Costs - Effectiveness of the Urban Health Center in Nakhon Ratchasima : A Case Study on Diabetes and Hypertension

SUPASIT PANNARUNOTHAI, M.D., Ph.D.*,
MANIT KONGPAN, M.D.**,
RUCHIRA MANGKLASIRI, M.D., M.P.H.**

Abstract

Health care reforms in Thailand are looking for a better health infrastructure within the urban setting. The urban health center is one of the models tried in many provinces. This study compared the costs - effectiveness of the urban health center in Nakhon Ratchsima with the Maharaj Nakhon Ratchasima Hospital, using diabetes and hypertension as tracer conditions. The point estimates by a retrospective review and cross-sectional study revealed that the overall costs (provider plus patient costs) of the urban health center for these tracers were lower than the costs of the Maharaj Hospital. The effectiveness of treatment at the urban health center was also better. It was concluded that the urban health center should be considered as a better alternative of primary care institution within the urban area.

Key word : Cost, Effectiveness, Primary Care, Diabetes, Hypertension, Thailand

**PANNARUNOTHAI S,
KONGPAN M, MANGKLASIRI R
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The health delivery system in Thailand needs fundamental reforms especially the establishment of primary care to promote comprehensive and continuity of care at the community level(1). There have been a lot of field trials to test the models of good primary care in both urban and rural areas(2,3). The main focus of these trials stresses the acceptability of the people in the community, and the feasibility and sustainability of providing the services.

The number of people with chronic diseases has expanded as life expectancy increased from 60

* Faculty of Medicine, Naresuan University, Phitsanulok 65000,
** Department of Social Medicine, Maharaj Nakhon Ratchasima Hospital, Nakhon Ratchasima 30000, Thailand.

years in 1975 to 72 years in 2000[4]. The chronically ill seek health services from hospitals rather than lower levels of health services. This aggravates overcrowding problems in big hospitals. Other modes of services, e.g. home health care, and community-based rehabilitation services, have been piloted to reduce the load to hospitals[5]. Under this consideration, primary care services if properly designed, can take care of the high demand for continuity of services.

Economic incentives for supporting the establishment of primary care are enormous in developed countries[6]. The integrated primary care team consists of a medical doctor, community nurse, medical social worker, etc, and is less expensive than the sophisticated hospital setting. Furthermore, payment to primary care is usually based on a capitation basis, and is very effective in containing health care costs[7]. Innovations on the fundholding model of primary care have been spread to many countries because it has been proved that primary care will not shift the costs to the hospitals.

To consider the economic aspects of an urban health center in Nakhon Ratchasima (see details in the next section), this study was set to compare the cost - effectiveness of care provided to chronic cases like hypertension and diabetes between the urban health center and the regional hospital. The results of the study should give the guidelines to restructure health care delivery in urban areas.

MATERIAL AND METHOD

The Maharaj Nakhon Ratchasima Urban Health Project

Nakhon Ratchasima is the second biggest province in Thailand after Bangkok, in terms of resident population (in 1999 the population in the province was 2.5 million). The Maharaj Nakhon Ratchasima Hospital is one of the regional hospitals of the northeastern part of Thailand. It covers not only Nakhon Ratchasima but also other nearby provinces. The services at the hospital are very busy with more than 2,000 outpatient visits a day so it is difficult to target the catchment population. The Social Medicine Department (SMD) of the Maharaj Hospital therefore set up an urban health center as a model development to provide primary care to the catchment population in the capital city. One urban health center takes care of around 10,000 people and is run by doctors, nurses and other paramedics from the Maharaj Hospital.

Method

The study employed the framework of economic evaluation[8] by comparing the costs - effectiveness of different modes of treatment; i.e. the urban health center, general medicine and special clinics of Maharaj Hospital. Retrospective data were analysed to determine the costs - effectiveness of different modes of treatment. Diabetes and hypertension were used as tracers for evaluating the cost - effectiveness.

Sample selection

In order to specify how cost - effective the urban health center (group I) is, two other modes of treatment were selected as the comparison groups. Regional hospitals usually provide outpatient care to people from many provinces. The first group for comparison was diabetic and hypertension patients who lived in the catchment area of the SMD (this was different from the catchment area of the urban health center), so they benefited from home visit programmes of the SMD after attending outpatient visits (group II). The second comparison group was diabetic and hypertension patients who lived in other areas and had no home visit programme (group III, see Fig. 1).

All cases of diabetes and hypertension, who registered and made use of the urban health center from 1994 to 1996 were recruited as group I. All diabetic and hypertension patients who resided in the catchment area of the SMD and visited the regional hospital from 1994 to 1996 were recruited as group II. Group III was recruited by accidental sampling among diabetic and hypertension patients who attended the regional hospital during 1997. Interviews with patients in groups I and II were made at their homes but interviews with patients in group III were made in the regional hospital.

Measurement of costs

Both provider and patient costs were considered in this study. Societal cost was omitted because it was difficult to estimate for all 3 groups.

Provider cost for group I was estimated by the standard cost accounting technique[9]. The

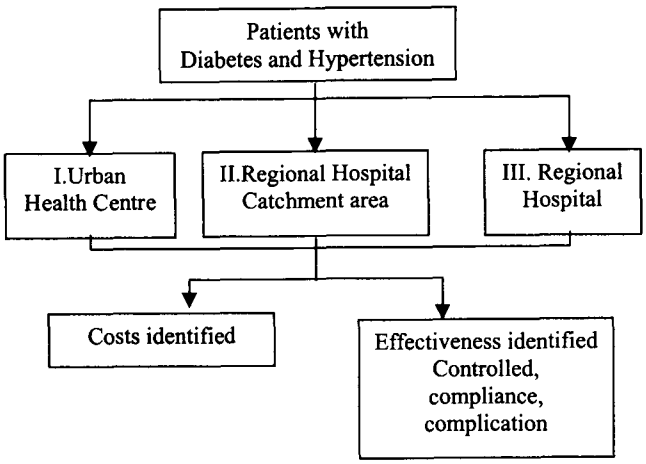

Fig. 1. Sample selection.

costs from the revenue-producing and non-revenue-producing cost centers were directly allocated to the patient service units because of the simple structure of the urban health center[10]. The fixed costs from the cost accounting analysis (for outpatient services at the urban health center and home visit) in this study did not include the drug costs. The full provider costs were the summation of these fixed costs (or costs at the non-revenue producing cost center), which were not chargeable from the patients.

The fixed costs for groups II and III were adopted from cost accounting analyses of other regional hospitals, because this hospital could not complete the cost study as reported elsewhere[11]. Cost of home visit for group II was estimated by the direct costing of this activity. Provider costs of group II included the fixed cost of outpatient visits, and home visit costs, but provider costs of group III included only the fixed cost of the regional hospital.

Patient costs covered the direct medical (drugs and investigations[1]), direct non-medical costs (travelling, food, accommodation costs of the patient and relatives) and the opportunity costs (fore-gone earnings of the patient and relatives). The non-medical costs were estimated by the interviews. The opportunity costs were estimated by multiplying time foregone with the daily earning for all people involved.

Measurement of effectiveness

Indicators to measure the success of diabetic and hypertension treatments are limited. HbA1c is the best indicator for good blood sugar control, but it is expensive and not widely available, so this study used the fasting blood sugar test and the value at 80-140 mg/dl was classified as successful control (80-120 mg/dl very good and 121-140 mg/dl good). Blood pressure control was a success if the reading was not higher than 160 mmHg systolic and 95 diastolic (140/80 mmHg very good and 160/95 mmHg good).

RESULTS

The fixed costs at the urban health center and regional hospital

The cost accounting study identified 5 patient service units as the final outputs of the urban health center. All costs of the non-revenue (administrative unit) and revenue producing cost centers (pharmacy, laboratory) had to be allocated to these 5 patient services. Table 1 presents the total cost (including salary and non-salary recurrent costs and the depreciation of the capital costs) per unit of

1 The direct medical costs were put under the patient costs because in Thailand patients usually pay for these ancillary services. For fee-exempted patients, the charges for these services were also added to be comparable with the self-paying patients.

Table 1. Unit cost of the urban health center (baht/visit)

	Cost/visit
General outpatient	67.82
Home visit	574.86
Well baby clinic	22.79
Family planning	126.25
Ante-natal clinic	64.89

The total cost included all work-load (both during and after the office hours) of the center.

output of each patient service unit. The highest cost was home visits, 575 baht per visit. The lowest cost was the well baby clinic, 23 baht per visit. The routine service costs for an outpatient visit at the regional hospital was averaged at 159 baht.

Cost - effectiveness of diabetic treatments

There were 36 diabetic patients treated at the urban health center (group I), 24 cases in group II and 37 in group III. On average, each patient in group I made 11.7 visits to the urban health center within a year and received 1.07 home visits per person per year. Groups II and III visited the outpatient departments of the hospital less often, about 7.5 and 7.7 visits per year, and group II received fewer home visits (0.3 visit/person/year) than group I.

Provider costs were the summation of fixed cost and home-visit cost (for groups I and II). The provider cost for one year was as follows: group I 1,409 baht, group II 1,457 baht and group III 1,224 baht (see details in annex).

The drug cost of group I averaged 143 baht per month (or 4.76 baht a day) while patients in group II and III had higher average drug costs, i.e. 253.64 baht per month (or 7.45 baht a day).

Patient costs were the summation of direct medical, direct non-medical costs and the opportunity cost each time the patient (and relatives) made a visit to the center or the hospital. The annual patient costs for groups I, II and III were 2,325, 4,576 and 4,670 baht respectively (see details in annex).

Effectiveness of diabetic treatment as measured by the percentage of controlled fasting blood sugar (between 80 and 140 mg/dl) out of the total blood sugar tests (the results of 400 tests were reviewed from the patient's records for each group). 50 per cent of the tests for group I were effectively controlled, 49 per cent for group II, and only 33 per cent for group III. Further details were noted for the comparability of each patient group. For the continuity of medication, about 5 per cent of patients in group I were lost to follow-up with an average 2.3 days of medication discontinuity. 15 per cent of patients in group II were lost to follow-up with 6.9 days of medication discontinuity and 12 per cent of group III with 15.6 days of medication discontinuity. For the complications of diabetic care, 32 per cent of patients in group I, 14 per cent of group II, and 24 per cent of group III reported minor complications (peripheral neuropathy). There were no severe complications and none were hospitalised because of complications of diabetes in 1996.

Finally, the cost - effectiveness of care for diabetic cases could be computed for groups I, II and III (see Table 2). The lowest cost per one case of controlled blood sugar was treatment at the urban health center (7,468 baht per year with 2,817 baht for provider side and 4,651 baht for patient side). The least cost - effective mode of treatment was the patients who had no community care (group III) with 17,861 baht per year for one controlled blood sugar.

Cost - effectiveness of hypertension treatments

There were 21 hypertension patients treated at the urban health center (group I), 24 cases in group II and 36 in group III. On average, each

Table 2. Cost-effectiveness of care for diabetic patients.

	Cost/case/year			Cost-effectiveness		
	Provider cost	Patient cost	Effectiveness	Provider cost	Patient cost	Total
Group I	1,408.59	2,325.25	0.50	2,817	4,651	7,468
Group II	1,457.11	4,576.27	0.49	2,974	9,339	12,313
Group III	1,224.30	4,669.76	0.33	3,710	14,151	17,861

Table 3. Cost-effectiveness of care for hypertension patients.

	Cost/case/year			Cost-effectiveness		
	Provider cost	Patient cost	Effectiveness	Provider cost	Patient cost	Total
Group I	916.54	3,632.42	0.794	1,154	4,575	5,729
Group II	980.22	4,192.75	0.728	1,346	5,791	7,137
Group III	1,049.40	4,692.54	0.798	1,315	5,880	7,195

patient in group I made 9.7 visits to the urban health center within a year and received 0.45 home visits per person per year. Groups II and III visited less often, about 5.0 and 6.6 visits per year, and group II received 0.21 home visits per person per year.

Provider costs were the summation of fixed cost and home visit cost (for groups I and II). The provider cost for one year was as follows: group I 917 baht, group II 980 baht and group III 1,049 baht.

The drug cost of group I averaged 281.05 baht per month (or 9.36 baht a day for 2.6 items of drugs) while patients in group II and III had lower average drug costs, i.e. 239.77 baht per month (or 7.99 baht a day for 3.2 items of drugs).

Patient costs were the summation of direct non-medical cost and the opportunity cost each time the patient (and relatives) made a visit to the center or the hospital. The annual patient costs for groups I, II and III were 3,632, 4,193 and 4,693 baht respectively (see details in annex).

Effectiveness of hypertension treatment as measured by blood pressure readings, 79.4 per cent of 194 readings for group I were under 95 mmHg and classified as controlled, while 72.4 per cent of 410 readings for group II and 79.8 per cent of 376 readings for group III were classified as controlled. Further details were also noted for the comparability of each group. For the continuity of medication, about 29 per cent of patients in group I were lost to follow-up with an average of 6.8 days of medication discontinuity. 15 per cent of patients in group II were lost to follow-up with 20.0 days of medication discontinuity and 8 per cent of group III with 19.0 days of medication discontinuity. For the complications of hypertension care, none of the 3 groups reported complications and none were hospitalised because of complications of hypertension in 1996.

Finally, the cost - effectiveness of care for hypertension cases could be computed for groups I, II and III (see Table 3). The lowest cost per one case of controlled blood pressure was treatment at the urban health center (5,729 baht per year with 1,154 baht for provider side and 4,575 baht for patient side). The least cost-effective mode of treatment was patients who had no community care (group III) with 7,195 baht per year for a case of controlled blood pressure.

DISCUSSION

This study was among the first of its kind to compare cost - effectiveness of a primary care setting with a hospital setting. It was the aim of the research and development project in Nakhon Ratchasima to provide some evidence of economic assessment on primary care development(2). However, the limitations of the study were not negligible.

The study was designed when the action research had already been implemented for 3 years. Data collection was done retrospectively for the urban health center and the regional hospital, and abstracted data from medical records were incomplete. The outcome variable for diabetic control was blood sugar instead of HbA1C, so there would be some misclassifications of success in this study.

The study gave similar results for both diabetes and hypertension that the urban health center was the most cost-effective way of treating these chronic cases. This was simply because the urban health center was less costly than the regional hospital, and perhaps provided better physician-patient relationships, hence better effectiveness. However, the small number of cases in this study gave indifference outcomes for hypertensive treatment and made cost-effectiveness results not impressive. Furthermore, some readers may argue for the non-comparability of cases entering each treatment group as well as non-comparability of other aspects of outcomes, eg. continuity of care, and complications.

Cost estimations of providers came from 2 sources, own estimates and adopted from another

	Recommended	*May recommend*
	The urban health centre	Regional hospital
Better success	+ home visit (Group I)	+ home visit (Group II)
Less success	*Not recommended*	*Not recommended*
	-	Regional hospital only (Group III)
	Low cost	**High cost**

Fig. 2. Cost and success comparison in search for recommendations.

study[11]. Own estimates were feasible for the urban health center because it was small and manageable. The cost of the regional hospital was adopted from the cost study in 9 provincial hospitals. The routine service cost at the regional hospital was 2.3 times higher than the cost at the urban health center. If the cost of the regional hospital was reduced by half, the provider costs for groups II and III would have been lowered than the cost for group I, and would have changed the conclusion of cost-effectiveness. This is a sketchy sensitivity analysis in terms of input costs.

If cost-effectiveness is not convincing, this study suggests another framework to arrive at the conclusion (see Fig. 2). The recommended model is the service, which consumes lower cost and generates better success (group I). The worst model is the service, which is more costly but achieves less success (group III).

Other aspects of the care for chronic diseases need to be considered for further research. The medical aspect on complications, eg. diabetic eyes are considered as one of the most common complications elsewhere but not in Thailand perhaps because the eye examinations by ophthalmologists are not well integrated to the system[12]. Socio-cultural dimensions and clients' perceptions are also crucial for the effectiveness of chronic care[13].

At the margin, this research provided evidence in search for appropriate health services for people in the urban areas. This should contribute to the development of health policy for restructuring health infrastructure in the urban area, which needs to be evidence-based[14]. The urban health center should be considered as a cost-effective health infrastructure in the urban area if it ensures the first contact, the continuity and well-coordinated, comprehensive care for the urban people.

SUMMARY

The urban health center was established in Nakhon Ratchasima to test the feasibility that it is a desirable primary care institution for urban people. After passing the acceptability test, it was evaluated in terms of the cost - effectiveness in this study. Using diabetes and hypertension as tracers for evaluation, it showed that the urban health center was less costly than the regional hospital and with better outcome in terms of controlled blood sugar and blood pressure.

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Annex

Annex table 1. Provider costs.

		OP Visits/ case/yr	Home visit/ case/yr	Baht/OP visit	Baht/HV	Baht/yr
DM	Group I	11.7	1.07	67.82	574.86	1,408.59
	Group II	7.5	0.3	159.00	882.02	1,457.11
	Group III	7.7	0	159.00	0	1,224.30
HT	Group I	9.7	0.45	67.82	574.86	916.54
	Group II	5	0.21	159.00	882.02	980.22
	Group III	6.6	0	159.00	0	1,049.40

DM is diabetes mellitus, HT is hypertension, OP is outpatient, HV is home visit

Annex table 2. Patient costs.

		N	Non-medical	Opportunity	Patient cost/yr
DM	Group I	36	6.94 ± 13.79	43.30 ± 137.52	2,325.25
	Group II	24	73.17 ± 49.75	125.77 ± 62.15	4,576.27
	Group III	37	77.95 ± 46.21	127.96 ± 94.03	4,669.76
HT	Group I	21	9.33 ± 15.66	12.93 ± 18.22	3,632.42
	Group II	24	76.66 ± 49.13	178.62 ± 154.59	4,192.75
	Group III	36	82.47 ± 41.96	186.65 ± 108.59	4,692.54

ต้นทุนและประสิทธิผลของศูนย์การแพทย์เขตเมืองนครราชสีมา : กรณีศึกษาของการดูแลผู้ป่วยเบาหวานและความดันโลหิตสูง

ศุภสิทธิ์ พรรณารุโณทัย, พ.บ., Ph.D.,*
มานิต คงแป้น, พ.บ., รุจิรา มังคละศิริ, พ.บ., สม.**

การปฏิรูประบบสาธารณสุขในประเทศไทยกำลังค้นหารูปแบบโครงสร้างของบริการสาธารณสุขที่เหมาะสมสำหรับประชาชนในเขตเมือง ศูนย์การแพทย์เขตเมืองเป็นรูปแบบหนึ่งที่ทดลองในพื้นที่หลายจังหวัด การศึกษานี้เปรียบเทียบต้นทุนและประสิทธิผลของการจัดบริการแบบศูนย์การแพทย์เขตเมืองนครราชสีมากับการจัดบริการที่โรงพยาบาลมหาราชนครราชสีมา โดยใช้กรณีเบาหวานและความดันโลหิตสูงเป็นกรอบของการเปรียบเทียบ ผลการศึกษาเสนอค่าประมาณการแบบจุดเดียวโดยการศึกษาย้อนหลังและการสัมภาษณ์ภาคตัดขวาง พบว่าต้นทุนทั้งหมด (รวมต้นทุนของผู้ให้บริการและต้นทุนผู้ป่วย) ของบริการที่ศูนย์แพทย์เขตเมืองต่ำกว่าต้นทุนบริการของโรงพยาบาลมหาราชนครราชสีมา ประสิทธิผลของบริการที่ศูนย์แพทย์เขตเมืองก็สูงกว่าด้วย จึงสรุปว่า การจัดบริการศูนย์การแพทย์เขตเมือง น่าจะเป็นรูปแบบที่ดีของระบบบริการการแพทย์ขั้นปฐมภูมิสำหรับประชาชนในเขตเมือง

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ศุภสิทธิ์ พรรณารุโณทัย, มานิต คงแป้น, รุจิรา มังคละศิริ
จดหมายเหตุทางแพทย์ ฯ 2544; 84: 1204–1211

* คณะแพทยศาสตร์ มหาวิทยาลัยนเรศวร, พิษณุโลก 65000
** กลุ่มงานเวชกรรมสังคม, โรงพยาบาลมหาราชนครราชสีมา, นครราชสีมา 30000