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# DISEASE MANAGEMENT: ORIGINS, BASIC CONCEPTS, AND PRACTICAL CONSIDERATIONS

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**T**raditional physician training focuses on the diagnosis and treatment of acute problems by a single provider in a single setting. However, the current health care environment demands that physicians know more than the pathophysiology of disease and the clinical and laboratory parameters used to formulate a differential diagnosis and define a treatment plan.

Today's medical educators, practicing physicians, and trainees face new challenges raised by an increasing demand for prevention and management of chronic diseases. Meeting these challenges requires a health care infrastructure that includes information systems to track and update health care processes, collaboration by professionals to provide a continuum of care, and patient education for self-management of chronic diseases [1]. A single physician—who is likely responsible for several thousand patients—often will be unable to single-handedly monitor, adjust, and control all the variables that impact the outcomes of a specific disease.

To illustrate, consider the difficulties Dr. Mangione faces in trying to provide quality medical care to one of his patients with congestive heart failure (CHF). Despite Dr. Mangione's best efforts at CHF management, his patient is not achieving good outcomes. Is Dr. Mangione's decision to refer his patient to a disease management program appropriate?

Dr. Mangione is an internist working within a large integrated health system. He is the senior member of an 8-physician general internal medicine group with an office located next to a large academic medical center. Approximately 40% of the group's patients are enrolled in 1 of 3 area health maintenance organizations (HMOs), 30% have Medicare cover-

age, 20% have traditional indemnity insurance, and the remaining 10% are covered by Medicaid.

Today, Dr. Mangione sees Mr. Jarvey for follow-up treatment of CHF. Mr. Jarvey is a 54-year-old man with a medical history significant for type 2 diabetes, hypertension, and a myocardial infarction (MI) that occurred 3 years ago. He does not smoke or drink alcohol and has no known allergies. His current medications include a diuretic (furosemide, 40 mg daily), a  $\beta$ -blocker (atenolol, 50 mg daily), and an oral hypoglycemic agent. Mr. Jarvey is employed as an accountant, is married, and has 2 adult children. His father died at age 45 as a result of complications following an MI. Mr. Jarvey has medical insurance through a managed care plan but does not have a prescription benefit.

The CHF diagnosis was made 18 months ago, at which time an echocardiogram revealed a decreased ejection fraction compared with a study 5 years earlier. Since the CHF diagnosis, Mr. Jarvey's diuretic dosage has been increased several times. He admits to being "less than perfect" about his dietary restrictions. He has required hospitalization 3 times during the past 18 months for CHF exacerbations. During his most recent hospitalization 1 month ago, a repeat echocardiogram revealed worsening left ventricular function. At discharge, he was given a prescription for an angiotensin-converting enzyme (ACE) inhibitor (enalapril, 10 mg daily).

During today's visit, Mr. Jarvey is markedly short of breath. Interval history reveals that he has experienced increased dyspnea on minimal exertion, orthopnea, and pedal edema. He never filled the prescription for the ACE inhibitor because "it cost over \$50 for just 30 pills." Physical examination reveals blood pressure and pulse within the normal range, rapid and labored breathing, and a 14-lb weight gain since his last hospital admission. Rales are present bilaterally throughout the lower third of the lung fields. Pretibial edema is present bilaterally.

Based on these findings, Dr. Mangione admits Mr. Jarvey to the hospital for acute management

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of his CHF exacerbation. He responds to intravenous treatment with furosemide, is started on an ACE inhibitor, and sees a dietitian for nutritional guidance. Arrangements are made for a visiting nurse to see him several days following discharge.

Mr. Jarvey's poor response to prior outpatient therapy, frequent readmissions, financial constraints affecting his compliance with medications, and inadequate knowledge regarding the underlying mechanisms of CHF prompt Dr. Mangione to consider what further actions should be taken to improve management of his CHF. Dr. Mangione is aware of several disease management programs for CHF to which he could refer Mr. Jarvey. One was developed by the health system to which Dr. Mangione belongs, another is offered by the managed care organization (MCO) in which Mr. Jarvey is enrolled, and a third is sponsored by a pharmaceutical company that produces ACE inhibitors. Dr. Mangione tells Mr. Jarvey that he will look into these options and call him in a week with a recommendation for referral to one of the programs.

Initially, Mr. Jarvey is hesitant to consider these options. However, Dr. Mangione reassures Mr. Jarvey that he will continue to care for him while he is enrolled in such a program. "Think of a disease management program as a team approach," Dr. Mangione explains. "A program like this will help me keep better track of your heart condition so we can manage your symptoms and keep you out of the hospital. In the program, you'll receive education to help you understand how your heart condition causes you to be short of breath, gain weight, and have swollen ankles. You'll also learn what you can do on your own to help you feel better, such as avoiding certain foods and substituting others that are better for you."

It is frustrating to see a patient repeatedly require emergent hospitalization in an acute care facility or fail to obtain necessary medication because of financial concerns or a lack of understanding regarding self-management through lifestyle modifications. Many of Mr. Jarvey's hospitalizations most likely could have been prevented with a coordinated team approach to patient care. The team could have taught Mr. Jarvey about the underlying nature of his disease and emphasized the importance of being involved in his own care. A dietitian could have helped Mr. Jarvey understand the importance of a low-sodium, diabetic diet. A nurse case manager could have supplied him with a scale to

monitor his weight and arranged for financial assistance to help him purchase medications.

Disease management is an alternative to traditional patient care that encourages a team of health care providers to work together to help patients with specific diseases achieve the best possible health outcomes. In disease management programs, patients are monitored proactively, before they become acutely ill, with early, aggressive clinical intervention by the appropriate providers at the appropriate time. Compared with traditional models of health care delivery, the disease management approach involves a shift in focus from episodic and acute care of individuals to provision of ongoing care for chronic illnesses that affect a population of patients (ie, population-based medicine). This shift is also reflected in an attempt to provide as much care as appropriate in an outpatient or home care setting; inpatient or hospital care is then reserved for patients who need acute interventions, advanced technologies, or both. Disease management thus requires redesigning systems of care delivery to work for patients, that is, to provide patients with critical education as well as easy and timely access to useful information and services (eg, medication refills, financial assistance, home-based care).

Caring for the whole person from childhood to old age is a concept deeply embedded in the traditional view of the "good doctor," to which most residents and new physicians aspire. Disease management programs are an attempt to return modern health care to this simple principle despite the current realities of the complex health care environment. This article provides a broad overview of the principles central to disease management, including fundamental definitions, the rationale behind and factors affecting the disease management movement, and barriers to progress toward new ways of delivering care.

### What is Disease Management?

Numerous and evolving definitions of disease management currently are in use. However, all definitions emphasize the importance of coordinating the delivery of appropriate, high-quality medical care for a specific (usually chronic) condition across the continuum of a patient's life using appropriate medical resources. The following principles are common to most disease management programs:

- Patients with chronic conditions should be identified and monitored to ensure that they receive appropriate surveillance, testing, and timely interventions.
- Chronic conditions are best treated when reliable evidence from the medical literature is used to identify best practices and develop evidence-based guidelines.

**Table 1.** Examples of Variations in Patient Care that Lead to Increased Cost and Poor Outcomes

### Variations

- Low frequency of measuring HbA<sub>1c</sub> levels in patients with diabetes
- Low frequency of prescribing inhaled steroids in patients with asthma
- Underuse of  $\beta$ -blockers, ACE inhibitors, and statin drugs in post-MI patients
- Underuse of ACE inhibitors in patients with CHF

### Poor outcomes

- Decreased patient satisfaction
- Increased complications (eg, retinopathy in patients with diabetes, worsening ejection fractions in CHF patients)
- Increased utilization of emergency department services
- Early hospital readmission following discharge
- Prolonged hospitalization

ACE = angiotensin-converting enzyme; CHF = congestive heart failure; HbA<sub>1c</sub> = glycosylated hemoglobin; MI = myocardial infarction.

- Appropriate outcomes should be measured to guarantee that desired results are achieved (eg, improvements in functional status, patient satisfaction, and clinical resource utilization).

Disease management programs have primarily been created outside the physician community and target conditions associated with the greatest resource utilization, cost, and practice variation for a designated population. A health plan or delivery system may develop a program internally to support primary care physicians (PCPs) and specialists (referred to as *carve-in programs*), or patients may be enrolled into programs purchased from external, for-profit vendors (referred to as *carve-out programs*). In either case, the disease management approach requires a commitment to ongoing evaluation and analysis of outcomes achieved through the program. Disease management can thus be viewed as an approach to care that uses the concepts and tools of continuous quality improvement (eg, data analysis, benchmarking, continuous monitoring, and refining care processes) to achieve population- and evidence-based best practices.

Disease management programs may focus on primary prevention, secondary prevention, or both. Primary prevention addresses populations at risk for developing a specific disease; secondary prevention seeks to avoid exacerbations and progression of disease in patients already diagnosed with a specific disease. Programs that

focus on both primary and secondary prevention are referred to as *health and disease management programs*. This article discusses disease management programs that emphasize secondary prevention. Secondary prevention efforts are critical to the current health care industry, in that as few as 10% of patients with chronic illnesses can account for approximately 70% of a health plan's treatment-related costs.

### Factors Stimulating the Disease Management Movement

The disease management movement has been spurred by increasingly costly advances in health care technology, documented patterns of wide practice variation, and over-utilization of increasingly scarce health care resources.

### Skyrocketing Health Care Costs

For many years, members of both the medical and lay communities believed that "optimal" care (most medically appropriate and cost-efficient) was synonymous with "maximal" care (overuse of resources even when not medically necessary or clinically indicated) and that society's medical needs would be met by use of unrestricted health care resources (eg, finances, technology, work force). Health care expenditures rose at rates higher than that of inflation, and it became clear that an unregulated health care delivery system could not remain financially viable [2]. As a result, factors aimed at reducing the rapid rate of increase in health care costs (eg, the proliferation of MCOs, the Balanced Budget Act of 1997, "third party" utilization monitors, physician report cards and review boards) have become commonplace.

In the wake of such changes, health care providers and consumers are seeking to restore a balance between stewardship of precious medical resources and physicians' authority to make autonomous decisions about patient care and medical necessity. Disease management approaches actively involve physicians in restoring the balance in ways that consider individual patient needs as well as available societal resources. By providing evidence-based, best-practice management strategies, disease management programs can help guide physicians in the appropriate use of resources.

### Wide Variations in Practice

Documented patterns of practice variation in the delivery of health care in the United States [3] are an additional impetus for the disease management movement (Table 1). Compliance with best practices and evidence-based recommendations is alarmingly low, and

variations in the frequency of surgical procedures, health system capacity (eg, physicians per capita), use of recommended medications in chronic conditions, and appropriate diagnostic testing have all been documented [4]. Disease management strategies for common conditions such as asthma, hypertension, diabetes, and CHF seek to reduce wide variations in provision of quality care. These interventions have been shown to lead to improvements in clinical predictors of disease control (eg, reduction in emergency department utilization and hospital admissions). Furthermore, such programs are instrumental in improving clinical parameters, such as decreased glycosylated hemoglobin levels in patients with diabetes, achievement of target blood pressure readings in patients with hypertension, and use of ACE inhibitors in patients with CHF. Disease management programs can include recommendations that lead to decreased variation and improved clinical outcomes as well as provide practitioners with feedback essential for ongoing quality improvement efforts.

#### **Congestive Heart Failure: A Documented Opportunity for Improved Care**

A closer look at variations in care for patients with CHF highlights the potential benefits of a disease management approach. CHF is a chronic condition that affects over 4 million Americans, with up to 400,000 new cases reported each year and an overall 5-year mortality of 50% [5,6]. Total health care costs associated with CHF are estimated to range between \$20 and \$40 billion. Numerous guidelines detailing best-practice recommendations for diagnosis and treatment of patients with CHF have been published [5,7,8], yet wide variations in care patterns continue to be observed.

For example, treatment with ACE inhibitors is the recommended initial therapy for patients with CHF [5,7,8]. Use of ACE inhibitors has been shown to significantly improve survival and reduce morbidity [9–12]. However, physician prescribing patterns continue to fall below recommended levels [13–15]; in 1994, as few as 31% of patients with CHF were prescribed ACE inhibitors [13]. These data clearly indicate that increased use of ACE inhibitors can reduce both patient mortality and the costs associated with avoidable future hospital admissions. These goals are best achieved through disease management programs that establish a network of care providers who share responsibility for helping patients understand their illness, providing optimal patient care, and educating patients regarding the need for self-management (eg, the importance of compliance with treatment protocols [16]).

### **History of Disease Management**

#### **Origins and Early Efforts**

Although current disease management strategies aim to improve outcomes and health care quality, early programs were developed in response to financial and market-driven pressures. During the early 1990s, prices for pharmaceutical stocks decreased sharply at a time when the pharmaceutical industry was under attack by the United States government for price-gouging [17]. Additionally, the rise of HMOs and pharmacy benefits management (PBM) firms led to the need for pharmaceutical companies to market their products to large health care provider systems in addition to directly targeting physicians via office visits and advertisements.

Because HMOs have tended through the use of sanctions and financial disincentives to pressure their providers to prescribe only medications on approved formulary lists, pharmaceutical companies began developing programs that guided patient care, instructed practitioners regarding overall management of disease states, and included evidence to support use of particular pharmaceutical products. These disease management programs could be used to identify patients who were candidates for specific medications by assessing the status of their disease process and its overall severity. In addition, the programs often sought to improve health care quality and patient compliance and to reduce overall resource utilization. Employers and HMOs could purchase these programs to reduce health care costs, and the pharmaceutical industry could gain more control over the demand for their products.

However, the inherent conflicts of interest that accompany pharmaceutical industry-sponsored programs may cause additional problems for providers who use them. First, because the pharmaceutical industry can identify patients at risk via surveys and telephone contact but usually can intervene only through PCPs, the programs may have little impact aside from the direct physician involvement. Second, such programs may inadvertently target the most severely ill within a population of individuals with a certain disease, thus neglecting other patients in need of improved management. This bias may stem from emphasis on particular management strategies that select for patients best suited to the use of particular pharmaceutical modalities [17]. Third, the programs may emphasize short-term goals (ie, that reduce initial expenditure but augment medication use) over long-term health management goals (eg, prevention of disease progression and disease-related complications), the latter of which may be better addressed through lifestyle modification than through use of medication and other resources [18].

In addition, carve-out disease management providers have evolved in response to market demands for disease management programs and services. Carve-out companies and pharmaceutical firms often view their programs as proprietary assets and rarely share them with health plans or other companies. The result is the proliferation of many similar but slightly different programs and a potentially fragmented health care system in which PCPs are marginalized (ie, take a secondary role in delivering total care to patients) rather than supported in a coordinated fashion.

### Second Generation Efforts

In response to evidence that disease management strategies can improve care and reduce costs, and perhaps also in response to the proliferation of programs developed by pharmaceutical manufacturers and for-profit disease management companies, provider-sponsored disease management programs have emerged. Group model and staff model HMOs are actively developing and managing in-house strategies. For example, Lovelace Health Systems, Group Health Cooperative of Puget Sound, Harvard Pilgrim Health Care, and Kaiser Health Plan all have developed disease management initiatives [16]. The University of Pennsylvania Health System, a large integrated delivery system, also has undertaken an ambitious disease management initiative. It coordinates care for 31 disease states in 300 physician practices and an academic medical center via an Intranet-driven database, a phone center, and direct outreach to physicians' offices through care managers and office re-engineering. These types of programs are challenged to contend with the limited resources and diminishing reimbursement of the current health care environment as well as with the difficult process of changing physician behavior and practice patterns [18]. Although it has been suggested that disease management will reduce long-term expenditures, the current climate in health care economics may not support the up-front costs associated with program development. Existing programs also may be at risk of losing funding because the costs are greater and the positive financial results take longer than expected.

### The Current State of the Art

Over the past decade, what began as a method of coordinating and directing pharmacy benefits programs has led to a second wave of programs that target individuals at highest risk for using costly resources. Although this cost-containment strategy reflects the status of most disease management initiatives currently in use, development of population-based care directed at treating patients with specific diseases is increasingly

common. This third generation of disease management programs uses risk stratification and prospective assessment of disease severity to devise care strategies appropriate for the full spectrum of patients who suffer to varying degrees from specific diseases. Currently, numerous national industry-based organizations are working to further define, develop, and coordinate the definitions and evolution of disease management programs. Based on current trends, the future may see the addition of "health management" strategies to established disease management strategies, resulting in a coordinated approach to health and disease across a population.

After carefully exploring the options available to Mr. Jarvey, Dr. Mangione recommends the disease management program offered by the HMO. Although many physicians are concerned that programs developed by HMOs may only be interested in containing costs, Dr. Mangione has reviewed the program and agrees with the rationale behind it. Specifically, the program emphasizes follow-up care and designates a clinical nurse manager to work with Mr. Jarvey on an ongoing basis after an initial home visit. In addition, it provides a home scale to facilitate daily weight monitoring as well as a series of educational talks on CHF for patients and their families. Finally, patients in the program are contacted by telephone twice weekly to monitor symptoms and to encourage compliance with the medication regimen and diet. Although the programs offered by Dr. Mangione's health system and the ACE inhibitor manufacturer are similar, they do not provide the free home scale or telephone-based follow-up services.

Mr. Jarvey's nurse case manager successfully arranges for him to receive assistance from the manufacturer of the ACE inhibitor Dr. Mangione prescribed, and financial constraints no longer interfere with Mr. Jarvey's compliance. In 6 months, Mr. Jarvey returns for a follow-up visit with Dr. Mangione, who has received monthly updates from the case manager. Mr. Jarvey's weight has been stable at 176 lb, and he has been feeling more energetic and is asymptomatic. His wife attended the educational talks and has been "nagging" him to comply with his diet and to try low-salt, sugar-free recipes, which he says are "not too bad." Mr. Jarvey still "cheats" occasionally but feels much more in control of his condition than before he enrolled in the program.

### Principles of the Disease Management Approach

For each disease selected for this new care approach, a disease management program should include recommendations (eg, guidelines, pathways) describing the current standards of care and best practices regarding diagnosis, treatment, and monitoring. Intensive education for patients, their families, and providers creates additional opportunities for improving patient self-management behaviors and overall program quality as well as for reducing costs. All programs should be evaluated periodically to ensure that desired outcomes are being achieved. Programs may be evaluated in several ways, such as:

- Analysis of data collected on outcome and process measures established upon creation of the program, with the goal being a percentage improvement in the measures
- Review of patient and physician satisfaction
- Periodic review by the program development committee via meetings to incorporate changes in the standard of care, in the literature, or in expert consensus

### Prioritizing Programs for Development

Several guiding principles govern the selection of the disease states to be addressed by disease management programs.

**The disease process is well defined.** A primary consideration when developing a disease management program is how well the disease state to be addressed is understood. Is the natural history well defined? Is there knowledge regarding the complications and severity of disease? Are good data available correlating improvement in outcomes with control of the disease? Is there consensus surrounding management strategies and treatment options? Can individuals at risk for the disease be identified and reliably stratified by severity? Is there evidence regarding the cost of the disease to society, a particular health system or payer, or both?

**Clinical leadership is available.** The existing knowledge base concerning a disease must be coupled with available expertise in the clinical area to be addressed. Clinical leadership is key to driving the successful development and implementation of disease management strategies. Thus, a high-volume or high-frequency disease state, about which there is consensus regarding diagnosis and management, combined with the input of a clinical expert (“champion”) is a potent combination when prioritizing programs for development.

**Resources are available.** Finally, diseases are more

**Table 2.** Steps to Developing and Implementing Disease Management Programs

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Mandate a new approach to care delivery*
Appoint a multidisciplinary team led by a physician champion with appropriate clinical expertise
Define disease and program impact and scope
Gather baseline data regarding current practice patterns and resource utilization (eg, current disease prevalence and burden, age and gender of affected patients, current patient usage of medications and other resources)
Search the medical literature for evidence regarding best practices
Synthesize and appraise available evidence
Consider benefit, harm, cost, and availability of potential interventions
Develop, adopt, or adapt evidence-based clinical guidelines, pathways, and algorithms
Define processes and outcomes to be measured
Create systems to monitor and measure outcomes and processes
Implement program and evaluate results
Practice continuous quality improvement

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NOTE. In most cases, a project or program coordinator drives each step in the development and maintenance of a disease management program. It is most effective if this individual is a physician (who may or may not be the physician champion).

\*This mandate usually comes from senior medical and administrative leadership.

likely to be targeted for disease management if resources are available for program development and potential cost savings, quality improvement, or both are projected. These latter 2 criteria are inherently codependent. Those entities at financial risk for a particular patient population—be they health systems, employers, or insurers—are more likely to finance the development of such programs if the pathways to the goals of cost savings and quality improvement are well known or well projected.

### Development and Implementation

Development of most disease management programs proceeds according to a common process (Table 2) [18]. However, developing disease management programs does not merely involve redesigning current care processes; it is an attempt to move toward a new paradigm of care delivery in which all providers are integrated, communicate with each other, and work toward common goals (Table 3). All parties should reach a consensus and participate in program design, development, and implementation. Provider “buy in”

**Table 3.** Key Participants in Disease Management Programs

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Physicians (primary care physicians and specialists)
Nurses, physician's assistants
Home health care professionals
Pharmacists
Radiologists
Laboratory medicine specialists
Rehabilitation specialists (physical, occupational, and speech therapists)
Information systems and data analysis experts
Quality improvement and disease management experts

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is critical to developing a multidisciplinary and integrated team approach to caring for patients, because disease management programs address the full spectrum of a disease (ie, prevention, treatment of acute and chronic exacerbations, and recovery) and involve all providers of care and sites within a health system.

Programs developed by a coordinated team that includes a clinical champion skilled in managing the particular disease as well as individuals skilled in crafting protocols are most likely to be well received. The clinical champion is often a physician who is well respected among peers and can effectively convince them of a program's merits, and clear and easy-to-use guidelines are likely to be used by participating providers. In many cases, evidence from the literature may not be available to support every treatment and care decision recommended by a program's protocols. Therefore, both expert consensus and ongoing program review and improvement are necessary to ensure that patients are receiving the best care possible.

### Barriers to Implementation

Developers of disease management programs often must overcome barriers within the health care environment (Table 4). For example, many practitioners perceive that guidelines, pathways, and protocols are unnecessary tools for ensuring that patient care follows current best practices. Instead, they believe that their years of training and experience are sufficient to guide patient care decisions. Another misperception is that best practices cannot be determined because each patient is unique and, therefore, general practice guidelines will not apply to all patients. This perception has led to the criticism that disease management is "cookbook" medicine that de-emphasizes experience and clinical decision making skills. A third misperception criticizes disease manage-

**Table 4.** Common Barriers to Disease Management Program Implementation

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### Provider misperceptions

Clinical training is sufficient to provide best practice care  
Disease management provides "rules," not tools  
Disease management is "cookbook" medicine  
Outcomes measurements are punitive  
The team approach of disease management disrupts the continuity of care

### Implementation barriers

Information systems are unable to provide relevant information in real time and are not equipped to allow access at all points along the continuum of care  
Data entry is inefficient  
Current severity and risk adjustment methods are inadequate  
Funding and staff are insufficient to implement interventions

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ment for delegating patient care responsibilities (eg, care delivery, treatment support, patient education) to other health care professionals (eg, nurses, physician's assistants, case managers). Critics suggest that if physicians do not deliver the majority of patient care, the care delivered will be substandard, patients will be dissatisfied, communication and continuity will be threatened, tests will be under- or overutilized, and reimbursement will be denied.

Other barriers have less to do with uninformed bias and result from the very real technical requirements of disease management programs. For example, the information systems infrastructure required to provide practitioners with the tools for accurately and efficiently gathering information (ie, an efficient, continuously updated database) may be costly to implement and maintain. In addition, users (both physicians and non-physician providers) must be trained to use the systems properly to ensure the availability of accurate patient information. Because disease management utilizes concepts fundamental to continuous quality improvement, analysis and interpretation of the outcomes achieved and determination of areas for further improvement may also be both costly and time consuming.

### Implications for Residency Training and Provider Education

In their 1995 report, the Council for Graduate Medical Education strongly recommended that residency programs in the United States expand their training to

include skills needed to practice in the evolving health care environment [19]. These include the skills necessary to appreciate and use disease management programs, such as knowledge of epidemiology, evidence-based medicine, decision analysis, and health economics as well as an understanding of collaborative care and managed care. Numerous publications detailing different educational proposals to achieve these goals have emerged from several leading institutions [20–24].

Documenting practice variation for residents and other trainees is a good first step toward meeting these new goals as well as preparing physicians to participate in disease management programs. For common diseases such as diabetes, asthma, and CHF, reports of practice variation and compliance with best practices (eg, rate of glycosylated hemoglobin monitoring; use of inhaled steroids, ACE inhibitors, or  $\beta$ -blockers) are well documented [3,25]. Supplementing evidence from the literature with instructing residents to perform a mini-review of their own medical clinic charts may effectively reveal improvement needs. Medical practitioners who are shown that current practices offer opportunity for meaningful improvement can begin to take steps to improve practice patterns.

Likewise, changes in behavior may be encouraged by demonstrating that following the outpatient guidelines and inpatient pathways recommended in disease management programs will lead to better patient outcomes [26]. Many physicians are taught to respect the value of data; thus, sharing documented improvements in outcomes can overcome resistance in both residents and physicians already in practice. Outcomes that may be achieved through use of disease management programs include the following:

- Improved patient satisfaction (eg, multidisciplinary team approaches that may improve access to health care providers, continuity of care, and follow-up and that may also decrease duplicate testing)
- Improved clinical quality (eg, decreased hospitalizations or use of emergency department services, improved quality of life and functional health status measures)
- Improved value (eg, decreased costs or resource utilization)

Recommended changes in physician behavior are also more likely to be adopted when they originate from a respected role model, mentor, or physician champion, rather than being imposed through mandates or threats [27]. Residents given the opportunity to participate in disease management program development and imple-

mentation may likewise see the value of the recommended interventions. Alternatively, program developers can adapt recommendations of nationally accepted programs to be appropriate for local use.

### Conclusion

Dr. Mangione sees Mr. Jarvey again after an additional 6 months. Mr. Jarvey feels "terrific" and has begun an exercise program suggested by his case manager. He is knowledgeable about his medication regimen and weighs himself daily; his weight remains stable at 175 lb. The nurse continues to keep Dr. Mangione informed of changes in Mr. Jarvey's condition. Mr. Jarvey has not required hospitalization or an emergency department visit during the past 12 months.

Because Dr. Mangione has had a positive experience with this program, he has enrolled all his patients who have CHF into one of the available programs. He is also looking into similar program offerings for his patients with diabetes. He now makes it a priority to discuss these collaborative, comprehensive programs and to share the successes he has witnessed with medical students and residents at the medical center where he holds a faculty appointment.

Like many physicians, Dr. Mangione is committed to the ongoing delivery of collaborative, integrated, high-quality care to individuals living with chronic illness. Dr. Mangione's involvement as a champion for disease management efforts at his institution is critical to their continued growth and development. This shift toward disease management illustrates a concerted and thoughtful response to the changes in the health care environment witnessed at the close of the 20th century. Change is never easy, however, and further health care reforms will continue to require much effort and dedication.

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