

ORIGINAL PAPER

Who “apparently” more spends, “in reality” spends less. Spending “a little” more for the rental of the extracorporeal lithotripter can save “a lot” about the days of hospitalization for urinary stones

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Summary

Objective: The right to health (according to the Article 32 of the Italian Republic

Constitution) is financially conditioned; for this reason the National Health System (NHS) has the objective of rationalize health expenditure according to the criteria of efficiency, effectiveness and economy. This paper is an example of rationalization concerning the extracorporeal shock wave lithotripsy (ESWL).

Materials and methods: Hospital admissions for urinary stones were taken into account. “Edotto”, the database of the Puglia region has identified 23 inpatient admissions during which was performed ESWL. A single operator performed ESWLs with a Storz lithotripter, Modulith SLK.

Results: The average hospital stay is conditioned by days “to wait” lithotripsy. In 2014 the hospitalization days “waiting for” lithotripsy were 100. The results were subjected to SWOT analysis and discussed with the Boston Consulting Group Matrix.

Discussion: Constant availability of the lithotripter would spare 100 days of hospitalization, amounting to € 88,200.00. This waste of resources corresponds to an additional cost equal to 98.3% on the cost for the rental of the lithotripter.

Instead, reducing “unnecessary” hospitalization days would get a saving of 79.3% on the rental cost. It is as if for 46 days of the lithotripter rent were paid 46 days, while for 365 days of the lithotripter rent were paid only 11.8 sessions per year. Conclusions: Rationalization of resources is not necessarily a synonym of “reduction” of resources, but of reduction of waste in the NHS. A good plan is the most important rational basis to get more resources. About the process taken into account it is seen as an investment of € 21,450.00 would keep unchanged the effectiveness of lithotripsy service but would add efficiency and economy (increase of sessions/year, increase in the active mobility, increase in orthopedic treatments) and would drastically reduce the number hospital days (a waste).

KEY WORDS: ESWL; Efficiency; Effectiveness; Economy.

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INTRODUCTION

The topic of this paper has origin in a distant time but still present in the article 32 of the Constitution of the Italian Republic of 1947: “The Republic protects health as

a fundamental right of the individual and as collective interest, and guarantees free medical care to the indigent” (1). But this right/interest is financially conditioned, therefore, by Law 833 of 1978 that introduced in the National Health System (NHS) also the objective of rationalization of health expenditure through the analysis based on long-term planning and short and medium term programming, as tools for controlling the use of resources. The ASLs (Local Health Agency) have the “objectives” to be pursued as in a “business management model”, focused on the achieved results and used resources (2). The ASLs as “companies” do not realize the profit, but must operate in maximum economy in order to make the best use of scarce resources and to positively improve results/resources ratio.

The company control techniques do not want to assert the primacy of the economic aspects on the technical and professional, ethical and social, but have the function of identifying the mechanisms able to improve the economic management, so more and more qualified services can be offered (3). In fact, the Management Control Committee (MCC) is the means by which managers ensure that the management is working effectively in conditions of efficiency and effectiveness (3), such as to enable the achievement of business objectives set in the strategic planning (4, 5). When talking about “control” the focus should not only be focused on the “ex post” aspects, performing a control approach on employed conducts and reached results by different organizational units (eg. the operating units or departments of a hospital), but above all on improving the “ex ante” decision-making processes (3). This work takes inspiration from this integral vision of the concept of “control”: starting from “analysis of processes” (3) of hospital admissions with a diagnosis of urolithiasis useful data “ex post” are obtained which become the basis for proposing a program aimed to improve the “ex ante” decision making, by putting the emphasis on making more efficient the process, minimizing waste and optimizing resources to be used, with the possibility to obtain an increase of the output volume (of the provided services), maintaining their quality.

MATERIALS AND METHODS

To verify the carried out activity in 2014 by U.O. Urology in "L. Bonomo" Hospital - Andria - ASL BAT, "Edotto", a data processing platform, was consulted.

Edotto (6) is the new Health Information System of the Puglia region, in operation since 2012. The system is a tool of the Information Communication Technology (ICT); It facilitates greater interaction between actors at various levels of health organization (*Welfare Department, Regional Health Agency, healthcare companies, general practitioners, pharmacies, hospital physicians, etc.*). The Edotto System is available without functional limitations only by authorized terminals connected to the RUPAR network (7). The application area on the "the hospital Admissions Management" was consulted to get the data. In this application area it is possible to search by setting the search criteria; the result can be printed or stored in PDF or Excel format. Research was performed in relation to DRGs and to performances (ICD-9-CM code).

DRG (8)

The DRG system (*Diagnosis Related Group: homogeneous diagnostic groupings*) is derived from the research begun in 1967 by the team at Yale University (United States), coordinated by Robert Fetter (9). The initial idea of Fetter was to identify the hospital product in terms of classes or categories of homogeneous patients for clinical and care characteristics, and therefore also with respect to the expected treatment from which it derives the consumption of resources and, therefore, a cost. These features make the DRG classification system suitable for use as a reference to specify the performance of hospitalization to which to attribute specific predetermined rates.

In this paper the DRGs 323 and 324 have been taken into account; they represent respectively: "Urinary stones, with complications and comorbidities and/or ultrasonic lithotripsy" for DRG 323 and "Urinary stones, without complications and comorbidities" for DRG 324. Within these two DRG the Advanced Search filter has been set for the 9851 procedure according to the ICD-9CM code, corresponding to the "extracorporeal lithotripsy of kidney, ureter and/or bladder".

ICD-9-CM (10)

The International Classification of Diseases (ICD) is a system that organizes diseases and injuries into groups. In 1893, the *International Institute of Statistics Conference*, which took place in Chicago, approved the International Classification of causes of death. Since 1948 (6th revision) *International Classification* was also adopted to detect the causes of morbidity. In 1975, in Geneva, in the course of the 29th Assembly of the World Health Organization it was approved the 9th revision of the Classification (ICD-9). Since 1979, in the United States, the National Center for Health Statistics (NCHS), section of the Center for Disease Control (CDC) (*where are represented the professional and academic associations of physicians, associations of hospitals, the Regional Office of the World Health Organization, the HCFA agency*) provides for annually updating a revised and extended version of the classification system, with the introduction of interventions and diagnostic and therapeutic procedures: the ICD-9-CM (*International Classification of Diseases, 9th*

revision, Clinical Modification). Since then, in October of each year, the ICD-9-CM updates are published. Since January 2009, the 2007 version of the ICD-9-CM classification is adopted throughout the Italian territory. This is the Italian translation of the US classification, prepared by the *Health Section of the Ministry of Labour, Health and Social Affairs and published by the Istituto Poligrafico e Zecca of State*.

ESWL

The procedure object of our reflection, classified as the 9851 ICD-9-CM, is the *Extracorporeal Shock Wave Lithotripsy or ESWL*. Currently, extracorporeal shock wave lithotripsy is performed electively in Day Service regime (which it is a day hospital with the patient's economic sharing who pays the ticket). Only patients admitted from the Emergency Department for renal colic and/or hydronephrosis and/or urosepsis may undergo extracorporeal shock wave lithotripsy in ordinary admission.

The lithotripter Storz Modulith SLK is a third-generation lithotripter. It is composed of an electromagnetic generator, it uses a dual-pointing system, ultrasonographic "in line" and radiological, with computerized "video track". The strongest point of this machine is constituted by "the degrees of freedom" of the arm on which the generator (called "head") is installed, that allow to perform ultrasonographic pointing of the stone by maneuvering the generator in a similar way and with the same inclinations of an ultrasound probe when it is used "free hand" for a diagnostic examination. For this reason there are very few stones that you cannot point and in any case all treatable keeping the patient in a "comfortable" position, lying prone or supine as needed.

Lease

The extracorporeal lithotripter used in ASL BAT is not owned by the ASL, but is entrusted in rent. The rental was awarded at the price per session of € 1,950.00 plus VAT (inclusive of all equipment, works and services, as well as technical support and maintenance). In the same resolution, it is written that the rental would be held for 4 sessions monthly.

Stakeholders

Among the external stakeholders of Lithotripsy Ambulatory there is also the supplier of the lithotripter rental. The price per session also includes the cost of transport, assembly at the beginning of the session and disassembly at the end of the session. If the ASL were to ask an additional monthly day of the lithotripter rental (5th session), the supplier company would ask to be able to permanently leave the lithotripter at the ambulatory of lithotripsy, making it available to carry out the treatments even on days above 5 monthly, required by possible new rental request. In doing so, the supplier company would save on transport costs and the ASL would have the lithotripter available for 365 days a year.

RESULTS

Edotto System was questioned about the number of hospitalizations between 1 January 2014 and 31 December 2014 in the Urology Unit of the Hospital of Andria, in the

ASL BAT. In the Urology Unit in the year 2014 they were performed 510 hospital admissions. They were taken into account admissions corresponding to DRG 323 ("Urinary stones, with CC (13) and/or ultrasonic lithotripsy") and the DRG 324 ("Urinary stones, without CC"). The Edotto system indicated 37 hospital admissions with DRG 323 and 11 hospital admissions with DRG 324 (48 hospital admissions in total). For both DRGs was performed advanced search by entering the procedure with the code 9851 ICD-9-CM, corresponding to the "extracorporeal lithotripsy of kidney, ureter and/or bladder". Twenty-three ordinary admissions for urinary stones during which the extracorporeal Shockwave lithotripsy (ESWL) was performed were selected. This data was summarized on the Excel worksheet with date of admission and date of discharge (Table 1).

Table 1.
Ordinary admission for ESWL.

DRG 323 ICD-9-CM 9851					
pz. nr	admission	discharge	Hospital days	day of ESWL	days for waiting -1
1	15/12/2014	19/12/2014	5	18/12/2014	3
2	01/12/2014	04/12/2014	4	03/12/2014	2
3	01/12/2014	23/12/2014	23	10/12/2014	9
4	28/11/2014	04/12/2014	7	03/12/2014	5
5	26/10/2014	31/11/2014	6	30/10/2014	4
6	25/10/2014	31/10/2014	7	30/10/2014	5
7	27/09/2014	02/10/2014	6	01/10/2014	4
8	12/09/2014	20/09/2014	9	17/09/2014	5
9	15/09/2014	18/09/2014	4	17/09/2014	2
10	25/08/2014	29/08/2014	5	28/08/2014	3
11	05/08/2014	07/08/2014	3	06/08/2014	0
12	28/07/2014	02/08/2014	6	31/07/2014	3
13	16/06/2014	20/06/2014	5	18/06/2014	2
14	14/04/2014	18/04/2014	5	16/04/2014	2
15	03/04/2014	23/04/2014	21	16/04/2014	13
16	05/03/2014	20/03/2014	16	19/04/2014	14
17	19/02/2014	27/02/2014	9	26/02/2014	7
18	16/01/2014	19/01/2014	4	19/01/2014	3
19	15/01/2014	20/01/2014	6	19/01/2014	4
DRG 324 ICD-9-CM 9851					
20	02/08/2014	07/08/2014	6	06/08/2014	4
21	16/06/2014	19/06/2014	4	18/06/2014	2
22	31/03/2014	05/04/2014	6	02/04/2014	2
23	03/03/2014	08/03/2014	6	05/03/2014	2
	TOT		173		100

The day when ESWL was performed was also inserted. It has been calculated, for each admission, the number of hospital days "to wait" for the lithotripsy session, -1 day (minus one day), corresponding to the day when the admission from the emergency department occurred, during which the patient completed the clinical evaluation and the examinations necessary for treatment. In 2014, "the days of hospitalization -1" waiting for the lithotripsy session were 100 in total (the Excel worksheet, once set, automatically calculates the result).

The following observations were made (Table 2).

- according to the reporting of the ASL BAT the total average cost of one day of hospitalization at the Urology Unit in 2014 was € 882.00 (11);
- if the extracorporeal lithotripter was constantly in the clinic, the patient once admitted from the emergency department should not have to wait for the scheduled day for the session of lithotripsy, but he would be treated on the day of admission or at the latest the following day. It follows that in 2014 at least 100 days of hospitalization would be spared, amounting to € 88,200.00;

Table 2.
Economic analyses.

	"ex post" analysis Current situation	"ex ante" analysis Proposal for + 1 session / month
Sessions/year [a]	46*	57*
Cost for session	€ 1.950,00	€ 1.950,00
Rental cost of the lithotripter / year [b]	€ 89.700,00	€ 111.150,00 (+ 23.9%)
Average cost for 100 days of hospitalization [c]	+ € 88.200,00	- € 88.200,00 (Savings on hospitalization)
Total cost for the ASL [b+c]	€ 177.900,00	€ 22.950,00 (= 11.8 sessions)
Real cost / session [(b+c)/a]	€ 3.867,00	€ 403,00
Deviation from the rental cost	+ 98.3%	-79.3%

* in August only 2 sessions are usually performed

- the rental price per session of lithotripsy is € 1,950.00 plus VAT; the ASL BAT is actually requiring the rental of the extracorporeal lithotripter for 4 sessions per month;
- if the ASL BAT would require an additional session per month (the fifth), the supplier company declared that they would consider cheaper to leave the lithotripter on the spot in the Andria Hospital to save the cost of transportation, so making the device available every day of the year;
- an additional cost per year would be added (considering that in August only 2 sessions are performed, the number of extra sessions per year would be 11 x € 1,950.00 = 21,450.00/year) but 100 days of hospitalization (882 x 100) would be saved because patients with urinary stones could be subjected to extracorporeal shock wave lithotripsy already on the day of admission or the next day to their admission, with a net saving of € 66,750.00 (€ 88,200.00 - 21,450.00);
- the current number of lithotripsy sessions for year is 46; adding one session a month (except in August) the number of session per year will be increased by 11 and the total number of sessions per year would become 57;
- since the lithotripter would remain constantly on site, 100 hospitalization days would be spared, amounting to € 88,200.00, that should be deducted from the expenditure for 57 rental days (€ 111,150.00), resulting in an overall net expenditure for the ASL of € 22,950.00 equivalent to 11.77 lithotripsy sessions, to the price of € 1,950.00. each.

In other words, at present the ASL BAT would pay 46 lithotripsy sessions "apparently" for the price of € 1,950.00/session, but in reality taking into account the cost of 100 hospitalization extra days, it is as if each lithotripsy session would cost € 3,860.00, that is 98.3% more. Otherwise, acquiring 11 sessions of lithotripsy extra, "apparently" the ASL would have an increase of 23.9% on spending for the lithotripter rental, but taking into account the savings that would be achieved on the days of hospitalization, it is as if it paid each rental day at the price of € 403.00/session, with a saving of 79.3% on the current price. The total cost of "operation" would be € 22,950.00, equivalent to 11.8 sessions of lithotripsy.

sy. It is as if, to have on site the lithotripter for 46 days, the ASL had to pay 46 sessions a year, whereas to have in place the lithotripter for 365 days a year the ASL should pay only 11.8 sessions per year, equivalent to the cost of the extra sessions to require, while the rest of the sessions would be "at no cost" (Table 2).

DISCUSSION

The "Process Analysis" which represents the first phase of the Control Protocol of the care path that we are reviewing ("what leads to extracorporeal lithotripsy after hospitalization from the emergency department") should be initially performed.

The "ex post" direction (analysis of the historical data) and the "ex ante" direction (planning and development assumptions) should follow.

Finally, the preliminary stages should be completed with some analysis tools (3) before submitting the project under review by the General Directorate and by the Management Control (Table 3).

Table 3.
SWOT analysis [12].

SWOT Analysis	Useful qualities to achieving the objectives	Harmful qualities to achieving the objectives
Internal elements (constituent of the analyzed process)	Strengths <ol style="list-style-type: none"> 1. Lithiasis is an endemic disease 2. The 80% of the stones will continue to be treated by ESWL 3. Active mobility is already present 	Weaknesses <ol style="list-style-type: none"> 5. Make acceptable that the rental cost increases of 23.9% in a year 6. It is necessary to wait an year to see the savings about DRG 323 and 324
External elements (in the context of the process)	Opportunity <ol style="list-style-type: none"> 4. It can become a good basis for developing a Stone Center 	Threats <ol style="list-style-type: none"> 7. Insurance for possible theft and damage 8. Increased wear: predict maintenance for 365 days/year

Strengths

1. Lithiasis is an endemic disease. According to ISTAT data (13), to 01 January 2015, the resident population in Puglia was 4,090,105 persons, while the population resident in the Barletta-Andria-Trani Province was 394,387 inhabitants. According to the most recently published data (14), showing a prevalence of urolithiasis in Puglia of 4.69% and an incidence of 2.53‰ it can be estimated that in Puglia 191,826 people are suffering for urinary stones, of which 18,497 in the BAT province, and that every year in Puglia 10,348 new cases of urolithiasis may arise, of which 998 only in the BAT province. It is likely that many of them will go to the emergency room of the hospital of Andria, the only hospital in the province with the Urology Unit.

2. 80% of the cases of urolithiasis will continue to be treated by ESWL Despite technological advances the treatment algorithm of urolithiasis still includes the Extracorporeal Lithotripsy as the reference treatment for most of the stones, as stated by the most recent international guidelines (15).

3. Active mobility. From the records of lithotripsy service it appears that 249 ESWL treatments were carried out in 2014, of which 14% to extra ASL patients, 10% to patients from Puglia but of other provinces and 4% to patients outside the region.

Opportunity

4. It can become a good basis for developing a Stone Center. Careful management of the health system should take account of directions of the population migrations, indicated by the data relating to the active and passive mobility, to enhance what the statistics show as reference centers.

Weaknesses

5. To accept that the cost of the lithotripter extracorporeal rental increases of 23.9% in a year.

6. The need to wait a year before checking the effective savings in hospital admissions related to DRGs 323 and 324.

Threats

7. Insurance for any theft or damage of the lithotripter that will be left in the hospital. A suitable area will be needed to the machine housing; where it can be left mounted and ready for use.

8. Increased wear. To introduce the maintenance service on 24 hours for 365 days/year in the lease.

Boston Consulting Group Matrix

Another tool that can be used in the preliminary stages of the Control Protocol is growth/share matrix that was designed in the seventies by BCG (Boston Consulting Group) BCG (16). This matrix is able to rank strategic business areas or activities of a company. It can also be used to evaluate the services and products of a local health organization. The parameters used for classification are: market growth rate, on the vertical axis (it is a measure of market attractiveness) and relative market share, on the horizontal axis (measuring the company's strength in that market).

The combination of these two elements can be used to identify four categories: Question Mark, Star, Cash Cow, Dog. For each of the described combinations exists a recommended behavior during the evaluation.

If we take into account the path of the patient suffering from urolithiasis that is hospitalized from the emergency department for renal colic (3), identified by DRGs 323 and 324, it is immediate to place these activities in the Dog category. In fact, these are "medical" DRGs treated in a "surgical department" with debatable appropriateness, which will be "at a loss", but that can never completely avoided. What can be do is to minimize the number of hospital days (minimize waste), where it is always available on site the extracorporeal lithotripter.

The lithotripsy service, which takes place as Day Service (with the participation of the patient through the payment of the ticket), may instead be classified in the "Cash Cow" category that is a strategic area of clinical performances which lead to constant cash flows obtained at the price of a few investments with a high profit margin. It is not a new strategic area, but an area well established in the health service, although still very profitable. The Cash Cows should be carefully cared by the ASL, because the gain is practically guaranteed. They are "cows" from which "milking" money to finance other activities.

The recommended behavior to the management is to "realize" (make a minimum investment in the face of a

high gain by the Day Service and a net reduction of losses by the ordinary hospitalization).

If implemented, the Stone Center would be classified in the Star category: The Star activities are characterized by a high market share (the urolithiasis is endemic in Puglia). They require investment to continue to grow, and then transform themselves into Stars. The behavior recommended to the management is to "maintain".

The crucial point is to make clear to the Management Control that to realize a Stone Center does not fall at all in the "Enigma" category (*Question Mark*). This category indicates a strategic business area that is located in an expanding market, without owning a significant share of this market. Typically Question Marks require massive investments in order to increase the market share.

In the case of urolithiasis there is a "market" and it is in expansion. There is not uncertainty about the possibility to increase the market share, as in the Question Mark category and, as we have seen, investment in a Stone Center, where there is already a lithotripsy service, are not massive. In any case, the recommended behavior to management in front of a product of the enigma category is to "develop".

CONCLUSIONS

Planning within the National Health System is essential to rationalize the use of resources. When budgeting, the directions can follow the top-down or bottom-up model. This case is an example of a budget proposal that follows the bottom-up model. Consequently a good plan becomes the most important rationale with which to get approval for more resources. The plan accurately identified that the key objectives continue to remain within the fold of effectiveness, efficiency and economy. In the path in question is clearly seen how, with an investment of € 21,450.00, the effectiveness of lithotripsy services would remain unchanged, but it would add efficiency and economy, because the use of the lithotripter would be optimized (increase in sessions/year, increase in the active mobility, increase in orthopedic treatments with shockwaves) and the number of hospital days related to DRGs 323 and 324 would be reduced drastically with a considerable saving on hospital days. It would also be a solid basis for the institution of a Stone Center. The role played by the persons is important in achieving objec-

tives; they are precisely the behaviors of managers, rather than the measures and the accounts, to represent the essence of the Planning and Control systems.

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