based Costing (ABC) Method

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Abstract: The reduced economic resources in health care and the consequent spending review have brought great interest in surgical costs. The aim of the study is to determine direct hospital costs for Orthognathic procedures using the Activity based costing method and evaluate the adequacy of the refund provided by the Italian National Health Service. From January 2017 to December 2017 9 consecutive patients underwent the following Orthognathic procedures at IRCCS Casa Sollievo della Sofferenza (San Giovanni Rotondo, Italy): bimaxillary osteotomy (n = 7), Le Fort I osteotomy (n = 1) and Bilateral Sagittal Split Osteotomy (BSSO) (n = 1). Activity based costing was used to obtain costs of each single hospitalization split into surgery, instay, and services. The mean total cost for a bimaxillary osteotomy was 7596.40€. We observed a total cost of 3925.00€ for Le Fort I osteotomy and of 4334.50€ for BSSO. The refund of 4378.00€ provided by the Italian National Health Service system for Orthognathic surgery seems insufficient to cover costs of bimaxillary osteotomy but consistent for single osteotomy (Le Fort I or BSSO).

Key Words: Activity based costing, cost analysis, DRG, orthognathic surgery, refund, tariff

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Orthognathic surgery represents a common procedure performed in Maxillofacial departments. The benefits of Orthognathic intervention have been well-documented and include 3 main aspects: improved dental and facial aesthetics, better dental function,

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and improvements in psycho-social characteristics and quality of life: for these reasons it is not a treatment that should be perceived as having only “cosmetic” benefits.¹ According to the American Association of Oral and Maxillofacial Surgeons, approximately 5% of the population would benefit from jaw surgery.² However, in recent years there has been a reduction in Orthognathic procedures performed in the United States, probably due to decreasing coverage of its costs by insurance companies that consider this surgery as cosmetic procedures.³ In addition, some Authors underlined that reimbursement per hour is significantly lower when Orthognathic surgery procedures are compared with other standard plastic surgery operations.⁴ Also in Italy the close relationship between Orthognathic and aesthetic surgery feeds the debate about the coverage of its hospitalization and surgical costs supported so far by the National Health System, especially in time of limited Healthcare resources and spending review. Irrespective of this animate controversy, it is still difficult to determine direct costs of Orthognathic surgery. The scientific literature regarding this topic is still scarce: during the last 10 years only 5 articles have explored costs of Orthognathic surgery,⁵ using controversial methods. Most of the studies used the national pay scale to calculate per minute staff costs and the mean salary, without showing precise costs sustained for every single specific admission. When assessing costs relating to a treatment, an accurate figure can only be derived by measuring resource consumption for each patient. However, patient-based costing is expensive and problems may arise when trying to apportion shared costs.⁶ Since 2009, IRCCS Casa Sollievo della Sofferenza (San Giovanni Rotondo, Italy) has adopted the activity based costing⁷ (ABC) approach to correctly allocate the resources spent for healthcare. This method allows computing the cost for a single hospitalization event split for each resource employed (ie, medical staff, nursing staff, drugs, devices, and other costs) divided into 3 different areas or activity centers named instay ward, surgery, and services. Adopting a precise method for cost analysis is mandatory also to compare the expenses incurred for Orthognathic surgery with the current refund provided by the National Health System (NHS), defined in Italy by the diagnosis related group (DRG) system introduced in 1992 and reviewed in the ministerial decree of October 18, 2012, referred to as Balduzzi reform.⁸ More precisely, the Italian DRG code concerning Orthognathic surgery and the current related tariff expressed in euros is the following:

- Diagnosis related group 63: “Other operations on the ear, nose, mouth, and throat without complications”: 4378€

The aim of this study is to perform a cost description analysis for Orthognathic procedures and to compare the expense to the refund provided by the NHS in order to estimate its adequacy.

METHODS

All patients underwent Orthognathic surgery at IRCCS Casa Sollievo della Sofferenza from January 2017 to December 2017 were selected and retrospectively evaluated. All patients' personal and

clinical data were recovered from the medical records. For each admission we collected data regarding hospital stay time and pre-postoperative exams performed. Surgical procedure, operation time, and number of operators involved were collected from the theatre registers. The costs of each single hospitalization event were calculated using the ABC method and divided into the following activity centers: instay ward, surgery, and services. Each center has the following cost items: medical personnel, nursing staff, other professional figures, drugs, devices, and expenses defined by the system as “other costs.” Subsequently, we compared the hospital costs for patients undergoing bimaxillary osteotomy to the costs of single osteotomy (Le Fort I and Bilateral Sagittal Split Osteotomy [BSSO]). Lastly, the costs obtained were compared to the refund provided by the Italian NHS (DRG 63).

RESULTS

The study cohort comprised 9 consecutive patients (M:F = 4:5) with a mean age of 27 years (range: 19–43 yy). Seven patients underwent bimaxillary osteotomy and for one of them a genioplasty was simultaneously performed. 1 patient underwent Le Fort I osteotomy and 1 patient had a BSSO. The mean instay time was 6.1 days, ranging from 4 to 8 days, and none of the patients needed an intensive care unit stay. Neither major nor minor complications were observed. All the surgical procedures were carried out by the same equipe composed of 3 consultant surgeons with a mean surgical time of 263.5 minutes (ranging from 125 to 350 minutes). Supplementary Digital Content, Table 1, <http://links.lww.com/SCS/B740> shows the details of the entire group. Supplementary Digital Content, Table 2, <http://links.lww.com/SCS/B740> shows the average costs for the group of patients underwent bimaxillary osteotomy (Patients 1–7). For this procedure, we observed a mean surgical cost of 5741.80€. The mean total amount for the entire hospitalization event was 7596.40€ with a mean hospital stay of 6.6 days. Hospitalization costs for the patient underwent Le Fort I osteotomy (Patient 8) are shown in Supplementary Digital Content, Table 3, <http://links.lww.com/SCS/B740>. For this patient we registered a surgical cost of 2756.50€ and a total cost of 3925.00€ for a hospital stay time of 4 days. Supplementary Digital Content, Table 4, <http://links.lww.com/SCS/B740> shows the costs for the BSSO patient (Patient 9): in detail, we observed a surgical cost of 2975.20 € and a total cost of 4334.50€ for a 4-day hospital stay.

Case Example: Patient 5

A 20-year-old female, presenting a II class division A malocclusion (Fig. 1). She underwent a bimaxillary osteotomy performed by 3 surgeons in 230' minutes using free hands modeling standard plates and screws. She did not experience any major or minor complication in a hospital length of stay of 6 days. Figure 2 shows final occlusion 6 months after surgery. Hospital costs of Patient 5 are shown precisely in the grid produced by the software used at IRCCS Casa Sollievo della Sofferenza (Fig. 3). Total cost amounted to 6152.78€ divided into hospital stay (1,181,96€), surgery (4602.95€), and services (367,87€).

DISCUSSION

Activity based costing is an advanced time-driven activity cost system that allocates resources to the products. It is a costing framework, mainly derived from the management accounting practices adopted by manufacturing industries, based on the assumption that in the productive cycle, resources are consumed by activities performed by different departments of the industry to generate products and services.⁹ In 2009, IRCCS Casa Sollievo della Sofferenza was one of the founder of the N.I.San., the Italian Health Network for the evaluation of Standard Costs.¹⁰ This



FIGURE 1. Preoperative occlusion of Patient 5: II class division A.

association is composed of Healthcare providers sharing the ABC methods and tools to estimate the production costs. This network of HealthCare providers defined the mean cost for each hospitalization event (identified by the proper DRG code) called “standard cost.” Each hospital belonging to the network can compare its own production costs to the standard cost and measure its efficiency. To the best of our knowledge, no article focused on direct hospital costs for Orthognathic surgery using the ABC



FIGURE 2. Postoperative occlusion of Patient 5.

Report economico per episodio di ricovero

Dati economici

Dati clinici	Prestitazioni	Sala Operatoria	Farmaci	Dispositivi	Altri	Totale
GG di ric.	Costi	Personale	Altre Fg.	Imp. (GG)	Costi	
GG di ric.	Totale	medico	professionisti			
6,0	1.270,00	294,12	348,14	149,93	43,04	41,80
6,0	1.270,00	294,12	348,14	149,93	43,04	41,80

Costi per categoria

Categoria	Costo
Chirurgia	5741,80
Diagnostica	1.874,40
Ricerca sanitaria	80,46
Costi per farmacia (FARM)	80,46
Costi per materiali (MATER)	6.617,72
TOTALE COSTI DI PRODUZIONE	13.996,84

FIGURE 3. Details of hospitalization costs of Patient 5.

method has been published in literature and only few papers explicitly analyze every single cost item. Kumar et al¹¹ observed amongst different English centers an average total cost for Orthognathic surgery of 6360.19€, with a wide range varying from 3835.90€ to 12,150.55€. The mean operating theatre cost was 2189.54€ and the average inpatient care cost was 1455.20€. Differences in the observed costings amongst the various centers were unexplained but they may reflect surgical difficulties, differences in clinical practice, or efficiency of patient care. In our study we observed that the most expensive category is surgery, consisting of 5741.80€ (76% of the total costs). Surgical time and number of surgeons/anesthesiologists involved mostly affected the final costs with a rate of 47% (Fig. 4). Since “Casa Sollievo della Sofferenza” is a non-university hospital, all the operators are consultants with no Specialty Registrars or trainees involved. However, even when trainees are part of a department or a surgical equipe, the ABC method is still capable to estimate the costs related to their presence, which are to be attributed to insurance coverage and personal surgical equipment rather than to their salary that is usually borne by the University.

Standard plates and screws used in our series do not significantly burden on surgical costs (9%). No virtual plan or personal specific implants were used for this cohort of patients. These new technologies, apparently more expensive than traditional techniques, are often subjected to cost analysis in Orthognathic surgery^{12,13}; however, their adoption can potentially produce money savings if generating a time saving.

We observed an average hospital stay of 6.6 days for bimaxillary osteotomy (range 6–8 days), with a mean instay cost of 1270.00€ that represents 17% of the overall costs. Despite the absence of major or minor complications, the hospital length of stay observed

in our series was significantly longer than the one reported in the literature, which is in most of the cases below 2 days.³ The reasons for this prolonged length of stay are to be related to different factors. First, as hospital policy, all patients who are candidates for general anesthesia are admitted to our department the day before for pre-surgical evaluation. This already accounts for 1 day of hospital stay, and we are planning to improve the prehospital phase to reduce the average length of stay. Second, there are logistic issues, related to the fact that patients referred to our department come from different parts of Italy, where there is often a lack of specialized outpatient clinics focused on Orthognathic surgery.¹⁵ Therefore, the length of postoperative hospital stay is usually prolonged until the patient is fit and well to guarantee the resolution of post-surgery sequelae and the correct diet and oral hygiene. However, taking into account that in this study the hospitalization cost represents only the 17% of the total costs, the reduction of length of stay would surely produce positive benefits on patients’ turnover, but would have a minimal impact on overall direct costs. To reduce the economic burden related to the hospital stay, Farrell¹⁴ suggested and described a postoperative management of patients in the office setting.

Comparing total costs for different Orthognathic procedures, we observed in our series that bimaxillary osteotomy is the most expensive treatment, followed by BSSO and lastly Le Fort I Osteotomy. However it is not possible to perform any statistically significant comparison due to the limited cohort of patients. Based on our findings, the current tariff provided by the Italian NHS seems inadequate to cover the hospital costs incurred for a bimaxillary osteotomy, amounting to 7596.40€ in our series, but on the other hand, are consistent with the costs incurred for a Le Fort I (3925.00€) and for a BSSO (4334.50€). An in-depth analysis of healthcare costs such as ours might allow a renegotiation for more appropriate tariffs. In accord with our findings, Zins¹⁶ denounced inequities in reimbursement for Orthognathic surgery. Calculating reimbursement per hour of surgeon work for sagittal splits, mandibular osteotomies, and maxillomandibular surgery and comparing reimbursement per hour to 3 other standard plastic surgery procedures (breast reduction, unipedicle transverse rectus myocutaneous flap, and lesion excision), he found that surgeons were paid less per hour for jaw surgery. In addition, the Author suggested that reduced compensation for the surgical procedure together with the difficulty in obtaining insurance coverage might explain the decrease in the incidence of Orthognathic surgery.

There may be some possible limitations in this study, mainly related to the small number of patients involved. This is due to the relatively recent introduction of ABC method for cost analysis, that will certainly be used for a larger group of patients in the coming years, allowing the evaluation of the efficiency trend. It would also be interesting to extend the analysis of the direct costs to the pre and postoperative phases, usually performed in the outpatient clinic, as described by Kumar¹⁷ in relation to orthodontic treatments. There are non-direct costs as well incurred by the patients and by their relatives such as the absence from work. These can be considered a social economic burden that may weigh on the community.

It is important to underline that each cost analysis in healthcare should be closely related to outcome, in order to generate value. Since value is defined as outcomes relative to costs, it encompasses efficiency. Cost reduction without regard to the outcomes achieved is dangerous and self defeating, leading to false “saving” and potentially limiting effective care.¹⁸ In this regard, Cunningham¹ evaluated the cost utility value in Orthognathic surgery via outcomes and changes in Quality of life, expressed in quality adjusted life years gained and cost utility-cost benefits.

Finally, as NHS or insurers look to reduce spending on services, many surgical specialties may be vulnerable to these changes without robust studies supporting the value of their procedures

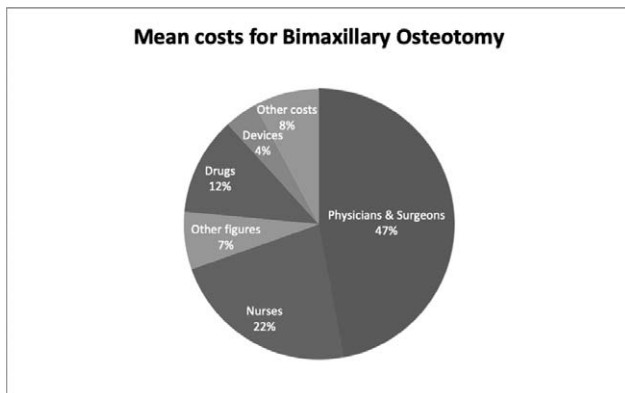


FIGURE 4. Mean costs for bimaxillary osteotomy split into productive factors.

and outcomes. Therefore, an economic evaluation linked to outcomes should be strongly endorsed by surgeons performing Orthognathic surgery because oral and maxillofacial surgery procedures may be particularly susceptible to spending review, given the small size of the field and the limited health economic literature.⁵

CONCLUSIONS

In times of spending review and limited economical resources, determining the hospitalization costs is still a challenge for those involved in health economics. Activity based costing method applied to orthognathic surgery is a reliable system for determining the cost of each productive factors divided by activities. The Italian NHS refund provided for Orthognathic surgery seems inadequate to cover the costs incurred for bimaxillary osteotomy observed in our series, but appears consistent with the costs incurred for Le Fort I and BSSO.

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