

A tale of two cities: Hospitalization costs in 1897 and 1997

Annelies Boonen
Johannes L. Severens
Sjef van der Linden
University Hospital Maastricht

The longer you can look back, the better you can look forward
—Sir Winston Churchill

Objectives: To compare the hospitalization day price, and the hospitalization costs 100 years ago with the present situation.

Methods: Municipal and hospital archives of two cities, Maastricht in The Netherlands and Tongeren in Belgium, were studied systematically for reports of costs. These were compared with the present accounts.

Results: Starting from the second part of the nineteenth century, an official day price was calculated each year by averaging the total hospital expenditures by the total number of hospitalization days. Of all expenditures, nutrition accounted for nearly 50% of expenses. Differences with the current situation are striking. Nowadays, the day price is a negotiated tariff. Management and salaries make up more than 70% of the present expenditures.

Conclusions: Hospitalization day prices have been used for approximately 150 years to determine hospitalization costs. Since then, the total hospital expenditures and the relative cost components have changed considerably. Compared with the spending power of people, the cost of one day in the hospital increased substantially.

Keywords: Hospitalization day price, Costs, History

Although hospitalizations are the cornerstone of present health care, they are a recent phenomenon in the history of medicine. For centuries, the sick were cared for within the family and only the ill without relatives needed a shelter. During the early Middle Ages, the sick poor found a caring space in the almshouses or hospices of the monasteries. Such hospices were mainly intended for pilgrims and paupers but often housed an infirmary or lazaretto. The thirteenth and fourteenth century saw the rise of the cities. The increasing number of wanderers and poor in the towns became a threat for the citizens because they brought criminality and epidemics such as leprosy and cholera. Slowly, charity became channeled in public social structures and the first municipal hospices and leper houses emerged. These hospices continued to provide the traditional welfare services of which medical care was merely a side product. Financially, these institutions were self-supporting through management of the properties they acquired from legacies and gifts. The next step toward modern

health care came with the philosophy of the Enlightenment in the eighteenth century. Application of the enlightened vision resulted in an expansion of clinical medicine and the belief that sickness could be controlled. The knot between poor relief and medical care was slowly cut in all European cities. At the same time, the French Revolution brought national involvement in health care. Poor relief and medical care were organized by more or less independent municipal organizations and run by civic minded businessmen (15). During the nineteenth century, medicine made an important progress and became a natural science. The traditional humoral theory was challenged by pioneers like Rudolph Virchow (1821) and Claude Bernard (1813). Their new approach stimulated search to detect etiologic agents and techniques for diagnosis and treatment. Pasteur (1822), Koch (1843), and von Behring proved the causal link between germs and contagious diseases. Laënnec built his first stethoscope, which enabled the investigation of diseases of the chest. The invention of the

Major historical steps in the development of health care, its organisation and financing

Period	Description historical situation
8–12th century	For centuries the ill were looked after by their family. The ill without family are cared for by the Church as part of charity, which included support for the insane, orphans, wanderers, poor. Most monasteries had a hospice, which often included an infirmary.
13–18th century	Wanderers and poor concentrate in the cities and are a threat to public health. The municipalities become increasingly involved with provision and financing of health care. The Tables of the Holy Spirit (for the distribution of food) and hospices emerge in each town. The organisation of health care is still mainly on a parish base.
1792–1815 (French Period)	Charity becomes secularised. The existing institutions are replaced by the “Commissions des Hospices Civils” (co-ordinating the organisation of the different hospices in each town) and the “Bureaux de Bienfaisance” (continuing the work of the Tables of the Holy Spirit). The structure of this organisation remains, also after the defeat of the French. The name of the organisation changes into “poor laws administration” and they regain some independence from the municipality.
Second half 19th century	Increasingly, medicine becomes technical and the care for the ill concentrates in the hospitals instead of within the family. At the same time the costs increase and the institutions are no longer self-supporting. Consequently, costs have to be claimed to the patients or their representatives.
20th century	In order to assure equal access to health care gradually local insurance companies emerge. More and more there is governmental involvement resulting in legislation on social security.

achromatic lens increased the accuracy of the microscope. In 1895, Röntgen discovered the diagnostic efficiency of the x-rays, and two years later, Hoffman made the first syringe. Meanwhile surgery made an important improvement due to the use of ether as an anesthetic in 1844 and chloroform in 1847. Thanks to the ideas of Semmelweis (1818), the conviction was spread that meticulous cleanliness during surgery was of a vital importance. It was Florence Nightingale who propagated the ideas of antiseptics in the new nursing schools all over Europe, and consequently, infectious diseases and surgical wards were separated from the medical wards (20). Because of the increasing numbers of patients admitted to hospitals and the increasing costs of medical care, the managers had to find solutions to face this financial burden. In this study, we try to determine when the transition to paid hospital care took place and how the charge of a hospitalization was calculated. We also compare the historic expenditures with the present situation.

METHODS

A systematic search of the municipal archives of Maastricht, the oldest town in The Netherlands, and of Tongeren, the oldest town in Belgium, was performed. We started to study the archives of the year 1900 and went backward in time as far as needed to find the first reports on costs. For Maastricht, we consulted the “Fonds Burgerlijke Instellingen Weldadigheid” (Fund of the Public Institutions of Welfare, Maastricht) (8), accessible through an inventory since 1987 (16) and the annual “Verslagen van den toestand der gemeente Maastricht” (Extensive Reports of the Situation of the City of Maastricht) (22). For Tongeren the “Fonds Godshuizen” (Fund Almshouses) (18), also having an inventory (3), were explored. In this article, we present the data of the year 1897,

because for that year, the records were complete in both archives.

Current expenditures were retrieved from the year accounts of 1997, one hundred years after the historic data (1;2). Because Maastricht became a university hospital in 1976 and costs of such hospitals are higher, we also used the 1997 year accounts of Sittard (19), a nearby Dutch regional hospital.

To estimate how costs relate to the spending power of people, it is recommended by economic historians to perform comparisons with the price of a 1 kg of bread and the day wage. For Belgium, bread prices for 1897 were available (21;23). In The Netherlands, official records of the bread prices were not documented after 1865 (7;17), and no other source of the price could be found. Therefore, we assumed the price of bread in The Netherlands would be equal to the price of bread in Belgium. For Belgium, several sources of day wages of an unskilled laborer for the region and period studied were found (11;14). For The Netherlands, the national data on mean overall income were used, after adjusting for region and profession by a weighing factor (24). For 1997, the official price of a 800 g of whole-meal bread and the national day wage of an industrial worker (6) were used.

To compare costs between Belgium and The Netherlands, we expressed Belgian francs (BEF) as Dutch guilders (DGL) for the former as well as for the present prices. For the prices in the late nineteenth century, the official currency exchange rate as reported by the Belgian National Bank was used (9). The currency was set by law at 2.0832 Belgian francs to one Dutch guilder and was stable from 1875 till the Great War (9). For prices of 1997, the currency of December 31, 1997 was used. At that time, 18.23 Belgian francs equalled one Dutch guilder. Exactly one year later, the official Euro currency was introduced. One Euro equals 2.20 DGL or 40.34 BEF.

RESULTS

Costs of Hospitalization and Hospital Day Price

From the middle of the nineteenth century onward, a hospitalization day price was the basis to calculate the total cost of a patient's hospitalization. In Belgium, the use of a day price became obliged by the law of February 18, 1845 (4). This law aimed at reducing the variability in hospitalization costs among cities. A clear description of the method to calculate the day price was given in an accompanying executive report. It took, however, until 1856 before the law was generally applied. In the Netherlands, the law on the municipalities of 1851 included an obligation to the almshouse administrations to report yearly expenditures and number of patients admitted (12). In Maastricht, day prices were calculated systematically from that time onward. We observed that, in both countries, the yearly expenditures per cost category were written by hand on pre-print documents, which also reported the number of patients admitted and the total number of hospitalization days. From these data, the day price was calculated by total cost averaging, that is, dividing the total expenditures by the total number of hospitalization days of that period. In Belgium, the final annual day price was an average of the past ten years and strikingly the in-living personnel was included in the total number of hospitalization days. The Belgian law required the national government to approve the price proposed by the municipal almshouse administration. In both countries, the final charge of a hospitalization was calculated by multiplying the day price by the number of days the patient had been admitted. Table 1 shows characteristics of both hospitals in 1897 and Table 2 the day price and its components. The day prices in both countries were remarkably comparable. All expenses were considered, including the pure medical costs, but also costs for salaries, costs of maintenance of buildings, and costs of food, linen, cleaning, funerals, and energy. Nutrition was the most important cost driver, exceeding the expenses of medical care and management (salaries and maintenance of buildings). In Maastricht, three categories of day prices were distinguished from 1891 onward: one for private patients (accounting for 6.9% of to-

tal hospital days), one for the poor (92.8% of total days), and one for patients with contagious diseases (0.3% of total days). For private patients, the costs of salaries (private patients had a private nurse), food (without the wine, which the rich brought themselves), heating, and cleaning were higher. In addition, but costs of physician's honoraria and funerals were not included in the day price, because these expenses had to be paid for separately. In contrast, for patients staying on the contagious diseases ward, costs of maintenance of the building, cleaning and heating, and funerals were higher. This resulted in a day price of 1.84 guilders for private patients, 1.07 guilders for the poor, and 3.38 guilders for the patients on the infectious disease ward. Because cost price calculations were available for the period 1887 to 1897, it could be seen that they were remarkably stable at that time. In Maastricht, the costs varied between 0.79 (1888) and 1.17 guilders (1894) per day, and in Tongeren, between 0.81 (1895) and 0.97 guilders (1893) per day. In Maastricht, a rise of 24% in total day price was noticed in 1891. In that year, the patients and personnel moved into the new hospital, resulting in a steep increase in costs of management, maintenance of buildings, heating, and cleaning.

Comparison with the Current Situation

Table 1 illustrates to what extent both cities and hospitals expanded over a period of 100 years. Adjusted for the growth in population, the number of beds increased 1.69 times in Maastricht and 1.45 times in Tongeren and the number of admissions 6.95 and 5.76 times in both cities, respectively. This important increase in the need for medical care could be realized by a decrease in the duration of the hospitalization (factor 0.23 in Maastricht and 0.11 in Tongeren). Table 2 presents for 1997 the tariff of the day price, which is in both countries a negotiated price, and for Maastricht a true cost estimate, such as provided in the recent Guidelines for Pharmacoeconomic Evaluations in The Netherlands (13) and reflecting an average for the Dutch university hospitals. In addition, the distribution of the real hospital expenditures over the distinguished cost categories is presented. The cost categories

Table 1. Characteristics of the Two Cities and Hospitals in 1897 and 1997

	Maastricht		Tongeren	
	1897	1997	1897	1997
Number of inhabitants	34,125	115,149	8,967	56,638
Number of hospital beds	120	685	42 ^a	385
Number of patients admitted/year	922	21,645	338 ^a	12,204
Admissions/year/1,000 inhabitants	27	188	38	215
Number of hospitalisation days/yr	35,793	192,776	15,454 ^a	106,409
Mean duration hospital stay, days/pt	38.8	8.9	76.5 ^a	8.7

^a Average over the previous decade.

Table 2. Comparison of the Day Price and Its Components for 1897 and 1997 in the Two Hospitals

	Maastricht		Tongeren	
	1897	1997	1897	1997
Day price (true cost estimate), DGL/day ^a	1.13	680 ^b [460 ^c]	0.91	Na
Official day price (tariff), DGL/day ^a	1.13	973 [654 ^d]	0.91	340
Salaries	7.4%	51.1%	7.9%	57.3%
Other management costs ^e	—	30.2%	—	15.5%
Maintenance buildings & furniture	9.8%	—	3.2%	—
Nutrition	48.4%	1.0%	56.1%	1.6%
Hotel costs	18.4%	2.1%	10.0%	6.3%
Clothing	3.9%	Na	3.2%	Na
Linen	1.9%	Na	1.1%	Na
Laundry	2.0%	Na	0.5%	Na
Lighting	2.7%	Na	0.5%	Na
Heating	5.4%	Na	4.2%	Na
Cleaning	2.5%	Na	0.5%	Na
Medical care	7.8%	15.6%	13.2%	18.9%
Drugs	7.3%	^e	14.8%	^e
Funerals and public worshipping	0.9%	—	3.2%	—
Various divers	—	—	0.5%	0.33%
Cost of an average hospitalisation (DGL)	44	8,660	70	2,954

Na: not available.

^a Since December 31, 1998, one Euro equals 2.20 Dutch guilders (DGL) and 40.34 Belgian francs.

^b True price estimate for a Dutch university hospital from the Dutch Guideline for PharmacoEconomic Evaluation.

^c True price estimate for Dutch regional hospital from the Dutch Guideline for PharmacoEconomic Evaluation.

^d Other management costs include general costs (administration, communication, insurance), costs to maintenance of the building (including energy costs), interests, leasing, rents.

^e Costs of drugs comprised in medical costs.

considered, remained comparable over time. What was referred to as “maintenance of buildings and furniture” in 1897 was comprised in the “other management costs” in 1997, including direct maintenance costs but also rents on loans and general costs of administration and communication. The total management costs have become now the major contributor to the total costs, while nutrition accounts for the smallest expense. When comparing both hospitals at the present time, we have to realize Maastricht became an academic hospital providing more complex and high-technology care. The tariff for the day price in 1997 for a peripheral Dutch hospital would be 654 DGL, more comparable with the Belgian hospital. The true cost estimate for a hospitalization day in a Dutch regional hospital would be 490 DGL in 1997, according to the calculation by the Dutch Guideline for PharmacoEconomic Evaluations (13). As explained, the tariff replaced the “true” cost price in the course of time. In The Netherlands, the tariff is negotiated within the global hospital budget between the health insurance company and the hospital, taking into account capacity and function (university or regional) of the hospital. A different tariff is set for the public (70%) and the private (30%) insured patients. In Belgium, the tariff is decided annually by the Ministry of Social Affairs and is based on the function and size of the hospital, as well as true costs of the previous years.

Relationship Between Day Price and Hospitalization Costs and Spending Power of People

To illustrate what the hospital day price means in terms of the spending power of people, we compared the price of 1 hospital day but also the price of an average hospitalization with the price of one loaf of bread and the income of one day’s work, a method which is classically advised in historic economic evaluations. In Table 3, the number of breads one can buy with one day’s wage but also the number of day wages required to pay 1 day in hospital or to pay one average hospitalization in 1897 and in 1997 are calculated. While the average income of an unskilled laborer increased approximately 230 times and the price of one bread approximately fifteen times, the price of one hospital day increased by factor 373 to 861 and the price of an average hospitalization by factor 42 to 198. On the other hand, because the length of an average hospitalization decreased dramatically, the financial impact of an hospitalization became less important.

DISCUSSION

Approximately 150 years ago, hospitals started to claim the costs of hospitalizations. The annually determined day price and the number of days of hospitalization were the basis for

Table 3. Comparison of the Hospitalization Costs in 1897 and 1997 in Relation to the Spending Power of People

	Maastricht		Tongeren	
	1897	1997	1897	1997
Price of bread, DGL ^a	0.17 ^b	2.99	0.17	2.51
Day wage, DGL/day ^a	0.70	161.0	0.80	179.0
Hospital day price, DGL/day ^a	1.13	973.0	0.91 ^c	339.5
Cost of an average hospitalization, DGL	44	8,660	70	2,954
Number of breads one can buy for one day as wage	4.1	53.7	4.8	71.2
Number of work days to pay for one day in hospital	1.6	6.1 ^d	1.1	2.2
Number of work days to pay for an average hospitalization	62.4	53.8	87.0	16.5

^a Since December 31, 1998, one Euro equals 2.20 Dutch guilders (DGL) and 40.34 Belgian francs.

^b The Belgian price of bread was used since the Dutch price for 1897 could not be retrieved.

^c Average over the previous 10 years.

^d Hospitalization in Sittard in 1997, a peripheral hospital near Maastricht, would cost 218.2 breads or 4.1 work days.

the total costs of one stay in a hospital. While at present the day price is a negotiated tariff, the historic price reflects the real average cost of 1 day in the hospital. Of interest, national regulations were required already at that time to reduce the large variability among hospitals in the exact method of cost price calculation. Over the 100 years considered in this study, the price of one bread increased approximately fifteen times but the cost of one hospitalization increased 42 to 198 times. Taking into account the population growth of inhabitants in both cities, a sixfold increase in the number of patients admitted was noted during the same period. The important rise in need for hospitalizations and the expenditures after 1897 should be seen in the light of the new medical insights. Although the theoretical principles of the empirical and intervention medicine had already been laid down before the period studied, there was a long time before the new ideas reached the regional hospitals. In Maastricht, written cleanliness reforms were introduced in 1881 and, in the same year, a microbiologic laboratory was installed, including a microscope. On the same line, a separate ward for patients with contagious diseases was opened in 1891, having a higher day price (DGL 3.39 per day compared with DGL 1.13 per day) in particular due to higher cleaning and maintenance costs. From the start of the institute in 1822, the Maastricht hospital had an operating room in which a barber performed small procedures. Only in 1881 was the first scientific surgeon appointed, and it took until 1892 before the first modern operating theater was added to the hospital. In the year of our study, approximately 50% of the patients underwent a surgical treatment in both city hospitals, but the expenditures for surgical instruments and wound materials stayed low, at approximately 1.7% of total Maastricht hospital expenditures. Although a primitive x-ray machine was donated to the Maastricht hospital in 1896, only one year after Röntgen's discovery, a true radiology department became operational in 1911 in Tongeren and in 1912 in Maastricht. Apart from the progression toward more technical and, therefore, more expensive health care, the need for specialized

inpatient health care increased over the period studied. Taking into account the growth of the population, we noted a sixfold increase in the number of patients admitted. The effectiveness of inpatient medical care is difficult to judge, but life expectancy raised from approximately fifty years in 1897 to approximately seventy-six years in 1997, while the hospital mortality in Maastricht decreased from 14% in 1897 to 3% in 1997.

We realize our study has several limitations. Historic research has its own methodology and weaknesses. At present, data are stored systematically but this finding is in striking contrast to former times. Reports on hospital costs in Maastricht before 1887 could not be found and were missing for the period 1898 to 1907 in Tongeren. Therefore, we presented the 1897 figures. Similar problems were encountered when searching for the historic price of bread and the day wage of an unskilled laborer, figures that were necessary to relate hospital costs to the spending power of people. The difference in source of the estimates contributes to the observed discrepancy in results between the countries. In addition, day wages are difficult to compare, because in 1897, the number of working hours were likely to be much higher and laborers often received additional remuneration in natural goods.

The comparison of the historic costs with the present data should be interpreted cautiously. Honoraria for physicians are not included in the historical and present hospital expenditures but are likely to have increased over time. Therefore, the observed increase of the costs of hospital care is definitely underestimated. The main change in the organization of hospital care is the extension of outpatient care, a facility just starting 100 years ago. For our study, it was impossible to separate the present expenditures for out- and inpatient care.

When comparing the impact of the day price on the spending power, one should realize that the hospital costs were not necessarily paid by the patients themselves. In 1897, costs were only charged directly to wealthy citizens. For the poor patients foreign to the city, costs were claimed to

the almshouse administration of the municipality of origin. However, increasingly also the poor belonging to their own municipality had to pay. This change resulted in unequal access to health care, and the idea of solidarity emerged. First, local initiatives of the industrial employers offered health insurance and insurance against work disability for their employees. It took until the middle of the twentieth century before national laws on social security and health care were approved in both countries. At the present time, in both countries an obligatory health insurance system exists. Direct charges to the patients are minimal, but charges are indirect through taxes and insurance premiums.

CONCLUSIONS AND POLICY IMPLICATIONS

This study illustrates the increasing need and increasing costs of hospital care, the shift in total expenditures from nutrition to managerial costs, and the disproportionate increase in the costs of the day price in relation to the spending power of people. Nowadays, policy makers and health economists again discuss the advantages of true cost price calculations, such as diagnosis-related groups (DRGs) to make hospital financing more translucent (5;10). The diversity in diagnoses and related costs makes such an approach more complex than in the past. Of interest, already 100 years ago, national regulations were required to reduce the variability in the day price among hospitals. Likely, this finding reflects that health-care provisions share characteristics of free market goods and that national regulations are mandatory to ensure accessibility of health care to all subjects in the past as well as at present.

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