

Chronic Disease Management:  
Evidence of Predictable Savings

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Prepared by:  
Jack Meyer, Ph.D.  
Health Management Associates  
and  
Barbara Markham Smith, J.D.  
Consultant

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## Executive Summary

As major health reform once again gains national attention, the drive to obtain better results in caring for those with chronic illness while slowing spending growth has grown stronger. This study shows that carefully targeted and well-designed care management programs can improve health outcomes for people with chronic illness and save money on a predictable basis. Our report identifies the key elements of care management interventions that maximize the opportunity for success.

While many experts expect savings from better care management, there are also detractors who believe that the evidence base will not support a conclusion that improved chronic disease management will yield savings on a predictable basis. The lack of consensus on savings arises from an evidence base that shows decidedly mixed results. The available research evaluates different interventions and different diseases in different settings among different populations according to different methodologies. Not surprisingly, the findings of these studies vary. However, an evidence base characterized by heterogeneity leading to mixed results is not the same thing as “no evidence.” Our reading of a wide range of peer-reviewed literature was designed to pierce the veil of heterogeneity that defines the evidence base. Our analysis leads to the conclusion that well-designed care management programs can generate a positive “rate of return on investment” (ROI).

The key findings of this research are as follows.

- ✚ The evidence base regarding the impact of care management is heterogeneous, and generalizations should be carefully framed. With that caveat in mind, we find certain consistent patterns through which savings can be achieved on a predictable basis. Studies showing no savings present their own patterns and tend to validate the findings of favorable studies.
- ✚ Targeting patients according to predictors of continued high utilization (e.g. recent hospitalization, frequent emergency room (ER) use, certain clinical indicators) substantially enhances the opportunity for savings.
- ✚ Highly individualized hospital pre-discharge planning and counseling by multi-disciplinary teams yield substantial savings in avoided readmissions, even in the absence of other interventions.
- ✚ Education-only interventions tend to be less effective, particularly in older patients, as do interventions based on low-intensity telephone contact that is the primary form of intervention rather than follow-up from higher-intensity interventions that are winding down to a level of patient self-management.
- ✚ Electronic interventions without feedback mechanisms and generic guidelines to physicians and not personalized to the care of specific patients also tend to be less cost-effective. Face-to-face meetings among multi-disciplinary teams and with care managers and guidelines in the context of targeted patient treatment work better.
- ✚ The elements of predictably successful interventions follow.

## Successful Interventions

- Targeting the intervention to sicker patients who are likely to generate high costs in the future
- Strong individualization, with interventions customized to the particular patient
- Intensive, multi-disciplinary hospital pre-discharge planning and counseling
- Intensive interventions in terms of time spent with the patient and multiple providers, frequency of contact, face-to-face patient contact, early access to physicians, and sustained follow-up
- Engagement of patients with multi-disciplinary teams, both pre-hospital discharge and post-discharge, to provide support and treatment across multiple interventions, e.g. dietary, pharmaceutical, social service support, self-management, early symptom spotting and access to physicians to prevent exacerbations
- Home visits after hospital discharge and pre-natal and post-partum home visits with high-risk pregnancies
- Education combined with treatment interventions
- Chronic disease management by the patient's treating physicians, nurses, or other professionals
- Intensive home environmental assessment and amelioration for asthma
- Telephonic interventions that initially are time-intensive, frequent, and individually engage the patient regarding clinical metrics and subjective assessments of conditions over time
- Health information technology that is frequent, highly interactive with patients, facilitates contact with clinicians, and provides information and decision-support to clinicians

✚ Interventions to manage congestive heart failure, multiple conditions among the elderly, and high-risk pregnancy provide the most fertile fields for improved outcomes and savings. Research consistently shows a strong ROI for CHF care management (e.g. ranging from 2.72 to 32.7 dollars saved per dollar invested). Because CHF represents a compressed spectrum of high costs and severity of illness, it particularly lends itself to savings potential. Thus, techniques such as weight management, intensive telephone contact with the patient, particularly in the first few days after hospital discharge, titrating medications, and daily automated monitoring have been shown to decrease the prospects for expensive readmissions.

✚ Most of the savings result from reductions in hospitalizations, particularly readmissions, and emergency department use. Among targeted CHF populations with more intensive interventions, the decline in hospital admissions ranged from 21 percent to roughly 48 percent. In asthma/COPD, the decline in hospital admissions or readmissions ranged from 11 percent to 60 percent. Reductions in ER use ranged from 24 percent to 69 percent. In diabetes, A1C values fell at least 1 percentage point and declines in hospitalizations ranged from 9 percent to 43 percent. In high-risk pregnancy, the reductions in NICU admissions ranged from 37 percent to 62 percent. Among seniors with multiple conditions, declines in hospitalization ranged from 9 percent to 44 percent.

- ✚ Many studies reviewed did not measure or report the cost of the intervention. Where such costs were measured, they tended to be relatively modest—ranging from \$100 to \$1399 per capita.
- ✚ Most studies referred to changes in utilization rather than dollars saved. Taken together, the missing elements of intervention cost and the dollar magnitude of savings complicate the task of determining a benefit/cost ratio.
- ✚ In most studies that separately identified pharmaceutical costs, total costs declined while medication costs increased with care management. Dietician-based management of diabetics can reduce prescription drug use.
- ✚ Savings can continue to be realized even when the number of planned in-person contacts with healthcare providers as much as doubles.
- ✚ Depression care management, as presently formulated, tends to increase costs, reflecting in part the substantial under-use of mental health services.
- ✚ Findings of the types of interventions that are effective and the populations for whom they work remain consistent across study methodologies.
- ✚ The Medicare chronic disease demonstration projects offer little predictive value for savings and costs in chronic disease management.
- ✚ The research agenda must be redesigned to fully capture the elements of predictable savings and costs.

A chart summarizing the effects of selected successful interventions and the studies with which they are associated is presented in the Appendix to this report.

## *Conclusion*

This evidence points to a number of steps that can be taken now that will improve care and lead to the ability to extract savings on a predictable basis.

- ✚ Managed care plans under contract with government and private payers should hold providers accountable and pay them for identifying high-risk, high-cost patients with chronic medical conditions through comprehensive health risk assessments. This should be followed by developing individualized care plans for these patients, with periodic reassessments. Continuous monitoring of these patients, including self-monitoring, adherence to medication regimens, reporting on conditions, and learning to recognize and act on danger signals should be a part of a good managed care system. Coordinating care and services after critical events leading to ER use or inpatient admissions can help manage chronic illness.
- ✚ Especially for people with CHF, multiple chronic conditions, and high-risk pregnancies, hospitals should provide multi-disciplinary team-based **pre-discharge** planning and intensive **pre-discharge** patient counseling followed with at least one post-discharge support home visit. We recommend that Medicare and Medicaid pay hospitals for this more intensive pre-discharge planning and counseling and pay hospitals or home health agencies, etc, for the post-discharge support. If hospitals fail to provide these elements of care, they should not be reimbursed for readmissions for the same condition.

- ✚ Asthma patients who use emergency departments or have been hospitalized should receive detailed home environmental assessment and amelioration. These should be mandatory services in Medicare and Medicaid managed care contracts with appropriate withholds for failure to reach specified levels of compliance. In the fee-for-service system, such interventions could come through hospital or emergency department discharge and through working with community health centers and medical groups.
- ✚ Medicaid should be required to provide intensive, individualized pre-natal and post-natal care to pregnant women with specified clinical presentations placing them at high risk, or who are adolescents or unmarried. Elements of care should include ongoing home visits throughout pregnancy and continuing into the post-partum period and involve dietary counseling. In managed care contracts, withholds should accompany failure to meet compliance levels. In fee-for-service Medicaid, such services should be provided through community clinics and through required referral to appropriate agencies from physician offices.
- ✚ Investments in mental health services for the seriously and persistently mentally ill are required before savings can be achieved. The studies reviewed evaluated very limited and superficial interventions applied to broadly targeted populations. If investments are made to achieve more intensive care management with narrowly targeted populations, consistent with the interventions studied for other diseases, potential savings can be achieved.
- ✚ Incentives should be provided to clinicians to adopt health information technology and electronic medical records that can be used as decision support tools and to track patient treatment and interventions. In particular, clinicians should be encouraged to use algorithms that provide decision-trees based on individual patient conditions.
- ✚ Public and private employers, and the managed care organizations with which they contract, should follow the same types of practices recommended here for Medicare and Medicaid.
- ✚ CMS should direct its research agenda and funding to carefully evaluating the relative contributions of various elements of care management (planned variation) to foster a better understanding of which interventions work best. CMS should also sponsor research that compares the strengths and weaknesses of vendor-based care management versus that conducted by health care providers.
- ✚ The recommendations offered here can work in either managed care arrangements with risk-based payments, or the fee-for-service system. Both public and private payers, however, should strongly consider new payment systems that directly reward physicians, hospitals, and other providers for making investments in better care management for people with chronic medical conditions. Gain-sharing arrangements can stimulate innovations that improve the health and functional status of people with chronic illness and reduce total costs.

# Introduction

## *Background*

As health care spending in the United States tops \$2.3 trillion for 2008, attention has focused on the growth of chronic disease among Americans as a significant source of costs. The impact is, in fact, enormous, leaving the single largest footprint on our healthcare system. While the data on the exact number of people suffering from chronic illness fluctuates at any given time, the magnitude and trends conform to a consistent pattern indicating a substantial and mushrooming problem (Thorpe 2005). Over 125 million people suffer from at least one chronic illness, while 75 million of them have two or more. These illnesses account for over 75 percent of total health care spending. (Geyman). Beneficiaries with three or more chronic conditions account for 92.9 percent of Medicare spending and virtually all spending growth since 1987 (Thorpe 2006). In Medicaid, chronic illness accounts for 83 percent of spending (Partnership for Solutions). Hypertension, heart disease, diabetes, asthma, and mood disorders alone account for 50 percent of US health spending. In Medicare, 14 percent of beneficiaries suffer from congestive heart failure (CHF) that drives 43 percent of Medicare spending. The 18 percent of Medicare beneficiaries with diabetes account for 32 percent of Medicare spending. (Linden)

Despite over a decade of discussion about prevention and management, care is still sought, delivered, and sustained episodically under highly constrained circumstances of office availability, arbitrary time limits on visits, and failure to utilize or coordinate supplementary services such as telephonic interactions with patients, nurse hotlines, and electronic support to track patients and enhance clinical decision-making. Among western industrialized nations, Americans have the smallest proportion of people who keep the same primary care provider for five years (Shoen). Among countries in the Organization for Economic Cooperation and Development, the United States ranks last on performance in care coordination.(McKinsey).

As major health reform once again gains national attention, the drive to obtain better results in caring for those with chronic illness while slowing spending growth has grown stronger. Both major candidates for President rely on savings from better management of chronic disease to finance coverage expansions. While many experts expect savings from better care management, there are also many detractors who believe that the evidence base will not support a conclusion

that improved chronic disease management will yield savings on a predictable basis. (CBO 2004). The detractors received substantial reinforcement with the suspension of two large Medicare chronic disease demonstrations due to disappointing results on savings.

### *Purpose and scope*

The lack of consensus on savings arises from an evidence base that shows decidedly mixed results. The available research evaluates different interventions and different diseases in different settings among different populations according to different methodologies. Not surprisingly, the findings of these studies vary. However, an evidence base characterized by heterogeneity leading to mixed results is not the same thing as “no evidence.”

Rather than reinforcing the views of advocates or skeptics, the purpose of this study is to dissect and organize the research evidence base and pierce the veil of heterogeneity to determine which interventions and contexts, if any, are more likely to yield favorable effects on health care utilization and outcomes than others, a process that is reflected only to a limited degree in the analyses of government agencies or in the existing literature. In other words, what do studies that show no changes have in common with each other, if anything? And what are the patterns among studies that show significant results? Are the methodologies used in the evaluations more predictive of the results than these other factors?

In addition to piecing together various strands of research evidence in peer-reviewed literature, this report will include an analysis of the Medicare demonstration projects and Medicaid experiences. To be clear, the report focuses on the management of chronic disease once diagnosed and engaged with the healthcare system. It will not examine various efforts in population-based disease prevention (e.g. reductions in obesity leading to reduced incidence of diabetes or the effects of improved immunization rates). On the basis of our analysis, the report will set forth the elements of care management, by disease where appropriate, that tend to be predictors of better and more efficient care.

# Methodology

This report analyzes studies evaluating outcomes of chronic disease management from peer-reviewed journals identified from the PubMed and Medline electronic data bases. It relies on English-language studies that present detailed descriptions of the interventions and include at least some measures of outcomes (e.g. clinical outcomes, quality of care, quality of life) and utilization or cost metrics. Medicaid experiences were documented either from the peer-reviewed literature or from interviews with managers in specific state programs.

Reflecting the available evidence base, studies were grouped by disease and focused on congestive heart failure, diabetes, asthma/COPD, depression, multiple conditions in older people, and high-risk pregnancies. In addition, we relied on reports and analyses of the strengths and flaws in the evidence base and of the Medicare chronic disease management demonstrations that were submitted to the Centers for Medicare and Medicaid Services (CMS) or appeared in peer-reviewed journals. We also reviewed the CBO analysis of research in this area. Overall, we relied on 27 studies after initially scanning more than 90. Of these, three were meta-analyses that relied in total on 148 studies, and two were literature reviews. However, the meta-analyses provided less detail on the interventions and the targeting criteria for the study populations. In some cases, the individual studies that we reviewed were also included in the literature reviews and meta-analysis which results in some overlap in our findings.

To analyze the studies, we divided them first by disease category. We then parsed them by type of intervention. Interventions were dissected according to intensity and frequency of contact, source of intervention (whether provider or contractor), duration of intervention, degree of engagement with the patient, degree of integration with the care process, patient targeting criteria, and evaluation window. Change (positive or negative) or absence of change in emergency room and hospital utilization was a focus of the analysis since many studies concentrated on these settings of care that reflect greater costs; however, any reported changes in utilization including medication and outpatient visits were taken into account. Clinical metrics such as improvement in lung function or changes in death rates were also evaluated. Not all metrics were present in every study. Only a minority of studies calculated actual costs of intervention compared to costs/savings associated with changes in utilization.

Interventions were compared to outcomes to determine the patterns of interventions that yielded positive results. The patterns were then evaluated according to the methodology of the studies, e.g. randomized controlled trials, pre-post, quasi-experimental, to determine if patterns shifted depending on the methodology of evaluation. Interventions that generated consistent results across methodologies were then identified.

## The Evidence

As indicated in the Introduction, this analysis focuses primarily on CHF, asthma/COPD, diabetes, depression, and the management of multiple conditions in older people. It also includes evidence related to high-risk pregnancy. These diseases differ not only in the populations affected and their effects on patient lives and the healthcare system but also in what constitutes “usual care.” For some chronic diseases, usual care is typified by a number of prospective interventions while in others usual care may be associated with relatively little care management and a high degree of reactive response.

How much attention each disease gets according to usual care standards affects the clinical and cost impact of chronic disease (CD) management. For example, asthma has attracted significant clinical and public health attention for a number of years. “Usual care” typically entails intensive interventions including education and follow-up. Therefore, additional interventions would have to exceed the outcomes already achieved with intensive clinical treatment, a higher bar to clear. By contrast, depression tends to be under-treated and is associated with limited access to care and follow-up (Goetzel). Therefore, most depression management interventions add substantial resources to usual care and increase contacts with the health system. This makes it harder to achieve cost savings that exceed the new investments, even if clinical and functional outcomes improve. Put another way, the baseline in the treatment of different diseases varies which in turn affects the magnitude of change that accompany CD management.

The natural course of the disease from diagnosis also affects evaluation of the outcomes of intervention. Most studies limit the evaluation to one or two years. Yet, the long-term effects of glucose control in diabetics, for example, may not be fully realized for ten years (Dove and Duncan). Thus, a short window of evaluation may significantly understate the potential for savings or improved outcomes.

Interventions across diseases range from limited telephone automated reminders to interventions with physicians rather than patients to intensive pre-discharge planning with multi-disciplinary teams and intensive and frequent face-to-face patient contacts. Even purely electronic interventions vary in their frequency and the degree to which patients interact with the system. Not surprisingly, results vary consistently according to the type and intensity of intervention, although the consistency is not perfect.

Results also vary according to how the intervention population is targeted. Again, these variations in targeted populations tend to be associated with predictable outcomes. For example, *CD management in broadly targeted populations (e.g. anyone with an asthma diagnosis) tends to produce less significant outcomes than concentrating interventions on those who use higher-cost intensive health services (e.g. hospitalizations, ER)*. While the ability to accurately target intervention groups based on prior utilization has been questioned, recent research suggests that specific algorithms can identify patients most likely to incur high medical costs in the coming year (Billings).<sup>\*\*</sup>

Thus, the most significant finding of this study may be that studies that find little effect tend to validate the findings of studies that show significant effects. In other words, the elements of the interventions in negative studies generally tend to differ systematically from the elements in the positive studies, enabling the identification of the key ingredients of successful approaches. A chart summarizing the effects of selected successful interventions and the studies with which they are associated is captured in the Appendix to this report.

### *Congestive Heart Failure*

*As a class, CD management of CHF yields consistently positive results across interventions and most target groups, reflective in part of the compressed spectrum of high costs and severity of illness that characterizes this disease combined with the current fragmentation of care (Dove and Duncan, Goetzel). According to Phillips, if appropriate intervention and patient targeting were applied program-wide, reductions in readmissions alone among CHF patients could yield savings of \$424 million annually to Medicare. However, care management for patients explicitly identified*

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<sup>\*\*</sup> This skepticism arises from concerns, notably expressed by the Congressional Budget Office (CBO 2004), that natural regression to the mean would cause high utilization in one year to be followed by less utilization in the next year, a concern that Billings' algorithm was able to control for.

as “low-risk” tends to yield no significant changes in outcomes or utilization (DeBusk). Where patients are targeted based on confirmed diagnosis rather than prior utilization, the results for CHF are more varied (CHCS, 21 to 24 percent reductions in total hospitalizations compared to three studies finding no changes).

Where patients are targeted based on hospitalization, the changes in utilization are the most pronounced, e.g. 36 percent reductions in readmissions, 45 percent reductions in readmissions, 35 percent reductions in hospital costs, and returns on investment (ROI) ranging from 1.4 to 32.7 (CHCS, Dove and Duncan). Other studies show similar findings, such as a 45.5 percent reduction in inpatient costs (Riegel) and a 35 percent reduction in total costs (Koelling). Studies also show reductions in utilization where patients are home-bound (Bowles). Findings of savings for CHF management for people who are more active users of the health system persist across study methodologies, although in some studies the magnitude of changes varies (CHCS, Del Sindaco, Goetzel).

The interventions vary more than the targeting of the intervention population. Interventions include hospital pharmacists following up with physicians after discharge (CHCS) to intensive pre-discharge planning and education, individualized plans of care, home visits or long-term individualized telephone and other electronic follow-up (Del Sindaco, Riegel, Koelling, Cousins, Bowles). Some interventions are solely electronic, although the intensity of the intervention and degree of patient engagement varied from periodic telephone check-ins to interactive systems with telephone follow-up (CHCS, Bowles).

*Generally, where interventions are more intensive and personalized and persist over a longer period, the changes in utilization are more substantial.* Thus, techniques such as weight management, intensive telephone contact with the patient, particularly in the first few days after hospital discharge, titrating medications, and daily automated monitoring have been shown to decrease the prospects for expensive readmissions. Interventions that focus on flexibly modulating drug use in CHF patients, however, also yield significant reductions in hospital admissions (CHCS). Intensive individualized pre-discharge planning and counseling standing alone has also been shown to be highly effective in reducing utilization (Koelling). Taken together, *individual studies, three meta-analyses and two literature reviews demonstrate favorable changes in utilization where narrow targeting of*

*patients is combined with intensive or individualized care management.* Similarly, two studies and one literature review show little effect where patients are broadly targeted and have shorter-term, less individualized interventions. One study and one literature review show changes with broad patient targeting and more intensive interventions (Cousins, CHCS). However, one study shows no favorable impact with intensive interventions for low-risk populations (DeBusk). Most studies, regardless of intervention or changes in utilization or costs, show no changes in mortality. Examples of three studies are set forth below.

#### **Phillips et al.**

- Meta-analysis of hospitalized patients age 55+
- Elements of care: comprehensive discharge planning + post-discharge support, home visits, frequent telephone contact, clinic visits, extended home care services.
- Results: readmission rates drop by 12%, 25% relative risk reduction for readmissions, home visit had same effect, extended home care services had half the effect [readmission drop of 6%, 12% relative risk reduction]; no effect from increased follow-up at clinics.
- Average cost of administering intervention: \$80.76 per member per month (PMPM) with savings of \$536 PMPM, or 6.6 times the cost of intervention.
- If brought to scale, pre-discharge planning + post-discharge support + home visits could prevent 84,000 Medicare CHF readmissions annually saving \$424 million per year.

### **Koelling et al.**

- 180 day post-hospital discharge evaluation of CHF patients
- Randomized clinical trial (RCT)
- Intervention: 60 minute one-on-one teaching session with nurse educator prior to discharge; follow-up calls at 30, 90, and 180 days for data
- Results: Overall costs of care in intervention group = \$2823; cost in control group = \$5644
- Cost of intervention: \$100

### **Galbreath et al.**

- 8 month intervention with adults over age 18 with symptoms of CHF
- RCT
- Telephone contact with nurse disease manager who provided education and medication management with PCP; call frequency initially weekly and transitioned to monthly and adjusted based on need.
- Results: No differences in utilization or costs

## *Asthma/COPD*

In a meta-analysis of 44 studies, Goetzel reports that across methodologies CD management of asthma, like CHF, yields strong returns on investment (ROI = 2.78). With some modification, the same patterns of relatively greater success associated with explicit targeting of patients and more intensive interventions generally persist in asthma management. However, targeting tends to include a broader swath of utilization than prior hospitalizations and includes patients of specialty asthma clinics and patients needing emergency room (ER) treatment. The outcome metrics of these studies often focus on reduced ER use, reflecting the patterns of patient utilization, and effects on work/school attendance (Castro). Generally, the more targeted the population, the more significant the changes in utilization. (Castro, CHCS, 5 of 7 studies showing favorable effects). In one study, significant changes were reported with broadly targeted intervention for all patients diagnosed or suspected of having asthma or COPD. The intervention was intensive, including care by multi-disciplinary teams, education, coordination of care, electronic medical record support, and treating clinician responsibility for care management (Lotte). In most cases, broad targeting resulted in no changes (CHCS, all 6 studies reporting no changes, Cranston).

Interventions for asthma/COPD were also more varied. There appears to be more reliance on electronic mechanisms including interactive multi-media education tools and telephonic coaching. There are also more programs that focus on guidelines and feedback letters to providers and do not engage the patients in any way. Finally, there is more reliance on community health workers, home visits, and intensive environmental assessment and intervention.

*As with CHF, intensive pre-discharge planning, detailed individualized education and monitoring, multi-disciplinary teams, follow-up, and sustained intervention over time yield substantial changes (Castro, Trappenburg, Petremann, CHCS, Cousins). Intensive home environmental assessment and amelioration and home visits also yield significant changes in utilization among asthma patients (CHCS). For COPD patients, interventions that include at least two elements of disease management yield statistically significant relative risk reductions in hospitalization, emergency room use, and unscheduled physician visits; reductions in length of stay; and reductions in total*

costs. Interventions with just one element of disease management yield no changes (Adams). Programs that focus on engaging providers rather than patients or changing provider behavior tend to be less effective as do programs that provide telephone coaching without other interventions (Cranston, CHCS).

#### **Adams et al.**

- Meta-analysis of 32 studies
- Interventions: self-management skills, individual and group engagement, mean intensity of 9.5 hours, mean follow-up time of 10 months
- Results: with at least 2 interventions, reduced length of stay (-2.51), reduced relative risk of hospitalization (0.78), and reduced relative risk of unscheduled/ED visits (0.58); where costs evaluated, reductions in overall costs ranging from 11% - 70% in pre-post studies and 34% to 70% in RCTs.
- Results: with 1 intervention, no changes.

#### **Castro, et al.**

- 1 year evaluation of hospital patients
- RCT
- Intervention: guidance to primary care physician (PCP) on care regimen, daily asthma care flow sheet in hospital, individualized education and self-management plan, psychosocial support, social service professionals facilitating discharge plan, outpatient follow-up through phone, home visits, and PCP appointments.
- Results: 60% reductions in readmissions, 69% reduction in total hospital days, no difference in PCP visits, no difference in ER visits; 76% reduction in lost school/work days.
- Results: savings = \$6462 per patient; cost of intervention = \$186 per patient.

#### **Trappenburg et al.**

- 6-month review of patients chosen by utilization indicators and recommendation from physician
- Quasi-experimental w/control group and pre-post evaluation

- Intervention: individualized daily interactive electronic monitoring of disease symptoms, medication compliance, and knowledge w/ instant feedback. Daily monitoring by nurses, algorithm in monitoring software detected problems, and electronic notification of providers of need for intervention. Lack of compliance or poor knowledge also triggered notification to providers, direct telephone follow-up. Average time by nurses in monitoring, consulting physicians, contacting patients = 13.7 - 60.6 minutes per patient per week.
- Results: 0.11 **decrease** in hospital admissions compared to 0.27 **increase** in control group, 12% increase in proportion of patients with no admissions, 5% **decrease** in patients with 2 admissions compared to 13% **increase** in control group; medication shift from short-acting bronchodilators to constant use medication, statistically insignificant increase in ER use.

#### CHCS (Butz et al.)

- 1 year evaluation of intervention with diagnosed asthma patients ages 2-9 needing different levels of care including primary care, specialty care, ER visits, or hospitalization
- RCT
- Intervention: parent education only, 6 one-hour in-home visits delivered by community health nurse
- Results: no changes in nebulizer use, morbidity, hospitalizations, or ER use

## *Diabetes*

Diabetes presents a more complex picture. The line between treatment and prevention is much more blurred. Interventions tend to emphasize education and monitoring. Most of the CD management attention in diabetes has focused on improving hemoglobin A1c (HbA1c) levels among diabetic and glucose intolerant patients and early intervention, so the targets tend to be broad. Utilization indicators do not appear to be used. Therefore, to get from glycemic control to utilization changes in the evidence base is sometimes a two-step process. First, there are studies that show the relative success of interventions in achieving and sustaining HbA1c level reductions (Aubert). Then there are studies that show different utilization patterns of people who have or have not achieved desirable HbA1c levels (Wagner). These results need to be synthesized to get a complete picture of the effects of diabetes care management.

For example, Aubert demonstrates that intensive interventions including use of multi-disciplinary teams applying type-specific treatment algorithms, monitoring that includes adjustments in medications, meal planning, exercise reinforcement, follow-up and extended education caused HbA1c levels to fall from 9 percent to 7.3 percent over 12 months, compared to people in a control group who achieved levels from 8.9 to 8.3 percent with usual care. Rothe showed that multi-disciplinary teams and integrated quality management led to similar reductions in HbA1c levels and significant improvements in the proportion of patients able to achieve desirable levels (78 percent compared to 69 percent at baseline). Sicker patients improved the most. Wagner in a retrospective chart review demonstrated that where HbA1c levels were reduced 1 percent and sustained over five years, mean per patient costs were \$685-\$950 less per year than the per patient costs of people in the control group, who by definition did not achieve glycemic control.

The seven diabetes studies reviewed by CHCS all showed significant reductions in utilization based on broadly-targeted interventions across study methodologies. All of these studies entailed substantial engagement of the patient. These interventions included combined group and individualized diabetes education and medication review, daily interactive electronic monitoring, compliance with treatment algorithms, and dietician-led individual and group sessions. Changes in utilization ranged from a 9 percent reduction in all-cause hospitalizations

(interactive electronic intervention) to a 71 percent reduction in combined ER/hospitalization visits (nurse/endocrinologist algorithm-based treatment).

Underscoring the broader population targeting in diabetes, a three-year study by The Diabetes Prevention Program Research Group examined both medication (metformin) and lifestyle interventions (diet and exercise) to determine if either could be effective in delaying the onset of diabetes. The study found that the lifestyle intervention reduced the incidence of Type 2 diabetes by 58 percent. The metformin intervention reduced the incidence by 31 percent. A third intervention combining both lifestyle and medication was not evaluated. The cost of both the lifestyle intervention and the medication intervention were the same at \$750 per participant per year. The effect on costs and disease trajectory of a reduction in the incidence of Type 2 diabetes was not provided.

Siderov compared 3118 patients with diabetes enrolled in a disease management program to a randomized control group of 3681 diabetic patients not participating in the program over two years. He found that program patients experienced fewer emergency room visits and had a larger number of primary care visits. Program enrollees also had higher HEDIS scores for HbA1c testing as well as for lipid, eye, and kidney screenings. Per member per month claims for program patients were about 21 percent lower (\$394.62 compared to \$502.48). (See also Frich, positive clinical but not utilization effects in 6-month intervention). Some studies show it may take up to 10 years for realize savings in diabetes. (Dove and Duncan).

#### **Rothe et al.**

- 2 year review + 3 year review of sicker subset of all diabetes patients drawn from 100% of specialists and 75% of GPs in Saxony; N= 291,771 while subset of sicker patients = 105,204;
- Pre-post evaluation of patients before and after interventions.
- Intervention: integrated practice guidelines, multi-disciplinary teams of specialists and GPs, shared care, integrated quality management.
- Results: sicker patients improved the most; median HbA1c dropped from 8.5% to 7.5%; no cost or utilization measures.

#### **Smith et al.**

- 21 month evaluation of diabetes patients in 97 PCP practices, randomized by physician; N= 5468
- Usual care: use of diabetes registry, established metrics for care, explicit strategies to adhere to standards of care, referral to specialty clinic if needed, diabetes educator in PCP practices, periodic generic electronic emails to PCPs on improving care and reducing cardiovascular risk.
- Intervention: electronic chart consultation by endocrinologists with PCP; specialist reviewed electronic chart for gaps in care and provided electronic advice to PCP with links to evidence base; average time of chart review = 4.4 minutes with 5% of reviews taking longer than 10 minutes; no patient engagement or contact.
- Results: PCP implemented specialist advice in 49% of instances; no changes in costs or clinical outcomes except more elective hospitalizations in intervention group for musculoskeletal problems.

### *Multiple Conditions*

Interventions for people, typically older people, with multiple chronic conditions demonstrate patterns similar to that of interventions for CHF. First and foremost, intervening with these populations is strongly associated with savings and favorable ROIs. (Billings, Counsell, Dove, Goetzel). Targeting to sicker patients yields more reductions in utilization (Counsell, Billings). Successful interventions tend to include intensive discharge planning and guidance, multi-disciplinary teams, sustained intervention over time, and often home visits by nurses and/or social workers (Billings, Counsell, Frich). Billings finds that interventions initiated in the hospital are more effective than interventions begun after discharge.

#### Counsell et al.

- 2-year evaluation of adults age 65+ and under 200% of federal poverty level (FPL) with multiple chronic conditions (adults under 200% of FPL = 46% of Medicare); subset of sicker patients evaluated separately
- RCT
- Intervention: 2 years of home-based assessment and management by nurse practitioner and social worker, collaboration with multi-disciplinary team including PCP and geriatricians with face-to-face meetings among all professionals, care plan, in-home follow-up visits, annual reassessment; explicit protocols, electronic medical record as tracking tool.
- Results: no changes until second year, 23% reduction in ED use in second year; subset of sicker patients show 44% fewer hospitalizations and 55% fewer ED visits in Year 2.

#### Frich et al.

- 6 month evaluation of educational nurse home visits with older patients with range of diseases and conditions
- Literature review based on RCTs
- Intervention: educational visits only of at least 3 months duration and follow-up of additional 3 months with minimum of 3 in-person contacts; visits ranged from advice and direction to extended interactive engagement with patient.
- Results: best educational effects in “younger-old;” effects in target population positively associated with duration of follow-up, number of visits, and time spent with patient; little utilization effects with patients with diabetes but positive clinical effects; limited follow-up such as 1 telephone call per month or automated telephone contact had no effect; possible reduction in nursing home admissions.

## *Depression and High-Risk Pregnancy*

While neither of these conditions were the focus of our study, some information did emerge during our review – with polar-opposite results.

### *Depression*

As a rule, patient targeting tended to be fairly broad (4 out of 5 studies, e.g. patients newly-diagnosed with depression and started on medication). Some interventions entailed coordination among PCP, pharmacists, and psychiatrists. While some patients were seen on an out-patient basis for a limited number of sessions (3 to 6) by a psychiatrist, PCP, or trained practice therapist, most patient contacts were by telephone with frequency varying from weekly and bi-weekly to monthly to semi-annually to check on medication adherence and symptoms (CHCS). The limited intensity of the interventions contrasts with the intensity of services reflected in CD management for other diseases. In all these cases, either no savings were achieved or net costs were incurred. In three out of five studies, there were modest clinical improvements for a subset of the study population. This is consistent with findings from Goetzl and Dove, both showing added costs, although interventions and targets are not described. It is unclear from the literature whether the interventions were conducted by the primary treating physician or by a behavioral health or disease management entities.

These interventions reveal the very limited care provided to people with potentially serious conditions. Face-to-face interactions and active treatment with patients tend to comprise a small proportion of care. The interventions emphasize telephone add-ons to a weak baseline, confirming the assessment that mental health care is characterized by under-utilization. Compared to the findings related to care management for other diseases, these studies strongly suggest that both the baseline of care and the CD management interventions require more individualization and direct patient engagement. Billings' analysis suggests that more investment of better-structured interventions directed at those with serious and persistent mental illness will yield more savings than the limited investment in more cursory approaches.

## *High-risk pregnancy*

By contrast, interventions with high-risk pregnancies appear uniformly to yield savings (CHCS). First, by definition, the patients are targeted narrowly for intervention as pregnant women who meet certain clinical criteria such as hypertension and diabetes, pregnant unmarried adolescents and pregnant unmarried low-income women. Second, interventions were consistently intensive, individualized, and patient-directed. For example, almost all interventions included multiple home visits for both educational and care purposes. Some home visits continued throughout pregnancy and into the post-partum period, lasting 1.5 to 2 hours each. Pre-discharge planning was included. Home visits emphasized post-birth life management including family planning, health, parenting education, employment, and life skills. Transportation to a healthcare professional was often provided. Where home visits were not an element of care, increased visits to healthcare providers were included that involved multi-disciplinary teams, e.g. nurse practitioners and dietitians. Results ranged from 37 percent to 62 percent reductions in admissions to Neonatal Intensive Care Units. In fact, by every measure of hospital utilization, spending declined. (CHCS). In this case, intensive inter-disciplinary care across settings yielded very large savings by dramatically reducing intensive hospital services.

## **State Experiences Managing Chronic Illness in Medicaid**

Thirty-five states have implemented care management programs under their Medicaid programs. States have built such programs into their contracts with managed care organizations (MCOs), or as part of their fee-for-service and primary care case management programs. States have used different combinations of “build, buy, and assemble” as they forge care management programs. Some buy from a single vendor, others assemble from multiple vendors and develop partnerships with universities and other state agencies, while still others “build” by administering care management with state staff. Some states have used “opt-in” models with voluntary enrollment while others have used “opt-out” models with mandatory enrollment up front unless an enrollee refuses. Some states are also using the Deficit Reduction Act (DRA) authority, normally associated with cost-sharing and benefit changes, to provide targeted disease management for a range of chronic medical conditions (Lewin).

States use a variety of techniques to select their targets of enrollment in care management programs. Some use specific diseases, such as asthma, COPD, and diabetes. Others target high-risk members while other states take a more broad-based, population health approach. States use a variety of tools to identify and stratify the members of their target populations, including predictive modeling, health risk assessments, risk stratification, and analysis of claims data. Thus, states vary in their targeting criteria across such indicators as high-risk, high-cost, and high-utilization. Some states use co-morbidity as a criterion while others focus on age and other demographic data. Populations are stratified as to lower-risk and higher-risk, and nurse case managers have the authority to move enrollees across categories as they make progress or their health conditions deteriorate. As noted elsewhere in this report, telephonic care management, along with the use of educational materials and audio health libraries, are prevalent for the lower-risk groups while high-touch, face-to-face interventions and/or more frequent calls from a nurse case manager are more common for higher-risk groups. Initial health assessments, using such tools as the SF-12 and the APQ questionnaire for behavioral health, are commonly conducted (Lewin).

States have worked on both sides of the provider/patient relationship. On the provider side, a number of states have worked with physician champions and various medical societies to develop concise versions of provider practice guidelines. Where possible, states have worked to get these guidelines endorsed by other public and private payers, so that providers are responding to a common version of evidence-based medicine. Some states, such as Pennsylvania, are using pay-for-performance (P4P) approaches to improving providers' adherence to best medical practices. Rewards are based on providers' willingness to participate, their help in enrolling patients, data collection and reporting, medication management, and process-of-care performance. Provider profiling can help states measure performance and offer peer counseling to providers whose practice patterns seem out of line. Some states also use patient registries to gather data across their populations and help providers reduce duplication of services by showing them data on medication use, ER visits, etc.

On the patient side of the relationship, states have used educational materials, reminder post cards, decision support systems with reminders, telemedicine for remote populations, telephonic monitoring and advice, call centers, and face-to-face meetings with a care manager to

improve patient outcomes. There is a strong emphasis on self-management and learning to recognize danger signals and warning signs, coupled with acting on these signals by getting immediate medical attention.

Indiana and North Carolina are illustrative of states that have spent several years working on developing, targeting, and implementing effective care management programs. Both states have sponsored evaluations that show evidence of positive program impact.

### *Indiana*

In 2003 Indiana developed a program targeted to asthma, diabetes, CHF, cardiovascular disease, and chronic kidney disease. The Indiana Chronic Disease Management Program (ICDMP) served mainly enrollees in the Aged, Blind, and Disabled (ABD) population of Medicaid. Building on this program, the state created Care Select, in November 2007. This program provides care management services to high-risk people via medical homes and tries to reduce inappropriate utilization of services.

To implement the original ICDMP program, Indiana partnered with AmeriChoice for a call center, the state's Primary Health Care Association for nurse care managers, and the Regenstrief Institute for help with member stratification and program evaluation. The state set up a call center, provider collaboratives, provider toolkits, and a care management program. Nurse care managers provide intense care management to high-risk enrollees and help patients set self-management goals. After 4-6 months of this intensive level of care, patients may move to a lower level of care involving calls from the care manager every three months. The program offers providers ongoing education, training, toolkits, learning sessions, and information about practice-site improvements.

Indiana's program evaluation found statistically significant cost savings for CHF in its randomized control trial and time series research. Members in the disease management program had lower hospital and care management services cost and higher drug costs. The net savings were \$720 PMPM, or \$36 million annually, for 4,300 members statewide (Lewin).

## *North Carolina*

The Community Care of North Carolina (CCNC) care management program was launched in 1998. It operates in 12 sites around the state—11 local networks and one statewide network. Networks include primary care physicians, local hospitals, local health departments, and the Department of Social Services. A total of 246 provider practices coordinate prevention, treatment, referrals, and institutional services. Each network receives \$2.50 per member per month from the State for administration and management. The networks identify high-risk people with chronic diseases, assist the PCPs with disease management, and conduct population health management.

The CCNC program is not “outsourced” to vendors. It was designed internally from the ground up, with considerable grass-roots participation within communities. The principal focus is avoiding ER use and reducing hospital admissions among patients with asthma and diabetes. The networks provide patients with a medical home, a toll-free number, and care management for people either referred by providers or identified via data as being at high risk. Care managers conduct chart reviews, work up a health risk assessment, and develop an individualized care plan. They are also assigned to physician offices, helping patients keep appointments and providers to adhere to practice guidelines.\*

An evaluation by the Sheps Center at the University of North Carolina used age-adjusted Medicaid claims data to compare enrollees in the regular primary care case management program (the control group) with those getting enhanced care management via the CCNC program’s provider networks. PMPM costs for asthma patients were 2.6 percent lower for enrollees in the treatment group in year one, and 4.7 percent lower in year two. Annual cost savings in asthma were \$294,000 in the first year, \$1.4 million in the second year, and \$1.58 million in the third year, for a total savings of \$3.3 million. There were 23 percent fewer hospital admissions in the first year. Children had 34 percent fewer ER visits in total, and 42.5 percent fewer asthma-related ER visits.

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\* Interview with Dr. Laura Gerald, North Carolina Foundation for Advanced Health Programs.

The Sheps Center evaluation of the diabetes intervention showed that it saved \$2.1 million over three years. Inpatient admissions were 9 percent lower for the CCNC group (University of North Carolina).

## Summary of Findings

While the heterogeneity of the studies requires us to be very cautious about generalization, in fact some consistent trends do emerge.

- ✚ Where patients are targeted according to predictors of continued high utilization (e.g. recent hospitalization, frequent ER use, certain clinical indicators) predictable savings emerge.
- ✚ Outside of the context of prevention, interventions for congestive heart failure, multiple conditions among the elderly, and high-risk pregnancy provide the most fertile fields for improved outcomes and savings. The meta-analyses confirm strong ROIs for CHF care management. Dove and Duncan report ROIs ranging from 4.8 to 32.7 per dollar invested. Goetzel found strong ROIs for CHF (2.78), asthma(2.72), and multiple conditions (6.65 to 10.87). Phillips projects savings of \$424 million per year in Medicare from reduced CHF readmissions alone. Care management for high-risk pregnancies yields reductions in NICU use ranging from 37 percent to 62 percent.
- ✚ The most common sources of savings are reductions in hospital admissions or readmissions and cost per stay, regardless of the length of stay. In asthma patients, reductions in ER visits are also a major metric of savings. Among targeted CHF populations with more intensive interventions, the decline in hospital admissions ranged from 21 percent to roughly 48 percent. In asthma/COPD, the decline in hospital admissions or readmissions ranged from 11 percent to 60 percent. Reductions in ER use ranged from 24 percent to 69 percent. In diabetes, HbA1c values fell at least 1 percent and hospitalizations dropped from 9 percent to 43 percent. In high-risk pregnancy, the reductions in NICU admissions ranged from 37

percent to 62 percent. Among seniors with multiple conditions, declines in hospitalization ranged from 9 percent to 44 percent.

- ✚ Studies also quantified utilization according to hospital length of stay, total hospital costs, outpatient costs and pharmaceutical costs. In most studies that quantified pharmaceuticals, total costs declined even as pharmaceutical costs increased. Some interventions, such as dietician-based management of diabetics, reduce prescription drug use (CHCS).
- ✚ Highly individualized hospital pre-discharge planning and counseling by multi-disciplinary teams yield substantial savings, even in the absence of other interventions. Multi-disciplinary teams appear to improve both financial and clinical outcomes across settings.
- ✚ When appropriately-targeted populations are coupled with intensive, individualized, face-to-face interventions that combine education and care and include facilitated contact with a primary care physician or specialist, or interactive electronic monitoring with follow-up, reductions in utilization and spending tend to be realized. This remains true even when the number of planned in-person contacts with healthcare providers as much as doubles (Lotte).
- ✚ Most of the studies reviewed came from peer-reviewed journals and involved care management from direct providers of care such as primary care physicians and specialists fully integrated into the clinical treatment of the patient rather than external care managers or vendors.
- ✚ Intensive home environmental evaluation and amelioration to change the home environment for asthma patients yield high returns.
- ✚ Intensive individualized education works well with non-elderly diabetics and with asthma patients when combined with treatment.
- ✚ Education-only interventions tend to be less effective, particularly in older patients, as does low-intensity telephone contact that is the primary form of intervention

rather than follow-up from higher intensity interventions that are winding down to a level of patient self-management.

- Peer education efforts and dissemination of guidelines appear to have little impact on physician behavior or patient costs. Face-to-face meetings among multi-disciplinary teams and with care managers and guidelines in the context of targeted patient treatment work better.
- The results for electronic interventions vary widely. Where interventions occur daily and are highly interactive across a number of domains from vital signs to subjective symptoms, eliciting feedback and providing feedback, results improve, particularly where complemented with home visits. In addition, health information technology such as electronic medical charts that provide clinicians with decision-support tools and enable patient tracking also appears as an important element in support of interventions that generate savings. Automated telephone reminders, provision of generic information, and limited engagement tend to have less favorable impact. For example, where patients were provided with electronic access to their medical chart, generic information on their chronic health conditions, and e-mail access to a nurse for questions, ER use increased 14 percent (CHCS).
- Where separately accounted for, costs of intervention were relatively small and ranged from \$100 to \$1399 per capita. Most studies referred to changes in utilization rather than dollars saved. As a result, few accounted for the costs of the interventions.

The small amount of investment associated with relatively large savings is particularly noteworthy. Billings conducted a “reverse” analysis to determine how much could be spent on interventions and still achieve savings. He used algorithms to identify high-risk patients and then determine the maximum amount of money that could be spent in New York City to achieve reductions in hospitalizations of 10 percent and 20 percent and still save money. For moderately high-risk patients, a 10 percent reduction in hospital admissions breaks even at a \$2500 intervention. For extremely high-risk patients, a 20 percent reduction in admissions breaks even at \$9000, a cost of intervention that was vastly larger than the intervention costs we

discovered in the various studies we reviewed that calculated such costs. Put another way, a \$3000 intervention leading to a 20 percent reduction in hospitalizations would yield net savings of \$10.2 million city-wide for SSI patients and \$24.6 million for those with serious and persistent mental illness. As indicated above, most successful interventions yielded more than 20 percent reductions in hospitalizations and intervention costs ranged from \$100 to \$1400.

## The Medicare Demonstration Projects

From 2002 through the present, Medicare has been involved in a series of demonstration projects to evaluate the cost-effectiveness of chronic disease management. The largest of these is the Medicare Coordinated Care Demonstration (MCCD). After the initiation of MCCD, Medicare also piloted the Medicare Health Support demonstration (MHS), similar in basic structure to MCCD. Both demonstrations relied on outside contractors in several sites to manage care in exchange for a fee per beneficiary, rather than incorporating certain models of care internally into provider practice. Medicare contracted with 15 entities ranging from hospitals and commercial disease management vendors to nursing homes and hospices. The MHS demonstration is scheduled to end soon as a result of disappointing results on savings, but this decision is subject to review.

An evaluation of MCCD performed by Mathematica Policy Research concludes that most of the fifteen programs funded under MCCD did not reduce hospitalizations or yield net savings (Brown). A careful look at the structure of the MCCD program reveals that possible flaws in the MCCD program implementation may account for failure to realize savings. The Mathematica report also makes clear that in a number of the sites it is possible that the programs were covering all their costs (cost-neutral in federal government parlance) but that the size of the savings was not large enough to pass the test of statistical significance. Mathematica concludes that they cannot reject the hypothesis that there are no net savings, but also cannot reject the hypothesis that there *are* such net savings. Their report states that “For six programs cost neutrality can be rejected statistically—net costs have increased for these programs. For the nine other programs, the evaluation cannot formally reject the hypothesis that total average Medicare expenditures per month for the treatment group, including the care coordination fee, are equal to expenditures for the cost group (cost neutrality)(Brown).” The programs are caught

in the netherworld between being clearly successful and being clearly unsuccessful. This ambiguity can be explained by the way the demonstration was set up, as explained below.

Some interesting findings in the Mathematica evaluation offer guidance for the content of future CD interventions. A careful analysis of these programs reveals why these demonstrations should not be considered conclusive with respect to the potential of CD management to improve health outcomes and lower spending (McCall). A review of the implementation of the demonstrations suggests that a modified study design would be needed to evaluate savings properly. Finally, findings related to the Medicare population such as lack of success in changing patient behaviors may not be fully applicable to the non-Medicare population in the context of coverage expansion. Discussed below are design, implementation, and evaluation elements that could affect the assessment of savings.

### *Factors influencing outcomes*

Based on the evaluation reports of both MCCD and MHS, it appears that seven factors may have influenced the results of the demonstrations. (1) It appears that unintended selection bias developed in all of the programs in the demonstration. (2) The control group may not have been adequately differentiated from the intervention group. (3) The fees paid to the MHS and MCCD contractors and providers were a very high percentage of total costs, making savings above outlays a very high hurdle to clear. (4) There were wide variations in spending among beneficiaries while sample sizes in some plans were relatively small, making averages a misleading picture of the actual experiences of individual patients or the potential for savings across a larger population. (5) It appears that prospective templates for the interventions to assure consistent levels of intensity and quality across programs were not applied in the contracting phase. (6) The interventions were relatively heavy on telephone contacts compared to face-to-face contact with patients and contained no financial incentives for physicians or major emphasis on changing physician practices; (7) Clinical indicators of underlying health status and improvement/deterioration were not applied, preventing assessment of longer-term implications. (7) The observation window for savings is likely to have been too short. Two years may simply not have been long enough to show longer-term benefits. Where not self-explanatory from the above description, a detailed discussion of a few of these factors is set forth below.

### *Selection bias and control group flaws*

The participants in both the intervention group and the control group emerged as healthier, more educated, more white, and wealthier than the Medicare population as a whole. Some programs enrolled some healthy (non-CD) patients in their study group, which would undermine a determination of savings on a program-wide basis since such beneficiaries likely would have low spending levels before the intervention. This would also be inconsistent with the findings in other studies showing that targeting interventions to sicker patients tends to produce more savings. In addition, the CHCS report notes that few patients in this demonstration were non-elderly, disabled Medicare enrollees and few were dual eligibles. These populations are known to be high users of health services and account for a disproportionate amount of Medicare outlays. In fact, two programs funded in this demonstration with the lowest pre-enrollment demonstration outlays (about \$500 per month) enrolled people, either in the intervention group or the control group, who did not meet demonstration eligibility standards because they were healthier than the targeted population (Brown).

The selection bias may have had two effects on study outcomes. First, the healthier people would have had low utilization profiles, making it unlikely that any intervention for them would save money. Second, for those with more chronic illness in the treatment group, this wealthier and better educated population may have already used medical care aggressively to control chronic disease and purchased well coordinated care prior to enrollment in the study. In these cases, the savings of an additional intervention would be negligible.

### *Contractor and provider fees*

Unlike the studies discussed earlier from peer-reviewed journals, most of the chronic disease management in the Medicare demonstrations was provided by contractors (whether vendors external to the site of care or healthcare facilities) paid through fees, as opposed to paying clinicians for the care they delivered. The fees paid were negotiated on a contractor-by-contractor basis and varied widely. In MHS, the fees averaged 8 to 9 percent of average per member per month (PMPM) costs in the control group (McCall). In MCCD, fees ranged from \$50 to \$475 PMPM based on the risk profile of each plan's study participants. Five programs had average fees that exceeded \$300 PMPM while 6 had average fees below \$175. The standard

for savings was defined as recovery of the cost of intervention in two years. This payment structure combined with the wide variation in beneficiary spending over a small sample made it very difficult to show statistically significant savings. Thus, in the MCCD study, a savings of 10 percent compared to control group spending per beneficiary without including contractor fees was required to achieve statistically significant savings. A 20 percent level of savings was needed for statistically significant savings if contractor fees were included. This is a very high bar to clear, particularly in a relatively short time frame such as two years. Overall, 10 of the 15 programs have not shown statistically significant savings (Brown).

The impact of using different models of care and compensation on savings potential can be seen in the early results of the Medicare Physician Group Practice Demonstration, a pay-for-performance demonstration designed to improve CD management. In this demonstration, physician groups directly manage the care of their patients and are compensated by sharing the savings experienced by Medicare. Preliminary evaluations indicate that most of the groups in the demonstration generated some savings (Kautter, Trisolini). This study used as its control group the entire Medicare population for the geographic area of the group practice meeting the eligibility criteria of the intervention group. This reduced the control group selection bias problems associated with the MCCD and MHS.

Currently, CMS is planning to discontinue 12 of the 15 programs under MCCD and continue three. If the above reasoning is correct, CMS could well be missing an opportunity to gain more information about program effectiveness by shutting down the majority of the initiatives rather than correcting implementation flaws and continuing the demonstration in a revised paradigm. In sum, the structure of the demonstration and the criteria for establishing savings may have erroneously and prematurely doomed the bulk of the demonstration sites.

### *Intervention consistency*

In retrospective interviews of study participants for the MCCD evaluation, it appears that there were significant differences in the intensity and quality of interventions conducted by different contractors or the degree to which they engaged patients. The demonstration contract did not include a standard template for requiring prospectively certain levels and quality of services. Contractors were also permitted considerable discretion (within limits) in targeting their enrolled populations. For example, some plans targeted single conditions (e.g. diabetes). Others enrolled patients based on hospitalization history or administrative data identifying high-risk patients. As noted above, some plans enrolled some healthy people in their programs. It appears that this design variation was intentional to try to determine what types of interventions were more likely to lead to savings. (Brown). However, the inconsistent designs and target groups led to results that averaged apples and oranges. A better design might have involved “planned variation” in which a core intervention technique is used in some sites and to which other intervention techniques are added incrementally. This might have permitted the evaluators to determine the independent effect of various program components.

## The Research Agenda

This section outlines some of the future directions that research and evaluation of care management could usefully take.

### *Planned variation*

This study has attempted to cull through a large volume of research and identify the elements of a successful care management model for people with chronic illness. But we have had to do this by piecing together the disparate strands of research. Generally speaking, we could not find studies that comparatively evaluated the different types of interventions through a model of planned variation. In other words, we need research designs that start with one element of care management and then add other elements (using the same target group and within the same study) one at a time to determine how much one element adds, over and above other elements. This is the key direction that new research should take.

For example, some interventions use telephonic interventions and others use face-to-face interventions. The latter are typically used for higher-risk patients while the former are implemented for lower-risk patients. Frequently, a care management organization will identify which patients are in a “Tier 1,” or higher-need situation, and which in Tier 2, or lower risk, and then assign them to one of the two types of interventions. But there is no direct comparison within the same set of enrollees with the same level of need of the relative impact of telephonic interventions vis a vis face-to-face interventions. Furthermore, care management programs differ not only the *intensity of contact*, but also in the *frequency of contact*. Both telephone contacts and face-to-face contacts could be done quarterly, monthly, or at some other interval.

We could identify the best approaches more readily if studies began with a single intervention delivered at a certain time interval for one group of patients, and then varied both the intensity and the frequency for other similarly situated patients. For example, one group could receive telephonic interventions once a quarter—this would be the mildest form of intervention. The next matched group could receive the same intervention, but monthly. Assuming the groups are of sufficient size and have similar characteristics, researchers could determine what difference the more frequent intervals make. Do similarly situated patients do better with telephonic interventions if they are contacted monthly than if the contact is quarterly?

Following this line of reasoning, a third group could receive face-to-face interventions quarterly while a fourth group gets such help monthly. This would effectively create a two-by-two grid in which the four combinations of intervention type and frequency *can be directly compared*. This would obviate the need to scan a whole range of different studies, each with somewhat different methodologies, target groups, and intervention designs, and try to tease out the ingredients of a successful approach.

Of course, this same type of approach could be used to identify the relative impact of other elements of care management. One very important comparison would be between a program that works exclusively on improving patient compliance or adherence and patient education, and a program that combines this approach to care management with corresponding outreach to providers. The latter could involve initiatives to bring data to physicians about their adherence to practice guidelines, relative to their peers, and encourages them to bring their practice

patterns in line with best clinical standards. In other words, what is the *value added* of such provider outreach to the results we can obtain simply by working with and educating patients?

### *Selection bias*

Some of the studies and evaluations we reviewed were hampered by selection bias. In the Medicare Coordinated Care Demonstration, as we have noted, the participants were generally healthier than the Medicare population as a whole. (Brown, McCall). If care management programs involve voluntary participation, many who participate are people who are already conscientious about managing their chronic illness and therefore have chronic illness that is already, pre-intervention, more under control. These are people who are relatively more willing to follow the advice of a nurse case manager, carefully read educational materials, and report warning signals. This could influence the results of an evaluation by making it hard to show a positive impact of an intervention.

Another problem involves separating what is called the “incident population” from the “prevalent population” among those participating in a care management program. The incident population consists of people identified *during* the evaluation period; they may be people who were in the health plan at the beginning of the year but newly identified during the year as having a chronic illness, as well as people with chronic illness who joined a health plan in the middle of the year. The prevalent population includes people identified *prior* to an evaluation. Changes in the sizes of these two populations can result in the exaggeration of program savings. For example, if the prevalent group has lower costs than the incident group, which is frequently the case, and the proportion of the prevalent population increases year after year, the overall costs will be lower over time even in the absence of an intervention. Overcoming this systematic bias requires calculating overall savings separately for the two populations and using member months to weight the contribution of each group (Liu).

A somewhat related problem involves “migration bias.” Migration bias, in effect, results from people moving from the treatment group to the control group, and vice versa, during the study. For example, substantial numbers of people placed in a control group because they are free of a chronic disease are diagnosed with such disease during a study period. They are the “high-cost patients” from the “low-cost group,” but then they move and become the relatively lower-cost

patients in the high-cost group. This migration has implications for the calculation of savings from care management programs.

Researchers frequently use an “actuarially adjusted historical control methodology,” in which a health care cost trend factor based on the non-chronically ill is applied to chronically ill members’ historic costs (i.e., pre-program costs), to predict the cost of the chronic population in the absence of a program. The researchers assume, frequently wrongly, that the non-chronically ill groups’ cost trends are good predictors of how people with chronic illness will fare in the absence of an intervention. If migration is not properly accounted for through actuarial adjustments, results attributed to an intervention might instead partially reflect migration. In fact, research has shown that a chronic population may become less risky over time (absent an intervention) and that a non-chronic population may become slightly riskier over time. Thus, risk-adjustment is needed to account for migration (Bachler).

In summary, research in the future should take a number of precautions to assure to the extent possible that findings of program impact are real and not the result of various types of biases built into study designs.

### *Comparative assessments of vendor and provider-based interventions*

Another area where more research is needed is to comparatively assess the impact on quality and cost of care management programs that involve contracting out with vendors vis a vis programs that are internally designed and operated. Among many Fortune 500 companies and managed health care plans, there has been a trend toward contracting with vendors for disease management and care management programs. According to one study, “Two-thirds of employers with 200 or more employees in 2005 had a disease management program in their job-based insurance plans (Geyman). Geyman states that “More often than not, disease management is being bought and sold between health plans, employers, and commercial vendors, without any real connection to the primary care system. ...There is no solid evidence yet that commercial for-profit disease management vendors will save money and improve care of chronic illness on a long-term basis (Geyman).”

A related but somewhat different way to conduct the comparison is between care management programs that are keyed to a primary care medical practice or “medical home” versus those that are not. Programs based on primary care and integrated within a managed care organization can be distinguished from programs, mostly outsourced from employers and health plans, that are somewhat removed from the medical community (Geyman). We need reliable comparisons of the effectiveness of these types of programs.

### *Changes that offset utilization improvements*

Another path that future research might take involves accounting for adjustments that may occur in the health care delivery system when utilization is reduced by a care management intervention. One effect might be that when utilization falls, resource intensity will rise to offset some of the gains. For example, the response to reduced hospital days could be greater intensity of resource use *per day*. This would negate some of the savings. Moreover, some believe that an intervention that succeeds in lowering the cost of care will induce greater demand for care, again offsetting some of the savings. The cost per unit of care falls but the number of units delivered rises. Whether this actually would occur in the case of improved results from care management programs could be explored in further research.

## **Conclusion**

What emerges from the existing research is a pathway to promising models of chronic care management that can reduce overall healthcare costs. Not every intervention labeled “disease management” works, and not every patient with a diagnosis is a candidate for disease management. It is clear, however, that while some conditions (e.g. depression) will require substantial investment, many interventions demand only small expenditures to achieve large effects (e.g. pre-discharge planning and counseling). While it may be possible to manage care inexpensively, it does not appear to be possible to manage care superficially. Designing care around the needs of the individual patient is as much a financial and clinical imperative as it is a health policy ideal. This evidence points to a number of steps that can be taken now that will improve care and lead to more efficient use of resources.

*Managed care plans under contract with government and private payers should hold providers accountable and pay them for identifying high-risk, high-cost patients with chronic medical conditions through comprehensive health risk assessments. This should be followed by developing individualized care plans for these patients, with periodic reassessments at the provider level.*

Continuous monitoring of these patients, including self-monitoring, adherence to medication regimens, reporting on conditions, and learning to recognize and act on danger signals should be a part of a good managed care system. Coordinating care and services after critical events leading to ER use or inpatient admissions can help manage chronic illness.

*Especially for people with CHF, multiple chronic conditions, and high-risk pregnancies, hospitals should provide multi-disciplinary team pre-discharge planning and intensive pre-discharge patient counseling followed with at least one post-discharge support home visit. Hospitals that fail to provide these elements of care should not be reimbursed for readmissions.* Elements of the patient counseling session including time spent with the patient should be documented in the patient chart. The costs associated with pre-discharge planning and counseling followed by post-discharge support have been demonstrated to be relatively low.

*Asthma patients who use emergency departments or have been hospitalized should receive detailed home environmental assessment and amelioration. These should be mandatory services in Medicare and Medicaid managed care contracts with appropriate withholds for failure to reach specified levels of compliance.* Again, detail of the elements of intervention should be provided in the patient's chart. Because these interventions have been demonstrated to yield substantial savings, adding them to managed care contracts should not require increases in capitation rates. In the fee-for-service system, these services could be linked to hospital or ED discharge and through working with community health centers and medical groups.

*Medicaid should be required to provide intensive, individualized pre-natal and post-natal care to pregnant women with specified clinical presentations or who are adolescents or unmarried. Elements of care should include ongoing home visits throughout pregnancy and continuing into the post-partum period and involve dietary counseling. In managed care contracts, withholds should accompany failure to meet compliance levels. In fee-for-service Medicaid, such services should be provided through community clinics and through required referral to appropriate agencies from physician offices.* Parenting education, family planning, and life-skill counseling is also associated with better outcomes. Because such services are associated with 37-62 percent

reduction in NICU admissions, increases in capitation or Medicaid spending should not be required.

*Investments in mental health services for the seriously and persistently mentally ill are required before savings can be achieved. If investments are made, the potential savings can be substantial.*

The studies reviewed on depression all involve interventions associated with absence of savings. In particular, the interventions studied tend to be broadly targeted, superficial and of limited duration. There appears to be little face-to-face contact with clinicians or flexible and adaptive pharmaceutical management. By adding superficial contacts to a wide swath of patients in a sector characterized by underutilization, the limited management generates more spending and only marginal clinical improvements. The evidence suggests that more robust interventions more consistent with the level of intervention seen with other diseases and targeted to sicker patients as with other diseases could yield substantial savings. This is confirmed by Billings' study showing that substantial investments for the seriously and persistently mentally ill could result in large savings. Depression represents a classic case of needing to spend money in order to save money.

*Incentives should be provided to clinicians to adopt health information technology and electronic medical records that can be used as decision support tools and to track patient treatment and interventions. In particular, clinicians should be encouraged to use algorithms that provide decision-trees based on individual patient condition.* These algorithms tend to be particularly useful as a mechanism for coordinating care. Incentives can be provided through managed care contracts and direct rewards to providers in the form of gain-sharing.

*Public and private employers, and the managed care organizations with which they contract, should follow the same types of practices recommended here for Medicare and Medicaid.*

*CMS should re-direct its research agenda and funding to carefully identify the components and characteristics of disease management.* Specifically, it should design demonstrations to evaluate the relative contributions of various elements of care management (planned variation) to foster a better understanding of which interventions work best. CMS should also sponsor research that compares the strengths and weaknesses of vendor-based care management versus that conducted by health care providers.

*The recommendations offered here can work in either managed care arrangements with risk-based payments, or the fee-for-service system. Both public and private payers, however, should strongly consider new payment systems that directly reward physicians, hospitals, and other providers for making investments in better care management for people with chronic medical conditions. Gain-sharing arrangements can stimulate innovations that improve the health and functional status of people with chronic illness and reduce total costs.*

It is not surprising that chronic disease management outcomes reflect the strengths and weaknesses of the underlying health system. Where care is generally deficient, it may be necessary to invest resources to begin to address the needs of the affected population. The evidence base supports the proposition that, appropriately designed, care management across a range of settings for different diseases and conditions can be an effective tool in predictably reducing health system costs.

## Appendix: Effects of Selected Chronic Disease Strategies

Disease/condition	Intervention	Utilization changes or savings	Studies
CHF, multiple chronic conditions, COPD	Multi-disciplinary pre-discharge planning and intensive patient counseling followed by post-discharge support that includes home visits	36% – 45% drop in readmissions; 35% – 45% drop in total hospital costs; ROIs from 1.4 to 32.7; savings of \$535 pmpm and Medicare savings from reduced CHF readmissions of \$424 million per year	Goetzel, Dove and Duncan, Riegel, Koelling, CHCS, Phillips
Asthma	Home environmental assessments and amelioration for patients with frequent ED use or hospitalization	49% reduction in combined urgent care utilization (ER, hospital, unscheduled clinic visit)	CHCS
High-risk pregnancy (clinical conditions, adolescents, unmarried and low-income)	Intensive pre- and post-natal care including dietary counseling and multiple home visits throughout pregnancy and post-partum	62%-31% drop in NICU admissions; 65%-39% drop in hospital costs; 16% drop in later pregnancies; 9 month drop in months that mothers on Medicaid	CHCS
Diabetes	Multi-disciplinary teams applying treatment algorithms, meal planning, exercise reinforcement, extensive individualized and group follow-up education	\$685 – \$950 drop in per patient per year costs; 9% drop in all-cause hospitalizations; 71% drop in ER/hospital utilization; 21% fewer total claims	Wagner, Siderov, CHCS
Mental Illness	Intensive individualized chronic care model for severely and persistently mentally ill	In New York City, \$3000 investment in services per patient yields savings of \$24.6 million per year	Billings

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