

# Multidisciplinary Team of a Physician and Clinical Pharmacists Managing Hypertension

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## Abstract

*Background:* Providing effective pharmaceutical care to ambulatory care patients with chronic diseases presents an enormous challenge. Medication therapy management (MTM) is defined as the direct, responsible provision of medication-related care for the purpose of achieving definite outcomes that improve a patient's quality of life. MTM is a patient-centred service, typically provided by clinical pharmacists in collaboration with physicians and other healthcare providers, that seeks to improve the quality of medication use and intended results among patients who are at high risk of having adverse reactions from medications.

*Methods and Findings:* We tested the hypothesis that MTM provides both improved outcomes and cost reduction as determined by differences in the measurable outcomes (lipid levels, tobacco consumption, weight, prescription cost, and average blood pressure values). Patients were given, at random, the opportunity to participate in MTM in a 5-month period. We found there was a significant reduction in blood pressure, glucose, LDL, triglycerides, cholesterol, and cost for patients participating in MTM.

*Conclusions:* MTM may improve pharmacotherapy outcomes and reduce medication costs.

*Keywords:* Chronic diseases; Medication cost; Medication therapy management; Pharmacotherapy outcomes; Hypertension; Diabetes

## Introduction

Providing effective pharmaceutical care to ambulatory care patients with chronic diseases such as diabetes, hypertension, and hyperlipidemia presents an enormous challenge to community health centres (CHCs). Currently, United States healthcare is quickly evolving. There is clearly a need for a better healthcare delivery system. This study represents one of the first medication therapy management (MTM) studies in the underserved, low-income patient population. The hypothesis is that incorporating a clinical pharmacist into the ambulatory team will provide both improved pharmacotherapy management and cost reduction in a not-for-profit indigent care clinic affiliated with a public university.

Chronic disease management is a daunting challenge when left to an individual healthcare professional. Data suggest that we achieve the standard of care only 50% to 60% of the time [1]. Optimal medication management appears to be a strategy to prevent drug therapy problems and reduce associated costs. In a milestone study, Johnson and Bootman projected costs associated with drug therapy problems to be U.S.\$76.6 billion [2]. In an update 6 years later, the projected costs associated with drug therapy problems had increased to U.S.\$177.4 billion [3]. The time and effort required to establish goals and to measure and monitor an individual patient's medication therapy progress requires an interprofessional team effort. Additional time

and resources are something the primary care physician seems to have less and less of. Years of declining payment have necessitated that the physician see more patients in less time. Having adequate time to listen to and examine the patient is becoming more of a challenge. Proper documentation and coding, past record review, testing, follow-up, and information management consume a large portion of the provider's time.

As a volunteer-driven, not-for-profit, community-supported clinic, Health for All provides care and disease management for approximately 5,000 patients per year. The charitable organization strives to improve patient outcomes in diabetes, hypertension, and hyperlipidemia while providing free basic healthcare to those in need who have no other access to primary care. Health for All serves a patient population in a wide geographic area covering a seven county region. As a university-affiliated clinic where faculty pharmacists and pharmacist interns have unlimited opportunity to counsel patients and have direct contact with university-based specialist physicians, this clinic provides an optimal environment to assess the value of MTM.

### **Brief Description Medication Therapy Management (MTM) Initiative**

MTM is a patient-centred service, provided by clinical pharmacists, in collaboration with physicians and other healthcare providers, that seeks to improve the quality of medication use and intended results among patients who are at high risk of having adverse reactions from medications [4] (see Table 1 for examples). MTM emerged in the 1990s as a means to assist physicians and patients in managing clinical, service, and cost outcomes of drug therapy. The U.S. government's Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA 2003) and the subsequent implementation of Medicare Part D in January 2006 (for the more than 20 million Medicare beneficiaries enrolled in the Part D benefit) formalized MTM services for a subset of high-cost patients. The primary goal of MTM is to increase patient adherence to medication regimens, enhance patient understanding of their medication therapy, and prevent drug complications. An analysis of MTM over a seven-year period (2000–2006) showed a mean U.S.\$93.73 in cost avoidance per encounter [5].

### **Methods**

After Institutional Review Board approval, an epidemiology graduate student who was not part of the clinical healthcare team randomly obtained retrospective baseline data as a retrospective control. Patients with a previous diagnosis of one or more of the following chronic diseases were randomly selected: diabetes, hypertension, or hyperlipidemia. Patients must have been on hypertensive medication for the duration of the study. Patients must have been seen in the clinic over at least six months or at least three clinic visits prior to beginning medication therapy management. Also, they must have had their blood drawn between two weeks and six months before the MTM intervention. Patients that could not speak English and did not bring their own translator were excluded from the study. The charts of 158

patients who received chronic disease care prior to September 2010 were screened. Of those, 106 patients met the criteria to be included in the study.

To test MTM's effect on chronic disease management, each patient served as his or her own control. It was determined that a randomized controlled trial would be an unacceptable study design because medication therapy management emphasizes common-knowledge health advice, and withholding such advice from a control group would be unethical in a primary care setting.

### Medication Therapy Management Period

Patients were informed that participation in MTM was completely voluntary and was not necessary to receive care. The MTM services were provided over a 5-month period (between September 2010 and January 2011) by clinical pharmacists and fourth-year pharmacy interns (under the direct supervision of faculty). The following chronic disease outcome measures were compared with baseline data to assess whether the provision of multidisciplinary-based care, specifically MTM, provided a significant improvement in outcomes: lipid levels, tobacco consumption, weight, prescription cost, and average blood pressure values.

### Medication Therapy Management Detailed Process

The clinic pharmacist and pharmacy interns provided extended counselling sessions (at least 20-minute periods) to patients at the time of scheduled physician visits, and had direct contact with university-based specialist physicians to provide MTM services and consultation. Table 1 describes MTM services provided.

### *Drug therapy problems*

The pharmacist reviewed the patient's medication history and recent laboratory findings and then recommended any new pharmacotherapy changes to the primary care provider (PCP). Medication cost-effective measures included enrolling patients in medication assistance programs, switching to appropriate generic or therapeutic alternatives, and employing other cost-saving measures such as tablet splitting. After discussion with the PCP, the recommendations were noted by the pharmacist in the progress notes of the medical record.

### *Patient education and adherence problems*

The pharmacist provided patients with lifestyle modification education specific to the chronic disease diagnosis and current pharmacotherapy. Adherence problems were discussed and patients were empowered to self-manage their chronic disease(s) through guidance on home monitoring of glucose, blood pressure, and dietary intake. If applicable, further steps were discussed with the PCP to optimize pharmacotherapy.

### Statistical Methods

Several statistical methods were used to determine differences in the measurable outcomes (lipid levels, tobacco consumption, weight, prescription cost, and average

Table 1.

**Medication therapy management indications**Managing  
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Indication for MTM	Description
<i>Drug therapy problems</i>	
<b>Complex drug therapy</b>	<i>Presentation of a patient taking multiple medications</i>
<b>Cost-efficacy</b>	Recommendation of a more cost-effective therapeutic alternative when available
<b>New therapy</b>	Initiation of a new prescription (e.g., untreated indication)
<b>Suboptimal therapy</b>	Drug therapy not at optimal dose or duration
<b>Adverse drug event</b>	Adverse reaction risk significant enough to render unsafe
<b>Drug interaction</b>	Drug interaction risk significant enough to render unsafe
<b>Administration</b>	<i>Administration technique inappropriate</i>
<i>Patient education and adherence</i>	
<b>Noncompliance</b>	<i>Address patient compliance-related problem</i>
<b>Patient education</b>	<i>Provide patient medication education or disease education</i>

blood pressure values). Differences in means of continuous variables were compared using a paired *t*-test. For response variables measured repeatedly on the same subject (i.e., tobacco consumption), a generalized estimating equation (GEE) was used to analyze univariate or multivariate relationships with the response variable and predictor variables. Analyses and tests were performed using version 9.2 of SAS statistical software (SAS Institute, Cary, North Carolina).

**Results**

MTM services were provided for a total of 106 patients between September 2010 and January 2011. All patients were between 18 and 65 years of age and had a previous diagnosis of diabetes, hypertension, and/or hyperlipidemia. This study revealed significant improvements in evaluated outcomes following MTM services, with exception of body mass index, where no significant change was observed. The improved chronic disease outcomes included a reduction in blood pressure, glucose values, hyperlipidemia values, and hypertensive medication costs.

Participant baseline characteristics were well balanced across gender and ethnicity (Table 2). There were 36 males (34.3%), and the mean age ( $\pm$  standard deviation) of participants was 52.6  $\pm$  7.9 years. Thirty-nine (37.1%) of our patients were Caucasian, with 34 (32.3%) African American and 32 (30.5%) Hispanic. The mean BMI before the intervention was 36.3 lb/in<sup>2</sup>. Average systolic blood pressure was 147.4 mmHg, and diastolic blood pressure was 87.7 mmHg. Glucose levels were at 173.7mg/dL, mean HDL levels were 44.3 mg/dL, and LDL levels were averaging

129.9 mg/dL. Triglycerides and cholesterol means were 232.9 and 203.2 mg/dL, respectively.

**Blood Pressure**

After MTM, a significant reduction in blood pressure was observed. Over five months, there was a statistically significant reduction in systolic (mean decrease = 12.7 mm Hg,  $t(104) = 6.74, p < .01$ , 95% CI [8.9, 16.4]) and diastolic (mean decrease 5.93 mm Hg,  $t(104) = 4.92, p < .01$ , 95% CI [3.5, 8.3]) blood pressure in our patients.

**Diabetes and Hyperlipidemia**

Diabetic patients obtained a significant reduction in glucose, LDL, triglycerides, and cholesterol over the duration of the study. A slight reduction in BMI was observed, but this was not clinically significant over the 5 months of measurements (mean decrease = 0.25 kg/m<sup>2</sup>,  $t(104) = 1.46, p < .1466$ ). Patients achieved an average glucose reduction of 20.7 mg/DL ( $t(100) = 2.52, p < 0.01$  95% CI [4.4, 37.0]), a reduction in LDL levels of 14.2 mg/DL ( $t(96) = 5.01, p < .01$ , 95% CI [8.6, 19.8]), as well as a reduction in triglycerides by 49.2 mg/DL ( $t(101) = 2.09, p < .04$ , 95% CI [2.6, 95.9]). Further, average cholesterol dropped 20.3 mg/DL ( $t(101) = 6.3, p < .01$ , 95% CI [13.9, 26.7]).

**Cost Savings on Hypertensive Medications**

After MTM, the average cost of patient hypertensive medications decreased from \$7.42 to \$4.13 per month ( $t(103) = 6.08, p < .01$ ).

*Table 2*  
**Baseline participant characteristics**

	N (%)
Mean age (years) ± standard deviation	52.6 ± 7.9
Male	36 (34.3%)
Caucasian	39 (37.1%)
African American	34 (32.3%)
Hispanic	32 (30.5%)
Diabetic	64 (62.74%)

*Table 3*

**MTM outcomes**

	Mean before MTM	Mean after MTM	Mean difference	p-value
<b>Systolic BP (mm Hg)</b>	147.4	134.7	12.7	< .01
<b>Diastolic BP (mm Hg)</b>	87.7	81.8	5.9	< .01
<b>Glucose (mg/DL)</b>	173.7	152.9	20.7	<.01
<b>LDL (mg/DL)</b>	129.9	115.7	14.2	< .01
<b>Triglycerides (mg/DL)</b>	232.9	183.7	49.2	<.04
<b>Cholesterol (mg/DL)</b>	203.2	182.8	20.3	< .01

MTM = medication therapy management, BP = blood pressure

## Discussion

Clinics that provide healthcare for low-income, underserved patients face extensive challenges in that patients generally embody low levels of health literacy and have few resources available compared with patients in other settings. In addition, the time needed to teach and empower patients of different languages and/or cultures is another barrier to improving chronic disease management. Collectively, these challenges perpetuate a vicious cycle of poor outcomes, poor quality of healthcare, and an increased financial burden on individuals and societies. However, this study revealed an association between improved outcomes and interprofessional care through MTM services (see Table 3). The improvement in chronic disease outcomes included reduced blood pressure, glucose values, hyperlipidemia values, and hypertensive medication costs. As previous MTM studies have shown, these results suggest that MTM services provided by clinical pharmacists help identify, resolve, and prevent medication-related complications and poor outcomes.

Patients with type 2 diabetes are predisposed to a clustering of cardiovascular risk factors, including hypertension and dyslipidemia. One limitation of this study was the short time frame of outcomes measurement. Further studies are needed to measure long-term outcomes reflecting macrovascular and microvascular disease. Macrovascular and microvascular disease are the leading cause of death and disability in these patients and contribute to a substantial increase in annual per capita management costs [6,7]. There is strong evidence that managing hypertension and dyslipidemia in these patients significantly lowers the risk of both microvascular and macrovascular complications [6]. Blood pressure reduction has an additional impact on cardiovascular event reduction [8-10]. A blood pressure reduction of 5 mm Hg can decrease the risk of stroke by 34%; the average cost per individual for a new stroke is U.S.\$76,581 to \$82,155 [11-13]. Another limitation of this study was the lack of a comparison group. Other explanations for observed changes in this MTM cannot fully be dismissed. For instance, the presence of the clinical pharmacist in the clinic could itself have affected the other clinicians' approach to pharmacotherapy management. Furthermore, there is no way to determine if the MTM service provided would have been performed by another healthcare provider regardless of the clinical pharmacist's presence.

## Conclusions

MTM is a patient-centred service, provided by clinical pharmacists, in collaboration with physicians and other healthcare providers, that seeks to improve the quality of medication use and intended results among patients who are at high risk of having adverse reactions from medications. Incorporating a clinical pharmacist into the ambulatory team resulted in both improved pharmacotherapy management and decreased medication costs in a not-for profit indigent care clinic affiliated with a public university. Significant improvements included achievement of lower blood pressure values, improved hyperlipidemia values (total cholesterol, LDL, and triglycerides) and lower medication costs. Findings from this study may be applicable to other healthcare clinics in the U.S.

**References**

1. Centers for Disease Control and Prevention. (2001). *Team care: Comprehensive lifetime management for diabetes*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.
2. Johnson, J.A., & Bootman, J.L. (1995). Drug-related morbidity and mortality: A cost-of-illness model. *Archives of Internal Medicine*, 155, 1949-1956.
3. Ernst, F.R., & Grizzle, A.G. (2001). Drug-related morbidity and mortality: Updating the cost-of-illness model. *Journal of the American Pharmacists Association*, 41, 192-199.
4. Centers for Medicare & Medicaid Services. (2010, June 8). *Fact sheet: 2010 Medicare Part D medication therapy management (MTM) programs*. URL: [www.cms.gov/PrescriptionDrugCovContra/Downloads/MTMFactSheet.pdf](http://www.cms.gov/PrescriptionDrugCovContra/Downloads/MTMFactSheet.pdf) [October 7, 2011].
5. Barnett, M.J., Frank, J., Wehring, H., Newland, B., VonMuenster, S, et al. (2009). Analysis of pharmacist-provided medication therapy management (MTM) services in community pharmacies over 7 years. *Journal of Managed Care Pharmacy*, 15(1), 18-31.
6. Simpson, S.H., Corabian, P., Jacobs, P., & Johnson, J.A. (2003). The cost of major comorbidity in people with diabetes mellitus. *Canadian Medical Association Journal*, 168, 1661-1667.
7. Gaede, P., Lund-Andersen, H., Parving, H.H., & Pedersen, O. (2008). Effect of a multifactorial intervention on mortality in type 2 diabetes. *New England Journal of Medicine*, 358, 580-591.
8. Stratton, I.M., Cull, C.A., Adler, A.I., Matthews, D.R., Neil, H.A. et al. (2006). Additive effects of glycaemia and blood pressure exposure on risk of complications in type 2 diabetes: A prospective observational study (UKPDS 75). *Diabetologia*, 49, 1761-1769.
9. CDC Diabetes Cost-effectiveness Group. (2002). Cost-effectiveness of intensive glycemic control, intensified hypertension control, and serum cholesterol level reduction for type 2 diabetes. *Journal of the American Medical Association*, 287, 2542-2551.
10. Brown, L.C., Johnson, J.A., Majumdar, S.R., Tsuyuki, R.T., & McAlister, F.A. (2004). Evidence of suboptimal management of cardiovascular risk in patients with type 2 diabetes mellitus and symptomatic atherosclerosis. *Canadian Medical Association Journal*, 171, 1189-1192.
11. Palmer, A.J. (2005). Overview of costs of stroke from published, incidence-based studies spanning 16 industrialized countries. *Current Medical Research & Opinion*, 21(1), 19-26.
12. Weber, C.A., Ernst, M.E., Sezate, G.S., Zheng, S., & Carter, B.L. (2010). Pharmacist-physician co-management of hypertension and reduction in 24-hour ambulatory blood pressures. *Archives of Internal Medicine*, 170(18), 1634-1639.
13. Bex, S.D., Boldt, A.S., Needham S.B., Bolf S.M., Walston C.M., et al. (2011). Effectiveness of a hypertension care management program provided by clinical pharmacists for veterans. *Pharmacotherapy*, 31(1), 31-38.