TELEMEDICINE JOURNAL AND e-HEALTH
Volume 10, Number 2, 2004

Guest Editorial

Redesigning the Management of Chronic Illness

INTRODUCTION

IT IS WIDELY RECOGNIZED that health care expenditures in the United States are increasing at unsustainable rates, and pressures are mounting for finding effective cost containment strategies, especially those that maintain access to care and assure quality. In 2004, health care spending will reach $1.6 trillion, or $6,167 per capita. Moreover, pre-Medicare Prescription Drug, Improvement, and Modernization Act estimates suggest that health care expenditures in the United States would reach $3.4 trillion and 18.4 percent of the Gross Domestic Product (GDP) in 2013, up from an estimated 15.5 percent of the GDP in 2004.[1] The problem will be exacerbated in the United States by changes in the demographic composition and the aging of the population, albeit at lower levels than predicted earlier.[1,2] If change does not occur from within the health care system to alter the traditional patterns of delivering medical services to improve efficiency, create effective substitutions, and streamline the care process, changes—likely more arbitrary—may be imposed upon it by forces outside the system. Few would disagree that we are near, if not already in, a health care crisis that is best averted rather than experienced.

By necessity, employers and payers in the public and private sectors will continue to look for ways to contain health care costs, hopefully without denying care for those who need it or jeopardizing quality of care. Traditionally, cost containment strategies have focused largely on price and payment method and not on the care process. While strategies to minimize payor reimbursement may have reached their limit, opportunities for additional cost containment may exist if we find more effective ways to deliver care to patients with chronic illness.

From a broad societal perspective, economic pressures on the health system come at a time of ever-expanding diagnostic and therapeutic capabilities and technologies that reduce morbidity and save lives, but also add to the cost of care. From the perspective of the chronically ill patient, opportunities for improved diagnostic procedures, drugs, and other therapeutic interventions have never been greater. The challenge for the health system is how to provide access to these opportunities while containing cost.

THE CARE PROCESS FOR CHRONIC ILLNESS

Most current payment models, especially those for chronic illness, provide incentives for what is essentially a "turnstile operation." Whether it is prospective payment or traditional fee-for-service, reimbursement generally requires that physicians see patients in the clinic. The concept that care is rendered and paid for only when the patient's shadow actually crosses the threshold has several negative implications. Insofar as chronic illness is concerned, typically return clinic visits are scheduled at arbitrary time intervals. While these routine visits may hold considerable value, and have been cited as the possible cause of the "placebo effect" noted in many clinical heart failure pharmaceuticals trials, they are not always optimally timed to prevent adverse clinical events.[3] Patients may have to wait for a scheduled visit when the onset of new problems or the flare-up of a chronic condition requires prompt attention. The chronic condition

may deteriorate or a new condition may develop in the days between scheduled routine visits, leading to more extensive and costly interventions including hospitalization.

Capitation models for reimbursement were developed in large part to address the inherent limitations of an event or visit-based reimbursement. However, the model has had limited success because it failed to recognize the importance of physician choice for patients and the incentive for physicians, perhaps arbitrarily, to limit the number of clinic visits. Moreover, it did not address the unique problem presented by the small segment of the population that accounts for the majority of health care expenditures, namely those with chronic illness. In most health plans, approximately 85 percent of health care expenses can be attributed to 27 percent of the members submitting medical claims.[4]

THE TELEMEDICINE SOLUTION

Medical management programs have been developed to manage long-term, chronic illnesses such as congestive heart failure, diabetes, asthma, and mental illness. Typically, these programs are designed to ensure that patients receive the appropriate interventions in the most effective and timely manner to optimize the use of health care resources. Some medical management programs in the 1990s were driven by pharmaceutical companies with an inherent incentive to maximize drug sales, and some by managed care organizations that sought to reduce short-term claims expenditures.[5] Hence, many medical management programs focused on patients' most acute illness episodes and did not attend to the lower risk patients where such management would not produce short-term pharmaceutical revenues or costs savings. Nonetheless, several group and staff-model HMO primary care-based medical management models achieved favorable clinical and financial viability.[5]

Indeed, the viability of medical management programs has been demonstrated for a number of conditions, including diabetes, low back pain, asthma, congestive heart failure, and mental illness.[6,7,8] Teams of nurses, physicians, and other health care providers work closely with patients to manage chronic conditions through explicit clinical guidelines, patient education, and other interventions. And, while these programs attempt to deliver the appropriate care at the appropriate time to patients, their design still requires numerous clinic visits by patients to be seen by healthcare professionals as well as ongoing contact with high level nursing and allied health care providers.

The illustrative solution described here for congestive heart failure follow-up care builds on successful medical management models, and goes a step further by ensuring that appropriate care is provided at *the most appropriate time and place in the most efficient manner.* It blends specialty clinical care and information technology, or telemedicine, for short. In this system, clinicians take advantage of the capabilities provided by telemedicine technology to monitor their patients daily according to explicit protocols, and, based upon improved timeliness and appropriateness of care and intervention, do an even more effective job than is possible through in-person clinic visits and telephone conversations.

A home-based system for congestive heart failure includes an electronic weight scale, automatic blood pressure cuff, electrocardiographic signal, and other user-friendly, unobtrusive, and intelligent monitoring devices, all linked to the Internet with store-and-forward capabilities. One such system is being developed at the University of Michigan Health System for the medical management of patients who are physically limited with symptomatic congestive heart failure. As envisioned, after an initial visit to the University of Michigan Congestive Heart Failure Clinic to establish their baseline weight, oxygenation, and medications, and to acquaint them with the intelligent monitoring system, patients will be monitored and cared for primarily at home. On a daily basis, they are instructed to weigh themselves, measure their blood pressure, heart rate, and heart rate variability, and assess the heart rhythm. Patients would also answer questions regarding their symptoms regarding general well-being, fatigue, swelling, angina, breathlessness, urine output, appetite, palpitations, and defibrillator shocks. Patients would also be able to indicate obstacles to their medical regimen, such as limitations to access to medications/

prescriptions. In this intelligent largely automated monitoring system, home care "nursing stations" would: 1) identify critical values or indicators that trigger intervention by a nurse or physician according to explicit protocols or algorithms; 2) capture vital health care information on the patient; 3) provide immediate feedback to the patient regarding appropriate action, specific health education, or instructions to revise the medication regimen as indicated; and 4) send the data to a central monitoring repository at the University of Michigan Health System.

The monitoring center retains all patient records and monitoring data. Each patient in the program will have an individualized electronic health record, including the patient's medical history, current classification/status, and entire medical profile. Special markers or "triggers" for intervention will be included for each patient, including weight, blood pressure, heart rate, and medication regimen. As long as values are within specified limits, an electronic message will be generated informing them that they appear to be stable and do not need to alter their medication regimen. If their weight, heart rate and/or blood pressure falls outside of control limits, a medical assistant will call the patient and work through an algorithm as to potential reasons for the change. If there is an indication of clinical problems, a supervising nurse will speak with the patient and make decisions regarding a clinic visit within 24 hours. If acute problems are indicated, patients will be advised to go to the emergency department or the urgent care clinic, and arrangements will be made to receive them. In this manner, arbitrarily scheduled routine visits for congestive heart failure follow-up would be limited, and emphasis would be placed on early intervention and prevention if there appears to be an alteration of the patient's physiologic state based on the intelligent monitoring system.

Previous attempts to study the effect of telemedicine interventions in chronic illness have shown encouraging results. Automated telephone calls with nurse follow-up have previously been shown to lead to fewer symptoms of poor glycemic control and greater satisfaction with health care in patients with diabetes.[9] A recent publication by Goldberg *et al.* demonstrated the value of a technology-based daily weight and symptom-monitoring system for patients with advanced heart failure.[10] In this study (The Weight Monitoring in Heart Failure Trial [WHARF]), 280 patients were randomized to receive care through a heart failure program or care through a heart failure program plus the home monitoring system. Patients randomized to receive the monitoring intervention showed no reduction in hospitalization, but experienced a 56% reduction in mortality. Whether a system optimizing the value of telemedicine technology in the presence or absence of a specialized heart failure program leads to clinical benefit in patients with heart failure is clearly a topic for future study.

This system is designed to provide hands-on medical care when it is medically appropriate and also convenient for the patient. It utilizes a fast expanding technology that enables the remote monitoring of many chronic conditions while patients remain at home. Redesigning the health care process to utilize the capabilities of this technology promises to contain cost while maintaining quality in the management of chronic illness. This is but one example of such applications. When fully operational, from the physicians' and patients' perspectives—both medically and economically—the system should provide a viable alternative to the traditional model of care for the chronically ill.

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