

ANTI-TUBERCULOSIS PROGRAMS IN THAILAND : A COST ANALYSIS

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Abstract. The standard regimen, a combination of isoniazid and thiacetazone, which has been used for treatment of tuberculosis (TB) in Thailand for the past 20 years is inexpensive, but possesses a high degree of toxicity and requires 18-24 months of continuous treatment, resulting in poor compliance and a low success rate of treatment. The more efficacious short-course chemotherapy introduced into the National Tuberculosis Program in 1985 is limited by the high costs of drugs. However, the cost of providing care is not limited only to drug costs but also includes other services costs. The present study was undertaken to compare the total provider costs of 3 short-course regimens with that of the standard program in the treatment of newly diagnosed pulmonary TB.

Data were collected at 4 zonal TB centers through out Thailand in 1987-1988. Analysis showed that the 3 short-course regimens had lower costs than the standard regimen from the provider perspective. Among these 3 regimens that of isoniazid, rifampicin and pyrazinamide for 2 months, followed by isoniazid and rifampicin twice a week for 4 months had the lowest costs (Baht 1,499). Despite the lowest drug cost (B 431) of the standard regimen, the total provider costs were the highest (B 2,541) due to the highest routine service cost of B 2,066. Thus to determine the cost of a disease requires consideration of both drug costs and also other cost components.

INTRODUCTION

In spite of a decline of some epidemiological indices, tuberculosis (TB) remains a major health problem in Thailand. For more than a decade, it has been rated as a top cause of death among communicable diseases and the fourth leading cause of death (Fact Finding Commission, National Epidemiology Board, 1987).

Since AIDS is becoming an alarming problem that could affect tuberculosis control in the future (Joint WHO/IUATLD working group, 1989), there is an urgent need to strengthen control activities, particularly in the area of tuberculosis treatment which is one of the major obstacles in tuberculosis control (Jittinandana, 1989).

The standard anti-tuberculosis drug regimen of isoniazid and thiacetazone which has been in use in the National Tuberculosis Program (NTP) for the past 20 years, although quite inexpensive, has substantial toxic side effects and requires 18-24 months of continuous treatment. The latter results in only an overall average of 50-60% of patients completing treatment, with an even lower success rate (Expert Committee on TB, 1989).

To improve the quality and success rate of ambulatory treatment, a more efficacious short-course chemotherapy (SCC) of 6-8 months duration has been adopted for use in the NTP since 1985 (Kejornnan, 1986). However, the use of these regimens in the NTP in developing countries like Thailand is rather limited from the government point of view because of the high costs of drugs. However, the cost of providing treatment to TB patients is not limited only to drug costs; other components of costs, ie routine service costs other medical care costs, may be substantially greater

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than drug costs.

Thus, we have undertaken a study to compare the total provider cost of delivering the service to TB patients with three short-course anti-tuberculosis programs with that of the standard regimen at the 4 zonal TB centers in treatment of new smear positive cases of pulmonary tuberculosis in Thailand.

MATERIALS AND METHODS

Total provider cost was calculated from labor costs, material costs and capital costs in 4 zonal TB centers during 21 months (January 1987 to September 1988) of observation. The 4 zonal TB centers were selected from the total of 12 centers all over the country using simple random sampling from each part of Thailand.

The cost to the provider was the true cost of delivering the service (Eisenberg, 1985) to TB patients who received 4-drug regimens in each center during the study period.

The regimens were :

1) 2 SHT/16 HT (standard regimen) : streptomycin (S) 750-1,000 mg/day, 5 times/week + isoniazid (H) 300 mg/day + thiacetazone (T) 150 mg/day daily for 2 months; followed by isoniazid 300 mg/day + thiacetazone 150 mg/day daily for another 16 months.

2) 2 HRZ/4 HR : isoniazid 300 mg/day + rifampicin (R) 450-600 mg/day + pyrazinamide (Z) 1,500-2,000 mg/day daily for 2 months; followed by isoniazid 300 mg/day + rifampicin 450-600 mg/day daily for another 4 months.

3) 2 SHRZ/6 HT : streptomycin 750-1,000 mg/day, 5 times/week + isoniazid 300 mg/day + rifampicin 450-600 mg/day + pyrazinamide 1,500-2,000 mg/day daily for 2 months; followed by isoniazid 300 mg/day + thiacetazone 150 mg/day daily for another 6 months.

4) 2 HRZ/4 H₂R₂ : isoniazid 300 mg/day + rifampicin 450-600 mg/day + pyrazinamide 1,500-2,000 mg/day daily for 2 months; followed by isoniazid 600 mg/day + rifampicin 600 mg/day twice a week for another 4 months.

All sections of the zonal TB centers were classified into 3 cost center categories : patient service, revenue producing services (radiology, laboratory and pharmacy sections) and non-revenue produc-

ing services administrative and supportive sections) (American Hospital Association, 1968; Berman and Weeks, 1976). Routine service costs (overhead costs) of delivering the services to TB patients included all components of costs in all sections of the TB centers during 21 months of the study, except:

(i) costs of evaluation and costs of training which are not directly related to the patient service;

(ii) material costs of the revenue producing cost center (radiological, laboratory and pharmaceutical sections) because these components of costs varied among patients who received different drug regimens. Therefore, they were calculated separately as medical care costs.

The routine service cost per visit was then calculated by dividing total overhead costs by the total number of patient visits during 21 months.

Thus, the total provider costs of delivering each drug regimen to TB patients is the sum of the total routine service costs (routine service unit costs multiplied by total number of patient visits for each regimen) and the material costs of the revenue producing cost center for each drug regimen, the so-called "medical care cost" (Fig 1).

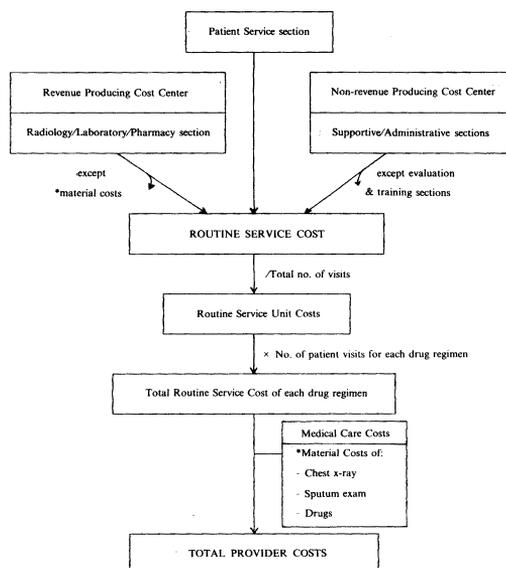


Fig 1—Calculation of total provider costs.

COST OF ANTI-TUBERCULOSIS PROGRAMS

Table 1

Overhead costs of 4 zonal TB centers (January 87-September 88).

Costs (B)	TB Center 3 (Chon Buri)	TB Center 7 (Ubon Ratchathani)	TB Center 8 (Nakhon Sawan)	TB Center 11 (Nakhon Si Thammarat)	Total
1. Labor costs	5,320,871.00 (80.4%)	4,383,666.50 (93.0%)	4,258,481.00 (90.5%)	4,387,495.00 (90.2%)	18,350,513.50 (87.79%)
2. Material costs*	837,146.50 (12.6%)	319,076.52 (6.8%)	253,168.01 (5.4%)	378,814.48 (7.8%)	1,788,205.51 (8.55%)
3. Capital costs	463,374.27 (7.0%)	11,134.18 (0.2%)	193,616.19 (4.1%)	96,125.14 (2.0%)	764,249.78 (3.66%)
Total	6,621,391.77 (100%)	4,713,877.20 (100%)	4,705,265.20 (100%)	4,862,434.62 (100%)	20,902,968.79 (100%)

* Note : exclude material cost of drug, laboratory examination and chest film.

RESULTS

Total overhead costs

Table 1 shows total overhead costs of each zonal TB center. Eighty-eight percent of the total costs are labor costs, while 8% are material and 3% are capital depreciation costs.

Routine service costs

= (Total overhead costs) - (Costs of evaluation section) - (Costs of training)
 = B 20,902,968.79 - 1,563,649.91 - 1,362,154.77
 = B 17,977,164.11

The total number of patients' visit during 21 months were 156,593 visits.

Therefore routine service costs/visit
 = B 17,977,164.11/156,593
 = B 114.80

Medical care costs

This was material costs of revenue producing cost center which will be varied among patients who received 4-drug regimens.

(a) Cost of sputum examination

- Cost of sputum cup = B 0.55
 - Cost of slide = B 0.50
 - Cost of staining (Neelsen) = B 0.50
 Cost of sputum examination = B 1.55/
 service

(b) Cost of chest x-ray

- Cost of film (small size) = B 6.975
 - Cost of solution = B 1.00
 Cost of chest x-ray = B 7.975/service

(c) Drug costs (based on TB Division)

Cost of Streptomycin (S)
 = B 5.082/1 g
 Cost of Isoniazid (H) (100 mg)
 = B 0.066/tablet
 Cost of Ethambutol (E) (400 mg)
 = B 1.40/tablet
 Cost of Pyrazinamide (Z) (500 mg)
 = B 2.22/tablet
 Cost of Rifampicin (R) (300 mg)
 = B 2.288/tablet
 Cost of Rifampicin (R) (450 mg)
 = B 3.575/tablet
 Cost of Isoniazid + Thiacetazone (H + T)
 = B 0.128/tablet

Therefore costs of drugs of each regimen are as follow :

2SHT/16HT = B 430.97
 2HRZ/4HR = B 1,078.74
 2SHRZ/6HT = B 918.71
 2HRZ/4H₂R₂ = B 785.10

Total provider costs

Total provider costs of delivering each drug

Table 2
Total provider costs.

Regimens	Costs (B)	Routine service* costs	Material costs		Drug costs	Total provider costs
			Sputum exam**	Chest x-ray exam***		
1. 2SHT/16HT (18 visits)		2,066.40	12.40 (B 1.55 × 8)	31.90 (7.975 × 4)	430.97	2,541.67
2. 2HRZ/4HR (6 visits)		688.80	9.30 (B 1.55 × 6)	15.95 (7.975 × 2)	1,078.74	1,792.79
3. 2SHRZ/6HT (8 visits)		918.40	12.40 (B 1.55 × 8)	15.95 (7.975 × 2)	918.71	1,865.46
4. 2HRZ/4H ₂ R ₂ (6 visits)		688.80	9.30 (B 1.55 × 6)	15.95 (7.975 × 2)	785.10	1,499.15

* Routine service costs/visit = B 114.8

(\$ 1 = 25.5 Baht)

** Costs/sputum exam = B 1.55

*** Costs/chest x-ray = B 7.975

Table 3
Comparison of total provider costs of each regimen among 4 zonal TB centers.

Regimens	2SHT/16HT	2HRZ/4HR	2SHRZ/6HT	2HRZ/4H ₂ R ₂
TB Center 3 (Chon Buri)	2,393.48	1,703.54	1,832.02	1,410.40
TB Center 7 (Ubon Ratchathani)	2,236.16	1,642.36	1,753.36	1,349.22
TB Center 8 (Nakhon Sawan)	3,471.14	2,122.63	2,370.85	1,829.49
TB Center 11 (Nakhon Si Thammarat)	2,809.64	1,865.38	2,040.10	1,572.24

regimen consisting of total routine service cost, cost of sputum examination, cost of chest x-ray and drug costs were shown in Table 2.

Analysis showed that the three short-course regimens had lower costs than the standard regimen from the provider perspective. Among three short-course programs, the regimen of isoniazid, rifampicin and pyrazinamide for 2 months, followed by isoniazid and rifampicin twice a week for 4 months had the lowest cost (B 1,499). Cost of drug of recent standard regimen; despite the most lowest (B 431), the total provider cost was the highest (B 2,541) due to the highest routine service costs (B 2,066) and cost of chest film (B 31.9).

Comparison of total provider cost of each regimen among 4 zonal TB centers are shown in Table 3. Total provider costs at TB center 8 (northern region) tended to have the highest costs, while center 7 (northeast region) tended to have the lowest costs in all regimens.

DISCUSSION

Tuberculosis is indeed a disease of poverty; therefore, economy is a significant matter of difficulty in tuberculosis control and treatment (Jittinandana, 1989).

The standard anti-tuberculosis drug regimen of isoniazid and thiacetazone has been recommended for use in the NTP for the past 20 years because it seemed to be appropriate in terms of affordability in developing countries like Thailand. This study has shown that, although the drug cost of the standard regimen was only B 431, other cost components were substantially greater than the drug costs, especially the routine service costs and other medical care costs. Therefore, to determine the cost of treatment of a disease requires identification and measurement of all the different types of costs.

At the same time both the cost and the effectiveness of each regimen should be brought into consideration in any evaluation (Drummond *et al*, 1987). This study applied the direct distribution method of cost allocation because services at zonal TB centers are fairly homogeneous.

Most of the total overhead costs of the zonal TB centers are labor costs which are similar to those in most public sectors in this country.

The total provider costs at the northern TB center were the highest, while those at the northeast TB center were the lowest. This finding could be explained by the different total number of patients' visits in each center because the total provider costs in each center were quite similar.

The viewpoint adopted in this study was that of the TB Division, Department of Communicable Disease Control, Ministry of Public Health. This perspective was selected because the TB Division was the ultimate decision maker responsible for the TB control program and the organization and administration of all medical and public health services for TB patients in the country. However, a patient's perspective or social perspective should also be considered.

The result of this study can be used as a component of economic evaluation of the application of the 3 short-course anti-tuberculous programs compared with the standard regimen in Thailand.

From the health care provider's point of view, it is demonstrated and recommended that given equal effectiveness of all anti-tuberculosis drug regimens, the 2HRZ/4H₂R₂ is the least cost approach, the 2HRZ/4HR and 2SHRZ/6HT have

almost equal but slightly higher cost, while the standard regimen (2SHT/16HT) has the highest provider cost.

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