Assessing Clinical Outcomes And Cost: Transforming Dyslipidemia Management

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This activity is supported by an educational grant from AstraZeneca LP
This supplement, “Assessing Clinical Outcomes and Cost: Transforming Dyslipidemia Management,” represents the second of two reports from the 2003 Medical Director Colloquy, a program that took place on May 1–3, 2003, in Chicago. This was the second annual event for medical directors that was devoted exclusively to the care and management of dyslipidemia.

This topic clearly merits ongoing attention, as many of the challenges that were addressed at the first Medical Director Colloquy have yet to be resolved. The underdiagnosis and undertreatment of the patient with dyslipidemia remain important issues within MCOs.

Efficacy, cost, and treatment options are central to an examination of dyslipidemia management, and this supplement provides a range of perspectives on these topics from an expert faculty. In today’s rapidly evolving health care market, progressively more effective methodologies continue to emerge to support health care professionals in implementing changes that improve care. Included in this supplement are discussions of new technological tools to optimize care delivery, such as highly efficient methods for identifying high-risk patients and recent advances in the diagnostic arena. Increasingly important managed care trends, such as the provision of quality incentives to physicians, are also highlighted.

Within these pages, E. Murat Tuzcu, MD, of the Cleveland Clinic, describes available and emerging methods for diagnosing dyslipidemia. Joyce A. Cramer, from Yale University School of Medicine, discusses effective ways to improve patient adherence to pharmacotherapy. Carol J. McCall, of Humana, presents the predictive modeling technique, a powerful statistical approach to attaining improved outcomes and reduced costs. Francois de Brantes, MBA, of General Electric, explores the employer perspective on how to improve the quality of care. The supplement concludes with a section that addresses pertinent questions from audience members about how to put these innovative ideas in practice in a managed care setting.

The 2003 Medical Director Colloquy provided a unique opportunity for a select panel of experts and medical management professionals to meet and examine innovative approaches to dyslipidemia management. This supplement is offered for continuing education credit to physicians and pharmacists by The Chatham Institute. In reading it, you receive all the benefits of an exchange that generated novel ideas intended to help restore the balance of outcomes and costs in dyslipidemia management.
Assessing Clinical Outcomes and Cost: Transforming Dyslipidemia Management
A CONTINUING EDUCATION ACTIVITY
The second of two reports based on presentations at the 2003 Medical Director Colloquy

Continuing education objectives and accreditation statements.........................2

Imaging Atherosclerotic Plaque:
What Is Its Diagnostic Role? .................................................................3
E. Murat Tuzcu, MD

Obtaining Optimal Compliance With Drug Therapy .................................9
Joyce A. Cramer

Improving Outcomes and Reducing Cost:
The Role of Predictive Modeling .......................................................12
Carol J. McCall

The Quality of Health Care:
An Employer’s Perspective ..............................................................17
François de Brantes, MBA

Question and Answer Session .................................................................23
Participants

CONTINUING EDUCATION
Post-test...............................................................................................26
Physician CME answer sheet/evaluation form.................................27
Pharmacist CPE answer sheet/evaluation form.................................28

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SELF-STUDY CONTINUING EDUCATION ACTIVITY
Assessing Outcomes and Cost: Transforming Dyslipidemia Management

Continuing education credit is offered to physicians and pharmacists who read pages 3 through 25 of this publication, complete the post-test on pages 26 and 29, and fill out the appropriate evaluation form on either page 27 (physicians) or 28 (pharmacists).

Purpose and overview
This supplement addresses the under-diagnosis and undertreatment of patients with dyslipidemia, and focuses on optimization of dyslipidemia management within managed care organizations. This activity is designed to assist decision makers in managed care as they address issues of efficacy, cost, and treatment options with respect to this disease. Additional highlights include the increasing importance of technology relative to the diagnosis of dyslipidemia, the newest statistical methodologies for identification of high-risk patients, and effective strategies for improving compliance in patients with dyslipidemia. Also, the concept of providing quality incentives to physicians is explored. The content of this program was developed on the basis of faculty perceptions of significant trends and/or issues.

Educational objectives
After reading this publication, participants should be able to:
1. Assess the emerging paradigm for the management of atherosclerosis.
2. Describe the various imaging technologies that are becoming available for cardiovascular patients.
3. Outline the impact of medication noncompliance on health outcomes relative to dyslipidemia.
4. Identify effective strategies for improving medication compliance.
5. Describe the usefulness of predictive modeling techniques in balancing costs and outcomes.
6. Discuss emerging technologies and their potential impact on clinical practice and outcomes measurement.
7. Highlight the employer's perspective relative to optimizing care delivery.
8. Gain insight into the multistakeholder approach to creating quality incentives.

Target audiences
Managed care organization medical directors and pharmacy directors; chief medical officers and other senior managers in managed care organizations; primary care physicians, pharmacists, and cardiologists.

CONTINUING EDUCATION
Accreditation
The Chatham Institute is accredited by the Accreditation Council for Continuing Medical Education (ACME) to provide continuing medical education for physicians.

The Chatham Institute designates this educational activity for a maximum of 2.0 category 1 credits toward the AMA Physician’s Recognition Award. Each physician should claim only those credits that he/she actually spent in the activity.

This CME activity has been planned and produced in accordance with the ACCME Essential Areas, Elements, and Policies.

The Chatham Institute is approved by the American Council on Pharmaceutical Education (ACPE) as a provider of continuing pharmaceutical education.

This activity provides 2.0 contact hours (0.2 CEU) of continuing education for pharmacists. Credit will be awarded upon successful completion of the activity post-test and the activity evaluation form. Credit certificates will be issued in 4–6 weeks.

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Francois de Brantes, Carol J. McCall, and E Murat Tuzcu have no relationships to disclose.

Joyce A Cramer reports that she is a consultant to and has received honoraria from AstraZeneca.

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The conventional paradigm guiding management of coronary atherosclerosis spurs cardiologists to respond with mechanical and pharmaceutical interventions to treat end-organ effects (e.g., myocardial infarction [MI], congestive heart failure) as they arise. As such, symptomatic patients often are referred to as candidates for secondary prevention—i.e., therapy aimed at reducing the risk of a recurrent coronary event.

The concept of secondary prevention rests on the assumption that patients will have survived their initial event. This is not necessarily true. This year, about 680,000 Americans will die of coronary artery disease (CAD), but approximately one third of these deaths will occur before the patient reaches a hospital (AHA 2002). Moreover, the survivors are exposed to a 4- to 6-fold increased risk of sudden cardiac death, and 80 percent of the CAD mortality among patients under the age of 65 is associated with the first MI. The survivors also experience significant morbidity from heart failure and arrhythmias, both of which entail high costs, particularly due to new device-driven therapies. In short, symptomatic coronary disease poses a tremendous public health problem in the United States. Identifying at-risk patients at an early stage, before they become symptomatic, thus acquires critical importance.

Determining appropriate action

The conventional paradigm holds that risk-factor analysis should be used to determine whether asymptomatic patients should be candidates for primary prevention—therapy intended to reduce the risk of a patient’s initial coronary event. Yet, in reality, patients do not fall neatly into clear categories. Instead, risk for CAD falls along a continuum. Some subsets of people are at extremely low risk, such as young, physically fit, nonsmoking women with no risk factors, but the problem facing managed care organizations is that the typical managed care population will contain a large proportion of patients with intermediate risk. This article discusses new imaging technologies that assist in determining which patients would benefit from various interventions and when these interventions should be used.

Atherosclerosis is not a disease that begins in middle-aged or elderly individuals; it begins in children and teenagers. In a series of 262 hearts transplanted at the Cleveland Clinic, 1 in 6 teenage donors displayed unequivocal evidence of atherosclerosis, by a conservative measure (Tuzcu 2001). For donors in their 20s, atherosclerosis was found in 37 percent of the transplants; among donors in their 30s, 60 percent showed clear signs of atherosclerosis. It should not be assumed that all these donors would have developed CAD had they lived, but people who develop CAD are likely to be drawn from cohorts like these.

The famous Framingham Heart Study has shown how a single risk factor like total cholesterol is insufficient. After 26 years of follow-up, 35 percent of the CAD seen in the Framingham Study occurred in patients whose total cholesterol was <200 mg/dL (Figure 1, page 4). Moreover, when grouped by total cholesterol concentrations, there was an 80 percent overlap between the patients with and without CAD (Castelli 1996). Hence, there has been a rise of multiple risk-factor analysis, such as that used in the guidelines issued by the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on the Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults [ATP III]. The NCEP has used Framingham data to develop a formula for calculating a patient’s 10-year risk of developing CAD. The formula assigns points for five major risk factors: age (the primary driver of this algorithm), total cholesterol, HDL chole-
terol, systolic blood pressure, and smoking status. Different scales are used for men and women.

For example, the current NCEP guidelines (NCEP 2001) show that a 48-year-old, nonsmoking asymptomatic male with the physical and laboratory findings shown in Table 1 would have a 10-year risk of only 8 percent. Per the ATP III guidelines (Table 2), he would not be a candidate for drug therapy, even though he has three major risk factors (a male, age 45 or older; HDL <40 mg/dL; and a family history of premature CAD, associated with the death of his father — a heavy smoker — from an MI at age 54).

In 2 years, when he turns 50, however, he becomes a candidate for drug therapy, as his 10-year risk will increase to 10 percent, at which point — the ATP III guidelines state — drug therapy should be considered to reduce his LDL cholesterol to his target of <130 mg/dL.

It should be noted that this patient also still meets — but just barely — the ATP III criteria for a diagnosis of metabolic syndrome, which responds well to therapeutic lifestyle changes (dietary improvements, exercise, and weight loss). The patient’s current physical and laboratory findings already reflect the results of a low-fat diet and a moderate amount of exercise (3 or 4 times per week), however. Can further improvements in his weight, blood sugar, and lipid profile be expected from his continued low-fat diet and exercise? What if he fails to follow his diet or stops exercising? Would it be prudent to institute drug therapy now, instead of waiting for him to cross some arbitrary threshold — especially in light of his family history?

This case study exposes some limitations of the Framingham algorithm (Grundy 1999a, Grundy 1999b, Grundy 2001). The authors of the guidelines were aware of these limitations but, taking a conservative approach, they were unable to address them because of the lack of long-term data. For this reason, predisposing risk factors are not taken into account — including obesity, physical inactivity, and socioeconomic status. These may not constitute independent risk factors in all data sets, but they certainly appear to predispose some patients to CAD. The Framingham risk assessment also does not take into consideration vari-
ous conditional risk factors (e.g., triglycerides, Lp(a), LDL particle size, homocysteine, fibrinogen, C-reactive protein). The ATP III, however, does recognize the value of numerous emerging risk factors for augmenting information obtained by assessing traditional risk factors.

**Detecting subclinical atherosclerosis**

Against a background of strategies for risk assessment, it becomes clear that we are entering an era of a paradigm shift. The new paradigm will shift clinicians’ focus from CAD to the detection of subclinical atherosclerosis, with special attention being paid to vulnerable atherosclerotic plaque. Some plaques are more prone to rupture than others, precipitating thrombi and acute coronary syndrome.

If the vulnerable plaque can be assessed, it may be possible to alter the natural course of atherosclerosis before clinical CAD develops. To do so, reliable, reproducible diagnostic methods with incremental predictive value are required. These tools should lead to the employment of some existing or new therapy that would cause the plaque to stabilize or, ideally, regress. Clinical trials would assess whether the new techniques improve morbidity and mortality.

Numerous approaches to the imaging of atherosclerosis are possible (Table 3). The ideal imaging modality would produce reliable, reproducible high-resolution images safely and noninvasively.

Coronary angiograms are useful when patients have obstructive coronary disease, but they are of little avail in the absence of obstruction. Even a coronary tree rife

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**TABLE 2** NCEP ATP III LDL-cholesterol goals for therapeutic lifestyle changes (TLC) and drug therapy

<table>
<thead>
<tr>
<th>Risk category</th>
<th>LDL goal</th>
<th>LDL level at which to initiate TLC</th>
<th>LDL level at which to consider drug therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAD or CAD risk equivalents (10-year risk &gt;20%)</td>
<td>&lt;100 mg/dL</td>
<td>≥100 mg/dL</td>
<td>≥130 mg/dL (100–129 mg/dL: drug optional)*</td>
</tr>
<tr>
<td>2+ risk factors (10-year risk ≤20%)</td>
<td>&lt;130 mg/dL</td>
<td>≥130 mg/dL</td>
<td>10-year risk 10%–20%: ≥130 mg/dL</td>
</tr>
<tr>
<td>0–1 risk factor†</td>
<td>&lt;160 mg/dL</td>
<td>≥160 mg/dL</td>
<td>≥190 mg/dL (160–189 mg/dL: drug optional)*</td>
</tr>
</tbody>
</table>

* Some authorities recommend use of LDL-lowering drugs in this category if an LDL-cholesterol level <100 mg/dL cannot be achieved by TLC. Others prefer use of drugs that primarily modify triglycerides and HDL (e.g., nicotinic acid or fibrate). Clinical judgment also may call for deferring drug therapy in this subcategory.

† Almost all people with 0–1 risk factor have a 10-year risk <10%; thus 10-year risk assessment in people with 0–1 risk factor is not necessary.


**SOURCE:** NCEP 2001

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**TABLE 3** Approaches to imaging atherosclerosis

<table>
<thead>
<tr>
<th>Lumen</th>
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<tr>
<td>Coronary angiography</td>
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<tr>
<th>Atheroma burden</th>
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<tbody>
<tr>
<td>Intravascular ultrasound (IVUS)</td>
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<tr>
<td>Optical coherence tomography (OCT)</td>
</tr>
<tr>
<td>Electron beam computed tomography (EBCT)</td>
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<tr>
<td>Magnetic resonance imaging (MRI)</td>
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<tr>
<td>Multislice computed tomography (CT)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Atheroma content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intravascular ultrasound (IVUS)</td>
</tr>
<tr>
<td>Optical coherence tomography (OCT)</td>
</tr>
<tr>
<td>Spectroscopy</td>
</tr>
<tr>
<td>Angioscopy</td>
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<tr>
<td>Magnetic resonance imaging (MRI)</td>
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<tr>
<td>Multislice CT</td>
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<tr>
<th>Inflammation</th>
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<tr>
<td>Thermography</td>
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<tr>
<td>Positron emission tomography (PET)</td>
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<th>Myocardial perfusion</th>
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<tr>
<td>Single photon emission computed tomography (SPECT)</td>
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<tr>
<td>Positron emission tomography (PET)</td>
</tr>
<tr>
<td>Exercise tolerance test (ETT)</td>
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<th>Surrogate markers</th>
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<tr>
<td>Ankle-brachial index (ABI)</td>
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<tr>
<td>Carotid intima-media thickness (cIMT)</td>
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<tr>
<td>Brachial flow-mediated vasodilation</td>
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</tbody>
</table>

1 Lp(a) is a protein made from the apo(a) gene. High levels of Lp(a) increase the risk of developing coronary disease.
with atherosclerotic plaque can appear normal on an angiogram. This occurs because the angiogram depicts only the lumen. As atherosclerosis grows in the wall of the blood vessel, the wall expands outward — in a process known as positive remodeling — to accommodate the growing atheroma (Glagov 1987). This remodeling continues until the compensatory mechanism is overwhelmed and the atheroma begins to obstruct the lumen. It is not present in all cases, but the phenomenon is extremely common. In addition, to detect an obstruction with an angiogram, an adjacent site of normal artery is required as a point of comparison. But if the entire coronary artery is diseased and covered by a sleeve of atherosclerosis, no point of comparison is available.

Evidence points to the regression of at least some atherosclerotic plaques through aggressive lipid-lowering. Little of this evidence is based on direct imaging, but in a few months, data that may shed light on this question will be presented from a study in which intravascular ultrasound (IVUS) images were generated 18 months apart in 600 patients who were randomized to aggressive or modest lipid-lowering. Angiography is an inadequate imaging tool for such studies. Angiograms can detect neither compensatory expansion of the arterial wall nor any reverse remodeling within the wall. For this purpose, IVUS is a better imaging technology, facilitating measurement of any change in the square millimeters of arterial wall covered by plaque.

Evaluating existing and emerging modalities

Optical coherence tomography (OCT) is a new imaging modality that uses light to produce images with a resolution of 10 microns. The resolution drops dramatically after 2 mm, however. Another drawback of OCT is that it works only in a bloodless field, which is created by flushing the artery or occluding it briefly with a balloon. Even so, OCT is likely to be used more in the future.

In a targeted section of larger arteries such as the aorta, magnetic resonance imaging (MRI) can be used as a research tool to image atherosclerosis with high resolution, but MRI is extremely difficult to apply to coronary arteries in a clinical setting. Multislice computed tomography (CT) may have more clinical utility, because it has the potential to depict the lumen and quantify the degree of obstruction (calcified and noncalcified) and the amount of plaque in coronary arteries.

Calcium scoring is a controversial technique, but knowing the density and area of calcified plaque provides a reasonably good assessment of overall atherosclerosis. The calcified area is not necessarily the dangerous area, but the presence of high amounts of calcium suggests the presence of potentially vulnerable plaques. The major flaw with all the published studies showing a good correlation between calcium scores and clinical events is that they are fraught with selection bias. Most of the patients were self-selected, and many went on to catheterization if their calcium scores were high, which resulted in endpoints that were not prespecified. Even so, among asymptomatic patients without CAD but with extremely high calcium scores (1,000 or higher), the probability of event-free survival rate was less than 50 percent after 3 years (Wayhs 2002). In a study in which statin therapy lowered the mean LDL cholesterol level from 164 mg/dL to 107 mg/dL, the patients treated with the statin had a minimal change in their calcium scores, while patients in the control group had an increase in their calcium scores (Achenbach 2002). This result suggests that serial electron beam tomography may have the capacity to gauge progression of atherosclerosis.

Plaques vulnerable to rupture are characterized by a core rich in cholesterol and necrotic elements — all covered by a thin fibrous cap that is inflamed, especially at its shoulders. In contrast, plaques with thick, fibrous caps are highly resistant to rupture. Identifying vulnerable plaques before they rupture — an event that often precipitates an MI, stroke, or peripheral vascular occlusion — constitutes another opportunity for atherosclerosis imaging.

Algorithms have been devised to account for the char-
acteristics of backscattered IVUS signals, allowing highly detailed information to be gathered about a minute portion of atherosclerotic plaque. With some algorithms, the predictive accuracy for differentiating fibrous, fibro-lipidic, calcified, and lipidic-necrotic cores is between 80 and 90 percent. Although such imaging is invasive, it may be a highly useful tool for understanding the histology of plaque. Software has been designed to create color-coded three-dimensional views of atherosclerotic arteries — virtual histology (Figure 2). Prospective registries are underway to evaluate this technology as a means to identify highly vulnerable plaque.

If interference problems can be solved, OCT also holds promise as a new tool for producing high-resolution images displaying histologic characteristics (Figure 3). Such high resolution allows accurate depiction of the fibrous cap (arrows) and lipid-rich core (L).

Angioscopy, an old tool, remains useful for imaging the surface of the atherosclerotic segments in a coronary artery. Angioscopic images in Figure 4 show multiple yellow shiny plaques in an MI patient and demonstrate why both CAD and MI should not be thought of as diseases of a single site but as a disease of an inflamed coronary tree, which makes systemic preventive measures critically important.

Multislice CT is a noninvasive tool that may prove useful for quantifying the extent of arterial obstruction and also for revealing the histology of vulnerable plaque. Another approach to identifying vulnerable plaque exploits temperature differences in inflamed tissue. Trials are studying the use of multithermostat catheters in coronary arteries to determine whether thermal differences identify vulnerable plaque. Preliminary results from Greece suggest that thermography can differentiate unstable angina and acute MI from stable angina (Stefanadis 1999). Preliminary investigations show some promise for positron emission tomography, another noninvasive, albeit expensive, technique for assessing subclinical atherosclerosis and inflammation (Rudd 2002).

Although new technologies may be exciting and interesting, surrogate markers of atherosclerosis should not be overlooked. The ankle-brachial index (ABI), for example, is a simple and inexpensive tool to assess the risk of CAD. It is calculated by measuring the blood pressure in both
arms and both legs. An index value of >0.91 is considered normal; 0.41–0.90 indicates mild-to-moderate peripheral arterial disease (PAD); and ≤0.40 marks severe PAD (Hiatt 2001). In a cohort of patients screened for PAD at a community hospital, the relative risk of all-cause mortality for patients with an ABI<0.40 was 4.5-fold higher than that of the general United States population (McKenna 1991). The ABI is problematic in some patients, particularly older diabetics or very hypertensive patients whose arteries have become noncompressible (indicated by an ABI >1.30).

Another inexpensive assessment tool is measurement of carotid intima-media thickness (cIMT), which may be the most studied and validated surrogate endpoint. It is a good predictor of CAD in men and women (Chambless 1997), and in a large study of older patients without a history of cardiovascular disease (N=5,858), quintiles of cIMT clearly defined cumulative event-free (MI or stroke) survival (O’Leary 1999). Carotid IMT, however, is not used extensively in clinical practice. It necessitates having committed technicians and instituting strict quality-control procedures, because quality is a prerequisite when extremely small distances must be measured.

Brachial flow-mediated vasodilation also is a simple noninvasive and fairly inexpensive test. It too necessitates meticulous attention to quality control. The test involves placing a blood pressure cuff on the forearm for 5 minutes and then assessing changes in arterial diameter with high-frequency ultrasound (Vogel 2001). If the endothelial function is intact, the brachial artery size increases when the cuff is released. Reduced brachial vasodilation, however, suggests endothelial dysfunction, and in some studies the test’s ability to predict cardiovascular events appears quite good (Schachinger 2000).

In Westernized societies the journey toward atherosclerotic disease begins early, and the source of new disease seems unending. Existing risk-assessment algorithms fail to capture all patients at risk for coronary events. The health care system must devote more resources to identification of those patients with subclinical atherosclerosis and those with vulnerable plaques, and then provide them with drug therapies to convert dangerous plaque into a more stable form. Various existing and emerging imaging tools present complementary modalities for stratifying risk and monitoring atherosclerotic disease. Growing evidence supports the use of such imaging in selected patients, notably those judged by traditional risk factors to be at intermediate risk of coronary disease (Tuzcu 2003).

References


Many patients with dyslipidemia or hypertension fail to meet their LDL and blood pressure goals — but not because physicians lack sufficiently powerful drugs. Rather, patients often fall short of their goals because they fail to take their medication as prescribed. One study has shown that, 5 years after being prescribed a statin, only half the surviving patients still are taking any statin (Avorn 1998).

Patients’ failure to comply with drug therapy cannot be accounted for on the basis of age, sex, race, education, socioeconomic status, severity or duration of illness, or presence or absence of symptoms. Neither can poor compliance be predicted through questionnaires or the judgment of the physician or the patient’s family.1

While compliance refers to taking a medication as prescribed, persistence refers to continuing to take the medication over the long term. Managed care organizations have a stake in helping patients improve their compliance and persistence with drug therapy. After all, drugs do not work in patients who do not take them.

Nevertheless, during a follow-up visit, when a physician is confronted with a patient who shows either no clinical response or a minimal response to drug therapy, great uncertainty sets in. Was the initial diagnosis correct? Was the appropriate treatment selected? Was the patient unable to tolerate the side effects? Should the dosage be increased? Should a second agent be added?

To understand the difficulty associated with achieving compliance with prescribed drug therapy, consider the challenge posed by recipients of transplanted organs. These patients may be required to take 14 different medications up to 8 times a day, which means that patients essentially must devote their entire day to abiding by their schedules. Yet, they should be highly motivated to do so, because failure to comply entails risking the loss of the transplanted organ, if not death. Moreover, these patients have received their transplants only because someone died or chose to donate an organ, so intense social pressures are at play. In addition, transplant recipients could be expected to receive considerable encouragement from their surgeons to comply with therapy. Beyond wanting to improve their patients’ health, the surgeons have an additional motive for wanting their patients to comply with therapy: Organ rejections are noted on the surgeons’ records. Despite the presumably high motivation among patients and physicians, however, poor compliance is a leading problem in transplant centers.

Costs of noncompliance

In the typical primary care setting, the costs of a poor clinical response are numerous. The additional office visits, laboratory tests, and physiological tests needed to address the uncertainty of the situation constitute one layer of costs. If the physician determines that combination treatment or a higher dose is needed, another layer of costs is added. Moreover, this set of circumstances provides the patient with negative feedback, suggesting that the physician is not competent. In the end, however, the one issue that clinicians often overlook during their reevaluation of nonresponders is whether the patient is complying with treatment. Many are not.

For example, one study examined the rate of persistence with antihypertensive therapy among patients enrolled in California’s Medicaid program (Medi-Cal) during 1 year of follow-up (McCombs 1994). These patients, adults over age 40, received their medication free of charge.
charge. Yet, after 1 year, only 14 percent had persisted with therapy, defined simply as continuing to refill their prescriptions. The 86 percent who were not persistent with treatment (n=5,504) consumed an average of $873 more per year in total costs for patient care (exclusive of a $281 reduction for prescription drug costs), the largest component of which was hospitalization ($637). In other words, savings of $4.8 million could have been realized had these patients persisted with their antihypertensive therapy.

In a study of Medicaid patients with a history of myocardial infarction, the risk of reinfarction or stroke was reduced only among patients who were optimal compliers with statin therapy (Benner 2002). If patients were just typical compliers, their risk of a recurrent infarction or stroke was about the same as that of patients who did not receive statins.

In a Japanese study of patients with heart failure, compliance with digoxin therapy was determined via monthly serum digoxin concentrations (Miura 2001). If the concentration was 0.0 ng/mL on at least three consecutive visits, patients were assigned to the noncompliant group (n=218). After 6 years of follow-up, these patients had twice as many hospitalizations (two per person) as patients in the compliant group, and their hospitalizations were of longer duration (28 days vs. 13 days). The cumulative all-cause mortality rate was twice as high among the noncompliant patients (15.0 percent vs. 7.8 percent), and it was attributed to worsening heart failure.

Except in cases like this one, the number of patients who are noncompliant usually is unknown — it may be very small, or more likely, rather large — because they are the patients who fail to fill their prescription and never return for another visit. If the physician ever sees a noncompliant patient again, it may be in the emergency room. Aside from that, they are lost to the medical record.

Partial compliance

Partial compliers, on the other hand, are the ones who deserve physicians’ attention, because by attending to partial compliance it is possible to make medical care more effective. Adequate compliance is defined by achieving a desired outcome — achieving the right blood pressure, reaching the LDL target — not by taking a given percentage of pills. If the desired outcome is not achieved, it may be because the patient is only partially complying with therapy. Partial compliance can be anything, ranging from the occasional missed dose, the occasional extra dose, or erratic dose-taking to a consistent pattern that is different from what was prescribed.

Educating patients about their disease state and the benefit of drug therapy often is portrayed as a means for improving compliance. Unfortunately, studies have not supported this contention. In one study, 756 patients hospitalized at Yale-New Haven Hospital with coronary artery disease were randomly assigned to usual care or nurse-based educational intervention (Mitka 2001). Usual care consisted of the materials traditionally given to hospitalized patients plus a mailed reminder about their 1-year follow-up visits; the educational intervention involved monthly educational mailings plus quarterly phone calls about patients’ cholesterol levels and LDL targets. At baseline, 5 percent of the patients in each group had known that their LDL target was less than 100 mg/dL. After 1 year, 20 percent of the patients in the educational group had become aware of this target, compared with only 7 percent in the usual-care group. Despite the increase in knowledge, there was no statistically significant difference in the percentage of patients who had reached their LDL goal — 67 percent in the usual-care group and 70 percent in the educated group.

Despite the best efforts of a medical care team, inadequate compliance and persistence lead to poor outcomes by any measure. This imposes a psychological burden on the team members, as they come to regard patients as continually passing through a revolving door. In the face of poor compliance and persistence, health care providers can feel unable to do anything constructive.

In general, across the spectrum of diseases, patients take about 75 percent of their medication as prescribed (Cramer 1989). For some reason, inhaled asthma medications are an exception, with lower compliance rates being observed.

Compliance declines as the number of doses per day increases (Claxton 2001). With once-daily dosing, the best compliance that can be expected is about 79 percent; 2 times daily, 69 percent; 3 times daily, 65 percent; and 4 times daily, 51 percent. These results were achieved by subjects who were selected because they were good patients and who knew that their compliance was being monitored, via a microprocessor in the cap that recorded the time and date whenever the bottle was opened.

Strategies to enhance compliance

Fortunately, some low-cost strategies are available to enhance compliance (Cramer 2002). One such intervention, a simple office-based compliance-enhancement program, can be used in clinical practice by a nontechnical person. Known as the Medication Usage Skills for Effectiveness (MUSE) program, this unobtrusive intervention can feel unable to do anything constructive.

In a study of Medicaid patients with a history of myocardial infarction, the risk of reinfarction or stroke was reduced only among patients who were optimal compliers with statin therapy (Benner 2002). If patients were just typical compliers, their risk of a recurrent infarction or stroke was about the same as that of patients who did not receive statins.

In a Japanese study of patients with heart failure, compliance with digoxin therapy was determined via monthly serum digoxin concentrations (Miura 2001). If the concentration was 0.0 ng/mL on at least three consecutive visits, patients were assigned to the noncompliant group (n=218). After 6 years of follow-up, these patients had twice as many hospitalizations (two per person) as patients in the compliant group, and their hospitalizations were of longer duration (28 days vs. 13 days). The cumulative all-cause mortality rate was twice as high among the noncompliant patients (15.0 percent vs. 7.8 percent), and it was attributed to worsening heart failure.

Except in cases like this one, the number of patients who are noncompliant usually is unknown — it may be very small, or more likely, rather large — because they are the patients who fail to fill their prescription and never return for another visit. If the physician ever sees a noncompliant patient again, it may be in the emergency room. Aside from that, they are lost to the medical record.

Partial compliance

Partial compliers, on the other hand, are the ones who deserve physicians’ attention, because by attending to partial compliance it is possible to make medical care more effective. Adequate compliance is defined by achieving a desired outcome — achieving the right blood pressure, reaching the LDL target — not by taking a given percentage of pills. If the desired outcome is not achieved, it may be because the patient is only partially complying with therapy. Partial compliance can be anything, ranging from the occasional missed dose, the occasional extra dose, or erratic dose-taking to a consistent pattern that is different from what was prescribed.

Educating patients about their disease state and the benefit of drug therapy often is portrayed as a means for
your lifestyle? A certain time of day?” If the patient prefers not to tie taking the medication to a given time, it can be linked with some activity, such as a meal or a dependable daily ritual.

This extremely brief interaction shows the patient that the clinician is interested in his or her welfare and is willing to let the patient make certain decisions. The goal is to help the patient find the particular cue that triggers the taking of the drug. The electronic bottle cap is used to generate data about a patient’s drug-taking patterns for the purpose of determining whether the cues are effective. If, as in the sample shown (Table 1), the electronic dosing record indicates that the patient is compliant with therapy during the week but missing doses on Saturdays and Sundays, the information can be used as the basis of a quick conversation about new cues that might be used to improve compliance on weekends.

This program has been used to enhance compliance with drug therapy for patients with severe, persistent mental illness — schizophrenia (Cramer 1999). In this population, cognitive impairment often further impedes compliance. Yet among patients receiving the intervention, the rate of compliance was 82 percent, versus 70 percent in the control group. After 6 months, compliance rates declined in both groups, but patients in the intervention group continued to have a better rate of compliance, 76 percent versus 60 percent.

In lieu of electronic dosing records, inexpensive medication boxes can be employed with great success. Pharmacists may pale at the thought of patients removing pills from their bottles, but many patients will benefit from placing their pills in a medication organizer (or from having a caregiver do so). In addition to making it easier for patients to take each medication without having to grapple with bottles that look almost identical to each other, the pill organizers provide extremely clear visual feedback if a dose is missed.

If physicians think to look at prescription refill records, patients with irregular patterns can be identified. This simple means of pinpointing patients whose persistence with medication has faltered is often overlooked.

In summary, partial compliance usually can be traced to lack of planning rather than to patients’ willful disregard of prescribing instructions. With a minimal investment of time or money, clinicians can help patients develop personalized systems for improving compliance with drug therapy. Systemwide benefits will be realized: prescribers will be pleased because they know that they have selected an effective drug, and patients will be put at ease because they will perceive that they are receiving good care.

References


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**TABLE 1** Sample electronic dosing record for a drug to be taken 3 times daily

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
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<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Improving Outcomes and Reducing Cost: The Role of Predictive Modeling

CAROL J. McCALL
Vice President, Center for Health Metrics, Humana

“The task is not to see what no one has yet seen… but to think what nobody has thought about that which everybody sees.” — Arthur Schopenhauer

The managed care industry is in the midst of a transition — or perhaps, more accurately, a transformation — that is redefining its relationship with consumers.

To varying degrees, health plans are focusing their health management strategies on the provision of disease management or case management services for very sick or chronically ill patients, in an attempt to ensure that they receive care that meets evidence-based guidelines. The old world of medical-necessity review that placed the health plan in the laps of physicians and poisoned relationships with consumers is being reevaluated. Humana has been moving aggressively to eliminate medical review and only perform a small amount of coverage review on well-defined issues that are spelled out in the member’s insurance policy.

The essence of this new strategy is focus — putting effort into organizing and managing care for the relatively small percentage of people who consume the most services. The logic is quite simple: find the few who use many services and, in making their care more efficient, reduce costs associated with their care.

Individuals who have been hospitalized and who meet certain clinical criteria are usually targeted for recruitment into disease management programs. It is not difficult to find such patients after a serious acute episode; it remains a significant challenge, however, to find such individuals at an earlier stage in their episode, when they actually can be helped. How does one get ahead of the curve? How does the plan determine which patients to target? How much information can a plan obtain about these patients? How early can they be found?

The search for answers to these and similar questions has helped to fuel the new impetus toward predictive modeling — which entails learning how to “read” data to identify individuals and populations at risk.

Predictive modeling is only a means to an end, however. The aim, which is not new, is to create a system of integrated health management linking interventions that are appropriate to each individual’s level of need when that intervention is most likely to be effective (Figure 1). The predictive sciences are new and now are being applied toward this goal.

Emergence of predictive modeling

Conventional models have excelled at identifying high-risk individuals, but, because they rely on evidence of high service use, they are inherently backward looking; many of the identified patients may have already passed their greatest period of risk.1 These models have not tended to be sufficiently forward looking, which is a concern because the best time to help people manage and organize their care is when they are at risk or on the verge of a “tipping point” that signals a meaningful change in health status (Gladwell 2000). This is the focus of many emerging prediction models.

New predictive modeling methods shed light on what will happen, as opposed to what has happened previously.

1 This is, in part, why disease management programs have difficulty demonstrating the effectiveness of their services. Because identification techniques tend to be based on high claim costs for specific diagnoses, they are generally associated with acute hospitalizations. By the time patients are enrolled in a disease management program, they are likely on the path to mending. It thus becomes difficult to differentiate the effect of disease management services from the underlying trajectory of the course of the patient’s disease.
Like hockey great Wayne Gretsky, who ascribed his success to “skating to where the puck was going to be,” those who deliver care have to learn to anticipate the health status of consumers and be ready with appropriate interventions at the right time and place.

Toward this aim, Humana is looking for patterns in data that will reveal areas likely to generate future health care expenditures. The intention is to learn something about both the magnitude and temporality of future episodes, because those who manage care are interested in both the likely severity and imminence of impending events.

The goal of predictive modeling is not simply to identify a utilization pattern but also to identify a pattern of behavior that can be understood and tracked. In this way, behavior modification efforts can be timed properly.

**Overview of predictive modeling**

Modeling is never done in a vacuum. It is done for a purpose, with specific sets of data. The models chosen are likely to be dependent on what kind of data are available — what their specific limitations are — and on the reason for the modeling. Thus, identifying an appropriate model involves matching the models to the available data, choosing the most productive model, and then linking the results to appropriate interventions.

This article will highlight some typical uses for predictive modeling, examine some commercially available approaches — including their major features and performance characteristics — identify aspects of successful models, and suggest a future direction for predictive modeling.

**Uses of predictive modeling**

Health insurance revolves around understanding and modeling health risk. There are many different types of prediction models; thus, it is important to understand their differences and how they fit a plan’s needs and goals. This modeling approach can be used in a variety of ways in a managed care setting, some of which are outlined in the section that follows.

- **Adjustment of payments to physicians and hospitals** ensures that payments have been adjusted for differences in patient illness burden and can reflect appropriately the level of services that are being provided.
- **Underwriting and experience analyses** enable an understanding of what is happening to the risk profile of a specific population, so that insurance products can be priced appropriately.
- **Provider profiling** allows an understanding of physician behavior and treatment patterns.
- **Identification of individuals for clinical programs** is used for focused case management and enrollment of patients in clinical case management programs.
- **Development of a member “early warning system”** is used to identify individuals who are at risk.

These purposes, though related, have different modeling requirements. For example, models that are focused on risk-adjusted payment to providers need to pay particular attention to the dates of specific treatments as well as to the specific providers involved. Models used for rate setting may pay less attention to specific providers and more to aggregate patterns and levels of predicted costs.

A wide variety of prediction models are currently in use (Table 1, page 14). These tend to differ along the following dimensions:

- **Prediction period.** Some models are constructed to understand the present (concurrent models); some are built to predict the future (prospective models). All models are inherently probabilistic, which means that there is always some margin of error associated with each.
- **Type of data used.** Models are only as good as the data that are fed into them. Some models are designed to work exclusively with pharmacy claims data, some work only with medical claims data, and others work with some combination of medical and pharmacy claims data.
• **Business-segment targeted models.** These models may be targeted to specific business segments (Medicare, Medicaid, or commercial), or to specific disease states or conditions.

• **Algorithms used.** Algorithms tend to be proprietary and often are not well explained.

When assessing prediction models, it is necessary to understand the differences among them and how these distinctive features fit the plan’s needs.

**Performance statistics**

There are many ways to evaluate the effectiveness of a model. The most common statistical measure is the amount of *variance* in the data that is explained by the model, summarized by a statistic called $r^2$. The models are written to attempt to find the patterns of meaning within the data. The higher the $r^2$ is, the better the model has been able to separate meaningful patterns from extraneous noise and predict future costs, given various inputs.

A recent review of risk-adjustment methodologies that was published for the American Society of Actuaries compared the performance of common commercial risk-adjustment models (Table 2) (Cumming 2002).

As Table 2 indicates, models using both diagnostic and pharmacy data tend to perform significantly better than models designed to use either medical or pharmacy claims alone for predicting the future trend. Also, the models based on the single data set generally perform much better when explaining concurrent period variation than when actually predicting future costs.

In addition to performance, there are other factors to consider when evaluating a prediction model:

• **Ease of use.** To operate the model, do you need an area of specialty or expertise (e.g., actuary or underwriter, clinician or scientist)?

• **Cost of software.** Aside from the acquisition cost, are there potential hidden costs?

• **Availability of reports.** Are reports available from the models? Can they be accessed quickly and relatively easily?

• **Reliability across settings.** Databases often contain data from different claims administration platforms. How consistent are the claims-coding practices and submission rates across these platforms? How reliable is the model across business segments, conditions, or products?

• **Data requirements and flexibility.** This is a fundamental issue in that model performance may vary with different data sets. Some models run on only pharmacy data, while other models offer the flexibility to run on either pharmacy or medical data but perhaps run less effectively than with both data sets together.

• **Links with interventions.** Predictive modeling is merely part of the process necessary for effective outcomes management. It is vital that the results of the modeling support the plan’s clinical intervention strategies. Even more important, models must be built to identify the types of people that the interventions are meant to target. Ideally, the results of the intervention, including any subsequent changes to individual behavior, should be fed back into the models for future fine-tuning of predictive and targeting capabilities.

• **Sensitivity to claims coding.** If the model is overly sensitive to different types of claims codes, the potential increases that the model will produce substantial extraneous information or noise. Two key questions then arise: how sensitive to that noise will the model be, and how will it filter out superfluous data? When models are used for risk adjustment of payments to providers, it is possible that fitting the model to specific codes can result in oversensitivity of the model and a vulnerability to upcoding — which occurs when a medical service has been coded and billed at a highest service value, although the procedure actually performed was less complex.

• **Underlying logic and methods.** There are a number of different methods and algorithms that can be

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2 It should be noted that some of the $r^2$ statistics are for nontruncated claims, meaning that people who experienced very high costs did not have their claims cut off at predetermined levels. This is important, because these rare events confuse some prediction-model algorithms and disrupt the $r^2$ data. Truncating claims at $100,000 adds approximately 4 to 5 percentage points to these $r^2$ levels.
used in prediction models. It is therefore important to understand whether and how the methods can accommodate novel and potentially unseen situations. Every model will have its limits; the key is to know what they are.

Emerging sophistication

The field of health services research has tended to rely on linear multivariate models and to use medical and/or pharmacy claims information exclusively. Recently, however, various sophisticated techniques from the engineering sciences have begun to be applied to the problem of risk measurement in ways that may improve the performance and efficacy of prediction models significantly.

New techniques in predictive modeling are not derived from clinical logic. Instead, they are based on signal-processing techniques from engineering sciences, such as acoustics, that are designed to find patterns in weak, noisy, or sparse data. These techniques have a number of advantages over traditional techniques.

First, they are not linear, which means that they are capable of capturing patterns for prediction from extremely small changes in behavior, and extremely small changes in behavior may signal big changes in health status.

Second, these new techniques are better able to deal with the inherently dynamic nature of health states. Conventional methods capture data snapshots of people, but to see the trajectory of an individual’s health state necessitates taking photographs continually. The models themselves need to be dynamic, not only to ascertain the member’s current status but also any changes in the member’s status over time — with the added ability to identify, characterize, and focus on those changes that are most meaningful.

Third, many traditional models truncate what might be considered outlier events, because these events are difficult to predict or manage. But the newer generation of prediction models actually is designed to find rare events rather than to filter them out.

Moreover, due to the sensitivity of these methods to weak data signals, they tend to be more effective at finding patterns in relatively sparse data. This quality has enormous practical implications for plans that need to be able to generate useful analyses for new customers and cannot wait for a year’s worth of data to initiate the work. A model that can obtain 75 percent of its ultimate performance within 2 months, instead of waiting for up to a year for final data, gives the plan’s clinical strategies a big boost.

Further, conventional models are self-limiting because they attempt to find one equation that will describe every possible situation. There is no single algorithm or methodology that can address every issue. The future of modeling will be focused on creating and customizing algorithms for specific situations, rather than trying to retrofit health issues into existing methodologies.

Finally, the new methodologies are iterative as well as self-adaptive — that is, they are designed to acknowledge errors that occur in predicting outcomes and then use this information to make refinements in its processes. Through time, the self-adaptive methodology drives the model and “learns” from experience.

Humana’s experience

Our data are compiled and organized so that we can build models of individual consumer behavior and experience. This means that rather than model the aggregate experience of a population, Humana is trying to model risk at

<table>
<thead>
<tr>
<th>Model</th>
<th>Concurrent ($r^2%$)</th>
<th>Prospective ($r^2%$)</th>
<th>Data used</th>
</tr>
</thead>
<tbody>
<tr>
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<td>10</td>
<td>Diagnosis</td>
</tr>
<tr>
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<td>Diagnosis + Rx</td>
</tr>
<tr>
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<td>40</td>
<td>Diagnosis + Rx + other</td>
</tr>
<tr>
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<td>10</td>
<td>Rx</td>
</tr>
<tr>
<td>McKesson†</td>
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<td>N/A</td>
<td>Diagnosis + Rx</td>
</tr>
<tr>
<td>MEDai†</td>
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<td>Diagnosis + Rx</td>
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<tr>
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<tr>
<td>RxRisk *</td>
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<td>11</td>
<td>Rx</td>
</tr>
</tbody>
</table>

By way of comparison, age and sex — when used to predict future costs — have an $r^2$ of approximately 3 to 4 percent.

$ACG=$Ambulatory Care Group; $DCG=$Diagnostic Cost Group; $ERG=$Episode Risk Group. $*$These $r^2$ statistics are for nontruncated claims; data from Cumming 2002. $†$From publicly available data.

SOURCE: HUMANA 2003
the individual level.

Humana is interested in assembling any and all information that could serve as a signal that an individual may be experiencing a change in health status or may be putting himself or herself at risk. To do this, we compile every bit of information we have about each member, which includes medical claims data, pharmacy claims data, health risk assessment information, and calls to our triage line or customer service line. We look not only at signals of new events but also at information indicating that needed care is not being received. For example, information about noncompliance with a pharmacy or treatment regimen — as indicated by a failure to fill a prescription or to see a physician for a recommended periodic test — could be meaningful in terms of future adverse events.

Significant preprocessing and data transformation enable us to use a variety of models to find patterns in the data that allow us to make predictions of costly future events (and with respect to the urgency of future events) at the individual level. We may use as many as 30 different models, each attuned to a different feature of the data, before arriving at a consensus assessment of the data's inherent patterns. These patterns describe the health trajectories of individual members, each expressed through various metrics representing the relative magnitude and immediacy of the prediction. These metrics are used to identify the appropriate clinical intervention and to prioritize and focus our efforts.

All the information identified, created, and organized around individual consumers also can be aggregated in various ways to provide new insights into the clinical dynamics of specific populations or subpopulations. We have new proprietary, internally developed insight tools to compare the clinical experience of different subpopulations of employees, to customize clinical interventions, and/or to view the effectiveness of clinical programs. This dynamic, automated data-mining, and statistical analysis software is designed to discover meaningful patterns within populations, across time and between variables.

Customization and personalization

Among the many benefits of individual health modeling is the opportunity it creates for customizing and personalizing services provided to health plan members. This becomes possible for two reasons: first, because these techniques are essentially modeling behavior, they can capture and account for behavioral differences before and after interventions, providing new insight into the effectiveness of the interventions. Secondly, as the models fine-tune themselves over time, it will be possible to adjust health care interventions to best suit each individual's behavioral profile.

Having identified the risk associated with each individual, these models then will provide heightened flexibility and precision relative to estimates of group and subgroup risk, which also will enable a greater degree of benefit customization at the employer level.

The predictive modeling that is generated for the timing and matching of clinical interventions will have enormous side benefits to help an industry — one that is reputedly insensitive to the needs of individual members — to begin to target and deliver tailored products and services that will help members manage their health care needs effectively.

References


During World War II America, employers were forced to take greater responsibility for their employees’ health care. Due to wage and price controls, employers found that they could entice potential new workers only by enriching their benefits programs. Over time, this employer-based health care system became codified and, as a consequence, employers continue to play an important role relative to how health care is delivered.

In the flush economic times that followed WWII, this responsibility may not have been perceived as burdensome. Nevertheless, increasing costs in the 1980s gave rise to employer-driven reforms that centered on shifting costs to employees and the growing popularity of managed care. Managed care offered employers the promise of controlled cost without sacrificing the quality of care.

In recent years, after a decade of tempered growth owing to the impact of managed care cost-control methods, costs associated with health care have begun to rise rapidly again. In 2001, the Institute of Medicine (IOM) identified six key attributes around which the health care system should be redesigned to become more “Safe, Timely, Effective, Efficient, Equitable, and Patient-centered (STEEP).” In its report, “Crossing the Quality Chasm,” the IOM called on purchasers and payers to become catalysts for change (Committee on Quality 2001). As a consequence, employers — as primary purchasers of health care — are trying more actively to rein in expenses again and to maximize positive clinical outcomes through a new national initiative called Bridges to Excellence. By proactively engaging both the provider and consumer in this program, employers are taking steps to control costs while simultaneously improving the quality of care delivered.

Bridges to Excellence endeavors to coordinate the provision of quality care and patient education initiatives by broadly encouraging, via best practice examples and behavioral modification techniques, a reengineering of care processes within physician offices. Performance measurement data that are derived from the Bridges to Excellence program are meant to help consumers choose health care providers and to help purchasers identify preferred providers more objectively. Three primary components comprise the Bridges to Excellence program: the Diabetes Care Link, the Cardiac Care Link — both of which are oriented toward patients — and the Physician Office Link. The Physician Office Link involves a fairly comprehensive reengineering of physician practices; the unit of measure is not the individual physician but the physician practice. This article will examine Bridges to Excellence and the strategies that are in place within it to assist both physicians and patients in meeting their health care goals.

Establishing the rules of engagement

As the 1990s progressed, purchasers of health care felt that the health care debate, which had revolved around cost containment and more punitive methods of changing physician behavior (through selective contracting or provider profiling based on utilization), needed to be re-focused on two key questions: How can quality be recognized in the marketplace? How can incentives be created and aligned among purchasers, health plans, physicians, and patients?

To recognize quality in the marketplace, performance measures first had to be defined; purchasers, providers, and plans needed to build a consensus around quality standards that were at once attainable and meaningful. As drivers of this process, purchasers recognized the need

**FACULTY PRESENTATION**

The Quality of Health Care: An Employer’s Perspective

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to engage employees — or consumers — in their health care decisions. The philosophical foundation of this quality process was this: If individuals were more involved in their health care, they would be more apt to follow treatment regimens and act in concert with their physicians, the eventual outcome being more appropriate (and less expensive) care.

To obtain their true involvement — and key in the development of these quality initiatives — consumers must both have a financial stake and be intellectually engaged; employers recognized from the creation of these initiatives the need to create financial incentives in the marketplace that reward all participants for better quality. Purchasers feared that a system that was lacking tangible incentives would be mired in the status quo and that change would be difficult to achieve.

The Leapfrog Group

An important step on the path toward greater provider/patient engagement was the creation of the Leapfrog Group. Founded in 2000 by an organization of Fortune 500 CEOs — the Business Roundtable — the Leapfrog Group is focused on improving the quality of care delivered at American hospitals (Mello 2003). Its mission states:

“The Leapfrog Group was created to help save lives and reduce preventable medical mistakes by mobilizing employer purchasing power to initiate breakthrough improvements in the safety of health care and by giving consumers information to make more informed hospital choices.” (Leapfrog Group 2002)

The Leapfrog Group now has more than 140 participating companies, representing approximately 34 million lives. Underlying its actions are specific principles: educate and engage consumers/patients, reward quality care, and collect and publicly release performance measures.

The next step: Bridges to Excellence

Moving beyond Leapfrogs purview, which is the inpatient setting, into the outpatient setting, the Bridges to Excellence program was formed. Started with a grant from the Robert Wood Johnson Foundation and implemented with the National Committee for Quality Assurance (NCQA), Bridges to Excellence is similar to Leapfrog in that its efforts center on the development of performance measures and, ultimately, the dissemination of these measures (Bridges to Excellence 2003).

The Leapfrog Group and Bridges to Excellence were founded on a process that is meant to initiate sustainable change. Valid measures of quality across the care spectrum are tied to meaningful incentives for both physicians and consumers and are widely disseminated to consumers.

As depicted in Figure 1, the program uses a decision-tree or algorithm in which the starting point is physician performance data, which are then made public and used for varied purposes: to drive organizational improvement (which, in turn, should increase performance levels); to reward “best in class” physicians; and to either assist patients in voluntarily selecting physicians who meet Bridges of Excellence standards or to steer patients toward the best-performing providers.

Nevertheless, with respect to the voluntary-selection component, consumers have yet to make full use of the available information regarding performance measures, which can enable them to become more actively involved in making their health care decisions rather than simply observing the data.

Changing incentives

The next generation of health care change management therefore aims to bring individuals into the process and transform them from passive patients to active consumers. To be able to enact such a meaningful change, the mere deployment of information is insufficient. Financial incentives for consumers must be tied to the decision-making process, and all players in the health care market need to see the benefits they stand to reap from active participation.

The use of incentives, such as those directed toward provider best practices, is not without its detractors on the payer side. In the debate concerning physician incentives, some payers feel that providers already are being paid to deliver care that meets industry standards and best practices; purchasers, however, respond that irrespective of whether certain guidelines should be met, in most cases, they are not. In fact, General Electric found, in a study performed by the Medstat Group, that 67 percent of its employees with diabetes receive care that is inconsistent with guidelines — a percentage that has remained relatively consistent through the past 6 years.

Bridges to Excellence also needs to overcome challenges posed by the ways in which patients and physicians interact. The paradigm presently employed, which holds that the patient consults with the physician when ill, means that the physician’s interaction with the patient is a transactional, one-time event, based on a specific episode of illness and the alleviation of a set of symptoms.

Purchasers now are asking physicians to shift their focus to the entire continuum of patient care and take care of the patient even when he or she has not come to the office with an identified health event. Nevertheless, physicians are not compensated for patient care unless...
it is centered on an episode of illness. Incentives for the physician, therefore, must change.

**Enlisting participation**

For the quality initiative to be effective, physicians first must be attracted to the program and consumers must be attracted to finding the best physicians. To accomplish this, purchasers, payers, and providers all need to see a return on their investment.

To meet performance measures, providers need to be willing first to participate in the measurement effort. Participation must carry some form of compensation for providers to become involved in a program that adds work to an already full schedule. Positive incentives and rewards must be designed to make the business case for providers.

This framework for increasing participation among physicians and patients is most successful when using a combination of methodologies. Figure 1 shows an aggressive consumer path toward “steered selection,” a strategy whereby patients are directed to specific providers who meet certain qualifying criteria. For the data to be used effectively by individuals, there must be a mechanism to support their efforts, either through differential levels of copayment or through select networks. Tiered copayments make marginal differences in consumer choices; select networks are an effective way to involve consumers in the decision-making process.

When steered selection is the only method of behavior modification used, a patient may find that a physician who ranks highly (based on performance measures) is not accepting new patients, which would merely serve as a source of frustration. Ideally, the provider pool must be large enough to allow the potential patient population to be serviced adequately. Direct financial rewards therefore are important motivators to increase the number of physicians participating in performance measurement programs.

**Measuring physician performance**

Because varying health plans tend to use different data sets for measuring performance, many physicians simply ignore all requests for such information. It is optimal then to find agreement among plans as to the performance measures that set the standard for physicians. To

ward this aim, and to the greatest extent possible, the Bridges to Excellence program uses only those data sets with which both health plans and physicians are comfortable.

**The Diabetes Care Link**

The management of dyslipidemia is critical to the reduction of complications linked to diabetes, and is a key component of the management of patients with diabetes. The most common and costly complication linked to diabetes for commercial insurers and most employers is coronary artery disease (CAD).

In fact, a recent analysis of GE data indicated that slightly more than half its covered members who had diabetes also were diagnosed with some form of CAD and had higher average costs of care. As such, management of lipids is an essential part of the appropriate management of patients with diabetes. The Diabetes Care Link is designed to improve the care of diabetic patients and engage them in their care. It is also designed to engage providers in meeting more rigorous performance measures and improving performance.

Both NCQA and Medstat are working with the purchaser community in this effort, wherein NCQA scores performance while Medstat aggregates data across purchasers and plans and pays the bonuses to the physicians.

The importance of bringing an objective third party into this performance-evaluation process became clear when physicians communicated to the developers of the Bridges to Excellence program, in its planning stages, that

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**FIGURE 1  A framework for sustainable change**

![Diagram showing framework for sustainable change](https://example.com/diagram)

The key is to have valid measures of quality across the care spectrum that are tied to meaningful incentives and then disseminated to consumers.

**SOURCE:** GENERAL ELECTRIC 2001–2003
they would perceive an attempt by the purchasers to measure performance as a conflict of interest. The conflict could come into play when purchasers paid out incentive bonuses for meeting performance standards; physicians perceived a potential tendency for purchasers to discount physician performance to minimize the dollar amount that was paid. Regardless of the accuracy of this perception, purchasers recognized the need to eliminate any potential barrier to provider participation and introduced NCQA as the impartial performance evaluator.

The provider outreach of the Diabetes Care Link is straightforward: meet the Diabetes Quality Improvement Program measures, endorsed by the American Diabetes Association (Table 1), and receive a bonus per patient.

These measures are meant to represent one of many possible ways to achieve more positive outcomes for diabetic patients. These data points are not absolutes, but are relative measures of performance on the part of the providers, meaning that the data are indicative of performance. Bridges to Excellence is not attempting to measure control of each individual patient, but rather the level of overall or average control in a practice’s diabetic-patient population.

The manner by which providers meet these measurements is quite direct: A random sample of 35 diabetic patients (including Medicare and Medicaid patients) is drawn from the practice, regardless of health plan affiliation. Given that the entire spectrum of patients is being audited, inevitably there will be some poorly controlled patients; one ambitious goal of Bridges to Excellence is to ensure that this poorly controlled population does not exceed 20 percent of the practice’s entire patient population.

The random-sampling methodology was designed to be easy to implement. An office could simply pull charts alphabetically until 35 diabetic patients were found or could base the sample on date of appointment. For physician offices that do not have a registry of their diabetic patients, the random-sampling process will be more time-consuming, yet absolutely attainable. Each physician office is subject to an audit by the NCQA on the submitted results. Potential audit flags might include physician data that are well outside the norm or improvement rates that are extremely high.

As the program progresses, physician incentives will be refined further. The program that is in place was developed on the basis of extensive physician input. One concern that was raised by physicians related to the issue of patients with conditions that are difficult to treat. Because physicians voiced concern that their sickest patients will increase the difficulty of meeting the performance measures, risk adjustment of outcomes measures is being made available through Michael Pine and Associates.

Preliminary results indicate that participating physicians are pleased with the program. Pilot programs in Kentucky, Ohio, and Massachusetts have been well received, and the number of applications and demands for applications at the NCQA site have increased in recent months.

Overall, the objectives are to measure physician performance through structural systems, as well as processes and outcomes of care, and to create a compelling business case for physicians to reengineer the way that they deliver care.

Nevertheless, to attain a realistic return on investment, the major challenge for the Bridges to Excellence program is to find ways to engage patients so that they are managing their condition better. The assumption held by purchasers is that more efficient disease management also will be more cost effective; in fact, for the Diabetes Care Link, purchasers expect a return on investment of approximately $175 per year per patient.

**Engaging the consumer**

Just as providers must be motivated to participate in the program and meet the performance measures, consumers must be motivated to look for these measures in their decision-making process. Engaging the employees and patients in Bridges to Excellence is critical. As shown in Figure 2, the initial phase of consumer engagement is called “create,” the purpose of which is to create aware-

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**TABLE 1 Specifications – adult patients**

<table>
<thead>
<tr>
<th>Measure</th>
<th>% patients achieving measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td>93</td>
</tr>
<tr>
<td>HbA1c ≤8%</td>
<td>55</td>
</tr>
<tr>
<td>HbA1c &gt;9.5%</td>
<td>≤21</td>
</tr>
<tr>
<td>Eye exams (annually)</td>
<td>61</td>
</tr>
<tr>
<td>Foot exam (annually)</td>
<td>80</td>
</tr>
<tr>
<td>BP monitored (annually)</td>
<td>97</td>
</tr>
<tr>
<td>BP &lt;140/90 mm Hg</td>
<td>65</td>
</tr>
<tr>
<td>Nephropathy assessed (annually)</td>
<td>73</td>
</tr>
<tr>
<td>Lipid profile*</td>
<td>85</td>
</tr>
<tr>
<td>LDL &lt;130 mg/dL*</td>
<td>63</td>
</tr>
</tbody>
</table>

* Consistent with Diabetes Quality Improvement Project and HEDIS measures.

ADA=American Diabetes Association; NCQA=National Committee for Quality Assurance; HEDIS=Health Plan Employer Data and Information Set.

SOURCE: BRIDGES TO EXCELLENCE 2003
ness of the problem. As James Prochaska, PhD, describes in his Transtheoretical Model, before an individual’s behavior can be modified, he or she must recognize that there is a problem and then be made aware that the problem can be addressed effectively.

The next step in the process of engaging consumers or patients is to develop “connectors” between them and their decision-support tools, which may include newsletters and e-mail alerts. Quality incentive programs — no matter how well planned, and despite raising awareness and furnishing appropriate decision-support tools — will not succeed if they do not assist consumers in making the connection to those tools. Enabling consumers to close this vital link helps them to convert the knowledge of health information into new behaviors. Connectors may take the form of nonpersonal communication (e.g., a Web site) and personal outreach (e.g., a nurse or certified diabetes educator [CDE]). In many cases, an effective connector is the patient’s physician, because an existing relationship between physician and patient often is based on trust.

In the diabetes program, patients often respond positively to CDEs. These specialty educators can assist patients in understanding practical ways to help themselves. CDEs provide this counseling to diabetic patients in a one-on-one setting, at a cost that is both reasonable for purchasers and nonthreatening to patients.

The use of external venues represents another important element of this program; by providing these support services away from a consumer’s place of employment, consumers — either in groups or individually — can more comfortably seek assistance from professionals.

**Consumer incentives**

A large part of the consumer program within Bridges to Excellence is an incentive system that is geared to patient needs. In this program, consumers earn points toward coupons that are redeemable for rewards. Each patient maintains a logbook and reports on specific scores, such as HbA1c levels. This process is based on Prochaska’s behavioral model, which states that individuals require constant, positive reinforcement toward an achievable goal (Prochaska 1995).

**Customizing the message**

Another important aspect of developing a quality incentive program is determining the level of the consumer’s readiness for change and customizing a message for this “active consumer” segment. Active consumers constitute the patient segment that is most ready for change, and it is within this group that outreach is likely to have the highest success rate. Bridges to Excellence utilizes a 10-point questionnaire, codeveloped with the Foundation for Accountability and designed to be simple to complete, as well as easy to implement. Scores on the questionnaire are reliable predictors of the level of activation of individual consumers. The survey is used to ascertain which consumers are willing to become engaged and understand health information versus those who are disinterested or who need assistance in interpreting the data.

A significant aspect of this program has been its use in demonstrating that illness does not necessarily prompt individuals to become more engaged in their care. Instead, it was found that the most significant determinant regarding the level of engagement is whether consumers can interpret health information without assistance. The need for assistance, then, is what creates dependency on the physician who acts as the coach or the interpreter of information.

Understanding the manner in which individuals interpret and absorb information is the key determinant of the type of message needed. Figure 3, on page 22, shows the distribution of consumer segments and their feelings toward health information.

The first group — the independent seekers — comprises patients who understand the data and their ap-

**FIGURE 2  Engaging consumers/patients: the General Electric way**

<table>
<thead>
<tr>
<th>Create</th>
<th>Connect</th>
<th>Support</th>
</tr>
</thead>
</table>
| • Take action  
• You can do it  
• “It’s your health”  
• “Research shows” | • Nurse/physician  
• Volunteers from the ADA CDEs  
• Information via Web site | • In-person coaching  
• Checklists of treatment goals  
• Expert-care team lists |

ADA=American Diabetes Association; CDE=Certified Diabetes Educator.  
propriate use. The next group, the physician-dependent actives, understands the data but these individuals have a tendency to feel overwhelmed by the information. For the patients in this group, it is helpful if the information is presented in small amounts, but they generally need assistance in interpreting data, via a "connector."

Barring an external communicator such as a CDE, the connector will be the physician. Alternatively, some programs may place a professional in the community to help an individual interpret the health information and create a pathway toward better self-management; disease management companies often provide access to “call-a-nurse” telephone information resources.

The final two groups, the physician-dependent passives and the uninvolved, are difficult to manage, because the amount of resources that are necessary to engage them exceeds any return on investment. These programs therefore do not cater to the needs of these extremely difficult groups.

There are specific messages to which independent seekers will react positively that may be completely contrary to the needs of the physician-dependent passives. Given that no single message will reach all audiences, Bridges to Excellence focuses on formulating messages directed to the two groups comprising individuals who are most likely to change. Yet, the populations that are not the primary focus of these behavior-change messages will still benefit from the physician-behavior interventions. While the program is helping physicians meet the performance measures, it also is activating and focusing on self-management for at least half the consumers. Also, after addressing the behavior of physicians and the more responsive patients, the program focus shifts toward passive patients via more stringent means such as steerage, i.e., directing patients toward physicians who are better performers.

Expectations for the future

The way that Bridges to Excellence will be evaluated is fairly rigorous. A national evaluation team will examine the differences in costs and outcomes between patients who use the self-help tools and those who do not. Additionally, the differences between physicians who meet the performance measures and those who do not will be analyzed.

The creators of the Bridges to Excellence program expect some type of return after 3 years. On entering the program, most participating purchasers understood that it likely would be a longer road to cost savings than is usually seen with health promotion (e.g., disease management) programs. Nonetheless, the change that will be incurred will be longer lasting and will help the system realize not just greater cost effectiveness but better outcomes for consumers.

Further, by designing a program that will be offering purchasers a return on investment and meeting the needs of the provider community, the creators of Bridges to Excellence believe that barriers to participation are lowered.

References


General Electric Corporate Health Care and Medical Services Programs. 2001–2003 internal data and studies. Fairfield, Conn.


In this section, Joyce A. Cramer and Francois de Brantes respond to questions from medical directors who attended the Colloquy.

PARTIAL COMPLIANCE

MEDICAL DIRECTOR: A physician can say to a patient, “I saw you 3 months ago, and you’ve filled the prescription once in 3 months. So, 1 month’s worth of pills lasted 3 months — we need to have a little further conversation.” The feedback that is being provided to the patient is, “We’ll know if you’re not taking your pills.”

JOYCE A. CRAMER: It’s extremely important to use all available information. If patients tell you that they take their medicine, then without some kind of record of their dosing in front of you, you won’t know how to help them.

MEDICAL DIRECTOR: I don’t think people tell the truth about whether they took their pills.

CRAMER: People simply can’t remember what they forgot! If a patient forgets to take doses and doesn’t count pills or have a medication-organizer box, he or she won’t know about those missed doses. The average person does not notice that a prescription lasted longer than expected. Patients are not counting days; they just get a refill when the bottle is empty. That’s why when you ask a patient if he or she takes the medicine regularly, the patient says “yes.” It’s not a lie but a memory lapse. It’s not that your patient is trying to fool you; he or she simply is not aware of having missed doses.

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MEDICAL DIRECTOR: Have you addressed this issue through telephonic interventions alone?

CRAMER: I have not. I think that people find it extremely annoying to be called with reminders about every dose. There are companies that have a business that is based on telephone calls or pagers for dose reminders. Some give patients cell phones that beep or page them every time they’re supposed to take a dose. These electronic devices often are just interference to the average person, however. Also, often, those who are willing to sign up for these programs are good compliers, so you are preaching to the choir. Someone who would sign up to have a beeper to remind him about a dose 4 times a day would be akin to me wanting to be 99.9 percent compliant when I’m already at 99 percent.

MEDICAL DIRECTOR: If you know, though, that a patient is not compliant by looking at prescription refills and so forth, telephonic intervention may be better than relying on office visits with doctor intervention.

CRAMER: Telephonic intervention is equivalent to a visit; it’s a contact. Any increase in the number of contacts that focuses the patient on the issue of taking the medication is very effective. It doesn’t have to be the doctor or the nurse.

MEDICAL DIRECTOR: Is the same information relevant to children? Or, is all this work done with adults?

CRAMER: Children are a different issue; you’re really measuring compliance of the mother, in many cases.

MEDICAL DIRECTOR: There are now electronic medication monitors that can be hooked into a phone to see how many medications the patient took each day. Are you familiar with that, and does that have any future?

CRAMER: Yes, Aprex has had those systems available for several years. The system automatically dials in over a modem at night. It’s highly effective, as is anything that is a contact with the individual, and the cost comes down with expanded use.

MEDICAL DIRECTOR: Has there been any research looking at how much individuals spend on a prescription in terms of whether they value it more because they’ve spent their own money? Is the cost of medication still just too insulated in our current system?

CRAMER: There have been studies comparing medication usage in systems where it’s free, where you have a copayment, et cetera. It really doesn’t seem to make that much difference in terms of compliance overall. The fact that some medicines cost $10,000 a year for someone who is uninsured is a separate issue. In terms of compliance and persistence, though, that’s not a key factor because the same type of problem exists among patients whose medications are free and those who make a small copayment.

MEDICAL DIRECTOR: Your comments are focused on providers. How much time do you spend communicating the importance of this issue in terms of its pub-
lic health importance? About 2 years ago, a study using an econometric model documented the cost of drug-related problems in the United States at about $177 billion and the cost of pharmaceuticals at about $130 billion; a substantial portion of those costs was related to hospitalizations that resulted directly from poor compliance. So, in our travels, we try to communicate that this is a public health issue, but I’m not sure that it always falls on receptive ears when we’re dealing with midlevel pharmacy benefit administrators who see this as just a cost, as opposed to an offset on the medical side.

CRAMER: When I speak at grand rounds, I find that physicians don’t want to think much about costs. But if I talk about the effect on their practice and the fact that they’ll feel more effective as physicians if their patients improve, this interests them. When I talk to pharmacy groups, I focus on costs and the fact that they shouldn’t have a silo mentality. I tell them that they’re shifting what may be a higher drug cost for them to the other side of the medical care system, if they don’t encourage compliance and persistence with effective treatments.

Today, I’m speaking to managed care leaders about covering both drug costs and long-term secondary costs, and the fact that you’re going to have a very high percentage of poor compliers in your system who are going to have that myocardial infarction or stroke. I want you to educate as many people as you can about the importance of compliance and persistence.

MEDICAL DIRECTOR: Dr. Prochaska discussed medication compliance, saying that the stages of change that apply to diet and exercise and smoking cessation could also apply to medication compliance. [Editor’s note: Please see “Staging: A Revolution in Helping People Change,” on pages 6–9, in the September Medical Director Colloquy Managed Care Supplement for a discussion of Prochaska’s theories.] He made the comment that when somebody relapses with a medication, they go all the way back to the stage of precontemplation. Would you comment on how the stages of change apply to noncompliance and nonpersistence? Do you see any interventions that would be effective, playing on the stages of change?

CRAMER: I’m very familiar with his work. I have not found that it integrates into this area. It’s a psychological theoretical construct that explains behavior, but in some ways the theoretical approach describes what already has happened. It tells me what the patient’s stage was or is, but not necessarily what will happen tomorrow. That’s why I introduced myself as a pragmatist. I have worked with psychological assessments with my colleagues for a long time to do the research, but I find that I cannot even begin to use the words psychology or behavior in discussion with patients — or anything that would sound like counseling when I speak with physicians — because they don’t want to participate in that. Physician-patient relationships should be about talking on a very basic level, one to one. Getting involved with your psychological status and your viewpoints on something as a theoretical construct doesn’t fit easily into doing it the pragmatic way in office-based practice.

MEDICAL DIRECTOR: One would think that with highly symptomatic disease states, patients might be more motivated to be compliant. If one controls for complexity of the treatment and the dosing regimens, have you found this to be true?

CRAMER: One would think that with hypertension, you would have somewhat lower compliance, but that’s not necessarily true; much of the research depends on which patients you study. Newly diagnosed patients have more motivation than those who have been controlled for years and who may be more erratic about taking doses. That’s due to the fact that, to an extent, partial compliance depends on your outcome. In other words, if you can get away with going to the doctor and having good blood pressure twice a year, you can afford to be a bit less careful. If you’re having angina, you want to be a lot more careful. You have other ancillary feedback that you’re not well, and you really have to be more focused on your medication.

Older people tend to be better compliers and persisters with medicines, because they’ve learned the hard way that these things don’t go away. If there’s one group to watch for as the poorest compliers, it’s young men — because they see themselves as “supermen.”

You can tell someone, “You have severe epilepsy; you’re going to keep having these seizures.” But the response you might get is: “Oh, that was just a one-time thing,” and the patient will take the medicine for 30 days and then stop. This is very common, no matter what the severity of the disorder.

MEDICAL DIRECTOR: What percentage of patients use plastic medication organizers?

CRAMER: Not enough.

MEDICAL DIRECTOR: Should health plans and pharmacy benefit managers give them out for free if they work that well?

CRAMER: I think you should teach everyone how to use pill organizers! Drug company representatives used to give me pillboxes, and I collect them and give them to people as I can. When you see somebody light up and say, “I know I’m going to use this,” then you know that with the simplest intervention, you can make a difference in somebody’s health care. I think you should
not only give them away but push them on people, show them how to use it, how to set up their medications once a week. It also is helpful to have the patients write down all their medications on a sheet for use as a guide when filling the box each week.

**MEDICAL DIRECTOR:** Maybe drug companies should give them in huge numbers to physicians’ offices.

**CRAMER:** They have over the years. I have a whole collection of them. This is a highly effective way to promote better daily compliance.

**HEALTH CARE QUALITY**

**MEDICAL DIRECTOR:** Do you have any sense as to whether employees are making decisions based on information from report cards?

**FRANCOIS DE BRANTES:** The majority of employees are not making decisions based on that information. That’s the frustrating part about the report cards. They have had a pretty significant effect on physicians but, so far, little effect on consumers. Consumers do look at them, but it’s not clear that they shift from one physician to another because of it. The next logical step is to create certain financial incentives at the consumer level to start shifting volume. But you don’t consider doing that unless you have a good supply of physicians meeting the performance measures. If we want the market to move toward better quality, then first we need to identify the better-quality performers, grow that pool — so that it represents a critical mass of providers — and then start shifting volume to it.

**MEDICAL DIRECTOR:** But I would think from the consumer side, like with everything else; you’re going to have some early adopters, and then you’ll see it grow. You’re going from a situation where the consumer has no information, then suddenly giving them information on the physicians. So there might be reluctance to make changes initially, based on that information.

**MEDICAL DIRECTOR:** We all have our referral base, and you refer people to different physicians based on their personalities. You wouldn’t send a little old lady who needs her hand stroked to the crotchety surgeon down the street, but you might send him the businessman who cares little whether anyone would stroke his ego and his hand but wants the best possible technician. So the guy with no bedside manner but great outcomes actually scores well in this model, but many people might not like to go to him because of his difficult personality.

**DE BRANTES:** That is why it is important to have both effectiveness-of-care and patient experience-of-care measures. If someone truly doesn’t care about bedside manner but is simply looking at who’s scoring best on performance measures, he or she can make that choice. Similarly, the patient who is more interested in someone with great patient experience-of-care results might migrate to that particular physician.

**MEDICAL DIRECTOR:** How do we identify what better pharmacy management or better management of chronic conditions looks like?

**DE BRANTES:** We’ve tried to intellectualize this and deal with the problem by saying, “We can try to micro-measure everything and probably fail, or we can ask whether there are certain structural processes, like a CPOE [computerized physician order entry] system within a hospital, that have been shown to reduce errors and increase quality.”

Studies clearly show reductions in overuse of radiology and overuse of certain lab orders, and a significant reduction in adverse drug events — thanks to electronic prescribing. Adding decision-support tools to make some smart edits greatly helps to reduce common mistakes as well as overuse.

My favorite example is in our population, in which 70 percent of the people who take prescription-strength NSAIDs are prescribed COX-2 inhibitors. Because they are no different from most commercial populations, there really is no clinical reason that they should be prescribed COX-2 inhibitors. In fact, my wife just had a foot operation, and before going to the hospital for the procedure, she received a home care kit containing rofecoxib. And you know, she’s never had a stomach problem in her entire life, so why this? So we know that overuse is occurring.

If you have decision-support tools in the physician’s office that prompt a question about whether a person has gastrointestinal problems or whether there is a reason to prescribe this medication as opposed to others that are as effective — while a significant drop is not guaranteed — indications are that physicians make better decisions, both clinically and financially.

Another advantage of focusing on adoption of certain structural processes is that it makes overall measurement of quality much easier. If you have registries and electronic medical records and other infrastructure in a physician’s office, being able to look at the data in that office is a lot easier than doing it as we do now, which is rather ineffective and very expensive.

Some of this is a bet, because there is no large-scale pilot that has been able to demonstrate that achievements in effectiveness and efficiency within organized systems can be replicated in a fragmented delivery system. So the question is, what’s the size of the bet? The answer is that it’s pretty small. Yet the transformative effect can be so significant that it’s worth that bet. Certainly, the status quo is no longer acceptable.
CONTINUING EDUCATION POST-TEST
Assessing Clinical Outcomes and Cost: Transforming Dyslipidemia Management

Directions: Please tear out the combined answer sheet/assessment form on page 27 (physicians) or page 28 (pharmacists). On the answer sheet, place an X in the box for the letter that represents the best answer to each question. There is only ONE answer per question.

1. At present, a patient’s risk of coronary artery disease is best determined by:
   a. LDL-cholesterol concentration.
   b. HDL-cholesterol concentration.
   c. Assessment of multiple risk factors.
   d. Family history of premature CAD.

2. In the context of atherosclerotic disease, positive remodeling is best described as:
   a. Adjusting physicians’ reimbursement schedules to accommodate new imaging modalities.
   b. The process by which the arterial wall accommodates atherosclerotic plaque without impinging on the size of the lumen.
   c. Updating physician offices to accommodate advanced tools for imaging atherosclerotic plaque.
   d. An invasive procedure for reshaping the lumen of obstructed coronary arteries.

3. Which of the following is an invasive method for assessing atherosclerosis?
   a. Brachial flow-mediated vasodilation.
   b. Ankle-brachial index.
   c. Positive emission tomography.
   d. Optical coherence tomography.

4. Identify the risk factor that is not incorporated in the NCEP’s algorithm for calculating a person’s 10-year risk of CAD:
   a. Total cholesterol.
   b. HDL cholesterol.
   c. LDL cholesterol.
   d. Systolic blood pressure.

5. The primary driver of the NCEP’s algorithm for calculating a person’s 10-year CAD risk is:
   a. Age.
   b. Sex.
   c. LDL cholesterol.
   d. Total cholesterol.

6. Angiograms are most useful for imaging:
   a. Vulnerable plaque.
   b. Coronary obstructions.
   c. Positive remodeling.
   d. Calcified plaque.

7. According to Adult Treatment Panel III, the LDL-cholesterol goal for a patient with CAD is:
   a. <190 mg/dL.
   b. <160 mg/dL.
   c. <130 mg/dL.
   d. <100 mg/dL.

8. According to Cramer, adequate compliance with drug therapy is determined by:
   a. Taking at least 80 percent of a medication over a span of 1 month.
   b. Taking at least 50 percent of a medication over a span of 1 month.
   c. Taking at least 80 percent of a medication over a span of 1 year.
   d. Achieving a desired outcome.

9. The best way to improve patients’ compliance with drug therapy is to educate them about their disease state and the benefit of drug therapy.
   a. True.
   b. False.

10. According to Cramer, partial compliance with drug therapy usually can be traced to:
    a. Poor reading-comprehension skills.
    b. Low socioeconomic status.
    c. Lack of planning.
    d. Willful disregard of prescribing instructions.

11. According to McCall, new health plan management strategies put effort into:
    a. Medical review.
    b. Reducing costs related to preventive care.
    c. Coverage review.
    d. Managing care for people who consume the most services.

12. Predictive modeling aims to link interventions that are appropriate to an individual’s level of need when that intervention is likely to be effective.
    a. True.
    b. False.

continued on page 29
CONTINUING EDUCATION ANSWER SHEET/CERTIFICATE REQUEST

Assessing Clinical Outcomes and Cost: Transforming Dyslipidemia Management

CME CREDIT FOR PHYSICIANS
See page 28 for answer sheet for pharmacists

Sponsored by The Chatham Institute

This activity is designated for a maximum of 2.0 category 1 AMA PRA credits.

I certify that I have completed this educational activity and post-test and claim ______ number of credits.

Signature _______________________________________
Date  ___________________________________________
First name, M.I. ___________________________________
Last name, degree ________________________________
Title ___________________________________________
Specialty _______________________________________
Affiliation _______________________________________
Address _________________________________________
City __________________ State _____ ZIP _________
Daytime telephone (_______) _______________________
Fax (________) ___________________________________
E-mail __________________________________________

Complete answer sheet/evaluation form and mail or fax to:
Office of Continuing Education
The Chatham Institute
26 Main Street, 3rd Floor
Chatham, NJ 07928
Fax: (973) 701-2515

Credit will be awarded on successful completion of the post-test and activity evaluation form. If a score of 80 percent or better is not achieved, no credit will be awarded. Please allow up to 6 weeks for processing.

The cost of this activity is provided at no charge to the participant through an educational grant provided by Astra Zeneca LP.

EXAMINATION: Place an X in the box of the letter that represents the best answer to each question on pages 26 and 29. There is only ONE answer per question. Place all answers on this answer form:

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PROGRAM EVALUATION
For us to assess the continuing education value of this activity, please complete the evaluation form.

Have the activity’s objectives been met? (See page 2 for objectives.)

<table>
<thead>
<tr>
<th>Objective</th>
<th>Yes</th>
<th>No</th>
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Was this publication fair, balanced, and free of commercial bias?  Yes _____ No _____
If no, please explain: _______________________________________________________
_____________________________________________________
_____________________________________________________

This educational activity has contributed to my personal effectiveness and should improve my ability to:

<table>
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<th>Strongly</th>
<th>Strongly</th>
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<td>agree</td>
<td>disagree</td>
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<td>Treat/manage patients</td>
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<tr>
<td>Communicate with patients</td>
<td>5</td>
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<tr>
<td>Manage my medical practice</td>
<td>5</td>
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<tr>
<td>Other ______________________</td>
<td>5</td>
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</table>

Effectiveness of this method of presentation:

<table>
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<tr>
<th>Excellent</th>
<th>Very good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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Time spent reading this publication: H ____ M _______

What other topics would you like to see addressed?

_____________________________________________________
_____________________________________________________
_____________________________________________________

Comments: _______________________________________
_____________________________________________________
_____________________________________________________

CMC304A
SUPPLEMENT / MANAGED CARE 27
CONTINUING EDUCATION ANSWER SHEET/REQUEST FOR STATEMENT OF CREDIT
Assessing Clinical Outcomes and Cost: Transforming Dyslipidemia Management

CPE CREDIT FOR PHARMACISTS
See page 27 for answer sheet for physicians

Sponsored by The Chatham Institute
This activity is approved for 2.0 contact hours (0.2 CEU).

ACPE Universal Program Number (UPN):
812-000-03-025-H01
Release date: Oct. 20, 2003
Expiration date: Oct. 20, 2004

I certify that I have completed this educational activity and post-test and claim ______ contact hour credits.

Signature _______________________________________

Date ____________________________________________________________________________

First name, M.I. ___________________________________

Last name, degree ________________________________

Title ___________________________________________

Specialty ________________________________________

Affiliation _______________________________________

Address _________________________________________

City _____________________ State _____ ZIP __________

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Fax: (973) 701-2515

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CMC304A

EXAMINATION: Place an X in the box of the letter that represents the best answer to each question on pages 26 and 29. There is only ONE answer per question. Place all answers on this answer form:

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PROGRAM EVALUATION
To receive continuing education credit, please provide all information requested below. This assures prompt and accurate issuance of your continuing education certificate.

Please rate this program as follows:

<table>
<thead>
<tr>
<th>Overall quality of program</th>
<th>Excellent</th>
<th>Very good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<tbody>
<tr>
<td>Content</td>
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<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Relevance to objectives</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Effectiveness of this format for learning</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Value to me in my daily responsibilities</td>
<td>5</td>
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</table>

How long did it take you to complete this continuing education activity?

Hours _____ Minutes _______

Requested topics/skills to address in future programs:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Did you detect any bias in this presentation?

Yes _____ No _______

If yes, please explain: _________________________________________________
________________________________________________________________________
________________________________________________________________________

Comments: ____________________________________________________________
________________________________________________________________________
________________________________________________________________________
13. Predictive modeling is used to:
   a. Identify a utilization pattern.
   b. Identify a pattern of behavior that can be understood and tracked.
   c. Both of the above.
   d. Neither of the above.

14. In predictive modeling, underwriting and experience analyses offer insight into the risk profile of a specific population, so that insurance products:
   a. Can be linked to specific products.
   b. Can be chosen accordingly.
   c. Can be priced appropriately.
   d. None of the above.

15. Advantages that new predictive modeling techniques have over traditional techniques include:
   a. Their linear nature.
   b. A heightened capacity to deal with the dynamic nature of health states.
   c. The capturing of data “snapshots.”
   d. The filtering out of rare events.

16. In World War II America, employers were:
   a. Pressured by employees to limit available benefits.
   b. Able to attract new workers by offering expanded benefit programs.
   c. Able to avoid increasing the available employee benefits.
   d. Inclined to convene for the purpose of creating the managed care system.

17. Bridges to Excellence proactively engages both provider and consumer to:
   a. Control costs and improve the quality of care delivered.
   b. Reduce physician responsibilities.
   c. Improve patient education.
   d. Create a more positive image of the physician in the health care community.

18. Bridges to Excellence endeavors to coordinate physician quality care and patient education initiatives using best practice examples and behavioral modification techniques.
   a. True.
   b. False.

19. An important aspect of developing a quality incentive program is determining the:
   a. Extent of a physician’s use of the latest technology.
   b. Financial commitment that the patient is willing to make to health care.
   c. History of success that the health plan has had with active consumers.
   d. Consumers’ readiness for change.

20. As performance measures become publicly known:
   a. Purchasers will voluntarily select plans that have not achieved National Committee for Quality Assurance accreditation.
   b. Plans will be unable to improve their scores to attain accreditation.
   c. Patients will be able to become more involved in their health care decisions.
   d. Patients will observe rather than participate in their health care.