

Healthcare information technology (IT) Although significant investment is being directed toward clinical IT, we should not lose sight of what can be achieved by focusing also on operational (i.e., administrative) IT systems. For example, data on waiting times throughout the care delivery process are virtually unobtainable, thereby masking inefficiencies and making it harder to redesign operations. Unlike clinical IT, operational IT systems already exist; they just need to be directed to measure appropriate statistics.

Cost saving from managing clinical variability Efforts to contain use based on clinical variability are not sufficient as a strategy for cost containment. Cost savings necessitate addressing both clinical and artificial flow variability to decrease excess capacity in the healthcare system. Variability methodology and operational management complement comparative effectiveness research and other efforts to reduce clinical variability to realize cost savings in the near future.

Opportunities for Implementation: Short- and Long-Term Goals

The core principles of variability methodology have been well established and proof of the concept has been demonstrated. Once hospital executives and physician leaders are educated about variability methodology and operational management and the process changes involved, they typically become strong advocates. The main missing ingredient for large-scale adoption is the lack of technical expertise and educational resources for hospitals interested in these methods. The newly established Institute for Healthcare Optimization aims to train 10 percent of U.S. hospitals in application of variability methodology over the next 5 years. In the long run, variability methodology should become the standard for design and improvement of healthcare delivery systems.

COST SAVINGS FROM MANAGING HIGH-RISK PATIENTS

*Timothy G. Ferris, M.D., M.P.H., Eric Weil, M.D.,
Gregg S. Meyer, M.D., M.Sc., Mary Neagle, M.P.H.,
James L. Heffernan, M.B.A., and David F. Torchiana, M.D.
Massachusetts General Hospital²*

In all the current attention to healthcare costs, the concentration of healthcare costs among a relatively small fraction of patients presents one

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of the most attractive opportunities for savings. Conventional wisdom suggests that a significant fraction of the costs of care of these patients reflects inefficient delivery and poor coordination of care. Despite the recent interest, efforts to better manage the care of the highest-risk patients are decades old, and the results have been mixed.

“Carve-outs,” including Medicare’s Program for All-Inclusive Care for the Elderly (Blumenthal and Buntin, 1998), have effectively contained costs among high-risk Medicare patients, but this approach has not been widely adopted (Gross et al., 2004). Working within the fee-for-service system, commercial insurance companies have approached cost reduction among the chronically ill primarily through nurse-based telephonic coaching services. Regardless of the effectiveness of these approaches, about which there is some debate, the applicability of these approaches to Medicare patients is unclear. Commercial populations have much lower costs than Medicare patients, and their costs are not as concentrated among a relatively small proportion of beneficiaries because commercially insured patients, generally being younger, are much less likely to have multiple chronic conditions. Delivery systems that operate within a budget (such as Kaiser Permanente and Group Health of Puget Sound) deploy care coordination services for high-risk patients, but because such services are not covered by conventional Medicare it is rare to find them in our predominantly fee-for-service delivery system. Care coordination services for high-risk patients are a key component of so-called medical home proposals.

Research on care coordination programs has shown mixed results; this highlights the difficulty of effectively improving quality and simultaneously reducing costs (Bott et al., 2009; Holtz-Eakin, 2004; Peikes et al., 2009; UnitedHealth Group, 2009). Explanations for the mixed results have included the heterogeneity of the interventions, numerous technical difficulties associated with conducting high-quality research on this topic, as well as the difficulties in effectively executing care coordination programs. Cost savings from care management requires the successful execution of a series of steps: (1) identification of patients who will eventually be high cost, (2) engagement of those patients in care management, (3) identification of the patient’s needs, and (4) effectively addressing the patients’ needs. As Eisenberg noted in his model of effective service delivery (Eisenberg and Power, 2000), imperfections at any of these steps will degrade the effectiveness of the service. Experience has shown that although a number of programs have done well with some of these steps, executing effectively on all is difficult (Ayanian, 2009).

poration, Thomas Elliot, and the primary care doctors of Massachusetts General Physician’s Organization.

CMS Demonstration at MGH

As part of their efforts to develop better systems of care delivery, Massachusetts General Hospital (MGH) and the Massachusetts General Physician's Organization (MGPO) jointly applied to participate in the CMS Care Management for High Cost Beneficiaries demonstration (CMS, 2005). This 3-year demonstration was designed to identify effective models of care delivery for high-risk patients. Key terms of the demonstration agreement were (1) MGPO would be paid a monthly management fee (\$120) for each enrolled patient, (2) the patients would continue to participate in their usual fee-for-service care leaving primary care relationships intact, and (3) MGPO would need to achieve 5 percent savings on the identified population in addition to covering the costs of the management fees. (The determination of savings was based on a comparison with a case-matched control group selected from other Boston academic medical centers and adjusted for baseline differences.)

This report provides a high-level description of the selection of patients and controls, the intervention and some preliminary results. A more detailed report is expected to be available in 2010.

The decision to participate included the assessment of several variables, but most importantly the hospital and physicians needed to know what fraction of the high-risk patient's total costs was generated from care provided by MGH and the affiliated physicians. Given the fact that these patients could choose to receive their care anywhere, it was important to know that a substantial fraction of their costs was for care provided in a setting that the hospital and physicians could control. An analysis of preliminary data suggested that (1) the more expensive the patient, the higher proportion of care they received at MGH, and (2) for the highest-risk patients an average of 65 percent of their costs were from care delivered within MGH.

Selection of Intervention and Control Patients

We included the Medicare patients of all 19 of our primary care practices (190 internal medicine physicians). Medicare identified potentially eligible patients using the provider tax identification numbers of the MGH physicians and applied several inclusion and exclusion criteria (Figure 9-5). The claims of all 15,230 patients were placed in an analytic database. Table 9-6 shows the distribution of the patients by risk, using the Centers for Medicare & Medicaid Services (CMS) Hierarchical Condition Category (HCC) risk adjustment system (Pope et al., 2004), and cost. The shaded cells indicate the risk and cost strata of the 2,619 patients chosen to participate in the demonstration project.

Who were these patients? On average they were 76 years old and

Inclusion	Reside in Suffolk, Essex, Middlesex, Norfolk, and Plymouth counties
	Meet HCC risk score ≥ 2.0 and annual cost $\geq \$2,000$ <i>or</i> Meet HCC risk score ≥ 3.0 and annual cost $\geq \$1,000$
	Two visits to MGH physicians in 12-month period <i>and</i> No inpatient visits or 50% of visits to MGH inpatient facilities
Exclusion	End-stage renal disease
	Residing in a skilled nursing facility or nursing home
	Participating in other CMS demonstration
	Hospice, at start of program
	Medicare Advantage
	Medicare as secondary payer
	No Part A or B
	On dialysis

FIGURE 9-5 Participation criteria.

51 percent female. A significant fraction (11 percent) were under 65 years old and qualified for Medicare based on a disability. These patients averaged 3.4 acute care hospitalizations per year and had 12.6 active medications on their medication list. The eligible high-risk patients had average annual costs of \$22,520 and total costs of \$58,716,619 in the year prior to enrollment. When presented with the list of their own eligible patients, MGH physicians responded that the eligible patients were indeed among the sickest, most complex, and highest-risk patients in their panel.

Comparison group patients were selected from patients that visited other Boston medical centers and met the inclusion and exclusion criteria. Instead of using physician identifiers to attribute patients to these centers, we used an algorithm that relied on the frequency of physician visits. Once the pool of eligible comparison patients was identified, the comparison patients were selected using a matching process that included criteria based on age, sex, several common chronic conditions, risk score, and cost.

TABLE 9-6 The Number of Patients Falling Within Incremental Units of CMS-HCC Risk Score* and Costs for the Eligible Population. Shaded Cells Identify the Risk and Cost Cells from Which the Eligible Patients Were Selected for the MGH Program

HCC Risk Score	Annual Cost										
	\$0	\$500	\$1,000	\$2,000	\$3,000	\$4,000	\$5,000	\$6,000	\$7,000	\$8,000	
≥ 0	15,230	14,154	12,163	8,859	6,799	5,481	4,615	4,009	3,587	3,264	
≥ 1.5	5,009	4,975	4,826	4,282	3,729	3,306	2,982	2,727	2,531	2,363	
≥ 1.6	4,557	4,528	4,423	3,973	3,493	3,109	2,829	2,602	2,426	2,269	
≥ 1.7	4,128	4,103	4,024	3,657	3,250	2,923	2,676	2,471	2,304	2,161	
≥ 1.8	3,747	3,732	3,671	3,373	3,024	2,738	2,521	2,336	2,187	2,056	
≥ 1.9	3,434	3,421	3,373	3,126	2,832	2,584	2,395	2,228	2,090	1,974	
≥ 2.0	3,113	3,103	3,064	2,870	2,622	2,405	2,241	2,096	1,982	1,874	
≥ 2.5	1,921	1,919	1,912	1,841	1,752	1,659	1,566	1,496	1,449	1,394	
≥ 3.0	1,222	1,222	1,221	1,210	1,179	1,137	1,097	1,063	1,032	1,005	
≥ 3.5	795	795	795	791	779	757	743	732	720	703	
≥ 4.0	506	506	506	506	503	496	493	488	482	474	
≥ 4.5	335	335	335	335	335	332	332	328	327	324	
≥ 5.0	216	216	216	216	216	216	216	216	215	214	
≥ 5.5	142	142	142	142	142	142	142	142	141	140	
≥ 6.0	93	93	93	93	93	93	93	93	93	92	

* Higher risk score indicates greater illness burden and greater likelihood of higher costs in future years.

MGH Care Management Program

The program enrolled patients using a combination of welcome letters, phone calls, and face-to-face meetings in physician offices. Among the 10 percent of eligible patients who declined to enroll, the most commonly stated reason was that the additional services were not necessary. Enrollment calls from the physician's office and the physicians themselves were particularly effective, distinguishing this program from outreach under some other demonstration where no prior relationship with the beneficiary exists.

The intervention principally relied on the assignment of a nurse care manager to each of the enrolled patients. Each group of practicing physicians was assigned a care manager who worked directly with the physicians in their offices and managed the care of about 200 patients. Using a large-scale customization approach, each patient's needs and care barriers were assessed, and interventions were tailored to meet their care needs or address their barriers to care. The major types of interventions included in the MGH Care Management Program are:

- Annual nurse assessment and care plan review with an MD,
- Telemonitoring for appropriate patients,
- Surveillance calls,
- Regular pharmacy review,
- Assistance with transitions from home to hospital or hospital to home,
- Advanced directives and end-of-life counseling,
- Facilitated communication among care team members,
- Urgent response and facilitated office access, and
- Psychosocial evaluations and management.

Even with this list, care managers had considerable flexibility to be creative in addressing their patients' care coordination issues. Physicians were paid a small management fee to cover the additional time they spent with the care managers, though as the program progressed they found that the care managers actually saved them time.

The program used information technology in three distinct ways. First, all physicians within the organization used an electronic record allowing real-time communication of changes in patient status or care plans. We facilitated communication by adding an icon to the electronic records of all enrolled patients. The icon identified the patient, the care manager, and the care manager's contact information. Second, administrative systems allowed for tracking of patients, management of care manager workflow, and automatic notification of physicians and care managers of the arrival

of an enrolled patient in the ER. Third, data from care management systems and administrative systems were loaded into an analytic database on a weekly basis to create a performance dashboard that allowed tracking of trends in use.

Experience and Preliminary Results

After 3 years of operations and 2 years and 9 months of claims data there has been sufficient experience and data to make some preliminary statements about the performance of the program. On the operational side, the program appeared to perform well on the criteria for success noted above. The patient selection process using billing data correctly identified high-risk patients with significant ongoing healthcare needs. The high patient enrollment (90 percent), completion of assessments on all patients, and high contact rates between care managers and enrolled patients suggest that opportunities for care coordination were identified. The high retention of care managers (100 percent) and survey results indicating high physician satisfaction suggest the program was well integrated into the fabric of the organization.

Monitoring reports from CMS indicated that the intervention group had consistently lower costs and fewer admissions than the comparison group even after adjusting for baseline differences and trimming of outliers (Table 9-7). Costs of the eligible intervention population initially increased compared to the comparison population, but after 6 months the intervention group costs were consistently below the comparison group costs.

The following results include all eligible patients (intention to treat) and adjust for baseline differences between the intervention and comparison groups (difference in differences). The program reached the break-even point (savings in the claims experience of the intervention group exceeded the management payments from CMS) at 16 months. The cumulative savings at the end of 2 years of operations was \$6 million, which represented 4.3 percent savings after covering the costs of management fees. During the third year of operations for which we have completed claims information (9 months), the cumulative savings after fees was 4.7 percent (savings peaked midway through the third year at 5.8 percent). This performance factored into the decision to grant the program a 3-year extension and expand the program to more sites (CMS, 2005). Internal data showed that much of the cost savings came from preventing admissions and readmissions to the hospital. Savings also accrued from increased use of hospice even though mortality in the intervention group was consistently lower than mortality in the comparison group.

A number of challenges related to the specific needs of the patient population and the work of the care managers surfaced during the program. The

TABLE 9-7 Calculation of Cost Savings to MGH Population Based on Savings Achieved Within the Eligible High-Risk Population^a

Characteristic	High-Risk Population, n (%)
Size, N = 15,230 ^b	2,619 (17.2)
Total cost ^c	\$58,619,716 (58.3)
Various Savings Scenarios	
Percentage Net Savings ^{e,f,g} Compared to Control Group	Savings on High-Risk Population (% of total population costs ^d)
3	\$1,758,591 (1.7)
4	\$2,344,789 (2.3)
5	\$2,930,986 (2.9)
6	\$3,517,183 (3.5)
7	\$4,103,380 (4.1)

^aData based on preliminary reports generated after 2.5 years of a 3-year project.

^bBecause of the way the population was selected, the exact size of the denominator is not known.

^cAssumes average cost across total population of \$6,600 per year per patient.

^dUses baseline year cost; costs varied over time.

^eSavings after costs has varied between 3.5 and 6.8 percent over the period for which we have data.

^fBecause intervention was less costly than control at baseline, and thus potentially more managed, these savings projections may underestimate program savings in less managed populations.

^gOutlier trimming affected control group more than intervention group so these savings projections may underestimate actual savings.

burden of issues related to mental health and cognitive impairment within this population (>50 percent with some impairment) required shifting resources to increase social services support. End-of-life issues were predictably common in this population (18 percent of the intervention patients died during each of the first 2 years of the program), and the associated care needs are challenging under the best of circumstances.

With regard to the care managers' work, the patient load for each nurse care manager was relatively high, with an average of 30 active patients at any one time and approximately 170 patients receiving routine surveillance. Weekly case discussions helped the care managers address the unavoidable tension between spending less time with more patients or more time with fewer patients. Care managers also needed to balance time spent building relationships with patients and doctors, with time spent working to address specific patient issues. Finally, the software used for tracking the care manager's work needed further optimization.

Demonstration leaders noted several opportunities to further improve

care and reduce costs, including incorporating a limited number of home visits (particularly to address urgent issues), improved office access, improved support from care managers during non-business hours, and an exemption from the rule requiring Medicare patients to remain within an acute care hospital for 72 hours before they can be discharged to a sub-acute facility. Admissions from post-acute care settings remained high among the intervention patients and were no better in the intervention than in the comparison group.

Potential Impact on Total Costs of Care

In determining the potential impact on costs of care for the Medicare population cared for at MGH, the first step is to determine the savings for the total population from which the high-risk group was selected. Table 9-7 shows a model for calculating population-level savings from the program. Although our program appears to be delivering net savings of between 4 and 5 percent, in order to provide additional context we show population-level savings of between 3 and 7 percent at 1 percent increments. This relatively simplistic approach to calculating savings has several limitations. Nonetheless, the sensitivity analysis suggests that the program delivers a 1 to 3 percent savings on the population as a whole (the high-risk population plus the population they were selected from).

Estimating the potential impact of similarly structured programs on national Medicare costs may be an illustrative exercise, but also requires additional assumptions.³ These assumptions lead to an estimated savings over a 2-year period of between \$604 million and \$1.5 billion.

Policy Considerations

The apparent success of the MGH Care Management Program suggests that prospective payment for the enhanced management of high-risk patients holds some promise for reducing costs. Nonetheless, several important considerations limit the translation of this demonstration to policy. First, MGH has several uncommon characteristics that may limit

³We used a relatively simple model that shows 1.6 percent population savings (from Table 9-6) and 45 million Medicare beneficiaries with an average annual cost of \$7,000. We also estimated (1) the size of the Medicare population receiving care within an integrated delivery system, and (2) the proportion of those integrated delivery systems that have the necessary information technology infrastructure. Both of these variables are currently in flux, and their rate of change will depend on future policy decisions, but for the sake of this exercise we assumed that between 40 percent and 60 percent of the U.S. population could receive care within an integrated delivery system and that between 30 percent and 50 percent of these delivery systems would have the required information technology infrastructure.

the generalizability of the program. Important among these characteristics are the integration of physician and hospital services, universal use of an electronic medical record, advanced clinical and administrative information systems, an extensive primary care network, and a full range of acute and chronic care services. On the other hand, the lower baseline costs of the intervention population may suggest that the MGH patients were relatively well managed prior to the start of the program, possibly indicating that there is even greater opportunity in less well-managed populations. In addition, recent research suggests that the infrastructure required for operating this type of program is increasing among large physician organizations (DesRoches et al., 2008; Shortell et al., 2009). Also, the results described here are consistent with those found in a similar trial conducted at Johns Hopkins (Leff et al., 2009).

Unlike most proposals to fund the infrastructure for medical homes, of which care coordination of high-risk patients is a key component, the MGH program included financial risk for the management fees. Whether or not financial risk is an essential element of this type of care management program remains unclear though it would certainly be possible to put in place the infrastructure for care management without effectively reducing costs. Future demonstrations will be necessary to clarify or resolve these questions.

HEALTH INFORMATION EXCHANGE AND CARE EFFICIENCY

*Ashish Jha, M.D., M.P.H.
Harvard University*

It is widely believed that the adoption of electronic health records (EHRs) and the development of an interoperable health information infrastructure that facilitates the flow of clinical and administrative data throughout the healthcare delivery system is critical to realizing healthcare cost savings, increased efficiency, and improved quality of care. Federal (and state) policy makers are increasingly promoting health information exchange (HIE), recently investing nearly \$30 billion to the Department of Health and Human Services in the American Recovery and Reinvestment Act of 2009 to spur adoption and promote the meaningful use of health information technology. Currently, over 30 billion healthcare transactions occur each year in an expensive, fragmented delivery system; most of these transactions are still conducted by phone, fax, or mail (Menduno, 1999). The lack of coordination and electronic data sharing between healthcare entities accrues large administrative costs and results in the absence of clinical information at the point of care. These system deficiencies yield redundant tests, unnecessary or harmful care that is often expensive, and