

# The First Breast Cancer Clinic, Experience In Evaluation Of Medical Equipment: The Case Mexican Institute Of Social Security (Imss)

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## ABSTRACT

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*The objective of the present work is to present the experience in the application of the criteria of evaluation of technical-economic propositions of medical equipment; for the creation of the first breast clinic in Mexico by the Mexican Social Security Institute. In this sense, the main arguments regarding the evaluation guidelines are presented and, at the same time, the concepts involved in each of the phases consist in the evaluation of the technical specifications of the medical equipment are analyzed, for which they were elaborated and used identification cards of description, highlighting the mastographs and ultrasounds that are the most representative teams of this type of projects. At this point, we have tried to synthesize the contribution to the topic of medical equipment technological evaluation, as part of the learning in the tasks of medical equipment management, as one of the topics of greatest debate in the field of biomedical engineering and bioengineering.*

**Keywords:** Medical Equipment Management, Acquisition Process, Medical Equipment Evaluation.

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## I. INTRODUCCIÓN

The world health organization (WHO) estimates that year by year in the world 1.38 million people are diagnosed with breast cancer and half a million are decimated by that cause. [1]

The Pan American Health Organization (PAHO) confirms this trend as the second cause of death due to malignant tumors in the countries of Latin America and the Caribbean. [1]

The creation of this Breast Clinic in 2016 as the first of its kind in which IMSS (Mexican Institute of Social Security) implements a specialized medical unit model that simplifies the detection and diagnosis of Breast Cancer in a period of eight days, replacing the ordinary process that extends to seven or eight months, contributing thus to the fulfillment of the directives foreseen in the National Plan of Development of the Government of the Republic.

Currently in the bibliography different procedures and methodologies have been established for the evaluation and acquisition of medical equipment.

However, in the opinion of the undersigned, these proposals are very general, and although they consider a large number of variables and concepts

Which are used in the evaluation of needs, such as the creation of procurement committees, impact on society, cost-benefit analysis, cost-effectiveness, determination of the useful life of the equipment, evaluation of suppliers among many other aspects.

An important trend is perceived which is related to its ineffectiveness in the operation of medical practice; since during the acquisition process these are limited by the lack of a systematic approach of the multiple variables that can interfere during its implementation, as well as the lack of monitoring and supervision in its operation.

We must consider that medical equipment is currently one of the key components in health systems, a situation that entails important implications regarding the cost and quality of services, its main objective is the safe care and management of the patient [2]

For this reason, it is important to consider the different technological options available in the market.

Concluding that the management of medical equipment technology every day plays a more important role in the institutions providing health services, since it is essential to have a correct process of technological acquisition, taking into account the high cost of these equipment and the implication that it has to be the direct bridge between the medical-assistance staff and the patients; without leaving aside the clinical opinion, because finally the medical team will be their tool of work with which they are diagnosed and emitted clinical results.

## II. METHODOLOGY

Given the diversity of norms and standards that guide the evaluation of medical teams, it was necessary to seek consensus, to unify criteria and to seek to apply a scientific methodology that would allow the implementation and operation of a practical evaluation system:

### A. Stages of the evaluation process.

PHASE I. - Assignment of values.

In the first phase, we seek to assign values to the weighting factors that may intervene in the process. These factors depend on the technology that is the object of the acquisition and the function that needs to be obtained from these, for it can be supported from the reports found in databases or from the market study conducted through questionnaires applied to users and engineer's leaders in the management of equipment for use in clinics and hospitals, as well as the data banks of the equipment manufacturers companies.

Phase I	Phase II	Phase III
<p>A. ASSESSMENT OF THE TECHNICAL CHARACTERISTICS.</p> <p>B. ARTICLE DESCRIPTION CODES</p> <p>C. TECHNICAL DOCUMENTS ADMINISTRATION EVALUATION</p> <p>D. CALL</p>	<p>A. INVITATION TO PARTICIPATE.</p> <p>B. SECTION OF QUESTIONS AND ANSWERS.</p> <p>C. OPENING OF PROPOSALS.</p> <p>D. EVALUATION:</p> <p style="padding-left: 20px;">a. EVALUATION-TECHNICAL-MEDICAL</p> <p style="padding-left: 20px;">b. TECHNICAL-ADMINISTRATIVE EVALUATION</p> <p style="padding-left: 20px;">c. ECONOMIC EVALUATION.</p> <p>E. SELECTION OF PROPOSALS AND ISSUANCE OF RESULTS.</p>	<p>A. EMISSION OF THE FAILURE.</p> <p>B. MEETING WITH SELECTED SUPPLIER.</p> <p>C. VALIDATION OF IMPLEMENTATION ACTIVITIES.</p> <p>D. SUPERVISION.</p> <p>E. START UP.</p> <p style="padding-left: 20px;">a. TRAINING.</p> <p style="padding-left: 20px;">b. MAINTENANCE.</p> <p>F VALIDATION IN THE OPERATION OF THE MEDICAL EQUIPMENT DURING MEDICAL PROCESS.</p>

**Table 1.** Phases in the biomedical technology evaluation process.

### b. PHASE II.- Evaluation of Technical Specifications.

The second phase consists on the evaluation of technical specifications of the equipment offered, in this phase we discard the equipment that do not accomplish with the basic technical specifications, for that we used the documents describing medical equipment established by the regulatory authorities of the Institute, corresponding to the mastographs and ultrasounds which are the most representative equipment of the project.

### c. PHASE III.- Formalization of Commitments.

The third phase seeks to negotiate with the supplier (s) of equipment that complied with the basic technical specifications.

For each of these phases a series of Forms are used, which allow to know the technological characteristics of the required equipment.

In the first form the technical specifications of the equipment are established, the second includes complementary services, added values, inputs or additional components as part of the equipment supplier's offer. The third form includes technical and administrative characteristics of the expected supplier type, which are indicated in Table 4.

### B. PHASE II.- Evaluation of Proposals.

With the consolidation of the Call, the electronic platform "COMPRANET" was used, which allows to make public the need for contracting medical equipment, as well to make the different providers aware of the technical-economic offer, facilitating these suppliers providing all documentation on the support of the company and the technical specifications of the equipment offered; situation that facilitates the disclosure of the call to disseminate the terms of the acquisition process and the form of evaluation, through the information provided by this type of information; it is possible to obtain qualitative data on the fact of discarding variables and assigning weighting to the variables considered important for the operation of the project.

CONCEPTO	DESCRIPCIÓN
(1) Amount of Stockholders' Equity.	Bidders must indicate the amount of Stockholders' Equity contained in the Financial Statements.
(2) Staff.	In case the bidder has employed workers, in terms of the provisions of the second paragraph of article 14 of the LAASSP.
(3) Participation of MIPYMES.	In case the bidder is an MIPYME and produces goods with technological innovation registered in the Mexican Institute of Industrial Property, in terms of the provisions of the second paragraph of article 14 of the Law on Acquisitions, Leases and Services.
(4) Technical Concepts of Goods.	You must indicate the warranty period offered. a. Delivery time (in days and, Warranty time (in years) b. Number of preventive maintenance during the guarantee. c. Number of calibrations during warranty. d. Number and copy of registration as medical equipment e. Training in user management (number of hours). f. Technical training (in number of hours). g. Years that will guarantee availability of spare parts h. Cost of annual preventive maintenance service i. Backup equipment. j. Service and operation manuals
(5) Agreement or Order	You must enter the Contract No. or Order presented in the "Technical - Administrative Evaluation" .
(6) Year of Contract or Order.	It must be based on the Contract Year or Order presented in the "Technical - Administrative Evaluation".
(7) Description of the equipment covered by the Contract.	It must settle the assets covered by the Contract or Order presented in the criteria of "Technical and Administrative Evaluation", which must be the same or similar to those offered in the present procurement procedure.
(8) Document that guarantees compliance with the contract or order.	You must indicate which document supports the fulfillment of the contracts, in accordance with what is indicated in the Criteria of "Technical - Administrative Evaluation".
(9) Items that it covers.	These are the items offered by the bidder in these proceedings. It should be noted that the contracts submitted must be of the same or similar characteristics to those offered

**Table 4.** Technical-Administrative Characteristics.

The evaluation model is based on a hierarchical procedure based on the following equation for each team to be evaluated:

$$P \text{ Phase I (25\%)} + P \text{ Phase II (25\%)} + P \text{ Phase III (50\%)} \quad (1)$$

Where the final score obtained PT by each supplier will depend on the points obtained in each of the phases, which can be summarized as follows:

P Phase I "Valuation of each of the technical parameters established in the equipment description sheets of the Institute".

P Phase II and Phase III "They value the competitive advantages of the proposals"

Given the importance of Phase III, since the calculation of the score for the price will have a maximum value of 50 points of 100 possible, so that from that Solvent Proposal (s) that offer lower unit price, with respect to the total of the same, will get 50 points.

For this and in order to determine the score corresponding to the net price proposed by each participant, the following formula was applied:

$$PPE = MPemb \times 50 / MPi \quad (2)$$

Where:

PPE: Score corresponding to the Economic Proposal

MPemb: Amount of the lowest economic proposal,

MPi: Amount of i-th Economic proposal.

To calculate the final result of the points obtained by each proposition, the following formula was applied:

$$PAd = TPT + PPE \quad (3)$$

Where:

PAd: Adjudicated Proposition

TPT: Total Points Obtained in the Technical-Administrative Proposal

PPE: Score or percentage units reached in the Economic Proposal.

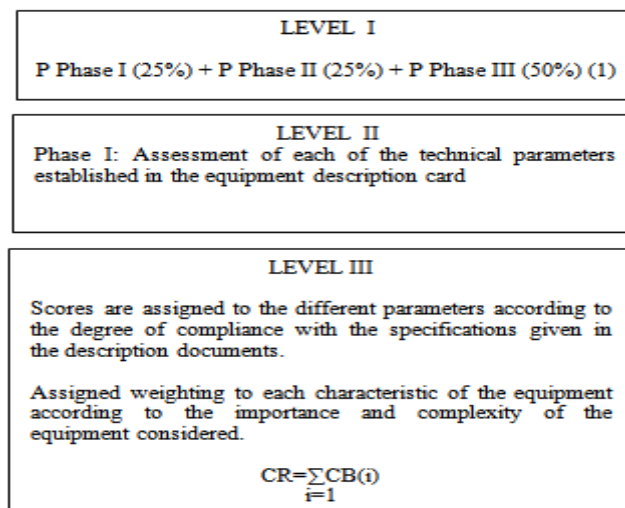
**C. PHASE III.- Agreement or Negotiation.**

All invited participants are informed of the results of the evaluation and those selected for this phase are invited to a face-to-face meeting in which each provider receives information about the technical aspects that represent a penalty in the obtained score.

This takes into account the fact that a skilled supplier could reduce the technical performance in order to reduce the price of equipment.

Once the final score has been calculated and verified that the proponents exceed the minimum requirements requested, in this way the selected proposal (s) will correspond to the one whose score is higher.

Finally, the calculation of the final score is published; it is advisable to invite the suppliers to improve their economic proposals in the future and even the technical ones.



**Figura. 1.** Describes the assignment of scores in the evaluation of the proposals in each one of its Phases.

The evaluation of the criteria established by the equipment descriptions, arise as the result of the technical specifications between the manufacturers or distributors of the equipment and specialists, therapists, nurses and engineers of the regulatory authorities of the health sector in Mexico.

The information acquired is processed in accordance with the criteria of descriptive statistics in order to find coincidences, usually common, as the importance of the technical characteristics of the requested equipment.

With this information is possible to obtain quantitative and qualitative data on the fact of discarding variables and assigning weighting to the variables considered important by the project leaders.

**III. RESULTS**

The proposed evaluation system was used for the acquisition of equipment of the first breast clinic, obtaining excellent results in the mechanisms and tools used, since in the case of the clinical evaluation this was materialized as a process in which one goes to members of clinical staff to evaluate the technology within their activities, in order to obtain information regarding the fulfillment of their characteristics, technological quality, clinical relevance, experience and total satisfaction. Table 5 Requirements of medical equipment.

Núm.	Description of the good	Quantity
1	Digital Mastography	3
2	Ultra sonograph intermediate (5-13 MHz)	2
3	Complete field digital mammography with stereotactic	1
4	Electronic Static Scale	1
5	Examination lamp with LED source	1
6	Portable aneroid sphygmomanometer (swivel base).	1
7	Single capsule stethoscope.	1
8	Self-Generating Tabletop Steam Sterilizer	1
9	Laboratory Refrigerator 14"	1
	<b>Total</b>	<b>12</b>

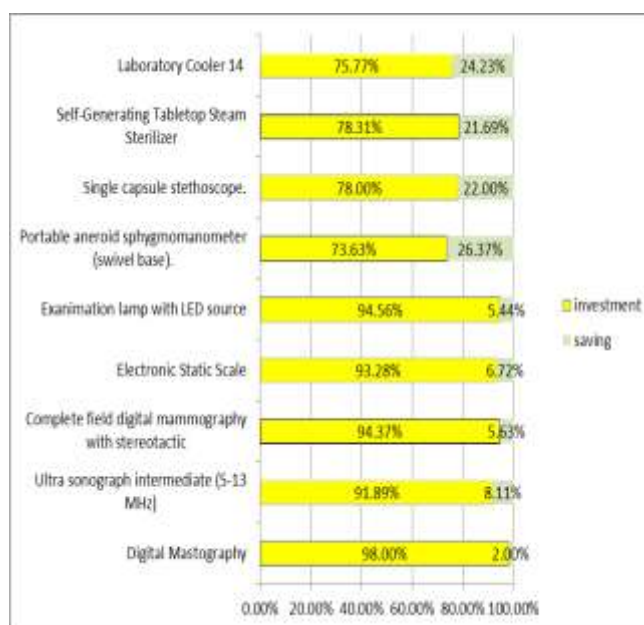
**Tabla.5:** List of the Equipment of the first Breast Cancer Clinic IMSS.

Table 6 and Graph 1 present the savings percentages obtained in each of the evaluated teams; obtaining an average saving close to 13% of the budget ceiling projected in the acquisition of medical equipment.

Additionally, it should be noted that no complaints, requests for clarification or complaints were received from the different suppliers who participated in the bidding event.

No.	Description of the good	Investment	Save
1	Digital Mastography	98.00%	2.00%
2	Ultra sonograph intermediate (5-13 MHz)	91.89%	8.11%
3	Complete field digital mammography with stereotactic	94.37%	5.63%
4	Electronic Static Scale	93.28%	6.72%
5	Examination lamp with LED source	94.56%	5.44%
6	Portable aneroid sphygmomanometer (swivel base).	73.63%	26.37%
7	Single capsule stethoscope.	78.00%	22.00%
8	Self-Generating Tabletop Steam Sterilizer	78.31%	21.69%
9	Laboratory Cooler 14	75.77%	24.23%

**Table 6** Medical Equipment of the First Breast Clinic IMSS



**Graph 1.** Comparison between the value authorized for its acquisition versus the value paid (investment) and the savings achieved in the process of acquisition of the clinical equipment of Mama: 1.-Digital Mastography, 2.- Intermediate sonographer, 3.- Complete Field Digital Mammography with Stereotactic, 4.-Electronic Scale with Statisometer, 5.-Examination Lamp with LED source, 6.- Portable Aneroid Sphygmomanometer (mobile base), 7.- Single Capsule Stethoscope, 8.- Sterilizer of Self-Generated Table Steam, 9.- Laboratory Refrigerator.

#### IV. DISCUSSION

From the experience by using this methodology, the following situations are considered.

A. It has been possible to save considerable sums of money and time, along with the social contribution of the conception of preventive medicine, the detection and timely diagnosis of Breast Cancer.

B. At present, the 12 medical teams are in operation, 6 medium-tech teams have their contractors for corrective and preventive maintenance with suppliers; that is to say, most of the equipment is taken over by the conservation service of the Unit itself, which guarantees its use in a timely manner.

C. This clinic is currently experiencing a considerable improvement in the performance of the available resources, achieving a greater use of the equipment, a saving in maintenance costs, as well as the reduction of the time in the interruption of the service of the equipment of mammography, which translates into areas of opportunity in the way the findings of the presence of breast cancer were made.

D. The above mentioned is made available as a methodological guide, so other institutions or health centers that are interested in formulating strategies will facilitate them to improve health care services in their units, and to the extent possible to reduce the costs that represents the acquisition of medical technology in our country.

## V. CONCLUSION

A. All acquisition processes demand a clear and sustainable methodology, to guarantee that what is acquired is the fulfillment or the projected need.

B. In public health institutions, it is essential to use existing tools or models related to the "evaluation of medical equipment", this is conducive to the culture of obtaining the best quality, support and functionality at the best price offered in the market.

C. The systemic analysis regarding the proposed evaluation method, allows to give juridical certainty to the bidding process, since with the assignment of scores and weighting to each of the parameters described in the article description cedula, it prevents the supplier can increase the qualification of its proposal, by offering characteristics that are not of greater importance, so that they can force their acquisition.

D. Indirectly this type of procedures allows the obtaining of better services due to the obligation of the offering companies to have trained personnel and to offer support those results in a better service.

Finally, the described process can be perfectible in the evaluation of those processes that involve the use of technologies in the health field, as well as in the evaluation of service providers.

## BIBLIOGRAPHY

- [1]. Instituto Nacional de Estadística y Geografía, "Estadística a Propósito del Día Mundial de la Lucha Contra el Cáncer de Mama", del 16 de Octubre de 2015. "<http://www.inegi.org.mx/saladeprensa/aproposito/2015/mama0.pdf>
- [2]. Bronzino, J.D., "Clinical Engineering: Evolution of a discipline". Dyro, J. F. Clinical Engineering Handbook. Elsevier, 1, 3-6, 2004.
- [3]. David, Y., Judd, T. M. "Management and Assessment of Medical Technology." The Biomedical Engineering Handbook: Second Edition Ed. Joseph D. Bronzino ch 168, y 168.2 – 168.5, 2000

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