

WHITE PAPER

A Comprehensive Literature Review of Studies on Care Coordination and Other Health Management Programs

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Executive Summary

Historically, the primary focus for health plans has been quality medical services delivery with the hope of reducing costs. More recently, the role of the health plan has been enhanced with the addition of health management tools and programs. Which programs are most effective and suitable to engaging a member population has yet to be determined. There are strong recommendations from the scientific literature for a health plan to focus on **multi-disciplinary care coordination and case management programs**. In general, the scientific evidence favors the multidisciplinary care coordination model as most appropriate and effective within the health plan environment. Multidisciplinary programs show documented improvements in clinical outcomes and cost savings through reduced hospitalizations, especially in the treatment of congestive heart failure (CHF), diabetes and asthma.

While it is generally accepted that **disease management** programs can be beneficial, there is no consensus in program design and wide variation in program content. Most health plans offer disease management programs to their self-insured clients, but many remain skeptical and are cautious about extending them to their fully insured population. Some offer only a CHF program, where there is some evidence of a positive return on investment. Results for telephone-based disease management programs are more mixed, with generally positive clinical outcomes but less evidence for short-term cost savings. Some recent population-based strategies have integrated health promotion, disease management and case management within the employer setting, but the effectiveness of this approach has yet to be validated.

Health promotion programs have been in place within the employer sector since the mid-1980s. In general, health promotion programs show short-term success in changing health behaviors (Heaney & Goetzel, 1997), and those changes are associated with reductions in

medical costs (Edington, 2001; Pelletier, 2001; Serxner et al., 2003; Chapman, 2005). The scientific evaluation of program outcomes has improved over time, but has often suffered from small sample sizes and experimental design flaws such as voluntary self-selection for participation and comparisons to non-participant populations. Despite these shortcomings, results are remarkably consistent across studies.

In our literature search, we came across very few articles on **utilization management** written in the last decade. One reason could be that the savings generated through denying coverage are straightforward, and the impact of the Hawthorne effect is well known within the industry. Another possibility could be the negative connotation associated with it (Grumbach et al., 1999; Kerr et al., 1999; Lessler & Wickizer, 2000; Koike et al., 2000).

Most recently, medical management has evolved into a **care advocacy model**, which assists individuals in navigating the medical system. Typically, these are telephone-based programs in which health advocates reach out proactively to plan members based on insights gained through utilization management reports, health risk appraisal triggers, predictive modeling, and referrals. They counsel those at risk for serious health issues or with complex health needs, and help those participants navigate the health care system. By helping members better understand their conditions, assisting with treatment-related medical decision making, and coordinating medical services—including physicians' plan of care, inpatient hospitalizations and discharge planning—it is thought that the use of medical benefits will be reduced with more appropriate utilization, and that care quality will be improved.

To date, one version of the care advocacy model was found in the literature search where a Medicare HMO plan coordinated utilization with referrals to lower-cost home- and community-based services. The program demonstrated increased use of primary care physicians and reduced numbers of hospital admissions and hospital days compared to control populations (Shannon et al., 2006). Broader applications of the advocacy model in other populations have been implemented by health plans, with financial outcomes yet to be determined

Another Ingenix client, a patient management services company, is also delivering a similar care advocacy model. This program has demonstrated a decline in inpatient hospital admissions and an improvement in follow-up care for participants. Financial ROI, however, is not yet available for this client.

In summary, as population management strategies are implemented (Wise et al., 2006), program coordination between employers and health plans could optimize resource utilization and allow both groups to deliver effective programs within their respective environments. Employers have access to employee populations for on-site prevention and health risk programs; health

plans have access to clinical expertise in promoting quality of health care delivery, including care coordination and case management, pay for performance (Glickman et al., 2007), and management of chronic disease conditions. Integrating these two diverse approaches in a coordinated system designed to benefit individual consumers could revolutionize medical care delivery, disease management, health promotion and disease prevention activities.

The table below summarizes the different types of outcomes (clinical, cost, etc.) by various medical management programs reviewed in this research.

Summary Table				
Program Area	# of Studies Reviewed	Clinical Outcomes	Cost and Utilization Outcomes	ROIs
Care Coordination	10	Wide range of program focus including complex care, surgical, COPD, CF, and end of life care coordination. Positive outcomes include increased patient satisfaction, improved management of disease, increased pain management, increased quality of life, decreased depression.	Decreased hospitalization, decreased ER visits and hospital days.	ROIs: 3.98 to 9.23. Strong study designs with most Randomized Control Trials (RCTs)
Case Management	9	Improved function (CHF), decreased HbA1c levels (Diabetes), improved depression outcomes (Depression), lowered LDLC levels (CHD), increased drug compliance (CHD, Depression), improved cancer symptom outcomes (Cancer)	Reduced re-admissions (CHF), reduced mortality (CHF), reduced ER and hospitalizations (COPD, Oncology).	ROIs: 1.82 to 6.63. Strong study designs with most RCT.
Disease Management	18	Lack of consistency in program components. Improved quality clinician indicators associated with management.	Mixed financial returns, especially short-term. Evidence of reduced hospitalization and reduced bed days.	ROIs: 1.23 to 3.37 over 1 to 3 years. Lack of consistency in analytical methodologies and definitions of "control populations."
Health Promotion	9	Successful individual health behavior change associated with comprehensive health promotion programs including screening, HRAs, wellness and one-on-one health counseling opportunities.	Lowered medical and pharmaceutical costs for participants relative to non-participants.	ROI: 3:1 after 3 years. Wide variety in methodologies, but consistent results and conclusions across studies.

Introduction: Theoretical Basis

Population-based health management strategies involve stratification of the target population along a defined continuum of health from healthy, to at-risk, to symptomatic and diseased, with coordinated programs to serve the needs of the population at each touch point along the continuum (Figure 1). Traditionally, health promotion programs within the employer sector have been directed at the left side of the spectrum, from healthy to at-risk. Examples include biometric screening (cholesterol and blood pressure), health risk appraisal, one-on-one telephone-based health coaching programs, and on-site wellness and lifestyle management programs that target specific health risks (e.g., weight management, physical activity, stress, etc.). More recently, both the employer and health plan sectors have seen a proliferation of disease management programs, typically delivered by telephone by nurse counselors that extend the focus of care management further along the continuum to include diagnosed disease.

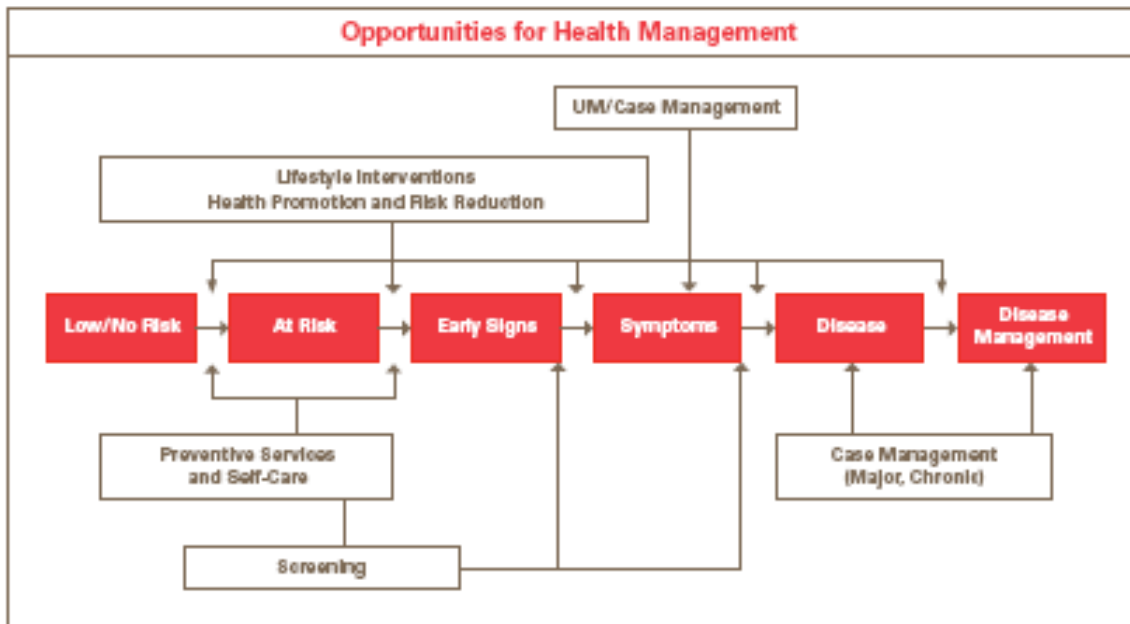


Figure 1. Population-based health management encompasses opportunities to serve the needs of the population along a defined continuum of health.

Within the health plan, health management is more often utilized throughout the medical care delivery continuum. Health advocates, care coordination and case management services are used in an integrated and sustained effort to coordinate, facilitate and monitor the patient experience prior, during and after a medical episode. In this environment, health management has now been extended to include longer-term disease management.

It is important to note that the combined application of health risk management and clinical management is still appropriate within the context of diagnosed disease for maximizing quality-of-life, minimizing clinical symptoms and decreasing utilization of medical services (Figure 2). Ideally, coordination between corporations and health plans would lead to comprehensive health management along the complete spectrum of individual health, and to the optimum employment of shared resources.

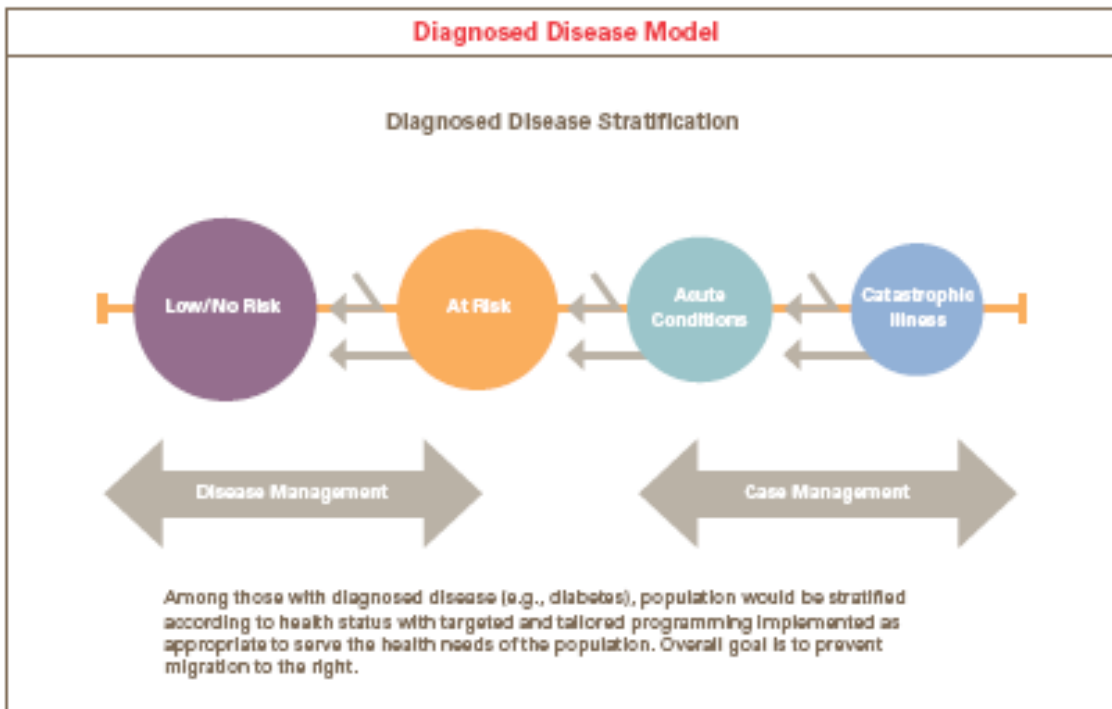


Figure 2. In the Diagnosed Disease Model, health management is more often utilized throughout the medical care delivery continuum.

A key issue for health plans has been attracting the right individuals into appropriate programs in sufficient numbers to serve population health management strategies. In addition, motivating individuals to remain engaged in selected programs has been problematic (Lynch et al., 2006).

Most often, health plan programs feature an opt-in, self-referral format, and attract only a very small, high-cost segment of the population. A consideration of delivery options is an essential component when designing an effective program and maximizing utilization. A health plan might utilize a health portal or a toll-free number for access to programs, with incentive-driven benefits designed to motivate member enrollment in appropriate programs (Tu & Ginsburg, 2007).

Searching the Health Care Literature

The comprehensive journal literature search system PubMed® was used to access article abstracts. PubMed® is a free service of the U.S. National Library of Medicine that includes over 17 million citations from MEDLINE and other life science journals. It provides links to selected electronic full-text articles and other related resources. Full-text

articles (electronic or hard copy) not available through PubMed® were obtained from the University of Michigan Libraries (Medical and Public Health).

Additionally, an online search was conducted for testimonials or press releases from various entities relevant to this topic, including both lesser-known sources and newly released items.

Methodology

Without providing a comprehensive literature search, articles were selected based on how recently they were published (most after 2000), representation (review articles or peer reviewed journal articles), sample size, and the strength of the study design. They were sourced from prominent medical or public health peer-reviewed scientific journals. Search words focused on the four programmatic areas of care coordination or continuity of care, case management, disease management and health promotion or wellness.

Articles chosen included a brief description of the program and focused on measurement of health as well as clinical or cost outcomes. Although cost outcomes may be a primary interest, positive health and clinical outcomes improve quality of life for the patient and provide the mechanism by which one might expect cost reductions. In addition, study timeframes are typically focused on short-term results (i.e., 1 to 2 years). Cost savings resulting from improved disease management and manifested in reduced complications and inpatient hospitalizations may not be realized for several years.

Return on investment studies involve numerous methodologies and are generally rare, often because program costs are not available. Methodological problems, including regression to the mean and small sample sizes, are especially problematic in disease management studies. Key to ROI calculations is the reference population or control. The strongest studies utilize randomized controlled trial (RCT) study designs. Other designs include matched controls and non-participants (voluntary choice or lack of phone numbers). It is important to note that articles are published to document success, and negative results often do not get the same attention. To the extent that negative results were reported, these results are included in the summary.

Summary of Results by Topic Area

Care Coordination

Continuity of care is considered an essential component of a high-quality health care system. It is implicit in primary care and an important component of chronic disease management. The concept implies a sustained partnership between the patient and clinicians that transcends multiple episodes of illness and includes responsibility for preventive care and care coordination (Cree et al., 2006). Continuity of care requires that providers have enough information about patients and their medical histories to make decisions about care, and that there is in place a consistent care management plan across providers (Weinberg et al., 2006).

Continuity of care has been associated with improved outcomes and reduced costs for patients with chronic diseases that require complex care across different health care settings. These include surgical procedures (joint replacement), end-of-life illness, stroke, and complex care diabetes and asthma. In general, care coordination studies are of the highest research quality: many are randomized controlled studies with large sample sizes and comparison controls consisting of populations receiving usual care.

Patients can be contacted and enrolled in care coordination programs prior to, during, or upon discharge following a medical episode. While there are a variety of medical focus areas, care coordination and case management program designs are relatively consistent with clinician-centric, multidisciplinary teams functioning across multiple

medical services areas. Patient-perceived need associated with an illness episode is usually high, which enhances the likelihood of effective program engagement and the documentation of positive clinical and cost outcomes.

Electronic data management is central to care coordination intervention, particularly in the form of an electronic medical record that can facilitate cross-site information transfer. Typically, a care coordination coach makes initial contact with the patient either in the hospital or through referral. Follow-up via home visits or telephone provides guidance and continuity across settings, facilitating quality of care and empowering patients to assert their preferences.

Coleman et al. (2006) documented an annual return on investment of \$3.98 for each dollar spent on a complex care program (11 chronic conditions targeted) that reduced re-hospitalization rates at 30, 90 and 180 days. End-of-life care coordination also showed positive outcomes with better management of disease, including increased awareness of resources, less acute disease symptoms, improved functioning, greater vitality, increased patient satisfaction, increased completion of advanced directives and substantial cost savings (ROI: 9.23) (Aiken et al., 2006; Engelhardt et al., 2006).

Improved medical and cost outcomes were documented for such diverse conditions as surgical knee replacements, stroke and asthma when care coordination or continuity of care interventions were added to the usual care measures (Weinberg et al., 2007; Claiborne, 2006; Cree et al., 2006).

The Veterans Administration used telehealth technology to promote care coordination for diabetic veterans with complex care requirements. They documented decreases in all-cause-related hospitalization rates of 25 percent and a decrease of diabetes-related hospitalizations of 6 percent (Barnett et al., 2006).

In 2002, the Centers for Medicare & Medicaid Services (CMS) launched the Medicare Coordinated Care Demonstration (MCCD) across 15 demonstration programs in a randomized controlled study. The purpose of the program was to improve health outcomes and reduce costs for chronically ill beneficiaries by encouraging adherence to self-care and medication regimens and improving communication with physicians.

Early results (after the first year) indicated high levels of patient and physician satisfaction, but no statistically significant changes were found for patient adherence to medication, diet or exercise regimens. At the time of publication, no estimates of program impacts on Medicare costs or quality of care were available. (See Exhibit A for Reference Summary Table).

Case Management

Case management is defined as any system for coordinating diagnosis, treatment or ongoing patient management (e.g., arrangement for referrals, follow-up of test results) by a person or multidisciplinary team in collaboration with, or supplemental to, the primary care clinician (Shojania et al., 2006).

Case management programs typically target complex care patients who constitute the highest cost segment (i.e., the top 1-5 percent) of the member population. Contact with the patient may be made prior to hospitalization, during an inpatient episode, or as part of discharge planning. The program consists of a nurse manager integrated into a clinician-centric, multidisciplinary team that is capable of implementing a plan of care across several medical disciplines as required by the patient's complex conditions and medical needs.

The key to managing the patient experience is an integrated database that allows program managers to track information across the medical continuum.

Intervention elements include patient and clinician reminders, information relays to clinicians, patient education, promotion to self-management, and continuous quality improvement in medical management. Programs may also include some version of predictive modeling to identify those individuals likely to experience a serious medical episode within the near-term (Lynch et al., 2000).

Complex care management programs that have been implemented to improve care quality for congestive heart failure, COPD, diabetes, CHD and oncology have consistently demonstrated improvements in clinical and cost outcomes. The quality of this research is very strong, with most study designs using randomized controlled trials that compare the intervention to usual care protocols. One key to successful case management strategies may be close coordination between the multidisciplinary team and the clinician who monitors and supplements medical service delivery.

Congestive heart failure is the condition that most often benefits from case management programs, and where studies of clinical outcomes have consistently shown improved functioning, reduced cardiac events, reduced mortality, reduced subsequent re-admissions and positive ROIs ranging from 2.13 to 10.87 (Capomolla et al., 2002; Riegel et al., 2002; Phillips et al., 2004).

Depression case management (in a review of 28 studies) showed improved depression outcomes with increased medication adherence, including mitigated depression symptoms, positive patient satisfaction and improved functional status. These clinical outcomes, however, were not associated with any evidence of cost savings and increased medication adherence may have resulted in pharmaceutical cost increases. (Williams et al., 2007).

Sweeney et al. (2007) detailed a complex care case management program (75 percent oncology patients; randomized controlled trial) within an HMO environment that resulted in decreased symptoms (nausea, anemia and dehydration); decreased inpatient admissions, inpatient days and ER visits; increased home care and hospice days; and a positive ROI of 2:1.

An extensive review of diabetes care management strategies (66 studies) indicated that case management was a significant strategy for reducing HbA1c levels, and documented an average reduction of 0.52 percent across the reviewed studies (Shojania, et al., 2006). A key programmatic component in these interventions seemed to be empowerment of nurses or pharmacists to make medication adjustments without physician authorization. Managing HbA1c levels as a quality metric for diabetes management has been consistently linked to lowered medical costs, with 16-20 percent reductions for good HbA1c control (<7) compared with fair or poor control (≥7 to ≤9, or >9, respectively, Oglesby et al., 2006).

The impact of case management on cardiovascular medication compliance was demonstrated in a randomized controlled study of patients recruited during hospitalization for coronary revascularization (Paez & Allen, 2006).

The intervention included lipid management through lifestyle modification and pharmaceuticals. LDL-C levels were lowered by 39 percent compared to 29 percent for usual care. Higher drug compliance (83 percent vs. 67 percent with usual care) was also associated with the intervention. Cost-effectiveness ratios were calculated at \$26 per unit reduction (in mg/dL) and \$39 per percentage point of LDL-C reduction (Paez & Allen, 2006). (See Exhibit B for reference summary table).

Disease Management

Disease management represents a rapid growth area in programmatic offerings driven by promises of substantial short-term economic returns. Despite considerable investment in this area, limited data are available to evaluate the effectiveness of these interventions. More than any other programmatic area, disease management lacks consistency in program design. In early studies within the HMO environment, disease management was population-based and implemented by multidisciplinary teams that included plan physicians, nurse managers, member support, advocates, clinical teams, and administrative teams. Technical resources included electronic disease registries and data tracking systems that integrated laboratory, pharmacy and medical record data (Rubin et al., 1998). Positive ROIs and documented cost savings generally resulted from this environment (Sidorov et al., 2002; Rubin et al., 1998).

There are two general disease management models.

Within the health plan, disease management is typically an integrated, population-based, multidisciplinary program. Teams include the clinician and nurse manager; tools include disease registries and integrated databases that track laboratory values, prescription renewals, office visits and preventive services compliance. Disease management programs are also available as free-standing, telephone-based nurse counselor programs independent of the health plan or clinician.

More recently, vendors of telephone-based disease management solutions have emerged independent of the medical plan. Typically, these consist of nurse counselors coordinated with a multidisciplinary team of health specialists that do not include the primary physician. In this model, compliance with clinical outcomes, medication adherence and laboratory values are most often self reported. Programs can be population-based or may exclusively target high-cost individuals (i.e., the top 1-10 percent) (Leatherman et al., 2003; Galbraith et al., 2004; Synder 2003; Berthiaume et al., 2007). The impacts of disease management following this model on clinical outcomes and economic returns are generally mixed.

Analyses of disease management programs are complicated by regression to the mean (high-cost participant models), small sample sizes, the lack of suitable control groups, and the frequent loss of up to 30 percent of the targeted population due to wrong phone numbers.

Study designs generally are pre/post comparisons of self-selected participants (who tend to be sicker and more costly) with contacted non-participants or unable-to-contact (i.e., no phone numbers) non-participants. Various matching methodologies have also been used to define suitable control groups (e.g., medical plans with and without disease management programs—Schwerner et al., 2006). To date, no consensus has been reached within the scientific community on the most appropriate analytical methodologies.

Within the HMO environment, disease management programs focused on diabetes, asthma and congestive heart failure have shown positive cost savings and ROIs. Results from diabetes disease management programs have been the most extensively published, with significant increases in clinical quality indicators of HbA1c, cholesterol, retinal and foot lesion screening, and decreases in HbA1c levels. While economic returns are more mixed across studies, generally positive cost savings have been documented with ROIs of 1.23 to 3.37 over 2 to 3 years (Rubin et al., 1009; Klonoff & Schwatz, 2000; CDC, 2001; Sidorov et al., 2002; Leatherman et al., 2003; Villagra & Ahmed, 2004; Norris et al., 2002; Snyder, 2003; Goetzel et al., 2005; Coberley et al, 2007).

An asthma self-management program with telephone follow-up reduced smoking and improved asthma knowledge, functional status, general health and vitality while reducing hospital admissions and ER visits and recording a positive ROI of 2.54 (Lucas et al., 2001).

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Congestive heart failure programs consistently show short-term savings in reduced re-admissions with intensive management (Goetzel et al., 2005). However, populations are often small, and while short-term clinical improvements in functionality and survival rates are positive, long-term economic outcomes (18 months to 2 years) are less certain (Galbraith et al., 2004).

One functional outcome of disease management that is receiving increased attention is improved pharmaceutical adherence. A recent study of telephone-based disease management intervention for 10,000 MCO members with CAD-integrated performance incentives for practitioners and hospitals documented significant improvements in drug adherence and medication management for lipid-lowering statins, ACE inhibitors and beta-blockers (Berthiaume et al., 2007). While no financial outcomes were assessed in this specific study, improved clinical outcomes for diabetes, CAD and depression are generally associated with increased medication adherence. As the evaluation of disease management programs matures, meta-analysis techniques may prove useful in summarizing the various studies statistically to assess aggregate program efficacy (Linden & Adams, 2007). (See Exhibit C for reference summary table.)

Health Promotion/Wellness

Health promotion or wellness programs, offered in the employer sector since the mid-1980s, are designed to improve individual health behaviors with the implicit purpose of reducing medical services utilization and subsequently reducing medical costs. The primary delivery methods used in health and wellness programs have been on-site programs and/or telephone-based delivery. Program components have been relatively well-established and include biometric screening, health risk appraisals, wellness programs and one-on-one telephone-based health coaching (Pelletier, 2001; Pelletier, 2005).

The relationship between health risks and medical costs has been well-documented: individuals with more health risks have higher medical costs than those with fewer health risks (Edington, 2001; Anderson et al, 2000; Goetzel et al., 1998). Health management strategies reflect both the effectiveness of programs in changing health behaviors and the empirical confirmation that medical costs track individual changes in health status. As health status improves, costs decline. As health status declines, costs increase (Edington, 2001).

The intensity of worksite health promotion can vary, but comprehensive programs typically include a health risk appraisal that evaluates and tracks individual risk factors and self-reported chronic conditions. Interventions are then targeted to address individual risk areas with communications, financial incentives, on-site biometric screening and wellness classes (with topics tailored to the population's risk profile), telephone-based coaching, Internet-based health information, and on-site fitness centers or reduced health club membership fees. In the past, health promotion evaluations have suffered from small sample sizes and poor experimental design. More recent studies have focused on improving research quality through larger study populations, participant/non-participant comparisons and retrospective analysis designs.

Despite the wide variety of approaches for economic analyses, there is remarkable consensus that comprehensive health promotion programs improve health outcomes, resulting in medical cost savings of 3:1 after about 3 years.

Pelletier's 2001 review of 15 studies continued his series of reviews monitoring the clinical and cost-effectiveness of health promotion programs. While cost-effectiveness varied and evaluations lacked standardization, individualized risk reduction within the context of comprehensive programs was the key component of most successful programs.

Overall, Pelletier concluded that the duration of programs must be from 3 to 6 months, and that cost-effectiveness can be demonstrated in 3 to 5 years. In a study of approximately 18,000 employees, Ozminkowski et al. (2002) showed medical savings of \$225 per employee per year over 4 years, with most savings realized in years 3 and 4. Substantiating that time frame, Aldana's 2002 review of 32 studies showed an average ROI of 3.48 over a mean program duration of 3.25 years. A follow-up study of school district employees showed no health care cost savings over 2 years (Aldana et al., 2005). A recent meta-evaluation by Chapman (2005) of 42 studies ranked for overall validity reported cost-benefit ratios from \$2.05 to \$6.30.

The impact of program intensity with higher levels of participation (i.e., higher number of programs or more intensive programs) has been well documented in a recent study by Serxner et al. (2003), which demonstrated \$212 savings over a 5-year period) for HRA-only participants. Those who completed 1, 2 and 3+ HRAs realized average savings of \$83, \$173, \$543, respectively. Adding other activities for the 1, 2 and 3+ HRA participants increased savings to \$391, \$607 and \$625, respectively.

The value of preventing low-risk individuals from migrating to higher-risk status with age was verified by Edington (2001), who used regression analyses to assign \$150 in medical and pharmaceutical cost savings per risk reduced, and increases of \$350 for each risk allowed to escalate. In general, between 10 and 30 percent of medical utilization and costs can be attributed to the presence of modifiable health risks, and thus are considered avoidable. (Edington, 2001; Butcher, 2007; Anderson et al., 2000).

To summarize: when health risk appraisals are administered as a core component of a comprehensive health promotion program, they provide tailored health reports for each participating member, as well as population-level risk assessments that can drive subsequent intervention targeting. The health risk appraisal can also be used to track changes in the population-level health risk profile over time, or to measure the effectiveness of selected health programs. Repeat use of the HRA over time appears to be a surrogate measure for engagement in health management, and is associated with medical cost savings (Serxner et al., 2003). Specialty uses of the HRA include health assessment for subgroups (e.g., older adults; Struck et al., 2007), and predictive modeling to identify probable high-cost over members (Coleman et al., 1998; Sylvia et al., 2006). (See Exhibit D for reference summary table).

Appendix 1 – Additional Sources of Information

Listed below is a selection of additional sources of information that were reviewed as part of this project but not referenced in the article. These are mainly non-peer-reviewed reports and news releases that provide information but were not included in the body of the article due to lack of scientific validity.

Care Coordination or Disease Management Outcomes

1. News Release. *HealthPartners reports most cost-effective programs in 2006*. HealthPartners. Dec. 28, 2006.

Brief (dated 12/06) from HealthPartners, pertaining to their savings from disease management and case management programs: <http://www.healthpartners.com/portal/3297.html>

Press release from HealthPartners (large consumer-governed, non-profit health care organization) announcing nearly \$70 million cost savings from three programmatic initiatives: generic drug initiative (\$34.5M), behavioral health case management program (\$3.6M) and disease management programs (100,000 members; \$30.1M). No details were given on program content or design.

2. North Carolina Medical Journal Table of Contents. 2006;67(6):415-462.

From the North Carolina Medical Journal (2006;67 (6):415-462), a list of articles (and links) pertaining to health promotion/workplace wellness: <http://www.ncmedicaljournal.com/nov-dec 06/toc1106.shtml>

This special issue of the North Carolina Medical Journal focused on a policy forum on worksite health promotion and wellness. The editorial staff invited a distinguished group of North Carolinians and national figures in the health promotion field to address a number of key issues within the health promotion field. Each invitee provided commentary on a variety of topics, including who are the beneficiaries of wellness programs (Edington), why employers should invest in health promotion (Goetzel), how important are incentives (Chapman), small business initiatives (Linnan), etc.

3. Mercer Consulting. Business Case for King County Health Reform Initiative. April 1, 2005.

An analysis from 2005 of various health initiatives implemented by King County (Washington State) and analyzed by Mercer (includes ROI for disease management and case management): http://www.metrokc.gov/employees/focus_on_employees/documents/HRI_Bus_Case_Council.pdf

Cost benefit projection analysis conducted by Mercer for King County (Washington State) of their health initiative, including a pilot disease management program, expanded case management, nurse advice line, provider best practice care considerations and high-performance specialist network. Wellness features included a health risk appraisal and targeted follow-up health behavioral change programs.

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Each programmatic component (with a set of assumptions), including disease and case management, nurse line and high-performance network, were projected to independently yield potential annual ROIs of 2.0 to 3.0 from 2005 through

2009. Best practice initiatives were projected to yield ROIs of 4.0 to 7.5 over the time period, with health promotion yielding between 1.0 to 2.0 in 3 to 5 years.

4. Weinberg D.B., Lusenhop R.W., Gittell J.G., Kautz C.M. *Coordination Between Formal Providers and Informal Caregivers*. Health Care Management Review 2007; 32(2):1-19.

Report from the Commonwealth Fund (dated 4/07):

http://www.commonwealthfund.org/usr_doc/1028_Weinberg_coord_formal_providers_informal_care.pdf?section=4039.

This study explored the effects of coordination between formal providers and informal caregivers on caregiver preparation to provide care at home and the effect of caregiver preparation on patient outcomes. Patients (N=222) were surveyed before and after knee replacement surgery to assess outcomes. Results of modeling indicated that relational coordination between formal providers and caregivers improved caregiver preparation and was positively associated with patient's freedom from pain, improved functional status and mental health.

5. Johns Hopkins and Healthways. *Improving Care Coordination Through Physician/Disease Management Collaboration*. 5th Annual Disease Management Outcomes Summit. November 12-13, 2005. Fort Lauderdale, Florida.

Report from Johns Hopkins and Healthways (dated 11/05): <http://www.healthways.com/WorkArea/showcontent.aspx?id=282>

This report summarized the 5th Annual Disease Management Outcomes Summit from November 2005, hosted by Johns Hopkins and Healthways, and focused on the delivery and issues associated with care coordination programming. The report includes a definition of care coordination and description of key components to be included in provided programming to be considered "care coordination."

Care Coordination

6. Brown R, Peikes D, Chen A, et al. The Evaluation of the Medicare Coordinated Care Demonstration: Findings for the First Two Years. Mathematica Policy Research, Inc. March 21, 2007. From Mathematica, a report on findings from the first two years of the Medicare care coordination demonstration (report dated 3/21/07):

<http://www.mathematica-mpr.com/publications/PDFs/mccdfirsttwoyrs.pdf>

This was a randomized, controlled study funded by CMS over 15 sites to determine the effectiveness of a coordinated care program within the Medicare beneficiary population. Findings of the study after 2 years indicated that, while in general patients and physicians were satisfied with the program, few programs had statistically detectable effects on patients' behavior or use of Medicare services. No clear impacts were indicated for patients' medication adherence, self-care or reduction in expenditures for Medicare Part A or B services for any program. All programs reported difficulty enrolling participants.

7. American Association of Preferred Provider Organizations. 2006 White Paper Series: Trends & Innovations in PPO Care Coordination. Sponsored by Healthways. September 18, 2006.

White paper from the AAPPO pertaining to care coordination practices in PPOs (dated 9/18/06).

This report provides a brief descriptive overview of care coordination programs across America's PPO delivery system including the following topics: core approaches to care coordination, hybrid utilization management products, disease management, identifying high-risk patients, role of technology, and recommendations for measuring the effectiveness of care coordination.

8. Hostetter, M. Quality Matters: Care Coordination. May/ June Newsletter. The Commonwealth Fund. May 17, 2007.

From The Commonwealth Fund, an article on care coordination (dated 5/17/07):
http://www.commonwealthfund.org/publications/publications_show.htm?doc_id=483050

In Focus Opinion piece recommending reform: "The care of many patients lacks necessary oversight and continuity, particularly during transitions among health care providers and settings. Current efforts to improve care coordination focus on patient coaching and tracking of high-risk groups, but widespread reform will require changes to the financing of care delivery and other system-wide changes."

Care Management

9. Statement of Debra Draper before the U.S. Senate Committee on Finance concerning commercial health plans' care management activities and the impact on costs, quality and outcomes. Health on the Medicare Advantage Program. April 11, 2007.

Senate testimony on commercial health plans' care management activities and the impact on cost, quality, and outcomes (dated 4/11/07): <http://www.senate.gov/~finance/hearings/testimony/2007test/041107testdd.pdf>

More health plans are offering care management activities such as disease management, case management, and health promotion and wellness. There is considerable variation across plans as to what is specifically offered and to whom. Determining the extent of these activities or the degree to which they are engaging their enrollees is difficult to assess. Furthermore, there is limited data as to what impact, if any, care management activities have on costs, quality and outcomes. Thus, financial support (through Medicare Advantage) for these activities is difficult to rationalize unless those providing the funding expect that as health plans gain more experience and sophistication, results will eventually justify the investment.

10. Butcher L. *Care Management Data Hard to Come By*. Managed Care Magazine. March 2007.

From Managed Care Magazine, an article on the difficulty of obtaining care management data (dated 3/07):<http://www.managedcaremag.com/archives/0703/0703.employer.html>

News article announcing the HERO Health Management Best Practice Scorecard launched in late 2006 developed by a task force that included Staywell's David Anderson and executives from BCBS of Rhode Island, Prudential Financial, Matria Health Care, Kellogg, Kimberly-Clark and others to gather information across employers for best practices in health and wellness programming, and to allow employers to compare themselves by industry type, number of employees, geographical region, etc.

11. Edlin M. *Care Management for Seniors Requires Heightened Coordination*. Managed Healthcare Executive. March 1, 2007.

Brief article from Managed Healthcare Executive, on case management for seniors (dated 3/1/07): <http://www.managedhealthcareexecutive.com/mhe/article/articleDetail.jsp?id=409184&&pageID=2>

This short article focuses on including remote monitoring devices in care management programs for seniors. An example was given for CHF remote telemonitoring devices transmitting weight, blood pressure and oxygen saturation levels to a nurse daily. In addition, touchscreen technology can be used to answer basic questions to alert nurses of problems. Other examples include devices being tested designed to stimulate brain activity to help improve attention span, mental acuity, power of listening and memory retention.

Disease Management

12. Lewis A. *New Math Provides Epiphany for Measuring ROI*. Managed Healthcare Executive Magazine. April 1, 2007.

From Managed Healthcare Executive magazine (dated 4/1/07), an article about calculating disease management ROI: <http://www.managedhealthcareexecutive.com/mhe/article/articleDetail.jsp?id=415870&pageID=1>

Recommendation to use population-based return-on-investment approaches rather than previous focus on DM-enrolled, high-cost participants: "The new model works because it is vastly more inclusive than the old. It doesn't just involve chronic diseases. It combines wellness, 24/7 nurseline, preference-sensitive conditions, complex case management, and care coordination into a one-stop shop.

Most importantly, it promises to bend the trend, not just on chronic care events (which make up surprisingly little of many employers' health spend, according to Health Dialog), but on the entire healthcare budget."

13. Zwar N, Harris M, Griffiths R, et al. *A Systematic Review of Chronic Disease Management*. Australian Primary Health Care Research Institute. The University of New South Wales School of Public Health and Community Medicine. September 2006.

From the Australian Primary Health Care Research Institute, this paper addresses disease management components and programs from various countries, including the U.S.: http://www.anu.edu.au/aphcri/Domain/ChronicDiseaseMgmt/Approved_25_Zwar.pdf

Primary focus on the chronic care model used to guide evidence-based care of chronic disease. Overall, there is a lack of evidence across countries for the impact of interventions and certainly for the implementation of the model as a whole. The chronic care model, while a very helpful conceptual framework, may not provide sufficient practical guidelines at the level of the health service to assist policy and decision makers to plan and guide organization and delivery of services.

Health Risk Assessment

14. Association of State and Territorial Health Officials (supported by the CDC). Issue Brief: *Health Risk Assessments (HRAs): Saving Costs and Improving Health in the Workplace*. January 2007.

From the Association of State and Territorial Health Officials, a white paper on HRA cost savings (dated 1/07): http://www.astho.org/pubs/HRAUpdatedPaperPAS_2_.pdf

Summary article on unpublished savings association with HRAs and wellness programming across several large private-sector employers: Bank of America, Procter & Gamble and DaimlerChrysler. Article also focuses on several state case studies with a conclusion that states should follow private business leads in implementing health risk assessments with the potential of saving money and improving productivity.

Health Promotion/Wellness Programs

15. The Perryman Group. *An Ounce of Prevention—The Potential Impact of Investments in Prevention, Wellness and Smoking Cessation Programs on Business Activity in Texas*. PowerPoint Presentation of Consultant Group. April 2007.

From the Texas Business Group on Health, the Texas Coalition for Worksite Wellness study (dated 4/07): <http://www.txworksitewellness.org/documents/perrymanreport.pdf>

Consultant report on potential savings associated with programming in the public sector modeling with different program scenarios.

16. Zank D, Friedsam D. *Employee Health Promotion Programs: What is the Return on Investment?* Issue Brief. Wisconsin Public Health & Health Policy Institute. 2005;6(5):1-2.

From the Wisconsin Public Health & Health Policy Institute, a report on health promotion ROI (dated 9/05): http://www.pophealth.wisc.edu/UWPHI/publications/issue_briefs/issue_brief_v06n05.pdf

This short review article summarizes the evidence for the financial returns for health promotion programming. The authors conclude: "Indeed, the business case for such programs is now well enough defined that some insurance brokers offer discounted rates to companies that institute or subscribe to wellness programs. Future questions will focus on how best to combine comprehensive and focused interventions, the intensity of elements and how to calibrate the dose-response model to achieve a target ROI."

17. Goetzel RZ, Oxminkowski RJ, Baase CM, Billotti GM. *Estimating the return-on-investment from changes in employee health risks on the Dow Chemical Company's health care costs*. Journal of Occupational and Environmental Medicine. 2005;47:759-768.

From the Journal of Occupational and Environmental Medicine, an article on Dow Chemical Company's ROI for their health promotion program (dated 8/05):

<http://healthproject.stanford.edu/publications/Estimating%20health%20care%20costs%20Goetzel.pdf>

Article describes several models with assumptions of necessary risk reduction levels needed to drive prospective positive returns on investment over the course of 10 years. A "break-even" scenario would require the company to reduce each of 10 population health risks by 0.17 percent per year over the course of 10 years.

18. Cable J. *The ROI of Wellness*. Occupational Hazards Magazine. April 13, 2007.

An article from Occupational Hazards Magazine (dated 4/13/07): http://www.occupationalhazards.com/News/Article/47545/The_ROI_of_Wellness.aspx

Short article based on an interview with Ron Goetzel discussing potential financial impacts associated with wellness programming. Article also includes case reports from American Cast Iron Pipe Company (on-site fitness center and physical rehabilitation program moved on-site; ROI 2.5:1 in medical and 3.5:1 including absenteeism savings) and Highsmith (evidence of reduced cholesterol and improved employee retention associated with program).

19. Jordan S. *Financial Carrot Is a Healthy Incentive*. Insurance NewsNet. Omaha World Herald. March 27, 2007.

Article from Insurance NewsNet, about wellness program incentives (dated 3/27/07):

<http://www.insurancenewsnet.com/article.asp?a=sa&id=77713>

This news article reviews current trends to tie health incentives to health plan premiums with required participation in given health promotion programming to maintain "discounted" premiums. The author suggested that these incentive approaches may bring together the motivations of employers, employees and physicians.

Appendix 2 – References

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Exhibit A – Care Coordination						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Aiken et al. 2008	162 Total 101 intervention; 61 controls Home-based case management; contacted every three months	COPD or CHF (end of life)	RCT	Compared to controls, those in program had increased: <ul style="list-style-type: none"> • Self-management of disease • Awareness of resources • Lower disease symptoms • Higher self-rated health • Improved functioning, • Greater vitality 	No change in ER visits	
Engelhardt et al. 2008	275 Total 153 intervention; 142 usual care. 8-session format for coordinated care with follow-up 3 and 8 months post enrollment	EOL (end of life illness)	RCT	Compared to usual care, those in program had: <ul style="list-style-type: none"> • Increased patient satisfaction • Increased provider support • Increased completion of advanced directives (89% vs. 48%) 	Savings: \$4,172 Cost of program: \$452.12	9.28
Claborn 2008	28 Total 18 intervention; 12 control. 3 month follow-up	Stroke	RCT	Compared to controls, those in program had: <ul style="list-style-type: none"> • Increased quality of life • Decreased depression • Increased adherence to self-care 		
Barnett et al. 2008	800 Total 400 intervention; 400 control. Telehealth program with 24 month follow-up.	Complex care diabetes	Matched control pre/post	Services included: performing patient assessments, placing orders for medications, helping patients manage medications, scheduling client and physician appointments.	All cause hospitalization decreased by 25%. DM-related hospitalization decreased by 6%. Coordinated care primary clinic visits decreased by 8.7%.	
Cree et al. 2008	2774 Total Continuity of care measured as index of asthma office visits made to same physician relative to all visits 2-4 year follow-up.	Asthma 5-45 years	Cross-sectional		High continuity of care associated with: <ul style="list-style-type: none"> • Decreased risk of hospitalization (RR 0.69; decreased 25%. • Decreased risk of any ER visit (RR 0.24; decreased 80-75%). • Decreased number of ER visits, Decreased total hospital days. 	

Exhibit A – Care Coordination (continued)						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Draper D. US Senate Testimony 2007		Care coordination across all disease states		Most health plans do not know the outcome but believe it is positive and it's the right thing to do.	Most health plans do not know the financial return.	
Brown et al. 2005	10,000 Medicare beneficiaries across 15 programs. Medicare Coordinated Care Demonstration (MCCD) Telephonic program averaging 12 to 8.2 contacts during the first year; focus to improve adherence to self-care and medication regimens and improve communication with physicians.	Targeted chronically ill beneficiaries across a number of conditions including CHF, CAD, cancer, those identified via high-risk algorithm and those with multiple conditions.	RCT	Early survey results indicate high patient and physician satisfaction with care. No statistical improvement in self-reported adherence to medication, diet and exercise regimens.	No estimates of program impact on Medicare costs and quality of care available to date.	

Exhibit B – Case Management						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Capomolla et al. 2002	234 Total 112 usual care; 112 day-hospital CM 12 month pgm	CHF	RCT (Randomized Control Trial)	Improved function: 15% improved and 18% worsened (UC) vs. 23% improved and 11% worsened (CM). Reduced cardiac events: 10.8% vs. 2.7%	Reduced readmissions: 11.6% vs. 8.3%	Savings of \$1,088 for each QALYs
Riegel et al. 2002	350 Total 120 telephonic nurse CM; 120 usual care. 6 month pgm	CHF	RCT	Heart failure hospitalization rate for intervention group 47.9% reduced. Heart failure days and multiple readmissions reduced.	Costs 45.5% reduced	\$1,000 savings; \$443 pgm cost ROI 2.28
Phillips et al. 2004	(Review) 3,304	CHF	Comprehensive discharge planning	Reduced readmissions (RR 0.74) Reduced mortality (RR 0.87)	Combined study medical savings: -\$536	Combined ROI: 8.83 (range 2.13 to 10.87)
Lynch et al. 2000	1.1 % targeting algorithm for case management; population management	Predictive modeling to be high cost	Pre/post Integrated registry; case manager; physicians; ancillary resources	Admission rate for plan reduced by 5.3%	Costs for intervention group dropped by 35.7% or from \$2500 PMPM to \$1688 PMPM	Savings of \$824.83 per participant in intervention group
Bourbeau et al. 2004	191 Total 98 usual care; 98 CM + self-management education; 8-7 weeks education and monthly follow-up calls; 12 month follow-up	COPD	RCT	Savings: • ER visits: \$201/patient (acute and other). • Hospitalizations: \$3,107/patient (acute and other).	Savings: \$3,338/patient PgM Cost: \$3,778/patient with 14 patients/manager	Actual ROI: 0.88 Estimated ROI: 1.62 with 50 patients per manager
Sweeney et al. 2007	758 Total 398 usual care; 358 patient-oriented CM; pgm length at least 3 months (significant reduction in utilization for those in pgm at least 9 months). Utilization data-base; 1.8 home visits/patient; 14 telephone contacts/month	Complex care patients: 75% oncology	RCT	Decreased inpatient codes: • Nausea -44% • Anemia -33% • Dehydration -17% • Inpatient admissions -38% • Inpatient days -38% • ER visits -30%	Costs reduced 26%. Home care increased 22%. Hospice days increased 82%.	ROI: 2:1

Exhibit B – Case Management (continued)

Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Sweeney et al. 2007	758 Total 398 usual care; 358 patient-centered CM; pfgm length at least 3 months (significant reduction in utilization for those in pfgm at least 9 months). Utilization database; 1.8 home visits/patient; 14 telephone contacts/month	Complex care patients: 75% oncology	RCT	Decreased inpatient codes: • Nausea -44% • Anemia -39% • Dehydration -17% • Inpatient admissions -38% • Inpatient days -38% ER visits -30%	Costs reduced 26%. Home care increased 22%. Hospice days increased 62%.	ROI: 2:1
Shojania et al. 2008	Meta-analysis scores 68 trials	Diabetes	Review	28 studies showed case management to be a significant strategy for reducing HbA1c levels: 0.52% on average (0.96% with medication adjustments within CM)	Interventions in which nurse or pharmacist could make medication adjustments without physician authorization were most effective	
Williams et al. 2007	Review 11,000 patients; Duration 3-24 months; 64% 4+ calls; program delivered via phone; pfgm included patient education and self-management; monitoring symptoms; decision support; patient registry; mental health supervision by CM	Depression		20 of 28 studies showed improved depression outcomes: Medication adherence increased 138%, Improved depression symptoms 18.4%, Positive patient satisfaction and functional status.	No cost savings. Most consistent positive outcomes found with medication adherence during acute and continuation phases.	No cost savings
Pasz & Allen 2006	228 patients recruited during hospitalization after coronary revascularization; 115 intervention; 113 usual care; Lipid management through lifestyle modification and pharmaceuticals 12 months	CHD	RCT	LDL-C levels lowered by 39% compared to 29% for usual care. Higher drug compliance 83% vs. 67% associated with intervention. Cost effectiveness ratio calculated per unit reduction at \$26.03 per mg/dL and \$39.05 per percentage reduction in LDL-C for the 12-month period.	Cost savings associated with prevention of cardiovascular events not calculated.	Pfgm cost \$1573.31 per patient for intervention and \$1182.81 for usual care.

Exhibit C – Disease Management (continued)						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Sidorov et al., 2002	6,799 Total 3,118 In DM; 3,681 non-participant control. Nurse-managed with physician within HMO, specialty clinics, chart review or claims extracts.	Diabetes	Retrospective claim review	Improved quality scores for HbA1c, lipid, eyes, kidney. HbA1c level > 9.5% reduced from 6.7% vs. 1.4% for control.	Decreased admissions. Decreased ER visits. Increased primary care physician visits.	ROI: 1.29 Savings of \$10286 pmpm. Cost of prgm \$83.33 pmpm.
Leatherman et al., 2003	Review Healthways	Diabetes		Reduced complication rates, but required 10 years run-out to realize savings.		ROI: 1.23 over 10 years. Negative ROI in short-term.
Villagra & Ahmed 2004	43,482 Total 27,876 full participants; HMO Population management; 8.77 telephone interactions for highest severity; Educational packets to all + 1 phone contact; physicians received updates.	Diabetes	Pre/post with control site	Improved quality metrics: retinal exams, albumin testing, lipid testing and tobacco use.	Reduced medical costs by 24.7%. Reduced pharmacy costs by 28%. Reduced inpatient costs by 11.4%. Reduced admissions by 30%.	\$137 pmpm savings for full participants; \$28 pmpm savings for all participants compared to control site. Program costs not given
Galbraith et al., 2004	1089 Telephonic DM Consultations	CHF	RCT (Randomized Control Trial)	Increased survival probability	No change in hospital admissions. No financial savings documented.	
Norris et al., 2002	Review Population management	Diabetes		GDM Improved -0.5% (-1.3% to -0.1%). Improved monitoring of GDM and retinopathy screening, foot lesions and peripheral neuropathy.		ROI: 1.86 pre-conception care

Exhibit C – Disease Management						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Rubin et al. 1998	7,000 Total HMO Multidisciplinary team includes plan physicians, diabetes nurse, member support advocate, administrative team, clinical team, electronic tracking. Population-based, 6 month-1 year	Diabetes	Retrospective pre/post	Increase in quality clinical indicators: HbA1c scores, cholesterol screening, eye tests, etc.	Hospital admissions decreased by 18%. Bed days decreased by 21%.	\$50 pmprn savings (12.3% reduction in overall costs)
Kionoff & Schwartz 2000	Review	Diabetes		Clearly cost saving: eye care, pre-conception care, improved glycemic control (Type 2)		ROIs: pre-conception care: 5.18:1/1.86:1 No other ROI studies strong enough
Lucas et al. 2001	213 Total	Asthma 2-year pre/post; 8-week classroom prgm; self-mgmt with regular follow-up calls.	Pre/Post	Smoking reduced from 3.7% to 0.9% at 2 years. Improved asthma knowledge, functional status, general health, vitality.	Reduced admissions 5.7% to 3.6%. Reduced ER visits 21.6% to 3.7%. Reduced hospital days 64 to 24 days.	ROI at 2 years: 2.54. Program cost: \$450 / participant over 2 years
CDC 2001	Review Medium of 12-18 month follow-ups	Diabetes		Task Forces on Prevention Services recommendations for: Disease management—GHb and lipid monitoring; screening for retinopathy, foot lesions and urine protein; reduced GHb levels. Case management: monitoring GHb levels		

Exhibit C – Disease Management (continued)						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Cousins & Liu 2003	76, 194 Total PPO health plan 1009 study group DM eligible; 2491 matched controls no DM available 12-month enrollment Education/nurse line Telephone/mail nurse contact 20% high intensity prgm.	Asthma, diabetes, CAD	Prediction model from matched controls compared to cost trends for DM eligibles.	Savings calculated for DM eligibles vs. predicted medical costs from matched control compared to actual costs for program eligibles.		ROI 2.84 Gross savings of \$1.45 pmpm.
Snyder 2003	883 Total 422 continuous participants; 3 years; American Healthways	Diabetes	Pre/post cohort	Increased A1c testing, retinal exams and foot exams. Decreased A1c levels.	Medical costs decreased by 26.8%. Inpatient costs decreased by 38%.	ROI 3.37 after 3 years. Savings: \$98.49 pmpm.
Goetzel et al., 2005	Review	Asthma CHF Diabetes	RCT; pre/post; pre/post controlled			Asthma ROI average 2.72 (-.19 to 5.42) over 1.3 years. CHF ROI average 2.78 (1.48 to 3.68) over 0.8 years. Diabetes ROI average 0.71 (0.54 to 2.23) over 2.5 years.
Schwamer et al. 2005	2 matched health plans in NE; 12 month pre/12 month post; Program Intervention not well defined: 2035 Intervention; 8738 controls.	14 complex chronic conditions	Pre/post matched control for plan without DM		Reduced claims trend and medical cost vs. control (-8% vs. +10%)	

Exhibit C – Disease Management (continued)						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Berthlaume et al., 2007	10,000 members with CAD under management MCO Multifactorial approach DM program (Healthways); Practitioners and hospital performance Incentives; CAD established guidelines; Value-add services: Clinician support, provider services, nurses, dietitians, physician visits.	CAD	Retrospective observational	Significant improvement in drug adherence & management: Lipid lowering (55% to 71%). Those on ACE Inhibitors increased (44% to 55%). Those on beta-blockers increased (36% to 47%).		
Coberley et al., 2007	5840 non-adherent for A1c or LDLC testing at baseline 28.7% with inaccurate phone numbers; 3965 received calls compared to 1875 not called	Diabetes	Participant/ non-participant comparison	30% increase in A1c testing compared to control 10% increase in LDLC testing. Linear trend for increased rates of adherence with increased frequency of telephonic contacts for both A1c and LDLC testing.	No financial outcomes assessed	
Ofman et al., 2004	Review 102 studies	11 chronic conditions		Depression management had the highest percentage of comparisons (48%) showing substantial improvements in patient care, whereas COPD and chronic pain appeared least effective. Of outcomes studied, DM appeared to improve patient satisfaction, patient adherence, and disease control.	Few studies demonstrated a notable reduction in costs.	

Exhibit D – Health Promotion/Wellness						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Pelleter 2001	Review 15 studies	Health risks and health behaviors	Most pre/post using non-participants as controls; voluntary selection into programs.	Individualized risk reduction within the context of comprehensive programs may be the most critical component.	Cost-effectiveness varies. Lack of standardized evaluations. Duration of the program must be 3-8 months with cost-effectiveness demonstrated in 3 to 5 years.	
Ozminkowski et al., 1999 and 2000	Chibank employees 11,194 participants; 11,644 non-participants.	10 health risks tracked with HRA	Quasi-experimental	8 of 10 risks reduced (exceptions were weight and cholesterol levels) over 2 years		ROI: 4.56 over 38 months
Ozminkowski et al., 2002	~18,000 employees Johnson & Johnson program				Decrease outpatient costs (\$45.17); mental health visits (\$70.69); and inpatient days (\$119.67)	Overall savings in medical costs \$224.66 /employee /year over 4 years (most savings realized in years 3 and 4). No program costs given.
Aldana 2002	Review Conclusion reached that health promotion impact on health care costs is "indicative" 32 studies average duration of programs 3.25 years	Risks associated with cost: obesity, cholesterol, blood pressure, stress, diet, alcohol, seat belt use, physical activity and multiple risks				ROI average: 3.48 (over 3.25 years)

Exhibit D – Health Promotion/Wellness (continued)						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Aldana et al, 2005	Washoe School District 1407 participants; 4839 non-participants	Health risks	Pre/post with non-participant control		No savings in health care costs over 2 years	
Senner et al, 2003	Chrysler employees eligible from 1992-1997 13,048 HRA or wellness participants; 13,383 non-participants Baseline 1992; participation between 1992 and 1997; Costs assessed in 1997	Health risks	Pre/post with non-participant control		Over a 5-year time period: HRA (only) participants cost \$212 with completers of 1, 2, and 3+ associated with savings of \$83, \$173, \$543, respectively. Adding other activities increased savings for 1, 2, and 3+ HRA and activities to \$391, \$607, \$825, respectively	
Chapman 2005	Meta-evaluation of 58 peer-reviewed studies. Newer programs include use of Trans-theoretical (Stages of Change) Model, Internet-provided health information, tailoring, benefits-linked financial incentives, telephonic high-risk intervention coaching, self-directed change and annual morbidity-based Health Risk Appraisals.	Health risks	Participant/ non-participant pre/post retrospective analysis	Lack of standardization in the methodology used in economic analysis of worksite programs. Despite widely varying methods and approaches, results show congruence.	Studies ranked for overall validity. Health care costs reduced by average 28% over studies.	Cost-benefit ratios of \$2.05 to \$6.30.

Exhibit D – Health Promotion/Wellness (continued)						
Study	N	Condition	Study Design	Clinical Outcomes	Cost and Utilization Outcomes	ROI
Edington 2001	Summary of research findings from the University of Michigan 20+ years of experience in employer evaluation	Health risks			Mean increase in medical/ pharmaceutical costs per risk factor gained (\$350). Mean decrease in costs per risk factor reduced (\$150). 25% to 30% of medical costs are associated with excess health risks.	
Burcher, 2007	Watson Wyatt analysis of health promotion activities				Typically between 10% and 20% of claims are avoidable.	ROI ranges from 2:1 to 4:1

About Us

Ingenix Consulting is a premier, data-driven health and human services consulting organization. We have over 1,000 consultants with experience working with hospitals, physician practices, health plans, employers, government agencies and pharmaceutical companies. This scale and exclusive health and human services focus set us apart.

About The Authors

Shirley Musich, senior consultant at Ingenix Consulting, is responsible for providing decision support to lead employers and other Ingenix clients through health evaluation, strategy design, intervention, measurement and evaluation processes. Prior to joining Ingenix, she was a Senior Data Analyst at the Health Management Research Center (HMRC) in the Division of Kinesiology at the University of Michigan. Dr. Musich's research focuses on the associations between participation in health promotion, risk reduction, and disease management programs, and their effects on health status (health risks) and medical and productivity cost outcome measures. She has numerous publications investigating the health benefits and cost savings (e.g., medical, short-term disability or workers' compensation costs) associated with comprehensive health promotion programs. Dr. Musich completed her doctoral degree in Kinesiology at the University of Michigan in 1998 with Dr. D.W. Edington and worked for 12 years at the University of Michigan HMRC.

Dr. Sadhna Paralkar, a physician consultant at Ingenix Consulting, is responsible for providing clinical expertise to our clients in the payer, provider, public sector, and employer markets. Her areas of expertise include health care informatics, medical management program design, clinical operations, benefit plan design, network management strategies to optimize health improvement while containing costs, and evaluation and implementation of disease management and wellness programs based on evidence-based medicine protocols. Dr. Paralkar joined Ingenix from OptumHealth, another UnitedHealth Group (UHG) company, where she served as the Director of Product Management for the Care Management suite of products since 2003. She was also responsible for the Care Management ROI model at OptumHealth and commercializing the Care Management value story. Dr. Paralkar has published several articles on Health and Productivity in peer-reviewed journals and is an invited speaker at national conferences on the business of health care. Dr. Paralkar completed her medical internship in 1992 at L.T.M. General Hospital of University of Bombay, India after earning her baccalaureate degree in Medicine and Surgery from the same institution in 1990. In 1995, she completed a Master of Science degree in Public Health from the University of Illinois at Urbana-Champaign focusing on health data analysis and epidemiology. Dr. Paralkar also completed an MBA with a focus on health industry management and marketing from the prestigious Kellogg School of Management of Northwestern University in 2003.