Technical Appendix

IMPROVING QUALITY *and* VALUE *in the* U.S.

Health Care System

August 2009

BIPARTISAN POLICY CENTER

THE LEADERS' PROJECT
On the State of American Health Care

Preamble

The Bipartisan Policy Center (BPC) is a public policy advocacy organization founded by former U.S. Senate Majority Leaders Howard Baker, Tom Daschle, Bob Dole, and George Mitchell. Its mission is to develop and promote solutions that can attract the public support and political momentum to achieve real progress. The BPC acts as an incubator for policy efforts that engage top political figures, advocates, academics, and business leaders in the art of principled compromise.

This report is part of a series commissioned by the BPC to advance the substantive work of the Leaders' Project on the State of American Health Care. It is intended to explore policy trade-offs and analyze the major decisions involved in improving health care delivery, and discuss them in the broader context of health reform. It does not necessarily reflect the views or opinions of Senators Baker, Daschle, and Dole or the BPC's Board of Directors.

The Leaders' Project was launched in March 2008. Co-Directed by Mark B. McClellan and Chris Jennings, its mission is (1) to create a bipartisan plan for health reform that can be used to transform the U.S. health care system, and (2) to demonstrate that health reform is an achievable political reality. Over the course of the project, Senators Baker, Daschle, and Dole hosted public policy forums across the country, and orchestrated a targeted outreach campaign to Members of Congress, the Administration, and key health care constituencies. In June 2009, they released the Project's final report entitled, *Crossing Our Lines: Working Together to Reform the U.S. Health System,* which includes a slate of comprehensive policy recommendations to address the delivery, cost, coverage, and financing challenges facing the nation's health system. For more information, please visit www.bipartisanpolicy.org

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Robert Wood Johnson Foundation

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Appendix I
Table of Studies

Disease Management

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
ASTHMA		
M.B. Bolton et al., "The cost and effectiveness of an education program for adults who have asthma," *Journal of General Internal Medicine* 6, no. 5 (1991): 401-407.	Adults (18- 70 years of age) with asthma	Provision of educational sessions on asthma that focused on medication compliance, methods to control and prevent attacks, effects of drugs and rationale for their use, relaxation exercises, and smoking cessation by a specially trained RN. Educational sessions were in addition to usual medical care and ED visit follow-up.
A.M. Butz et al., "Effectiveness of nebulizer use-targeted asthma education on underserved children with asthma," *Archives of Pediatrics & Adolescent Medicine* 160, no. 6 (2006): 622-668.	Children (2-9 years of age) with persistent asthma, regular nebulizer use, and an ED visit or hospitalization within the past 12 months	Use of home-based asthma education, including symptom recognition, home treatment of acute symptoms, appropriate asthma medication, and nebulizer practice.
M. Castro et al., "Asthma intervention program prevents readmissions in high healthcare users," *American Journal of Respiratory & Critical Care Medicine* 168, no. 9 (2003):1095-1099.	Adult (predominantly young African American women) hospitalized with an asthma exacerbation, who had a history of frequent healthcare use	Use of asthma nurse specialist in hospital to provide guideline-based recommendations to physicians, and self-management education, psychosocial support, and follow-up care to patients.
J.A. Finkelstein et al., "Practice-level effects of interventions to improve asthma care in primary care settings: the Pediatric Asthma Care Patient Outcomes Research Team," *Health Services Research* 40, No. 6, Part 1 (2005): 1737-1757.	Children (5-17 years of age) with asthma in primary care practices affiliated with managed health care plans	Use of physician peer leader interventions or peer leaders in combination with the introduction of asthma education nurses to facilitate care improvement.
Z. Harish et al., "A comprehensive inner-city asthma program reduces hospital and emergency room utilization," *Annals of Allergy, Asthma, & Immunology* 86, no. 2 (2001):185-189.	Children (2-17 years of age) being treated for asthma in the pediatric ED	Use of specialty clinic to provide comprehensive asthma program, including education, close monitoring, and 24-hour availability.
J.W. Krieger et al., "The Seattle-King County Healthy Homes Project: a randomized, controlled trial of a community health worker intervention to decrease exposure to indoor asthma triggers," *American Journal of Public Health* 95, no. 4 (2005): 652-659.	Children (4-12 years of age, low-income) with asthma	Use of community health workers to provided in-home environmental assessments, generate and encourage completion of action plans, provide education and social support, deliver resources to reduce exposures, and advocate for improved housing conditions (including roach and rodent eradication). Free skin prick allergy testing available at multiple clinic sites and at special asthma fairs.
S. Krishna et al, "Internet enabled interactive multimedia asthma education program: a randomized trial," *Pediatrics* 111, no. 3 (2003): 503-510.	Children (younger than 18 years of age) with asthma	Provision of an interactive asthma control and tracking computer program to children and families during routine office visits in addition to conventional patient education. The program covered the basic pathophysiology of asthma, environmental triggers, quick-relief and control medicines, and strategies to control and manage asthma; incorporated principles of self-management in an interactive format; and tracked participants' completion and mastery of lessons.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
1 year	**Utilization:** Reduction in asthma-related ED visits in intervention group (16 visits per 100 persons vs. 39 visits). **Cost:** $85 per person cost for the educational sessions was offset by the $628 per person reduction in emergency room charges.	Randomized controlled trial
1 year	**Utilization:** No significant differences in ED visits or hospitalizations. **Quality:** No significant differences in home nebulizer practice, or asthma morbidity.	Randomized controlled trial
September 1996-July 1999	**Utilization:** 60% reduction in total hospitalizations, with no significant change in ED visits. Readmissions for asthma reduced by 54%. Reduction in lost work or school days (246 vs. 1,040 days in the control group). **Cost:** 67% decrease in asthma-relatedhospital costs. $6,462 per patient reduction in direct and indirect healthcare costs.	Prospective randomized controlled trial
2 years	**Utilization:** The proportion of children with persistent asthma prescribed controllers increased in all study arms. No statistically significant differences between intervention and control groups in the proportion of patients dispensed a single controller or dispensed these medicines chronically. 8-10% increase in ambulatory care beyond control group in first year. No statistically significant differences in ambulatory care in second year. No statistically significant difference in ED visits or hospitalizations.	Primary care practices were randomly assigned to one of two care improvement arms or to usual care. Automated claims data were analyzed for 12-month periods using a repeated cross-sectional design.
2 years	**Utilization:** 69% reduction in year 1 ED visits. 60% reduction in year 2 ED visits. No significant different in hospitalizations	Prospective randomized controlled trial
1 year	**Utilization:** 15% reduction in combined asthma related urgent health services use (ED, hospital, or unscheduled clinic visit). **Cost:** $189–$721 in projected 4-year net savings per child among the high-intensity group relative to the low-intensity group.	Randomized controlled trial
1 year	**Utilization:** Significant decrease in annual ED visits in intervention group (1.93 vs 0.62 per year). **Quality:** Significant decrease in days with asthma symptoms in intervention group (81 vs. 51 per year). Significant decreases in the average daily dose of ICS used by intervention group at visit 3 (434 vs. 754 µg), although doses were similar at visit 1 (353 vs. 351 µg).	Randomized controlled trial

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
ASTHMA		
L.F. Rossiter et al., "The Impact of Disease Management on Outcomes and Cost of Care: A Study of Low-Income Asthma Patients," *Inquiry* 37, no. 2 (2000): 188-202.	Children and adults with children enrolled in a primary care case management program	Participation in a voluntary, intensive, asthma education program for physicians. Key elements include: training in communication skills (special focus on asthma), provision of information on advances in clinical practice and medications, and periodic feedback on emergency service encounters for their asthma patients enrolled in the program.
S.R. Smith et al., "Improving follow-up for children with asthma after an Acute Emergency Department visit," *Journal of Pediatrics* 145, no. 6 (2004): 772-777.	Children (2-12 years of age, low-income) who were treated for asthma in the ED and had Medicaid or no insurance	Use of telephone-coaching and monetary incentives targeting caregivers to encourage post-ED visit follow-up care from a PCP.
CONGESTIVE HEART FAILURE		
A.D. Galbreath et al., "Long-Term Health Care and Cost Outcomes of Disease Management in a Large, Randomized, Community-Based Population with Heart Failure," *Circulation* 110 (2004): 1-9.	Adults (18 years of age and older) with symptoms of CHF and documented systolic or diastolic dysfunction	Participation in a telephonic disease management program executed by a cardiac-trained RNs in conjunction with a PCP. RNs provide patient education and medication management, including instruction on diet, medication compliance, exercise, and signs of CHF exacerbation. Support also included a 24-hour-a-day, 7-day-a-week toll-free hotline, educational material on CHF self-management, and smoking cessation.
D.S. Krause, "Economic effectiveness of disease management programs: a meta-analysis," *Disease Management* 8, no. 2 (2005): 114-134.	Various study populations	Participation in a disease management programs for asthma, diabetes, and heart disease.
M.W. Rich et al., "A Multidisciplinary Intervention to Prevent the Readmission of Elderly Patients with Congestive Heart Failure," *New England Journal of Medicine* 333, no. 18 (1995): 1190-1195.	High-risk adult (70 years of age and older) who were hospitalized with CHF	Participation in a nurse-directed, multidisciplinary intervention consisting of comprehensive patient and family education, a prescribed diet, social-service consultation and planning for early discharge, a review of medications, and intensive follow-up.
B. Riegel et al., "Which Patients with Heart Failure Respond Best to Multidisciplinary Disease Management?" *Journal of Cardiac Failure* 6, no. 4 (2000): 290-299	Elderly adults who were hospitalized and had a confirmed clinical diagnosis of heart failure	Participation in a telephonic case management program executed by RNs using decision support software program that identifies factors shown to predict hospitalization in persons with CHF and uses automated tools to set setting priorities for patient education, data collection, and documentation. Patients also receive monthly educational mailings and physicians were sent automated reports produced by the software that updated them on patient progress and were telephoned by the case managers as needed.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
July 1995-March 1997	**Utilization:** 41% decrease in ED visit claims from same quarter a year earlier in intervention group (vs. 18% in control group). 6% decrease in ED visit rates for all intervention community physicians among moderate-to-severe asthma patients. 25% increase in distribution of some recommended asthma drugs. **Cost:** Cost-effectiveness analysis projected direct savings to Medicaid of $3 to $4 for every incremental dollar spent providing disease management support to physicians.	Intervention area-comparison area
6 months	**Utilization:** No statistically significant difference in number of ED visits or hospitalizations. Significant increase in asthma-planning visits. **Quality:** Significant decrease in asthma symptoms shortly after asthma ED visits.	Prospective randomized controlled trial
1.5 years	**Utilization:** No statistically significant decrease in total healthcare utilization, CHF-related healthcare utilization, including drug use, office visits, ED visits, procedures, or hospitalizations **Cost:** No statistically significant decreases in total heath care costs. **Quality:** Statistically significant reduction in mortality in intervention group; patients in the intervention group lived approximately 76 days longer than patients in the control group;. No statistically significant effect on cardiac event–free survival.	Single-center randomized controlled clinical trial
Reviewed studies from January 1995-September 2003	**Costs:** Magnitude of average effect size for equally weighted studies was 0.311. No statistically significant differences in effect sizes by study design, disease type and intensity of disease management program interventions when disease severity was taken into consideration. Results suggest that disease management programs are more economically effective with severely ill enrollees and that chronic disease interventions are most effective when coordinated with disease severity.	Meta-analysis; the authors quantitatively analyzed publicly available empirical studies related to the economic effectiveness of chronic disease management programs for the period between January 1995 and September 2003.
Study ran from July 1990-June 1994; patient tracked 90 days following hospital discharge	**Utilization:** Statistically significant difference in 90 day survival without readmission in intervention group among survivors of initial hospitalization (66.9% in intervention group vs. 54.3% in control). 44.4% reduction in total number of readmissions during follow-up. 35.7% reduction in total number of days of hospitalization. 56.2% reduction in readmissions for heart failure. **Costs:** Average intervention cost at $216 per patient, with overall cost of care reduced by $460 per patient ($153 per patient per month). Quality: Quality-of-life scores at 90 days improved more for a subgroup of 126 patients in the treatment group (P=0.001).	Prospective randomized trial
6 months	**Utilization:** 45.7% reduction in HF re-hospitalization rates at 3 months compared to control group. 47.8% reduction at 6 months. **Cost:** 45.5% reduction in inpatient HF costs at 6 months with no evidence of cost shifting to outpatient setting. Savings per patient estimated at $1,000, with intervention cost was $443, for an ROI of 2.26. **Quality:** Patient satisfaction with care was higher in intervention group.	Randomized controlled trial

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
DIABETES		
R.E. Aubert et al., "Nurse Case Management to Improve Glycemic Control in Diabetic Patients in a Health Maintenance Organization," *Annals of Internal Medicine* 129, no. 8 (1998): 605-612.	Patients with type 1 or type 2 diabetes	Use of written algorithms specific to diabetes type by nurse case managers to help manage diabetic patients. Patients' PCPs were kept informed of changes to the patients' treatment regimens.
Centers for Disease Control (CDC), "Cost-Effectiveness of Intensive Glycemic Control, Intensified Hypertension Control, and Serum Cholesterol Level Reduction for Type 2 Diabetes," *Journal of the American Medical Association* 287, no. 19 (2002): 2542-2551.	Hypothetical cohort of adults (ages 25 years or older) who were newly diagnosed with type 2 diabetes	Use of insulin or sulfonylurea therapy for intensive glycemic control; angiotensin-converting enzyme inhibitor or β-blocker for intensified hypertension control; and pravastatin for reduction of serum cholesterol level.
E. S. Domurat, "Diabetes Managed Care and Clinical Outcomes: The Harbor City, California Kaiser Permanente Diabetes Care System," *American Journal of Managed Care* 5, no. 10 (1999): 1299-1307.	High risk diabetic patients	Use of a diabetes care management program for high risk patients consisting of a variety of healthcare providers focusing on different aspects of care, including regular exams and follow-up, with the aid of a computerized tracking system.
A. Elixhauser et al., "Cost-benefit analysis of preconception care for women with established diabetes mellitus," *Diabetes Care* 16, no. 8 (1993): 1146–57.	Pregnant women with preexisting diabetes mellitus	Use of team-based health coaching and monitoring during preconception to reduce problems that may occur during pregnancy or birth.
W.H. Gomaa, T. Morrow and P. Muntendam, "Technology-Based Disease Management: A Low-Cost, High-Value Solution for the Management of Chronic Disease," *Disease Management Health Outcomes* 9, no. 10 (2001): 577-588	Private- health plan members with diabetes, asthma, CHF, or coronary artery disease.	Use of mail, internet, and interactive voice response (IVR) services with limited nurse interventions to engage patients and intervene in their care. Program risk stratifies patients based on clinical status and ability to self manage care, tracks progress, and determines the follow-up activities. Patients receive personalized feedback booklet as part of a care kit.
D.C. Klonoff and D.M. Schwartz, "An Economic Analysis of Interventions for Diabetes," *Diabetes Care* 23, no. 3 (2000): 390-404.	Patients with diabetes receiving one or more common interventions to control diabetes	Use of popular diabetes interventions, including eye care, case management, self-management, and exercise.
W.P. Munroe et al., "Economic Evaluation of Pharmacist Involvement in Disease Management in a Community Pharmacy Setting," *Clinical Therapeutics* 19, no. 1 (1997): 113-123.	Adults with hypertension, diabetes, asthma, and/or hypercholesterolemia	Use of patient-focused pharmacy-based disease management program. Specially trained pharmacists provide targeted patient education, perform systematic patient monitoring, offer feedback and behavior modification, and communicate regularly with patients' physicians to enable early intervention for drug-related problems.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
1 year	**Quality:** 1.7 % decrease in HbA1C in intervention group (vs. 0.60% in control group). 43 mg/dL decline in fasting glucose level in intervention group (vs. 15 mg/dL). The intervention group reported being in better health than the control group.	Randomized, controlled trial
n/a (hypothetical cohort)	**Cost/Quality:** Incremental cost-effectiveness ratio for intensive glycemic control at $41,384 per QALY; ratio increased with age at diagnosis ($9614 per QALY for patients aged 25 to 34 years vs. $2.1 million for patients aged 85 to 94 years). Cost-effectiveness ratio for intensified hypertension control at -$1,959 per QALY. Cost effectiveness ratio for reduction in serum cholesterol level at $51,889 per QALY; ratio varied by age at diagnosis and is lowest for patients diagnosed between ages 45 to 84.	Cost-effectiveness analysis of a hypothetical cohort using a Markov model
2 years	**Utilization:** Increase in screening rates for HbA1C, serum lipids and urine protein in intervention group. Decrease in inpatient utilization for long-term patients in intervention group. **Quality:** Decrease in HBA1c levels in both groups at time of follow up; however, subsequent decrease of elevated blood pressure only in the intervention group.	Retrospective matched cohort study with two control groups: usual care patients and patients who dropped out of the DM program.
Various study and survey lengths	**Cost:** Although the costs of preconception and prenatal care ($17,519 per delivery) are $3,676 more per delivery than the cost of prenatal care alone ($13,843 per delivery), the intervention produces a net savings of $1,720 per enrollee due to lower rates of adverse events.	Literature reviews, consensus from an expert physician panel, and surveys of health care professionals to gain information about the costs and benefits of preconception.
12 months	**Utilization:** 55.2% increase in diabetic patients receiving glycosylated hemoglobin A1c test, and 27% self-reported increase in the use of low-dose aspirin for participants with a cardiovascular condition in intervention group. **Cost:** Per member per year savings ranged from $US300 to $US1000 depending on the specific disease state. In all cases, the programs demonstrated a significant positive gross saving.	Quasi-experimental pre-post design, comparing changes in health outcomes and costs at baseline (1999) and one year later (2000).
Reviewed studies from January 1984-December 1997	None of the interventions reviewed by the authors were deemed non-cost effective, but the economic outcome of most of the interventions was classified as unclear. **Utilization:** 30% fewer hospital admissions per 1,000 members in the intervention group care and pre-conception care were noted to be clearly cost-saving, while self-management training and preventing kidney disease in type 2 diabetics were seen as clearly cost-effective.	
September 1993-January 1995	**Cost:** Savings in total monthly medical costs, ranging from $143.95 per patient per month to $293.39 per patient per month when controlling for age, comorbid conditions, and disease severity.	Used insurance claim data to monitor health care costs in two populations of patients, one receiving disease management services and the other receiving traditional pharmacy services. Control and intervention sites were matched as closely as possible with respect to the distribution of patients with each of the four target diseases, patient age, and prescription volume.

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
DIABETES		
S.L. Norris et al., "The Effectiveness of Disease and Case Management for People with Diabetes: A Systematic Review," *American Journal of Preventive Medicine* 22, no. 4 (2002): 15-38.	Various study populations	Use of disease management on glycemic control, including screenings for diabetic retinopathy, foot lesions and peripheral neuropathy, and proteinuria, and monitoring of lipid concentrations.
J. Sidorov et al., "Does Diabetes Disease Management Save Money and Improve Outcomes?," *Diabetes Care* 25, no. 4 (2002): 684-689.	Adults who fulfilled HEDIS criteria for diabetes and were in a HMO-sponsored disease management program	Use of disease management program, including promotion of diabetes clinical guidelines by nurses to PCPs and patients, HMO sponsored CME sessions for PCPs, early and appropriate specialty clinic referral, and primary care site–based patient education and case management by the HMO nurses. Free one-time provision of a glucose meter and 100 glucose meter strips.
V.G. Villagra and T. Ahmed, "Effectiveness of a Disease Management Program for Patients with Diabetes," *Health Affairs* 23, no. 4 (2004): 255-266.	Adults with diabetes enrolled in HMO or point-of-service plans	Use of telephonic disease management program, web-based patient education, home remote patient monitoring devices, and reminders and educational mailings for patients, with mail, fax, or telephone progress reports to PCPs.
E.H. Wagner et al., "Chronic Care Clinics for Diabetes in Primary Care," *Diabetes Care* 25, no. 4 (2001): 695-700.	Adults (30 years of age and older) with diabetes in a large HMO	Use of chronic-care and primary-care clinics to provide patient education and counseling and visits by several health care professionals

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
Reviewed literature through December 2000 using the MEDLINE database	**Utilization:** GHb improved in 18 of 19 studies, with a median net change of 0.5%. Strong evidence of improvement in the percent of providers performing annual monitoring of GHb and for retinopathy screening. Sufficient evidence of improvement in screening by providers for foot lesions or peripheral neuropathy, lipid concentrations, and proteinuria. When case management is delivered along with disease management, sufficient evidence of improvement in provider monitoring of GHb. **Cost:** With the exception of one study, there is no evidence of direct cost savings from improved glycemic control. **Quality:** Insufficient evidence on the effectiveness of disease management on other patient outcomes, including weight and body mass index, blood pressure, and lipid concentrations.	Systematic review of the effectiveness and economic efficiency of disease management and case management for people with diabetes
2 year	**Utilization:** Reduced inpatient health care use in intervention group (mean of 0.12 admissions and 0.56 inpatient days per patient per year) compared to control group (mean of 0.16 admissions and 0.98 inpatient days). Reduced ED visits in intervention group (0.49 per member per year vs. 0.56 in control group). Increased primary care visits in intervention group (8.36 vs. 7.78 in control group). Improved HEDIS scores for HbA1c testing (96.6%), and lipid (91.1%), eye (79.1%), and kidney screenings (68.5%) in intervention group (vs. 83.8, 77.6, 64.9, and 39.3% in control group). **Cost**: $394.62 per patient per month paid claims for program patients (vs. $502.48 in control group) for an estimated savings of $107.86 per patient per month over two years. **Quality:** Among patients with HbA1c levels measured in a HEDIS chart audit, 6.7% in intervention group had a HbA1c level > 9.5% (vs.14.4% in control group.	Retrospective analysis of paid health care claims and other measures of health care use over 2 years among continuously enrolled Geisinger Health Plan patients. Comparison of HEDIS data on HbA1c testing, percent not in control, lipid testing, diabetic eye screening, and kidney disease screening.
1 year	**Utilization:** 30% fewer hospital admissions per 1,000 members in the intervention group. **Cost:** Per member per months costs in the intervention group ($417) were $137 lower than the control group ($554). The intervention group spent $9.02 (7.6%) less on pharmaceuticals, and inpatient costs were $17 (11.4%) lower. However, pharmacy costs rose in the intervention group from baseline to the conclusion of the study. **Quality:** Improvement in quality indicators for dilated retinal exam, microalbumin testing, lipid testing, and tobacco use in intervention group.	Quasi-experimental , with pre-post comparison and geographic controls (when available)
2 years	**Utilization:** Increase in recommended preventive services and primary care visits in intervention group compared to control group. Decrease in specialist and ED visits in intervention group compared to control group. **Quality:** Better general health and fewer days confined to bed reported by those in intervention group. No significant improvement in HBA1c and cholesterol levels in intervention group compared to control group.	Practice-level randomized, controlled trial

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
DIABETES		
J.L. Wolff et al. "Prevalence, Expenditures, and Complications of Multiple Chronic Conditions in the Elderly," *Archives of Internal Medicine* 162, no. 20 (2002): 2269-2276.	Obese patients with type 2 diabetes	Use of case-management services, including in-person and telephonic support and education.
REVIEW		
T. Bodenheimer, E.H. Wagner, and K. Grumbach, "Improving Primary Care for Patients with Chronic Illness, Part 2," *Journal of the American Medical Association* 288, no. 15 (2002): 1909-1914.	Elderly adults with diabetes	The most common interventions were disease self-management support, education of and meetings with physicians, use of care managers or teams, and reminder and feedback systems for physician performance.

Care Coordination

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
CONROLLED INTERVENTION TRIALS		
M.S. Bauer et al., "Collaborative Care for Bipolar Disorder: Part II. Impact on Clinical Outcome, Function, and Costs," *Psychiatric Services 57, no. 7 (2006): 937-945.*	Veterans with bipolar disorder	Use of group psychoeducation to enhance patient self-management skills. Use of clinician decision support with simplified practice guidelines and nurse care coordinators to improve access to care, continuity of care, and information flow.
N.R. Chumbler et al., "Health Services Utilization of Care Coordination/Home-Telehealth Program for Veterans with Diabetes," *Journal of Ambulatory Care Management* 28, no. 3 (2005): 230-240.	High-risk veterans with diabetes who were hospitalized or visited the ED two or more times in the past year.	Use of nurse care coordinators to manage treatments, monitor health status with a telehealth system, teach self-management, and facilitate "just-in-time" primary care visits when symptoms worsened..
E.A. Coleman et al., "Preparing Patients and Caregivers to Participate in Care Delivered Across Settings: The Care Transitions Intervention," *Journal of American Geriatric Society* 52, no. 11 (2004): 1817-1825.	Elderly adults living in community after hospital stay	Use of transition coach to support transitions from hospital to home. The coach coordinated medication management, record-keeping, doctor follow-up, and education about warning symptoms with patients and caregivers.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
1 year	**Utilization:** Decreased use of medications (mostly diabetes medications) in intervention group by 0.8 medications compared to control group **Cost:** The intervention cost $350 per person. **Quality:** Greater weight loss and decrease in waist circumference at month-12 than control group. Improvements in HbA1c levels was greatest at four months; by month-12, the difference was no longer statistically significant. Improvements in seven out of nine quality-of-life domains in intervention group compared to control.	Randomized, controlled trial
Various study lengths	**Utilization:** 16 of 20 studies that included process measures showed improvement. **Costs:** Mixed evidence on whether reforms can lower health care use and costs. **Quality:** 20 of 28 studies that included outcome measures showed improvement	Systematic review of 39 studies in which health care providers implemented elements of the Chronic Care Model. Studies reviewed included controlled before-and-after trials and randomized controlled trials.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
3 years	**Cost:** Three-year costs, including the cost of the intervention, were insignificantly lower. **Quality:** 14% decrease (6.2 weeks) in affective episode and 23%decrease (4.5 weeks) in manic episode. Functional outcomes improved across the board, usually significantly. SF-36 quality of life scored improved significantly.	Randomized Controlled Trial
1 year	**Utilization:** No significant differences in changes in hospitalization between intervention and control group. Need-based primary care visits (which the intervention directly targeted) were significantly higher for treatment group, but ED visits were also significantly higher for the treatment group.	Retrospective matched cohort control group chosen based on the same inclusion criteria as the treatment group. Propensity score matching and controlling for baseline HbA1c scores were also used in comparisons.
Transition coaching for 24 days after hospital discharge, followed by 180 days of observation	**Utilization:** Post discharge hospital use at 30, 90, and 180 days was significantly and substantially lower versus control group (odds ratios of 0.52, 0.43, and 0.57).	Intervention group voluntarily agreed to participate in the study, but was otherwise generated similarly to the administrative data control group and risk-adjusted comparison was performed. Patients who refused to participate were little different from nonparticipants in age, sex or admitting diagnosis.

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
CONROLLED INTERVENTION TRIALS		
E.A. Coleman et al., "The Care Transitions Intervention: Results of a Randomized Controlled Trial," *Archives of Internal Medicine* 166, no. 17 (2006): 1822-1828.	Elderly adults living in community after hospital stay	Use of transition coach to support transitions from hospital to home. The coach coordinated medication management, record-keeping, doctor follow-up, and education about warning symptoms with patients and caregivers.
S.R. Counsell et al., "Geriatric Care Management for Low-Income Seniors: A Randomized Controlled Trial," *Journal of the American Medical Association* 298, no. 22 (2007): 2623-2633.	Low-income elderly adults living in community	Use of nurse practitioner and social worker to coordinate home-based care in collaboration with a PCP and geriatrics team.
D.A. Dorr et al., "Implementing a Multi-disease Chronic Care Model in Primary Care Using People and Technology." *Disease Management* 9, no. 1 (2006): 1-15.	Patients with chronic disease treated at multi-payer primary care clinics	Use of care managers to coordinate patient treatment among physicians and other providers. Use of electronic health records to augment information flow and make it available at the point of care.
M. Dwight-Johnson, K. Ell, and P. Lee, "Can Collaborative Care Address the Needs of Low-Income Latinas with Comorbid Depression and Cancer? Results from a Randomized Pilot Study," *Psychosomatics* 46, no. 3 (2005): 224-232.	Low-income Latinas with depression and cancer	Use of a multifaceted oncology depression program that included regular contact with a social worker trained to provide manualized psychotherapy (problem-solving therapy), support antidepressant medication adherence, and assist with systems navigation. The social worker contacted patients in person or by phone at least every 2 weeks to assess side effects, medication adherence, and depressive symptom severity, and provide feedback to the oncologist and the study psychiatrist.
R. Kobb et al., "Enhancing Elder Chronic Care through Technology and Care Coordination: Report from a Pilot," *Telemedicine Journal and e-Health* 9, no. 2 (2003): 189-195.	Rural high-cost, high-use veterans with chronic diseases	Use of nurse and social worker care coordinators to manage patients with complex conditions, monitor patients' health with telehealth devices, and educate patients in self-management, in collaboration with PCPs.
P. Lozano et al., "A Multisite Randomized Trial of the Effects of Physician Education and Organizational Change in Chronic-Asthma Care," *Archives of Pediatrics and Adolescent Medicine* 158, no. 9 (2004): 875-883.	Children with asthma	Provision of asthma guideline and peer education training for one physician "peer leader" per practice treating child asthma patients. A subset of these practices also used nurse care managers to coordinate asthma management, following the Chronic Care Model. Control practices received only printed materials on asthma guidelines.

	EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
	Transition coaching for 28 days after hospital discharge, followed by 180 days of observation	*Utilization:* Rehospitalization rates at 30 days and 90 days were significantly and substantially lower versus control group (180 days rehospitalization was lower, but not statistically significant). **Cost:** Mean hospital costs were 20% lower ($p<.05$) for intervention group. Net of intervention costs, total costs savings were approximately $290 per patient over the 6-month time frame.	Randomized Controlled Trial
	2 years	**Utilization:** Intervention group had significantly fewer ED visits and lower (insignificant) hospital admissions rates. **Quality:** Across the board improvements for intervention group relative to control in SF-36 outcome measures, and statistically significant improvement in general health, vitality, social functioning, and mental health. However, no differences between intervention and control in ADLs or mortality.	Randomized Controlled Trial
	2003	**Cost:** 27% reduction in managed depression treatment costs relative to controls. 8% increase in physician productivity. Almost 90% satisfaction rate among physicians. Social net cost savings (excluding health IT costs, since already present in the clinics) were substantial ($28,930 per physician), but clinics lost money as patients and payers captured most of the gains. **Quality:** Care-managed diabetes patients scored significantly better in process measures for treatment and in outcomes relative to control patients.	Comparison of outcomes of patients who received care coordination with control patients at similar clinics matched on risk factors, including age, gender, comorbidity, and previous utilization. However, nonrandom selection of patients and clinics (which already had substantial health IT) may limit generalizability of results.
	8 months	**Quality:** Relative to the control, the intervention group was significantly more likely to show 50% or greater improvement in depressive symptoms and improved well-being. Mortality was also significantly lower. Effects were very large, as statistical significance was achieved with a small sample of 55 patients.	Randomized Controlled Trial
	1 year	**Utilization:** Resource utilization fell substantially versus the previous year across the board for treatment group, versus increases for controls (significance was not analyzed, but the differences were quite large). 60% decrease in hospital admissions in intervention group (vs. 27% increase in control). 68% decrease in bed days of care in intervention group (vs. 32% increase in control).	Retrospective matched cohort control group chosen based on having similar diagnoses, clinical outcomes, and health care use.
	2 years	**Quality:** Both interventions led to improved patient outcomes, with the more expensive nurse care management leading to greater improvements. Peer-leader physician training led to 6.5 fewer symptom days per year (from a baseline of 107.4 days; statistically insignificant) and 36 percent lower oral steroid burst rate per year (significant) versus controls. Training and nurse care management led to 13.3 fewer annual symptom days and 39 percent lower oral steroid burst rate (both significant).	Randomized Controlled Trial

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
CONROLLED INTERVENTION TRIALS		
E.Z. Oddone et al., "Enhanced Access to Primary Care for Patients with Congestive Heart Failure: Veterans Affairs Cooperative Study Group on Primary Care and Hospital Readmission," *Effective Clinical Practices* 2, no. 5 (1999): 201-209.	Patients with CHF	Patients in treatment group got Provision of enhanced access to primary care with access to a primary care physician and nurse, increased telephone contact, increased primary care visits, and education.
G.A. Piatt et al., "Translating the Chronic Care Model into the Community," *Diabetes Care* 29, no. 4 (2006): 811-817.	Elderly adults with diabetes	Use of a full-scale Chronic Care Model intervention in practices serving elderly diabetes patients. Providers and patients received education; providers were encouraged to redesign patient treatment processes; and a diabetes educator provided decision support and care coordination. One control group received only provider education, and one followed usual care.
D. Schillinger et al., "Effects of Primary Care Coordination on Public Hospital Patients," *Journal of General Internal Medicine* 15, no. 5 (2000): 329-336.	Patients at public hospital	Requirement that patients seek PCP approval before receiving specialty care and emergency department services.
LARGE-SCALE POLICY EXPERIMENTS		
M.W. Battersby and the SA HealthPlus Team, "Health Reform through Coordinated Care: SA HealthPlus," *British Medical Journal* 330 (2005): 662-665.	Patients with chronic disease in Australia	Use of nurse service coordinators to assess patient condition, provide support for self-management, and combine information from all the patient's doctors. General practitioners conducted health assessments and designed a care plan.
R. Brown et al., "The Evaluation of the Medicare Coordinated Care Demonstration: Findings of the First Two Years," *Mathmatica,* March 2007, http://www.mathematica-mpr.com/publications/PDFs/mccdfirsttwoyrs.pdf	Medicare beneficiaries	15 Medicare Care Coordination Demonstration programs implemented interventions to improve care coordination, targeting a variety of different diseases and patient types. Interventions generally involved hiring nurse care managers, assessing patients' needs, improving patient education, checking in with patients regularly (monthly or more), and using electronic systems (of varying sophistication) to manage data and generate reminders and feedback reports. Most studies did not place new burdens or provide significant new incentives for physicians.
P.A. Buescher et al., "An Evaluation of the Impact of Maternity Care Coordination on Medicaid Birth Outcomes in North Carolina," *American Journal of Public Health* 81, no. 12 (1991): 1625-1629.	Pregnant Medicaid beneficiaries	Use of maternity care coordinators to ensure that women were receiving proper prenatal care services, and to address their nutritional and psychosocial needs.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
6 months	**Quality:** Intervention groups experienced similar treatment compliance and quality of life outcomes. **Utilization:** Hospitalizations were significantly higher for the treatment group.	Randomized Controlled Trial
1999-2003	**Quality:** HbA1c and HDL cholesterol outcomes improved significantly in the l intervention group versus usual care. Glucose self-monitoring also increased significantly. Provider education alone did not result in significant improvements compared to usual care.	Randomized Controlled Trial
1 year	**Utilization:** Significant decreases in specialty use and insignificant increases in primary care visits in intervention group versus controls. ED usage was similar, while hospitalization was significantly lower. **Quality:** Measures of patient satisfaction and care access were similar between groups.	Randomized Controlled Trial
2 years	**Costs:** Non-coordination health costs increased slightly, though they fell for recently hospitalized patients, but with the coordination expenses, costs were much higher for intervention groups. **Quality:** Of 8 regional projects, 6 saw significant improvements over control groups in SF-36 scores for mental or physical health measures (true for 3 of the 4 randomized projects) and 4 saw improvements for both mental and physical health.	Randomized controls for 4 projects, geographical controls for 4 projects.
2 years (first 2 years out of 4 year demonstration)	**Costs:** No significant reduction in Medicare part A and B expenditures for any of the 15 trials. One of the few statistically significant effects was a 2% reduction across all trials in the fraction of patients hospitalized in year after enrollment. **Quality:** Programs generally had trouble enrolling target numbers of patients, and satisfaction, though high, was not higher in intervention groups. Few statistically significant differences between intervention group and control group.	Randomized Controlled Trial. However, enrolled patient mix differed significantly from all Medicare beneficiaries in being higher income, more educated, and less likely to be minority.
2 years	**Costs:** Average medical care costs (not adjusted for baseline risk factors) were $277 lower for care coordination infants, compared with the care coordination cost of $137 per mother, yielding a return-on-investment ratio of 2.02. **Quality:** Baseline risk-adjusted likelihood of low-birthweight babies (<2500 g and <1500 g) and infant mortality were significantly lower for care coordination mothers.	Nonrandom quasi-experimental design. Care coordination pregnancies were compared with simultaneous non-care coordination pregnancies within North Carolina Medicaid, controlling for demographic and behavioral risk factors. Selection bias may be a significant problem. Although care coordination mothers actually had a worse observed risk profile, unmeasured motivation may be a significant driver of the better results for care coordination mothers.

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
LARGE-SCALE POLICY EXPERIMENTS		
E.T. Momany et al., "A Cost Analysis of the Iowa Medicaid Primary Care Case Management Program," *Health Services Research* 41, no. 4 (2006): 1357-1371.	Iowa Medicaid beneficiaries	Physician participation in the Iowa MediPASS program. Physicians were paid $2 per month per Medicaid enrollee covered to act as care managers, who acted as gatekeepers for ER and specialist visits.
REVIEW ARTICLES		
T. Bodenheimer, et al, "Improving Primary Care for Patients with Chronic Illness: The Chronic Care Model, Part 2," *Journal of the American Medical Association* 288, no. 15 (2002): 1909-1914.	Elderly adults with diabetes	The most common interventions were disease self-management support, education of and meetings with physicians, use of care managers or teams, and reminder and feedback systems for physician performance.
B. Starfield and L. Shi, "The Medical Home, Access to Care, and Insurance: A Review of Evidence," *Pediatrics* 113, no. 5 (2004): 1493-1498.	Various study populations	Provision of "medical home" where patients can receive primary care that is accessible, long-term person-focused, and comprehensive, and which coordinates outside care.

Value-Based Insurance Design

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
B.A. Bunting and C.W. Cranor, "The Asheville Project: Long-Term Clinical, Humanistic, and Economic Outcomes of a Community-Based Medication Therapy Management Program for Asthma," *Journal of the American Pharmaceutical Association* 46, no. 2 (2006): 133–147.	Adults with asthma enrolled in a medication therapy management program	In exchange for undergoing disease-related education and monitoring by pharmacists and physicians, asthmatic patients received asthma medication at no out-of-pocket cost. Study authors evaluated the program's effects on health outcome, service utilization and health spending using a pre-post, longitudinal, quasi-experiment design.
M.E. Chernew et al, "Impact of Decreasing Copayments on Medication Adherence within a Disease Management Environment," *Health Affairs* 27, no. 1 (2008): 103-112.	Employees and dependents (ages 18–64) at a large firm enrolled in a disease management program	A large employer eliminated copayments for generics and cut copayments in half (actual copay reductions after implementation turned out to be around 30%) for five classes of drugs used to treat chronic disease. Study evaluated the effects of these changes on medication adherence.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
(1989-1997	**Costs:** Greater enrollment in the care management program (MediPASS) was associated with significantly lower costs per patient in most areas of care, including inpatient care, physician services, and lab and radiological services. Spending was higher for outpatient care and pharmaceuticals. Overall, MediPASS was associated with a 3.8% decrease in costs, with the cost-cutting effect increasing with program duration.	County-level panel regression analysis of non-HMO Medicaid costs per patient versus enrollment in the care management program, controlling for Medicaid HMO enrollment and patient characteristics (time trends and county fixed effects included). Potential for bias from selection effects: counties with greater potential savings may have adopted the program more readily.
Various study lengths	**Utilization:** 16 of 20 studies that included process measures showed improvement. **Costs:** Mixed evidence on whether reforms can lower health care use and costs. **Quality:** 20 of 28 studies that included outcome measures showed improvement	Systematic review of 39 studies in which health care providers implemented elements of the Chronic Care Model. Studies reviewed included controlled before-and-after trials and randomized controlled trials.
Various study lengths	**Cost/Quality:** Primary care along the lines of a medical home is associated with better health, lower costs of care, and lesser disparities in health.	Various cross-sectional correlation studies, relying on area-level variation (cross-country, cross-states, etc.) or patient-level variation, controlling for covariates. Suggestive evidence of potential benefits of primary care-based reforms.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
January 1999-December 2003	**Cost:** Direct asthma-related costs declined by $725 per patient per year, and indirect costs decreased by $1,230 per patient per year. **Utilization:** 8.6% decrease in ED visits and 2.1% decrease in hospitalizations in intervention group. Patients were six times less likely to have an ED or hospitalization event after they received the intervention.	Pre-post, longitudinal, quasi-experiment design
2004-2005	**Utilization:** Statistically significant (7% to 14%) reduction in nonadherence for ACE inhibitors, ARBs, beta-blockers, diabetes drugs, and statins. Of the five classes of drugs studied, only steroids did not show a statistically significant increase in adherence, which was measured by calculating Medication Possession Ratios.	Pre-post, quasi-experimental study design with a control group

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
N.K. Choudhry et al., "Should Patients Receive Secondary Prevention Medications for Free after a Myocardial Infarction? An Economic Analysis," *Health Affairs* 26, no. 1 (2007): 186–194.	Adult (65 and older) who had previously been hospitalized for a heart attack	The authors created a model to estimate changes in event rates and health care spending if individuals who were previously hospitalized for a heart attack were able to receive drugs to prevent coronary heart disease at no out-of-pocket costs.
C.W Cranor, B.A. Bunting, D.B. Christensen, "The Asheville Project: Long-term Clinical and Economic Outcomes of a Community Pharmacy Diabetes Care Program," *Journal of the American Pharmaceutical Association* 43, no. 2 (2003): 173-184.	Adult with diabetes enrolled in a medication therapy management program	In exchange for undergoing disease-related education and monitoring by pharmacists and physicians, diabetic patients received asthma medication at no out-of-pocket cost. Study authors evaluated the program's effects on health outcome, service utilization and health spending.
D.A. Draper, A. Liebhaber, and P.B. Ginsburg, "High-Performance Health Plan Networks: Early Experiences," *Issue Brief Center for Studying Health System Change,* no. 11(2007): 1-6.	N/A	High-performance networks that encourage enrollees to choose network physicians who score well on measures of efficiency and quality.
B.H. Gilman and J. Kautter, "Consumer Response to Dual Incentives Under Multitiered Drug Formularies," *The American Journal of Managed Care* 13, no. 6 (2007): 353-359	Retired Medicare beneficiaries and their dependent spouses who receive prescription drug coverage under an employer-sponsored health plan	5 plan categories, each with a different copayment structure for prescription drugs. Researchers studied the effect of multitiered formularies on drug utilization and spending, specifically: 1) the effect of higher copayments for drug equivalents on utilization, and 2) the effect of wider differential copayments between drug equivalents on use of generics.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
n/a (hypothetical cohort)	**Cost:** Under the base-case scenario, the program resulted in a decrease in event-related costs by $6,770 per patient, outweighing the additional $644 per patient cost of expanded coverage and resulting in $5,974 in savings per patient. If the authors' intervention had been applied to all eligible Americans with drug coverage in 2006, insurers would have saved more than $2.5 billion. **Utilization:** 6.6 fewer readmissions for CHF for every 100 post-MI patients than with current coverage.	The authors modeled two scenarios, a base case and a conservative case. The model was created using claims and cost data and literature-based estimations of medication adherence, changes in medication usage to decreased copayments, and the ability of drugs to reduce coronary heart disease-related events.
1997-2001	**Cost:** Compared with baseline, average yearly per patient medical costs decreased from $1,872 to $1,200.	Pre-post, longitudinal, quasi-experiment design
January 2005-June 2005	**Cost:** Results suggest that employers' total premium savings from HPNs range between 3%-5%.	The authors used site visits to collect information on high-performance networks at both the national and regional levels. The researchers also used semi-structured interviews with 20 respondents knowledgeable about high-performance networks in the markets studied by HPN. Respondents included representatives of health plans, providers or employers or were benefit consultants.
Used data from 2002	**Utilization:** A 10% increase in copayments for drug equivalents was associated with a 1.3% reduction in total drug spending, a 16% increase in out-of-pocket expenditures, a 2% reduction in the number of prescriptions filled, and a 0.7% reduction in the proportion of prescriptions filled with generics.	Gilman and Kautter used multivariate regression analysis to measure the effects of higher copayments or an increased differential in copayments on annual total drug payments, annual enrollee out-of-pocket drug spending, the number of prescriptions filled, and the proportion of prescriptions filled with generic drugs. The authors include enrollee-level covariates—age, sex and a calculated health status index—to control for drug utilization and spending. The inclusion of these covariates in the model, the authors state, helps control for firm-level selection. Gilman and Kautter also note that the study sample may not be representative of the Medicare population.

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
D.P. Goldman et al., "Pharmacy Benefits and the Use of Drugs by the Chronically Ill," *Journal of the American Medical Association* 291, no. 19 (2004): 2344-2350.	Adults (18-64 years of age) who have been enrolled in the same private insurance plan for 1-4 years	The authors linked pharmacy claims data and information on health plan benefit designs to estimate the effects of cost-sharing on chronically ill, privately insured individuals' use of commonly prescribed drug classes.
H.A. Huskamp et al, "The Effect of Incentive-Based Formularies on Prescription-Drug Utilization and Spending," *New England Journal of Medicine* 349, no. 23 (2003): 2224-2232.	Employees enrolled in employer-sponsored insurance at two large companies	The study authors examined changes in employee spending and utilization of ACE inhibitors, proton-pump inhibitors, and statins at two large employers at two large firms. Firm 1 firm switched from a one-tier to a three-tier prescription drug benefit with increase copayments for all three tiers. Firm 2 switched from a two-tier to a three-tier system with increased copayment for tier 3 drugs only.
J.J. Mahoney, "Reducing Patient Drug Acquisition Costs can Lower Diabetes Health Claims," *American Journal of Managed Care* 11, no. 5 (2005): S170-S176.	Pitney Bowes employees and their dependents with diabetes, asthma or hypertension	Reduced copayments for drugs for diabetes, asthma and hypertension from between 25% and 50% to 10%.
A.B. Rosen et al, "Cost-Effectiveness of Full Medicare Coverage of Angiotensin-Converting Enzyme Inhibitos for Beneficiaries with Diabetes," *Annals of Internal Medicine* 143, no. 2 (2005): 89-99.	Medicare beneficiaries (65 years of age) with diabetes	Full coverage of ACE inhibitors for diabetic Medicare beneficiaries compared with pre-Part D Medicare policies.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
1997-2000	**Utilization:** Doubling co-payments was associated with reductions in use of 8 therapeutic classes: nonsteroidal anti-inflammatory drugs (NSAIDs) (45%), antihistamines (44%), antihyperlipidemics (34%), antiulcerants (33%), antiasthmatics (32%), antihypertensives (26%), antidepressants (26%), and antidiabetics (25%). Among patients diagnosed as having a chronic illness and receiving ongoing care, use was less responsive to co-payment changes. Use of antidepressants by depressed patients declined by 8%; use of antihypertensives by hypertensive patients decreased by 10%. Larger reductions were observed for arthritis patients taking NSAIDs (27%), allergy patients taking antihistamines (31%), and diabetes patients taking antidiabetics drugs (23%).	The authors used multi-variate regression analysis to model the effects of an increase in copayments on the utilization of eight commonly prescribed types of drugs. The principal independent variable in the model was an index of plan generosity, as calculated by the authors. Other independent variables noted whether a health plan included out-of-pocket payments for physician office visits or whether a plan mandated the use of generics. The authors also controlled for comorbid conditions, age, gender, income, time period, whether or not an individual lived in an urban area, and whether or not an individual was working or retired.
January 1999-December 2001	**Utilization:** *Employer 1:* Among enrollees in the intervention group, 41.6% of those taking ACE inhibitors, 35.1% of those taking proton-pump inhibitors, and 49.4% of those taking statins switched to drugs in a lower tier. However, 42.3% continued to use tier-3 ACE inhibitors, 32.9% continued taking tier 3 proton-pump inhibitors, and 29.2% continued taking tier 3 statins. Those in the intervention group who took tier-3 drugs were significantly more likely than those in the control group to stop using a tier 3 drug. *Employer 2:* By contrast, the policy changes implemented by Employer 2 had smaller effects on the use of and spending on prescription drugs. 41.0% of enrollees in the intervention group taking ACE inhibitors, 17.6% of those taking proton-pump inhibitors, and 48.5% of those taking statins switched to drugs in a lower tier. 50.6% in the intervention group continued to use tier 3 ACE inhibitors, 64.7% continued taking tier 3 proton-pump inhibitors, 42.4% continued taking tier 3 statins.	The authors used multivariate regression analysis to estimate the effects of changes in pharmacy benefits on spending on and utilization of three classes of drugs. A comparison group—enrollees covered by the same insurer as those in the intervention group—was created for the two "intervention group" firms. Enrollees in the comparison group had various similar characteristics to those in the intervention group, including similar demographic characteristics and similar health plan benefits.
2001-2003	**Cost:** Overall, net plan costs per participant in 2003 were $2,500 lower than the industry benchmark. Though total yearly pharmacy costs increased slightly, pharmacy costs for diabetes decreased by 7%. **Utilization:** Percent diabetics with poor adherence to insulin therapy decreased by two-thirds. The rate of ED visits by diabetic enrollees decreased by 26%, and the overall medical costs of enrollees with diabetes decreased by 6%.	Descriptive study lacking controls that noted changes in cost and utilization after Pitney Bowes changes its drug benefit
n/a (hypothetical cohort)	**Cost/Quality:** Full coverage reduced beneficiary lifetime costs from $117,549 to $115,943 (savings of $1,606) and increased quality-adjusted life years (QALY) from 8.13 to 8.36 (increase of 0.23). In order for full coverage of ACE inhibitors to be cost-saving to Medicare, their use would have to increase by 7.2% and remain less than $20,000 per QALY if use increases by 2.9% more than the baseline 40% rate of use.	Markov model with costs and benefits discounted at 3%

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
D.P. Scanlon, R.C. Lindrooth, and J.B. Christianson, "Steering Patients to Safer Hospitals? The Effect of a Tiered Network on Hospital Admissions," *Health Services Research* 43, no.5 (2008)(published online 29 Aug 2008; http://www.hsr.org/hsr/abouthret/content/hsrtheme.pdf)	Union and non-union employees at a large Midwestern manufacturing company	Employees who were members of either the machinists' or engineers' union paid no out-of-pocket costs if they were admitted to hospitals compliant with Leapfrog Group safety recommendations. Otherwise, employees had to make copayments (averaging $400) for hospital care received. No such program was available to the company's non-union employees. Researchers studied how this program impacted employee decisions about seeking care at specific hospitals.
R. Tamblyn et al., "Adverse Events Associated With Prescription Drug Cost-Sharing Among Poor and Elderly Patients," *Journal of the American Medical Association* 285, no. 4 (2001): 421-429.	Elderly and adult welfare recipients from Quebec who are on medication	Quebec introduced cost-sharing for prescription drugs in August 1996. Using information from provincial databases, the authors estimated the effect of cost-sharing on the utilization of essential and non-essential drugs by elderly people and welfare recipients. The authors also examined the rate of ED admissions before and after the policy change.
M.D. Wong, "Effects of Cost Sharing on Care Seeking and Health Status: Results From the Medical Outcomes Study," *American Journal of Public Health* 91, no. 11 (2001): 1889-1894.	Individuals with one or more chronic illnesses who completed 12- and 18-month surveys	Authors used data from the Medical Outcomes Study to assess the effects of cost-sharing on rates of physician use for minor and serious symptoms and mental and physical health status. Study subjects were divided into no-, low-, and high-copay groups.

Payment Reform

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
CONTROLLED INTERVENTION TRIALS		
A.S. Casale, et al., "ProvenCare: A Provider-Driven Pay-for-Performance Program for Acute Episodic Cardiac Surgical Care," *Annals of Surgery* 246, no. 4 (2007): 613-623.	Surgeons and patients undergoing CABG surgery in an integrated delivery system at Geisinger Health System	Provision of health IT decision support and bundled payments for the CABG surgery and 90 days of postoperative care for surgeons. Provision of postoperative management education for patients.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
2004-2006	**Utilization:** Union engineers were 14% more likely to seek care at a preferred "safer" hospital after the incentive was put in place (an increase from 12% to 26%). Union machinists and non-union employees did not change their hospital selections in any meaningful way. Overall, the program did not seem to affect the health-care decisions of employees admitted to hospitals with surgical diagnoses.	The authors created a conditional logistic regression to measure the effect of tiered hospital benefits on hospital choice for medical and surgical procedures, controlling for variables such as hospital type and drive time. The authors note that it may be difficult to generalize from this study, given the singular characteristics of the market, employers and benefit design studied.
August 1995-August 1997	**Utilization:** After the policy change went into effect, use of essential drugs decreased by 9.12% in the elderly and by 14.42% in the welfare recipients. Use of non-essential drugs decreased by 15.14% in the elderly and by 22.39% in those on welfare. ED visits increased by 14.2 per 10,000 person-months in the elderly and by 54.2 per 10,000 person-months in those on welfare.	The authors conducted an interrupted time-series analysis of data from 32 months before and 17 months after introduction of a prescription coinsurance and deductible cost-sharing policy in Quebec in 1996. They also carried out 10-month pre-policy control and post-policy cohort studies to estimate the effect of the change in drug benefits on the occurrence of adverse events and emergency department visits.
1 and 1.5 year follow-up surveys	**Utilization:** 34% of respondents in the no-copayment group, 26% of the low-copayment group, and 18% of the high-copayment group sought care for minor symptoms. 33% of those in the no-copayment group, 31% of those in the low-copayment group, and 18% in the high-copayment group sought care for serious symptoms. **Quality:** Higher levels of cost-sharing did not seem to affect health status.	The authors conducted bivariate comparisons of the groups with different levels of cost sharing to assess the association between cost sharing, health status, and satisfaction with care. The authors controlled for variables such as demographic characteristics, health status and number of symptoms experienced.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
1 Year	**Utilization/Quality:** Adherence to best treatment practices increased from 59% initially to 100% by the end of the study period. Clinical outcomes, including readmissions, likelihood of discharge home, and complications were higher across the board relative to control patients, but due to small sample sizes, only home discharge improvements were statistically significant.	Treatment best practices adherence did not have a control group but was longitudinally analyzed. Clinical outcomes were compared to a usual care control group treated at Geisinger the year before implementation of the reforms. Because of the small sample size and nonequivalent control group, results should be interpreted cautiously.

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
CONTROLLED INTERVENTION TRIALS		
L.L. Johnson and R.L. Becker, "An Alternative Health-Care Reimbursement System—Application of Arthroscopy and Financial Warranty: Results of a 2-Year Pilot Study," *Journal of Arthroscopic and Related Surgery* 10, no. 4 (1994): 462-470.	Orthopedic Surgeon	Provision of a two-year "warranty" on surgeries after charging one bundled payment for the surgery and two years of follow-up care, including all related physician and hospital charges and additional care related to complications from the original surgery.
W.G. Manning, et al., "Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment," *American Economic Review* 77, no. 3 (1987): 251-277.	Families	Random assignment of families to different health insurance arrangements. Plans of interest included a 0% coinsurance FFS plan and a staff-model HMO with no cost-sharing.
MEDICARE DEMONSTRATIONS		
P.K. Lindenauer et al., "Public Reporting and Pay for Performance in Hospital Quality Improvement," *New England Journal of Medicine* 356, no. 5 (2007): 486-496.	Hospitals	Provision of a small monetary incentive for participating Premier hospitals to deliver effective treatments in five clinical areas, including the three examined in this study. Hospitals performing in the top two deciles (among participating hospitals) based on this process measure received bonuses, while the poorest performers risked penalties. All hospitals in this study engaged in voluntary public reporting, so the results reflect the incremental effect of pay-for-performance incentives over public reporting.
J. Cromwell, et al., "Medicare Participating Heart Bypass Center Demonstration: Final Report," *Health Economics Research* (1998).	Hospitals and physicians performing CABG surgery	Provision of bundled payment rates hospitals and their physicians for CABG surgery and all related inpatient care, including related readmissions.
S.W. Glickman et al., "Pay for Performance, Quality of Care, and Outcomes in Acute Myocardial Infarction," *Journal of the American Medical Association* 297, no. 21 (2007): 2373-2380.	Hospitals	Provision of a small monetary incentive for participating Premier hospitals to deliver effective treatments in five clinical areas, including acute myocardial infarction. Hospitals performing in the top two deciles (among participating hospitals) based on a process measure received bonuses, while the poorest performers risked penalties.
S.R. Grossbart, "What's the Return? Assessing the Effect of 'Pay-for-Performance' Initiatives on the Quality of Care Delivery," *Medical Care Research and Review* 63, no. 1 supplement (2006): 29S-48S.	Hospitals	Provision of a small monetary incentive for participating Premier hospitals to deliver effective treatments in five clinical areas, including the three examined in this study. Hospitals performing in the top two deciles (among participating hospitals) based on this process measure received bonuses, while the poorest performers risked penalties.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
2 years	**Utilization/Cost:** Surgical recommendations were reduced and the cost of care was lower for the patients for whom surgery was performed. The HMO, surgeon, and affiliated hospital all reaped financial gains from greater treatment efficiency. **Quality:** Surgery quality was not analyzed, but the surgeon had an incentive to prevent rehospitalizations for which he would be financially responsible.	Comparison of expenditures by the HMO versus what they would have paid had they reimbursed for each of the services actually delivered.
1976-1981	**Costs:** Expenditures on the HMO group were 28% lower than for the zero cost-sharing FFS plan. **Utilization:** Hospitalization days among the HMO group were 41% lower.	Randomized Controlled Trial
2003-2005	**Quality:** Significantly improvements in treatment delivery overall, and in disease-specific measures for heart failure, acute myocardial infarction, and pneumonia. Results persisted even after controlling for observable differences between incentive and control hospitals, notably pre-intervention performance, with the incentive intervention associated with an improvement of 2.6 to 4.1 percentage points.	Comparison between CMS/Premier participants and nonparticipants among 613 hospitals who voluntarily engaged in public information reporting. Multivariate modeling used to control for observable differences between participants and nonparticipants.
1991-1996	**Costs:** Medicare spending through 90-days post-discharge was 10% lower than would have been expected in traditional Medicare, mostly from lower inpatient spending, which translated into lower copayments for beneficiaries and Medigap insurers. Hospitals profited by cutting inpatient costs even more significantly. **Quality:** Inpatient and post-discharge mortality fell overall by about 0.5 %, but it was unclear whether this was higher than would have occurred absent the demonstration.	For spending, bundled payments were compared with what would have been spent under regular Medicare payment rules. For clinical outcomes, demonstration results were compared to national and local hospital trends, sometimes with statistical risk adjusting. Because of the large national trends and lack of a natural control group, outcome results should be interpreted with caution.
2003-2006	**Utilization/Quality:** There was no significant difference in improvement of a composite score of process measures between treatment and control hospitals. This result held for both the six treatments subject to incentive compensation in the CMS program and eight other common treatments for acute myocardial infarction. In addition, there was no significant difference in mortality improvements between treatment and control hospitals.	Comparison between CMS/Premier participants and nonparticipants among 500 hospitals studied by the separate CRUSADE survey. Though the authors present evidence that treatment and control hospitals are observably similar, they were not randomly assigned.
2003-2004	**Utilization/Quality:** Incentive hospitals showed statistically significant and substantially greater improvement in delivery of heart failure treatments. However, incentive and non-incentive hospitals improved similarly in the treatments of acute myocardial infarction and pneumonia.	Comparison between CMS/Premier participants and nonparticipants among 10 Catholic Healthcare Partners hospitals. While the treatment and control hospitals are similar, participation in the treatment group voluntarily selected into the CMS/Premier demonstration, while the control group selected out of the demonstration.

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
MEDICARE DEMONSTRATIONS		
J. Kautter, "Medicare Physician Group Practice Demonstration Design: Quality and Efficiency Pay-for-Performance," *Health Care Financing and Review* 29, no. 1 (2007): 15-29.	Physician Group Practices	Provision of a portion of shared cost savings to physician group practices (PGPs) providing more effective care to Medicare patients compared to patients at nonintervention PGPs in the same locality, adjusted for case-mix differences. The compensation fraction received by PGPs increased with measured treatment quality improvements for four common conditions.
NATURAL EXPERIMENTS		
S. Pearson et al., "Impact of Pay-for-Performance on Health Care Quality in Massachusetts, 2001-2003," *Health Affairs* 27, no. 4 (2008): 1167-1176.	Physician Groups under contract with commercial health plans in Massachusetts	Implementation of P4P incentives for physician groups improving treatment for several diseases on a variety of standard process measures. Because P4P programs were implemented by private contracts between health plans and providers, the incentive structure varied widely.
M.B. Rosenthal, et al., "Early Experience with Pay-for-Performance," *Journal of the American Medical Association* 294, no. 14 (2005): 1788-1793.	Physician Group Practices in California	Provision of bonuses to medical groups who met a fixed target performance in a number of clinical, patient-reported, and hospital recommendation quality measures. Bonus payments could be as large as 5% of capitation charges for PacifiCare patients.
REVIEW ARTICLES		
R.F. Coulam and G.L. Gaumer, "Medicare's Prospective Payment System: A Critical Appraisal," *Health Care Financing Review* annual supplement (1991): 45-77.	Hospitals	This study reviews the literature studying the introduction of risk-adjusted bundled rates for all inpatient services based on diagnosis at admission, under the Medicare Prospective Payment System beginning in 1983-84.
R.A. Dudley et al., "Strategies to Support Quality-Based Purchasing: A Review of the Evidence," *AHRQ Technical Review* (2004).	Various study populations (generally physicians or provider groups)	This study reviews eight randomly controlled trials of performance-based payments and one trial of reputational incentives are reviewed. In the former, monetary incentives to improve care were provided to individuals or groups of providers either via the FFS system or through bonuses. In the latter, the impact of greater reporting of adverse events and treatment quality was assessed.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
3 years (with data currently through year 2)	**Costs:** In year one of the demonstration, 2 of 10 PGPs achieved cost savings, and in year two, 4 of 10 did so. **Quality:** Nearly all PGPs showed across-the-board improvements in measured quality of care.	CMS chose the 10 PGPs who participated based on a competitive process, raising the potential of selection bias versus the control group of similar nonparticipating PGPs in the same locality.
2001-2003	**Utilization/Quality:** P4P programs were not associated with improved care. Among 30 treatment-physician group pairs subject to pay-for-performance incentives, 22 showed results statistically indistinguishable from those of a non-incentive comparison group. Just four incentive groups fared better than comparison groups, and four performed worse. There was no relationship between the size of the incentive and the magnitude of improvement relative to comparison groups.	Differential timing in the introduction of pay-for-performance incentives in contracts between health plans and physician groups served as a natural experiment. Physician group-treatment pairs not subject to incentives and with similar baseline performance serve as the control group. Spillover effects of statewide pay-for-performance implementation on physicians not yet subject to P4P incentives are a potential source of bias.
April 2003-April 2004	**Utilization/Quality:** Relative to PacifiCare reimbursed physician groups in Oregon and Washington who did not face the quality incentive, California groups showed statistically greater improvement in one of three measures studied, with statistically indistinguishable differences on two other measures.	Natural experiment study based on the imposition of a pay-for-performance program by PacifiCare for California providers but not for its Oregon and Washington providers. Authors present evidence that the three states had similar quality trends in the years before the intervention.
Various study lengths	**Utilization:** The consensus of the literature is that the reform reduced hospital admissions, lengths of stay, and intensity of treatment during stays. **Costs:** Although a portion of this reduced treatment was shifted to outpatient care and post-acute care, there was a significant overall reduction in the rate of spending growth for Medicare. **Quality:** There was little indication of reductions in care quality or health outcomes.	Research designs varied for the reviewed studies, but mostly used longitudinal data. Some studies also utilize differences in the timing of reform implementation in different areas as a source of variation.
Various study lengths (4-30 months)	**Utilization/Costs/Quality:** In the performance-based payment trials, 6 of 10 incentive variables tested showed significantly greater improvement among the incentive group relative to the control group. Incentives targeted to individual providers were generally more successful than group-targeted incentives, and there was no relationship between incentive size and result magnitude. The lone reputational incentive trial showed low scoring hospitals undertook greater measures to improve future performance.	Randomized Controlled Trials

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
REVIEW ARTICLES		
J.D. Goodson, "The Future of Capitation: The Physician Role in Managing Change in Practice," *Journal of General Internal Medicine* 16, no 4. (2001): 250-256.	Various study populations	The study compared care delivered by physicians reimbursed by FFS mechanisms to care delivered by physicians reimbursed with capitations or partial capitations.
F.J. Hellinger, "The Impact of Financial Incentives on Physician Behavior in Managed Care Plans: A Review of the Evidence," *Medical Care Research and Review* 53, no. 3 (1996): 294-314.	Physicians	The study reviewed the evidence on the impact of financial incentives imposed on physicians by managed care plans, including payment on a per-patient basis and use of withholding and bonuses, on physician behavior.

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Comparative Effectiveness Research

CITATION	STUDY OBJECTIVE
Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial Group, "Major Outcomes in High-Risk Hypertensive Patients Randomized to Angiotensin-Converting Enzyme Inhibitor or Calcium Channel Blocker vs Diuretic," *Journal of the American Medical Association* 288, no. 23 (2002): 2981-2997.	To determine whether treatment with a calcium channel blocker or an angiotensin-converting enzyme inhibitor lowers the incidence of coronary heart disease (CHD) or other cardiovascular disease (CVD) events versus treatment with a diuretic. Authors analyzed 33,357 participants aged 55 years or older with hypertension and at least 1 other CHD risk factor from 623 North American centers.
S.J. Bernstein et al., "The appropriateness of hysterectomy. A comparison of care in seven health plans. Health Maintenance Organization Quality of Care Consortium," *Journal of the American Medical Association* 269, no. 18 (1993): 2398-2402.	To develop and test a method for comparing the appropriateness of hysterectomy use in different health plans. Researchers, retrospectively, analyzed a random sample of all nonemergency, non-oncological hysterectomies performed in seven managed care organizations over a 1-year period.
W.E. Boden et al., "Outcomes in Patients with Acute Non–Q-Wave Myocardial Infarction Randomly Assigned to an Invasive as Compared with a Conservative Management Strategy," *New England Journal of Medicine* 338, no. 25 (1998):1785-1792.	To compare traditional "invasive" management or "conservative" management, defined as medical therapy and noninvasive testing for a total of 920 patients having experienced a non-Q-wave myocardial infarction.
M.R. Brennan et al., "The Cost-Effectiveness of Cyclooxygenase-2 Selective Inhibitors in the Management of Chronic Arthritis," *Annals of Internal Medicine* 138, no. 10 (2003): 795-806.	To conduct a systematic review to determine whether the degree of risk reduction in gastrointestinal complications by coxibs offsets their increased cost compared with a generic nonselective NSAID. Researchers studied patients with osteoarthritis or rheumatoid arthritis who are not taking aspirin and who require long-term NSAID therapy for moderate to severe arthritis pain.
M.E. Chernew, A.B. Rosen, and A.M. Fendrick, "Rising out-of-pocket costs in disease management programs," *American Journal of Managed Care* 12, no. 3 (2006):150-154.	To analyze data from 2 large health plans and compare cost sharing in disease management programs with cost sharing outside of disease management programs.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
Various study lengths	**Utilization/Quality:** Fee-for-service reimbursed physicians order substantially more tests, elective procedures, and consultations, and their patients are hospitalized and see specialists more often.	Mostly cross-sectional correlation evidence, sometimes for the same doctors treating different patients who are reimbursed differently.
Various study lengths	**Utilization:** Physicians reimbursed in managed care arrangements had substantially lower utilization rates than those reimbursed in FFS arrangements. This result held consistently across all study types examined.	Study designs fell into three categories. The best studies randomly assigned patients or doctors, while most examined existing arrangements, comparing utilization between managed care and FFS either for the same diseases or for doctors seeing patients under both reimbursement types. Evidence for lower utilization in managed care was uniform across study types.

INEFFICIENCY
Thiazide-type diuretics are superior in preventing 1 or more major forms of CVD and are less expensive. They should be preferred for first-step antihypertensive therapy.
16% of women underwent hysterectomy for reasons judged to be clinically inappropriate.
Most patients with non–Q-wave myocardial infarction do not benefit from routine, early invasive management consisting of coronary angiography and revascularization. A conservative, ischemia-guided initial approach is both safe and effective.
Using a coxib instead of a nonselective NSAID in average-risk patients cost an incremental $275 809 per year to gain 1 additional QALY. The risk reduction seen with coxibs does not offset increased costs compared with nonselective NSAIDs in the management of average-risk patients with chronic arthritis.
There may be merit in greater consumer cost sharing in some instances and disease management in other instances, but it does not make economic sense to combine greater cost sharing with disease management.

CITATION	STUDY OBJECTIVE
F.J. Fowler, Jr. et al., "Relationship between Regional Per Capita Medicare Expenditures and Patient Perceptions of Quality of Care," *Journal of the American Medical Association* 299, no. 20 (2008): 2406-2412.	To evaluate how Medicare beneficiaries' perceptions of their health care are related to per capita expenditure in the areas where they live through a probability sample survey of Medicare beneficiaries living in households in the United States.
J. Grimshaw et al., "Toward evidence-based quality improvement. Evidence (and its limitations) of the effectiveness of guideline dissemination and implementation strategies 1966-1998," *Journal of General Internal Medicine* 21, supplement 2 (2006):S14-20.	To determine effectiveness and costs of different guideline dissemination and implementation strategies through a systematic review of the literature.
E. Guadagnoli et al., "Variation in the use of cardiac procedures after acute myocardial infarction," *New England Journal of Medicine* 333, no. 9 (1995): 573-578.	To compare the patterns of treatment of clinically similar groups of patients in the two states, and compared mortality rates and measures of the health-related quality of life. Analyzed patients covered by Medicare who were 65 to 79 years of age and were admitted to 478 hospitals with acute myocardial infarctions during 1990 in New York (1852 patients), where the rate of use of cardiac procedures is low, and in Texas (1837 patients), where the rate of use of such procedures is high.
J.J. Kim, T.C. Wright, and S.J. Goldie, "Cost-effectiveness of Alternative Triage Strategies for Atypical Squamous Cells of Undetermined Significance," *Journal of the American Medical Association* 287, no. 18 (2002): 2382-2390.	To determine the most efficient and cost-effective management strategy for women in the United States diagnosed as having ASC-US. Conducted a cost-effectiveness analysis by comparing 4 management strategies for a cytological result of ASC-US using a computer based model.
J.A. Lieberman et al., "Effectiveness of Antipsychotic Drugs in Patients with Chronic Schizophrenia." *New England Journal of Medicine* 353, no. 12 (2005): 1209-1223.	To determine differences in the overall effectiveness of a first-generation antipsychotic, with several newer drugs. Analyzed data from 1493 patients with diagnosed schizophrenia, across 57 U.S. clinical sites.
National Emphysema Treatment Trial Research Group, "A Randomized Trial Comparing Lung-Volume–Reduction Surgery with Medical Therapy for Severe Emphysema," *New England Journal of Medicine* 348, no. 21 (2003): 2059-2073.	To study the effects of lung-volume-reduction surgery on mortality, the magnitude and durability of benefits, and criteria for the selection of patients as a palliative treatment for severe emphysema. Researchers studied 1218 patients with severe emphysema who underwent pulmonary rehabilitation and were randomly assigned to undergo lung-volume-reduction surgery or to receive continued medical treatment.
The ESCAPE Investigators and ESCAPE Study Coordinators, "Evaluation Study of Congestive Heart Failure and Pulmonary Artery Catheterization Effectiveness," *Journal of the American Medical Association* 294, no. 13 (2005): 1625-1633.	To compare pulmanary artery catheter (PAC) use with clinical assessment in patients hospitalized with severe symptomatic and recurrent heart failure. Researchers studied 433 patients across 26 experienced heart failure centers in the United States and Canada. Patients receive therapy guided by clinical assessment and a PAC or clinical assessment alone.
R. Rosenheck et al., "Effectiveness and Cost of Olanzapine and Haloperidol in the Treatment of Schizophrenia: A Randomized Controlled Trial," *Journal of the American Medical Association* 290, no. 20 (2003): 2693-2702.	To evaluate the effectiveness and cost impact of olanzapine compared with haloperidol in the treatment of schizophrenia. Analyzed data on three hundred nine patients with a diagnosis of schizophrenia or schizoaffective disorder, serious symptoms, and serious dysfunction for the previous 2 years.
B.E. Sirovich et al., "Regional Variations in Health Care Intensity and Physician Perceptions of Quality of Care," *Annals of Internal Medicine* 144, no. 9 (2006): 641-649.	To determine whether physicians in high-intensity regions feel better able to care for patients than physicians in low-intensity regions through a survey of 10 577 physicians who provided care to adults in 1998 or 1999.

INEFFICIENCY
In this representative sample of Medicare beneficiaries, no consistent association was observed between the mean per capita expenditure in a geographic area and the perceptions of the quality of medical care of the people who live in those areas.
Current guideline dissemination and implementation strategies can lead to improvements in care within the context of rigorous evaluative studies. However, there is an imperfect evidence base to support decisions about which guideline dissemination and implementation strategies are likely to be efficient under different circumstances. Decision makers need to use considerable judgment about how best to use the limited resources they have for quality improvement activities.
Physicians in Texas were more likely to perform angiography than physicians in New York for patients whose conditions allowed more discretion in the use of cardiac procedures. On average, there appears to be no advantage with respect to mortality or health-related quality of life to performing the procedures at the higher rate used in Texas.
Reflex HPV DNA testing provides the same or greater life expectancy benefits and is more cost-effective than other management strategies for women diagnosed as having ASC-US.
The majority of patients in each group discontinued their assigned treatment owing to inefficacy or intolerable side effects or for other reasons. The efficacy of the conventional antipsychotic agent appeared similar to that of the newer ones.
Overall, lung-volume-reduction surgery increases the chance of improved exercise capacity but does not confer a survival advantage over medical therapy.
Therapy in both groups led to substantial reduction in symptoms, jugular venous pressure, and edema. Use of the PAC did not significantly affect the primary end point of days alive and out of the hospital during the first 6 months.
Olanzapine does not demonstrate advantages compared with haloperidol (in combination with prophylactic benztropine) in compliance, symptoms, extrapyramidal symptoms, or overall quality of life, and its benefits in reducing akathisia and improving cognition must be balanced with the problems of weight gain and higher cost.
Despite more resources, physicians in regions of high health care intensity did not report greater ease in obtaining needed services or greater ability to provide high-quality care.

CITATION	STUDY OBJECTIVE
U.S. General Accounting Office, *Beneficiary Use of Clinical Preventive Services,* April 2002, http://www.gao.gov/new.items/d02422.pdf.	To conduct an investigation to determine to what extent Medicare beneficiaries are using covered preventive services, and what action has CMS taken to increase the use of preventive services among the Medicare population.

Health Information Technology

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
CONTROLLED INTERVENTION TRIALS		
Bates, et al., "The Impact of Computerized Physician Order Entry on Medication Error Prevention," *Journal of the American Medical Informatics* 6 (1999): 313-21.	Physicians at Brigham and Women's Hospital	Use of computerized order entry with decision support features by physicians.
Chertow, et al., "Guided Medication Dosing for Inpatients with Renal Insufficiency," *Journal of American Medical Association* 6(2001): 313-21.	Inpatient adults with renal insufficiency	Provision of real-time computerized decision support for providers. Default dose amount, default frequency, and adjusted dose list are displayed to the order-entry user. Users were also informed as to whether adjustments were made based on renal insufficiency.
Dexter, et al., "Inpatient Computer-Based Standing Orders vs Physician Reminders to Increase Influenza and Pneumococcal Vaccination Rates: A Randomized Trial," *Journal of the American Medical Association* 292 (2004): 2366-71.	General medicine patients	Use of hospital CPOE system to produce vaccine orders for nurses and reminders for physicians of patients with standing orders and patients eligible for pneumococcal and influenza vaccines, at the time of discharge.
Evans, et al., "Evaluation of a Computer-Assisted Antibiotic-Dose Monitor," *Annals of Pharmacotherapy* 33 (1999): 1026-31.	Patients receiving targeted antibiotics	Use of a computer-assisted antibiotic-dose monitor to check the renal function of patients receiving any of five targeted antibiotics (vancomycin, gentamicin, imipenem, cefazolin, cefuroxime). Pharmacists received a computer listing of patients who may have been receiving excessive dosages and contacted patients' physician if the dosage change suggested by the program was appropriate.
Hicks, et al., "Impact of Computerized Decision Support on Blood Pressure Management and Control: A Randomized Clinical Trial," *Journal of General Internal Medicine* 23 (2008).	Adult patients receiving hypertension care	Use of computerized decision support program designed to improve hypertension care and outcomes in primary care patients. .
Hillestad, et al., "Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, and Costs," *Health Affairs* 24, no. 5 (2005).	Electronic medical record systems	Implementation of electronic medical record systems versus the current paper-based method.
Javitt, et al., "Using a Claims Data-Based Sentinel System to Improve Compliance With Clinical Guidelines: Results of a Randomized Prospective Study," *American Journal of Managed Care* 11, no. 2 (2005): 93-102.	Members of a Midwestern care plan	Use of a sentinel system that scans administrative claims information and clinical data to detect and mitigate errors in care and deviations from best medical practices. Providers received patient-specific, clinically actionable alerts.

INEFFICIENCY
Immunization rates vary considerably for the three interventions CMS pays for— breast cancer screening and immunizations against flu and pneumonia. The majority of techniques being used in these interventions, such as developing reminder systems medical offices can use to alert providers and patients when breast cancer screenings are needed, have been found effective in the past.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
6 months	**Quality:** The computerized order entry system reduced medical errors. Further reductions in medical errors were achieved when the decision support features were enabled.	Prospective Study
7 months	**Utilization:** Guided medication dosing improved frequency and dose choices for inpatients with renal insufficiency; 67% in the intervention group vs. 54% in the control group received appropriate prescriptions.	Quasi Experimental Design
14 months	**Utilization:** Patients with computer-based standing orders received a pneumococcal vaccination (51%) and/or an influenza vaccine (42%) more often than patients who received reminders (41% and 30% respectively).	Randomized Trial
3 years (2 years of pre-intervention, 1 year of intervention)	**Utilization/Cost/Quality:** The computer-assisted antibiotic-dose monitor proved effective in preventing adverse drug events and reducing excess cost and use of antibiotic therapy.	Prospective Cohort Study
1.5 years	**Quality:** Physicians in the intervention group had 1.39 the odds of adhering to the Joint National Committee's guidelines for appropriate medication prescribing compared to physicians in the control group.	Randomized Control Trial
2 years	**Utilization/Cost/Quality:** Adoption of electronic medical record systems have the potential to reduce national healthcare spending and hospital errors and increase appropriate preventative and palliative care.	Prospective Cost-Benefit Study
1 year	**Cost/Health/Utilization:** Ongoing use of the sentinel system resulted in a reduction in medical costs, morbidity, and hospitalization.	Randomized Prospective Study

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
Litzelman, et al., "Requiring Physicians to Respond to Computerized Reminders Improves Their Compliance with Preventive Care Protocols," *Journal of General Internal Medicine* 8 (1993): 311-7.	Academic primary care internal medicine practitioners	Use of computer-generated reminders to remind providers to perform fecal occult blood testing (FOBT), mammography, and cervical Papanicolaou (Pap) testing. Primary care teams of internal medicine residents and faculty were required to circle one of four responses: 1) "done/order today," 2) "not applicable to this patient," 3) "patient refused," or 4) "next visit."
Teich, et al., "Effects of Computerized Physician Order Entry on Prescribing Practices," *Archives of Internal Medicine* 160 (2000): 2741-7.	Physicians in the inpatient setting	Employed computerized order entry systems to assess prescribing patterns compared to the traditional system.
Tierney, et al., "Delayed Feedback of Physician Performance Versus Immediate Reminders to Perform Preventive Care. Effects on Physician Compliance," *Medical Care* 24 (1986): 659-66.	General practitioners	Provision of immediate reminders to physicians to perform preventive care as compared to monthly reminders.
W.M. Tierney et al., "Can computer-generated evidence-based care suggestions enhance evidence-based management of asthma and chronic obstructive pulmonary disease? A randomized, controlled trial," Health Serv Res 40, no. 2 (2005): 477-497.	Adult (18 years of age and older) with asthma or COPD treated in primary care practices	Provision of guideline-based care suggestions concerning drugs and patient monitoring information delivered to physicians on computer workstations at point of order-writing.
LARGE-SCALE POLICY EXPERIMENTS		
Weber, et al., "Employing the Electronic Health Record to Improve Diabetes Care: A Multi-Faceted Intervention in an Integrated Delivery System," *Journal of General Internal Medicine* 23 (2008).	Physicians treating patients with diabetes	Use of electronic medical records to improve compliance with diabetes performance measures.
Wang, et al., "A Cost-Benefit Analysis of Electronic Medical Records in Primary Care," *American Journal of Medicine* 114 (2003: 397-403.	Primary care physician	Use of an electronic medical record system for five years or a paper-based medical record.
REVIEW ARTICLES		
Bigelow, et al., "Analysis of Healthcare Interventions That Change Patient Trajectories," *RAND* (2005).	Healthcare stakeholders	Analyzed the importance of health information technology and how the systems can improve health and reduce cost.
Bower, et al., "The Diffusion and Value of Healthcare Information Technology," *RAND* (2004).	Healthcare stakeholders	Reviewed the current health information technology landscape and the value of health information technology.
Congressional Budget Office, "Evidence on the Costs and Benefits of Health Information Technology," (2008) available at http://www.cbo.gov/ftpdocs/91xx/doc9168/05-20-HealthIT.pdf.	Healthcare stakeholders	Reviewed the current health information technology landscape and the value of health information technology.

EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
6 months	**Utilization/Quality:** Physicians who responded to the reminders complied more frequently than physicians in the control group (46% vs. 38%).	Prospective Randomized Control Trial
2 years	**Utilization/Quality:** Physician's prescribing practices improved when the hospital employed a computerized order entry system.	Cohort Study
n/a	**Utilization:** Physician's receiving regular feedback more often complied with mammography, fecal occult blood testing, use of metronidazole, and pneumococcal vaccination than physicians who received delayed feedback.	Randomized Control Trial
3 years	**Utilization:** No differences between groups in ED visits, hospitalizations, or medication compliance. **Costs:** Significant increase in total health care costs among physicians receiving the intervention. **Quality:** No change in adherence to the care suggestions, generic or condition-specific quality of life, or satisfaction with physicians or pharmacists when compared to control group.	Randomized controlled trial
1 year	**Quality:** Combined use of health IT and quality measurement improved the percentage of patients with ideal glucose control from 32.2% to 34.8% and blood pressure control from 39.7% to 43.9%.	Prospective Study
5 years	**Cost:** Healthcare organizations will see a positive return on investment, about $86,400 after a 5-year period, after the implementation, in the primary care setting, of an electronic medical record system.	Cost-Benefit Study
Various study lengths	**Cost:** The use of health information technology may reduce costs by 30-50 percent.	Cost-Benefit Study
Various study lengths	**Health/Utilization:** Incremental implementation of health information technology with consistent and regular evaluation of the implementation.	Review
Various study lengths	**Health/Utilization:** Incremental implementation of health information technology with consistent and regular evaluation of the implementation.	Review

CITATION	TARGET POPULATION	INTERVENTION STRATEGIES
REVIEW ARTICLES		
Fonkych, et al., "The State and Pattern of Health Information Technology Adoption," *RAND* 2005 available at http://www.rand.org/publications/MG/MG409/.	Healthcare stakeholders	Estimated the pattern and current level of health information technology adoption.
Girosi, et al., "Extrapolating Evidence of Health Information Technology Savings and Costs," *RAND* 2005.	Healthcare stakeholders	Analyzed the cost, benefit, and incentives for adoption of health information technology similar to Santa Barbara's.
The Robert Wood Johnson Foundation, "Health Information Technology in the United States: The Information Base for Progress," (2006).	Healthcare stakeholders	Provided an overview of the status of health information technology work in the U.S. including: current levels of adoption, whether differential adoption will exacerbate disparities, and barriers and incentives to adoption.
Department of Health and Human Services, "Data & Technical Standards: Standards and Recognition," webpage http://www.hhs.gov/healthit/standards/recognition/, last accessed on September 20, 2008.	Federal agencies	HHS and all federal agencies were required to implement HHS interoperability standards.
U.S. Department of Health and Human Services, Office of the National Coordinator for Health Information Technology, "Health IT Strategic Framework: Glossary of Selected Terms," (2004).	Healthcare stakeholders	n/a

	EVALUATION TIMEFRAME	IMPACTS	STUDY DESIGN
	Various study lengths	**Health/Utilization:** High heterogeneity in HIT adoption across types of providers and health information technology applications.	Review
	Various study lengths	**Cost:** It would cost $2.5 billion to implement a system across the US that is comparable to Santa Barbara's system.	Cost-Benefit Study
	Various study lengths	**Health/Utilization:** Provided recommendations for future health information technology work.	Policy Statement
	16 months	**Utilization:** HHS was minimally prescriptive with how federal agencies implemented these policy changes.	Policy Implementation
	Various study lengths	n/a	Health Information Technology Glossary of Terms

Appendix II
Model Structure and Assumptions

Modeling for this section was performed by Professor Jon Gruber of Massachusetts Institute of Technology (MIT), using the health insurance microsimulation model he has developed and described in detail elsewhere.[1] This section outlines the basic structure of the model and describes the key assumptions about its economic parameters.

The basic agents of the microsimulation model are health insurance units (individuals or families who obtain coverage together), who make decisions about their coverage based on the prices faced for different options, their demographic characteristics, and behavioral assumptions derived from the health insurance literature. The starting population is drawn from the Census's March Current Population Survey (CPS), a nationally representative survey of more than 50,000 households that is a standard source of statistics on U.S. health insurance coverage. From this base, individuals covered by Medicare—people age 65 and older, Social Security Disability Insurance recipients, and individuals with end-stage renal disease—are excluded because they are unlikely to switch to other forms of coverage or to become uninsured. In addition, armed forces and veterans families covered by military health insurance are excluded because of the difficulty of modeling their insurance and because they are unlikely to switch coverage. Together, these two excluded groups represented 17.5 percent of the population in 2007.[2] Because we exclude these groups who have health insurance coverage, the starting uninsured rates in the model are higher than standard uninsured rates reported by the Census (15.3 percent in 2007).[3]

The model takes into account supplementary data on employer-sponsored insurance (ESI) and nongroup premiums, adjustments to premiums based on demographic factors, and underlying health care expenditures from a variety of sources.[4] This forms the starting population information for 2008, the first year modeled. To model the progression of coverage over the 10 years from 2009 to 2018, realistic demographic and economic changes are applied to the base information. The most important assumptions are those on health insurance premium growth. As described in Section 4 and depicted in Figure 1 therein, real employer-sponsored insurance (ESI) premiums are assumed to grow on average 4.3 percent annually, based on an assumption of 6 percent nominal growth annually and deflating by the GDP deflator. While higher than the past three years, this growth is significantly below the growth in the early 2000s. Real GDP is assumed to grow on average 3 percent annually, following the CBO baseline. And per capita incomes are assumed to increase by an average of 2.1 percent annually.[5] Incomes are assumed to grow at the same rates across the income distribution. To account for aging of the population and the accompanying changes it brings, age weights on the CPS sample are adjusted over the 10 years to reflect the Census Bureau's population projections.

As each modeling year passes, families face increased premiums on private health insurance coverage options. However, rising premiums do not automatically indicate that health insurance coverage should fall. Rising premiums primarily reflect technological improvements that generally increase the value of care more than the associated costs.[6] In addition, the same technological improvements driving premium growth can dramatically increase the cost of care in illness, making the risk protection that health insurance provides even more valuable. Both of these effects suggest that rising premiums in fact might increase the demand for health insurance. However, increasing premiums may also partly reflect greater inefficiencies in the health care system due to moral hazard and supplier-induced demand. Thus, financially-constrained individuals may be unable to purchase health insurance when premiums increase. In addition, the presence of what is effectively catastrophic coverage through uncompensated care at public hospitals may also crowd out private coverage, and rising premiums should in theory increase this level of crowd-out.[7] Thus, higher premiums may also lower the demand for health insurance. The baseline model assumes that on net, premium growth results in reductions in the rate of private employer and nongroup coverage over time, in line with the results from empirical evidence.[8] As a result, the nonelderly uninsurance rate increases over time, from about 19% in 2008 to 23% in 2018. In addition, the model assumes that Medicaid take-up increases and Medicaid eligibility provisions are adjusted over time to prevent general income growth from requiring low-income families to

disenroll from Medicaid. These assumptions about the baseline result in declining group and nongroup coverage and rising Medicaid coverage and uninsurance over time, roughly in line with the baseline for CBO's microsimulation model.

Decreases in premiums due to successful delivery reforms are also modeled. Because these reflect pure efficiency improvements rather than changing medical technology, they unambiguously raise the demand for health insurance. Health insurance units' behavior responds continuously to these premium changes based on elasticities drawn from the health insurance literature.[9] For instance, if an uninsured family sees its premiums fall due to delivery reforms, it may choose to purchase nongroup coverage. The percent of uninsured families who purchase nongroup coverage in response to a 1.0 percent decrease in premiums is called the demand elasticity. Elasticities comprise the core behavioral assumptions in the model, and the values used are detailed by Gruber elsewhere.[10] The most important family-level assumptions involve the decisions to take-up employer offers of ESI, to purchase nongroup coverage, to switch between group and nongroup coverage, and to take up the government's offer of Medicaid. In addition, the model covers firm behavior, with price elasticities and other assumptions related to offering ESI, subsidizing ESI premiums, and adjusting wages in response to offering and take-up. The model creates synthetic firms out of individuals in the CPS data, based on regional and demographic characteristics, and changes insurance offering and subsidy decisions based on the preferences of the median employee. Because more than 90 percent of private coverage is ESI, explicit modeling of this process is important to obtain realistic results.

Endnotes

[1] See J. Gruber, "Tax Policy for Health Insurance," NBER Working Paper 10977 (2004).

[2] DeNavas-Walt, Proctor, and Smith, 2008.

[3] In addition, the coverage numbers may differ from the latest Census figures because the base model population is drawn from the March 2005 CPS, with adjustments made for population trends since 2005.

[4] See Gruber, 2004.

[5] The year-to-year premium, GDP, and population assumptions used in the model fluctuate mildly around these averages, following the CBO and Census projections.

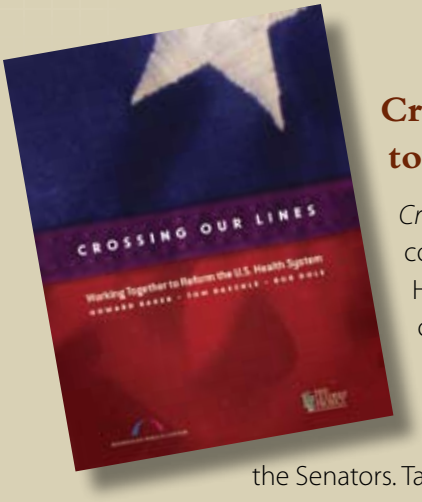
[6] D.M. Cutler and M. McClellan, "Is Technological Change in Medicine Worth It?" Health Affairs 20, no. 5 (2001): 11-29.

[7] There is some dispute about whether uncompensated care crowds out private insurance. For evidence in support of crowd out, see K.N. Rask and K.J. Rask, "Public Insurance Substituting for Private Insurance," Journal of Health Economics 19 (2000):1-31; and B. Herring, "The Effect of the Availability of Charity Care to the Uninsured on the Demand for Private Health Insurance," Journal of Health Economics 24 (2005): 225-52. However, for evidence of no crowd out by public hospitals, see A.T. Lo Sasso and B.D. Meyer, "The Health Care Safety Net and Crowd-Out of Private Health Insurance," NBER Working Paper 11977 (2006).

[8] M. Chernew, D.M. Cutler, and P.S. Keenan, "Increasing Health Insurance Costs and the Decline in Insurance Coverage," Health Services Research 40, no. 4 (2005): 1021-39.

[9] As such, the model falls into the category of health insurance microsimulation models that Remler, Zivin, and Glied term "elasticity approach" models. This approach has the advantages of avoiding endogeneity biases in estimating behavioral responses (since elasticities are drawn from external literature) but the disadvantage of imposing unrealistic homogeneity of elasticities across price levels. See D.K. Remler, J.G. Zivin, and S.A. Glied, "Modeling Health Insurance Expansions: Effects of Alternative Approaches," NBER Working Paper 9130 (2002).

[10] See Gruber, 2004.



Crossing Our Lines: Working Together to Reform the U.S. Health System

Crossing Our Lines is a bipartisan agreement for comprehensive health reform reached by Senators Howard Baker, Tom Daschle, and Bob Dole. It is the culmination of an inclusive year-and-a-half effort that included strategic outreach to key health care stakeholders, a series of state-based public policy forums, and months of personal deliberations by the Senators. Taken together, the recommendations ensure that all Americans have quality, affordable health coverage, while improving health care quality and reining in skyrocketing costs. Organized around four "pillars" of health reform, the policies are inextricably intertwined, and consequently work together to achieve more significant improvements in the health care system than could be achieved if they were considered in an isolated manner.

I. **Promoting High-Quality, High-Value Care**

II. **Making Health Insurance Available, Meaningful and Affordable**

III. **Emphasizing and Supporting Personal Responsibility and Healthy Choices**

IV. **Developing a Workable and Sustainable Approach to Health Care Financing**

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