

RESEARCH ARTICLE

Unit cost of diabetes screening in community pharmacy

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Abstract

Diabetes mellitus, one of major health concerns of the world, can be early detected to provide better care. The disease involves not less than 60% of people in Thai communities who are not aware of their high risk diabetic factors and have never been screened for early diagnosis. Community pharmacy has started a new role in the primary health care to support disease awareness and increase screening coverage on individual basis with cost-effectiveness evaluation. A cross-sectional descriptive study was thus designed by comparing among 3, 6 and 2 accredited community pharmacies in 3 provinces, Nakorn Ratchasima, Khon Kaen and Maha Sarakham, respectively, so as to rationalize this diabetes screening model during October 2008-March 2009. Diabetes screening was conducted for customers who met the criteria of at risk diabetes, resulting in a total of 1,482 cases. Unit cost of the diabetes screening was investigated in the provider perspective, including direct medical cost. The maximum screening number was 30 cases/month/pharmacy. There were about 10% of the high risk cases who successfully referred for medical care with confirmatory diagnosis. The unit cost of each diabetes screening per visit was estimated to be about 64 baht (~ US\$ 2), costing from 50% labor, 44% materials and 6% capital. This estimated unit cost tends to be a guideline for performance-based payment mechanism for screening service in an accredited community pharmacy. It is concluded that diabetes screening by community pharmacists in accredited pharmacies are able to promote community's interest on diabetes. The figure of 10% at risk diabetes who were screened and early treated in appropriate settings was thought to be lower than actual.

Introduction

Diabetes Mellitus (DM) is one of world-wide health problems which involve high cost with several long-term consequences. In Thailand, The World Health Organization has anticipated that diabetic cases should double that of the current figure by 2025 (Aekplakorn *et al*, 2003; Wild *et al*, 2004; Bureau of Policy and Strategy Ministry of Public Health Thailand, 2008; International Diabetes Federation, 2006). To effectively manage DM, stakeholders such as health professionals, patients and their family supports, and third parties who support the budget for health services (Fleming *et al*, 2001; Task Force on Community Preventive Services, 2002) should have joint activities. More than 60% of people with high risk diabetic factors in a community have not been screened for the disease and are not well aware of the risk and consequences (Samukee Primary Care Unit, 2008).

An impact of the Thai national health policy to promote rather than to treat has implement community-focus serving as primary health care and establish "Primary Care Unit or PCU" (Samukee Primary Care Unit, 2008). To reduce over-utilization in public hospitals and improve the health service quality (Silaruks *et al*, 2008), PCU were assigned to be responsible for health screening and selecting cases for referring to hospitals. The Thai Ministry of Public Health emphasized on effective management of chronic diseases, e.g., DM, hypertension, by screening and early diagnosis. However, lack of proficient PCU staff to monitor the screening schemes leads to seek other possibilities so as to achieve the national goal. Community pharmacies or drugstores serve as one of the health care provide settings which situate in the community is an alternative to enable the scheme. Unit cost can be estimated from direct medical cost of screening. It is composed of 3

expenses, i.e. labor, materials and capitals.

This observational study was aimed to evaluate and compare the new scheme developed in Thai community pharmacies to screen for at risk diabetes in terms of effectiveness, unit cost and provider payment method. The benefits of this study would involve community awareness of the disease and health care with preventive concerns for each individual as well as early referring to hospital which should eventually prevent complications and long-term consequences.

Methods

This cross-sectional, descriptive study was conducted during October 2008 and March 2009. The present research was approved by the institutional ethical committee before commencing. There were 11 qualified drugstores in 3 provinces of the Northeast of Thailand participated the study, i.e. 3 from Nakorn Ratchasima, 6 from Khon Kaen, and 2 from Maha Sarakham. Among them, 11 have been accredited by the Thai Pharmacy Council. From the selected areas of coverage by the 11 qualified drugstores in the municipal areas, there was a total population of 63,352 who were ≥ 35 years old. Purposive sampling from this group of population was conducted by enquiring those who visited the drugstores of their intent to participate in diabetes screening.

Unit cost was evaluated from the provider perspective, prospectively collected the direct medical cost (direct non-medical cost and indirect cost were not included) during 6 months between October 2008 and March 2009. Simple one-way sensitivity analysis was used.

Data were divided into 3 parts. The spent time for each diabetes screening was by stopwatch that was recorded by

trained assistants. Labor cost was estimated per spent time from salaries or payment made to each staff or personnel involving with each diabetes screening. Expenditures on materials and accessories were calculated from those spent for blood glucose strips, documents (information leaflets, patient monitoring forms, patient folders) and

others (electricity and telephone used for monitoring which were estimated on shared basis). Capital cost consisted in the depreciation cost of equipment or medical instruments for screening calculated by using straight line method. The profile of each case was recorded in data collection form.

Table 1 Demographic data of participants in 3 provinces who were diabetes screened

Characteristics	Frequency (%)			
	Nakorn Ratchasrima (n = 221)	Khon Kaen (n = 928)	Maha Sarakham (n = 333)	Total (n = 1,482)
Gender				
Male	154 (69.7)	375 (40.4)	140 (42)	669 (45.1)
Female	67 (30.3)	553 (59.6)	193 (58)	813 (54.9)
Age (mean±SD, yr)	49.6±11.9	47.6 ± 9.2	50.0±11.7	49.1±10.9
Weight (mean±SD, kg)	63.3±12.1	62.2 ± 11.1	61.3±11.1	62.3±11.4
Height (mean±SD, cm)	159.5±7.6	159.3 ± 7.9	159.5±8.6	159.47±8.0
Body mass index (mean±SD, kg/m ²)	24.9±4.4	24.4 ± 3.7	23.9±3.6	24.4±3.9
Marital status				
Single	41 (18.6)	n/a	29 (13)	70 (15.8)
Married	148 (67.3)	n/a	168 (75.3)	316 (71.3)
Divorced/separated	15 (6.8)	n/a	10 (4.5)	25 (5.7)
Widow	16 (7.3)	n/a	16 (7.2)	32 (7.2)
Insurance system				
Universal coverage (UC)*	165 (74.7)	406 (43.7)	333(100)	904 (61)
Non – UC	56 (25.3)	522 (56.3)	-	578 (39)
Reasons of this participation				
Buying other medications	71 (33.3)	n/a	15 (4.5)	86 (5.8)
Leaflets announcement	53 (24.9)	n/a	24 (7.2)	77 (5.2)
Convince by trainees	29 (13.6)	n/a	175 (52.6)	204 (13.8)
Radio	6 (2.8)	n/a	1 (0.3)	7 (0.5)
Own observation	-	n/a	102 (30.6)	102 (6.9)
Promotion activity	54 (25.4)	497(53.6)	-	551 (37.5)
Others	-	n/a	16 (4.8)	16 (1.1)
No data available	-	431 (46.4)	-	431 (29.2)

* The universal coverage for health insurance scheme under Thai Ministry of Public Health management

One-way sensitivity analysis was performed into 2 cases, (1) unit cost if the shared material cost such as electricity charge and water pipe supply charge was excluded (2) unit cost if the monthly income of the community pharmacist in the three provinces was fixed as 20,000 baht (~ US\$ 596).

Results and Discussion

Studied samples: Total of 1482 people aged ≥35 years were DM screened by 11 accredited community pharmacies. During six months, 3 drugstores in Nakorn Ratchasrima were able to

screen 221 people, 6 drugstores in Khon Kean were able to screen 928 people and 2 drugstores in Maha Sarakham were able to screen 333 people. The characteristics of these 1,482 screened people are shown in Table 1.

Effectiveness of diabetic screening by the 11 accredited community pharmacies: In a total of 1482 screened people, 532 (35.9%) were the high risk people and referred to have an early diagnosis for confirmation at the Community Medical Units (CMU) or the PCU. Nine-hundred fifty people (64.1%)

were not in the criteria for such referring or showed a normal fasting blood sugar (less than 100 mg/dl).

Out of 532 referred people, 113 (7.6%) were screened to be risk persons for diabetes, 331 (22.4%) were found to be on high risk for hypertension, and 88 (5.9%) were persons who have a risk on both diseases as shown in Table 2.

Coverage of the diabetes screening in the community: In the municipality area of these 3 provinces, 8 CMUs had taken a responsibility on health care for

a population of 145,195 persons. People aged ≥ 35 years who were the target persons for diabetes screening was 63,352 persons. During 6 months of screening, the 11 community pharmacies were able to screen 1,482 persons. Thus the community pharmacies helped to cover for diabetes screening of 15,373 persons whom were screened by 8 CMUs to be 16,855 persons. Totally, community pharmacies could increase the coverage by around 10% as shown in Table 3.

Table 2 Effectiveness of screening in 11 accredited community pharmacies

Effectiveness	Frequency (%)			Total
	Nakorn Ratchasrima	Khon Kaen	Maha Sarakham	
Number of screened people	221	928	333	1482
Screening results				
Not referred to CMU (normal)	110 (49.8)	704 (75.9)	136 (40.8)	950 (64.1)
Referred to CMU (High risk)	111 (50.2)	224 (24.1)	197 (59.2)	532 (35.9)
Diseases at risk				
	(n=111)	(n=224)	(n=197)	(n=532)
Diabetes	4 (1.8)	56 (6.0)	53 (15.9)	113 (7.6)
Hypertension	95 (43.0)	140 (15.1)	96 (28.8)	331 (22.4)
Diabetes and hypertension	12 (5.4)	28 (3.0)	48 (14.5)	88 (5.9)
Diagnosis confirmed at CMU				
No. of patients visited CMU after screening	12 (10.8)	44 (19.6)	100 (50.8)	156 (29.3)
1. Normal	2 (16.7)	12 (27.3)	18 (18)	32 (20.5)
2. High risk on diseases*				
- Diabetes	-	4 (9.1)	9 (9.0)	13 (8.3)
- Hypertension	4 (33.3)	9 (20.5)	60 (60.0)	73 (46.8)
- Diabetes and hypertension	-	2 (4.5)	4 (4.0)	6 (3.8)
3. Early diagnosed**				
- Diabetes	-	5 (11.4)	1 (1.0)	6 (3.8)
- Hypertension	6 (50.0)	9 (20.5)	4 (4.0)	19 (12.2)
- Diabetes and hypertension	-	3 (6.8)	1 (1.0)	4 (2.6)

* High risk on diabetes, FPG 100-125 mg/dl

** Early diagnosed on diabetes, FPG ≥ 126 mg/dl; high risk on hypertension, BP 120/80-139/89 mm Hg; early diagnosed on hypertension, BP $\geq 140/90$ mmHg. Data Source: The development Thai drugstore project, Thai Food and Drug Administration (2008)

Table 3 The coverage of diabetes screening in three provinces

Coverage	Number of persons (%)			Total
	Nakorn Rachasrima	Khon Kaen	Maha Sarakham	
Total population	34,244	90,000	20,951	145,195
Targeted population (aged ≥ 35 years)	13,670	41,124	8,558	63,352
No. of screening				
1. in CMU or PCU	50	28	51	129
2. in drugstore	3	6	2	11
Screening results				
1. Screening at CMU or PCU (1 yr)	2,262	9,087	4,024	15,373
2. Screening at drugstores (6 mo)	221	928	333	1,482
3. Total screening	2,483 (18.2)	10,015 (73.4)	4,360 (50.9)	16,855
% Addition of coverage	9.8	10.2	8.3	9.6

Table 4 Unit cost of diabetes screening in three provinces

Cost	Cost per screening a person (baht/person)			Average (baht/US\$*)	%
	Nakorn Rachasrima	Khon Kaen	Maha Sarakahm		
Labor	51.04	20.50	38.63	32.13/0.95	50.1
Material	27.61	25.42	38.89	28.46/0.85	44.4
Capital	2.62	5.10	0.34	3.56/0.11	5.5
Total	81.27	51.02	77.86	64.15/1.91	100.0

*US\$ 1 = 33.8 baht (2008)

Table 5 Unit cost of diabetes screening between 8 CMU and 11 accredited community pharmacies in three provinces

Cost structure	Unit cost (baht/US\$*)	
	CMU (n=8)	Community pharmacies (n=11)
Number of screened in 6 mo	3,168	1,482
Labor cost	36.09/1.08	32.13/0.95
Material cost	20.38/0.61	28.46/0.85
Capital cost	1.50/0.04	3.56/0.11
Total cost	57.97/1.73	64.15/1.91

*US\$ 1 = 33.8 baht (2008)

Table 6 Sensitivity analysis of the unit cost of diabetes screening in accredited community pharmacies

Cost structure	Sensitivity analysis	
	Case 1	Case 2
Labor cost	32.13	34.38
Material cost	22.68	28.46
Capital cost	3.56	3.56
Total cost	58.37 (1.74 USD)	66.41 (1.98 USD)

Note : Case 1 = Excluded shared material cost, Case 2 = Fixed monthly income of community pharmacist =20,000 Baht USD= 33.8 Thai Bahts (THB)

Unit cost of diabetes screening:

From cost data of the 11 accredited community pharmacies in a provider perspective and calculated from direct medical cost, the unit cost of diabetes screening for one person was 64.15 baht or US\$ 1.91. The range of monthly income of pharmacists in the accredited community pharmacies was 20,000-35,000 baht that was depended on the where the community pharmacy was established. The average time of screening by the pharmacist was 19.30 min per service. The components of unit cost were 50.1% of labor cost, 44.4% of material cost and 5.5% of capital cost, as shown in Table 4.

When comparing the unit cost of screening between the CMU and the 11 accredited drugstores, we found that screening for one person at 8 CMUs was

at the average unit cost lower than screening at the average cost of the 11 drugstores, 57.97 baht or US\$ 1.73 and 64.15 baht or US\$ 1.91, respectively. The reason why the unit cost of screening in drugstores was higher are (1) the leaflet and information material costs for attracting people on disease knowledge and awareness about screening, (2) the profile costs for monitoring people at high risk, and (3) the medical equipment costs for investment on examining the blood pressure in the drugstore. The details of unit cost are shown in Table 5. The Average of shared material cost of diabetes screening by the community pharmacist at the drugstore was 6.21 baht (30.5% of all material cost) per service.

Provider Payment Method for diabetes screening: From the discussion with the experts in pharmacy service, the payment mechanism for diabetes screening in the community pharmacies by pharmacists, the payment was done with the service charge rate of 65 baht or US\$ 1.94 by 3 models as shown below.

Screening people of the universal coverage scheme who registered in the responsible area of the community pharmacy - The rational payment mechanism is performance-based with the charge rate of 65 baht per service. The community pharmacies could reimburse the money from the budget of promotion and prevention community-based services. This budget is managed by the CUP of the NHSO which organizing the Universal Coverage Scheme in Thailand.

Screening people of the UC scheme who were not in the responsible area of the community pharmacy - The performance-based payment from P&P-COM budget with the charge rate of 10 baht per service was proposed. People who come to be screened in a community pharmacies where is out of their registered area have to pay the sharing cost with the fixed charge rate of 30 baht (material cost for screening).

Screening people of the UC scheme who registered in the responsible area of the community pharmacy with more than one time re-screening per year - The performance-based payment from P&P-COM budget with the charge rate of 65 baht per service was proposed for the annual screening. People have to pay the cost-sharing for the re-screening service with the fixed charge rate of 30 baht per service (material cost for screening).

Sensitivity analysis: The one-way simple sensitivity analysis was performed in two cases. (1) Excluding the shared material cost such as electricity charge and water pipe supply charge (2) Fixing the monthly income of the community pharmacist in the three provinces to be 20,000 baht or US\$ 596. The unit cost of screening was not much changed as shown in Table 6.

Conclusion

The community pharmacist can be a key person for providing of a primary healthcare such as diabetes screening. Several studies showed the effectiveness of community pharmacists on this service (Silaruks *et al*, 2008, National Health Services, 2005, Sookaneknun *et al*, 2010). A total of 1,482 people who aged ≥ 35 years were screened for their diabetes risk factors. One community pharmacy could screen an average of 30 cases per month and about 10.5% of screened people who had high risk factors were referred to the CMU for rechecking their fasting blood sugar and seeing a physician for confirmation of diagnosis. The unit cost of a diabetes screening was 64.15 baht per service (US\$ 1.91) that was composed of labor cost (50%), material cost (44%) and capital cost (6%). The rational payment mechanism for screening service in accredited community pharmacy was a performance-based payment with 65 baht per service. When compared with the unit cost of diabetes screening in community pharmacy in Samukee primary care unit (2007) which was 351.7 baht (US\$ 9.8) (Sookaneknun *et al*, 2010). However, with the difference in the cost structure of the unit cost, in the study of 2007, it was composed including both direct medical cost (i.e. disposal glucose test strips) and direct non-medical cost (i.e. travel expenses), whereas the unit cost of this study was composed only direct medical cost. Moreover, in the 2007 study, the depreciation of community pharmacy

building was included whereas it was excluded in this study. The component of unit cost was similar to the study in 2007 which was 74.6% of labor cost, 16.0% of material cost, and 8.5% of capital cost (Sookaneknun *et al*, 2010). Community pharmacies can reimburse the performance-based money from the budget of P&P-the COM budget from CUP of the NHSO who organizes the Universal Coverage Scheme in each area.

We conclude that diabetes screening by community pharmacists in the accredited pharmacies are able to promote community people's interest on diabetes screening and support the coverage of screening in people with risk factors. Community pharmacists as primary care providers can reimburse their money with the rational payment thereby increasing their efforts to provide the service.

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References

- Aekplakorn W, Stolk RP, Neal B, Suriyawongpaisal P, Chongsuvivatwong V, Cheepudomwit S, *et al*. The prevalence and management of diabetes in Thai adults. *Diabetes Care*. 2003;26:2758-2763.
- Bureau of Policy and Strategy Ministry of Public Health Thailand. Population statistic midyear 2008. Website - <http://bps.ops.moph.go.th/index.php?mod=bps&doc=5>. 2008.
- Fleming BB, Greenfield S, Engalgau MM, Pogach LM, Clauser SB, Marian A and Parrott MA. The diabetes quality improvement project: moving science into health policy to gain an edge on the diabetes epidemic. *Diabetes Care*. 2001;24:1815-1820.
- International Diabetes Federation. *Diabetes Atlas 3rd edition*. Belgium: Hoorens Printing NV 2006.
- National Health Services. A Guide to Support for Pharmacists, PCTs and SHAs as they implement the new Community Pharmacy Contractual Framework, 2005. Website - <http://www.primarycarecontracting.nh.uk/pharmacy>. 2008.
- Samukee Primary Care Unit, The Annual Report of Activities in the fiscal year 2007. Thailand:Ministry of Health 2008.
- Silaruks B, Limwattananon C, Limwattananon S and Boonkaw P. Community participation in diabetes screening service: in the context of primary care unit, Thai J Hosp Pharm. 2008;18: 52-62.
- Sookaneknun P, Saramunee K, Rattarom R, Kongsri S, Senanokb R, Pinitkit P, *et al*. Economic analysis of the diabetes and hypertension screening collaboration between community pharmacies and a Thai government primary care unit. *Diabetes Care* 2010;4:5155-5164.
- Task Force on Community Preventive Services. Recommendations for health-care system and self-management education interventions to reduce morbidity and mortality from diabetes. *Am J Prev Med*. 2002;22(Suppl):10-14.
- Wild S, Roglic G, Green A, Sicree R and King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004;27:1047-1053.