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Artículo 137.873

Pilot Benchmarking Study of Thoracic Surgery in Spain: Comparison of Cases of Lung Resection and Indicators of Quality

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OBJECTIVE: This article describes the methods and conclusions of the first Spanish benchmarking study of thoracic surgery. The proposed aims were to describe cases of lung resection in 9 Spanish hospitals, compare indicators of quality among the 9 participating centers, and identify and propose common areas where lung-resection processes could be improved.

METHODS: Information was taken from the minimum basic data set for lobectomy and pneumonectomy processes performed in 2002 and 2003. The chosen outcome indicators were in-hospital mortality, morbidity, length of hospital stay, and emergency readmissions within 30 days of discharge, adjusted according to surgical complexity. Once the results had been analyzed, the participating centers with best outcomes were identified and a variety of proposed improvements were discussed.

RESULTS: A total of 1666 procedures (1276 lobectomies and 390 pneumectomies) were studied. We found differences in mean length of stay, mortality, readmission rate, and morbidity that identified centers with lower mortality or shorter hospital stay for comparable or more complex surgical procedures. However, higher morbidity and readmission rates were found in these centers.

CONCLUSIONS: Measures were proposed to ensure that relevant diagnostic information is recorded on discharge. It was also proposed to reduce unnecessarily long hospital stays and to standardize the procedures. With such an approach, reliable criteria that improve the quality of lung-resection processes can be established in the future.

Key words: *Lung resection. Health care benchmarking. Clinical pathways. Quality of clinical practice.*

Experiencia piloto de *benchmarking* en cirugía torácica: comparación de la casuística e indicadores de calidad en resección pulmonar

OBJETIVO: En el presente artículo se describen los métodos y las conclusiones del primer estudio español de *benchmarking* en cirugía torácica. Los objetivos propuestos fueron: describir la casuística de resección pulmonar desarrollada en 9 hospitales españoles, comparar indicadores de calidad entre los 9 centros participantes e identificar y proponer áreas de mejora comunes para los procesos de resección pulmonar.

MÉTODOS: Se utilizó como fuente de información el conjunto mínimo básico de datos de los años 2002 y 2003 de los procesos de lobectomía o neumonectomía. Los indicadores de resultados seleccionados fueron: mortalidad hospitalaria, morbilidad, estancia y readmisiones urgentes en los 30 días siguientes al alta, ajustadas por complejidad de los casos. Una vez presentados los resultados entre los participantes, se identificaron las unidades con mejores resultados y se discutieron diversas propuestas de mejora.

RESULTADOS: Se ha estudiado un total de 1.666 procedimientos (1.276 lobectomías y 390 neumonectomías). Se detectaron diferencias en estancia media, mortalidad, tasa de readmisiones y morbilidad, que permitieron identificar unidades, de complejidad equiparable o superior, con baja mortalidad y estancia. Sin embargo, en estas unidades se apreciaron tasas de morbilidad y readmisión más elevadas.

CONCLUSIONES: Se propusieron medidas encaminadas a registrar todos los diagnósticos relevantes en los informes de alta, disminuir las estancias inadecuadas y estandarizar los procedimientos que permitirán en el futuro establecer criterios fiables para mejorar la calidad de los procesos de resección pulmonar.

Palabras clave: *Resección pulmonar.* Benchmarking *sanitario. Vías clínicas. Calidad de la práctica clínica.*

Introduction

Benchmarking originated in companies outside the health sector. The term refers to a continuous process to compare efficiency (in terms of productivity, quality,

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Manuscript received July 21, 2005. Accepted for publication November 15, 2005.

and working practices) with other organizations renowned for their excellence in a specific activity.[1] The practice of benchmarking has spread to a wide range of professional activities, including health, where it represents an attempt to define possible areas for improvement relative to the best results obtained by comparable clinical units.

This article describes a benchmarking initiative for thoracic surgery with the participation of 9 thoracic surgery units in Spanish university hospitals. The specific objectives of the publication are as follows: *a)* to compare cases of lung resection in the thoracic surgery services of 9 Spanish university hospitals; *b)* for these 9 participating centers, to compare several indicators of quality (hospital stay, postoperative complications, in-hospital mortality, and emergency readmissions within 30 days of the original episode) for lobectomies and pneumonectomies; and *c)* to identify and propose, by consensus among the participants, some common areas for improvement in lung resections, based on the experience of the groups with the best results.

Methods

Participating Centers

The thoracic surgery services of the following Spanish hospitals participated in the study: Complejo Hospitalario Juan Canalejo, A Coruña; Hospital Clínic de Barcelona; Hospital Universitari Vall d'Hebron, Barcelona; Hospital Universitario de Salamanca; Hospital Universitari Germans Trias i Pujol, Badalona, Barcelona; Hospital Universitari Sagrat Cor, Barcelona; Hospital de Canarias Dr. Negrín, Las Palmas de Gran Canaria, Las Palmas; Hospital Donostia, San Sebastian; and Hospital Clínico San Carlos, Madrid.

Data Source

The data were taken from the minimum basic data set (MBDS) for hospitalization corresponding to 2002 and 2003, provided directly by the participating centers, with no mediation from the heads of the thoracic surgery units.

Case Selection

The cases studied corresponded to all patients with hospital records discharged in 2002 and 2003 after lobectomy or pneumonectomy. Cases were identified using codes for surgical procedures according to the International Classification of Diseases, Clinical Modification (ICD-9-CM). In this classification, lobectomy corresponds to codes ICD-9-CM 32.4 and 32.3 and pneumonectomy to codes ICD-9-CM 32.6 and 32.5.

Outcome Indicators

Assessment of outcome was based on the following indicators:

1. Mean stay in hospital. Distinction was made between mean preoperative, postoperative, and overall stay for the 2 procedures studied. The mean stay was adjusted according to the degree of complexity, as explained below.

2. Mortality. In-hospital mortality was determined and, as before, adjusted according to the degree of complexity.

3. Complications. Initially, the rates of a variety of postoperative complications were calculated, specifically, atelectasis, postoperative pneumonia, postoperative subcutaneous emphysema, supraventricular tachycardia, postpneumonectomy pulmonary edema, bronchopleural fistula (differentiating between lobectomy and pneumonectomy), sustained postoperative air leak, recurrent nerve lesion, iatrogenic pneumothorax, postoperative respiratory failure, diaphragm paralysis, postoperative hemorrhage, pulmonary thromboembolism, and postoperative shock. However, in view of the lack of prospectively defined criteria for classification and the range of definitions applied to each complication, it was thought more appropriate to analyze the overall rate of postoperative complications for each procedure and not draw conclusions based on specific complications.

4. Readmissions. The rate of emergency readmissions within 30 days of discharge after the first admission to hospital was calculated and adjusted according to complexity.

Adjustment for complexity was done by classifying the patients according to refined diagnostic criteria. Each group of a given diagnostic criterion was subdivided into 4 categories of severity (from 0 to 3, where 0 is the least severe) for surgical procedures, given that all patients actually underwent an operation.[2] This adjustment allowed the outcome to be determined according to the degree of severity of the patients.

Methods of Data Analysis and Discussion of the Findings

Data collection and analysis were subcontracted to a private company (IASIST SA, Barcelona, Spain). For each hospital, a code, known only to the collaborator in each participating unit, was assigned to ensure that data were presented anonymously. Two meetings were arranged in which the findings obtained were discussed and recommendations made in accordance with the consensus of the majority of the participants. These recommendations were based on the experience of the centers with the best results and, therefore, cannot be considered as conclusions reached by deduction and scientific methods.

Results

In total, 1666 procedures were studied (1276 lobectomies and 390 pneumectomies) in 2002 and 2003. The distribution of cases by hospital is shown in Table 1. Figure 1 shows the distribution of cases by complexity and hospital. The cases were not evenly

TABLE 1
Cases Analyzed With Hospitals Coded (H1-H9) to Ensure Anonymity

Hospital	Lobectomies	Pneumonectomies
H1	137	61
H2	169	63
H3	71	27
H4	58	19
H5	124	41
H6	170	61
H7	186	45
H8	200	47
H9	161	26
Total	1276	390

distributed according to complexity–some hospitals had a higher proportion of patients with low severity (degree 1 and 2) than other hospitals.

Table 2 presents a summary of the indicators analyzed. Figure 2 is a plot of overall hospital stay for the 2 procedures. Of note is the short stay in 2 centers (H3 and H7). According to Figure 1, H7 had more complex cases, the degree of complexity being comparable to that of H8. The overall mortality is shown in Figure 3. The lowest mortality corresponded to H7 and H3, centers with differing degrees of case complexity. However, the rates of complications and emergency readmissions (Figures 4 and 5) are higher for H7, in contrast to the in-hospital mortality in this center.

Discussion

Importance and Significance of Benchmarking Studies in a Clinical Setting

Voices inside and outside the health care sector are calling for better knowledge of outcomes and effectiveness and efficiency. In fact, information comparing clinical outcomes within Spain and between Spain and other countries is disseminated in specialist press available to the general public[3] and on the Internet.[4]

Our study should not be interpreted as an attempt to classify the participating centers as good or bad. It was designed without economic considerations, unlike similar studies done by private companies, and its aim was to compare units to identify opportunities for improving clinical practice and bring them up-to-date. That objective required interaction with hospital management of the participating hospitals and an initial effort to understand the organization and the processes and practices analyzed,[5] given that it is difficult to see how systems proposed by other participants might be applicable without an in-depth knowledge of their procedures.[6]

TABLE 2
Summary of Indicators by Processes and for the Whole Study Population

Indicator	Benchmarking Group
Lobectomies (n=1276)	
Mean stay, d	12.5
Mortality	51 (3.9%)
Complications	363 (28.4%)
Readmissions	84 (6.5%)
Pneumonectomies (n=390)	
Mean stay, d	13.6
Mortality	40 (10.2%)
Complications	178 (45.6%)
Readmissions	43 (11%)
Resections (n=1666)	
Mean stay	12.7
Mortality	91 (5.4%)
Complications	541 (32.4%)
Readmissions	127 (7.6%)

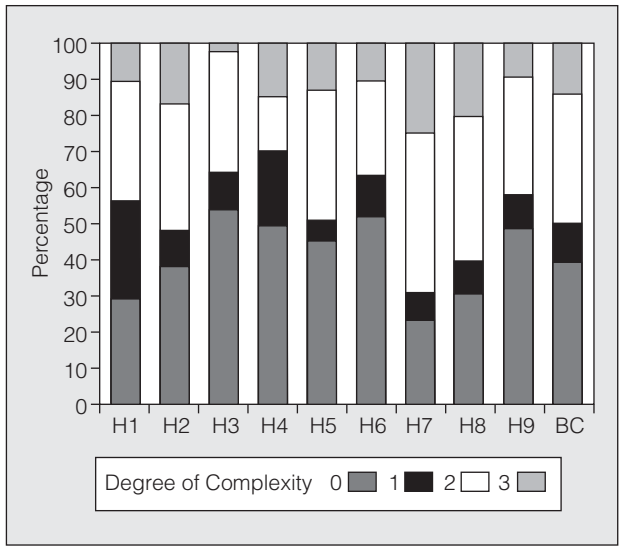

Figure 1. Distribution of cases by complexity and hospital (data expressed as percentages). H1-H9 are the codes for the participating hospitals. BC indicates the mean of the centers participating in the benchmarking.

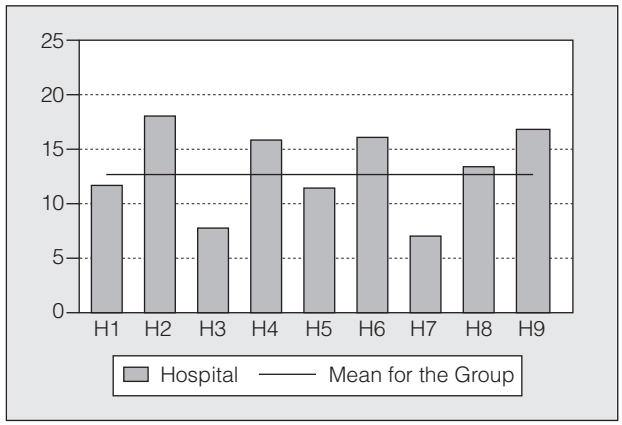

Figure 2. Overall hospital stay for the population analyzed. Raw data and data adjusted according to complexity. H1-H9 are the codes for the participating hospitals.

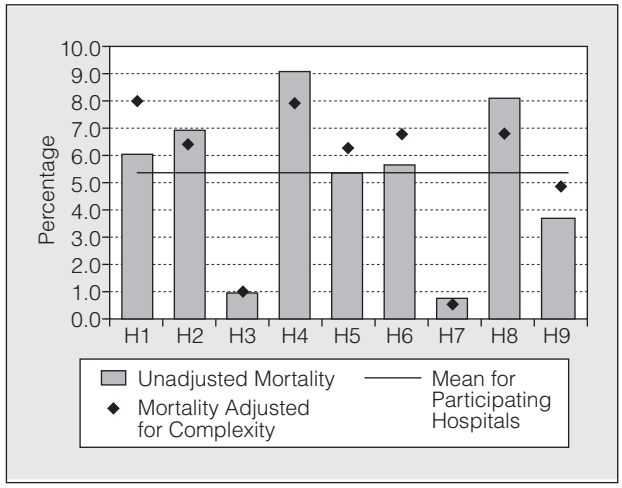

Figure 3. Overall mortality of the population analyzed. Raw data and data adjusted for complexity.

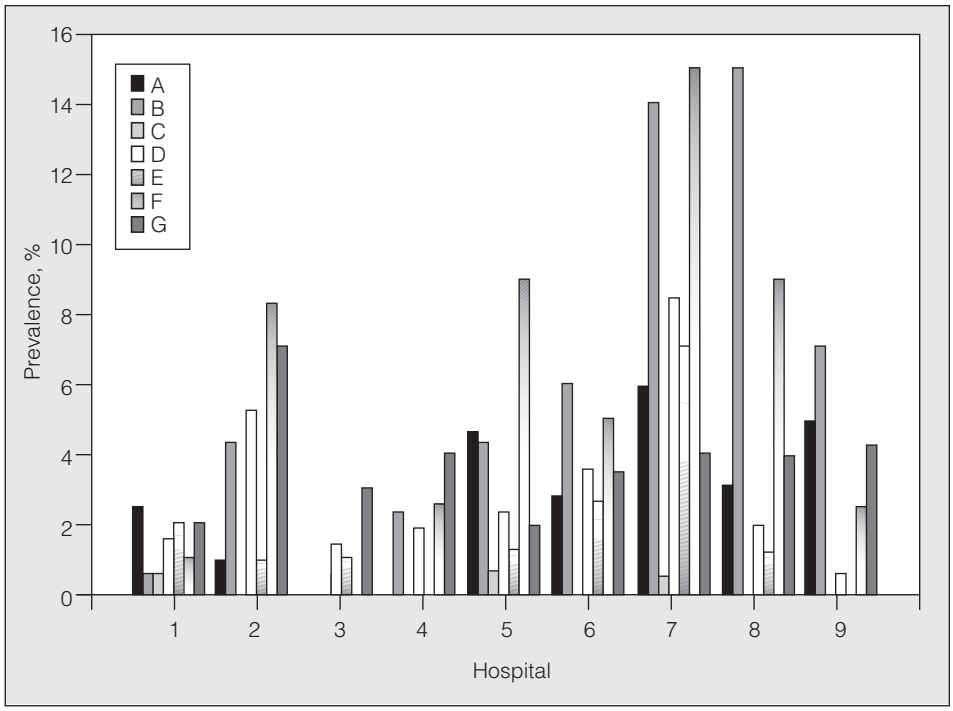

Figure 4. Comparison of the prevalence of different postoperative complications by hospital. A indicates pulmonary or lobular atelectasis; B, nosocomial pneumonia; C, atrial fibrillation; D, persistent airway leak; E, postoperative pneumothorax; F, postoperative respiratory failure; G, postoperative hemorrhage.

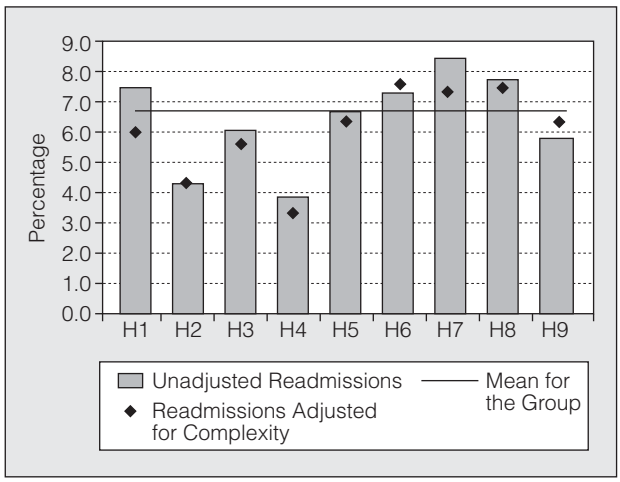

Figure 5. Readmissions. Raw data and data adjusted according to complexity. H1-H9 are the codes for the participating hospitals.

There are currently no rigorous studies that show beneficial clinical effects arising from processes of continuous quality improvement in hospitals. Nonetheless, some investigators have called for this type of study to be undertaken on a large scale by health care providers.[7]

Limitations of the Present Study

This is the first benchmarking study of thoracic surgery to be carried out in Spain and it is subject to a number of limitations and shortcomings that should be corrected in the future.

The first problem is that hospitals from many parts of Spain were not represented, and so the conclusions and recommendations are inevitably weakened.

The origin of the data analyzed is also subject to debate. In Spain, major errors have been reported in MBDS coding, particularly with regard to coding of procedures.[8] The study design would be much stronger if the data were taken from a prospective registry with internal quality control. For example, such a method has been applied by the Bronchogenic Carcinoma Cooperative Group of the Spanish Society for Pulmonology and Thoracic Surgery (SEPAR).[9] The limitations of benchmarking studies based on MBDS data were extensively discussed in an article by Peiró.[10] According to this author, one of the drawbacks of such data is that they do not suitably represent the complexity of the procedures in patients with multiple concurrent diseases or complications. He also pointed out that very different patients are assigned the same code as a result of the way in which the ICD-9-CM classification works.

Nevertheless, a strength of our method is that it ensures the participants could not have manipulated the data, which were collected directly from the MBDS of the hospital.

The results associated with some outcome variables were also questionable. The definition of mortality used in our study (in-hospital mortality) does not catch all mortality attributable to the procedures, and it has been reported that no more than half of all surgical mortality is accounted for even at 30 days after surgery.[11] However, in-hospital mortality is a very robust variable that is collected systematically in the MBDS and so we consider it valid for comparing the activity of the participating hospitals. No reference

data are available for comparison with our results for mortality. The most appropriate mortality rates for comparison are probably those published recently in Europe.[12] According to these figures, the current in-hospital mortality is 2% for lobectomy and 4% for pneumonectomy, that is, better than the mean rates reported here but in agreement with the data from the hospitals with the best results.

We ran into difficulties when analyzing complications associated with the procedures studied. In fact, the rates probably did not reflect the true situation, and we have highlighted the need to improve clinical coding and to record information more accurately to obtain better and more homogeneous data for comparison of complications between different centers. In the future, we hope to have more conclusive data on surgical complications. This will enable us to analyze the rate of complications adjusted for risk, at least for the most common complications associated with pulmonary resection.

The rate of emergency readmissions has been studied in the literature as an indicator of good practice.[13] According to some authors, shorter hospital stays for pulmonary resection are not associated with the rate of readmission.[14] In any case, little information is available to guide our assessment of the true implications of the readmission rates found in our study.

Finally, we should point out that length of stay in hospital is a variable that is currently widely studied because it bears directly on the cost of the procedures. In Spain, the length of hospital stay for pulmonary resection varies greatly.[15] It has been reported that standardization of the pulmonary resection processes can help reduce hospital stay without adversely affecting the clinical outcome.[16] Our study could help in the design of future clinical approaches to pulmonary resection, based on a broad consensus among the health care professionals directly implicated in patient care, in order to shorten hospital stays.

Conclusions and Recommendations of the Groups Participating in the Study

The points presented below should be considered as recommendations of the groups participating in the study. In view of the methods used, these recommendations should not be considered scientific conclusions as such.

On results related to organization. The elements for improvement suggested by the hospitals with the best outcomes are as follows:

1. Systematic admission of the patient the day before or even on the same day as the intervention.

2. Modification of the normal practice for preanesthetic tests. Two organizational approaches are proposed:

– Liaison with the anesthesia service to arrange the presurgery and preanesthesia visits on the same day. This will be much appreciated by the patients, who will only need to attend the hospital once.

– Agreement with the anesthesia service on clinical guidelines for preoperative assessment of patients scheduled for pulmonary resection and carrying out the preanesthesia visit on the day of admission.

3. Should surgical procedures be canceled due to organizational or other problems, the following patients should not be rescheduled to accommodate the cancelation. The patients whose operations have been canceled should be discharged and the procedures rescheduled as soon as possible.

4. Do not transfer patients from other services for surgical procedures. Patients referred internally from other services should be discharged and scheduled for surgery in a separate hospital admission.

5. Some centers have opted for more restrictive postoperative criteria for admission to the intensive care unit so that the demand for beds is lower and hence fewer operations are canceled.

Other measures that influence stay in hospital proposed by the groups with best outcomes include establishing postoperative analgesic protocols and discharging patients from hospital with Heimlich valves.[17] The importance of mental preparation of the patient for the coming stay in hospital was also mentioned in the working groups.

On results for indicators of health care quality. The participants agreed that findings about complications are sensitive to how accurately secondary diagnoses relevant to these complications are recorded. Importance was placed on correctly coding all the information, a task that would require computerized databases. Bronchopleural fistulas, respiratory failure, and postoperative hemorrhage were considered complications of particular relevance. The recommendation was to develop a basic guideline for coding the processes studied.

Acknowledgments

The authors thank Antoni Arias and Mercedes Sáez, of IASIST SA, for their suggestions and contributions to the drafting of this manuscript.

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