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Abt Associates Inc.

**Academy of Managed
Care Pharmacy
(AMCP)**

**An Annotated
Bibliography of
Managed Care
Pharmacy
Interventions**

Revised Bibliography

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An Annotated Bibliography of Managed Care Pharmacy Interventions

The following annotated bibliography provides a list of relevant peer-reviewed literature on the effect or impact of managed care pharmacy interventions on various outcomes. The bibliography includes a brief definition of the intervention or tool, followed by a list of relevant articles on that topic, and a brief description of the article. For each article you can link to the PubMed abstracts or full-text version of articles; for the articles that are available in free full-text version we indicate it with [Full Text], and for those articles available by subscription or for purchase we indicate with [Abstract].

The bibliography includes articles from 1990 onward, and there are only annotations for articles published between 2000 and 2009 and primarily for the first six interventions listed below, as well as for the review articles on several managed care pharmacy interventions (listed at the end of the bibliography). The articles for each intervention are presented in reverse chronological order so that the most recent articles and evidence on the specific managed care intervention is presented first; thereafter, the interventions are presented alphabetically. The following are the managed care pharmacy interventions covered in this bibliography:

- Step Therapy
- Prior Authorization
- Tiered Approaches to Formulary Management
- Therapeutic Interchange
- Drug Utilization Review
- Medication Therapy Management (MTM)
- Formulary Management and Cost-Sharing Strategies
- Rebates or Contracting
- Educational Interventions
- Monitoring and Feedback
- Disease Management
- Review Articles on Managed Care Pharmacy Interventions

Step Therapy

Step therapy is “designed to encourage the use of therapeutically equivalent, lower-cost medications (i.e., first-line therapy) before “stepping up” to more expensive therapy (i.e., second-line therapy).”¹

Mark, T. et al. (2009). The Effects of Antihypertensive Step-Therapy Protocols on Pharmaceutical and Medical Utilization and Expenditures. *The American Journal of Managed Care*, 15(2).

[Full Text](#)

Mark et al. “examined the effects of antihypertensive step-therapy on prescription drug utilization and spending, and other medical care utilization and spending.” They found an initial 7.9% reduction in medication days supplied and 3.1% reduction in medication costs, though these percentages grew in each quarter thereafter. Additionally, they found that users in the step-therapy program experienced increased inpatient admissions and emergency room visits, and after an initial decline in spending incurred \$99 more per user in quarterly expenditures than the comparison group.

Yokoyama, K. et al. (2007). Effects of a Step-Therapy Program for Angiotensin Receptor Blockers on Antihypertensive Medication Utilization Patterns and Cost of Drug Therapy. *Journal of Managed Care Pharmacy*, 12(3).

[Full Text](#)

Yokoyama et al. (2007) assessed the effectiveness of a step-therapy intervention for angiotensin receptor blockers (ARBs), including ARB/hydrochlorothiazide combinations. They found that approximately 45% of patients who did not receive an ARB as a result of the step-therapy intervention had either switched to or added an ARB within 12 months, and 6.6% of patients did not receive any antihypertensive therapy. Additionally, drug costs were 13% lower for the ACEI/ARB patients in the intervention group, creating approximately \$368,000 in savings in 1 year or \$0.03 per member per month across the 1 million health plan members.

Dunn, J. et al. (2006). Utilization and Drug Cost Outcomes of a Step-Therapy Edit for Generic Antidepressants in an HMO in an Integrated Health System. *Journal of Managed Care Pharmacy*, 12(4).

[Full Text](#)

Dunn et al. evaluated the impact on utilization and costs of a generic step-therapy edit for antidepressant drugs excluding tricyclic antidepressants in an HMO in an integrated health system. They found that the step therapy edit resulted in drug cost savings of 9.0% for the entire class of antidepressants, equal to over \$1.8 million (\$0.36 PMPM) in 2005 dollars in the first year of the intervention.

¹ Cox ER, Henderson R, Motheral BR. Health plan member experience with point-of-service prescription step therapy. *J Manag Care Pharm*. 2004;10(4):291-298.

Panzer, P. et al. (2005). Implications of an SSRI Generic Step Therapy Pharmacy Benefit Design: An Economic Model in Anxiety Disorders. *The American Journal of Managed Care, 13(10)*.

[Full Text](#)

Panzer et al. developed a conceptual framework to simulate the pharmacologic treatment pathway of patients diagnosed with anxiety in a hypothetical health plan in order to evaluate the economic impact of a generic step-therapy benefit design. The results of the model indicate that “implementing generic step therapy for selective serotonin reuptake inhibitors (SSRIs) in patients with anxiety disorders may be associated with an increased amount of therapy change and early treatment discontinuation, resulting in overall cost increase to a health plan.”

Cox, E. et al. (2004). Health plan member experience with point-of-service prescription step therapy. *J Manag Care Pharm. 2004;10(4):291-298*.

[Full Text](#)

Cox et al. conducted a mail survey of health plan members to understand their experience with a point-of-service step therapy edit. They found that 44% of members obtained a different medication than was originally prescribed, 15% obtained permission to use the brand and paid their brand copay, 11% received no medication, and 11% paid the full price for the brand drug out of pocket. Pharmacy or member contact with the physician significantly influenced whether the member obtained a covered medication or not.

Motheral, B. et al. (2004). Plan-Sponsor Savings and Member Experience with Point-of-Service Prescription Step Therapy. *The American Journal of Managed Care, 10(7)*.

[Full Text](#)

Motheral et al. examined the effect of prescription step-therapy programs on plan-sponsor savings and members' experiences. The step therapy programs were implemented for proton pump inhibitors, selective serotonin reuptake inhibitors, and nonsteroidal anti-inflammatory drugs. The plan experienced a decrease of \$0.83 in net cost after implementing step therapy, as compared with the comparison group which experienced an increase of \$0.10 PMPM for the therapy classes selected. However, pharmacy benefit satisfaction varied based on the medication received: paying out of pocket for the brand and receiving no medication were associated with significantly lower pharmacy benefit satisfaction compared with those who received a generic.

Prior Authorization

Prior authorization is “an administrative tool normally used by a health plan or prescription benefit management company (PBM) that requires the prescriber to receive pre-approval for prescribing a drug in order for the drug to qualify for coverage under the terms of the pharmacy benefit plan.”²

Linton, A. et al. (2009). Proton-Pump Inhibitor Utilization Associated with the Change to Nonpreferred Formulary Status for Esomeprazole in the TRICARE Formulary. *Journal of Managed Care Pharmacy*, 15(1).

[Full Text](#)

Linton et al quantified the changes in TRICARE beneficiary utilization of esomeprazole relative to our proton pump inhibitors (PPIs) and the pharmacy settings used after a the Department of Defense (DoD) put esomeprazole in the third copayment tier. They found that the formulary change was associated with a migration of approximately 5% of all PPI fills and 25% of esomeprazole fills to the preferred PPIs in the first post-intervention month.

Brown CM, Richards K, Rascati KL, Gavaza P, Corbell Z, Zachry W, et al. (2008). Effects of a psychotherapeutic drug prior authorization (PA) requirement on patients and providers: a providers' perspective. *Adm Policy Ment Health*. 2008 May;35(3):181-8. Epub 2007 Dec 7.

[\[Abstract\]](#)

Brown et al. examined the effect of a Texas prior authorization requirement for psychotherapeutic medications. They assessed the impact of “(1) system/administrative factors; (2) costs/outcomes; (3) prescribing issues; (4) evaluation criteria; and (5) patient-provider relationship and patient visit” in the PA process. They found that the PA practice was associated with administrative burden and unintended patient outcomes.

Bukstein DA, Cherayil GA, Gepner AD, Luskin AT, Kooistra JB, Olson RM. (2006). The economic burden associated with prior authorizations in an allergist office. *Allergy Asthma Proc*. 27(2):119-122.

[\[Abstract\]](#)

Bukstein et al. examined the cost for physicians and nurses to process prior authorizations (PA) over an 8 weeks period. During this period, they discovered that “nurses spent >40 hours on 231 calls and physicians spent >8 hours on 154 calls.” They found that “the total cost in this specialty practice was dollars 17.77 per PA” and 98.7% of requests were approved the first time they were processed. Since substantial costs are associated with the PA process for nonformulary drugs, the authors concluded that “specialty physicians should have a different process for obtaining nonformulary medications because almost 100% of their requests are granted.”

Delate, T. et al. (2005). Clinical and Financial Outcomes Associated With a Proton Pump Inhibitor Prior-Authorization Program in a Medicaid Population. *The American Journal of Managed Care*, 11(1).

[Full Text](#)

² AMCP. Concepts in Managed Care Pharmacy: Prior Authorization and the Formulary Exception Process.

Delate et al. examined the clinical and financial outcomes of a prior authorization (PA) program of proton pump inhibitors (PPIs) in a Medicaid population. They found that the PA program reduced the use of high-cost PPIs, while encouraging use of lower cost histamine₂ receptor antagonists (H₂As) without evidence of adverse medical consequences.

Gleason, P. et al. (2005). Medical and Pharmacy Expenditures After Implementation of a Cyclooxygenase-2 Inhibitor Prior Authorization Program. *Pharmacotherapy*, 25(7).

[\[Abstract\]](#)

Gleason et al. “evaluated the effects of a cyclooxygenase-2 (COX-2) inhibitor prior authorization (PA) program on direct medical and pharmacy costs.” They found that for members denied coverage for a COX-2 inhibitor after implementation of the PA program, pharmacy costs declined without a medical cost increase associated with gastrointestinal diagnoses.

Fischer, M. et al. (2004). Medicaid Prior-Authorization Programs and the Use of Cyclooxygenase-2 Inhibitors. *The New England Journal of Medicine*, 351(21).

[Full Text](#)

Fischer et al. evaluated the effect of prior authorization programs across 50 state Medicaid programs on the use of coxibs by Medicaid beneficiaries. They found that “the use of coxibs and spending on NSAIDs varied widely by state and declined substantially after the implementation of PA programs.”

Hartung, D. et al. (2004). Effects of a Prior-Authorization Policy for Celecoxib on Medical Service and Prescription Drug use in a Managed Care Medicaid Population. *Clinical Therapeutics*, 26(9).

[\[Abstract\]](#)

Hartung et al. (2004) evaluated “the intended and unintended effects of a PA policy for celecoxib on pharmacy and medical-service utilization in a Medicaid managed care organization.” They found that celecoxib was substantially reduced after the implementation of a PA policy, and no changes in use of other drug classes were detected.

Stacy, J. et al. (2004). Pharmacoeconomic Modeling of Prior-Authorization Intervention for COX-2 Specific Inhibitors in a 3-Tier Copay Plan. *Journal of Managed Care Pharmacy*, 9(4).

[Full Text](#)

Stacy et al conducted a modeling exercise to “determine from a health plan’s perspective the cost effectiveness of cyclooxygenase-2 (COX-2) inhibitors with and without a prior authorization process.” They reported that the one-year model predicted that costs associated with an increase in COX-2 utilization after removal of PA would exceed the costs to administer PA and treat NSAID-related serious GI events in the managed care population.

LaPensee, K. (2003). Analysis of a Prescription Drug Prior Authorization Program in a Medicaid Health Maintenance Organization. *Journal of Managed Care Pharmacy*, 9(1).

[Full Text](#)

LaPensee determined “the factors important in approving prescription reimbursement under prior authorization (PA) in a Medicaid managed care organization.” LaPensee found that “although nonformulary products were more frequently subjected to PA, three-quarters of PA procedures

were in response to requests for products on formulary.” The overall rejection rate for this Medicaid health plan was 4.4% (7.1% for non-formulary versus 3.7% for formulary drugs).

Lexchin, J. (2002). Effects of Restrictive Formularies in the Ambulatory Care Setting. *The American Journal of Managed Care*, 8(1).

[Full Text](#)

Lexchin reviewed the English and French literature between 1977 and 1999 to determine the consequences of restrictive formularies in the ambulatory care setting. He reviewed three studies on prior authorization, and reported that they all showed that Medicaid drug costs declined.

McCombs, J. et al. (2002). A Retrospective Analysis of the Revocation of Prior Authorization Restrictions and the use of Antidepressant Medications for Treating Major Depressive Disorder. *Clinical Therapeutics*, 24(11).

[\[Abstract\]](#)

McCombs et al. examined how revoking prior authorization for two SSRIs affected patient compliance and the likelihood of switching antidepressant therapies. Based on the results, they concluded that it was unclear whether patients benefited clinically from the formulary expansion, and the significant changes in the characteristics of the patient population in response to open access (access effect) complicated attempts to measure the impact of open access on treatment patterns.

MacKinnon, N. et al. (2001). Prior Authorization Programs: A Critical Review of the Literature. *Journal of Managed Care Pharmacy*, 7(4).

[Full Text](#)

MacKinnon et al. conducted a reviewed six studies of prior authorization and found that most of the studies had methodological limitations, and overall PA programs appeared to reduce drug-related costs. Additionally, they reported some evidence that PA programs reduce non-drug related costs, but little evidence of a positive effect on clinical or humanistic outcomes.

Herrier RN, Spencer JR, Davis CD. (2000). Case study using descriptive analysis to estimate hidden costs in processing third party prescriptions. *J Am Pharm Assoc.* 40: 658-665.

[\[Abstract\]](#)

Herrier et al. examined the costs of processing third party prescriptions, and found that the hidden costs for rejected prescriptions “averaged \$1.10 at the supermarket chain pharmacy and \$1.54 at the independent pharmacy, with the difference attributable to the higher level of pharmacy staff involvement in resolving rejections at the independent pharmacy.”

Feldman SR, Fleischer AB Jr, Chen GJ. (1999). Is prior authorization of topical tretinoin for acne cost effective? *Am J Manag Care.* 5(4):457-463.

[Full Text](#)

Feldman et al. conducted a retrospective, cross-sectional study of data from the National Ambulatory Medical Care Survey to measure the impact of prior authorization for topical tretinoin. They found that the cost of requiring prior authorization increased as the prior authorization age decreased. Although eliminating prior authorization could result to a small cost increase, this cost would be balanced by the benefits gained by both patients and physicians.

Phillips CR, Larson LN. (1997). Evaluating the operational performance and financial effects of a drug prior authorization program. *J Manag Care Pharm.* 3:699-706.

[Full Text](#)

Phillips et al. examined the performance of a drug prior authorization program and found response times well below the HCFA guidelines with relatively high approval rates. They also noticed a large total net saving of \$2.51 million to \$3.83 million for antiarthritics, benzodiazepines, antiulcer, and antihistamines with the use of prior authorization.

Kotzan JA, Perri M, Martin BC. (1996). Assessment of Medicaid prior-approval policies on prescription expenditures: Market-share analysis of Medicaid and cash prescriptions. *J Manag Care Pharm.* 2:651-656.

[Full Text](#)

Kotzan et al. compared market share changes produced by prior-approval policies of Georgia Medicaid agency and calculated costs averted by the operation. They found the “Georgia Department of Medical Assistance PA program, when viewed from the perspective of market shares for multiple drug products, appears to reduce the cost of the drug program.”

Smalley WE, Griffin MR, Fought RL, Sullivan L, Ray WA. (1995). Effect of a prior-authorization requirement on the use of non-steroidal antiinflammatory drugs by Medicaid patients. *N Engl J Med.* 332:1612-1617.

[Full Text](#)

Smalley et al. assessed the effects of a prior-authorization policy involving brand nonsteroidal antiinflammatory drugs (NSAIDs) in the Medicaid program in Tennessee and found an estimated savings of \$12.8 million with cost decreased of 53 percent over two years. Authors concluded that prior-authorization is a cost effective means of controlling expenditures for NSAIDs, but more studies are needed to measure its effect on other classes of drugs.

Kotzan JA, McMillan JA, Jankel CA, Foster AL. (1993). Initial impact of a Medicaid prior authorization program for NSAID prescriptions. *J Res Pharm Econ.* 5:25-41.

[\[Abstract\]](#)

No abstract available

Tiered Formularies

A prominent approach in formulary management is the use of 3-tier drug formularies: in these plans, patients receive financial incentives from the plan to use generic medicines over branded products or else select the branded medicine designated as the preferred one.³

Hodgkin D, Parks Thomas C, Simoni-Wastila L, Ritter GA, Lee S. (2008). The effect of a three-tier formulary on antidepressant utilization and expenditures. *J Ment Health Policy Econ.* 2008 Jun;11(2):67-77.

[\[Abstract\]](#)

Hodgkins et al. examined the effect of a three-tier formulary on antidepressant utilization and expenditures. They found that the three-tier formulary “increased out-of-pocket payments while reducing plan payments and total spending.” Since the effect of a tier formulary may be different in psychotropic medications, future studies should evaluate its impact on adherence, quality of care, and clinical and economic outcomes.

Berger J. (2007). Economic and clinical impact of innovative pharmacy benefit designs in the management of diabetes pharmacotherapy. *Am J Manag Care.* 13(suppl 2):S55-S58.

[Full Text](#)

Berger discussed the barriers to diabetes control and the effect of a pharmacy benefit design by Pitney Bowes on the management of diabetes. By moving diabetic medications from tier 2 to tier 1, Pitney Bowes increased patient adherence and reduced healthcare cost. Using innovative pharmacy benefit design can potentially improve patient outcomes and decrease cost over time.

Gilman BH, Kautter J. (2007). Consumer response to dual incentives under multi-tiered prescription drug formularies. *Am J Manag Care.* 13(6, pt 2):353-359.

[Full Text](#)

Gilman et al. examined consumer responses to multi-tiered prescription drug formularies. They found that a “10% increase in copayments for drug equivalents was associated with a 1.3% reduction in total drug spending, a 16.0% increase in out-of-pocket expenditures, a 2.0% reduction in the number of prescriptions filled, and a 0.7% reduction in proportion of prescriptions filled with generics.” In addition, they discovered that “a 10% increase in copayment differentials between drug equivalents was associated with a 1.0% reduction in total drug spending, a 4.1% increase in out-of-pocket expenditures, a 1.0% reduction in the number of prescriptions filled, and a 0.7% increase in proportion of prescriptions filled with generics.” The results showed that increasing copayment was an effective approach for cost saving.

Huskamp, H. et al. (2007). The Effect of Three-Tier Formulary Adoption on Medication Continuation and Spending Among Elderly Retirees. *Health Services Research,* 42(5).

[Full Text](#)

Huskamp et al. assess the effect of 3-tier formulary on medication continuation and spending among elderly members of retiree health plans, and found that 3-tier formulary resulted in shifting of costs from plan to enrollee, with relatively small effects on medication continuation. Additionally, they found that although implementation had little effect on continuation on

³ Briesacher, B. et al. (2004). Three-Tiered—Copayment Drug Coverage and Use of Nonsteroidal Anti-Inflammatory Drugs. *Archives of Internal Medicine*, 164(15).

average, a small minority of patients were more likely to have gaps in use and discontinue use relative to comparison patients.

Landon BE, Rosenthal MB, Normand SL, et al. (2007). Incentive formularies and changes in prescription drug spending. *Am J Manag Care*. 13(6, pt 2):360-369.

[Full Text](#)

Landon et al. examined the effect of incentive formularies on prescription drug spending. They found that changing single tier or 2-tier formulary to 3-tier formulary resulted to an a total cost saving of 5% to 15% and a 20% decreased in plan spending, but increased out-of pocket spending by 20% to >100%. Overall, the use of nonformulary decreased and the usage of generic and formulary preferred medications increased. The authors concluded that an incentive formulary may reduce prescription drug spending; however, its effects on patients' outcomes still need to be evaluated.

Mager DE, Cox ER. (2007). Relationship between generic and preferred-brand prescription copayment differentials and generic fill rate. *Am J Manag Care*. 13(6, pt 2):347-352.

[Full Text](#)

Mager et al. conducted a cross-sectional study to examine the relationship between generic and brand copayment differentials and generic fill rate (GFR). They found that step therapy, 3-tier plan design and increased generic and brand copayment differentials positively influenced generic usage.

Shrank WH, Stedman M, Ettner SL, DeLapp D, Dirstine J, Brookhart MA, Fischer MA, Avorn J, Asch SM. (2007). Patient, physician, pharmacy, and pharmacy benefit design factors related to generic medication use. *J Gen Intern Med*;22(9):1298-304. Epub 2007 Jul 24.

[\[Abstract\]](#)

Shrank et al. performed an observational analysis to examine the impact of physician, patient, pharmacy benefit design and pharmacy characteristics on generic usage. Although tiered pharmacy benefit designs and mail-order pharmacies may help steer patients toward generic usage, they found that patient factors and physicians had the greatest impact on generic initiation.

Spence MM, Hui R, Chan J. (2006). Cost reduction strategies used by elderly patients with chronic obstructive pulmonary disease to cope with a generic-only pharmacy benefit. *J Manag Care Pharm*. 12(5):377-382.

[Full Text](#)

Spence et al. examined the methods that elderly patients suffering from COPD used to control their out-of-pocket (OOP) expenses in a generic-only pharmacy benefit. They discovered that the most common method elderly patients use to reduce cost was by discussing OOP costs with their physicians. They found that "elderly patients with COPD and a generic-drug-only pharmacy benefit are more likely to report using a variety of strategies to reduce their OOP costs compared with similar patients with single-tier copayment or 2-tier copayment pharmacy benefits."

Taira DA, Wong KS, Frech-Tamas F, Chung RS. (2006). Copayment level and compliance with antihypertensive medication: analysis and policy implications for managed care. *Am J Manag Care*. 12(11): 678-683.

[Full Text](#)

Taira et al. conducted a retrospective observational analysis to evaluate the effect of copayment level on compliance rate with antihypertensive medications. They found that lower copayment was associated with greater compliance. Since copayment level is a strong predictor of compliance rate, this factor should be taken into consideration before implementing new pricing or policy decisions.

Gleason PP, Gunderson BW, Gericke KR. (2005). Are incentive-based formularies inversely associated with drug utilization in managed care? *Ann Pharmacother*;39(2):339-45. Epub 2005 Jan 11.

[\[Abstract\]](#)

Gleason et al. evaluated the effect of incentive-based multitier formularies on pharmaceutical costs and utilization. The review suggests “a potential inverse relationship between pharmaceutical utilization and incentive-based formularies that increase member contribution to drug costs.” Future studies examining price points and percentage increase will shed more light onto this topic.

Huskamp, H. et al. (2005). Impact of 3-Tier Formularies on Drug Treatment of Attention-Deficit/Hyperactivity Disorder in Children. *Archives of General Psychiatry*, 62(4).

[Full Text](#)

Huskamp et al. examined the effect of copayment increases associated with a 3-tier formulary on use and spending for ADHD medications for children, and concluded from the results that “the copayment increases associated with 3-tier formulary implementation by one employer resulted in lower total ADHD medication spending, sizeable increases in out-of-pocket expenditures for families of children with ADHD, and a significant decrease in the probability of using these medications.”

Landsman PB, Yu W, Liu X, Teutsch SM, Berger ML. (2005). Impact of 3-tier pharmacy benefit design and increased consumer cost-sharing on drug utilization. *Am J Manag Care*. 11(10):621-628.

[Full Text](#)

Landsman et al. performed a retrospective prescription claims analysis to compare the impact of increased cost-sharing with constant cost-sharing. Overall, they found that medication possession ratios decreased for the group with increased cost-sharing and increased for the group with constant cost-sharing. The authors concluded that the demand for pharmaceutical was relatively inelastic with increased copayment decreasing drug usage within 9 specific classes of medications.

Roblin, D. et al. (2005). Effect of Increased Cost-Sharing on Oral Hypoglycemic Use in Five Managed Care Organizations: How Much is too Much? *Medical Care*, 43(10).

[\[Abstract\]](#)

Roblin et al. aimed to “estimate the effects of small (\$1-6 per 30-day supply), moderate (\$7-10), and large (>\$10) increases in medication cost-sharing on 12-month trends in oral hypoglycemic (OH) use among adults with type 2 diabetes.” Based on their results, they concluded that “large increases in medication cost-sharing were associated with immediate and persistent reductions in OH use, and small and moderate increases had little effect on OH use in the 6-month period after the increase.”

Briesacher, B. et al. (2004). Three-Tiered—Copayment Drug Coverage and Use of Nonsteroidal Anti-Inflammatory Drugs. *Archives of Internal Medicine*, 164(15).

[Full Text](#)

Briesacher et al. conducted a retrospective study using a large database of employer-sponsored health plans to determine whether 3-tier formularies influence the use of nonsteroidal anti-inflammatory drugs (NSAIDs) in a population of patients with arthritis. Based on their results, they concluded that “three-tier formularies appear to reduce the use of COX-2–selective inhibitors among all patients with arthritis, even those at risk of experiencing gastrointestinal complications from using nonselective NSAIDs.”

Ganther-Urmie JM, Nair KV, Valuck R, McCollum M, Lewis SJ, Turpin RS. (2004) Consumer attitudes and factors related to prescription switching decisions in multitier copayment drug benefit plans. *Am J Manag Care*; 10(3):201-8.

[Full Text](#)

Ganther-Urmie examined consumer attitudes regarding formulary medications and medication-related decision making in multitier copayment prescription drug plans. They found that most plan members believed that formulary drug were placed there primarily due to cost rather than efficacy. Results showed that while “most plan members were receptive to switching from a nonformulary to a formulary medication, financial incentives alone may not convince some plan members to make the switch.”

Goldman DP, Joyce GE, Escarce JJ, et al. (2004). Pharmacy benefits and the use of drugs by the chronically ill. *JAMA*. 291 :2344-2350.

[Full Text](#)

Goldman et al. conducted a retrospective study to examine the effect of changes in cost sharing in the chronically ill and privately insured. They found that increasing copayment decreased use of 8 therapeutic classes with the largest reduction in the nonsteroidal anti-inflammatory drugs and antihistamines. Antihypertensive, antiasthmatic, antidepressant, antiulcerant, antihyperlipidemic, antidiabetic, and antiulcerant agents also showed significant price responsiveness. Chronically ill patients were less responsive to co-payment changes. Overall, there is a concern with potential adverse health consequences due to increase copayment.

Harris BN, West DS, Johnson JT, Hong SH, Stowe CD. (2004). Effects on the cost and utilization of proton pump inhibitors from adding over-the-counter omeprazole to drug benefit coverage in a state employee health plan. *J Manag Care Pharm*. 10(5):449-455.

[Full Text](#)

Harris et al. assessed the impact of adding over-the-counter (OTC) omeprazole to state employee drug benefit coverage on cost and utilization of proton pump inhibitors (PPI). They found that adding OTC to the plan “produced savings to the state of as much as 50% of the total cost of PPI drugs despite an apparent small increase in utilization of PPIs and an increase in pharmacy reimbursement of more than 100%.”

Kamal-Bahl S, Briesacher B. (2004). How do incentive-based formularies influence drug selection and spending for hypertension? *Health Aff (Milwood)*. 23(1):227-236.

[Full Text](#)

Kamal-Bahl et al. examined the impact of incentive-based formularies on drug selection and spending for hypertension. They found that increasing co-payment in a multitier system had greater effect on the usage of antihypertensive than raising them in a single-tier formulary. In addition, they found that “incentive formularies were associated with lower total antihypertensive

spending by plans, but enrollees paid more out of pocket.”

Meissner BL, Moore WM, Shinogle JA, Reeder CE, Little JM. (2004). Effects of an increase in prescription copayment on utilization of low-sedating antihistamines and nasal steroids. *J Manag Care Pharm.* 10(3):226-233.

[Full Text](#)

Meissner et al. evaluated the impact of increase copayment on the use of low-sedating antihistamines and nasal steroids and found that nasal steroids “exhibited a greater arc price elasticity compared with low-sedating oral antihistamines.” They discovered that an average \$10 per prescription increase in patient cost-sharing was associated with an increase in combined utilization of low-sedating antihistamines and nasal steroids for allergic rhinitis.

Olson BM, Malone DC, Zachary WM, Coons SJ. (2004). Consumer understanding and satisfaction associated with a 3-tier prescription drug benefit. *J Manag Care Pharm.* 11(6):480-492.

[Full Text](#)

Olson et al. examined consumer understanding and satisfaction level with a 3-tier prescription drug benefit and found very low average level of understanding and a near neutral satisfaction rate. In addition, they discovered that level of understanding was correlated to the amount of drug benefit used.

Fairman, K. et al. (2003). Retrospective, Long-Term Follow-Up Study of the Effect of a Three-Tier Prescription Drug Copayment System on Pharmaceutical and Other Medical Utilization and Costs. *Clinical Therapeutics*, 25(12).

[\[Abstract\]](#)

Fairman et al. examined “the effect of a 3-tier copayment system on drug and medical utilization and cost for 30 months after implementation in a population of commercially insured, preferred-provider organization members.” They found that the comparison group compared to the intervention group showed reduced growth in net cost and lower utilization of third-tier medications. Additionally, there were no significant differences between the intervention and comparison groups on the numbers of office visits, emergency department visits, or hospitalizations.

Huskamp, H. et al. (2003). The Effect of Incentive-Based Formularies on Prescription-Drug Utilization and Spending. *The New England Journal of Medicine*, 394(23).

[Full Text](#)

Huskamp et al compared the utilization of and spending on drugs in two employer-sponsored plans that implemented changes in their formularies: i) one plan simultaneously switched from a one-tier to a three-tier formulary and increased all enrollee copayments for medications, ii) the second plan switched from a two-tier to a three-tier formulary, changing only the copayments for tier-3 drugs. From the results, they concluded that “different changes in formularies may have dramatically different effects on utilization and spending and may in some instances lead enrollees to discontinue therapy.” They also concluded that “the associated changes in copays can substantially alter out-of-pocket spending, the continuation of the use of medications, and possibly the quality of care.”

Nair, K. et al. (2003). Effects of a 3-Tier Pharmacy Benefit Design on the Prescription Purchasing Behavior of Individuals With Chronic Disease. *Journal of Managed care*

Pharmacy, 9(2).

[Full Text](#)

Nair et al evaluated the impact of 3-tier (copayment) pharmacy benefit structure on medication utilization behavior, and concluded from their results that “shifting individuals from a 2-tier to a 3-tier copayment structure resulted in changes in medication utilization.”

Rector TS, Finch MD, Danzon PM, Pauly MV, Manda BS. (2003). Effect of tiered prescription copayments on the use of preferred brand medications. *Med Care. 41 (3):398-406.*

[\[Abstract\]](#)

Rector et al. conducted a longitudinal logistic regression analyses to evaluate the effect of tiered copayment on the use of preferred brands. This financial incentive led to a significant shift from non-preferred to preferred medications. A tiered formulary appeared to be an effective means of reducing healthcare cost; however, its impact on patient outcomes required further assessment.

Joyce GF, Escarce JJ, Solomon MD, Goldman DP. (2002). Employer drug benefit plans and spending on prescription drugs. *JAMA. 288(14): 1733-1739.*

[Full Text](#)

Joyce et al. conducted a retrospective study to evaluate the impact of innovative benefits packages on total cost and out-of-pocket payments. They found that “adding an additional level of co-payment, increasing existing copayments or coinsurance rates, and requiring mandatory generic substitution all reduced plan payments and overall drug spending among working-age enrollees with employer-provided drug coverage.” In addition, “reduction in drug spending largely benefited health insurance plans because the percentage of drug expenses beneficiaries paid out of-pocket rose significantly.”

Nair KV, Ganther JM, Valuck RJ, McCollum MM, Lewis SJ. (2002). Impact of multi-tiered pharmacy benefits on attitudes of plan members with chronic disease states. *J Manag Care Pharm. 8(6):477-491.*

[Full Text](#)

Nair et al. assessed the impact of 2-and 3-tiered pharmacy benefit plans on members with chronic disease states and found that members of the 2-tier plans reported higher satisfaction rate compared to members of the 3-tier plans. Attitude toward prescription drug coverage may be influenced by social economic standing and number of chronic diseases that member have.

Fendrick AM, Smith DG, Chernew ME, Shah SN. (2001). A benefit-based copay for prescription drugs: Patient contribution based on total benefits, not drug acquisition cost. *Am J Manag Care. 7:861-867.*

[Full Text](#)

Fendrick et al. discussed a benefit-based copay system for prescription drugs, which determined cost of medications based on evidence-based clinical benefits to patients. Using this system, patients with higher potential benefit would have lower copays than patients that have lower potential benefit. The authors concluded that “implementation of such a system would provide a financial incentive for individuals to prioritize their out-of pocket drug expenditures based on the value of their medications, not their price.”

Motheral, B. et al. (2001). Effect of a Three-Tier Prescription Copay on Pharmaceutical and Other Medical Utilization. *Medical Care, 39(12).*

[\[Abstract\]](#)

Motheral et al studied effect of a 3-tier pharmacy benefit on prescription utilization, expenditures, medication continuation, and use of other medical resources. They found that the intervention group experienced lower prescription utilization and expenditures and reduced net costs. Additionally, they found “medication continuation rates to be lower at 6 and 11 months in one of four chronic therapy classes examined; however, discontinuation could not be clearly linked to tier-three medication use.” Lastly, they found no significant differences in physician office visits, inpatient, or emergency room use rates.

Saul A. Multitier co-pays emerge at two managed care groups. (2001). *Drug Topics*, 2001: 24.

[\[Abstract\]](#)

No abstract available

Giaquinta D. (2000). Pharmacy management and three-tier copays: Cost management or cost shifting. *Manag Care Interface*. 13:64-65.

[\[Abstract\]](#)

No abstract available

Johnson RE, Goodman MJ, Hornbrook MC, Eldredge MB. (1997). The impact of increasing patient prescription drug cost sharing on therapeutic classes of drugs received and on the health status of elderly HMO members. *Health Serv Res*. 32:1 03-122.

[Full Text](#)

Johnson et al. evaluated the effect of higher prescription drug copayments on health status of elderly and the therapeutic classes of drugs received. They found that increased prescription drug copayment did not affect relative exposure, annual days of use, or prescription drug costs for drugs used in chronic disease and in self-limiting conditions. However, health status may have been adversely affected. The authors concluded that small changes in copayment did not affect outcomes, but more studies are needed to evaluate the effect of greater increase in copayments.

Therapeutic Interchange

Therapeutic interchange programs, also referred to as “switch” or “conversion” programs, encourage the use of formulary drugs by switching from one agent in a therapeutic class not on the formulary to an agent on the formulary and less expensive for the managed care organization.⁴

Brixner DI, Joish VN, Odera GM, Avey SG, Hanson DM, Cannon HE. (2007). Effects of benefit design change across 5 disease states. *Am J Manag Care.* 13(6, pt 2):370-376.

[Full Text](#)

Brixner et al. conducted a retrospective study to evaluate the effects of benefit design change (BDC) on medication adherence, medication persistence, drug costs, and total healthcare costs. Although BDC was associated with lower pharmacy cost, results showed that there was no effect on medication compliance and overall healthcare costs within 1 year for patients with allergic rhinitis, asthma, hypertension, or osteoarthritis.

Abourjaily P, Gouveia WA, Selker HP, Zucker DR. (2005). Evaluating the nondrug costs of formulary coverage restrictions. *Manag Care.* 14(8):50-57, 62.

[\[Abstract\]](#)

Abourjaily et al. assessed the nondrug cost of formulary coverage restrictions. They found that “it took an average of 11.1, 18.9, and 16.4 minutes for physicians, nurses, and nurse practitioners/physician assistants, respectively, to make the medication switch” and “the mean number of switches per month ranged from 10.6 to 36.9.” Although “the majority of physicians and nurse practitioners/physician assistants did not feel this process damaged patient-provider relations, most nurses did.” The authors concluded that other costs are incurred by the patients and providers due to the formulary restrictions.

Thiebaud P, Patel BV, Nichol MB, Berenbeim DM. (2005). The effect of switching on compliance and persistence: the case of statin treatment. *Am J Manag Care.* 11 (11):670-674.

[Full Text](#)

Thiebaud et al. performed a retrospective database analysis to investigate the impact of switching on compliance and persistence of statin usage as measured by medication possession ratio and time to discontinuation. They found that “switching statins substantially reduces the likelihood that patients will be compliant and remain on treatment long enough to obtain the full benefit of statin treatment,” therefore, special attention should be given to patients who switch medications to ensure better compliance.

Witt DM, Tillman DJ, Evans CM, Plotkin TV, Sadler MA. (2003). Evaluation of the clinical and economic impact of a brand name-to-generic warfarin sodium conversion program. *Pharmacotherapy.* 2003 Mar;23(3):360-8.

[\[Abstract\]](#)

Witt et al. examined the clinical and economical effects of switching brand warfarin to generic warfarin. Implementation of program proved to be successful for most patients. To ensure clinical efficacy, supplemental INR monitoring is needed for conversion.

⁴ Lipton HL, Gross DJ, Stebbins MR, Syed LH. (2000). Managing the Pharmacy Benefit in Medicare HMOs: What do we know? *Health Affairs*;19(2):42-58.

Hilleman DE, Wurdeman RL, Lenz TL. (2001). Therapeutic change of HMG-CoA reductase inhibitors in patients with coronary artery disease. *Pharmacotherapy*. 21:410-415.

[\[Abstract\]](#)

Hilleman et al. evaluated the short-term outcomes of substituting atorvastatin for pravastatin or simvastatin for patients with coronary artery disease in a university-affiliated hospital and outpatient clinics. They found that the “therapeutic interchange from pravastatin 20 and 40 mg/day and simvastatin 20 mg/day to atorvastatin 10 mg/day atorvastatin was associated with both cost savings and significant reductions in LDL.”

Sweet BV, Stevenson JG. (2001). Pharmacy costs associated with non-formulary drug requests. *Am J Health Syst Pharm*. 58(18): 1746-1752.

[\[Abstract\]](#)

Sweet et al. evaluated pharmacy costs associated with non-formulary drug requests. Results showed that the conversion of non-formulary injectable to formulary products led to the highest cost saving. They also found that “incremental pharmacy costs associated with processing non-formulary medication requests in an inpatient setting are greater than the drug acquisition cost saving for most agents, particularly oral medications.”

Amidon PB, Jankovich R, Stoukides CA, Kaul AF. (2000). Proton pump inhibitor therapy: Preliminary results of a therapeutic interchange program. *Am J Manag Care*. 6:593-601.

[Full Text](#)

Amidon et al. studied a proton pump inhibitor therapeutic interchange program in a VA hospital, and found that “the potential 12% savings from a mandated therapeutic interchange program were quickly offset by the overall lansoprazole-associated failure rate of 28%.”

Andrade, S. et al. (2000). Evaluation of a Formulary Switch from Conjugated to Esterified Estrogens in a Managed Care Setting. *Medical Care*, 38(9).

[\[Abstract\]](#)

Andrade et al. evaluated the impact of a formulary switch from conjugated to esterified estrogen in a mixed- model HMO. Based on their findings, the study suggested that plan efforts were successful in switching most users of conjugated estrogens to esterified estrogens, but the switch was associated with an increase in utilization of health care services.

Benedetto SR, Sloan AS, Duncan BS. (2000). Impact of interventions designed to increase market share and prescribing of fexofenadine at HMOs. *Am J Health Syst Pharm*. 57:1778-1785.

[\[Abstract\]](#)

Benedetto et al. studied the impact of different interventions to encourage prescribing shifts from loratadine to fexofenadine.

Carroll NV. (2000). Therapeutic interchange in community pharmacies in Virginia. *Am J Health Syst Pharm*. 57:882-894.

[\[Abstract\]](#)

No abstract available

Clay DR, Bourg MP, Lawrence DB. (2000). Outcomes of an amlodipine-to-felodipine therapeutic interchange program. *Am J Health Syst Pharm*. 57:1604-1607.

[\[Abstract\]](#)

No abstract available

Fugit RV, Resch ND. (2000). Conversion of patients from simvastatin to lovastatin in an outpatient pharmacy clinic. *Am J Health Syst Pharm.* 57:1703-1708.

[\[Abstract\]](#)

No abstract available

Gerson LB, Hatton BN, Ryono R, et al. (2000). Clinical and fiscal impact of lansoprazole intolerance in veterans with gastroesophageal reflux disease. *Aliment Pharmacol Ther.* 14:397-406.

[Full Text](#)

Gerson et al. studied the clinical and fiscal impact of lansoprazole as the only PPI on the VA formulary. Based on the results, they concluded that intolerance to lansoprazole required conversion to omeprazole “in 5% of veterans on proton pump inhibitor therapy for chronic gastro-oesophageal reflux disease (GERD) symptoms and in 10% of patients with prior omeprazole success,” and the “VA realized substantial cost savings.”

Good CB, Fultz SL, Trilli L, Etchason J. (2000). Therapeutic substitution of cimetidine for nizatidine was not associated with an increase in healthcare utilization. *Am J Manag Care.* 6: 1141-1146.

[Full Text](#)

Good et al. examined the effect of a formulary switch from cimetidine to nizatidine on health care utilization. They found “no evidence of increased utilization of healthcare resources during the 6 months after the formulary switch.”

Mamdani MM, Resig CJ, Stevenson JG. (2000). Cost analysis of therapeutic interchange of calcium channel blockers for the treatment of hypertension: Unexpected results from a conversion program. *J Manag Care Pharm.* 6:390-394.

[Full Text](#)

Mamdani et al examined drug expenses and overall health care costs of a therapeutic interchange program of calcium channel blockers in a VA medical center. They found that “the total cost of drug therapy was significantly higher during the nine-month postconversion period relative to the nine-month preconversion period,” and concluded that the increase appears to “have been due to an increased number of pre-scriptions filled in the postconversion period relative to the preconversion period.”

Nelson WW, Vermeulen LC, Geurkink EA, Ehlert DA, Reichelderfer M. (2000). Clinical and humanistic outcomes in patients with gastroesophageal reflux disease converted from omeprazole to lansoprazole. *Arch Intern Med.* 160:2491-2496.

[Full Text](#)

Nelson et al. examined the clinical and humanistic outcomes of a proton pump inhibitor conversion for members of a health plan. They found that “after the PPI therapeutic interchange from omeprazole to lansoprazole, patients with GERD or heartburn previously stabilized while receiving omeprazole experienced more severe symptoms and expressed decreased patient satisfaction.”

Parra D, Beckey NP, Korman L. (2000). Retrospective evaluation of the conversion of amlodipine to alternative calcium channel blockers. *Pharmacotherapy*. 20:1072-1078.

[\[Abstract\]](#)

Parra et al. evaluated a formulary conversion program from amlodipine to other calcium channel blocker in a VA medical center. They found that the conversion resulted in significant reductions in blood pressure and was safe and cost-effective.

Walters J, Noel H, Folstad J, Kapadia V, White CM. (2000). Prospective evaluation of the therapeutic interchange of felodipine ER for amlodipine in patients with hypertension. *Hosp Pharm*. 35:48-51.

[\[Abstract\]](#)

No abstract available

Oatis GM, Stowers AD. (2000). Conversion from amlodipine to felodipine ER: Did the change fulfill expectations? *Formulary*. 35:435-442.

[\[Abstract\]](#)

Oatis and Stowers examined a therapeutic conversion of calcium channel blockers.

Alexis G, Sessler NE, Conlin PR. (1999). Safety and efficacy of a mandatory formulary switch from nifedipine GITS to amlodipine. *J Manag Care Pharm*. 5:225-229.

[Full Text](#)

Alexis et al. conducted a retrospective study to evaluate the effect of a mandatory switch of nifedipine GITS to amlodipine on blood pressure control. They found that the conversion was safe and resulted to identical blood pressure control in most patients, infrequent concomitant medication changes, and few drug discontinuations.

Baluch WM, Gardner JS, Krauss RH, Scholes D. (1999). Therapeutic interchange of conjugated and esterified estrogens in a managed care organization. *Am J Health Syst Pharm*. 56:537-542.

[\[Abstract\]](#)

Baluch et al. examined the effect of substituting esterified for conjugated estrogens in an HMO. At the end, they were able to avoid a large increase in drug costs with only 6.5% switching back to conjugated estrogens and most patients having a neutral to positive experience with the conversion.

Cantrell WC, Kimber GH, Morrill GB. (1999). Evaluation of blood pressure and adverse effects in patients converted from lisinopril to benazepril. *J Manag Care Pharm*. 5:52-54.

[Full Text](#)

Cantrell et al. conducted a retrospective analysis of the lisinopril to benazepril conversion on clinical outcomes in a Veterans Affairs Medical Center located in the western United States. They found that there were no statistical differences in blood pressure or serum potassium with the conversion; however, there was a statistical impact on the serum creatinine, even though the change may not be clinically significant. The authors concluded that the conversion resulted to an annual cost saving of \$50,000 at the center, with no significant impact on clinical outcomes.

Condra LJ, Morreale AP, Stolley SN, Marcus D. (1999). Assessment of patient satisfaction with a formulary switch from omeprazole to lansoprazole in gastroesophageal reflux disease maintenance therapy. *Am J Manag Care*. 5:631-638.

[Full Text](#)

Condra et al. evaluated the clinical and economically impact of omeprazole to lansoprazole conversion for gastroesophageal reflux disease maintenance therapy in the Veterans Affairs San Diego Healthcare System. They found that omeprazole resulted to lower adverse effects and was preferred over lansoprazole. Although there was a potential cost saving for the formulary conversion, the saving appeared to come at the expense of patient satisfaction.

Jansen DJ, Resch ND, Hoffman RM. (1999). Doxazosin-to-terazosin switch for benign prostatic hyperplasia. *Am J Health Syst Pharm.* 56:1351.

[\[Abstract\]](#)

Jansen et al. evaluated the effect of switching patients from doxazosin to terazosin for benign prostatic hyperplasia in the VA medical center in Albuquerque, New Mexico. They found similar International Prostate Symptoms Score, blood pressure and adverse events before and after conversion, with 83% of patients having similar to better control of symptoms with terazosin. Thus, the dosage-conversion protocol was effective for most patients.

Kinnon AL, Bourne J, Blizzard S, Hunter D, Phillips C. (1999). Outcome analysis of a formulary transition from nifedipine to felodipine at a Veterans Affairs Medical Center. *J Manag Care Pharm.* 5:425-428.

[Full Text](#)

Kinnon et al. conducted a retrospective chart review to measure efficacy and cost outcome of a formulary transition from nifedipine to felodipine at a Veterans Affairs Medical Center. They found that patients illustrated similar blood pressure and heart rate control with conversion. The switch was proven to be safe and cost –effective.

Oh T, Mehta SS, Bonanno C. (1999). Managed care organization’s experience with a therapeutic conversion program in hypertensive patients. *Am J Health Syst Pharm.* 56(Jun):P-51.

No abstract available

Patel RJ, Gray DR, Pierce R, Jafari M. (1999). Impact of therapeutic interchange from pravastatin to lovastatin in a Veterans Affairs Medical Center. *Am J Manag Care.* 5:465-474.

[Full Text](#)

Patel et al. conducted a prospective cohort study to evaluate the impact of therapeutic conversion from pravastatin to lovastatin in a Veterans Affairs Medical Center. Clinical outcomes, quality of life and patient satisfaction were similar for both treatments. The conversion was expected to have an annual cost-saving of approximately \$211,000.

Brufsky JW, Ross DD, Calabrese D, Gao X, Soumerai SB. (1998). Shifting physician prescribing to a preferred histamine-2-receptor antagonist. Effects of a multifactorial intervention in a mixed-model health maintenance organization. *Med Care.* 36:321-332.

[\[Abstract\]](#)

Brufsky et al. conducted a study to “determine whether a program of education, therapeutic reevaluation of eligible patients, and performance feedback could shift prescribing to cimetidine from other histamine-2 receptor antagonists, which commonly are used in the management of ulcers and reflux, and reduce costs without increasing rates of ulcer-related hospital admissions.”

They found that “annual savings in histamine-2 receptor antagonist expenditures after this multifaceted intervention were more than implementation costs, with no discernible effects on numbers of hospitalizations.” The staff model showed stronger effect and cost savings. Further researches are needed to determine the feasibility of this approach to other settings.”

Gardner JS, Scholes D, Baluch WM, Krauss RH. (1998). Acceptability of a substitution of estrogen replacement therapy to women enrolled in a health maintenance organization. *J Women’s Health*. 7: 1027-1031.

[\[Abstract\]](#)

Gardner et al. examined the acceptability of a therapeutic conversion of Permarin tablets to Estratab tablets among users of estrogen replacement therapy in a health maintenance organization (HMO). They found that the conversion was well-tolerated and acceptable to most women in this HMO setting.

Hilleman DE, Mohiuddin SM, Wurdeman RL, Wadibia EC. (1997). Outcomes and cost savings of an ACE inhibitor therapeutic inter-change. *J Manag Care Pharm*. 3:219-223.

[Full Text](#)

Hilleman et al. conducted an open-label, nonrandomized study to measure the cost-effectiveness and outcomes of a therapeutic conversion of captopril, enalapril or lisinopril to quinapril in hypertensive patients. They found that the conversion was safe and cost-effective for patients with mild – to – moderate hypertension, with a saving of \$138 per patient during the first year of the switch.

Briscoe TA, Dearing CJ. (1996). Clinical and economic effects of replacing enalapril with benazepril in hypertensive patients. *Am J Health Syst Pharm*. 53:2191-2193.

[\[Abstract\]](#)

Briscoe et al. conducted a retrospective study to evaluate the clinical and economic outcomes of converting enalapril to benazepril in patients with hypertension. They found that the conversion was “clinically sound and economically prudent.”

Gustin G, White WB, Taylor S, Daragjati C. (1996). Clinical outcome of a mandatory formulary switch for dihydropyridine calcium channel blocker therapy at a Veteran’s Administration Medical Center. *Am J Hypertens*. 9:312-316.

[\[Abstract\]](#)

Gustin et al. conducted a prospective study to evaluate the clinical outcomes of a mandatory formulary switch of nifedipine GITS to felodipine at a Veteran’s Administration Medical Center. They found that the switch in therapy was safe with no significant variation in short term blood pressure control or adverse events between the two therapies.

Krantz SR, Rase RS, Piepho RW. (1996). Retrospective analysis of formulary transition at a large metropolitan HMO: Nifedipine GITS to Felodipine ER. *J Manag Care Pharm*. 2:642-646.

[Full Text](#)

Krantz et al. performed a retrospective analysis to assess the efficacy, safety and cost-effectiveness of a therapeutic conversion of nifedipine GITS to felodipine in a health maintenance organization. They found that the two medications illustrated “therapeutic equivalence and comparable safety profile,” and the formulary transition led to a 15% cost savings to the health

care system.

Landry FJ, Horwhat JD, Tomich D, Pinski L. (1996). Felodipine as an alternative to more expensive calcium antagonists in mild to moderate hypertension. *South Med J.* 89:573-577.

[\[Abstract\]](#)

Landry et al. evaluated the clinical and economical impacts of the therapeutic substitution of once-daily diltiazem hydrochloride (Cardizem CD) or nifedipine (Procardia XL) to felodipine (Plendil) for hypertensive patients. The medication change resulted to slight improvement in blood pressure control and an annual cost-savings of approximately \$72,000 with no statistically significant differences among the symptoms measured with the conversion.

Korman L, Borysiuk L. (1995). Replacing lovastatin with pravastatin: Effect on serum lipids and costs. *Am J Health Syst Pharm.* 52:1078-1082.

[\[Abstract\]](#)

Korman et al. measured the effects of replacing lovastatin with pravastatin and found no significant change in mean serum lipid concentrations with conversion. The authors concluded that the medication change was clinically sound and cost-effective, resulting to a 21% cost reduction.

Nadel HL. (1995). Formulary conversion from glipizide to glyburide: A cost-minimization analysis. *Hosp Pharm.* 30:467-474.

[\[Abstract\]](#)

Nadel performed a cost-minimization analysis of the effect of formulary substitution of glipizide to glyburide on glycemic control, safety and costs. The program was successful, with the conversion presenting similar clinical outcomes and a 51% cost savings.

Stock AJ, Kofoed L. (1994). Therapeutic interchange of fluoxetine and sertraline: Experience in the clinical setting. *Am J Hosp Pharm.* 51:2279-2281.

[\[Abstract\]](#)

Stock et al. examined the effect of a therapeutic interchange policy of fluoxetine and sertraline and found unsuccessful conversion. Therapeutic conversion of the fluoxetine to sertraline “could not be validly guided by recommendations of equivalent dosages based on noncrossover studies of depressed patients.” The authors concluded that “interchange policies should be implemented cautiously and evaluated systematically and prospectively.”

Alexis G, Henault R, Sparr HB. (1993). Conversion from glipizide to glyburide: Long-term follow-up of a cost-impact survey focusing on the elderly. *Clin Ther.* 15:607-615.

[\[Abstract\]](#)

Alexis et al. examined the long-term effect of glipizide to glyburide conversion on elderly in a 24-month follow-up. The preconversion dose of glipizide was higher than the mean final daily dose of glyburide. They found that the conversion decreased mean daily dose of medication and conferred a projected saving of 49% in 2 years.

McDonough KP, Weaver RH, Viall GD. (1992). Enalapril to lisinopril: Economic impact of a voluntary angiotensin-converting enzyme-inhibitor substitution program in a staff-model health maintenance organization. *Ann Pharmacother.* 26:399-404.

[\[Abstract\]](#)

McDonough et al. conducted a nonrandomized, controlled trial to evaluate the cost-effectiveness of the enalapril to lisinopril substitution in patients with benign essential hypertension in a health maintenance organization. They found that the conversion led to net saving that ranged from \$85 to \$110 per patient. The authors concluded that voluntary therapeutic interchange program was an effective means of achieving cost controls.

Lindgren-Furmaga EM, Schuna AA, Wolff NL, Goodfriend TL. (1991). Cost of switching hypertensive patients from enalapril maleate to lisinopril. *Am J Hosp Pharm.* 48:276-279.

[Abstract]

Lindgren et al. examined the effects of switching enalapril maleate to lisinopril in hypertensive patients. They found that “the total direct cost of switching patients to lisinopril was \$66.33 per patient” and that the “annual drug cost savings per patient for switching to lisinopril would be \$52.08, \$46.80, and \$120.24 for therapy with one 5-, 10-, and 20-mg tablet per day, respectively.” Therefore, “a patient would have to receive 15, 17, or 7 months of therapy with 5-, 10-, or 20-mg tablets of lisinopril, respectively, before a net cost savings would be realized.” The authors concluded that the total cost of switching must be considered when evaluating the cost-effectiveness of therapeutic conversions.

Drug Utilization Review

Drug utilization review (DUR) is essentially synonymous with drug use evaluation (DUE), which is defined as an authorized, structured, ongoing review of physician prescribing, pharmacist dispensing, and patient use of medication. It involves a comprehensive review of patients' prescription and medication data before, during, and after dispensing to ensure appropriate medication decision making and positive patient outcomes.⁵

Starner et al. (2009). Assessment of a Retrospective Drug Utilization Review using Beers' List of Potentially Inappropriate Medications. [Abstract] *Journal of Managed Care Pharmacy*. 15(2):176.

[Full Text](#)

Starner et al presented at the AMCP Annual meeting on a study that identified members aged 65 or older with a PIM, notified the prescriber of possible safety concerns through a retrospective drug utilization review (RetroDUR), and assessed the impact of the RetroDUR using a concurrent quasi-experimental study design. Based on the study findings, they concluded that RetroDUR was associated with a significant 6.9% absolute reduction in PIM claims, and for every 15 PIM claims for which there was an intervention, 1 additional PIM was discontinued.

Lyles A, Sleath B, Fulda TR, Collins TM. (2001). Ambulatory drug utilization review: Opportunities for improved prescription drug use. *Am J Manag Care*. 7:75-81.

[Full Text](#)

Lyles et al. examined an ambulatory drug utilization review (DUR). They found that DUR may lead to “better pharmacotherapy and improved medication adherence,” but it might also “increase the drug line-item expense for the organization.” Although the DUR process likely has positive impacts, further studies are needed to evaluate its effects on clinical and economical outcomes globally.

Fulda TR, Valuck R, Zanden J, et al. (2000). Disagreement among drug compendia on inclusion and ratings of drug-drug interactions. *Curr Ther Res Clin Exp*. 61:540-548.

[\[Abstract\]](#)

No abstract available

Moore WJ, Gutermuth K, Pracht EE. (2000). Systemwide effects of Medicaid retrospective drug utilization review programs. *J Health Polit Policy Law*. 25:653-688.

[\[Abstract\]](#)

Moore et al examined the effects of Medicaid retrospective DUR programs on drug and nondrug outcomes and found a significant cost savings in the drugs without spillover to other budgets.

Seltzer JK, Kurt TL, Knodel LC, et al, and the Texas Medicaid Vendor Drug Program Drug Utilization Review Board. (2000). Drug utilization review of sedative/hypnotic agents in Texas Medicaid patients. *J Am Pharm Assoc*. 40:495-499.

[\[Abstract\]](#)

⁵ AMCP. Concepts in Managed Care Pharmacy: Drug Use Evaluation.

Seltzer et al. found that retrospective DUR can be “useful not only in identifying problem areas, but also in encouraging physicians to modify prescribing practices through educational means.”

Sleath B, Konrad TR, Fulda T, Collins TM. (2000). Medicaid drug utilization review and managed care: The perspectives and experiences of state program directors. *J Manag Care Pharm.* 6:131-136.

[Full Text](#)

Sleath et al. evaluated the experiences of Medicaid directors on drug utilization review (DUR) program and obtained their assessment on the role of managed care. They concluded that more studies are needed to explore the “types of DUR activities managed care organization are undertaking for Medicaid enrollees” in order for state agencies to create “more informed decision about the future of Medicaid DUR under managed care.”

Kidder D, Bae J. (1999). Evaluation results from prospective drug utilization review: Medicaid demonstrations. *Health Care Financ Rev.* 20:107-118.

[\[Abstract\]](#)

Kidder et al. examined retrospective drug utilization review (RDUR) interventions and prospective drug utilization review (PDUR) interventions including on-line prospective drug utilization review (OPDUR) and pharmacist provided cognitive services (CS). At the end, they concluded that the RDUR had instant impacts on physicians while PDUR failed to influence frequency of drug problems, utilization of drugs or clinical outcomes.

Lyles A, Zuckerman IH, DeSipio SM, Fulda T. (1998). When warnings are not enough: Primary prevention through drug use review. *Health Aff.* 17:175-183. PMID: 9769581 [PubMed - indexed for MEDLINE]

[Full Text](#)

Lyles et al. discussed “(1) the medication risks of uncoordinated care, (2) initiatives to standardize data elements to support coordinated care, (3) the shortcomings of current DUR systems, and (4) opportunities to realize primary prevention through DUR, with special attention to Medicaid programs” in ambulatory settings.

Smith DH, Christensen DB, Stergachis A, Holmes G. (1998). A randomized controlled trial of a drug use review intervention for sedative hypnotic medications. *Med Care.* 36:1013-1021.

[\[Abstract\]](#)

Smith et al. conducted a randomized controlled trial to measure the impact of a one-time mailed drug review intervention for sedative hypnotic medications and found that the intervention decreased targeted drug use. This outcome would likely reduce the risk of fracture associated with benzodiazepine use. They concluded that mailed drug use review interventions had a positive impact on patient drug use.

Collins TM, Mott DA, Bigelow WE, Zimmerman DR. (1997). A controlled letter intervention to change prescribing behavior: Results of a dual-targeted approach. *Health Serv Res.* 32:471-489.

[Full Text](#)

Collins et al. conducted a study to examine the effects of drug utilization review (DUR) letters interventions that were sent only to physicians, only to pharmacists or to both groups on physician prescribing behavior for dipyridamole. They found that interventions that included both physicians and pharmacists resulted to “greater percentage of patients discontinuing

dipyridamole” and concluded that interventions that included physicians and another person may have larger impacts on prescribing behaviors than those involving only the physicians.

Rascati KL, Okano GJ, Burch C. (1996). Evaluation of physician intervention letters. *Med Care.* 34:760-766.

[\[Abstract\]](#)

Rascati et al. evaluated the effects of intervention letters indicating duplicative anti-ulcer medications on changing physicians’ prescriptive behaviors. They found statistically significant reduction of duplicative therapy, high response rate and moderately high agreement with the letters and concluded that intervention letters can be a valuable tool to change prescribing. However, further studies are needed “to assess the effects of educational intervention letters for other drug categories, for other populations, and for longer periods of time; and the effect these changes may have on true patient outcomes.”

Soumerai SB, Lipton HL. (1995). Computer-based drug utilization review-risk, benefit, or boondoggle? *N Engl J Med.* 332:1641-1645.

[Full Text](#)

No abstract available

Medication Therapy Management (MTM)

The Medicare Prescription Drug Improvement and Modernization Act of 2003 (MMA) required prescription drug plans to offer Medication Therapy Management (MTM) Programs to eligible, high-risk beneficiaries. MTM is a distinct service or group of services that optimize therapeutic outcomes for individual patients.⁶

Barnett, M. 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).

[Full Text](#)

Barnett et al. described and quantified the changes over a 7-year period of pharmacist-provided MTM services. Based on their results, they concluded that MTM interventions had evolved from primarily the provision of patient education involving acute medications towards consultation-type services for chronic medications, though it is unclear if this shift is a result of clinical need, documentation requirements, or reimbursement opportunities. These changes were associated with increases in reimbursement rates and pharmacist-estimated cost savings.

Fox, D. et al. (2009). A Medication Therapy Management Program's Impact on Low-Density Lipoprotein Cholesterol Goal Attainment in Medicare Part D Patients with Diabetes. *Journal of the American Pharmacists Association*, 49(2).

[\[Abstract\]](#)

Fox et al. conducted a study to determine a medication therapy management (MTM) service's impact on Healthcare Effectiveness Data and Information Set (HEDIS) quality measures for cholesterol and use and cost expenditures. Based on their results, they concluded that beneficiaries who were eligible for MTM services but did not receive them had poorer clinical, use, and cost outcomes compared with the MTM intervention group.

Monte SV, Slazak EM, Albanese NP, Adelman M, Rao G, Paladino JA. (2009). Clinical and economic impact of a diabetes clinical pharmacy service program in a university and primary care-based collaboration model. *J Am Pharm Assoc*;49(2):200-8.

[\[Abstract\]](#)

Monte et al. assessed the clinical and economical effects of clinical pharmacy services (CPSs) in patients with type 2 diabetes. They found that the program improved clinical outcomes and reduced total direct medical costs, but there was an increase in hypoglycemic medications and total medication costs.

Welch EK, Delate T, Chester EA, Stubbings T. (2009) Assessment of the impact of medication therapy management delivered to home-based Medicare beneficiaries. *Ann Pharmacother*. 2009 Apr;43(4):603-10.

[\[Abstract\]](#)

Welch et al. performed a nonrandomized controlled study to quantify drug-related problems (DRPs) and to assess the effect of MTM program on healthcare utilization, medication costs, and

⁶ Bluml, B. (2005). Definition of medication therapy management: Development of profession-wide consensus. *Journal of the American Pharmacists Association*, 45, 566–72.

mortality. Based on the results, they supported the use of MTM since it may help reduce mortality rate among risk high Medicare patients.

Stockl, K. et al. (2008). Effect of an Intervention to Increase Statin Use in Medicare Members Who Qualified for a Medication Therapy Management Program. *Journal of Managed Care Pharmacy*, 14(6).

[Full Text](#)

Stockl et al conducted a study to measure the increase in new users of statins associated with the implementation of a statin initiation intervention aimed at prescribers for Medicare Part D MTM members with diabetes or CAD and estimate the potential cost savings associated with the projected reduction in CV events based on published controlled trials. Based the results, they concluded that the intervention was successful at increasing statin use among this group of members at high risk for CV events.

Touchette DR, Burns AL, Bough MA, Blackburn JC. Survey of Medicare Part D Plans' Medication Therapy Management Programs. Effective Health Care Research Report No. 1 (Prepared by University of Illinois-Chicago DEcide Center Under Contract No. HSA29020050038I.) Rockville, MD: Agency for Healthcare Research and Quality. February 2007.

[Full Text](#)

Touchette et al. conducted a 12-item survey of MTM benefit plan managers from 70 health plans covering over 12 million Medicare beneficiaries to describe and summarize the enrollment criteria and benefit design for MTM programs being offered throughout the United States in 2006. Based on the survey results, they concluded that MTM programs offered by PDP's and MA-PD's were highly variable.

Garrett DG, Bluml BM. (2005). Patient self-management program for diabetes: first-year clinical, humanistic, and economic outcomes. *J Am Pharm Assoc* (2003). 45(2):1 30-137.

[Full Text](#)

Garrett et al. conducted a quasi-experimental, pre-post cohort study to assess the first-year clinical, humanistic and economical outcomes of diabetic patients in a multisite community pharmacy care services (PCS) program. The program resulted to decrease in hemoglobin A1C level, low-density lipoprotein cholesterol (LDL-C), and blood pressure, followed by increase in patient satisfaction, influenza vaccination rates, foot examinations, and eye examinations. In addition, they found that "total mean health care costs per patient were \$918 lower than projections for the initial year of enrollment." They concluded that this PCS program lead to positive clinical, humanistic and economic outcomes.

Stebbins, M. et al. (2005). The PRICE Clinic for Low-Income Elderly: A Managed Care Model for Implementing Pharmacist-Directed Services. *Journal of Managed Care Pharmacy*, 11(4).

[Full Text](#)

Stebbins et al conducted a study to characterize and document the number and type of PRICE clinic interventions; measure changes in generic drug use; document savings in out-of-pocket (OOP) drug costs; and measure patient access to drugs that had been, or would have been, discontinued because of cost. They found that OOP medication expenditures decreased 68%, from \$185 to \$60 per patient per month, or \$1,500 per patient per year. They conclude that "the results from this pilot study indicate the benefits of providing pharmacist-directed services under

MTM to Medicare beneficiaries with multiple chronic diseases, multiple drugs, and high drug costs.”

Etemad LR, Hay JW. (2003). Cost-effectiveness analysis of pharmaceutical care in a Medicare drug benefit program. *Value Health*. 6(4):425-435.

[\[Abstract\]](#)

Etemad et al. performed a cost-effectiveness analysis to evaluate the pharmacists’ impact on patient adherence, inappropriate prescribing, and medication-related morbidity and mortality within a Medicare drug benefits program. According to study, the “pharmaceutical care benefit in the elderly population would cost US dollars 2100 (year 2000 prices) per life-year saved,” and “reasonable changes in model parameters did not raise the cost-effectiveness ratio above US dollars 13000 per life-year saved.” Despite limitations of the data available, the authors concluded that “pharmaceutical care appears to be a highly cost-effective augmentation to a Medicare drug benefit program.”

Isetts, B. et al. (2003). Clinical and Economic Outcomes of Medication Therapy Management Services: The Minnesota Experience. *Journal of the American Pharmacists Association*, 48(2).

[\[Abstract\]](#)

Isetts et al. conducted a study of MTM to measure the clinical effects associated with the provision of MTM, to measure the percent of patients achieving HEDIS goals for hypertension and hyperlipidemia in the MTM services intervention group in relationship to a comparison group who did not receive MTM services, and to compare patients’ total health expenditures for the year before and after receiving MTM services. They concluded from their results that “patients receiving face-to-face MTM services provided by pharmacists in collaboration with prescribers experienced improved clinical outcomes and lower total health expenditures.”

Fischer, L. et al. (2002). Pharmaceutical Care and Health Care Utilization in an HMO. *Effective Clinical Practice*, 5(2).

[Full Text](#)

Fischer et al. assessed whether a pharmaceutical care program decreased health care utilization, medication use, or charges in an HMO. They concluded, based on the results, that “pharmaceutical care for patients with chronic health conditions appeared to be associated with a modest increase rather than a decrease in health care utilization.”

Formulary Management and Cost-Sharing Strategies

A formulary is a continually updated, dynamic list of medications that represent the current clinical judgment of experts. In managed care, formularies have evolved to become formal systems of “managed care tools for assuring the selection of medications that have been demonstrated to be safe, effective, and affordable while maintaining or improving quality patient care.”⁷ Therefore, formulary management is an integrated patient care process which enables physicians, pharmacists and other healthcare professionals to work together to promote clinically sound, cost-effective pharmaceutical care.

Doshi JA, Zhu J, Lee BY, Kimmel SE, Volpp KG. (2009). Impact of a Prescription Copayment Increase on Lipid-Lowering Medication Adherence in Veterans. *Circulation*, 119:390-397

[Full Text](#)

Doshi et al. conducted a quasiexperimental study to examine the effect of higher copayment on lipid-lower medication adherence in the Veterans Affairs. They found that an increase in copayment decreased adherence among veterans, which can negatively impact clinical outcomes.

Hartung DM, Carlson MJ, Kraemer DF, et al. (2008) Impact of a Medicaid copayment policy on prescription drug and health services utilization in a fee-for-service Medicaid population. *Med Care*; 46(6):565-72.

[\[Abstract\]](#)

Hartung et al. examined the effect of copay on healthcare utilization in Medicaid patients suffering from chronic disease. They found that implementation of copay decreased prescription drug utilization by 17.2% with greater reduction in the use of nonindicated drugs than medications that were specified for their chronic condition.

Page RL 2nd, Barton P, Nair K. (2008). Effect of cost-sharing for prescription medications on health outcomes in older adults: a critical review of the literature and potential implications for managed care. *Consult Pharm*;23(1):44-54.

[\[Abstract\]](#)

Barton et al. reviewed literature to examine the impact of increased cost-sharing of prescription medications within managed care setting in adults. They found that “increased cost-sharing of prescription medications for elderly beneficiaries appears to exert negative effects on health outcomes and may be related to an increase in utilization of other health care services.”

Sedjo RL, Cox E. (2008). Lowering Copayments: Impact of Simvastatin Patent Expiration on Patient Adherence. *Am J Manag Care*, 14:813-818.

[Full Text](#)

Sedjo conducted a quasi-experimental study to examine the effect of decrease copayment on statin adherence. Although decreasing copayments increased statin usage, its clinical significance is unknown because the overall increase in adherence was modest.

⁷ AMCP. Concepts in Managed Care Pharmacy: Formulary Management.

Johnsrud M, Lawson KA, Shepherd MD. (2007). Comparison of mail-order with community pharmacy in plan sponsor cost and member cost in two large pharmacy benefit plans. *J Manag Care Pharm.* 13(2): 122-134.

[Full Text](#)

Johnsrud et al. compared mail-order and community pharmacy in member cost and plan sponsor cost in pharmacy benefit plans. They found that “savings from lower unit pricing through the mail-order channel benefited the member and did not translate into significant cost reductions for the plan sponsor.” In addition, they also discovered “the plan sponsor either realized small savings or incurred slightly higher costs when paying for drugs in the top therapeutic categories through the mail-order channel.”

Karter AJ, Parker M, Moffett H, Ahmed A, Chan J, Spence M, et al. (2007). Effect of Cost-Sharing Changes on Self-monitoring of Blood Glucose. *Am J Manag Care*, 13:408-416.

[Full Text](#)

Karter et al. evaluated the impact of cost-sharing policy changes on self-monitoring of blood glucose and they found that offering free test strip increased cost to health plans, without improving patient adherence.

Kessler RC, Cantrell CR, Berglund P, Sokol MC. (2007). The effects of co-payments on medication adherence during the first two years of prescription drug treatment. *J Occup Environ Med.* 49(6):597-609.

[\[Abstract\]](#)

Kessler et al. examined the effect of copayments on medication adherence. The results showed that “high copayments and observed copayment increases were associated with termination of medication use.” Although the “effects of copayment level were limited to the first few fills, effects of observed increases in copayments were persistent.”

Zeber JE, Grazier KL, Valenstein M, Blow FC, Lantz PM. (2007). Effect of a medication copayment increase in veterans with schizophrenia. *Am J Manag Care.* 13(6, pt 2):335-346.

[Full Text](#)

Zeber et al. performed a quasi-experimental study to examine the impact of increase copayment on the refill decision and health services utilization among veterans with schizophrenia. Results showed that the new policy was effective in reducing use and cost with “minimal clinical consequences to date”. Nevertheless, “higher inpatient utilization resulting from cost-related nonadherence is troubling within an already high-risk and poorly adherent population, especially considering the reduction in psychiatric drug refills.”

Dunn JD, Cannon HE. (2006). Effects of a polypharmacy edit and reduced quantity limits on the utilization of triptans and overall costs in an integrated health system. *Manag Care Interface.* 19(5):46-51

[\[Abstract\]](#)

Dunn et al. evaluated the effects of a polypharmacy edit and reduced quantity limits of triptans on overall cost and utilization of triptans in Intermountain Healthcare Health Plans. The implementation of this policy reduced total triptans spending by 872,718 dollars in the following year. Educating patients and health care professionals about appropriate triptans usage can improve clinical outcomes.

Gershovich, O. et al. (2006). Assessment of Clinical, Service, and Cost Outcomes of a Conversion Program of Sumatriptan to Rizatriptan ODT in Primary Care Patients With

Migraine Headaches. *Journal of Managed Care Pharmacy*, 12(3).

[Full Text](#)

Gershovich et al. assessed “conversion success, migraine drug utilizations, and patient satisfaction with a clinical pharmacist-managed conversion program from sumatriptan to rizatriptan ODT, both formulary drugs.” Based on the study results, they concluded that the program was successful in converting almost half of primary care patients to the preferred product despite the absence of a copayment incentive for members to agree to the conversion, and they found no measurable medical or economic consequences of the conversion, and patient satisfaction with the quality of care was maintained.

Gibson TB, Mark TL, Axelsen K, Baser O, Rublee DA, McGuigan KA. (2006). Impact of statin copayments on adherence and medical care utilization and expenditures. *Am J Manag Care*. 12(spec no):SP11-S P19.

[Full Text](#)

Gibson conducted a retrospective, observational study to assess the effect of statin copayments on patient adherence, and healthcare utilization and spending. They found that lower copayment was associated with higher adherence. Results showed “a \$10 increase in copayment resulted in a 1.8 percentage point reduction in the probability of adherence for new users and a 3 percentage point reduction in the probability of adherence for continuing users.”

Gibson TB, Mark TL, McGuigan KA, Axelsen K, Wang S. (2006). The effects of prescription drug copayments on statin adherence. *Am J Manag Care*. 12(9):509-517.

[Full Text](#)

Gibson et al. conducted a cross-sectional time-series design to examine the effect of prescription drug copayments on statin adherence. They discovered that higher copayment was associated with lower statin usage which may negatively affect clinical outcomes. The potential consequences of nonadherence to statin should be considered when creating new policies.

Goldman DP, Joyce GF, Karaca-Mandic P. (2006). Varying pharmacy benefits with clinical status: the case of cholesterol-lowering therapy. *Am J Manag Care*. 12(1):21-28.

[Full Text](#)

Goldman et al. examined the effect of varies copayments for cholesterol-lowering (CL) therapy based on expected therapeutic benefit. The authors concluded that “although many obstacles exist, varying copayments for CL therapy by therapeutic need would reduce hospitalizations and emergency department use—with total savings of more than \$1 billion annually.”

Hartung DM, Ketchum KL, Haxby DG. (2006). An evaluation of Oregon’s evidence-based Practitioner-Managed Prescription Drug Plan. *Health Aff (Milwood)*. 25(5):1423-1432.

[Full Text](#)

Hartung et al. described Oregon’s implementation of Practitioner-Managed Prescription Drug Plan (PMPDP). They found that pharmacy cost decreased 9.1 % with dispense as written exception process and decreased 17.7% with educational prior authorization.

Hsu J, Price M, Huang J, et al. (2006). Unintended consequences of caps on Medicare drug benefits. *N Engl J Med*. 354(22):2349-2359.

[Full Text](#)

Hsu et al. examined the effect of caps on Medicare drug benefits and found that it was associated with lower drug consumption, poorer adherence to drug therapy and negative clinical outcomes.

Therefore, the “savings in drug costs from the caps were offset by increases in the costs of hospitalization and emergency department care.”

Mahoney JJ. (2006). Lowering patient drug acquisition costs to improve health outcomes and costs. *Manag Care Interface*. 19(4):13.

[\[Abstract\]](#)

No abstract available

Meissner, B. et al. (2006). Drug and Medical Cost Effects of a Drug Formulary Change with Therapeutic Interchange for Statin Drugs in a Multistate Managed Medicaid Organization. *Journal of Managed Care Pharmacy*, 12(4).

[Full Text](#)

Meissner et al. assessed drug cost and drug therapy management costs of a therapeutic interchange (TI) intervention following a change in the drug formulary for statin drugs, including the conversion of atorvastatin from formulary to nonformulary status. Based on the study results, they concluded that total costs for medical management of dyslipidemia with statin therapy decreased following implementation of the TI intervention for atorvastatin users. They also reported an 11.7% savings in statin drug cost, before consideration of manufacturer rebate revenues, became a net savings of 10.0% after inclusion of the medical costs associated with laboratory tests and physician office visits.

Trystad TK, Hansen RA, Wegner SE. (2006). Evaluation of product switching after a state Medicaid program began covering loratadine OTC 1 year after market

[Full Text](#)

Trystad et al. examined the impact of product switching after a state Medicaid program converted loratadine to over-the-counter status. They found that “although coverage of loratadine OTC offers a substantial cost-savings opportunity for the Medicaid program compared with Rx-only low sedating antihistamines, not covering the OTC product immediately at the time of OTC availability contributed to (a) increased switching to Rx-only low sedating antihistamine products and (b) little use of loratadine OTC in the subsequent OTC coverage period.”

Carroll NV, Brusilovsky I, York B, Oscar R. (2005). Comparison of costs of community and mail service pharmacy. *J Am Pharm Assoc*. 45(3):336-343.

[\[Abstract\]](#)

Carroll et al. compared the cost of prescription for community and mail service pharmacy for a health plan in the northeastern United States. They found that “total costs to the health plan were dollar 4,726,637 through mail versus dollar 4,417,733 at community pharmacies” and “member costs were dollar 1,674,987 through mail versus dollar 2,484,519 at community pharmacies.” The authors concluded that mail service pharmacy was more expensive to health plans but less expensive for patients and overall.

Delate T, Henderson R. (2005). Effect of patient notification of formulary change on formulary adherence. *Journal of Managed Care Pharmacy*, 11:493-498.

[Full Text](#)

Delate et al. assessed the effect of patient notification of formulary change on formulary adherence. Results showed that a letter-based formulary change notification program can provide patient education and allow them to interact more actively in their pharmacotherapy decision making, which can result to increase drug formulary adherence.

Murawski MM, Abdelgawad T. (2005). Exploration of the impact of preferred drug lists on hospital and physician visits and the costs to Medicaid. *Am J Manag Care.* 11 (spec no):SP35-SP42.

[Full Text](#)

Murawski et al. examined the effect of preferred drug lists (PDL) on hospital and physician visits and costs to Medicaid. They found a statistically significant increase in hospital and physician visits and an estimated average Medicaid reimbursement costs increase with PDL.

Sullivan, P. et al. (2005). The Effect of the Rx-to-OTC Switch of Loratadine and Changes in Prescription Drug Benefits on Utilization and Cost of Therapy. *The American Journal of Managed Care, 11(6).*

[Full Text](#)

Sullivan et al. assessed the effect of a prescription-to-OTC switch and the effect of different benefit structures on drug utilization and cost. Based on their results, they concluded that utilization and cost decreased substantially for all types of medications and all pharmacy benefit structures.

Wilson J, Axelsen K, Tang S. (2005). Medicaid prescription drug access restrictions: exploring the effect on patient persistence with hypertension medications. *Am J Manag Care.* 11 (spec no):SP27-SP34.

[Full Text](#)

Wilson et al. conducted a retrospective cohort study to examine the effect of Medicaid drug access restrictions on patient persistence with hypertension medication. Due to the usage of the preferred drug list, patients were more likely to discontinue antihypertensive medications.

Abughosh SM, Kogut SJ, Andrade SE, Larrat P, Gurwitz J. (2004). Persistence with lipid-lowering therapy: influence of the type of lipid-lowering agent and drug benefit plan option in elderly patients. *J Manag Care Pharm.* 10(5):404-411.

[Full Text](#)

Abughosh et al. performed a retrospective cohort study to evaluate the effect of drug benefit plan option of lipid-lower agents (LLAs) usage among elderly. They found that the “persistence with LLAs is low among older patients regardless of scope of drug benefit coverage or the drug class; A multifaceted approach is needed to address the challenges of maintaining adherence in elderly population.

Ozminkowski RJ, Marder WD, Hawkins K, et al. (2004). The use of disease-modifying new drugs for multiple sclerosis treatment in private-sector health plans. *Clin Ther.* 26:1 341-1354.

[\[Abstract\]](#)

Ozminkowski et al. examined the use of disease-modifying drugs from multiple sclerosis. Results showed that an association between copayments and the use of disease-modifying drugs for multiple sclerosis existed. Future studies “should test whether reducing copayments for MS treatment would reduce the use of other health care services (via better MS treatment that modifies the course of illness), or whether the use of disease-modifying drugs would increase total costs to the plan, resulting in slightly higher premiums.”

Christian-Herman, J. et al. (2004). Effects of Generic-Only Drug Coverage in a Medicare HMO [Supplement]. *Health Affairs, July-December Web Exclusives.*

[Full Text](#)

Christian-Herman et al. “examined data for members of a Medicare HMO whose coverage changed to a generic-only benefit and found that the change was associated with reduced health plan pharmacy cost, increased out-of-pocket pharmacy costs for members, increased overall hospital admissions, changed drug-use patterns, and a negative impact on quality metrics for certain conditions.”

Delate, T. et al. (2004). Randomized Controlled Trial of a Dose Consolidation Program. *Journal of Managed Care Pharmacy, 10(5).*

[Full Text](#)

Delate et al. evaluated the effectiveness and financial impact of a dose consolidation program using a letter intervention, and concluded based on the findings “after taking into consideration program administrative costs, high rates of refill discontinuation, and dose consolidation that occurs naturally without intervention, the results indicated that a letter-based dose consolidation program did not appreciably decrease pharmacy expenditures.”

Lexchin, J. et al. (2004). Effects of Prescription Drug User Fees on Drug and Health Services Use and on Health Status in Vulnerable Populations: A Systematic Review of the Evidence. *International Journal of Health Services: Planning, Administration, and Evaluation, 34(1).*

[Abstract](#)

Lexchin et al. conducted a systematic review of the English and French literature from 1977 – 2002 on the effects of cost sharing on vulnerable populations. They found that virtually every article supports the view that cost sharing decreases the use of prescription drugs in these populations. Also, that copayments or a cap on the monthly number of subsidized prescriptions lower drug costs for the payer, but any savings may be offset by increases in other health care areas. Lastly, they found that cost sharing also leads to patients foregoing essential medications and to a decline in health care status.

Lurk JT, DeJong DJ, Woods TM, Knell ME, Carroll CA. (2004). Effects of changes in patient cost sharing and drug sample policies on prescription drug costs and utilization in a safety-net-provider setting. *Am J Health Syst Pharm. 61 (3):267-272.*

[Abstract](#)

Lurk et al. evaluated the impact of cost-containment strategies on prescription drug utilization and costs in an ambulatory care safety-net-provider. The results showed an increase in prescription drug copayment was associated with decrease prescription drug utilization and costs.

Motheral BR, Heinle SM. (2004). Predictors of satisfaction of health plan members with prescription drug benefits. *Am J Health Syst Pharm. 61 (10):1007-1014.*

[Abstract](#)

Motheral et al. studied the determinants of satisfaction of health plan members with prescription drug benefits. They discovered that “higher copayments, coinsurance, closed formularies, intensive managed care, large health care premiums, a recent increase in copayments, and a recent denial of coverage were associated with lower satisfaction with the prescription drug benefit” and “excellent health and use of mail-order pharmacy were associated with greater

satisfaction.” The authors concluded that the extent of patient cost sharing was the strongest predictors of satisfaction.

Sansgiry SS, Sikri S, Kawatkar A. (2004). Consumer knowledge and perceptions of formularies. *Manag Care Interface*. 17(1): 21-26, 30.

[\[Abstract\]](#)

Sansgiry et al. performed a survey to examine consumer knowledge and formularies perceptions. Overall, the members were satisfied with their prescription insurance plans, but had negative attitudes toward formularies. They found that most patients had no knowledge of the medications covered on the formulary and only 25% of the participants had a copy of the formulary. Providing patient education may be an effective tool for reducing the time used for resolving formulary issues.

Tseng CW, Brook RH, Keeler E, Steers WN, Mangione CM. (2004). Cost-lowering strategies used by Medicare beneficiaries who exceed drug benefit caps and have a gap in drug coverage. *JAMA*. 292(8):952-960.

[Full Text](#)

Tseng et al. reviewed the “strategies adopted by beneficiaries exceeding annual drug benefit caps to lower prescription costs, the type of medications involved, and their financial burden.” Results showed that, “Medicare beneficiaries often decreased use of essential medications and experienced difficulty paying for prescriptions during gaps in coverage.” Methods to lessen the effect of caps on patients’ health are needed.

Fischer MA, Avorn J. (2003). Economic consequences of underuse of generic drugs: evidence from Medicaid and implications for prescription drug benefit plans. *Health Serv Res*. 38(4):1051-1064.

[Full Text](#)

Fischer et al. examined the financial effect of underuse generic drugs. Analysis of Medicaid prescription drug spending identified a potential saving of \$229 million with greater use of generic drug. In addition, they noticed that saving up to \$450 million could occur if the best pricing for generic medications were used. By concentrating on specific agents and applying the lowest priced available, further saving can be achieved.

Mojtabai R, Olfson M. (2003). Medication costs, adherence, and health outcomes among Medicare beneficiaries. *Health Aff (Milwood)*. 22(4):220-229.

[Full Text](#)

Mojtabai evaluated the effect of medication costs on adherence and health outcomes among Medicare beneficiaries. They found that more than two million elderly patients did not adhere to their drug regime because of cost. This poor adherence is likely to increase complications and rate of hospitalization. “Pattern of cost-related poor medication adherence” should be considered when developing new Medicare prescription drug benefit legislation.

Tseng CW, Brook RH, Keeler E, Mangione CM. (2003). Impact of an annual dollar limit or “cap” on prescription drug benefits for Medicare patients. *JAMA*. 290(2):222-227.

[Full Text](#)

Tseng et al. conducted a cross-sectional analysis to evaluate the effect of “cap” on prescription drug benefits for Medicare patients. They found that a substantial proportion of Medicare patients exceeded their annual drug benefit when cap are low, and “to continue the same medication use as

before exceeding caps, these patients faced potentially high increases in out-of-pocket costs for medications.”

Artz MB, Hadsall RS, Schondelmeyer SW. (2002). Impact of generosity level of outpatient prescription drug coverage on prescription drug events and expenditure among older persons. *Am J Public Health.* 92(8):1 257-1263.

[Full Text](#)

Artz et al. examined the effect of generosity on elderly prescription fills and spending. They found that prescription fills increased when drug coverage generosity is higher and then decreased at the most generous level.

Joyce GF, Escarce JJ, Solomon MD, Goldman DP. (2002). Employer drug benefit plans and spending on prescription drugs. *JAMA.* 288(14): 1733-1739.

[Full Text](#)

Joyce et al. conducted a retrospective study to assess innovative employer drug benefit plans and spending on prescription drugs. They found that increasing copayment, adding additional level of co-payment, and requiring mandatory generic substitution reduced plan payments and overall medication spending. Results showed that “the reduction in drug spending largely benefited health insurance plans because the percentage of drug expenses beneficiaries paid out-of-pocket rose significantly.”

Thomas, C. et al. (2002). Impact of Health Plan Design and Management on Retirees’ Prescription Drug Use and Spending, 2001 [Supplement]. *Health Affairs, July-December Web Exclusives.*

[Full Text](#)

Thomas et al. examined prescription claims of a range of employer-based retiree plans administered by a PBM to understand how use and spending differ with various cost-sharing approaches and other drug use management techniques among the elderly. They found that “in these plans, most of which had generous benefits and substantial use of mail order, more aggressive cost-sharing requirements combined with other management strategies were associated with greater member cost sharing, a shift to less costly medications (generic and mail order), and lower total prescription drug spending.” Although they did not find lower rates of use in plans with aggressive cost sharing, that may be attributable in part to their higher drug use associated with mail-order incentives.

Adams AS, Soumerai SB, Ross-Degnan D. (2001). Use of antihypertensive drugs by Medicare enrollees: does type of drug coverage matter? *Health Aff (Millwood).* 20(1):276-286.

[Full Text](#)

Adams et al. examined the effects of different type of drug coverage on the consumption and cost of anti-hypertensive medications. They found “that while both state- and employer-sponsored drug coverage are associated with greater consumption of antihypertensive drugs and lower out-of-pocket costs per tablet, private supplemental coverage is not associated with greater use and is associated with only slightly lower out-of-pocket costs than among noncovered beneficiaries.”

Cox ER, Jernigan C, Coons SJ, Draugalis JL. (2001). Medicare beneficiaries’ management of capped prescription benefits. *Med Care.* 39(3):296-301.

[\[Abstract\]](#)

Cox et al. conducted questionnaires to examine the effect of capped prescription benefits on

Medicare beneficiaries. The results showed that approximately half of the patients participated in strategies such as obtaining samples from physicians, decreasing medications consumption and discontinuing medications to lower their out-of-pocket prescription expense. The authors concluded that some of these behaviors can negatively affect patients' outcomes and place them at greater risk of morbidity and mortality.

Danzon PM, Pauly MV (2001). Insurance and new technology: From hospital to drugstore. *Health Aff.* 20:86-100.

[Full Text](#)

Danzon et al. examined the relationship between insurance and new technology from inpatient to outpatient setting. They found that the "shift was accompanied by an increase in the extent of private insurance coverage for outpatient treatments; technological change both caused the increase in coverage (for more costly treatments) and was affected by it (as lower user prices increased the demand for new types of care)." Overall, transformation appears to be more successful in private insurance than for Medicare.

Desselle SP. (2001). Determinants of satisfaction with prescription drug plans. *Am J Health Syst Pharm.* 58(12):1110-1119.

[\[Abstract\]](#)

Desselle examined the satisfaction rate among patient with different prescription drug plans via surveys. The study evaluated satisfaction rates of various sectors of pharmacy benefit plans and obtained health-related and sociodemographic information. Based on the results, the author concluded that most patients were satisfied with their current prescription plans and that satisfaction rate was mainly determined by having various plan options and their perceptions of plan limitations.

Johnson K, Chen M, Kathuria S, Grinnell K. (2001). Use of regression analysis to predict benefit tiers and resulting cost savings. *J Manag Care Pharm;* 7:364. Abstract

[\[Abstract\]](#)

Johnson et al. conducted a regression analysis to measure benefit tiers and cost saving. Depending on the benefit design, the proposed benefits would increase generic utilization by 1% to 9% and decrease PMPM by \$1.76 - \$ 11.86. The authors concluded that "a multiple regression model is capable of predicting the differences required in benefit tiers to change member behavior, as well as the reductions in PMPM that will occur from new benefit designs."

Richerson MA, Downs JR, Remund D. (2001). Economic and clinical outcomes following application of a cholesterol population model in a closed class formulary decision. *Am J Health Syst Pharm.* 58(Jun):P-39E.

No abstract available

Schneeweiss S, Maclure M, Walker AM, et al. (2001). On the evaluation of drug benefits policy changes with longitudinal claims data: The policy maker's versus the clinician's perspective. *Health Policy.* 55:97-109.

[\[Abstract\]](#)

Schneeweiss et al evaluated longitudinal claims data to develop a structural framework to assess drug-benefits changes. Outcomes from policy models "apply only to a specific policy implementation and tend to underestimate effects when non-compliance is high, and "a clinical model must sometimes make, unprovable assumptions about the appropriate control of selection

factors.” Therefore, in order to fully evaluate impacts of drug –containment policies, both clinical and policy models should be tested

Tucker G, Moore A, Avant D, Monteiro M. (2001). A cost analysis of four benefit strategies for managing a Cox-II inhibitor. *J Manag Care Pharm.* 7:224-227.

[Full Text](#)

Tucker et al. conducted a cost analysis of four benefits strategies to determine which is most successful in ensuring proper celecoxib usage. Prior authorization, step therapy, therapeutic buy-up program, and three-tier copayment were evaluated. Based on the results, the authors concluded that step therapy led to the greatest cost savings to health plans.

Jean CD, Triplett JW. (2000). Investigating patient experiences after a formulary change. *Am J Hosp Pharm.* 57:1052-1054.

[\[Abstract\]](#)

No abstract available

Lipton HL, Gross DJ, Stebbins MR, Syed LH. (2000). Managing the Pharmacy Benefit in Medicare HMOs: What do we Really Know? *Health Affairs.* 19: 42-58

[Full Text](#)

Lipton et al. conducted an exploratory case-study of four large Medicare health maintenance organizations to evaluate the effect of drug-use management strategies on costs and quality of care. The articles also discussed issues concerning policy makers and health services researchers such as the topic of Medicare outpatient drug benefit.

Motheral BR, Delate TA, Shaw JA, Henderson R. (2000). The Effect of a Closed Formulary in the Face of Real-Life Enrollment and Disenrollment Patterns. *Journal of Managed Care Pharmacy.* 6: 293-298.

[\[Abstract\]](#)

No abstract available

Schweitzer SO. (2000). Differences in managed care drug formularies: What can consumers learn? *Medical Care Research and Review.* 57: 326-339.

[\[Abstract\]](#)

Schweitzer et al. examined different types of pharmaceutical coverage in drug formularies. They found that while plans vary greatly regarding their drug coverage, satisfaction level of health plan members are not highly correlated with formulary generosity.

Hillman AL, Pauly MV, Escarce JJ, et al. (1999). Financial incentives and drug spending in managed care. *Health Aff (Milwood).* 18(2): 189-200.

[Full Text](#)

Hillman et al. examined various physician payment plans to evaluate the effect of patient financial incentives on medication usage and cost. They assessed two different models of physician compensations including independent practice association (IPA) model and network-model health maintenance organization (HMOs). They noticed a trend of lower drug spending in IPA plans when higher patient copayments for prescription medications were implemented. However, increase in payments had no significant impact on drug spending in HMOs, where physicians carried the financial risk of all prescribing activities. In addition, they found that higher copayments for physician visit were associated with lower drug spending in both IPA and

network plans. Further studies are needed to determine which types of medications are most impacted by these financial incentives and the clinical outcomes of these behaviors.

Lyles, A. et al. (1999). The Effects of Managed Care on Prescription Drug Costs and Benefits. *Pharmacoeconomics*, 15(2).

[\[Abstract\]](#)

Lyles et al reviewed the effects of managed care interventions on prescription drug costs and benefits and found supporting data. Further researches which assess the influences of restrictive formularies, capitation, and disease management on drug utilization and cost are needed.

Motheral BR, Henderson R. (1999). The Effect of a Closed Formulary on Prescription Drug Use and Costs. *Inquiry*. 36: 481-491.

[\[Abstract\]](#)

Motheral et al. compared open formulary against closed formulary on pharmaceutical utilization and cost. When age, gender and chronic disease scores were control, they found that “closed formulary was associated with significantly lower increases in utilization and expenditures, a higher prior authorization rate, and a reduced rate of continuation with chronic medications in the nine months following its implementation.”

Motheral, B. et al. (1999). The Effect of a Copay Increase on Pharmaceutical Utilization, Expenditures, and Treatment Continuation. *The American Journal of Managed Care*, 5(11).

[Full Text](#)

Motheral et al. conducted a controlled quasi-experimental pre-post design study to assess the impact of increase brand medications copayments on participation rates, treatment continuation and expenditures. The experimental group illustrated an increase of \$10 to \$15 dollars for brand copay while the control group maintained a brand copay of \$10. When other predictor factors were controlled for, there was no significant effect in overall drug utilization with increase brand copayment; however, brand utilization was substantially lower in the experimental group. The experimental group led to greater cost saving which was primarily due to the shift from brand to generic medications. The authors concluded that increase copayments did not effect overall pharmaceutical utilization and may be an effective tool for cost reduction.

Streja, D. et al. (1999). Selective Contracting and Patient Outcomes: A Case Study of Formulary Restrictions for Selective Serotonin Reuptake Inhibitor Antidepressants. *The American Journal of Managed Care*, 5(9).

[Full Text](#)

Streja et al. evaluated the effects of “single-drug” formulary restrictions for selective serotonin reuptake inhibitor (SSRI) antidepressants on new patients. They found that in HMO which provided single preferred SSRI, paroxetine, 80% of patients were less likely to complete treatment when compared to HMO with two preferred SSRIs, fluoxetine and paroxetine. In addition, they also noticed a correlation between drug selection and completion rate where patients taking sertraline had a shorter completion rate than patients taking fluoxetine. The authors concluded that formulary restrictions on SSRI may have a negative effect on treatment outcomes.

Horn SD, Sharkey PD, Phillips-Harris C. (1998). Formulary limitations and the elderly: Results from the managed care outcomes project. *Am J Manag Care*. 4:1105-1113.

[Full Text](#)

Horn et al. conducted a cross-sectional, longitudinal study to evaluate the effects of formulary limitations on patients' health utilization. They found that drugs use, patient visits and hospitalizations were different between elderly and non-elderly groups. They concluded that greater formulary limitations were linked with higher resource utilizations by elderly patients

Grabowski H, Mullins CD. (1997). Pharmacy benefit management, cost-effectiveness analysis and drug formulary decisions. *Soc Sci Med.* 45:535-544.

[\[Abstract\]](#)

Grabowski et al. evaluated the evolution of pharmacy benefit management companies. Although past focuses are rested on drug formularies and rebates, they are predicating a greater emphasis on disease management and cost-effectiveness studies in the near future.

Johnson RE, Goodman MJ, Hornbrook MC, Eldredge MB. (1997). The effect of increased prescription drug cost-sharing on medical care utilization and expenses of elderly health maintenance organization members. *Med Care.* 35:1119-1131.

[\[Abstract\]](#)

Johnson et al. assessed the effect of increase cost-sharing on prescription drugs in elderly. They found that an increase of from \$1 to \$3, \$3 to \$5 per copayment and from 50% to 70% per dispensing had no consistent impact on medical care utilization and expense but led to decrease in drug utilization and expense. Further studies are needed to assess the impact of cost-sharing on different medications and copayment rates.

DeZearn K, Springer S, Benson D, Stephens C. (1996). Promoting use of a preferred histamine H2-receptor antagonist in managed care organizations. *Am J Health Syst Pharm,* 5 3:865-867.

[\[Abstract\]](#)

DeZearn et al. examined a program that promoted the use of generic cimetidine in managed care organizations with letter interventions. The program successfully reduced cost by shifting the use of brand histamine H2-receptor antagonists to generic cimetidine.

Horn SD, Sharkey PD, Tracy DM, et al. (1996). Intended and unintended consequences of HMO cost-containment strategies: Results from the Managed Care Outcomes Project. *Am J Manag Care.* 2:253-264.

[Full Text](#)

Horn et al. conducted a longitudinal, prospective study to evaluate the impacts of cost-containment strategies on ambulatory care utilizations for patients with arthritis, asthma, epigastric pain/ulcer, hypertension, or otitis media in HMO settings. They found a strong positive association between healthcare utilization and disease severity. In addition, they noticed that formulary restrictions led to a significant increase in emergency department visits and hospital admissions in all cases except otitis media. The results showed that many unexpected consequences had occurred with the use of cost-containment strategies. In order to ensure quality care, the author concluded that a "system or disease -/ case management approach" that incorporate "interactions among components of care" for cost-containment is needed

Kravitz RL, Romano PS. (1996). Managed care cost containment and the law of unintended consequences. *Am J Manag Care.* 2:323-324.

[\[Abstract\]](#)

No abstract available

Gurwitz JH, McLaughlin TJ, Fish LS (1995). The effect of an Rx-to-OTC switch on medication prescribing patterns and utilization of physician services: the case of vaginal antifungal products. *Health Serv Res*, 30:672-685.

[Full Text](#)

Gurwitz et al. assessed the impact of the prescription to over-the-counter (OTC) switch on vaginal antifungal products. They found that the number of prescriptions dispensed was decreased by 6.42 per 100 females and physician visits for vaginitis was reduced by 0.66 per 100 members. The saving estimated to be \$42,528 for drug costs and \$12,768 to \$25,729 for physician visits for the one-year period following OTC implementation. Although there was a cost saving associated with availability of OTC vaginal antifungal products, this saving must be measured against clinical outcomes and potential adverse events to ensure optimal care.

Smith DG. (1993). The effects of copayments and generic substitution on the use and costs of prescription drugs. *Inquiry*. 30:1 89-198.

[\[Abstract\]](#)

Smith inspected the impacts of copayment and generic substitution prescription drug utilization and cost. They found that “a common change in the rate of copayment from \$3 to \$5 per prescription is estimated to be associated with a 5% decrease in the number of prescriptions, an offsetting increase in ingredient costs per prescription, a 10% decrease in employer costs per person, and an increase in employee costs of approximately the \$2 copayment per prescription.”

Soumerai SB, Ross-Degnan D, Fortess EE, Abelson J. (1993). A critical analysis of studies of state drug reimbursement policies: Research in need of discipline. *Milbank Q*. 71:217-252.

[\[Abstract\]](#)

Soumerai et al. reviewed studies regarding “cost sharing, drug reimbursement limits, and administrative limitations on access to particular drugs via formularies, category exclusions, or prior authorization requirements; evaluates their methodological rigor; summarizes the state of current knowledge; and proposes future research directions.” They found that medication limitations, drug reimbursement caps and cost-sharing can led to unexpected consequences such as decrease medication compliance and drug substitution effects.

Soumerai SB, Ross-Degnan D, Avorn J, et al. (1991). Effects of Medicaid drug-payment limits on admission to hospitals and nursing homes. *N Engl J Med*; 325:1072-1077.

[\[Abstract\]](#)

Soumerai et al. examined the effects of Medicaid drug-payment limitations on hospitals and nursing homes admissions. They found that reimbursement limitations for effective medications can negatively impact the clinical outcomes of low-income, frail, elderly patients, which may increase the overall Medicaid expenditures.

Harris BL, Stergachis A, Ried LD. (1990). The effect of drug copayments on utilization and cost of pharmaceuticals in a health maintenance organization. *Med Care*. 28:907-917.

[\[Abstract\]](#)

Harris et al. conducted a study to measure the impact of changing drug costs on drug utilizations for beneficiaries less than 65 years old who initially had no medication co-pay. Modifications in co-payment rates of \$1.50, \$3.00 and \$3.00 with other benefit changes occurred over a three year period. They found that “implementation of progressively greater levels of co-payments continued to have a significant effect on drug utilization since each co-payment level resulted in an additional reduction in drug utilization; 10.6% with the \$3 co-payment and 12.0% when the \$3

drug co-payment was combined with other cost-sharing provisions.” The authors concluded that “co-payments were associated with lower per capita drug costs and higher per prescription unit costs.”

Kozma CM, Reeder CE, Lingle EW. (1990). Expanding Medicaid drug formulary coverage: Effects on utilization of related services. *Med Care*. 28:963-977.

[\[Abstract\]](#)

Korma et al. evaluated the impacts of expanding Medicaid drug formulary coverage on utilization and expenditures. Medical care services are interconnected in which the actions of one sector of the system influence the outcomes of another portion. To optimize resources allocations, medical care programs should be managed as a system of interrelated activities rather than independently.

Lingle EW, Reeder CE, Kozma CM. (1990). Impact of an open formulary system on the utilization of medical services. *J Res Pharm Econ*. 2:93-123.

[\[Abstract\]](#)

No abstract available

Soumerai SB, Ross-Degnan D. (1990). Experience of state drug benefit programs. *Health Aff*. 9:36-54.

[Full Text](#)

Soumerai et al. examined the experience of state drug benefit programs. They discussed the effects of various initiatives and advised government to seek lessons from the past when creating new policies for Medicare and Medicaid. The authors argued “for an increased federal effort to produce and disseminate rigorous evaluation research on this topic to policymakers and also draw some tentative conclusions on the risks and benefits of several popular cost-sharing, regulatory, and informational interventions.”

Soumerai SB, Ross-Degnan D, Gortmaker S, Avorn J. (1990). Withdrawing payment for nonscientific drug therapy: Intended and unexpected effects of a large-scale natural experiment. *JAMA*. 263:83-91.

Soumerai et al. examined the effect of limiting reimbursement for 12 types of drugs therapies that had questionable efficacy. Throughout the 42-month study, prescriptions usage increased from 0.86 to 1.00 monthly prescriptions. Although there was a decrease of 21.7 for study drug prescriptions per 1000 patients, there was also an increase of 33.7 prescriptions for substitute medications. They found that imposing reimbursement restrictions had positive and negative effects. The authors concluded that education must also be provided to encourage proper behavior and optimal outcomes.

Rebates or Contracting

Rebates or contracting are mechanisms that managed care organizations can use to secure lower drug prices from pharmaceutical manufacturers as part of their effort to control drug expenditures.⁸ “

Okunade, A. (2001). The Impact of 1990 Medicaid Drug Rebates Policy on Access to Prescriptions. *Journal of Health and Social Policy, 12(3)*.

[\[Abstract\]](#)

Okunada evaluated the effect of the 1990 Medicaid Drug Rebates Policy on prescription access. The regression model showed that “competing drug price impact sales significantly and Medicaid drug rebates expand access to drug interventions by stimulating retail transactions.” Expansion of Medicare program drug rebate policy is being examined.

Rentmeester, C. et al. (2008). Rebates and Spreads: Pharmacy Benefit Management Practices and Corporate Citizenship. *Journal of Health Politics, Policy, and Law, 33(5)*.

[\[Abstract\]](#)

Rentmeester et al. examined the ethical dimensions of pharmacy benefit management (PBM) practices in terms of rebate and spread-pricing practices and offered suggestion for future negotiations. The authors analyzed “employers’ and employees’ vulnerabilities” and “raise questions regarding transparency in contract agreement between PBMs and employers.”

Curtiss, F. (2003). The Relative Value of Disease Management Programs Versus Drug Manufacturer Rebates [Editorial]. *Journal of Managed Care Pharmacy, 9(6)*.

[Full Text](#)

Curtiss compared the relative value of disease management program against manufacturer rebates. The Office of Program Policy Analysis & Government Accountability (OPPAGA) found that the disease management program saved the state \$35M in 2002, which was \$30M less than the amount supplemental rebates saved. Therefore, the OPPAGA recommended that “supplemental rebates be required for all the drugs in preferred drug list and that the disease management programs be funded from a portion of the supplemental rebate incomes.”

Curtiss, F. (2003). Pressure on Pharmacy Benefit Managers for Disclosure and Demonstration of Value— Rebates and Drug Benefit Cost Savings [Editorial]. *Journal of Managed Care Pharmacy, 9(4)*.

[Full Text](#)

Curtiss et al. discussed the increasing pressure that pharmacy benefit managers are facing regarding value demonstration of their service, such as rebates and drug benefit cost saving. The author stated that “while this is a guidance and not a list of explicit demands, it is clear that customers, including the federal and state governments, will continue to seek and demand more complete disclosure of revenues and profits earned by PBMs from drug manufacturer payments, and the OIG will scrutinize professional education and grant making by pharmaceutical manufacturers to ensure that these functions are divorced from drug product sales and marketing.”

⁸ AMCP. Concepts in Managed Care Pharmacy – Maintaining the Affordability of the Prescription Drug Benefit: How Managed Care Organizations Secure Price Concessions from Pharmaceutical Manufacturers.

Educational Interventions

Managed care organizations use educational interventions to improve the quality of prescribing using physician profiling, for example, with recommendations for changes; some managed care organizations have even used member educational interventions.⁹

Simon SR, Rodriguez HP, Majumdar SR, Kleinman K, Warner C, Salem-Schatz S, Miroshnik I, Soumerai SB, Prosser LA. (2007). Economic analysis of a randomized trial of academic detailing interventions to improve use of antihypertensive medications. *Journal of Clinical Hypertension*, 9:15-20.

[\[Abstract\]](#)

Simon et al. conducted a randomized trial to analyze the effect of academic detailing intervention on the use of antihypertensive medications. They evaluated the impact of mailed guideline, group detailing and individual detailing and found that total annual drug cost saving in individual detailing was \$21,711. This information can be used in health plan decision making for academic interventions development to improve prescribing.

Yuan Y, Hay JW, McCombs JS. (2003). Effects of ambulatory-care pharmacist consultation on mortality and hospitalization. *American Journal of Managed Care*, 9:45-56.

[Full Text](#)

Yuan et al. examined the effect of 3 alternative models of ambulatory-care pharmacist consultation on clinical outcomes. Results of the 2 years intervention showed that intensive outpatient consultation for high-risk patients improved survival and decreased hospitalization, while broader nontargeted consultation reduced hospitalization, but did not reduce mortality.

Perz JF, Craig AS, Coffey CS, Jorgensen DM, Mitchel E, Hall S, Schaffner W, Griffin MR. (2002). Changes in antibiotic prescribing for children after a community-wide campaign. *JAMA*, 287:3103-3109.

[Full Text](#)

Perz et al. examined the effect of a community-wide campaign in Knot Country that encouraged reduction of antibiotic usage among children. Results showed that antibiotic prescription rates declined 19% among children of Knot County and 8% among the control county children. The authors concluded that community-wide campaign appears to be helpful in reducing antibiotics usage among children.

Stevens VJ, Shneidman RJ, Johnson RE, Boles M, Steele PE, Lee NL. (2002). Helicobacter pylori eradication in dyspeptic primary care patients: a randomized controlled trial of a pharmacy intervention. *Western Journal of Medicine*, 176:92-96.

[Full Text](#)

Stevens et al. performed a randomized controlled clinical trial to evaluate the effect of pharmacy intervention on patients' adherence to drug regimen for Helicobacter pylori eradication in a health

⁹ Pearson SA, Ross-Degnan D, Payson A, Soumerai S. (2003). Changing medication use in managed care: A critical review of the available evidence. *American Journal of Managed Care*, 9:715-731.

maintenance organization. They found that pharmacist counseling did not affect self-reported adherence to medication therapy, eradication rate or symptoms, however, it did improve patient satisfaction.

Lin EH, Simon GE, Katzelnick DJ, Pearson SD. (2001). Does physician education on depression management improve treatment in primary care? *Journal of General Internal Medicine*, 16:617-619.

[Full Text](#)

Lin et al. evaluated the impact of additional physician training on optimal depression management. Results showed that physicians that had additional education for depression management performed the same as usual care doctors in terms of depression diagnosis or pharmacotherapy.

Finkelstein JA, Davis RL, Dowell SF, et al. (2001). Reducing antibiotic use in children: a randomized trial in 12 practices. *Milbank Q.* 1 08:1-7.

[Full Text](#)

Finkelstein et al. evaluated the effect of educational outreach intervention for decreasing antibiotics usage in children under 6 years old in twelve practices in eastern Massachusetts and northwest Washington State. They found that an “outreach intervention for parents and providers reduced antibiotic use among children in primary care practices.” Future intervention discussing the dangers of antibiotics overuse will lead to more judicious prescribing.

Brown JB, Shye D, McFarland BH, et al. (2000). Controlled trials of CQI and academic detailing to implement a clinical practice guideline for depression. *Jt Comm J Qual Improv.* 26: 39-54.

[\[Abstract\]](#)

Brown et al. conducted controlled trials to evaluate the impact of continuous quality improvement (CQI) and academic detailing method on depression. They found that while most of the CQI’s proposals were not implemented, academic detailing did increase treatment rate, but did not impact overall outcome. They concluded that “new organizational structures may be necessary before CQI teams and academic detailing can substantially change complex processes such as the primary care of depression.”

Legorreta AP, Leung KM, Berkbigler D, Evans, Liu R. (2000). Outcomes of a population-based asthma management program: quality of life, absenteeism, and utilization. *Ann Allergy Asthma Immunol.* 85:28-34.

[\[Abstract\]](#)

Legorreta et al. conducted a prospective study to evaluate the effectiveness of asthma management programs in health maintenance organization (HMO) settings. When compared to patients with normal care, they found that patients that participated in program had greater improvement on home peak flow meter usage, steroid inhaler usage, and self-reported knowledge on asthma. They concluded that “population-based programs can improve functional status, increase self-monitoring and knowledge about asthma, and decrease absenteeism and hospitalization for asthma by directly providing asthmatic patients with educational materials and self-monitoring tools.”

Simon GE, Von Korff M, Rutter C, Wagner E. (2000). Randomised trial of monitoring, feedback, and management of care by telephone to improve treatment of depression in primary care. *BMJ.* 320:550-554.

[Full Text](#)

Simon et al. conducted a randomized trial to measure the effects of feedback only and feedback plus care management on acute depression in primary care. The feedback only group consisted of feedback and algorithm based recommendations from data of pharmacy and visits while the feedback plus care management included follow up phone calls, treatment recommendations and practice support by care managers. Based on the finding, the authors concluded that “monitoring and feedback to doctors yielded no significant benefits for patients in primary care starting antidepressant treatment. A programme of systematic follow up and care management by telephone, however, significantly improved outcomes at modest cost.”

Gonzales R, Steiner JF, Lum A, Barrett PH, Jr. (1999). Decreasing antibiotic use in ambulatory practice: impact of a multidimensional intervention on the treatment of uncomplicated acute bronchitis in adults. *JAMA*. 281:1512-1519.

[Full Text](#)

Gonzales et al. conducted a prospective, nonrandomized controlled trial to measure the impact of a multidimensional intervention on the treatment of uncomplicated acute bronchitis in adult. They found that active patient and physician intervention can greatly reduce the overuse of antibiotics and spread of antibiotic-resistant *Streptococcus pneumoniae* in US communities.

Gregory C, Cifaldi M, Tanner LA. (1999). Targeted intervention pro-grams: creating a customized practice model to improve the treatment of allergic rhinitis in a managed care population. *Am J Manag Care*. 5:485-496.

[Full Text](#)

Gregory et al. examined the impacts that intervention programs have on the outcomes of patients with allergic rhinitis. The Episodes of Care (EOC) team developed guidelines and education programs through multidisciplinary effort. About 50% of the physician changed their practice patterns due to the intervention programs. Results of the intervention were positive showing decrease in use of rescue medications and increase in preventive measures. They concluded that the multidisciplinary approach to the EOC model provided broader participation and improved providers and patient behavior.

Lee M, Kemp JA, Canning A, et al. (1999). A randomized controlled trial of an enhanced patient compliance program for *Helicobacter pylori* therapy. *Arch Intern Med*. 159:2312-2316.

[Full Text](#)

Lee et al. conducted a randomized controlled trial to identify reasons that affect medication adherence and to evaluate the impact of an enhanced compliance program (ECP) on patient compliance with bismuth subsalicylate, metronidazole, and tetracycline hydrochloride (BMT) triple therapy for *Helicobacter pylori* infection. They found that while most patients were able to complete 60% of their therapy, an ECP program is effective in further improving the percentage of the medications taken. In addition, they found that increasing frequency of dosing and numbers of pills are factors that affect compliance.

Santos R, Cifaldi M, Gregory C, Seitz P. (1999). Economic outcomes of a targeted intervention program: the costs of treating allergic rhinitis patients. *Am J Manag Care*. 5:S225-S234.

[Full Text](#)

Santos et al. conducted an economic study to determine the annual costs of treating allergic rhinitis and to evaluate the impact of treatment intervention program on direct and indirect costs

in a managed care organization. The results showed an additional annual cost of \$2 million for allergic rhinitis. They also found that the intervention program showed a trend toward decreased indirect cost, but it had limited influence on direct cost. The authors concluded that while allergic rhinitis showed high annual expenditure, a well-designed intervention program can potentially decrease this cost.

Kaplan RC, Psaty BM, Kriesel D, et al. (1998). Replacing short-acting nifedipine with alternative medications at a large health maintenance organization. *Am J Hypertens.* 11:471-477.

[\[Abstract\]](#)

Kaplan et al. showed that presenting evidences about safety of short-acting nifedipine to physicians and patients was an effective method of motivating “broad scale change to safer alternative drug therapies.”

Powell KM, Edgren B. (1995). Failure of educational videotapes to improve medication compliance in a health maintenance organization. *Am J Health Syst Phar.* 52:2 196-2199.

[\[Abstract\]](#)

Powell et al. assessed the effect of mailed educational tapes on improving compliance. The experimental group had a one-time educational video mailed to them and the control group received no additional material. The results showed that almost 87% of the study group watched the video and of this group, 88% found the video to be at least somewhat useful. However, they found no statistically significant difference between the mean medication possession ratios in the experimental versus the control group.

Schectman JM, Kanwal NK, Schroth WS, Elinsky EG. (1995). The effect of an education and feedback intervention on group-model and network-model health maintenance organization physician prescribing behavior. *Med Care.* 33:139-144.

[\[Abstract\]](#)

Schectman et al. assessed the impact of educational and feedback intervention on H2-blocker prescribing pattern in network-verses group-model health maintenance organization physicians and in academic versus nonacademic settings. They found that “a significant response to the intervention was noted among academic and nonacademic group-model HMO physicians, but not among network physicians (adjusted mean absolute prescribing changes of +9.9% and +8.9% versus -2.8%, P = .02).” However, type of intervention did not affect prescribing behavior. The authors concluded “that a simple passive educational intervention can be effective at changing group-model HMO physician behavior.”

Sclar DA, Chin A, Skaer TL, et al. (1991). Effect of health education in promoting prescription refill compliance among patients with hypertension. *Clin Ther.* 13:489-495.

[\[Abstract\]](#)

Sclar et al. examined the effect of health education program on medication compliance among hypertensive patients. Patients in the experimental group received an enrollment kit containing 30-day supply of atenolol, an educational newsletter, information on nutrition, and an overview of the program. In addition to this, the experimental group also received a monthly newsletter and reminder for renewal. They found that medication possession ratio was significantly greater for the experimental group when compared to the control group. An analysis of “multiple regression analyses revealed that enrollment in the health-education program increased the number of days’

supply of atenolol obtained by existing patients by 27 (P less than or equal to 0.001), and by new patients by 40 (P less than or equal to 0.001).”

Soumerai SB, Avorn J. (1990). Principles of educational outreach (“academic detailing”) to improve clinical decision making. *JAMA*. 263:549-556.

[\[Abstract\]](#)

Soumerai et al. showed that academic detailing can reduce unnecessary health care expenditures by encouraging better quality and cost-effective prescribing behaviors.

Monitoring and Feedback

Monitoring and feedback interventions include, but are not limited to, prescribing audits and feedback, or computerized alerts, and reminders or telephone outreach.¹⁰

Bambauer KZ, Adams AS, Zhang F, Minkoff N, Grande A, Weisblatt R, Soumerai SB, Ross-Degnan D (2006). Physician alerts to increase antidepressant adherence: fax or fiction? *Archives of Internal Medicine*, 166:498-504.

[Full Text](#)

Bambauer et al. examined the effect of antidepressant compliance program on adherence among members of Harvard Pilgrim Health Care. They found that alerting physicians through real-time pharmacy information was not an effective tool in promoting increasing adherence. The authors concluded that “effectiveness of electronically triggered, patient-specific, faxed feedback should be carefully evaluated before widespread implementation, because faxes are insufficient as a stand-alone policy tool.”

Feldstein A, Elmer PJ, Smith DH, Herson M, Orwoll E, Chen C, Aickin M, Swain MC. (2006). Electronic medical record reminder improves osteoporosis management after a fracture: a randomized, controlled trial. *Journal of the American Geriatrics Society*, 54:450-457.

[\[Abstract\]](#)

Feldstein et al. conducted a randomized, controlled trial to evaluate the effect of electronic medical records (EMR) on osteoporosis management postfracture in a Pacific Northwest nonprofit health maintenance organization. The intervention included patient specific postfracture message to provider delivered by EMR or EMR reminder and educational letter for the patient. After 6 months, BMD measurement or osteoporosis medication was illustrated in 51.5% of patients with the provider EMR reminder, 43.1% of patients with provider EMR reminder and patient education, and 5.9% of patients with normal care. In addition, they also found that patients from 60-69 years old were more likely to receive BMD measurement or osteoporosis medication than patients that were 80-89 years old. The authors concluded that patient-specific reminder to the provider through an EMR message appeared to be a promising tool for osteoporosis management after fracture.

Feldstein AC, Smith DH, Perrin N, Yang X, Rix M, Raebel MA, Magid DJ, Simon SR, Soumerai SB. (2006). Improved therapeutic monitoring with several interventions: a randomized trial. *Archives of Internal Medicine*, 166:1848-1854.

[\[Abstract\]](#)

Feldstein et al. conducted a randomized trial to see whether several interventions improved laboratory monitoring at medication initiation. These interventions included use of electronic medical record reminder to prescribing healthcare provider, an automated voice message to patients, and a pharmacy outreach team to patients. They found that all three interventions were

¹⁰ Lu, C. et al. (2008). Interventions Designed to Improve the Quality and Efficiency of Medication Use in Managed Care: A Critical Review of the Literature- 2001-2007. BioMed Central Health Services Research, 8(75).

successful in improving therapeutic monitoring; however, further studies are needed to evaluate their effect on patient outcomes.

Feldstein AC, Smith DH, Perrin N, Yang X, Simon SR, Krall M, Sittig DF, Ditmer D, Platt R, Soumerai SB. (2006). Reducing warfarin medication interactions: an interrupted time series evaluation. *Archives of Internal Medicine*, 166:1009-1015.

[Full Text](#)

Feldstein et al. examined the impact of electronic medical alerts and academic detailing on reducing coprescriptions of warfarin-interacting medications. They found that usage of medication interaction alerts resulted to 14.9% relative reduction of warfarin-interacting medication prescription rate. The authors concluded that while academic detailing had limited effect on decreasing interaction, electronic medical alert slightly reduced rate of coprescribing interacting medications.

Palen TE, Raebel M, Lyons E, Magid DM. (2006). Evaluation of laboratory monitoring alerts within a computerized physician order entry system for medication orders. *American Journal of Managed Care*, 12:389-395.

[Full Text](#)

Palen et al. conducted a randomized prospective intervention study to assess the impact of alerts within a computerized physician order entry system (CPOE) on increasing physician compliance with laboratory monitoring during therapy initiation. The results showed that the intervention group was not significantly different when compared to the control group in the overall rate of physician compliance in ordering recommended laboratory monitoring for patients. The author concluded that additional decision support tools are needed as CPOE becomes more widespread.

Raebel MA, Chester EA, Newsom EE, Lyons EE, Kelleher JA, Long C, Miller C, Magid DJ. (2006). Randomized trial to improve laboratory safety monitoring of ongoing drug therapy in ambulatory patients. *Pharmacotherapy*, 26:619-626.

[\[Abstract\]](#)

Raebel et al conducted a randomized trial to evaluate the impact of electronic tool on increasing laboratory monitoring of ongoing drug therapy. The intervention group consisted of monitoring guidelines that were developed by physicians and pharmacists. First, the pharmacists were electronically informed of missing laboratory data, then they arranged the test, reminded patients to undergo test and evaluated the lab results. They found that “computerized tool plus collaboration of health care professionals effectively increased the number of patients who received laboratory safety monitoring of drug therapy.”

Rickles NM, Svarstad BL, Statz-Paynter JL, Taylor LV, Kobak KA. (2006). Improving patient feedback about and outcomes with anti-depressant treatment: a study in eight community pharmacies. *Journal of the American Pharmacists Association: JAPhA* 46(1):25-32.

[\[Abstract\]](#)

No abstract available

Simon SR, Smith DH, Feldstein AC, Perrin N, Yang X, Zhou Y, Platt R, Soumerai SB. (2006). Computerized prescribing alerts and group academic detailing to reduce the use of potentially inappropriate medications in older people. *Journal of the American Geriatrics Society*, 54:963-968.

[\[Abstract\]](#)

Simon et al. examined the effect of age-specific computerized prescribing alerts and academic detailing on the rate of dispensing potentially inappropriate medications to older people. They found that group academic detailing did not enhance alerts; however, “age-specific alerts sustained the effectiveness of drug-specific alerts to reduce potentially inappropriate prescribing in older people and resulted in a considerably decreased burden of the alerts.”

Smith DH, Perrin N, Feldstein A, Yang X, Kuang D, Simon SR, Sittig DF, Platt R, Soumerai SB. (2006). The impact of prescribing safety alerts for elderly persons in an electronic medical record: an interrupted time series evaluation. *Archives of Internal Medicine*, 166:1098-1104.

[Full Text](#)

Smith et al. assessed the effect of computerized order entry with clinical decision support in decreasing the use of potential contraindicated medications in elderly patients. They found that the drug-specific alerts resulted to a 22% relative reduction in elderly exposure to contraindicated agents. The authors concluded that usage of alerts in outpatients electronic medical records may effectively decrease prescribing of contraindicated medicine in elderly; however, further studies regarding the effect of alerts on clinical outcomes is needed.

Vollmer WM, Kirshner M, Peters D, Drane A, Stibolt T, Hickey T, Tom GI, Buist AS, O'Connor EA, Frazier EA, Mosen D. (2006). Use and impact of an automated telephone outreach system for asthma in a managed care setting. *American Journal of Managed Care*, 12:725-733.

[Full Text](#)

Vollmer et al. conducted a randomized clinical trial to evaluate the effect of an automated telephone outreach system for asthma management in a managed care organization. The participants of the intervention group received 3 outreach calls within a 10-month period and a survey at the end of the intervention. An intent-to-treat analysis showed that there was no significant difference between the intervention and the control group in terms of medication use, healthcare utilization, asthma control or quality of life. However, post hoc analysis illustrated greater use of inhaled steroids, greater routine medical visits, higher patients' satisfaction, better quality of life and decrease use of short-acting β agonist with the intervention group. They authors concluded that although “the study did not find improved health outcomes in the primary analyses, the intervention was well accepted by providers” and “the individuals who participated in the calls appeared to have benefited from them.” More studies regarding automated telephone outreach interventions are needed to truly assess its value.

Raebel MA, Lyons EE, Chester EA, Bodily MA, Kelleher JA, Long CL, Miller C, Magid DJ. (2005). Improving laboratory monitoring at initiation of drug therapy in ambulatory care: a randomized trial. *Archives of Internal Medicine*, 165:2395-2401.

[Full Text](#)

Raebel et al. conducted a randomized trial to determine the impact of computerized medical alerts on laboratory monitoring at therapy initiation. Pharmacists and physicians worked in collaboration to develop specific guidelines for monitoring selected drugs and in alerting, reviewing and managing laboratory results. Monitoring occurred in 79.1% of the patients in the intervention group compared to 70.2% of usual-care patients. The authors concluded that healthcare collaboration with computerized tool is an effective mean of increasing laboratory monitoring at drug initiation.

Rickles NM, Svarstad BL, Statz-Paynter JL, Taylor LV, Kobak KA. (2005). Pharmacist telemonitoring of antidepressant use: effects on pharmacist-patient collaboration. *Journal of the American Pharmacists Association: JAPhA* 45(3):344-53.

[\[Abstract\]](#)

Rickles et al. conducted a randomized, controlled, unblinded, mixed experimental design to investigate the effect of telephone-based education and monitoring on multiple outcomes of pharmacist-patient collaboration. The intervention included three monthly phone calls either from pharmacists offering pharmacist-guided education and monitoring (PGEM) or usual pharmacist's care. The usual pharmacist's care was defined as education and monitoring that community pharmacist provided to patients. They found that PGEM group showed more positive "patient feedback, knowledge, medication beliefs and perceptions of program." Although, there was no statistically significant difference in adherence or symptoms at 3 months, there appeared to be greater compliance with the PGEM intervention at 6 months. The authors concluded that "antidepressant telemonitoring by community pharmacists can significantly and positively affect patient feedback and collaboration with pharmacists."

Simon SR, Soumerai SB. (2005). Failure of Internet-based audit and feedback to improve quality of care delivered by primary care residents. *International Journal for Quality in Health Care* 17:427-431.

[Full Text](#)

Simon et al. conducted a time-series analysis to examine the impact of internet-based audit and feedback on physicians' quality of care for diabetic and hypertensive patients. Over a one year period, only four of the 12 residents visited the websites, with three residents visiting the site only one time and one resident visiting it three times. They found that internet-based intervention had limited impact on patients' adherence; however, the development of more advance programs that involved physicians interacting with technology may improve quality of care.

Gonzales R, Sauaia A, Corbett KK, Maselli JH, Erbacher K, Leeman-Castillo BA, Darr CA, Houck PM. (2004). Antibiotic treatment of acute respiratory tract infections in the elderly: effect of a multidimensional educational intervention. *Journal of the American Geriatrics Society*, 52:39-45.

[\[Abstract\]](#)

Gonzales et al. conducted a prospective, nonrandomized controlled trial to determine and improve antibiotic use for acute respiratory tract infections (ARIs) in elderly population. Intervention included proper antibiotic use, mailed educational materials regarding antibiotics resistance, and education posters at intervention offices. Although antibiotic prescription rates varied slightly by age, sex or underlying chronic lung disease, it greatly differed by diagnosis. They also found that educational intervention had little impact on antibiotics prescription rate. The authors concluded that the "wide variation in antibiotic prescription rates suggests that quality improvement efforts are needed to optimize antibiotic use in the elderly."

Goff DC Jr., Gu L, Cantley LK, Sheedy DJ, Cohen SJ. (2003). Quality of care for secondary prevention for patients with coronary heart disease: results of the Hastening the Effective Application of Research through Technology (HEART) trial. *American Heart Journal* 146:1045-1051.

[\[Abstract\]](#)

Goff et al. examined the results of increasing use of -hydroxy-3methylglutaryl coenzyme A

(HMG CoA) reductase inhibitors, beta-blockers, and angiotensin-converting enzyme (ACE) inhibitors for secondary prevention of coronary heart disease (CHD) in Hastening the Effective Application of Research through Technology (HEART) trial. The intervention group included mailing guideline summaries, performance feedback reports, and chart reminders to patients. They found that all three medications increased with time, but usage of the HMG CoA decreased in the final year with no difference in medication use between the two groups. The authors concluded that more intensive intervention may be needed to improve patient outcomes for CHD.

Hoffman L, Enders J, Luo J, Segal R, Pippins J, Kimberlin C (2003). Impact of an antidepressant management program on medication adherence. *American Journal of Managed Care*, 9:70-80.

[Full Text](#)

Hoffman et al. performed a 6-months randomized, controlled, prospective study to assess the effect of mail-based physician and member educational interventions on patient compliance to antidepressant medications. The results showed that a monthly mail-based educational intervention discussing Health Plan Employer Data and Information Set (HEDIS) standards or providing educational materials had positive impact on patients' adherence to antidepressant medications.

Fendrick AM, Smith DG, Chernew ME, Shah SN. (2001). A benefit-based copay for prescription drugs: patient contribution based on total benefits, not drug acquisition cost. *American Journal of Managed Care*, 7:861-867.

[Full Text](#)

Fendrick et al. discussed a benefit-based copay system for prescription drugs, which determined cost of medications based on evidence-based clinical benefits to patients. Using this system, patients with higher potential benefit would have lower copays than patients that have lower potential benefit. The authors concluded that "implementation of such a system would provide a financial incentive for individuals to prioritize their out-of pocket drug expenditures based on the value of their medications, not their price."

Disease Management

Disease management interventions and programs use population-based approaches to treat and monitor persons with or at risk of chronic illness.⁹

Katon W, Russo J, Von Korff M, Lin E, Simon G, Bush T, Ludman E, Walker E. (2002). Long-term effects of a collaborative care intervention in persistently depressed primary care patients. *Journal of General Internal Medicine*, 17:741-748.

[Full Text](#)

Katon et al. conducted a randomized trial to compare the effects of stepped collaborative care and usual care on outcomes of patients suffering from depressive symptoms. They found that the implementation of collaborative management with a psychiatrist and a primary care physician effectively increased adherence without affecting cost in approximately two-thirds of patients.

Katon WJ, Von Korff M, Lin EH, Simon G, Ludman E, Russo J, Ciechanowski P, Walker E, Bush T. (2001). The Pathways Study: a randomized trial of collaborative care in patients with diabetes and depression. *Archives of General Psychiatry*, 61:1042-1049.

[Full Text](#)

Katon et al. performed a randomized trial to evaluate the effect of improving quality of care on patients with diabetes and depression. There were two groups, the intervention group and the control group. The participants of the intervention group received more education and support for their antidepressant treatments. Results showed that Pathways collaborative care model improved patients' outcomes with depression, but had no effect on glycemic control.

Unutzer J, Rubenstein L, Katon WJ, Tang L, Duan N, Lagomasino IT, Wells KB. (2001). Two-year effects of quality improvement programs on medication management for depression. *Archives of General Psychiatry*, 58:935-942.

[Full Text](#)

Unutzer et al. conducted randomized controlled studies to assess the effect of quality improvement (QI) programs on medication management for depression. There were three groups including the usual care, QI-therapy program and QI-medication program. The QI program involved a collaboration of trained experts and physician working together to improve patient quality of care. They found that both quality improvement programs for depression led to higher rate of antidepressant use; however, patients in the QI-medication program were also associated with reduction in long-term use of minor tranquilizers.

Finkelstein JA, Lozano P, Fuhlbrigge AL, Carey VJ, Inui TS, Soumerai SB, Sullivan SD, Wagner EH, Weiss ST, Weiss KB. (2005). Pediatric Asthma Care Patient Outcomes Research Team: Practice-level effects of interventions to improve asthma care in primary care settings: the Pediatric Asthma Care Patient Outcomes Research Team. *Health Serv Res*, 40:1737-1757.

[Full Text](#)

Finkelstein et al. assessed practice-level impacts of physician peer leader intervention and peer leaders in collaboration with asthma education nurses on patients' care and compared their findings with previous studies. Unlike past trials, the intervention had limited impact on

medication use at the practice level. In addition, the collaboration illustrated only slight increase in ambulatory asthma visits.

Lozano P, Finkelstein JA, Carey VJ, Wagner EH, Inui TS, Fuhlbrigge AL, Soumerai SB, Sullivan SD, Weiss ST, Weiss KB. (2004). A multisite randomized trial of the effects of physician education and organizational change in chronic-asthma care: health outcomes of the Pediatric Asthma Care Patient Outcomes Research Team II Study. *Archives of Pediatrics & Adolescent Medicine*, 158:875-883.

[Full Text](#)

Lozano et al. assessed the effect of two asthma care improvement strategies, peer leader education and planned care on chronic asthma care in children. Peer leader education consisted of training physicians regarding asthma guidelines and peer teaching methods and planned care was a combination of the peer leader program and nurse-mediated organizational change. They found that the execution of planned care appeared to be more effective than using solely peer leader education for enhancing asthma care in children.

Allison JE, Hurley LB, Hiatt RA, Levin TR, Ackerson LM, Lieu TA. (2003). A randomized controlled trial of test-and-treat strategy for *Helicobacter pylori*: clinical outcomes and health care costs in a managed care population receiving long-term acid suppression therapy for physician-diagnosed peptic ulcer disease. *Archives of Internal Medicine*, 163:1165-1171.

[Full Text](#)

Allison et al. conducted an open-label, randomized controlled trial to assess the clinical outcomes and costs of *Helicobacter pylori* (HP) test-and-treat strategy in patients that were receiving long-term therapy for peptic ulcer disease (PUD). They found that routinely testing and treating did significantly reduce the clinical symptoms and use of acid-reducing medications; however, it did not lower the overall cost of care for PUD.

Ofman JJ, Segal R, Russell WL, Cook DJ, Sandhu M, Maue SK, Lowenstein EH, Pourfarzib R, Blanchette E, Ellrodt G, Weingarten SR. (2003). A randomized trial of an acid-peptic disease management pro-gram in a managed care environment. *American Journal of Managed Care* 9(6):425-33.

[Full Text](#)

Ofman et al. conducted a cluster-randomized clinical trial to evaluate the impact of a disease management program in comparison to usual care for patients with acid-related disorders. The disease management program is a combination of academic detailing, evidence-based guidelines, and multidisciplinary teams. Results showed that the disease management program led to “improvement in *Helicobacter pylori* testing, use of recommended *H pylori* treatment regimens and discontinuation rates of proton pump therapy after treatment.” In addition, the disease management program had no impact in total cost but it did decrease usage of anti-secretory agents.

Ray WA, Daugherty JR, Meador KG. (2003). Effect of a mental health “carve-out” program on the continuity of antipsychotic therapy. *N Eng J Med*, 348:1885-1894.

[Full Text](#)

Ray et al. assessed the effect of a mental health “carve-out” program on the continuity of antipsychotic therapy in patients with mental illnesses. They found that the carve-out program led to a decrease use of antipsychotic medications. The authors concluded that both projected

cost reduction and clinical outcomes should be evaluated before implementing new programs to avoid adverse patients' care.

Katon W, Rutter C, Ludman EJ, et al. (2001). A randomized trial of relapse prevention of depression in primary care. *Arch Gen Psychiatry*. 58:241 -247.

[Full Text](#)

Katon et al. examined the impact of relapse prevention intervention program on patients with depression in primary care settings. The results showed that the patients participating in the intervention had significantly greater medication adherence and lower depressive symptoms when compared to the usual care patients.

Schoenbaum M, Unutzer J, Sherbourne C, et al. (2001). Cost-effectiveness of practice-initiated quality improvement for depression: results of a randomized controlled trial. *JAMA*. 286:1 325-1 330.

[Full Text](#)

Schoenbaum et al. conducted a randomized controlled trial to determine the cost-effectiveness of a practice quality improvement (QI) intervention on clinical outcomes and patient employment. The authors concluded that "societal cost-effectiveness of practice-initiated QI efforts for depression is comparable with that of accepted medical interventions."

Sherbourne CD, Wells KB, Duan NH, et al. (2001). Long-term effectiveness of disseminating quality improvement for depression in primary care. *Arch Gen Psychiatry*. 58:696-703.

[Full Text](#)

Sherbourne et al. evaluated the long-term effectiveness of two short-term quality improvement (QI) interventions relative to usual care (UC) for depression in primary care settings over a 2 year period. The two QI interventions included QI-meds and QI-therapy. They found that outcome improvement were not sustained over a full 2 years in any of the three groups. However, the results showed that the QI interventions led to better clinical outcomes compared to UC over a 12 months period and that "QI-therapy reduced overall poor outcomes compared with UC by about 8 percentage points throughout 2 years, and by 10 percentage points compared with QI-meds at 24 months." The authors concluded that incorporating "psychotherapy and medication treatment strategies in primary care have the potential for relatively long-term patient benefits."

Wagner EH, Grothaus LC, Sandhu N, et al. (2001). Chronic care clinics for diabetes in primary care: a system-wide randomized trial. *Diabetes Care*. 24:695-700.

[Full Text](#)

Wagner et al. evaluated the effect of chronic care clinics for diabetes in primary care. Patients were randomized to either chronic care clinics intervention or usual care group. The intervention group received standardized assessments, visits with healthcare professionals, group education and peer support meeting. The results showed that the intervention group was associated with better health status, greater primary care visits, and fewer emergency room visits. In addition, they also found the number of visits was positively correlated to patients' outcomes.

Hunkeler EM, Meresman JF, Hargreaves WA, et al. (2000). Efficacy of nurse telehealth care and peer support in augmenting treatment of depression in primary care. *Arch Fam Med*. 9:700-708.

[Full Text](#)

Hunkeler et al. conducted a randomized trial to examine the impact of usual care, telehealth care and telehealth care plus peer support on improving treatment of depression in two adult primary care clinics. The telehealth care system provided emotional support and behavioral intervention through ten 6 minute calls by nurses and the peer support included in-person and telephone contacts from a trained health plan members that had recovered from depression. The authors found that telehealth care alone was effective in improving clinical outcomes and patient satisfaction.

Johnston B, Wheeler L, Deuser J, Sousa KH. (2000). Outcomes of the Kaiser Permanente Tele-Home Health Research Project. *Arch Fam Med.* 9:40-45.

[Full Text](#)

Johnson et al. examined the impact of remote video technology in home health care setting on patient satisfaction, use, cost saving and quality indicators. The authors concluded that “remote video technology in the home healthcare setting was shown to be effective, well received by patients, capable of maintaining quality of care, and to have the potential for cost savings.”

Katzelnick DJ, Simon GE, Pearson SD, et al. (2000). Randomized trial of a depression management program in high utilizers of medical care. *Arch Fam Med.* 9:345-351.

[Full Text](#)

Katzelnick et al. performed a randomized clinical trial to examine the effect of offering a systematic primary care-based depression treatment program to depressed “high utilizers” that were not currently taking medications. The study included two groups, the depression management program (DMP) practice and the usual care (UC) group. The DMP program offered patient education, physician education, telephone-based treatment and antidepressant pharmacotherapy. Based on an intent-to-treat analysis, they found that 69.3% of DMP patients versus 18.5% of the UC patients filled at least 3 antidepressant prescriptions in the first 6 months. In addition, they also saw greater improvement in Ham-D score, mental health, social functioning and general health perceptions scales in the intervention group. The authors concluded that “systematic primary care-based treatment program can substantially increase adequate antidepressant treatment, decrease depression severity, and improve general health status compared with usual care in depressed high utilizers that are not already on active treatment.”

Kelly C, Rodgers PT. (2000). Implementation and evaluation of a pharmacist-managed diabetes service. *J Manag Care Pharm.* 6:488-493.

[Full Text](#)

Kelly et al. evaluated the effect of pharmacist intervention on clinical outcomes in diabetic patients. They found that a pharmacist-managed clinic resulted to lower HgA1c and trending toward lower systolic blood pressure, but had limited effect on lipid lowering. The authors concluded that pharmacist-managed clinic had a positive impact diabetic control.

Lin EH, Von Korff M, Russo J, et al. (2000). Can depression treatment in primary care reduce disability? A stepped care approach. *Arch Fam Med.* 9:1 052-1058.

[Full Text](#)

Lin et al. conducted a randomized controlled trial to evaluate the impact of stepped care intervention on patients suffering from depression. A multidisciplinary team of psychiatrist and primary care physician offered patient education, pharmacotherapy adjustment and proactive monitoring of clinical outcomes. Results showed that patients who received stepped collaborative care had small to moderate functional improvements.

Meredith LS, Jackson-Triche M, Duan NH, et al. (2000). Quality improvement for depression enhances long-term treatment knowledge for primary care clinicians. *J Gen Intern Med.* 15:868-877.

[Full Text](#)

Meredith et al. assessed the impact of quality improvement (QI) programs compared to usual care for depression on clinicians' knowledge about treatment. The QI-meds program included resources for nurse follow-up on medications use and the QI-therapy program provided reduced therapy copayment from local therapist. They found that the intervention increased clinicians' pharmacotherapy knowledge, but had limited effect on medication knowledge. In addition, they found that the knowledge score was higher in the QI-therapy group than the QI-meds group. The authors concluded that both QI programs for depression improved clinicians' treatment knowledge, but the program that incorporated therapist was more effective.

Price D, Beck A, Nimmer C, Bensen S. (2000). The treatment of anxiety disorders in a primary care HMO setting. *Psychiatr Q.* 71 :31-45.

[\[Abstract\]](#)

Price et al. examined the use of an integrated primary care/mental health model approach for patients with anxiety disorders. They found that the intervention led to a decrease in anxiety symptoms and higher patients' satisfaction.

Wells KB, Sherbourne C, Schoenbaum M, et al. (2000). Impact of disseminating quality improvement programs for depression in managed primary care: a randomized controlled trial. *JAMA.* 283:212-220.

[Full Text](#)

Wells et al. conducted a randomized controlled trial to evaluate the impact of QI programs on quality of care, health outcomes and employments for depressed patients. They found that QI programs did not affect overall medical visits, however, quality of care, mental health outcomes and employment retentions did improved in patients suffering from depression.

Coleman EA, Grothaus LC, Sandhu N, Wagner EH. (1999). Chronic care clinics: a randomized controlled trial of a new model of primary care for frail older adults. *J Am Geriatr Soc.* 47:775-783.

[\[Abstract\]](#)

Coleman et al. evaluated the Chronic Care Clinics, a new model of primary care in a randomized controlled trial to evaluate its impact on common geriatric syndromes. The intervention included half day chronic care clinics every 3 to 4 months, extended visits with physician and nurse, a pharmacist visit to increase medication knowledge, patient self-assessment and support group. They found that the intervention increased patients' satisfaction, but it did not improve outcomes for selected geriatric syndromes. The authors concluded that further studies are needed to properly manage and improve outcomes of geriatric syndromes.

Katon W, Von Korff M, Lin E, et al. (1999). Stepped collaborative care for primary care patients with persistent symptoms of depression: a randomized trial. *Arch Gen Psychiatry.* 56:1 109-1115.

[Full Text](#)

Katon et al. conducted a randomized trial to evaluate the impact of stepped collaborative care for patients with persistent symptoms of depression. The intervention group received enhanced education and increased rate of visits by a multidisciplinary team of psychiatrists and primary

care physicians. They found that a “multifaceted program targeted to patients whose depressive symptoms persisted 6 to 8 weeks after initiation of antidepressant medication by their primary care physician was found to significantly improve adherence to antidepressants, satisfaction with care, and depressive outcomes compared with usual care.”

Lin EH, Simon GE, Katon WJ, et al. (1999). Can enhanced acute-phase treatment of depression improve long-term outcomes? A report of randomized trials in primary care. *Am J Psychiatry.* 156:643-645.

[Full Text](#)

Lin et al. performed a 19-month follow-up assessment for the Collaborative Care intervention trial to evaluate the long-term effects of the enhanced acute-phase treatment on patients suffering from depression. Although the enhanced acute-phase treatment improved adherence and resulted to better clinical outcome at 4 and 7 months, it did not have a sustained effect over a 19 month period. The authors concluded that “continued enhancement of depression treatment may be needed to ensure better long-term results.”

Sadur CN, Moline N, Costa M, et al. (1999). Diabetes management in a health maintenance organization. Efficacy of care management using cluster visits. *Diabetes Care.* 22:201 1-2017.

[Full Text](#)

Sadur et al. examined the effectiveness of care management using cluster visit model for diabetic patients. They found that the 6-months cluster visit group model of care reduced healthcare utilization and improved glycemic control, self-efficacy, and patient satisfaction.

Aubert RE, Herman WH, Waters J, et al. (1998). Nurse case management to improve glycemic control in diabetic patients in a health maintenance organization. A randomized, controlled trial. *Ann Intern Med.* 129:605-612.

[\[Abstract\]](#)

Aubert et al. conducted a randomized controlled trial to evaluate the impact of nurse case management on diabetic patients. The patients were separated into two groups, the usual care and the intervention group which included a collaboration of primary care physicians, an endocrinologist and nurse case manager. They found that patients in the nurse care group presented a mean decrease of “1.7 percentage points in HbA1c values and 43 mg/dL (2.38 mmol/L) in fasting glucose levels” and “patients in the usual care group had decreases of 0.6 percentage points in HbA1c values and 15 mg/dL (0.83 mmol/L) in fasting glucose levels (P < 0.01).” There was also an increase in the self-reported health status with the intervention; however, there were no changes in the medication type, body weight, blood pressure, lipid level or adverse effects. The authors concluded that integrating nurse care with primary physicians and endocrinologists improved glycemic control in this diabetic population.

Rubin RJ, Dietrich KA, Hawk AD. (1998). Clinical and economic impact of implementing a comprehensive diabetes management program in managed care. *J Clin Endocrinol Metab;* 83:2635-2642.

[Full Text](#)

Rubin et al. performed a retrospective analysis to evaluate the clinical and economical impact of the Diabetes Treatment Centers of America’s Diabetes NetCareSM, (Nashville, TN), a comprehensive diabetes management program. They found that the Diabetes NetCareSM “achieved gross economic adjusted saving of \$50 per diabetic member per month (12.3%), with gross unadjusted saving of \$44 (10.9%) per diabetic member per month.” In addition, they also

found an 18% decrease in hospital admission and a 21% decrease in bed days and higher rates of HbA1c, foot, eye, and cholesterol screening in patients enrolled in the program. These results showed that a comprehensive diabetic management program was effective at reducing cost and improving clinical outcomes in the short-run. These improvements are projected to increase over time with the reduction in diabetic complications and improvement in health status.

Simon GE, Katon W, Rutter C, et al. (1998). Impact of improved depression treatment in primary care on daily functioning and disability. *Psychol Med.*28:693-701.

[\[Abstract\]](#)

Simon et al. evaluated the effect of collaborative management program on daily function and disability. The management program included patient education, on-site mental treatment, antidepressant medication adjustment, behavior activation and monitoring of medication adherence. Assessing data from 4 and 7 months illustrated fewer somatic symptoms and more favorable overall health with intervention, but none of these values were statistically significant. They found that an effective acute-phase depression treatment may reduce somatic symptoms and improve health status; however, many other factors can affect the overall outcomes.

Von Korff M, Katon W, Bush T, et al. (1998). Treatment costs, cost offset, and cost-effectiveness of collaborative management of depression. *Psychosom Med.* March/April 60:143-149.

[Full Text](#)

Von Korff et al. conducted two randomized, controlled trial to determine the treatment costs, cost offset and cost effectiveness of a collaborative management of depression. The first randomized trial consisted of consulting psychiatrists providing enhanced pharmacotherapy management and brief psychoeducational intervention to enhance adherence and the second randomized study evaluated the Collaborative Care program which included cognitive-behavior therapy and enhanced patient education by psychologists. The results showed that “Collaborative Care increased depression treatment costs and improved the cost-effectiveness of treatment for patients with major depression. A cost offset in specialty mental health costs, but not medical care costs, was observed.” They concluded that “Collaborative Care may provide a means of increasing the value of treatment services for major depression.”

Beck A, Scott J, Williams P, et al. (1997). A randomized trial of group out-patient visits for chronically ill older HMO members: the Cooperative Health Care Clinic. *J Am Geriatr Soc.* 45:543-549.

[\[Abstract\]](#)

Beck et al. conducted a randomized trial to compare the impact of group outpatient visits to traditional care among chronically ill patients. Intervention included monthly group visits discussing health education, prevention measures, opportunities for socialization, mutual support and consultation from physicians and nurses. They found that the group visits increased patient and physician satisfaction and reduced hospital admission and emergency visit, and cost of care.

Katon W, Robinson P, Von Korff M, et al. (1996). A multifaceted intervention to improve treatment of depression in primary care. *Arch Gen Psychiatry.* 53:924-932.

[\[Abstract\]](#)

Katon et al. evaluated the impact of multifaceted intervention for patients with depression in primary care. The participants of the intervention received structured depression treatment program that included behavioral treatment and counseling. They found that the multifaceted intervention increased patients’ adherence and satisfaction with care in patients with depression.

Nevertheless, the favorable outcomes were more defined among patients with major depression compared to patients with minor depression.

O'Connor PJ, Rush WA, Peterson J, et al. (1996). Continuous quality improvement can improve glycemic control for HMO patients with diabetes. *Arch Fam Med.* 5:502-506.

[Full Text](#)

O'Connor et al. assess the effect of a continuous quality improvement (CQI) program on glycemic control of diabetic patients in an 18 months study. The results showed that the collaboration of nurses, physicians and managers in the CQI process improved glycemic control without increasing healthcare utilization.

Franco K, Tamburino M, Campbell N, et al. (1995). The added costs of depression to medical care. *PharmacoEconomics.* 7(4): 284-291.

PMID: 10155318 [PubMed - indexed for MEDLINE]

[\[Abstract\]](#)

No abstract available

Katon W, Von Korff M, Lin E, et al. (1995). Collaborative management to achieve treatment guidelines. Impact on depression in primary care. *JAMA.* 273:1 026-1031.

[\[Abstract\]](#)

Katon et al. performed a randomized controlled trial to evaluate the effectiveness of a collaborative care management program when compared to usual care for patients suffering from depression in primary care. Patients in the intervention group received patient education, continued surveillance for medication adherence, and higher frequency and intensity of visits from a primary care physician and psychiatrist. They found that the patients in the collaborative care management group had better adherence to antidepressant regimens. There was higher satisfaction of care and more favorable outcomes in patients with major depression compared to patients with minor depression.

DeBusk RF, Miller NH, Superko HR, et al. (1994). A case-management system for coronary risk factor modification after acute myocardial infarction. *Ann Intern Med.* 120:721-729.

[\[Abstract\]](#)

DeBusk et al. conducted a randomized trial to measure the impact of a physician-directed, nurse-managed, home-based case-management systems for coronary risk factor modification after myocardial infarction. They found that the integrated care from the case-management system was more effective than usual care in modifying coronary risk factors.

The Diabetes Control and Complications Research Group. (1993). The effects of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med.* 329:977-986.

[Full Text](#)

The Diabetes Control and Complications Research Group examined the impact of intensive therapy compared to traditional therapy in patients with insulin-dependent diabetes mellitus (IDDM) over approximately 6.5 years. Intensive therapy included three or more daily insulin injections compared to conventional therapy which included one to two daily insulin injections. They found that intensive therapy “effectively delays the onset and slows the progression of diabetic retinopathy, nephropathy, and neuropathy in patients with IDDM.”

Katon W, Von Korff M, Lin E, Bush T, Ormel J. (1992). Adequacy and duration of antidepressant treatment in primary care. *Med Care.* 30:67-76.

[Abstract]

Katon et al. examined the use of antidepressant medications in primary care and found that there was a higher rate of refill for newer antidepressants compared to first-generation antidepressants. This increased adherence is likely due to the more favorable side effect profiles of the newer agents.

Collaborative Care Involving Pharmacists

Collaboration of pharmacists in the care of patients in managed care and other settings has been an approach used to improve quality of care and patient outcomes.¹⁰

Rehring TF, Stolcpart RS, Sandhoff BG, Merenich JA, Hollis HW Jr. (2006). Effect of a clinical pharmacy service on lipid control in patients with peripheral arterial disease. *Journal of Vascular Surgery*, 43:1205-1210.

[\[Abstract\]](#)

Rehring et al. evaluated the impact of a pharmacist-managed, physician-monitored approach to outpatient management of lipids in patients with peripheral artery disease. Patients in the intervention group had lower LDL and presented higher statin usage compared to patients obtaining usual care.

Straka RJ, Taheri R, Cooper SL, Smith JC. (2005). Achieving cholesterol target in a managed care organization (ACTION) trial. *Pharmacotherapy*, 25:360-371.

[\[Abstract\]](#)

Straka et al. conducted a prospective, multiclinic, controlled study to compare a collaborative approach using pharmacists to usual care for achieving a low-density lipoprotein (LDL) cholesterol goal in patients with coronary heart disease. They found that “after a mean of 6.5 months follow-up, 107 (72%) patients in the intervention group and 61 (18%) patients in the control group had attained their LDL goal ($p < 0.001$). Mean LDL levels were reduced by 35.6 mg/dl (27.5%) and 6.7 mg/dl (4.6%) in the intervention and control groups, respectively ($p < 0.001$). When the active program was discontinued, results of the 18-month follow-up indicated that 85 (65%) intervention patients remained at goal compared with 96 (42%) controls ($p < 0.001$).” The results provided quantitative evidences to support the collaborative approach to care in CHD patients that failed to meet LDL goals.

Borenstein JE, Graber G, Saltiel E, Wallace J, Ryu S, Archi J, Deutsch S, Weingarten SR. (2003). Physician-pharmacist comanagement of hypertension: a randomized, comparative trial. *Pharmacotherapy*, 23:209-216.

[\[Abstract\]](#)

Borenstein et al. performed a randomized, comparative trial to evaluate the impact of primary care physicians and clinical pharmacists’ co-management (PPCM) approach for hypertension. They found that patients in the PPCM group experienced greater reduction in systolic blood pressure and more achieved blood pressure goals compared to patients that obtained usual care. In addition, they also realized a reduction in average visit costs per patient with the PPCM program. The authors concluded that a PPCM approach improved clinical outcomes and reduced patients’ cost.

Finley PR, Rens HR, Pont JT, Gess SL, Louie C, Bull SA, Lee JY, Bero LA. (2003). Impact of a collaborative care model on depression in a primary care setting: a randomized controlled trial. *Pharmacotherapy*, 23:1 175-1185.

[\[Abstract\]](#)

Finley et al. evaluated the effect of a collaborative care model, which incorporated clinical pharmacists, for the treatment of depression in a primary care setting. The results showed that the

collaboration increased medication adherence, patients' satisfaction, and providers' satisfaction after 6 months.

Okamoto MP, Nakahiro RK. (2001). Pharmaco-economic evaluation of a pharmacist-managed hypertension clinic. *Pharmacotherapy*, 21:1337-1344.

[Abstract]

Okamoto et al. conducted a prospective, randomized, comparative study to assess the clinical, economic and humanistic outcomes of pharmacist-managed hypertensive clinics. A 6 months evaluation showed significantly lower blood pressure and higher patient satisfaction with pharmacist intervention. The authors concluded that pharmacist managed hypertension clinic improve clinical outcomes and patient satisfaction and may be a cost-effective alternative to physician care for hypertension.

Review Articles on Managed Care Pharmacy Interventions

Several review articles examined the evidence of several managed care pharmacy tools or interventions examining different aims of the tools. The reviews cut across many of the interventions or tools described in this bibliography, as well as additional interventions not specifically addressed here.

Carroll, N. (2002). How Effectively Do Managed Care Organizations Influence Prescribing and Dispensing Decisions? *The American Journal of Managed Care*, 8(12).

[Full Text](#)

Carroll conducted a review of the literature from 1966 – 2001 on formularies, therapeutic interchange, and prior approval to examine the extent to which managed care organizations (MCOs) use these tools and to determine how effectively these tools influence prescribing and dispensing decisions. From their review they concluded that “most MCOs have had limited success using these tools to influence prescribing and dispensing decisions, although the tools have been effective in some situations, their impacts was limited by low utilization.”

Gibson, TB et al. (2005). The Effects of Prescription Drug Cost Sharing: A Review of the Evidence. *The American Journal of Managed Care*, 11(11).

[Full Text](#)

Gibson et al. conducted a review of the literature from 1974 – 2005 to determine whether patients response to prescription drug cost sharing, and to examine the relationship between cost sharing on medication utilization, health outcomes, adherence, and costs. From their review, they concluded that “costs sharing reduced the consumption of prescription drugs but may have had unintended consequences on the process and outcomes of therapy.”

Lu, C. et al. (2008). Interventions Designed to Improve the Quality and Efficiency of Medication Use in Managed Care: A Critical Review of the Literature- 2001-2007. *BioMed Central Health Services Research*, 8(75).

[Full Text](#)

Lu et al conducted a review of the literature from 2001 – 2007 to update the review conducted by Pearson et al. (2003) on interventions to improve the quality and efficiency of medication use. From their review, Lu et al. concluded that several strategies have evidence of effectiveness, but little is known about the cost-effectiveness of these interventions, and “few well-designed studies have assessed the potential negative clinical effects of formulary-related interventions despite their widespread use.”

McAdam-Marx, C et al. (2008). Systematic Analysis of Outcomes Evaluations Applied to Drug Management Programs. *The American Journal of Managed Care*, 14(11):SP36-SP45.

[Full Text](#)

McAdam-Marx et al. examined 77 studies from 1996 – 2007 that evaluated the drug management programs of managed care. The authors concluded from their evaluation of prior analyses, that “while the number of studies evaluating drug management programs has trended upward, only a handful have examined economic, clinical, and/or humanistic outcomes” when evaluating the effects of drug management programs.

Olson, BM. (2003). Approaches to pharmacy benefit management and the impact of consumer cost sharing. *Clinical Therapeutics*. 25(1):250-272.

[\[Abstract\]](#)

Olson conducted a review of the literature from 1966 – 2002 on approaches to pharmacy benefit management and the impact of such programs. The review includes literature on prior authorization, drug utilization review, tiered approaches, and formulary management.

Pearson, SA et al. (2003). Changing Medication Use in Managed Care: A Critical Review of the Available Evidence. *The American Journal of Managed Care*, 9:715-731.

[Full Text](#)

Pearson et al. conducted a review of the literature from 1966 – 2001 on the “effectiveness of strategies to improve the quality and efficiency of medication use in managed care organizations.” From their review, they concluded that high-quality studies of interventions to improve medication use in managed care are increasing in frequency. They also concluded that while there is evidence of effectiveness of several strategies, little is known about the longer-term clinical outcomes. Lastly, they concluded that there are “few well-designed, published studies assessing the efficacy and safety of financial incentives for physicians, tiered copayments for patients, or formularies – despite their widespread use.”