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*Full Length Research Paper*

# Chronic care model for diabetics by pharmacist home health in Bangkok Metropolitan: A community based study

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**Diabetes was increased in Thailand with increasing burden of morbidity and mortality. There were 42.8% of diabetes patients in Bangkok who had been treated, but the disease conditions were uncontrolled. Diabetes with drug related problems (DRPs) frequently occurred, leading to problems of uncontrolled disease conditions. The objective of this study was to apply chronic care model (CCM) which has been introduced using medication therapy management (MTM) services by community pharmacist home health care and monitor patients' drug utilization in diabetic patients at home. An action research was conducted in the community in Bangkok Metropolitan. The uncontrolled diabetes conditions were purposively selected and identified by nurse home care team. The community pharmacists provided the MTM service 3 times as the delivery service design template that was planned over the 6-month period. The study implemented on CCM with MTM services as the main delivery system. The outcomes were evaluated on three aspect of ECHO model. Data were gathered for 288 uncontrolled diabetic patients with high prevalence of drug related problems. The number of drug were taking mean standard deviation (SD) 7.1 (3.1) per patient at enrollment. The 2.98 number problems per patient and 95.8% non-adherence were identified by community pharmacist. After 3 interventions, non-adherent patients' state was changed to adherent medication level and partially medication adherent level by 18.2 and 26.0%, respectively. The pharmacists identified problems and improved in safety issues (adverse drug reactions, drug interactions), adherence issue and effectiveness issue (sub-therapeutic dosage). The clinical outcome found the average systolic and diastolic blood pressures to improve significantly in 48.6% patients with hypertension including those in pre-hypertension, stage I and stage II. The data was limited and results showed that the fasting plasma glucose (FPG) was not significantly reduced from baseline due to lack of linkage among hospital and community settings. The non-compliance issue had an effect on excessive medications per patient on the average of $543.24 per year. This study concluded that implementation MTM service through CCM by community pharmacist home health care could alleviate patients' medication utilization problems and would thus improve overall quality of patient care.**

**Key words:** Chronic care model (CCM), drug related problems (DRPs), medication adherence, home health care, medication therapy management (MTM).

## INTRODUCTION

In Thailand, diabetes is a common chronic disease with increasing burdens as the prevalence had risen to 6.9% in 2009. It was found out that 42.8% of patients in Bangkok were unable to control the disease condition (Aekplakorn, 2009). The co-morbidities and diabetes-related complications were associated with an increase in health care costs and hospitalization. The fundamental

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role of the diabetes management team by multi-disciplinary professionals is the development of a model for continuity of care and services for diabetes (McGill and Felton, 2007). The chronic care model (CCM) was a guide to higher-quality chronic illness management that brought new conceptual frameworks and innovations for redesigning the service platform and structure of the healthcare setting (Bodenheimer and Grumbach, 2007). The CCM strives to foster more productive interactions between prepared, proactive practice teams and well-informed, motivated patient by delivery system design involves diabetes care visit (Wagner et al., 2001). A good illustration of this new service concept was pharmacist home health care service for elderly taking polypharmacy and those with poor cognition had improved their medication adherence within a week after being monitored (Stewart et al., 1988; Osterberg and Blaschke, 2005).

Drug related problems (DRPs) were frequently found among patients discharged from hospitals and could potentially interfere desired health outcomes (Hepler and Strand, 1990). Typically, the control of hyperglycemia required multidrug regimens, associated with an increase risk of adverse drug events (Hanlon et al., 1996; Grant et al., 2003; Chrischilles et al., 1992). The medication therapy management (MTM) service was driven by the philosophy of pharmaceutical care, which was viewed as a comprehensive framework for patient care service focusing on drug use monitoring (American Pharmacists Association and the National Association of Chain Drug Stores Foundation, 2008). Pharmacists had used MTM as a strategy to reduce drug related problems from polypharmacy (Viktil et al., 2006; Christensen et al., 2007). The MTM program could improve medical adherence and lead to a reduction in the overall health care expenditures by optimizing therapeutic outcomes, especially in elderly patients. In Thailand, the CCM for diabetes was mainly delivered in secondary and tertiary hospital settings. The role of primary health care settings, especially community pharmacies, in continually monitoring and managing patients' chronic medications was limited. The pharmacist home health care service was initiated as a mechanism to ensure the continuity of care for patients. Improvement of community and home-based diabetes care programs was needed to strengthen the service of home health care (Katekaew, 2005; Debavalya and Moolasarn, 2008). Therefore, this study integrated the MTM service into pharmacist home health care as the delivery care element for CCM. The proven effectiveness of this model would not only reduce drug related problems and improve diabetes patients' outcomes, but also reinforce the drug cost containment through the decrease of medication utilization and the optimization of therapeutic outcomes.

### STUDY DESIGN

The study period was during May 2009 to July 2010. It was an action research with one group before-and-after design. A total of 34 communities in 5 community health centers were purposively selected as the study areas. The sample of 288 chronic patients identified by nurses from the community health centers as having uncontrolled diabetic conditions were referred to community pharmacies for home health care visits to periodically monitor patients' drug utilization. The pharmacist providing home health care intervention followed 5 components of MTM services, including the medication therapy reviews, a personal medication record, a medication action plan, intervention and referral, documentation and follow-up for problems solving. The framework of MTM services by home health care pharmacists is as shown in Figure 1. Pharmacist provided each MTM services for patient every 2 to 4 weeks for 3 visits and 2 more follow-ups for an outcome assessment during the next 2 months. The time spent in each home health care visit was 20 min for interview as well as medication review among patient and/or caregiver and 40 min on intervention, patient medication record, documentation and referral if needed. This study was designed with the emphasis on the practice level of the CCM with the MTM service as the main delivery system as in practice elements. The implement of CCM was outlined as shown in Table 1.

The outcomes were evaluated on three aspects of ECHO model: economic, clinical and humanistic outcomes (Kozma et al., 1993). During each home health care visit, DRPs were identified and intervened. The drug related problems were classified into categories such as adverse drug reactions, drug interactions observed by the symptoms occurs, over-dosage or under-dosage identified from medication labels, untreated indication, improper drug used and non-adherence evaluated by modified brief medication questionnaire (Svarstad et al., 1999). The economic aspect was assessment in excessive drug cost per patient. The average cost of excessive drug was calculated from actual drug list for prescriber only by review of records and pills count between interval visits.

## RESULTS

The baseline demographic characteristics of all patients were collected during the first visit. Out of 288 patients, 81.7% had hypertension as the main co-morbidity and 90.0% had two or more chronic diseases. They were taken on the average (±SD) of 7.1 (±3.0) medications, and 89.3% of patients had 4 or more medications. Some patients dropped out from the project and some relocated during the studied period remaining 236 patients or 81.9% with completed 3 pharmacist visits/interventions. Patients were classified into 3 groups according to adherence levels using the pill count method. Adherent were those with the average of ≥ 80% medication compliance, partially adherent were those between ≥ 60 to <80% and non-adherent were those taking medication less than 60% (Asher-Svanum et al., 2009). Table 2 revealed that the number of patients in non-adherence level was improved to 18.2% and became adherent and 26.0% improved to partially adherent after completion of pharmacist home health care visits. The partially adherent level also improved to adherent in 32.8% of patients.

The pharmacists identified that a total of 858 DRPs issues were detected during the first visit with the mean number of 2.98 DRPs per patient. Majority of the

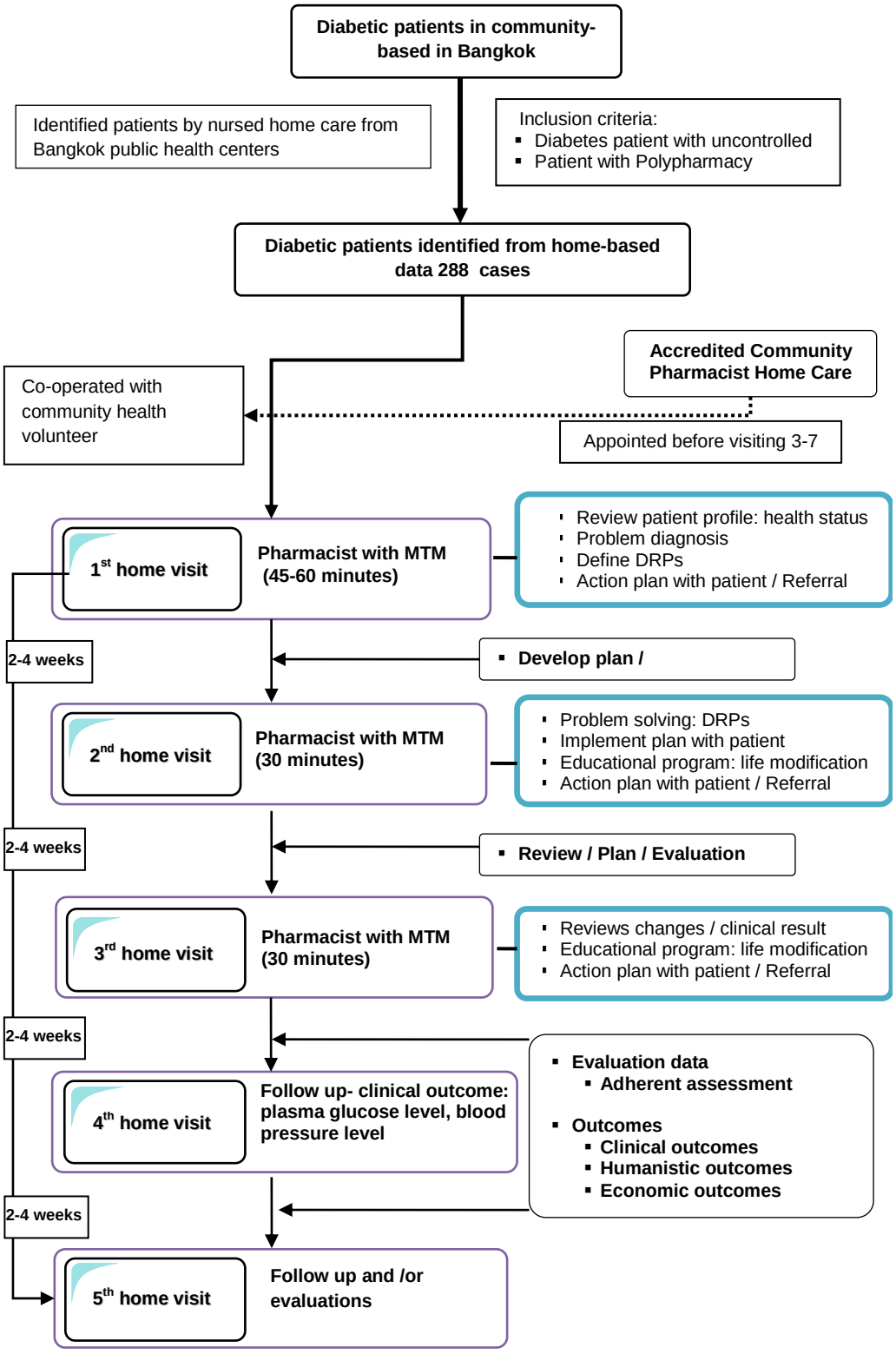


**Figure 1.** Framework of MTM services by pharmacist home health care.

problems 822 (95.8%) were non-adherence and 21 adverse drug reactions problems. After the third pharmacist home visit, the change of drug related problems were improved in safety issues (adverse drug

**Table 1.** Implement of CCM for diabetes care.

| CCM component | Management and activities |
|---|---|
| **Policy level** | |
| Health System<br>Health care organization | Financial incentives supported from National Health Security Office (NHSO) |
| Community resources and policies | To encourage patients to participate in effective community program, the following should be done:<br>– Community Pharmacy Association organized and supported |
| **Practice level** | |
| Self-management support | Pharmacist provided the materials and services.<br>– Emphasis on patient empowerment and acquisition of self-management skill.<br>– A personal medication record handbook for patient<br>– Education family/or care giver |
| Delivery system design | MTM services for each visiting.<br>Pharmacist home health care by 3 times of medication therapy management services: |
| Decision support | – Specialist expertise team for support about the clinical management<br>– Develop drug related problem guideline<br>– Provide the case/problem based learning program |
| Clinical information systems | – An application on handheld devices.<br>– An application for registering patients, care givers and pharmacies |

**Table 2.** The change stage of adherent level by pharmacist home health care services.

| Adherence level baseline (N[a]=236) | The change stage of adherence level after MTM service at home | | |
|---|---|---|---|
| | Adherent (%) (n=66) | Partially adherent (%) (n=70) | Non-adherent (%) (n=100) |
| Adherent (n=65) | 38.5 | 32.3 | 29.2 |
| Partially adherent (n=67) | 32.8 | 32.8 | 34.4 |
| Non-adherent (n=104) | 18.2 | 26.0 | 55.8 |

[a]Number of patients who had completely pill counts in 3 visits and exclude error data.

reactions, drug interaction), adherence issue and effectiveness issue (sub-therapeutic dosage). The untreated indication issues found out that there were no changes, whereas pharmacists could detect more problems, as shown in Table 3. The pharmacists provided all patients education or counseling that did not require a physician response. Thirty-four patients (11.8%) were referred to their physicians for immediate actions due to safety issue. The physicians acted 55% of response rates from referral patients. The changes in drug therapy were recommended as stopping, switching medication or dose changes. The clinical outcome found out that the average systolic and diastolic blood pressures showed significant improvement in 48.6% of patients with hypertension including those in pre-hypertension, stage I and stage II. Stage II patients showed decrease in significantly both systolic and diastolic blood pressure levels after intervention. This study had the constraint in acquiring patients' HbA1c test results due to the difficulty in linkage among hospital and community settings, only fasting plasma glucose (FPG) levels before the first visit and after the third visit. Data was limited and results showed that the FPG was not significantly reduced from baseline.

The humanistic outcomes were measured by patient satisfaction using a diabetes specific instrument, modified diabetes quality of life (DCCT Research Group, 1998) during the follow-up visit. The results showed that patients

**Table 3.** The change of number of DRPs issues after pharmacist home services.

| DRPs issues | Number of problems 1st visit | Number of problems 3rd visit | Change of drug-related issue |
|---|---|---|---|
| Number of DRPs per patient | 2.98 | 2.69 | - |
| **Adherence** | | | |
| Non-compliance | 822 | 684 | Decreased problems |
| **Indication** | | | |
| Untreated indication | 4 | 15 | Increased problems |
| Improper drug selection | 2 | 2 | Not changed |
| Invalid indication | 1 | 0 | Decreased problems |
| **Safety** | | | |
| Adverse drug reaction | 21 | 8 | Decreased problems |
| Drug interaction | 5 | 0 | Decreased problems |
| **Effectiveness** | | | |
| Sub-therapeutic dosage | 3 | 0 | Decreased problems |
| Over-dosage | 0 | 1 | Not changed |
| Total of number of problems | 858 | 710 | Decreased problems |

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during the follow-up visit. The results showed that patients were satisfied with all 3 dimensions in 33 items with Cronbach's Alpha *0.780 (r)* on five-point Likert scale, including life and daily activity (4.485 ± 0.537), 0.870 *(r)*, diabetic disease impact (3.875 ± 1.028), 0.877*(r)* and worries about diabetes (4.019 ± 1.122), 0.933*(r)*. On the economic aspect, the outcomes showed that most patients carried more medications than necessary. The average excessive drug expenditures were $45.27 per patients per month or $543.24 per year. It was noticeable that patients under the Health Universal Coverage has the lowest excessive cost at $12.84 and those paying out-of-pocket had the highest excessive drug cost at $205.90. These excessive drug expenditures were calculated from current drug items by interval visiting prescribed by physicians only.

## DISCUSSION

This study found out that the pharmacist home health care provided the MTM services through the chronic care model that improved patient outcomes on clinical, humanistic and economic outcomes. The results show that the pharmacist improve diabetes care by addressing the important issue of adherence to medication, although, this was not explicitly measured in fasting plasma glucose level. The levels of blood plasma glucose and glycated hemoglobin were not recorded and perceived by diabetes patients. The patient data profiles were limited due to lack of linkage between hospital and pharmacy. The medication adherence stages improved by MTM service which identified the problems, planning, medication dose interventions and co-operation with health care professionals. Adherence is complex and is bound up with the need of integration with social life as well as health beliefs. However, pharmacist home care services operated reminder system, consulted the medication management, self-medication record, supplied patient education and facilitated communication between patients and physicians for medication adherence. This continuity of care model between hospitals and community pharmacies initiated in this research was in its early stage; the cooperation between them was for patient clinical outcomes. Thus, only 77 patients had FPG data, showed no significant change. If more data could be obtained, the result could have been more informative. However, patients' blood pressure levels showed significant improvement with stage II. These results correspond to the improvement of patients' adherence. Researcher found out that better patients' adherence was partly due to the impact from personal medication record (PMR), which was used as self-management support for patients. Not only did it serve as a memory recall for patients, but it was also an effective tool for pharmacist to continuously monitor patients' drug utilization. The data linkage between hospitals and community pharmacies will allow the program to render patient medication monitoring to be more effective and efficient. DRPs found a great number of non-compliance

that caused the misunderstanding in medication used, the stop taking drug, health beliefs in herbals, many of drug items and several drug regimen too complex with daily life. Pharmacists helped patient adherent to develop the level of trust in each other to support the cooperation needed for effective drug therapy management. The safety issues were addressed and solved in adverse drug reactions and drug interactions that were acceptant recommended from physicians. The CCM by pharmacist home health care using MTM services as delivery system design in this study enhanced the effectiveness of pharmacists in providing patient care leading to achievement of the therapeutic goals by improving overall health, at the same time it decreased the overall health care system costs. The economic efficiency was increased through reducing excessive and improper medication use, preventing adverse drug events, and other undesirable outcomes. The role of the community pharmacist in primary health care team had proven to be a good linkage between tertiary, secondary and primary care. This research confirmed that community pharmacists could effectively provide diabetic care, reduce drug related problems and improve medication adherence.

## Conclusions

This study concluded that redesigning care using implemented CCM through the MTM services by pharmacist home health care was an effective cooperative model for diabetic care management. The findings of this study led to the recommendation that health care providers should integrate MTM services by pharmacists to help improve the quality of patient medication utilization in chronic conditions. The continuity of the institution and home through community pharmacist home health care would benefit diabetic patients therapeutically and economically, leading to improved patient care and better health outcomes.

## POLICY RECOMMENDATIONS

The MTM service by community pharmacists should then be valued and recommended as a part of benefit package for patients. The financial incentives supported by the National Health Security Office (NHSO) would strengthen the sustainability of pharmacist home health care services. Patient registration at their selected community pharmacy would allow better continuity of care for all patients and preventive care for their families. This suggested system would endorse the “family pharmacist” concept by community pharmacists to manage family medication and health.

## LIMITATIONS

The limitations of this study should be considered. Lack of data linkage between service units impeded the completion on some clinical information. Some of the clinical outcomes as HbA1c or FPG could not be analyzed for all patients.

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