



# Development of Physician–Pharmacist Collaborative Refill Clinic for Reducing the Oversupply and Costs of Medicine in Orthopaedic Outpatient Clinic, Naresuan University Hospital

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## Abstract

**Background:** The number of patients with degenerative disorder of skeletal system in outpatient clinic is increasing, thus crowd of patients waiting for health care service is typically time consuming in every scale of public hospital. Hence, a Physician–Pharmacist Collaborative Refill Clinic (Refill Clinic) was implemented in the outpatient clinic of orthopaedic department, Naresuan University Hospital, and we aimed to evaluate the impact of this program on medication possession ratio (MPR) and medication cost saving.

**Method:** This study is prospective cohort study during one fiscal year. The physician screened and referred patients who had stable condition, and required for long-term medication to the Refill Clinic. The pharmacist reviewed patient's medications profile and conducted medication reconciliation to assess patient's adherence and drug-related problems, as well as determined medication's quantity, and dispensed medications at the adequate quantity until the next refill date. All the adverse reactions were also monitored. The MPR and medication costs saving after attending the Refill Clinic were primary outcomes. MPR 0.9–1.1 is determined as appropriate supply.

**Results:** Of 162 patients participating in the Refill Clinic, mean age was  $59 \pm 12.6$  years, and 69.7% were female. The patient who had an appropriate drug possession prior to join the Refill Clinic ranged from 6.7–50%. After implementing the Refill Clinic, the appropriate supply increased to the range of 35.0–100.0%. The Refill Clinic project can totally save 66,294 baht of drug costs. None of the patient experienced severe side effects from medication.

**Conclusion:** The Refill Clinic could improve the MPR and reduce total budget of medication in the patient who has stable condition, and required for long-term medication.

**Keyword:** Refill clinic, Medication possession ratio, Chronic disease, Drug cost, Orthopaedic

## Introduction

Nowadays, Thailand is entering an aging society, and thereby the number of patients with degenerative disease is inevitably increasing. A large number of patients may require a continuous treatment, while the number of physicians and health care personnel in public hospital may not be in a good proportion. Thus, crowd of patients waiting for physician is typically observed in every scale of public hospital, and also the process until taking medicine is vastly time consuming. There are some strategies trying to solve this problem, for instance extending the next patient's appointment and supplying drugs for 3–6 months period. While, this longer period of follow-up might equivocally reduce the number of patients coming to the hospital, it may lead to some concerning consequences, such as patients not being monitored properly for adverse reactions of medicine, the



compliance for the drug use in appropriate time and having oversupply of medication. These problems might thereafter affect the efficacy of treatment as well as the budget of the hospital and the government. (Ratanawijitrasin & Kulsomboon, 2001)

The information from “Health Insurance System Research Office” found the value of drug consumption in Thailand from 1995–2005 was 30–44% of the total cost of healthcare services. This cost of medicine is higher than those in the Developed countries which drug expenditures is approximately 10% (Dilokthornsakul et al., 2010; Riege, 2005). This study also reported prevalence and cost from oversupply medication in each patient by using the data from one of University Hospital in Thailand. They found 23–63% of an unnecessary dispensing and it could cause dissipation of total budget for medication by 3.77%. If the hospital can reduce the incidence of unnecessary drug possession, it will not only reduce the hospital costs for drug, it may also increase the safety of drug use and patient’s adherence.

Based on a review of evidence, there are many studies which establish a continuous drug exposure system for patients with chronic disease. These health care systems could improve patient’s adherence without medication oversupply such as 1.) Refill clinic by prescribed the medicine through online portal (Lyles et al., 2016). 2.) The collaboration among healthcare professionals including physicians, pharmacists and nurses (McKinnon & Jorgenson, 2009; Stroupe et al., 2000; Stroupe et al., 2004; Zermansky et al., 2001; Nguyen & Zare, 2015). 3.) The electronic medication refill system (Rim et al., 2018; Schoenhaus et al., 2016) The results of the studies showed that this system could increase patient safety, reduce the burden of costs for unnecessary dispensing, and reduce the workload of health care personnel Also, the system may reduce crowd of patients waiting for physician and shorten waiting time until taking medicine.

In the present study, we developed a Physician–pharmacist Collaborative Refill Clinic (Refill Clinic) through collaboration between physicians, pharmacists, and nurses. The objective of this study is to evaluate the impact of this development on Medication Possession Ratio (MPR) and drug cost saving.

### **Methods and Materials**

This study is prospective cohort study which the Refill Clinic was implemented in the outpatient clinic of orthopaedic department, Naresuan University Hospital, Phitsanulok, Thailand. The roles and functions of the multidisciplinary team were assigned. Physician made the diagnosis and treatment for patients and enrolled patients who had stable clinical symptoms and sign with normal laboratory results, and required for long–term medication. Exclusion criteria were 1) patients with other systemic disease who required monitoring of clinical symptom and sign by multidisciplinary team. 2) Patients who were unable to receive their own medication by themselves. Thereafter, the pharmacist would follow 3 steps of guideline that were 1) review patient’s profile, medications, and related laboratory testing. 2) Interview each patient to assess medication adherence and identify drug related problems which including adverse drug reactions, interactions between herbal, supplement with current medications 3) Reconcile medication’s quantity, and dispense medications at the adequate quantity, and record the information in the data collection form as well as medical record, and determine the next refill date. All the adverse reactions and patient adherence were also monitored in every visit at the Refill Clinic. The patients who had serious adverse effect from medication, had new symptom and sign, and had no clinical improvement from the previous visit would return to be evaluated by the physician. The Refill Clinic was piloted for 4 months. Afterward, all information was prospectively collected from medical record and electronic databases



during one fiscal year. The MPR and medication costs saving after attending the Refill Clinic were primary outcomes. Usually, MPR is the sum of the days' supply for all prescription fills within a time interval, divided by the number of days in a particular time period as formula below.

$$\text{MPR} = \frac{\text{Days of medication supply}}{\text{Days of interval period}}$$

MPR < 0.9 is determined as undersupply, MPR 0.9–1.1 is appropriate supply, and MPR > 1.1 is oversupply. The estimated cost savings were calculated conservatively by using the number of pills that could be saved multiplied by the reference price of each medication during one fiscal year. Descriptive statistics including percentage, frequency, median and distribution were used in the analysis with SPSS software (Statistical Package for Social Sciences, version 17.0; SPSS Inc, Chicago, IL).

## Results

From collecting data during one fiscal year, there were 162 patients participating in the Refill Clinic. The mean age was  $59 \pm 12.6$  years, and 69.7% were female. Approximately 61% of the patients were in the Civil Servant Medical Benefit Scheme (CSMBS), while 35.2% and 3.6% were in Universal Coverage Scheme and Social Security Scheme, respectively (table 1). The median of drug items in each patient were 5, and the mean of appointment period by the Refill Clinic was  $58 \pm 18$  days.

**Table 1** Demographic data of patients participating in the Refill Clinic

Patient data	Number (percent)
Total number of patients	162
Mean age (years $\pm$ SD)	59 (12.6)
Sex	
Female	113 (69.7)
Male	49 (30.3)
Health coverage scheme	
Civil Servant Medical Benefit Scheme (CSMBS)	153 (61.2)
Universal Coverage Scheme	88 (35.2)
Social Security Scheme	8 (3.6)

SD = standard derivation

### Medication Possession Ratio (MPR)

Of 162 participants, there were 10 drug items have been continuously dispensed and were used for analysis of MPR. The patient who had an appropriate drug possession (MPR 0.9–1.1) prior to join the Refill Clinic ranged from 6.7–50%. The number of patients with undersupply (MPR < 0.9) and oversupply (MPR > 1.1) ranged from 25.0–73.3% and 0–59.4%, respectively. After implementing the Refill Clinic program, the number of patients with the appropriate drug possession increased to the range of 35.0–100%. The number of patients with undersupply and oversupply decreased to the range of 0–45.0% and 0–20.0%, respectively. The proportion of each drug possession before and after attending the Refill Clinic is shown in Table 2.



### Medication costs

We found that the Refill Clinic project can totally save 66,294 baht of drug costs that comprised of 19,378.5 Baht (29.2%) and 46,915.5 Baht (70.8%) of essential drug (ED) and non-essential drug (NED) from National List of Medicine, respectively (Table 3).

### Safety of patients

There was none of the patient experienced severe side effects from medication. One patient had drug interaction between ibuprofen and warfarin which receiving from internist as the treatment of venous thromboembolism. However, this patient did not experience any serious complications.

**Table 2** Medication Possession Ratio (MPR) before and after implementing of the Refill clinic

Drug	MPR Before the refill clinic service			MPR After the refill clinic service		
	Under-supply	Appropriate supply	Over-supply	Under-supply	Appropriate supply	Over-supply
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Bisphosphonate*	1 (25)	1 (25)	2 (50)	0	5 (100)	0
Allopurinol	2 (50)	2 (50)	0	3 (42.8)	3 (42.8)	1 (14.4)
Amitriptyline	33 (73.3)	3 (6.7)	9 (20)	16 (42.1)	17 (44.7)	5 (13.2)
Vitamin D	2 (25)	2 (25)	4 (50)	4 (26.7)	9 (60)	2 (13.3)
Calcium*	8 (25)	5 (15.6)	19 (59.4)	22 (26.8)	49 (59.7)	11 (13.5)
Colchicine	2 (40)	1 (20)	2 (40)	4 (33.3)	7 (58.3)	1 (8.4)
Diacerein	1 (50)	0	1 (50)	2 (33.3)	4 (66.7)	0
Gabapentin**	6 (31.6)	4 (21.1)	9 (47.4)	9 (45)	7 (35)	4 (20)
Glucosamine <sup>+</sup>	16 (48.5)	7 (21.2)	10 (30.3)	19 (35.8)	29 (54.7)	5 (9.5)
Vitamins <sup>#</sup>	34 (37)	15 (16.3)	43 (46.7)	44 (34.4)	78 (60.9)	6 (4.7)

\*Bisphosphonate including alendronate and Ibandronate, \$ calcium carbonate including 850mg/tablet and 1500 mg/tablet, \*\* gabapentin including 100 mg/tablet and 300 mg/tablet, + glucosamine sulfate including 500 mg/capsule and 1500 mg/sachet, # Vitamins including multivitamin B, vitamin B complex, mecobalamin, folic acid

**Table 3** Cost-saving of Essential and Non-essential Drug of National list of Medicine

Drug	Number of tablets that can be saved	Unit price (Baht/tablet)	Costs saving (Baht)
<b>Essential drug (ED)</b>			
Calcium carbonate	1,756	3	5,268
Vitamin	1,360	0.5	3,320
Amitriptyline	1,323	0.5	661.5
Colchicine	305	1.5	457.5
Gabapentin	290	23	6,670
Vitamin D	261	11.5	3,001.5
<b>Non-essential drug (NED)</b>			
Glucosamine sulphate	1,369	3.5	4,791.5
Diacerein	86	41	3,526
Bisphosphonates	21	1,838	38,598



## Discussion

Nowadays refill clinic is more implemented for many non-communicable diseases. This clinic system help to increase patients adherence and decrease workload of healthcare professional (Billups et al., 2013; Nguyen & Zare, 2015; Gross et al., 2005). Same as the results of this study, demonstrated that the operation of the Refill Clinic increased the number of patients with the appropriate drug supply (MPR 0.9–1.1), particularly in the biphosphonate group which reached 100% of appropriate drug possession. Of 162 patients, the total cost of drugs could be reduced by 66,294 baht in one fiscal year.

About the safety of Refill clinic, previous studies have found that refill clinics are relatively safe (Gross et al., 2005; Nguyen & Zare, 2015; Ong et al., 2016). Same as this study, there is none of serious adverse effects from medication. There is only one drug interaction between ibuprofen and warfarin and no serious complications.

The reduction in drug costs is directly as a result of reduction in oversupply of medicine, especially the NED which is typically more expensive. Although, Calcium carbonate and vitamins are inexpensive ED, but the amount of drug remaining and high proportion of inappropriate possession may reflect a low medication adherence to agents which do not directly show its efficacy. The Refill Clinic allows pharmacists to identify drug related adverse effects, and the problems associated to patient compliance and medication adherence (Nguyen & Zare, 2015; Stroupe et al., 2000; Stroupe et al., 2004; Zermansky et al., 2001). In addition, the Refill Clinic as one-stop service may help reduce crowd of patients waiting for physician and reduce time consuming regarding regular process. It also provides more time for doctors to treat new patients. On the other hand, this alternative workflow may facilitate a social distancing management during an epidemic.

According to the study, our results may support the role of the Refill Clinic as another strategy to improve cost-effectiveness of ED and NED use. However, we realize some limitations in this study. First, we could not know actually the remaining drug if the patient forgot to bring it on appointment of the Refill Clinic. Second, the medication possession ratio (MPR) is only applicable to the medicines that are taken continuously to prevent or control the disease. Thus, we did not determine the MPR of the medicines that were taken intermittently to relieve symptoms, such as nonsteroidal anti-inflammatory drugs (NSAIDs). Third, this study did not assess patient's satisfaction which is one of the most important issue that can improve patient's adherence (Shapiro et al., 2001), and also did not determine other associated costs such as travel costs. Lastly, this study was conducted only at the orthopaedic outpatient clinic, and therefore the results might not be appropriately extrapolated to other specific group of patients. Hence further investigation may be considered before implementing the Refill Clinic to outpatient service for other chronic NCDs such as diabetes, hypertension, etc.

## Conclusion and Suggestions

The Physician-pharmacist Collaborative Refill Clinic could improve the medication possession ratio and reduce total budget of medication in the patient who has stable clinical symptoms and sign, and required for long-term medication from orthopaedic clinic. The expand implementation of Refill clinic in other department is value for study.





## References

- Billups, S. J., Delate, T., Newlon, C., Schwiesow, S., Jahnke, R., & Nadrash, A. (2013). Outcomes of a pharmacist-managed medication refill program. *Journal of the American Pharmacists Association*, 53(5), 505–512. <https://doi.org/10.1331/JAPhA.2013.13008>
- Dilokthornsakul, P., Chaiyakunapruk, N., & Nimpitakpong, P. (2010). PHP39 the effects of direct billing system in patients with civil-servant medical benefit schemes on prescribing patterns. *Value in Health*, 13(7), A539. [http://dx.doi.org/10.1016/S1098-3015\(11\)73245-4](http://dx.doi.org/10.1016/S1098-3015(11)73245-4)
- Gross, R., Zhang, Y., & Grossberg, R. (2005). Medication refill logistics and refill adherence in HIV. *Pharmacoepidemiology and Drug Safety*, 14(11), 789–793. <https://doi.org/10.1002/pds.1109>
- Lyles, C. R., Sarkar, U., Schillinger, D., Ralston, J. D., Allen, J. Y., Nguyen, R., & Karter, A. J. (2016). Refilling medications through an online patient portal: Consistent improvements in adherence across racial/ethnic groups. *Journal of the American Medical Informatics Association*, 23(e1), 28–33. <https://doi.org/10.1093/jamia/ocv126>
- McKinnon, A., & Jorgenson, D. (2009). Pharmacist and physician collaborative prescribing: for medication renewals within a primary health centre. *Canadian family physician Medecin de famille canadien*, 55(12), 86–91.
- Nguyen, M., & Zare, M. (2015). Impact of a clinical pharmacist-managed medication refill clinic. *Journal of Primary Care & Community Health*, 6(3), 187–192. <https://doi.org/10.1177/2150131915569068>
- Ong, K. Y., Chen, L. L., Wong, J. A., Lim, J. C., Teo, D. B. H., & Tan, M. C. (2016). Dispensing medication refills without counselling: An evaluation on efficiency, safety and patient acceptance. *International Journal of Health Care Quality Assurance*, 29(8), 846–852. <https://doi.org/10.1108/IJHCQA-04-2016-0040>
- Ratanawijitrasin, S., & Kulsomboon, V. (Eds.). (2001). *Health insurance system in Thailand*. Nonthaburi: Health Systems Research Institute.
- Riege, V. J. (2005). A patient safety program & research evaluation of U.S. navy pharmacy refill clinics. In K. Henriksen, J. Battles, E. Marks & D. I. Lewin (Eds.), *Advances in patient safety: From research to implementation (Volume 1: Research Findings)* (pp. 213–224). Rockville, MD: Agency for Healthcare Research and Quality.
- Rim, M. H., Thomas, K. C., Hatch, B., Kelly, M., & Tyler, L. S. (2018). Development and implementation of a centralized comprehensive refill authorization program in an academic health system. *American Journal of Health-System Pharmacy*, 75(3), 132–138. <https://doi.org/10.2146/ajhp170333>
- Schoenhaus, R., Lustig, A., Rivas, S., Monreal, V., Westrich, K. D., & Dubois, R. W. (2016). Using an electronic medication refill system to improve provider productivity in an accountable care setting. *Journal of Managed Care & Specialty Pharmacy*, 22(3), 204–208. <https://doi.org/10.18553/jmcp.2016.22.3.204>
- Shapiro, N. L., Breen, M., & Mategrano, V. A. (2001). Patient satisfaction with a scheduled prescription-refill service. *American Journal of Health-System Pharmacy*, 58(4), 322–325. <https://doi.org/10.1093/ajhp/58.4.322>



- Stroupe, K. T., Murray, M. D., Stump, T. E., & Callahan, C. M. (2000). Association between medication supplies and healthcare costs in older adults from an urban healthcare system. *Journal of the American Geriatrics Society*, 48(7), 760–68. <https://doi.org/10.1111/j.1532-5415.2000.tb04750.x>
- Stroupe, K. T., Teal, E. Y., Weiner, M., Gradus-Pizlo, I., Brater, D. C., & Murray, M. D. (2004). Health care and medication costs and use among older adults with heart failure. *The American Journal of Medicine*, 116(7), 443–450. <https://doi.org/10.1016/j.amjmed.2003.11.016>
- Zermansky, A. G., Petty, D. R., Raynor, D. K., Freemantle, N., Vail, A., & Lowe, C. L. (2001). Randomised controlled trial of clinical medication review by a pharmacist of elderly patients receiving repeat prescriptions in general practice. *BMJ*, 323( 7325), 1340–1340. <https://doi.org/10.1136/bmj.323.7325.1340>