Resource Utilization and Cost of Rheumatic Fever

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ABSTRACT. ***Objective.*** The socioeconomic effects of rheumatic fever (RF) in Brazil, including direct and indirect costs to patients and their families and to society, are largely unknown. We evaluated the utilization of resources and costs related to RF in a tertiary center caring for low income patients in the city of São Paulo, Brazil.

Methods. One hundred patients with RF, younger than 18 yrs, with followup of at least one year, were sequentially selected to provide complete information on a questionnaire. Additional data were collected from patients' charts. The utilization of resources was evaluated for each patient throughout the entire disease course. Costs were determined for patients and their families as well as for the society, using variables from 3 different systems: the national public health system, used by most lower income groups; the Brazilian Medical Association, which regulates charges and fees utilized by health plans and insurance companies; and costs charged by private practitioners, paid directly by patients.

Results. The RF population studied belonged to a low socioeconomic level. The mean monthly family income was $625.20 US. The mean disease duration was 3.9 yrs (range 1–10). Patients had a total of 1657 medical consultations, 22 hospital admissions, and 4 admissions to intensive care unit. Work absenteeism among parents was calculated as 22.9%, equivalent to 901 days of missed work; about 5% of the parents lost their jobs. Patients showed a high rate of school failure (22%). Considering the public system as a reference, direct, indirect, and total costs to society per 100 patients throughout the entire disease duration were $105,860 US ($271/patient/yr), $18,803 US ($48/patient/yr), and $124,663 US (US $319/patient/yr), respectively. When health care plan and private systems were taken as reference, the total costs were $423,550 US and $684,351 US, respectively.

Conclusion. RF and rheumatic heart disease have an important socioeconomic impact in Brazil; costs of RF made up roughly 1.3% of annual family income. The estimated annual cost of RF for society in Brazil is $51,144,347.00 US. (J Rheumatol 2001;28:1394–7)

Key Indexing Terms:
RHEUMATIC FEVER CHILDREN COST OF ILLNESS RESOURCE UTILIZATION

Rheumatic fever (RF) is the most frequent and important cause of acquired cardiovascular disease in childhood and adolescence, posing a financial burden on the patient, the family, and society[1]. The incidence of RF in families of low socioeconomic level living in underdeveloped, overpopulated countries is about 100 cases/100,000 children[2]. The prevalence of RF in these countries is 5.3/1000 healthy school age children[3].

The cost of RF is high due to repeated medical consultations, hospital admissions, particularly of patients with rheumatic heart disease, expenses of clinical and surgical treatment, and the physical and psychological burden on patients and their families. In addition, there is a substantial cost related to considerable losses of productivity for the society and to individual suffering[2].

We evaluated the utilization of resources and the effect for children and adolescents with RF attending a tertiary hospital that provides care to low income patients in the city of São Paulo, and determined the direct and indirect costs to patients, their families, and the society. As well we compared the costs of RF using values for fees and services from 3 different levels of organization of health care: the National Public Health System, the Brazilian Medical Society, and private practitioners' fees paid directly by patients.

MATERIALS AND METHODS

One hundred patients were sequentially selected during a 3 month period among those attending the Pediatric Rheumatology Unit of the Federal University of São Paulo (UNIFESP), at Hospital São Paulo, with diagnosis of RF based on the modified Jones criteria[4]. Our unit is part of a public general hospital supported by the federal government. Inclusion criteria were age under 18 yrs, with followup in the clinic for at least one year, and ability of the patient or guardian to provide complete information on a

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questionnaire. The questionnaire was administered by one researcher (MTT) and included demographic data, clinical data, prescriptions, use of primary and secondary prophylaxis with benzathine penicillin G, information on hospitalizations and cardiac surgery, consultation in other health care facilities, socioeconomic status of the family, travel expenses incurred for treatment, number of work days lost by the guardian, and school days lost by the patient due to disease. Additional data were collected from patients' medical charts to compare with the patient's or guardian's information, and for calculation of costs, including number of medical visits, number of days in the hospital, laboratory tests performed during hospital stays and clinic visits, and medications taken by the patient throughout the entire course of the disease. We evaluated the prescriptions and medical reports from other institutions and care providers to obtain patients' data prior to enrollment in our clinic.

For analysis of costs, direct costs were those resulting from direct interventions in the disease based on other methodologic studies[5,6]. Direct costs attributed to the patients/family were: medical consultations, laboratory tests, transportation, and costs of other services; direct costs attributed to society were consultations not paid by the patient/family, hospital admissions, cardiac catheterizations and surgery, and medications and laboratory tests provided by the hospital or public clinics, as well as hospital expenses not formally reimbursed by the public health system, which are ultimately paid by society. Indirect costs for the patients/family were those resulting from deductions subtracted from the parent's salary by the employer, as a result of medical consultations or hospital admissions for the treatment of the disease; indirect costs for society were the production losses related to sick days. The Brazilian currency (reais) was converted to US dollars in the year of the study (in 1998, $1 US = R$1.15).

The cost for each utilized resource was estimated based on the standard reimbursement fees and charges for services and procedures from the public health system (Unified Health System; government). This system was considered as the reference to derive the costs for 2 other groups: (1) Index of reimbursement of services and procedures from the Brazilian Medical Association, which regulates fees charged by health plans and insurance companies, paid by the patients or families; and (2) prices charged by private hospitals and practitioners, obtained by taking the mean of the fees charged by 3 private hospitals and 3 private laboratories, reflecting the costs of patients using private health services. Prices of prescription medications were obtained from the index of prices for public pharmacies (Pharmacy Guide, Official Diary, executive secretary, document no. 37, May 1992). Prices of medications provided free of charge by public outpatient clinics were calculated based on prices of the public "Central of Medications." Travel expenses were calculated by estimating the costs with public transportation (bus, metro, or train) or private transportation (cost of gasoline for a round trip of an estimated distance of 10 km to the hospital plus cost of 2 hour parking). It was assumed that patients who used health insurance plans and private patients used private transportation. The loss of income was calculated from the proportion of missed work days due to the disease, in relation to the mean family income. These losses were attributed to the patient when the guardian had his (her) daily wage subtracted from the monthly salary, and to society if it was considered sick pay.

RESULTS

The demographic and clinical characteristics of the patients are presented on Table 1. There was a predominance of female patients (58%); the mean age at disease onset was 9.2 years, and mean disease duration was 3.9 years. The most frequent initial manifestation (isolated or associated) was arthritis, in 68% of the patients, followed by carditis (49%) and chorea (32%). The socioeconomic characteristics are shown in Table 2. The mean family monthly income was $625 US. Mean number of family members was 5.1, and about 16% of the parents were illiterate.

Table 1. Demographic and clinical characteristics of patients with RF (n = 100).

Characteristic	
Female, %	58
Ethnic origin Caucasian, %	51
Age at disease onset, yrs, mean (range)	9.2 (2.4–15)
Time until diagnosis	1.0 mo (1–2 yrs)
Disease duration, yrs, mean (range)	3.9 (1.0–10.0)
No. of flares, %	
1	86
2	11
3	2
4	1
Clinical manifestations, first flare, %	
Arthritis	68
Carditis	49
Chorea	32
Most frequent valvulopathies, %	
Mitral insufficiency	9.2
Mitral stenosis	45.1
Secondary, penicillin G, %	99
Prophylaxis failure, n (%)	36 (36)

Table 2. Socioeconomic characteristics of families of patients with RF (n = 100).

Characteristic	
Working parents, %	
Fathers	87.6
Mothers	46.5
Other*	13.0
Family income/mo, mean (range)	$625.00 US (87–3391)
No. of family members, mean (range)	5.1 (1–13)
Patients in a rented house, n (%)	21 (21)
Parents with primary school education level	Fathers 74.5%, mothers 76.0%
Parents illiterate	Fathers 17.3%, mothers 15%

* Siblings, aunts, uncles, grandparents.

Table 3 summarizes total numbers of medical consultations, hospital admissions, laboratory tests, the main medications, and cardiac surgeries. Of the 1859 medical consultations, 202 occurred outside our institution, prior to enrollment of the patient in the Rheumatology Clinic. Admissions in our hospital were due to carditis (20 patients) and chorea (2 patients). The most frequently used medicines were benzathine penicillin G (98% of patients) and acetylsalicylic acid (ASA) 500 mg tablets (49% of patients). Other medications as well as laboratory tests were considered but not listed because of the low frequency they were used. All patients had erythrocyte sedimentation rate (ESR) and antistreptolysin-O (ASO) titer determined, at a mean of one test/patient/year. Two hundred two laboratory tests were performed elsewhere. Cardiac surgeries were mitral valvuloplasty on 2 occasions in one patient, and aortic valve

Table 3. Resource utilization of patients with RF.

	No. of Patients	Quantity of Consumption	Quantity/ Patient/Year
Medical consultants			
Our institution	100	1657	4.2
Other	47	202	0.5
Hospital admissions (days)			
Our institution	22	302	0.8
Other	23	137	0.4
Intensive care admissions (days)			
Our institution	4	39	0.1
Other	2	12	0.03
Laboratory tests			
ESR	100	422	1.1
ASO	100	487	1.2
Blood count	99	453	1.2
CRP	89	217	0.6
Mucoprotein	87	214	0.6
Echocardiogram	86	202	0.5
Electrocardiogram	82	215	0.6
Chest radiograph	81	147	0.4
Protein electrophoresis	70	133	.3
ANA	36	45	0.1
Medications			
Benzathine penicillin G, 1.2 million U ampoules	98	7058	18.1
ASA, 500 mg, tablet	49	5411	13.9
Prednisone 20 mg tablet	28	2610	6.7
Haloperidol 1 mg tablet	27	5913	15.2
Benzathine penicillin G, 600,000 U ampoules	22	489	1.3
Cardiac surgeries	2	3	0.01

replacement, mitral valvuloplasty, and mitral commissurotomy in another patient. Patients did not have medical consultations or hospital admissions in other health care facilities besides our hospital during the followup period.

Direct (consultations, hospital admissions, catheterization, cardiac surgeries, medications, laboratory tests, and transportation) and indirect total costs for society at large are presented on Table 4. Considering the public system as a reference, direct, indirect, and total costs for society per 100 patients, throughout the entire disease duration of RF, were $105,860 US ($271/patient/yr), $18,803 US ($48/patient/yr), and $124,663 US ($319/patient/yr), respectively. When health care plan and private systems were taken as reference, total costs were $423,550 US and $684,351 US, respectively.

Direct (consultations, medications, laboratory tests, and transportation) and indirect costs for the patient/family are shown in Table 5. Considering the public system as a reference, direct, indirect, and total costs were $37,692 US, $334 US, and $38,026 US, respectively. When the health care plan and private systems were taken as reference, total costs were $185,647 US and $383,930 US, respectively.

Travel expenses incurred by the patients and their guardians related to medical consultations, laboratory tests, or hospital admissions were calculated based on a total of 2667 visits. There were 12,391 bus trips, 1914 metro trips, and 796 train trips. Seventeen patients used private transportation for at least one of their visits, comprising a total of 167 trips.

Table 4. Direct and indirect costs for society (US$).

	Public System, $ US (mean/patient/yr)	Health Care Plan System, $ US (mean/patient/yr)	Private System, $ US (mean/patient/yr)
Direct costs	105,860 (271.5)	404,746 (1,037.8)	665,548 (1,706.5)
Indirect costs	18,803 (48.2)	18,803 (48.2)	18,803 (48.2)
Total	124,663 (319.7)	423,550 (1,086.0)	684,351 (1,754.8)

Table 5. Direct and indirect costs for the patient (US$).

	Public System, $ US (mean/patient/yr)	Health Care Plan System, $ US (mean/patient/yr)	Private System, $ US (mean/patient/yr)
Direct costs	37,692 (96.6)	185,313 (475.1)	383,596 (983.5)
Indirect costs	334 (0.9)	334 (0.9)	334 (0.9)
Total	38,026 (97.5)	185,647 (476.0)	383,930 (984.3)

Indirect costs were estimated based on the losses of school or work days. Forty-three (22.9%) fathers or mothers missed 901 work days. Of these missed work days, 16 caused daily wages to be deducted from monthly salaries. The remaining 885 were considered sick days, and losses were attributed to society. Nine guardians (4.8%) lost their jobs due to work absenteeism related to the child's disease. Indirect costs estimated based on the mean monthly income ($21 US per day) were $334 US and $18,803 US attributed to the patient/family and to society, respectively. Eighty-four patients lost 1812 school days since the beginning of their illness, at a mean of 21.6 days/patient. School absenteeism was due to disease activity or to medical consultations and/or laboratory tests. Twenty-two children failed to be promoted to the next grade in school (0.06 failures/patient/yr).

Considering the incidence of RF in Brazil to be similar to that in other underdeveloped countries, which is reported as roughly 100/100,000 individuals/yr, we can estimate the costs of RF for the population of the city of São Paulo (11 million inhabitants), the State of São Paulo (20 million), and the country as a whole (160 million). The annual costs, considering that all patients diagnosed are treated, were estimated at $3,516,174 US, $6,393,043 US, and $51,144,347 US, respectively. The estimated total costs for Brazil correspond to 0.007% of the gross national product (in 1998). Of this, 3.2% were allocated to the public health care system. We estimated that 0.2% were allocated to the care of RF.

DISCUSSION

Considering the public system as a reference, total costs for

the society per 100 patients, throughout the entire disease duration of RF (direct and indirect costs) were $124,663 ($319 US/patient/yr). When the health care plan and private systems were taken as reference, total costs were $423,550 US and $684,351 US, respectively. Our results show that RF and rheumatic heart disease present a major financial burden for society in Brazil.

The population in this study was of low socioeconomic level, with a high rate of illiteracy, suggesting that difficulties may have been associated with poor understanding of treatment goals and followup of patients. For some patients, diagnosis was delayed for up to 2 years. Delay in starting secondary prophylaxis with benzathine penicillin G and the high rate of prophylaxis failure (36.4%) found in this study may account for an increased risk of recurrence and rheumatic heart disease. Hospital admissions for chronic rheumatic heart disease are more common among patients 20 to 60 years old[7]. We have observed a low frequency of hospital admissions in our patients, perhaps because they belonged to a younger age group.

Loss of work days among parents caused significant psychosocial impact, including deductions of daily wages from the monthly salary, despite justification of absence, and even loss of the job, for some of the parents. This causes aggravation of the socioeconomic problems of these low income families. School absenteeism and failure is a common problem among low income populations, which was aggravated among children with RF in our study, as indicated by the finding of a high rate of school failure (22%) among patients. We cannot attribute this to the medical condition, since the figures of healthy children with the same socioeconomic level are similar in our country.

Although benzathine penicillin G for secondary prophylaxis of RF should theoretically be available through the public system in our country, we found that the majority of the patients (74%) had to pay for this medication in regular pharmacies occasionally, or at all times, throughout the illness, generating more expenses and possibly decreasing treatment compliance.

We estimate that a mean of $97 US/year, about 1/12 of our current annual minimal wage, was spent by each RF patient/family on direct costs, if the patient was cared for by the public system. This amount was 5-fold and 10-fold higher if the same patient received care provided by the health insurance plan and private systems, respectively. Whether the people who would use these 2 other systems would have the same course of disease remains unknown.

In Brazil, hospitals taking care of these patients are underpaid by the public system, which leads to financial deficits further compromising the quality of care. As expected among patients with RF, the highest costs were among those with rheumatic heart disease, who required hospital admissions and surgery, and needed more laboratory tests and medications. Direct costs for the patient were $97 US/patient/year, adding up to a total cost of $271 US/patient/year for society. Total costs (direct and indirect) were estimated at $97 US/patient/year and $320 US/patient/year for the patient/family and society, respectively. Prophylaxis with benzathine penicillin G has been shown to prevent disease recurrence, reduce health care costs, and decrease the incidence of new cases of the disease[8]. Secondary prophylaxis with benzathine penicillin G 1.2 million units every 21 days costs $23 US/patient/year, much less than the direct and indirect costs of RF for the society, estimated as $320 US/patient/year.

There are costs that could not be calculated, including those resulting from impaired quality of life as a consequence of pain and anxiety for the patients and their families; limited work opportunities due to physical limitations as these patients reach adulthood; and eventual limitations due to school absenteeism or to loss of family income.

Our results show that rheumatic fever and rheumatic heart disease present a major financial burden for society in Brazil. In countries such as ours, financial resources are limited and cost/benefit issues should be carefully analyzed. Therefore, preventive measures should be emphasized whenever possible, including the case of RF. Total costs (direct and indirect), based on reimbursements by our public health system were probably underestimated. Indeed, when reimbursement variables from health plans and insurance companies and private systems were used, the costs were 5- and 10-fold higher, respectively. The psychosocial impact of RF in Brazil, as shown by loss of work days, loss of jobs, school absenteeism, and high rates of school failures, was remarkable, and could be associated with further disadvantages, regarding fewer work opportunities for these children in the future.

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