Two Ophthalmology Departments Financed by Compulsory Health Insurance: What Is It that Makes a Difference in Costs and Clinical Effectiveness?

Mirjana Nasić, Stjepan Orešković

Department of Ophthalmology, Zagreb University Hospital Center; and 1Andrija Štampar School of Public Health, Zagreb University School of Medicine, Zagreb, Croatia

Aim. To identify factors contributing to significant differences between two university hospital departments of ophthalmology, one in Paris, France, and the other in Zagreb, Croatia, in their clinical effectiveness and cost-efficiency.

Method. Structural, clinical, and financial characteristics of a Croatian and French ophthalmology department were compared for the 1996-2000 period. We used Paris ophthalmology department reports from 1996-2000 period as data source. Data on the Zagreb department performance for the same time period were obtained from the financial department. After comparative analysis of performance to show consistency and comparability of the two departments according to the type and prevalence of pathology, case-mix, and approaches to therapeutic, educational, and research activities, hospital budget analysis was performed, with special reference to the length of hospital stay according to diagnosis, number of examinations, material expenses, salaries, and investment. The variables analyzed were the number of emergency, regular, and hospitalized patients; number of physicians; number and type of surgical procedures; number of patients and length of hospital stay according to diagnosis; hospital budget distribution; and usage of hospital beds.

Results. Although the structure, technology, level of education, organization, and patient profile at the two departments were similar, the mean number of operative procedures per specialist per year was different (109.4 for Zagreb vs 199.2 for Paris). Hospital bed occupancy was 99.4% in Zagreb and 74.9% in Paris. The mean duration of hospital stay was 7.5 days in Zagreb and 2.2 days in Paris. Zagreb had considerably longer hospital stay for all diagnoses except severe infections. Zagreb had lower investment in new technologies (0.4%) than Paris (20.1%), and higher material expenses (33.2% vs 10.1%, respectively).

Conclusion. Different instruments of hospital services payment result in different clinical and organizational behavior of the hospital personnel and management. The three-fold longer stay in Zagreb can be explained by the mechanism of service payment, which is based on payment for capacity and structure and process in Zagreb instead of payment for service and service-related outcomes in Paris. Comparison of the two departments indicates that clinical efficiency and effectiveness cannot and should not be separated from financial incentives that can stimulate (Paris) or discourage (Zagreb) rational and evidence-based clinical behavior.

Key words: Croatia; efficiency, organizational; France; health care reform; hospital departments; length of stay; ophthalmology; quality of health care
intraocular pressure, and optic nerve and macula diseases. The prevalence of blindness due to corneal diseases has been considerably reduced through the establishment of donation-based eye banks with support of precise methods for assessment of tissue viability (1). Laser therapy has been routinely used treatment of retinal diseases and refraction errors, whereas cataract operation has become a safe and simple procedure with the introduction of ultrasound requiring one-day hospitalization (2). The cost of introduction of a novel technology in the light of benefits from shorter and more efficacious treatment has been the subject of coordinated analysis and activities of the profession, science, and policy. In discussions launched through the media as well as within professional societies, health reform has been opposed, among others, by hypotheses that reduced hospital stay increases risk for certain diagnoses and postoperative outpatient care, and that it is impossible to keep pace with new technologies (3). However, statistical indicators reported by the Ministry of Health of the United Kingdom have shown that reduction in the number of paid hospital days significantly improves the effectiveness and efficiency of the overall system of hospital treatment (4).

The aim of the study was to compare all parameters that caused considerable differences in clinical effectiveness and cost-efficiency of two eye clinics with equal model of financing and different instruments of hospital service payment.

Method

Data from two ophthalmologic departments, Quinze-Vingts Centre Hospitalier National d’Ophthalmologie, Paris, France, and Department of Ophthalmology at Zagreb University Hospital Center, Zagreb, Croatia, were used for comparative analysis of the departments’ performance. We used Paris department reports from year 2000 and 1996-1999 period as data source (5,6). Data on the Zagreb department performance for the same period of time were obtained from the financial department. The study consisted of two parts: a) comparative analysis of performance, aimed to show consistency and comparability of the two departments according to the type and prevalence of pathology, case mix, and approaches to therapeutic, educational, and research activities; and b) hospital budget analysis, with special reference to the length of hospital stay according to diagnosis, number of examinations, material expenses, salaries, and investment.

The variables analyzed were the number of emergency, regular, and hospitalized patients; number of physicians; number and type of surgical procedures; number of patients and length of hospital stay according to diagnosis; hospital budget distribution; and usage of hospital beds.

For data analysis we used STATISTICA for Windows package (Version 5, StatSoft, Inc., Tulsa, Oklahoma, USA) and t-test after arc-sin transformation of proportions. Arc-sin transformation is a standard procedure for transformation of percentages, which enables a comparison of two groups composed of percentages, with a t-test. All tests were two-tailed and p-values <0.05 were considered statistically significant.

Results

Functioning of the Departments

Basic activities at the two departments were threefold: patient treatment, medical personnel education at all levels, and scientific research. The departments were mostly financed through the Ministry of Health and health insurance funds (the Bismarck type of health insurance), with sporadic donations in equipment and funding of scientific projects by the Ministry of Science, and in France from various foundations. In Paris, the physicians in private practice have the right to make contracts with the affiliation hospital and work at a 1:4 ratio, ie, they are allowed to treat one patient in private practice per four treated through health insurance. This ratio also holds for operative schedules. In Zagreb, the conditions of private practice vs government-hospital-based patient treatment have not been legislatively regulated yet.

Technical equipment (the number and type of instruments) at the two departments was comparable, with the exception of the laser for corneal surgery, which was not available at the Zagreb department (it is available in private practice, though). Treatment techniques and operative procedures were found to be identical, with the exception of cataract surgery. At Paris department, it was exclusively performed by ultrasound technique allowing for a single-day in-hospital postoperative care, whereas at Zagreb department it was predominantly done by extracapsular method (85.0% vs 15% ultrasound in 2000), which requires prolonged hospitalization and is associated with a higher risk of complications than ultrasound method.

In total, 2,288 patients were examined per specialist per year in Zagreb and 2,196 in Paris, out of whom 17.0% and 25.0% were emergencies, respectively. From total number of patients who visited the departments, 4.8-6.6% of the patients were hospitalized. The number of operations per specialist per year in Paris was twofold that in Zagreb (Table 1), with both hospitals providing 24-hour admission service.

At both departments, lens diseases were the most common cause of hospitalization, followed by diseases of the retina, orbit, and lacrimal duct, and ocular muscle anomalies (Table 2). The former four diseases accounted for more than 81% of pathology at the Zagreb department and about 88% at the Paris department.

<table>
<thead>
<tr>
<th>Visits</th>
<th>Zagreb</th>
<th>Paris</th>
<th>t-test for proportions&lt;sup&gt;a&lt;/sup&gt;</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patient visits (mean, %)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>299,993 (78.2)</td>
<td>415,233 (68.4)</td>
<td>30.073</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Emergency</td>
<td>65,215 (17.0)</td>
<td>151,766 (25.0)</td>
<td>27.852</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>18,413 (4.8)</td>
<td>40,066 (6.6)</td>
<td>21.994</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total</td>
<td>383,621</td>
<td>607,065</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of admissions per specialist per year</td>
<td>2,288</td>
<td>2,196</td>
<td>3.196</td>
<td>0.013</td>
</tr>
<tr>
<td>No. of operations per specialist per year</td>
<td>109.4</td>
<td>199.2</td>
<td>26.142</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<sup>a</sup>df = 8.
Table 2. Diagnoses of patients hospitalized at the Department of Ophthalmology at Zagreb University Hospital Center, Zagreb (N = 18,413) and Quinze-Vingts Department of Ophthalmology, Paris (N = 40,066), 1996-2000

<table>
<thead>
<tr>
<th>Disease</th>
<th>Mean percentage of patients hospitalized in Zagreb</th>
<th>Mean percentage of patients hospitalized in Paris</th>
<th>t-test*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract</td>
<td>34.0</td>
<td>41.4</td>
<td>2.746</td>
<td>0.032</td>
</tr>
<tr>
<td>Retinal disease</td>
<td>25.3</td>
<td>32.1</td>
<td>10.582</td>
<td>0.008</td>
</tr>
<tr>
<td>Orbital and lacrimal diseases</td>
<td>14.1</td>
<td>14.1</td>
<td>70.488</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Strabismus</td>
<td>10.5</td>
<td>10.1</td>
<td>1.857</td>
<td>0.137</td>
</tr>
<tr>
<td>Other</td>
<td>16.1</td>
<td>11.5</td>
<td>7.575</td>
<td>0.002</td>
</tr>
</tbody>
</table>

*df=4.

Table 3. Diagnoses of surgically treated patients at the Department of Ophthalmology at Zagreb University Hospital Center, Zagreb (N = 15,410) and Quinze-Vingts Department of Ophthalmology, Paris (N = 50,135), 1996-2000

<table>
<thead>
<tr>
<th>Disease</th>
<th>Mean percentage of patients hospitalized in Zagreb</th>
<th>Mean percentage of patients hospitalized in Paris</th>
<th>t-test*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract</td>
<td>35.5</td>
<td>43.0</td>
<td>25.924</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Retinal disease</td>
<td>29.7</td>
<td>32.1</td>
<td>2.246</td>
<td>0.088</td>
</tr>
<tr>
<td>Orbital and lacrimal diseases</td>
<td>11.2</td>
<td>6.0</td>
<td>19.202</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Strabismus</td>
<td>9.5</td>
<td>5.0</td>
<td>7.409</td>
<td>0.002</td>
</tr>
<tr>
<td>Other</td>
<td>14.0</td>
<td>14.0</td>
<td>0.092</td>
<td>0.931</td>
</tr>
</tbody>
</table>

*df=4.

Emergency surgeries were rare, accounting for 0.5% of overall surgical schedule in Zagreb and 0.3% in Paris. Cataract operation was most common, followed by the operations on the retina, orbit, lacrimal apparatus, and ocular muscles (Table 3). These four types of operation accounted for 86.0% of surgical procedures at both departments.

Analysis of hospital bed distribution showed that Zagreb department had a considerably greater percentage of pediatric beds than Paris (20.5% vs 7.9%); however, Paris had 6.6% beds reserved for outpatient procedures, whereas Zagreb had none.

Considering overall characteristics of activities, pathology and surgical schedules as well as mode of financing, the two departments appeared to be eligible for comparative analysis.

Departments’ Costs

The structure of the hospital budget and available resources allocation to personnel salaries, patient comfort, and investment in new technologies are the keys to improvement of clinical and financial efficiency. The percentage of total budget spent for employees’ salaries was slightly lower in Zagreb than in Paris (Table 4). Great differences had been observed in material expenses (drugs, food, electricity, cleaning material, heating, etc.), which were twofold in Zagreb. About 1.5% of the hospital budget was spent on various forms of trips, jubilee rewards, solidarity support, etc. In Zagreb, investment in new technologies was low in comparison with Paris (Table 4).

The length of hospital stay was analyzed for the year 1999-2000, when the ultrasound cataract surgery was becoming a routine procedure in Zagreb.

The analysis of the duration of hospitalization according to diagnosis revealed that only hospitalization for severe infections was approximately identical at the two departments. Hospital stay of patients with all other diagnoses was two to three times longer in Zagreb than in Paris. In Zagreb, four- to fivefold longer duration of hospitalization than in Paris had been recorded for patients with diseases associated with intraocular pressure elevation, ocular muscle anomalies, corneal diseases, inflammatory diseases of iris, and cataract operation (Fig. 1). Mean number of days of hospitalization in Zagreb in the 1999-2000 period was 7.5 days, about one day less than the average for Croatia as a whole (8.4). In Paris, the mean length of hospital stay was 2.2 days, which was half the average for France (4.4 days) as a whole. In Zagreb, mean bed occupancy was 99.4%, and 74.9% in Paris.

Figure 1. Length of hospital stay (mean number of days) according to pathology at Department of Ophthalmology, Zagreb University Hospital Center, Zagreb (closed bars) and Quinze-Vingts Department of Ophthalmology, Paris (open bars), 1999-2000. The departments significantly differ in all pathology variables (p<0.05).

The number and type of radiological and laboratory tests and consultative examinations could not be presented, because in Paris such examinations were available for all polyclinic and hospitalized patients alike, whereas in Zagreb they were exclusively performed for inpatients and emergency patients, whereas other patients had to wait for up to 6 months (6 months for fluorescein angiography, and 4 months for vision field).

Since inpatients are more severe category in terms of health care, they require greater number of examinations. At the same time, the system record keeping at the Zagreb Department (e.g., each blood count divided into segments, then adding up the number of red blood count tests; computerized tomography is divided into 8 layers, with every next
layer in particular; similar procedure for X-rays, etc.) does not allow an insight into the exact number of examinations per patient per diagnosis. It is quite clear that the laboratory and clinical records management differs substantially from that in Paris where it was possible to count the exact number of radiological and laboratory tests per diagnosis.

**Discussion**

Methods of financing within health care correlate with the quality and efficiency of treatment and hospital management policy (7,8). Follow-up of the work at several hospitals revealed that the same physicians had different length of stay for the same procedures in different hospitals, depending on the hospital management policy, and that different physicians had the same length of stay for the same operative procedures in the same hospital (8). One of the first moves in the process of restructuring is the reduction in the duration of hospitalization and consistent reduction in the number of beds, which could only be accepted by the profession when the mode of funding is changed. In contrast to France, the service in Croatia is paid according to the following formula: service + hospital days, where the hospital day contributes considerably to hospital budget. Financial records of the Zagreb department show that the earnings from operative procedures with anesthesia account for 14.8% of total income, whereas the earnings from hospital days make 15.9% of total income. Other earnings derive from other polyclinic activities and examinations performed. Such a low share from operative procedures, which is almost equal to that from hospital days, can by no means be stimulating for hospital staff and management. It is, therefore, no surprise that the number of surgical interventions and investments in technology were considerably lower in Zagreb than in Paris, whereas hospital bed occupancy in Zagreb exceeds the occupancy in Paris by one third. Given the national system of payment, better organization and availability of inpatient examinations within particular health care units are among the most decisive factors influencing the inpatient treatment efficiency (9). Zagreb department is faced with both an unstimulating model of payment and unavailability of particular examinations.

Restructuring in ophthalmology is the topic of cost-effectiveness analysis in the countries with different levels of economic development. Some consider that such programs should be led by ophthalmologists (10), whereas others prefer hospital manager teams, e.g., India (11), England (12), USA (13-15), and Germany (16). They all tend not to imperil the attained medical standards by rationalization but to improve them. The Organization for Economic Cooperation and Development database has revealed great variation in the number of hospital days for patients with cataract operation, ranging from 6 days in Italy to only one day in the USA (17). In all countries, a general but variable decline has been recorded over the past 5 years in the length of hospital stay (17). Hospital stay reduction was found to have no impact on the duration of recovery or rate of complications for a number of conditions, such as breast cancer surgery, myocardial infarction, cardiac bypass implantation, plastic surgery, hip replacement, gallbladder removal, prostate operation, hysterectomy, and many others (18,19).

Had restructuring of the Zagreb department been performed, it would have resulted in hospital stay reduction to the average found in modern departments such as Quinze-Vingts from Paris, and annual saving of 14,967 days of hospitalization. Only high quality service and safe procedures along with rapid and supreme diagnostics allow for fast patient discharge from hospital care. The Zagreb department has already been equipped with sophisticated equipment for cataract and diabetic retinopathy surgery and other operative procedures in ophthalmology, but the level of personnel education requires minor training interventions. Operative theatre should probably be reconstructed, and supply with disposable and sterile fluids, bandages, and gloves should be improved.

Effect manifested as reduction in the length of hospital stay and increase in the number of patients treated is a subject of thorough analysis.

Change in the mode of funding should be paralleled by computerization to introduce the system of quality improvement and total quality management (20,21), including the patient quality of life (22), continuous protocols for statistical analysis (23), monitoring of side effects (24), structural improvements (25), and establishment of telemedicine networks within the national or international systems (26-29).

Although the income of ophthalmologists in Croatia is about 3.5 times higher than state salary average (30), which is within the range for some European countries in the process of health reform (17), proper stimulation of medical personnel is crucial for success of the restructuring. Such a stimulation could be offered through the model used in Paris, where private practice can be performed at the hospital, at a controlled ratio (1:4) against the work delivered through health insurance fund, thus stimulating physicians to invest in sophisticated equipment and latest methods to attract patients and offer them high-quality and safe treatment and care. Another mode of stimulation could be realized through allocation of resources for experimental research laboratories and preventive programs (31), which are lacking in Croatian ophthalmology. Besides epidemiological studies, which have organizational and medical value, early detection of diabetic retinopathy and glaucoma appears to be of paramount importance because of their high prevalence in the population (32-34). Also, follow-up of the quality of life of the blind and those with vision impairment (35), and organization of rehabilitation centers, such as the one organized at the Paris hospital (36-38), should be initiated.

In spite of all efforts invested in the promotion of ophthalmologic care, even countries such as Great Britain are faced with unexpectedly variable, social class-dependent health care availability. A study conducted in Scotland in 1973, showed the rate of vision impairment due to uncorrected vision anomaly in children from families with lowest income to be two-
fold that found in children from families with highest income (39). Such studies indicate that new and different methodologies of priority determination and planning should be developed and used in health care, especially in transition countries (40), and that the rational decisions on allocation of resources should also include funds for national preventive programs in ophthalmology.

Acknowledgments

We thank Professor Laurent Laroche, president of the management board of Paris des Quinze-Vingts from Paris, and his assistant, Ms. Francoise Zamfirescu, for having allowed Dr. Nasić a thorough insight into their Department performance. We also thank Ms. Gordana Budić, head of economic affairs of the Zagreb University Hospital Center from Zagreb, for help in data collection.

References


Received: February 7, 2002
Accepted: June 13, 2002

Correspondence to:
Mirkana Nasić
Department of Ophthalmology
Zagreb University Hospital Center
Kišpatičeva 12
10000 Zagreb, Croatia
mirjana.nasic@zg.hinet.hr