Cost of acute lymphoblastic leukaemia treatment for paediatric patients in Mexico

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General topic No. 1. Paper proposed for the Colloquium of the IAAHS.

Abstract

Objective: Estimate the expected cost of the variable component for acute lymphoblastic leukemia (ALL) treatment in pediatric patients. Analyze epidemiological information to quantifying financial requirements for the provision of services to these patients considering different coverage options. **Materials and methods:** The analysis is structured under five stages: (a) definition of a suitable medical protocol, (b) determination of a set of reimbursement products related to the protocol, (c) compilation of statistics, identification of inputs and acquisition costs, (d) construction of the expected cost for the variable component of the treatment, (e) quantification of the necessary resources to provide financial protection to ALL patients for the Mexican case in 2005. **Results:** The expected variable cost for the ALL treatment rises to USD$33,423 and to USD$58,601 for transplanted patients ($10.8 Mexican pesos - $1 USD). **Discussion, conclusions and recommendations:** Results suggest that expected cost of ALL treatment varies substantially based on four fundamental issues: the initial risk classification, the bone marrow transplantation, the presence of infectious episodes and verification of relapses. With actual resources it is possible to provide financial coverage to all pediatric patients not covered by social security.

Key words: variable cost analysis, acute lymphoblastic leukemia, reimbursement product, incidence, withdrawal of treatment, financial coverage.

Resumen

Objetivo: Estimar el costo esperado del componente variable del tratamiento de leucemia linfoblástica aguda (LLA) para pacientes pediátricos. Analizar la información epidemiológica con objeto de cuantificar los requerimientos financieros para la atención de estos pacientes bajo diferentes opciones de cobertura financiera. **Materiales y métodos**: El análisis consta de cinco etapas: (a)definición del protocolo de atención, (b)determinación de productos facturables relacionados a dicho protocolo, (c)compilación de información estadística y de costos de insumos, (d)construcción del costo esperado del componente variable del tratamiento, (e)cuantificación de recursos necesarios para financiar la atención de LLA en el caso de México para el año 2005. **Resultados:** El costo esperado para el tratamiento de la LLA es de $360,974 y de $632,892 para pacientes trasplantados ($10.8 pesos - $1 USD). **Discusión, conclusiones y recomendaciones**: Los resultados sugieren que el costo del tratamiento de la LLA varía sustancialmente en función de cuatro factores fundamentales: la clasificación inicial según riesgo, el trasplante de médula ósea, la presencia de episodios infecciosos y la ocurrencia de recaídas. Con los recursos disponibles si es posible financiar el tratamiento a todos los pacientes pediátricos no cubiertos por la seguridad social.

Palabras clave: análisis del costo variable, leucemia linfoblástica aguda, producto facturable, incidencia, abandono del tratamiento, cobertura financiera.

INTRODUCTION

Financing treatments of high specialty is one of the most challenging components of any public health system. Given the complexity of the treatments of high specialty as well as the material and financial constrains, there is the need of developing studies to inform policy makers on the convenience of providing financial coverage to treatments which are more cost-effectiveness than others.

In Mexico, since the creation of the System of Social Protection in Health (SSPH) the urgent necessity arises to develop studies that support the prioritization of treatments of high specialty to be financed by the system. In the prioritization process one has determined by the competent authorities that the acute lymphoblastic leukemia in children is one of the diseases whose treatment must be financed. This decision was based on the frequency of cases and the evidence of the effectiveness of the existing treatment in international literature.

For the Mexican case, there were two main sources of financing for the treatment of ALL up to 2004. On the one hand, the budget for the social security institutions, (Mexican Institute of Social Security, Social Institute of Security and Services of the Mexican Workers of the State, Mexican Petroleum, Secretariat of the National defense, Secretariat of Navy and state institutes of social security) covering patients who belong to families insured by the social security. On the other hand, the out of pocket expenditure made by the uninsured families when the event occurs. There is also a reduced group of patients who receive financing through private insurance or via the intervention of nongovernmental organizations but his number is sufficiently small not to be significant from the statistical perspective. Nevertheless the contribution of these two last sources of financing must be considered for effects of any policy of health that is desired to implement.

Since the reform to the General Health Law in 2003[1] in where the SSPH is created, the federal and state governments are aiming to reduce the negative effects of three types of health expenditure: a) out-of-pocket; b) impoverishing; and c) catastrophic, through the financial coverage for uninsured population when some diseases of high complexity appear. The source of financing for this financial protection is defined in the General Health Law as the eight percent of the federal and state contributions to the SSPH.

From the perspective of the financial risk management, the creation and operation of the Fund against Catastrophic Expenses (FACE) as part of the SSPH structure offers a vehicle of strategic planning for the negotiation with hospitals that will provide services of high specialty. The FACE also is an instrument to manage other secondary sources of financing for services of high specialty. Between these secondary sources the most important are the donations that the tobacco industry will be making from August 2004 until December 2006.

The way to access the services that FACE will finance is as follows: A general hospital of the SSPH network detects patients suffering one of the diseases covered by FACE. Then it refers them to the nearest specialty hospital certified by the Ministry of Health and the General Health Council. The FACE pays to the specialty hospital the treatment previously agreed with the National Commission of Social Protection for Health that manages the FACE.

Thus the present study covers the need to developing studies that support the component of the purchase of the services necessary to offer the attention of the diseases of high specialty. In particular this analysis focuses in the cost of the variable component of the treatment for pediatric patients with acute lymphoblastic leukemia (ICD10: C910). To calculate the cost of this treatment is essential in the financial planning of the resources necessary to determine the limits of coverage of the pediatric population of the country.

It is important to indicate that the present work focuses to the cost of the variable component because the fixed component (infrastructure and personnel) of the specialty hospitals at the moment is financed through an historical budget by federal resources, state resources or a combination of these.

METHODOLOGY

The present cost study is divided in five stages, considering several clinical, statistical, epidemiological and financial components.

In the first stage of the study a detailed protocol of attention for the average pediatric case with ALL was developed. This initial protocol[2] was defined by a group of clinical experts summoned by the General Health Council (among their members there are representatives of the public and

private sectors involved in stewardship, provision and production of health services). This protocol was refined by clinical experts consulted by the National Commission of Social Protection in Health[3]. The protocol differentiates the attention to patients of high or habitual risk and considers if they are candidates to bone marrow transplant. In addition a protocol for the attention of patients in relapse (protocol of San Judas XIII) internationally accepted was incorporated.

The protocols define dose and number of cycles of all the medicines needed for the treatment of the average case (patient with a square meter of corporal surface and 30 kilograms of weight). In addition, there is a listings of medical material, as well as studies (laboratory, radiological and special) needed during the treatment. It is important to emphasize that all medicines and medical material defined in the protocol are included in the Basic List of Medicines and Medical Material guaranteed by the General Health Council[4-6]. Fro the studies, although these do not have a basic list, they are guaranteed by the General Health Council as best medical practices based on evidence.

In the second stage of analysis, the protocols were taken as bases for the application of a costing method. In this stage several methods were analyzed[7-9], considering the level of development of the costing systems used in the specialized hospitals, as well as the viability for implementation in the hospitals that will offer the service and in the central offices of the SSPH.

Several methodologies exist for costing diseases. On the one hand, there is the classical methodology by cost centers[7]. On the other hand there is the methodology by diagnosis related groups (DRG)[8-9]. Finally, there is the methodology by reimbursement products[10-11]. The three methodologies are focused to determining prospective costs, that is to say, the obtained amount is a reflection of the treatment agreed in advance.

The methodology by cost centers is the most basic option for the calculation of costs since it is based on an “up-down” approach (budget divided by hospital activity). The DRG methodology is a more refined approach whose main limit is to focusing on episodes of attention, loosing the optics of integral attention of a disease. Finally the methodology by reimbursable products allows to costing the attention in a pre-established protocol by disease, thus making it an integral cost of

treatment. It is worth mentioning that the methodology by reimbursable products can use the results of the DRG methodology as part of the established stages of attention in the protocol that is being paid for, reason why these last two methodologies can be complementary.

Considering the existing structure of costing in the public hospitals that will offer the service and looking for a viable alternative of implementation for financing ALL treatments, we decided to use the method of reimbursable products in this case.

Each reimbursable product tries to reflect one or several defined clinical stages in the protocols where an important difference in costs appears. In the present exercise the reimbursable products are structured to include one month of activity, this is all the medicines, medical material and studies needed during a month of treatment. This timing responds to the payment system to the hospitals that the SSPH is implementing.

In the third stage statistical information was compiled on the percentage of patients by type of risk, mortality during the treatment and withdrawal of the treatment. In addition, information on purchasing of medicines, medical material and studies from the public sector were obtained.

In order to obtain the statistics specific questionnaires were sent to eleven public hospitals which offer attention to pediatric patients with ALL. These hospitals are units of the State Health Services (9 units) as well as units of the National Institutes of Health (2 units). The questions were structured to obtain percentages of death and withdrawal after completion of each reimbursable product. The answers used in the present study come from seven of the eleven contacted hospitals (64% of the sample). The original statistics from the hospitals were complemented with information from international literature, in particular to obtain data for the probability of occurrence of neutropenia and infeccions.[12] The statistics were used to calculate the expected costs for each reimbursable product after adjusting for the probability of exit by death or abandonment of the treatment. In addition the statistics from the hospitals were applied to quantify the expected number of relapses.

The information on prices for medicines and medical materials was obtained from, the biggest public purchaser of the country. [13] Prices for the laboratory studies were obtained from one of the biggest private laboratories in the country. Finally, the prices for the radiological and special

studies were obtained from the recovery fees that public hospital can charge. These fees are authorized by the Ministry of Finances[14] and updated in an annual basis.

For the fourth stage the prices of medicines were tied with the doses and cycles of the medicines, medical material and studies established for each reimbursable product. This stage implied the tie of the medicines and medical material purchasing presentations with the stipulated doses of the protocol. The entailment resulted in the expected cost for the variable component by reimbursable product for all the treatment. This expected cost incorporated in a first stage the death probability as well as the withdrawal probability. The incorporation of both probabilities allowed to measuring the influence of each one of the two possible causes of unsuccessful exit of the average treatment. This measurement helped to deciding to only adjust by death, since the percentage of withdrawal is strongly tie with the existence of a financing source.

For the last stage we developed three scenarios of financial coverage for the pediatric population at risk of suffering ALL. The first scenario includes the expected cases and costs of all the pediatric population of the country. The second scenario presents the expected cases of the uninsured pediatric population. The third scenario shows the expected cases of the pediatric population affiliated with the SSPH.

To accomplish these scenarios observed incidence rates by age group and sex were calculated considering the cases reported in the Hospital Discharge System (HDS) during the years 2000 to 2003.[15]

The HDS registers the hospital activity of almost 600 hospitals of the 32 State Health Services. The HDS reflects the existing data registered in the discharge form that all public hospitals must fill up. This form contains data of the patient (age, sex, place of residence); of the disease by which the patient was hospitalized; and of the reason for discharging the patient (complete healing, improvement, death or another reason). It is worth noting that although the National Institutes of Health did not report activity to the HDS during this period, their activity is a subgroup already caught by the hospitals of the State Health Services that report to the HDS, since the institutes are hospitals of high specialty of national reference.

The rates calculated were compared against incidence rates reported in the international literature[16] to determine the robustness of the results. Once determined the rates of incidence, we calculated the number of new cases by age group and sex for each of the pediatric populations of interest. As part of the analysis we also calculated the total expected number of prevalent cases in the different pediatric populations. We calculated the prevalence according to treatment duration.[17]

The new and prevalent cases were distributed by type of risk according to the statistics reported by the hospitals. After the distribution the expected cases were multiplied by the respective cost of treatment to obtain the total expected cost of the cover.

Finally, the total expected cost of the cover under the different scenarios was compared against the expected resources for the FACE to being able to determine the financial sufficiency[18], emitting recommendations and observations.

RESULTS

The application of the selected method resulted in the definition of a protocol with four possible clinical routes. The protocol contemplates the following treatment durations according to risk, the possibility of transplant or the presence of relapse: 128 weeks for patients of habitual risk and high risk without transplant; 124 weeks for patients of high risk with transplant and 128 weeks for patients in relapse.

Eight reimbursable products were defined from these protocols, which appear in figures 1(a) and 1(b). Each product, (identified like Pi with i = 1, 2....7), reflects one or several defined clinical stages and presents an important difference in costs. The reimbursable products P1 to P5 reflect the stages of treatment derived from the protocols for patients of habitual and high risk, whereas the P6 product reflects the conventional protocol of treatment for neutropenia and infections. Finally the P7 product includes the cost of the treatment applying the protocol for relapses (protocol of San Judas XIII) stipulated by the experts.

The distribution of patients by type of risk is in average for the seven hospitals that responded the questionnaire, is as follows: 62% of the patients are of low risk (±7% standard deviation); 38% of

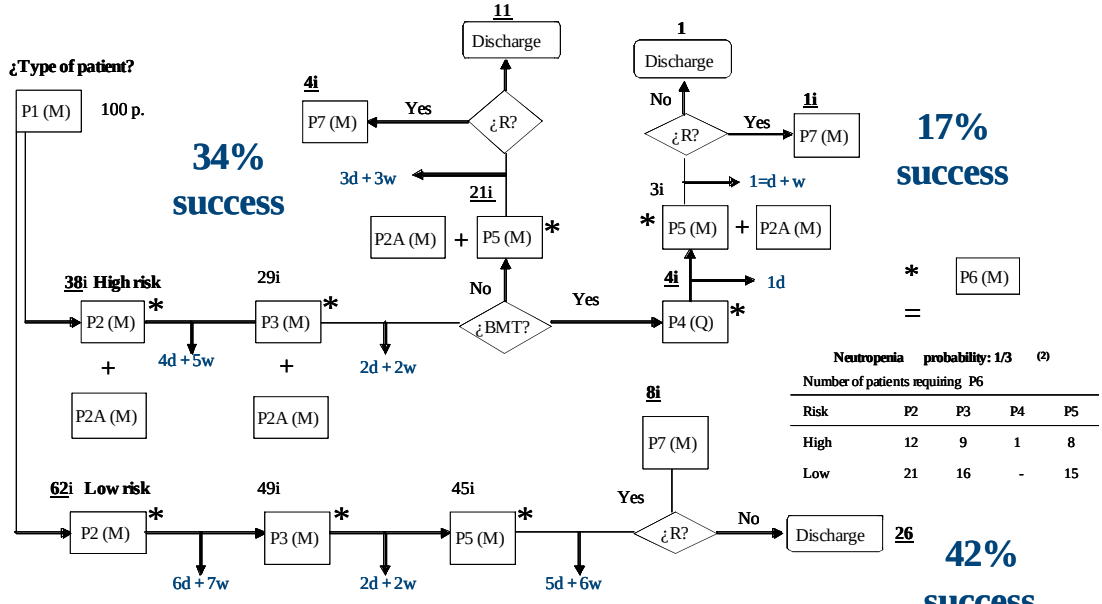
the patients are of high risk (±7% standard deviation) and 16% of the total of patients of high risk are candidates for a bone marrow transplant (±8% standard deviation). Notice that under the protocols stipulated by the experts neither the patients of low risk, nor the patients in relapse are candidates to bone marrow transplant.

The statistics presented in figure 1 and table 1 show the enormous influence that the withdrawal of treatment has (10% at the end of each reimbursable product in average for the seven hospitals). Mortality during the treatment also shows an important influence (9% at the end of each product in average for the seven hospitals excluding mortality derived from transplant). These percentages are added to obtain the total of patients who present an unsuccessful exit of the treatment after each reimbursable product.

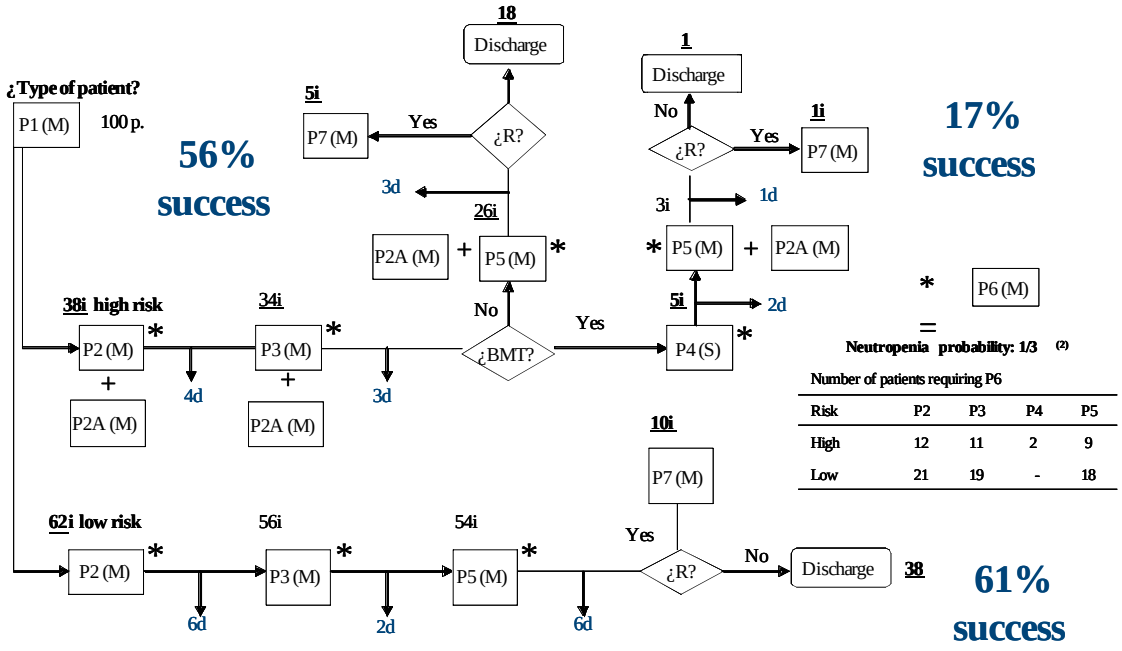
The accumulated percentage of mortality and withdrawal throughout the treatment resulted in 43.1% of medical discharges (without considering relapse discharges) for patients of habitual risk and 36.3% of medical discharge for patients of high risk (See figure 1(a)). On the other hand, if we only consider the percentage of mortality during the treatment we obtain 62,8% of medical discharge for patients of habitual risk and 50,8% for the patients of high risk (to see figure 1(b)). The results only considering mortality, although more encouraging that the ones considering withdrawal and mortality, still are below the standards reported internationally (75% of medical discharge on average for both types of risk).

Figure 1. Decision trees for the treatment of ALL in average pediatric patients

(a) Adjustment by mortality and withdrawal



(a) Adjustment by mortality



(M): Medical procedure. (S): Surgical procedure. R = relapse. BMT = bone marrow transplant. p = patient; i=identified patient d = death; w=withdrawal. (1)Average of seven hospitals. (2)Neutropenia Support Association Inc.: www.neutropenia.ca. P1:Specific diagnosis. P2:Induction. P2a:Intensification for high risk. P3:Consolidation. P4:Transplant. P5:Maintenance. P6:Treatment of neutropenia and infections. P7: Relapses.
Source: Economical Analysis Unit based on agreed protocols and statistics from 7 hospitals.

Table 1. Basic statistics for ALL average pediatric patients

Concept	Average 1/	S.D.
I. Risk type		
High	37.6	7.2
Habitual	62.4	7.2
High with transplant	15.6	8.1
II. Proportion of patients with relapse according to risk		
High	21.3	10.5
Habitual	18.4	7.7
III. Time to relapse (in months) according to risk		
High	11.4	3
Habitual	18.2	5.3
IV. Probability of death		
a) High risk		
P2	11.2	7.7
P3	7.5	9.9
P4	35.0	14.1
P5	13.0	7.6
b) Habitual risk		
P2	8.9	6.8
P3	3.6	4.8
P4	n.a.	n.a.
P5	10.1	7.5
V. Probability of withdrawal		
a) High risk		
P2	11.8	13.4
P3	5.2	5.3
P4	n.a.	n.a.
P5	14.7	16.5
b) Habitual risk		
P2	11.4	13.3
P3	3.9	4.6
P4	n.a.	n.a.
P5	13.2	9.8
VI. Probability of neutropenia		
P6	33.0	n.d.

P2: Induction. P3: Consolidation. P4: Transplant. P5: Maintenance. P6: Treatment of neutropenia and infections. P7: Relapses. n.a.: Does not apply. n.d.: Non-available.
Source: Economical Analysis Unit based on data from seven hospitals. 1/Average. 2/Only two of the seven hospitals have the infrastructure for bone marrow transplant.

For the reimbursable product corresponding to transplant (P4) only death was considered, since actually is not possible that a patient leaves a surgical process. In addition, for the transplant an adjustment in the probability of death was applied, since the death happens generally after the operation, reason why most of the medicines, medical materials and procedures specified in P4 already have been used and must be paid. The adjustment to the probability of death was made multiplying the average probability of death after P4 reported by the percentage of patients who are candidates to transplant.

Mortality is more frequent in the maintenance stage (P5), during which the patient is more exposed to develop infections. These infections are frequently related with hospital sepsis and with sepsis in the place where the patient commonly lives. The decrease in mortality due to infections is one of the most important challenges during the treatment. In order to reach this decrease it is fundamental to manage the early attention of any infection which implies the training of the relatives responsible for the pediatric patient so that they can detect any anomaly, as well as the reinforcement of the asepsis in the hospitals that offer the services and in the place where the patient lives.

Prices of medicines and medical materials for each reimbursable product were obtained from the system of public biddings of the Mexican Institute of the Social Security of year 2003. Prices of the laboratory studies came from one of the biggest private laboratories of reference of the country. Prices of these studies are for year 2004. The recovery fees 2003 were used for prices of radiological and special studies. For consistency all the prices were updated to prices of September 2004 in agreement with the general inflation index because this month is the specified in the prices provided by the private laboratory of reference.

Table II shows that of the eight reimbursable products, seven of these are essentially non-surgical, whereas product P4 is the only surgical one. The product related to the attention of neutropenia and infections (P6) is the most expensive by cycle, after the product related to the bone marrow transplant (P4). Medicines used in product P6 are very expensive, even considering prices of public biddings. The price of medicines, combined with the duration of the treatment

and an average of four cycles (episodes) per year according to the protocols, generates an amount that ascends to USD$3,932 ($10.8 pesos = $1 USD) by cycle or USD$10,381 considering the whole duration of the treatment and the mortality associated to infections.

Table II. Expected variable cost of treatment for ALL average pediatric patients. Adjustment by mortality during treatment.

			Exit probability 1/		Patient classified as:		
Reimbursable product	Cost in USD	Number of cycles	Without transplant 2/	With transplant	Without transplant 2/	With transplant	Relapse 3/
P1 (M)	$810	1	0.0000	0.0000	$810	$810	
P2 (M)	$1,419	1	0.0977	0.1117	$1,281	$1,261	$857
P2A (M)	$492	3	0.1189	0.3164	$489	$1,321	
P3 (M)	$1,225	1	0.0505	0.0750	$1,163	$1,133	$549
P4 (Q)	$26,222	1		0.0547		$24,789	
P5 (M) 5/	$724	30	0.1116	0.1297	$19,300	$18,906	$21,046
P6 (M) 6/	$3,932	8	0.3300	0.3300	$10,381	$10,381	$10,381
				Total	$33,424	$58,601	$32,832
				Total with relapse 7/	$55,862	$77,935	

1/Probability of death. 2/ Includes low and high risk patients, thus the value is a weighted average of the proportion of patients in each type of risk. 3/ All relapses are classified as high risk without transplant. 4/ P2A is used for high risk patients only i.e., the cost is a weighted average of the number of patients in this category. Notice that Exit probability (P2A) =Exit probability (P2) + Exit probability (P3) + Exit probability (P5). For the full cost (P2A) each probability is used separately to the amount (P2A) and then added. 5/ P5 is calculated per each two months for the case of relapse, thus for this case there are 15 cycles instead of 30. 6/The probability of neutropenia is independent of the patient risk classification. 7/ Includes the cost of the proportion of treatment before the relapse and the cost of the relapse for a treatment of 50 months on average.

The expected cost for the full treatment of ALL is USD$33,424 for habitual or high risk patients without transplant. (We decided to obtain an average cost for these two cases because the differences in the full cost of each were small.). The expected cost for high risk patients with transplant ascends to USD$58,601. The expected cost of treatment for relapse is USD$32,832. The expected cost of treatment for patients without transplant who suffer a relapse ascends to $55,862. Finally the expected cost of treatment with transplant and relapse is USD$77,935. These costs are the expected amounts that would be pay by average case as stipulated in the protocols

and considering mortality during the treatment. These costs will serve as bases to negotiate tariffs by reimbursable product with each one of the reference hospitals that offer treatment to ALL pediatric patients. In addition the adjustment by mortality must be updated periodically to reflect the improvements in the treatment that is expected under a scheme of financial cover and applying a system of evaluation of the hospital performance, as well as a training program to relatives of the patient.

Table III presents the incidence rates considering observed cases and the incidence from the literature. The results show a no-significant difference in most of the age groups, except in group 1 to 4 years, in where the rates of observed incidence are significantly smaller than the incidence rates from the literature. Since in this group of ages the expected cases are concentrated, we decided to use the rates from the literature for the coverage analysis.

Table III. Incidence rates per 1,000,000 pediatric population.

Group of age	From Literature 1/	Observed 2/ Male	Female	Both
<1	20.0	20.1648	18.5798	19.3910
1-4	80.0	47.1009	34.3458	40.8537
5-9	30.6	33.0878	28.3106	30.7451
10-14	17.4	25.4825	19.4919	22.5446
15-19	13.0	18.8169	16.1441	17.4944

1/ Ries LAG, Smith MA, et al., (edts.) "Cancer Incidence and Survival among Children and Adolescents: United States SEER Program 1975-1995", National Cancer Institute, SEER Program. NIH Pub. No. 99-4649, 1999. 2/ Datos calculados por la Unidad de Análisis Económico basados en el SAEH experiencia 2000-2003 y reportados en Morales, Vázquez, Gutiérrez "Medición de la demanda de servicios para las enfermedades a cubrir por el FPGC", mimeo, 2004.

Total expected new cases were obtained when using the selected incidence rates into each one of the pediatric populations analyzed. Then the total cases were distributed in agreement with the distribution of patients by type of risk. The number of relapse was calculated in similar form (see table I). A factor of duration of the treatment was applied to the total of the cases already distributed by type of risk to calculate the prevalent cases (2.23 representing the average number of years of treatment). The total incident and prevalent cases appears in table IV.

Table IV. Cost of coverage for ALL average pediatric patients. 2005 projection.

Risk	Average cost per case /1	New expected cases /2	Total cost of new cases	Prevalent expected cases /3	Total cost of prevalent cases
Coverage to all pediatric population 4/					
Without transplant	$33,424	1,017	$33,978,088	2,268	$52,724,620
With transplant	$58,601	62	$3,626,175	138	$5,626,823
Cases without relapse		**1,078**	**$37,604,264**	**2,406**	**$58,351,443**
Relapse 5/	$57,158	261	$14,931,986	583	$23,170,323
Cases with and without relapse		**1,340**	**$52,536,250**	**2,989**	**$81,521,767**
Coverage to uninsured pediatric population 6/					
Without transplant	$33,424	540	$18,034,200	1,204	$27,984,103
With transplant	$58,601	33	$1,924,628	73	$2,986,491
Cases without relapse		**572**	**$19,958,827**	**1,277**	**$30,970,594**
Relapse 5/	$57,158	139	$7,925,296	309	$12,297,873
Cases with and without relapse		**711**	**$27,884,123**	**1,586**	**$43,268,467**
Coverage to SPH afiliated pediatric population (target 2005: 3,390,462 families) 7/					
Without transplant	$33,424	131	$4,379,546	292	$6,795,847
With transplant	$58,601	8	$467,389	18	$725,259
Cases without relapse		139	**$4,846,935**	310	**$7,521,106**
Relapse 5/	$57,158	34	$1,924,632	75	$2,986,498
Cases with and without relapse		**173**	**$6,771,567**	**385**	**$10,507,604**

Source: UAE calculations based on population projections by CONAPO, DGIS and 2005 affiliation target by NCSPH. 1/ Variable cost per case adjusted by mortality. Mortality calculated from statistics of 7 hospitals. 2/ Cancer incidence and survival among children and adolescent: United States 1975-1995, SEER Pediatric Monograph, National Cancer Institute, 1999. 3/ Prevalence considering average treatment duration of 32 months. 4/ Based on 2000-2050 population projections by CONAPO. 5/ Patients with relapse are classified as high risk without transplant and represent on average 20% of the patients in the maintenance stage. 6/ Based on 2000-2005 population projections by DGIS. 7/ Affiliation target by the NCSPH in 2004.

Estimations of the necessary resources for the cover of patients under the three scenarios are also presented in table IV. Notice that the extreme cases are: a) cover only of incident patients of the SPSS (USD$6.8 million) against cover of incident patients of all population (USD$52.5 million) and b) cover to the prevalent patients of the pediatric population affiliated with the SPSS (USD$10.5 million) against the cover of all the pediatric patients of the country (USD$81.5 million).

As shown in table IV, the resources available in the FACE projected for 2005[18] allow to considering viable the cover of the prevalent cases for the uninsured population. The cover for this population requires of USD$43.1 million, amount that is equivalent to 29% of the budgetary income projected to be available during 2005 or to 37% of the donation from the tobacco industry in the same period. Here it is important to emphasize that it is not recommended to consider the

cover for all the population for two main reasons: a) the patients covered by the social security, who approximately represent half of the cases, already have financial coverage for the treatment of ALL; b) The FACE also must finance other diseases of high specialty previously agreed with the participant federal organizations in the SPSS, which includes treatment of cervix-uteri cancer, intensive care for premature new born with respiratory insufficiency (syndrome of the hyaline membrane) or with neonatal sepsis and the antiretrovirals for patients with HIV/AIDS.

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The present exercise provided with the cost of protocols agreed by experts for the attention of the average pediatric patient with acute lymphoblastic leukemia (ALL) in Mexico. These protocols are supported by the General Health Council, which by law must identify the interventions, medicines and medical material for the treatment of the diseases that generate catastrophic expenses to the SSPH. The protocols were ratified by the National Commission of Social Protection in Health that by law manages the FACE which will finance the attention of the patients.

The results of the present analysis indicate that the cost of the attention to pediatric patients with ALL must be divided in cost for patients without transplant, patients with transplant and patients in relapse, since the type of interventions and the duration of the treatment vary substantially in agreement with this division.

In addition, derived from the influence that mortality during treatment has the costs were adjust by the death probabilities during the treatment since ALL requires a lengthy treatment that exposes the patient to a greater risk of dying before completion.

The results also offer support for the decision making with respect to the financial cover of ALL considering the projected resources. The results indicate that with the expected resources from the budget and from the tobacco industry towards the FACE the financial cover of all the uninsured patients with ALL can be considered.

The results force to reflect on the subject of the supply of services, since although there are sufficient financial resources to cover the cases among the uninsured population, is pertinent to

determine if there is sufficient infrastructure (human and material) that will allow to offer the service obtaining positive results, that is to say, diminishing the withdrawal and the episodes of infections that generally cause death or relapse of the patients.

Finally the present exercise allows to listing an important series of observations with respect to non-clinical factors that powerfully influence the obtaining of good results during and after the clinical treatment. Among the observations are: a) the monitoring of the percentage of patients who withdraw the treatment and the reasons for withdrawal; b) the percentage of patients who die as a result of infections; c) the condition of hospital infrastructure and d) the networks of social support (psychological advisory to relatives, lodging and transfers) necessary to provide pediatric patients with ALL conditions that allow them to complete the treatment. In this last factor the participation of the civil society and the NGO's turn out crucial to obtain the best possible results for the patients.

ACKNOWLEDGMENTS

We acknowledge the collaboration and comments of Manuel Aguilar and Gabriel Sotelo from the Consejo de Salubridad General; Alberto Olaya and Roberto Rivera from the Instituto Nacional de Pediatría; Ilse Molina, Emilio Herrera and Juan Antonio Fernández from the Comisión Nacional de Protección Social en Salud, Mariana Barraza and Juan Pablo Ortiz from the Unidad de Análisis Económico, as well as the personnel from the following hospitals: Instituto Nacional de Pediatría, Hospital Infantil de México, Hospital para el Niño Poblano, Hospital del Niño “Dr. Rodolfo Nieto Padrón”, Hospital General Agustín O’Haran, Hospital Central “Dr. Ignacio Morones” and Hospital Infantil del Estado de Sonora for providing the data used in this document. All the comments, omissions and possible errors in the present document are exclusive responsibility of the authors.

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