PROMOTING WELLNESS

Biomedical versus Outcomes Models

This chapter grew out of my experience of being named as the Wellness Lecturer at the University of California, San Diego, in 1991. It is remarkable to consider what changes have occurred over these last few years. Yet, it is also remarkable that we still face many of the same problems. In 1991, managed care had captured only a small percentage of the health care market in the United States. Today, managed care is a dominant force in most areas of the country. In 1991, few observers challenged the autonomy of physicians as sole decision makers. Today, practice guidelines for the individual health care providers are an accepted part of practice. Finally, the use of public health and preventive health care approaches, although recognized as important in 1991, were not common parts of practice. Today, the reorganization of health care has provided new opportunities for incorporation of prevention paradigms. These changes have stimulated rethinking of the basic foundations of health care organization and delivery, and this chapter addresses some of the related issues. We will begin by considering the framework proposed in 1991.

WHAT ARE THE PROBLEMS?

The major problems in the American health care system might be described as the three A's: affordability, access, and accountability (Kaplan, 1993). Similar problems were identified by Relman (1989).
Affordability

The affordability problem results from our inability to pay for all the health care that is desired. Health care costs in the United States grew remarkably between 1940 and the mid-1990s. In 1940, approximately four billion dollars per year were spent on health care in the United States. That amount tripled by 1950 and continued to escalate at an exponential rate through the early 1990s. Health expenditures were over a trillion dollars in 1996. It now takes just over a day to match the yearly expenditure from 1940.

The high costs of American health care cause very serious problems for U.S. products in the world marketplace. This is because the costs of health care are represented in every product that the United States exports. Since our per capita expenditures on health care are twice what they are in countries such as Great Britain or Japan, health care costs contribute proportionally more to the expense of American exports. We pay for expensive health care in many different ways. In some cases patients pay more for services. However, we also pay for high health care costs when we purchase consumer products. Part of the price of each product is the health insurance paid on behalf of the workers. More important, workers are doubly affected by increased health care costs. When their employers pay more for health insurance, workers get lower wages and retirement benefits (Center for Health Economics Research, 1994). If spending on health benefits rises, other aspects of compensation may be held constant or may decline.

Access

The United States remains the only industrialized country that does not provide universal access to health care. Part of the problem is that health care is usually unaffordable without insurance. The exact number of uninsured people is difficult to determine. Current estimates suggest that over 40 million Americans have no regular source of health care. The only group that has universal coverage is the elderly since virtually all Americans older than age 65 are covered by the Medicare program. The uninsured are not necessarily the unemployed. In fact, the majority of those without health insurance are working or dependents of workers. However, many employers provide either no health insurance or inadequate coverage.
Accountability

Health care may be the only major American industry that is not held accountable for what it produces. Although we produce more health care services per capita than any country in the world, it is not clear that Americans are in any way healthier than residents of other developed countries, where considerably less is spent on health care. Patient satisfaction surveys suggest that consumers are significantly more satisfied with health care services in countries that spend considerably less. One analysis compared satisfaction and expenditures in 10 countries (the United States, Canada, France, Germany, Sweden, Australia, the Netherlands, Italy, Japan, and the United Kingdom). Among these countries, the United States spends more per capita and is significantly lower in the percentage of consumers satisfied with the services they receive (Blendon et al., 1990).

In summary, the U.S. health care system is in serious trouble. Solutions to these problems require that we consider all three dimensions. In addition, we must challenge some of the most basic models of health care. The accountability piece of the puzzle is perhaps the most challenging. In order to address accountability, we must address central ideas about the purpose of health care. Most of this chapter reviews methods for accounting for health care benefits.

BIOMEDICAL AND OUTCOMES MODELS

Health care has been dominated by a traditional biomedical model. According to this model, human pain and suffering are caused by disease processes. Disease activity is measured by judgments of trained physicians and by physiological measures, including blood chemistry or radiographic evidence of pathology. The traditional medical model recognizes behavioral factors as predictors of these outcomes. Behavioral risk factors might be cigarette smoking, high-risk behaviors, or the consumption of a high-fat diet (Kaplan, 1984). In addition, the traditional biomedical model suggests that disease process is determined by genetic predispositions, environmental exposures, and the aging process itself. The disease process is also affected by medical care and the use of regular medical tests (Wilson and Cleary, 1995).

According to the traditional biomedical model, the purpose of medicine is to find disease pathology and to fix it. We sometimes refer to this
as “find it–fix it medicine.” For problems such as high blood pressure, for example, the physician’s task is to diagnose the problem and to administer a medicine that will make blood pressure normal. The measure of success is a blood pressure reading that falls within a defined range of normality. Unfortunately, many medical procedures may affect biological processes, but may not affect life expectancy or life quality. It has been estimated that 30% to 50% of all medical procedures have little effect on long-term outcomes (Brook and Lohr, 1987). Further, some procedures may have a negative effect on survival and quality of life.

An alternative model for health care, known as the outcomes model, is similar to the traditional biomedical model. However, the ultimate outcome is not a measure of disease process. The goals of health care are to extend the duration of life and/or to improve the quality of life. Disease processes are of interest because pathology may either shorten life expectancy or make life less desirable. The same variables that predict disease process may also predict life expectancy or quality of life. However, in contrast to the traditional biomedical model, behaviors or biological events may affect life expectancy independently of disease process. Further, the measures of success in the outcomes model are different than those in the traditional biomedical model. The outcomes model emphasizes quality of life and life duration instead of clinical measures of disease process. As similar as these two models appear, they lead to substantially different approaches to organizing, financing, and delivering health care (Kaplan, 1990). These distinctions are addressed in the following sections.

Valuing Health Services

The traditional biomedical model uses procedures to fix biological problems. The greater use of procedures in the United States than in other countries resulted in the American system becoming more expensive than the systems in other countries. By 1990, it was clear that cost control would dominate the health policy agenda throughout the decade. Often, cost reduction is considered the major objective of health care reform. Pauly (1995), for example, argues that cost should be the central consideration in policy analysis. However, too much attention to cost may neglect the primary mission of health care. For example, if cost is the only criterion, the development of guidelines for appropriate care may exclude expensive services. In order to choose between alternative health programs, it is best to evaluate not only the costs but also the
benefits (Sturm and Wells, 1995). Such an evaluation recognizes all financial and health outcomes as either a cost or a benefit. Financial outcomes are easily understood, but clinical outcome measures are often poorly understood, especially from a patient perspective. For example, a change in an arterial blood gas value is not an ideal health outcome measure because it may not mean much to a patient or to a public policy maker. On the other hand, restoration or preservation of the ability to perform activities of daily living is the goal of many therapies. Because patient-centered outcomes are measurable and meaningful, a paradigm shift in medicine is beginning to embrace patient-centered reports.

Despite the improvements in measuring patient outcomes, determining the value of health services has been particularly difficult. In contrast to cost-benefit analysis, which focuses on the dollar returns for investing in particular programs, or consumer willingness to pay for service, cost-utility analysis used in some health services evaluations considers the health outcomes of a program, weighted by patient preferences for outcomes, in relation to the financial costs of the program. In economics, the value of a product is related to the willingness of consumers to pay for it. For example, the value of a Mercedes-Benz automobile is set by the price that consumers are willing to pay for the car. If the price is too high, few cars are sold. Health services are difficult to value in this manner because consumers rarely pay for them directly. Instead, the charges are paid by third parties. Third-party payment leaves consumers out of the loop and makes it difficult to establish whether the services are valuable to patients.

**A GENERAL HEALTH POLICY MODEL**

In order to understand health outcomes, it is necessary to build a comprehensive theoretical model of health status. The major aspects of the model include mortality (death) and morbidity (health-related quality of life). In several papers, we have suggested that diseases and disabilities are important for two reasons. First, illness may cause the life expectancy to be shortened. Second, illness may make life less desirable at times prior to death (diminished health-related quality of life) (Kaplan and Anderson, 1988; Kaplan et al., 1993).

Over the last two decades, a group of investigators at the University of California, San Diego, has developed the General Health Policy Model (GHPM). Central to the model is a general conceptualization of
quality of life. The model separates aspects of health status and life quality into distinct components. These are life expectancy (mortality), functioning and symptoms (morbidity), preference for observed health states (utility), and duration of stay in health states (prognosis). Each component is described here in more detail.

**Mortality.** A model of health outcomes necessarily includes a component for mortality. Indeed, many public health statistics focus exclusively on mortality through estimations of crude mortality rates, age-adjusted mortality rates, and infant mortality rates.

**Morbidity.** Health-related quality of life is also an important outcome. Most public health indicators are relatively insensitive to variations toward the well end of the death-wellness continuum. Measures of mortality, to give an extreme example, ignore all variations of morbidity: a person in a coma is considered equivalent to an asymptomatic person at full function. Both, after all, are alive. In addition, disability measures often ignore those who are relatively healthy. For example, the RAND Health Insurance Study reported that about 80% of the general population have no dysfunction. Thus, they would estimate that 80% of the population is well. But in studies that assess symptoms and function, only about 12% of the general population report no symptoms on a particular day (Kaplan et al., 1976). In other words, health symptoms or problems are a very common aspect of the human experience. Some might argue that symptoms are unimportant because they are subjective and unobservable. However, symptoms are highly correlated with the demand for medical services, expenditures on health care, and motivations to alter lifestyles. Further symptoms lower quality of life even if a disease cannot be detected. Thus, we feel that the quantification of symptoms is very important when assessing morbidity. The GHPM, using the Quality of Well-Being (QWB) scale described later, considers functioning in three areas (mobility, physical activity, and social activity) and symptoms.

**Utility (Relative Importance).** Not all outcomes are equally important. For example, a treatment that prevents nausea is not equivalent to one that prevents death. Given that mortality and the various components of morbidity can be tabulated, it is important to consider their relative importance. A key component of the GHPM attempts to scale the various health outcomes according to their relative importance. This exercise adds the “quality” dimensions
to health status. In the preceding example, the relative importance of dying would be weighted more than developing nausea. The weighting is accomplished by rating all states on a quality continuum ranging from 0 (for dead) to 1.0 (for optimum, asymptomatic functioning). These ratings are typically provided by independent judges who are representative of the general population. Using this system it is possible to express the relative importance of states in relation to the life-death continuum. A point halfway on the scale (0.5) is regarded as halfway between optimum function and death. The quality-of-life weighting system for the QWB has been described in several different publications (Kaplan et al., 1976, 1978, 1979).

Prognosis. In the GHPM, the term “prognosis” refers to the probability of transition among health states over the course of time and includes consideration of duration of problems. A headache that lasts one hour is not equivalent to a headache that lasts one month. A cough that lasts three days is not equivalent to a cough that lasts three years. In considering the severity of illness, duration of the problem is central. As basic as this concept is, most contemporary models of health outcome measurement completely disregard the duration component. The GHPM considers the point at which the problem begins. A person may have no symptoms or dysfunctions currently but may have a high probability of health problems in the future. The prognosis component of the model takes these transitions into consideration. A discount rate is used for future outcomes if the utility of a future outcome is not the same as that of a present outcome. For example, a daylong headache that will begin a year from now may be less of a concern than a daylong headache that will start immediately.

The components of the model can be integrated to express outcomes in terms of quality-adjusted life years (QALYs). A QALY is defined as the equivalent of a completely well year of life, or a year of life free of any symptoms, problems, or health-related disabilities. A principal advantage of the QALY is that it provides a common metric that allows different programs to be directly compared. The quality-adjusted life expectancy is the current life expectancy adjusted for diminished quality of life associated with dysfunctional states and the duration of stay in each state.

Consider, for example, a person with a rare lung disease and in a state of functioning and symptoms that is rated by community peers as 0.5 on
the 0-to-1.0 utility scale described previously. If the person remains in that state for one year, he or she would have lost the equivalent of one-half of one year of life. However, a person who has the flu may also be rated as 0.50. In this case, the illness might last only three days, and the total loss in QALYs might be $\frac{3}{365} \times 0.50$, which is equal to 0.004 QALYs. By itself, it is clear that the flu does not produce as significant a health outcome as the lung disease. But suppose that 5,000 people in a community get the flu. The QALYs lost would then be $5,000 \times 0.004$, which is equal to 20 years, or greater than the one person with the rare lung disease. This indicates that the flu may be a greater health policy problem than the rare disease.

Now suppose that a vaccination becomes available and that the threat of the flu can be eliminated by vaccinating the 35,000 people in the community. The cost of the vaccine is $5 per person, or $175,000. The average cost/utility of the program would be as follows:

$$\frac{\text{net cost}}{\text{net utility}} = \frac{$175K}{20 \text{ QALYs}} = $8,750/\text{QALY}$$

Using the concept of the QALY, the net cost/utility ratio of two alternative programs can be calculated as follows:

$$\frac{\text{net - incremental cost}}{\text{net - incremental QALY}} = \frac{\text{net cost of treatment}_2 - \text{net cost of treatment}_1}{[\text{QALY}_2 - \text{QALY}_1]}$$

It is important to consider the marginal, or incremental, cost/utility of programs. Although we could compare the simple costs and effects of different programs, we most often have to decide how much we are willing to pay in order to add an additional benefit. For example, behavior modification has been shown to be valuable for helping people kick the smoking habit. However, the benefits might be enhanced if nicotine replacement therapy is added to behavior modification. Analysis might show that both behavior modification and behavior modification plus nicotine replacement reduce tobacco use. However, we must decide if we are willing to pay the extra expense for adding nicotine replacement. Usually, we must choose between several programs.

Another way to evaluate outcomes is within "policy space." Various approaches to cost/benefit and cost/utility analysis occasionally produce different results. The output for cost/benefit analysis is in monetary terms—a program that produces cost savings. Cost/utility analysis
Figure 3.1. Two-dimensional policy space from Anderson et al. (1986). Tobacco excise tax may be one of the few policy examples that is in the upper-right quadrant. 

focuses on the cost to produce a QALY. Anderson et al. (1986) integrated the concepts of QALYs and net dollars returned within a common framework. This was accomplished by creating a two-dimensional policy space as illustrated in Figure 3.1. The x-axis in the figure represents net dollars returned per person. Returns are defined as benefits minus costs in dollar units. The y-axis displays well years lost or gained through a particular treatment program, clinical intervention, or policy change.

The right half of the plane would be used to represent programs in which benefits exceed costs, while the left half would display situations in which costs exceed benefits. The upper half of the figure displays outcomes that have positive health effects in terms of QALYs. Those in the bottom half of the figure would be used to represent negative health outcomes in well-year units.

The two-dimensional space yields four quadrants. One quadrant, the lower left, represents unsuitable alternatives. In these cases, dollars are being spent, and negative health consequences occur. Administration of a uniformly toxic treatment might be represented by this quadrant. The upper-right quadrant represents the most attractive alternatives. Here, QALY health benefits are gained, and there are also economic benefits. Increasing tobacco excise tax may be one of the few true examples of such a program. The upper-left quadrant shows QALY gains, but with more significant costs associated with these improvements. Transplantation surgery for the elderly might be described by this quadrant. Here
there are significant health benefits, but the recipients may not return to the productive economic sector.

The lower-right quadrant represents another level of economic trade-off. Here, society may be willing to sacrifice some health benefits in exchange for cost savings. Anderson and colleagues suggested that these trade-offs may be common in studies involving nuclear power; pollution control; occupational, environmental, and consumer product safety; highway speed limits; and so on.

**DECISIONS: OUTCOMES VERSUS TRADITIONAL BIOMEDICAL MODELS**

Although the traditional biomedical model and the outcomes model are similar in many ways, they lead to different decisions about the use of resources for prevention. In the following sections, several examples are reviewed.

**Diagnosis versus Outcomes**

The traditional biomedical model is centered on medical diagnoses. Diagnosis defines the problems that have been found and gives direction about what needs to be fixed. The traditional system pays providers for using diagnostic tests to find problems and for using therapeutic interventions to fix the problems. Despite the importance of diagnosis, it often obscures or confuses the importance of some health problems. There are at least three reasons why focusing on diagnosis may have led us in some wrong directions. First, diagnoses do not always lead to better health outcomes. Often, people are placed in categories, but identification of a condition does not necessarily mean that an effective treatment can be applied. Second, diagnoses are not always correct, and in some cases, individuals will be treated for conditions they do not have or will fail to be effectively treated because the correct diagnosis was overlooked. Third, in many cases, poor health outcomes result from risky behavior or from exposure to risk factors. Community health outcomes can be enhanced by removing the risk factor or by modifying behavior. The identification of a disease on the pathway between the risk factor and the outcome is interesting but not essential.

There are approximately 2,150,000 deaths in the United States each
year. Deaths are tallied according to major and underlying cause. The traditional biomedical model emphasized disease-specific causes of death, and therefore pathways to prevention typically considered risk factors for particular diseases. For example, cigarette smoking is associated with deaths from cancer of the lung. Thus, efforts to reduce lung cancer concentrate on smoking cessation. However, most of the major causes of death are associated with a variety of different risk factors. Further, many risk factors are associated with death from a variety of different causes. For example, tobacco use causes not only lung cancer but also a wide variety of other malignancies, heart disease, stroke, and birth complications (Kaplan et al., 1995). By concentrating on diagnoses, the traditional model often misses the relationship between behaviors and outcomes.

Major nongenetic contributors to mortality were examined in an important analysis by McGinnis and Foege (1993). When these external factors are considered independent of the disease model, clear priorities for prevention emerge. A summary of the estimates for actual causes of death in the United States is presented in Table 3.1. Tobacco use is associated with more than 400,000 deaths each year, while diet and activity patterns account for an additional 300,000. These dwarf the number of deaths associated with problems that the public is generally concerned about, such as illicit drug use. The McGinnis and Foege analysis challenged us to think differently about the way we track health indicators in the United States. Only a small fraction of the trillion dollars the United States spends annually on health care is devoted to the control of the major factors that cause premature mortality in the United States. Estimates suggest that less than 5% of the total annual health care budget is devoted to prevention efforts (Rothenberg et al., 1987). If the focus of attention shifts from finding and fixing diseases to producing QALYs, it becomes clear that preventive efforts to reduce tobacco, drug, and alcohol use and to promote exercise deserve greater attention.

It is commonly argued that traditional fee-for-service medicine provides few incentives to offer preventive services. Indeed, the higher the rates of service utilization, the greater the revenue. One attractive feature of managed care is that there are substantial incentives to prevent illness and to reduce health care utilization. From a public health perspective, managed care organizations have responsibility for a defined population. If they can keep this population healthy by investing in prevention, they may ultimately profit by having reduced costs and higher consumer satisfaction.
The traditional biomedical model has dominated thinking about prevention. Most of the 3% to 5% of the health care dollar used for prevention is devoted to clinical preventive services offered by physicians. For example, the great majority of expenditures on prevention relate to screening for diseases, such as breast cancer, cervical cancer, and prostate cancer. The purpose of the prevention service is to detect a disease that already exists and intervene medically so that progression is retarded. The screening tests have become profitable for the providers who offer them, and there is growing concern about abuses or profiteering by those who administer tests to people who do not need them.

Guidelines for preventive services might limit reimbursement to those services recommended in the Guide to Clinical Preventive Services. The U.S. Preventive Services Taskforce has prepared this excellent document that describes the appropriate use of a wide variety of medical preventive services. The strong emphasis in the Guide is on the appropriate use of medical screening tests by physicians. The latest version of the guide includes 70 chapters. There are 11 chapters devoted specifically to counseling (tobacco, physical activity, diet, motor vehicle injuries, household and recreational injuries, youth violence, low-back pain, dental/periodontal disease, HIV and STD, unintended pregnancy, and gynecological cancers). However, most of the guidelines advise physicians on testing and the medical implications for those who have been found to have a disease. For example, 47 of the 60 sets of guidelines in the first edition of the Guide concern the application of medical screening tests. Another five consider immunizations and chemoprophylaxis. The remaining eight guidelines are on counseling.
The guidelines for preventive services arise from the traditional find it–fix it model. The emphasis is on using medical screening tests that identify diseases that already exist. These are the services that have traditionally generated fees for providers. The limited yield from this approach is reviewed in the next section. The current environment favors an outcomes-oriented approach. According to the outcomes model, diagnosis and treatment are important only if they make life longer and/or better.

Medical Geography

The traditional biomedical model of health care rests on several important assumptions. One assumption is that medical technology enhances health outcomes and that there is a pool of untreated disease on which these technologies might be successfully deployed. If this is true, then more applications of medical technologies should result in better health outcomes. A second assumption is that any well-trained doctor presented with the same problem will come to the same diagnosis. However, it has been known for some time that there is substantial variation in the rate at which problems are diagnosed and treated in different communities. Thus, even though the distribution of a disease may be the same in different communities, the rate at which diseases are diagnosed varies substantially. Wennberg and colleagues have devoted the past quarter of a century to a description of this problem (Wennberg, 1996).

Wennberg argues that a major factor in the use of medical services is “supplier-induced demand.” This implies that providers create demand for services by diagnosing illness. Most surgical subspecialists would agree there is a need to perform surgery on some well-defined cases. These might include amputation of a toe with gangrene, removal of some well-defined tumors, or intervention to repair a compound fracture. However, there is also substantial discretion in the use of some medical and surgical procedures. This is well illustrated by the comparison of procedures in two communities: Boston, Massachusetts, and New Haven, Connecticut.

Boston and New Haven are similar in a variety of ways. Both are traditional New England cities that have multiethnic populations. The two cities have approximately the same climate, and both cities are home to prestigious Ivy League universities. Since the cities are near each other, we would expect that the costs of medical care should be approximately the same. Using data from the mid-1970s, Wennberg and
colleagues (1990) demonstrated that, in fact, medical care costs in Boston were nearly twice as high as they were in New Haven.

Figure 3.2 shows the distribution of costs in Connecticut service areas and in Massachusetts services areas in the 1970s. In 1975, Medicare was paying $324 per recipient per month in Boston and only $155 per month for residents of New Haven. The situation has not changed much. In 1989, per capita hospital expenditures for acute care were $1,524 for residents of Boston and $777 for those living in New Haven.

Further study by Wennberg and his colleagues showed that Boston has more hospital capacity than does New Haven. In Boston, there are 4.3 hospital beds for every 1,000 residents, while in New Haven, there are fewer than 2.3 beds per 1,000 residents. Residents of Boston are more likely to be hospitalized for a wide variety of acute medical conditions than are residents of New Haven. For many different medical conditions, such as pneumonia or congestive heart failure, Bostonians are more likely to be cared for as hospital inpatients, while residents of New Haven are treated outside the hospital.

Some of the differences between Boston and New Haven might be attributed to the greater development of hospital facilities. New Haven has only one major medical school (Yale), while Boston has three medical schools. The Harvard Medical School is associated with several different teaching hospitals. Further, Boston has four hospitals associated with different religious establishments, while there is only one religious-affiliated hospital in New Haven.

The Boston–New Haven comparison is particularly interesting from a public policy perspective. Medicare is a federal program that hopes to provide equal benefit to all its recipients. Yet, on average, Medicare spends twice as much per capita in Boston as it does in New Haven (Wennberg et al., 1996) for the same care. Are New Haven residents getting a bad deal? Since the government is spending less on New Haven residents, it might be argued that their health should suffer. However, outcomes evidence does not show that residents of Boston are any healthier than residents of New Haven. In fact, some evidence implies that Boston residents may be worse off. For example, people in Boston are more likely to be rehospitalized for the same condition than are people in New Haven. Residents of Boston appear to have more complications from medical treatment. More may not necessarily be better. Indeed, there is some evidence that more may be worse (Fisher et al., 1994).

In the next section, we consider this question. Under a traditional model that focuses on diagnosis, more facilities will lead to more diagnoses.
Figure 3.2. Distribution of costs in Connecticut service areas and in Massachusetts service areas in the 1970s. Each dot represents one of the 11 most populated market areas in Connecticut or Massachusetts. Per capita expenditures for hospitals are generally lower in Connecticut, but there is a twofold range of variation. The circled dots represent the New Haven and Boston markets, where the majority of hospitalizations occur in teaching hospitals. Adapted from Wennberg (1990).
The outcomes model regards diagnosis as important only if it leads to patient betterment.

**A War on Cancer**

Numerous studies raise questions about the association between volume of medical care and community health status. Two recent examples come from studies on the treatment of cancer and the treatment of cardiovascular disease. In 1971 Congress passed the National Cancer Act, which was also described as President Nixon’s War on Cancer (National Cancer Act, PL 99-158, 1971). The purpose of the National Cancer Act was to deploy significant resources toward the eradication of cancer. Most of those resources have been directed toward treatment, with relatively few resources devoted to cancer cause and prevention. Progress in the War on Cancer was recently evaluated by Bailar and Gornik (1997).

Figure 3.3 summarizes recent trends in cancer mortality in the United States between 1996 and 1994. Mortality from cancer appeared to peak in about 1991 and has gone down slightly since then. Overall, there have been slight increases in cancer mortality since the War on Cancer began in 1971. However, changes in cancer death rates have been relatively modest. The American Cancer Society provides data on cancer mortality trends over the past 60 years for men (Figure 3.4) and women (Figure 3.5). For both men and women, there have been significant declines in cancers of the stomach and significant increases in cancers of the lung. For women, there have also been significant declines in cancers of the uterus and small declines in cancers of the colon and rectum. However, for most sites, the proportions of people dying of cancers have been relatively unaffected by major changes in medical care. The rapid increase in deaths from cancers of the lung can be attributed almost exclusively to the use of cigarettes. It is encouraging that deaths from lung cancer appear to have peaked for males by 1990 and are now declining as cigarette use has decreased. Rates of lung cancer for women, however, are continuing to increase.

One example of the differences between the traditional biomedical and the outcomes models concerns screening and treatment for prostate cancer. The War on Cancer followed a traditional find it–fix it biomedical model. The identification of cancer dictates treatment, which in turn is evaluated by changes in biological process or disease activity. In the case of prostate cancer, a digital rectal exam may identify an asymmetric prostate, leading to a biopsy and the identification of prostate
cancer. Diagnosis of cancer often leads to a radical prostectomy (surgical removal of the prostate gland). The success of the surgery would be confirmed by eradication of the tumor, reduced prostate-specific antigen (PSA), and patient survival.

In contrast to the traditional biomedical model, an outcomes perspective embraces public health notions of benefit. Instead of focusing on disease process, benefit is defined in terms of life duration and quality of life. Studies have demonstrated that serum PSA is elevated in men with clinically diagnosed prostate cancer (Hudson et al., 1989) and that PSA levels above 4.0 ng/mL have positive predictive value for prostate cancer. Despite the promise of PSA screening, there are also significant controversies. Prostate cancer is common for men age 70 years and older (Lu-Yao et al., 1994). Averaging data across eight autopsy studies, Coley et al. (1997) estimated the prevalence of prostate cancer to be 39% in 70- to 79-year-old men. The treatment of this disease varies dramatically from country to country and within regions of the United States. For example,
radical prostectomy is done nearly twice as often in the Pacific Northwest as it is in New England, yet survival rates and deaths from prostate cancer are no different in the two regions (Fleming et al., 1993). PSA screening finds many cases. However, in the great majority of cases, the men would have died of another cause long before developing their first symptom of prostate cancer. When the disease is found, it is often “fixed” with surgical treatment. However, the fix has consequences, often leaving the man incontinent and/or impotent. The outcome model considers the benefits of screening and treatment from the patient’s perspective. Often, using information provided by patients, it is concluded that quality-adjusted life expectancy is optimized without screening and treatment (Kaplan, 1997).

In considering changes in mortalities since 1970, Bailar and Gornik
(1997) concluded that cancer has not been defeated. The find it–fix it model has found and treated significantly more cancer, but the increased treatment has not produced clear public health benefits. In fact, they argue that it is time to reevaluate the dominant strategy of the past 40 years, which placed most emphasis on improving treatments and little emphasis on prevention. The major increases in cancer have been associated with cigarette smoking, yet few of the resources have been devoted to the eradication of tobacco use. The outcomes model clearly leads toward an emphasis on factors that alter health outcomes. Bailar and Gornik concluded, “A national commitment to prevention of cancer, largely replacing reliance on hopes for universal cures, is now the way to go” (1997, p. 1574).
Looking into Arteries

Other examples come from the treatment of cardiovascular disease. Acute myocardial infarction is the most common cause of morbidity and mortality in both the United States and Canada. However, the two countries approach the treatment of cardiovascular disease differently. Invasive cardiac procedures, such as coronary angiography, are performed considerably more often in the United States than in Canada. Some years ago, we noted that about eight of every ten well-insured patients in San Diego received angiography following a heart attack, if they were treated in private hospitals (Nicod et al., 1991). However, only 40% patients at the San Diego Veterans Affairs Health Center received the procedure following a heart attack. In Vancouver, only 20% of post-myocardial infarction patients got angiography, and only 10% of patients in Sweden received the procedure. This variation would be acceptable if we knew that more care led to better health. However, there was little evidence that more aggressive care produced better results. Controlling for the seriousness of the heart attack (measured by the ejection fraction), the probability of surviving a heart attack in San Diego, Vancouver, and Sweden was comparable.

More recently, the use of invasive cardiac procedures in the United States and Canada was evaluated for 224,258 elderly Medicare recipients in the United States and 9,444 older patients in Ontario, Canada. Each of these patients had been the victim of heart attack after 1991. Among American patients, 34.9% underwent coronary angiography, while only 6.7% of the Canadian patients received this procedure. Having coronary angiography increases the likelihood that other invasive procedures will be performed. Among the American patients, 11.7% underwent transluminal coronary angioplasty in comparison to 1.5% of the Canadian patients. Further, 10.6% of the American patients versus only 1.4% of the Canadian patients underwent coronary artery bypass surgery. Figure 3.6 summarizes both the procedure rates and the mortality rates for these patients. It might be presumed that American patients are better off because they are more likely to obtain the latest procedures. However, mortality rates 30 days following the attack were comparable in the two countries (21.4% vs. 22.3%). Further, the mortality rates one year later were virtually identical (34.3% in the United States vs. 34.4% in Canada). These data suggest that the use of high-technology medical procedures is much more likely in the American system than in
Figure 3.6. Rates of coronary angiography (section a), cardiovascular procedures (section b), and heart disease mortality (section c) in the United States and Canada. Adapted from Tu et al. (1997).
the Canadian health care system. However, there is no clear evidence that patients benefit, at least in terms of survival (Tu et al., 1997).

These findings suggest that the find it–fix it approach to established coronary heart disease may have limited benefits. The procedures are expensive but may not extend life. An alternative might be to invest in programs that attempt to enhance outcomes by promoting health in entire communities. For heart disease, this might be accomplished by changing behaviors to reduce cholesterol. Programs to lower cholesterol might have only a small benefit for individuals but might have a substantial benefit for communities. As many as 40% of men and 20% of women have serum cholesterol levels less than 240 mg/dl. One analysis considered the benefits of population-wide heart disease prevention programs in California and Finland. Some of these programs have been criticized because they reduce serum cholesterol by only 1% to 4%. However, these slight reductions in average serum cholesterol may have contributed to as much as one-third in the decline in coronary heart disease in the United States since the mid-1960s. The education programs in Finland and California use media campaigns and face-to-face instruction. The programs cost about $4.95 per person per year and, on average, produce a reduction of about 2% in serum cholesterol. The programs produce a quality-adjusted year of life at about $3,200 for individuals at risk for coronary
heart disease. A more intensive program that reduces serum cholesterol by about 3% might cost $16.55 for the first year and $8.28 per year thereafter and could produce a year of life at about $6,100. Even though advances in medical care have cut mortality from coronary heart disease (Hunink et al., 1997), the evidence suggests that population-based efforts to reduce serum cholesterol should become part of U.S. health policy (Tosteson et al., 1997).

THE OREGON EXPERIMENT

There have been a few attempts to apply outcomes thinking to health policy. One heroic attempt to apply an outcomes model to public policy was considered by the State of Oregon. In the late 1980s, Oregon was faced with the fact that costs of health care were expanding much more rapidly than the budgets for Medicaid. Collectively, Oregon citizens spent approximately $6 billion on health care in 1989, which is about three times what they spent in state income taxes. Oregon also recognized that American health care is not a two-tiered system but rather a three-tiered system. The three-tiered system includes people who have regular insurance and can pay for their care, people enrolled in Medicaid, and a growing third tier of people who had no health insurance at all. By 1993, this third tier represented about 450,000 citizens, or about one-fifth the population of the state. In addition, another 230,000 were underinsured, and the trend indicated that the number of uninsured and underinsured was steadily increasing. In order to address the growing crisis of funding for health care, the only alternatives were to (1) change eligibility criteria and remove some individuals from the Medicaid rolls, (2) continue to provide care to a large number of people but limit the care they receive, or (3) increase revenues (taxes) to pay for the current system.

Led by a grassroots citizens group known as Oregon Health Decisions, it was argued that Oregon, like other states and countries, was already rationing health care. The problem was that rationing was implicit and not open to public scrutiny. In fact, people were being rationed rather than services. In other words, many individuals in need of care received none because they were in the wrong category. Pregnant women, for example, were covered. A young woman employed as an hourly worker may be ineligible for health care, but an unemployed woman would be eligible if she were to become pregnant. Thus, the system created incentives to become pregnant in order to have a regular source of health care. The system allowed health care under Medicaid for
poor families with young children but disallowed coverage for poor families with older children. Oregon, like many other states, defined Medicaid eligibility for the Aid for Families with Dependent Children (AFDC) as 50% of the poverty line. That policy set the criterion income at about $5,700 per year for a family of three. A hard-working independent carpenter earning $11,000 annually might be completely excluded by the system even though he was at high risk for injury.

These arguments caught the attention of John Kitzhaber, M.D., the president of the state senate and now the governor of Oregon. Under Kitzhaber's leadership, Oregon passed three pieces of legislation to attack this problem (Kitzhaber, 1990). In this chapter we focus most specifically on Senate Bill 27, which mandated that health services be prioritized from most to least important. The purpose of the prioritization was to eliminate services that did not provide benefit. The process of creating the prioritized list was an extremely difficult one. The commission began by attempting to create a prioritized list of all health services. However, it soon became apparent that this was a nearly impossible task. Thus, the commissioners began searching for a combination of conditions and treatments that could be lumped together. They refer to these as condition-treatment pairs. Examples of these condition-treatment pairs are shown in Table 3.2. For example, the condition of rectal prolapse is paired with the treatment partial colectomy, while osteoporosis is paired with medical therapy.

A Health Services Commission was created in order to develop the prioritized list. This commission obtained several sources of information. First, it held public hearings to learn about preferences for medical care in the Oregon communities. These meetings helped clarify how citizens viewed medical services. Various approaches to care were rated and discussed. On the basis of 48 town meetings that were attended by more than 1,000 people, 13 community values emerged. These values included prevention, cost-effectiveness, quality of life, ability to function, length of life, and so on. The major lesson from the community meetings was that citizens wanted preventive services. Further, the people consistently stated that the state should forgo expensive heroic treatments for individuals or small groups in order to offer basic services for everyone. In order to pay for these basic services, it was necessary to reduce spending elsewhere, and it was therefore important to rank services according to their desirability as determined by studies of community values. The commission chose to evaluate services using the QWB scale and a modified GHPM.
TABLE 3.2 EXAMPLES OF CONDITION-TREATMENT PAIRS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectal prolapse</td>
<td>Partial colectomy</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>Medical therapy</td>
</tr>
<tr>
<td>Ophthalmic injury</td>
<td>Closure</td>
</tr>
<tr>
<td>Obesity</td>
<td>Nutritional and lifestyle counseling</td>
</tr>
</tbody>
</table>

Two factors influenced the commission’s decision to modify the standard GHPM approach. First, the commission could not conduct clinical trials for each of the many condition-treatment pairs. Further, estimation of treatment benefit using the QWB cannot be left to laymen. Thus, the commission formed a medical committee that had expertise in essentially all specialty areas and nearly all the major provider groups in the state. The Oregon citizens were concerned about using weights from California in assigning priorities in their state. Thus, 1,001 Oregon citizens participated in a separate weighting experiment. The weights were obtained in a telephone survey that was conducted by Oregon State University.

Multiple Lists

The Oregon Health Services Commission created multiple versions of the prioritized list. The first list was created in 1990. This list rank-ordered 1,692 condition-treatment pairs. The Health Services Commission used rough estimates of QWB changes and cost to create this list. Although this list has been the target of extensive criticism, the Health Services Commission probably intended it to be a working document rather than a final list. While they were working on the list, they completed a first draft that was discussed at a public meeting.

The list was put together in a hasty manner. As a result, there were some obvious problems. For example, 314 different medical therapies were all valued at $98.51, and an additional 177 were all estimated to cost $2,560.65 (Tengs et al., 1996). The last 193 pairs on the 1,692-item list were ranked alphabetically according to diagnosis. In addition, there were many counterintuitive orderings on the list. For example, treatment for thumb sucking was ranked higher than treatment for AIDS. Although the 1990 list was clearly flawed, it is also important to emphasize that it was never officially released. There are many reasons why the list may not have been dependable. Perhaps most important was that the
overburdened staff was required to evaluate many condition-treatment pairs in a very short period of time. In most cases, systematic data were not available to guide their evaluations.

Perhaps the most discussed list was the one released in 1991. This list included 709 items. The list was based on the QWB scale to estimate benefit and included estimates of costs. In the 1991 list, the system was reorganized according to three basic categories of care: essential, very important, and valuable to certain individuals (Table 3.3). Within these major groupings there were 17 subcategories. Nine of the 17 subcategories were classified as essential. The commission decided to place greatest emphasis on problems that were acute, fatal, and reversible. In these cases, treatment prevents death, and there is full recovery, for example, appendectomy for appendicitis and nonsurgical treatment for whooping cough. Other subcategories classified as essential included maternity care, treatment for conditions that prevent death but do not allow full recovery, and preventive care for children.

Listed as very important were treatments for nonfatal conditions that would return the individual to a previous state of health. Also included in this category were acute, nonfatal, one-time treatments that might improve quality of life. These might be hip replacements and cornea transplants. At the bottom of the list were treatments for fatal or nonfatal conditions that did not improve quality of life or extend life. These might be progressive treatments for the end stages of diseases such as cancer and AIDS or care for conditions for which the treatments were known not to be effective. In the revised approach, the commission decided to ignore cost information and to allow their own subjective judgments to influence the rankings on the list. Table 3.4 summarizes the conditions selected from the top of the list, the middle of the list, and the bottom of the list. Unfortunately, the final exercise in Oregon resulted in many deviations from the GHPM. However, the exercise demonstrates an attempt to resolve the healthcare crisis on the basis of health outcome.

One of the most important criticisms of the Oregon plan has been offered by Tengs and her associates (Tengs, 1996; Tengs et al., 1996). These investigators used rank-order correlational methods to compare the Oregon lists with cost-effectiveness analyses that have been published in the literature. They report that the 1990 list showed essentially no correlation with published cost-effectiveness analyses. The 1991 list was correlated 0.39 with published studies, while the correlation of the 1992 list was 0.25. The correlation with the 1993 list was 0.24. The Tengs analyses are important, and they have received widespread attention as criti-
TABLE 3.3 SUBCATEGORIES OF 1991 OREGON LIST

**Essential**
1. Acute fatal—treatment prevents death and allows full recovery: appendectomy for appendicitis; nonsurgical treatment for whooping cough; repair of deep, open wound in neck; nonsurgical treatment for infection of the heart muscle (myocarditis)
2. Maternity care, including most newborn disorders: obstetrical care for pregnancy; care of the newborn
3. Acute fatal—treatment prevents death but does not allow full recovery: nonsurgical treatment for stroke; all treatment for burns; treatment for severe head injuries
4. Preventive care for children: immunizations and well-child exams
5. Chronic fatal—treatment improves life span and quality of life: nonsurgical treatment for insulin-dependent diabetes; medical and surgical treatment for treatable cancer of the uterus; medical treatment for asthma; drug therapy for HIV disease
6. Reproductive services—excludes maternity and infertility services: birth control and sterilization
7. Comfort care: pain management and hospice care for the end stages of diseases such as cancer and AIDS
8. Preventive dental care—adults and children: exams; cleaning and fluoride treatment
9. Proven effective preventive care for adults: mammograms; blood pressure screening; Pap smears

**Very Important**
10. Acute nonfatal—treatment causes return to previous health: nonsurgical treatment for acute thyroiditis; medical treatment for vaginitis; fillings for cavities
11. Chronic nonfatal—one-time treatment improves quality of life: hip replacement; corneal transplants for cataracts; rheumatic fever
12. Acute nonfatal—treatment without return to previous health: relocation of dislocated elbow; repair of cut to cornea
13. Chronic nonfatal—repetitive treatment improves quality of life: nonsurgical treatment for rheumatoid arthritis; gout; migraine headaches

**Valuable to Certain Individuals**
14. Acute nonfatal—treatment speeds recovery: medical treatment for viral sore throat; diaper rash
15. Infertility services: medical treatment for infertility; in vitro fertilization; artificial insemination
16. Less effective preventive care for adults: routine screening for those people not otherwise at risk, such as diabetes screening if the person is under 40 years old and not pregnant
17. Fatal or nonfatal—treatment causes minimal or no improvement in quality of life: aggressive treatment for end stages of diseases such as cancer and AIDS; medical treatment for nongenital warts.

**Note:** Every person is entitled to services necessary for a diagnosis. Each health service on the list is presumed to include necessary ancillary services, such as hospital care, prescription drugs, and medical equipment and supplies necessary for successful treatment.

**Source:** Oregon Health Services Commission.
TABLE 3.4 EXAMPLES OF CONDITION-TREATMENT PAIRS FROM TOP, MIDDLE, AND BOTTOM OF LIST

**Top 10**
1. Medical treatment for bacterial pneumonia
2. Medical treatment of tuberculosis
3. Medical or surgical treatment for peritonitis
4. Removal for foreign body from pharynx, larynx, trachea, bronchus, and esophagus
5. Appendectomy
6. Repair of ruptured intestine
7. Repair of hernia with obstruction and/or gangrene
8. Medical therapy for croup syndrome
9. Medical therapy for acute orbital cellulitis
10. Surgery for ectopic pregnancy

**Middle 10**
350. Repair of open wounds
351. Drainage and medical therapy for abscessed cysts of Bartholin's gland
352. Medical therapy for pilonidal cyst with abscess
353. Medical therapy for acute thyroiditis
354. Medical therapy for acute otitis media
355. Drainage tubes or tonsil-adenoidectomy for chronic otitis media
356. Surgical treatment for cholesteatoma
357. Medical therapy for sinusitis
358. Medical therapy for acute conjunctivitis
359. Medical therapy for spina bifida without hydrocephalus

**Bottom 10**
700. Mastopexy for gynecomastia
701. Medical and surgical therapy for cyst of the kidney
702. Medical therapy for end-stage HIV disease (comfort care excluded—it is high on list)
703. Surgery for chronic pancreatitis
704. Medical therapy for superficial wounds without infection
705. Medical therapy for constitutional aplastic anemia
706. Surgical treatment for prolapsed urethral mucosa
707. Paracentesis of aqueous for central retinal artery occlusion
708. Life support for extremely low birth weight (<500 g) and under 23-week gestation
709. Life support for anencephalos

Cisms of the Oregon process and the GHPM. However, the Tengs et al. analyses did not apply the GHPM and do not consider health-related quality of life. In fact, all of the analyses used in their evaluation were studies that valued the cost per year of life saved, and studies considering cost per quality-adjusted life year were systematically eliminated. Since one of the most important aspects of medical care is to improve
functioning and the quality of life, this could be a serious problem. The rationale for disregarding health-related quality of life was that too few studies have evaluated these outcomes. On the other hand, it is not clear that the correlation between rigorous cost-effectiveness analysis and the Oregon process would have been improved by inclusion of quality of life data. As Tengs (1996) notes, problems with the 1991 Oregon list included poor measures of cost, failure to discount future costs, and considering health outcomes for only the first five years after treatment.

It is of interest to note that the 1991 list, the one closest to using the GHPM, showed the strongest correlation with the published literature. The correlation of .39 is statistically significant and substantial. It is important to emphasize that the Oregon project and the previously published analyses were conducted using very different methods. Further, the Tengs's analysis makes the assumptions that the rank ordering of previously published studies is correct and that failure to replicate this rank ordering must be incorrect. It is known that there is substantial variability in the estimates of cost-effectiveness across published studies.

Perhaps the most misunderstood aspect of the Oregon experience is the belief that Oregon rationed health care on the basis of cost-effectiveness. Tengs (1996) argued that Oregon intended to allocate resources using a systematic approach. However, in response to political pressures and political realities, the state abandoned the use of systematic decision analysis. They first eliminated cost for consideration, and then they eliminated quality of life from the analysis and focused on subjective estimates of treatment effectiveness over a short time interval of five years. Not only did the system applied in Oregon differ from systematic cost-effectiveness analysis, but in fact the priorities were only weakly related to results from systematic analysis.

**Update on the Oregon Plan**

Despite all the criticisms of the Oregon plan, there is some evidence that the outcomes approach produced benefits. The Medicaid portion of the Oregon Health Plan enrolled 120,000 new members during its first year. This was equal to the number projected for the five-year life span of the demonstration project. The initial evaluation showed that emergency room visits declined 5.3% in 1994 and that urgent care visits declined by 1%. A 1995 evaluation suggested that emergency room visits dropped an additional 2.1% overall and 6.2% in Oregon's rural areas. One of the advantages of the program is that insuring more people reduces bad debt
and the need for cost shifting. In 1994, charity care declined 18.7%, and bad debts 10.6%, in Oregon. In the Portland metropolitan area, these reductions were 23.8% and 15.7%, respectively. In 1995, charity care was reduced by over 30% relative to the 1994 levels.

One of the interesting results of the plan was that the number of Oregon families receiving AFDC declined. Since it was no longer necessary to be in AFDC in order to get health care, the incentives for being on welfare were removed (Conviser, 1997).

CONCLUSIONS

This chapter has outlined a new paradigm for thinking about alternatives in health care. In short, it is suggested that limited health care resources be used to maximize life expectancy and health-related quality of life. Services that do not achieve their objectives should not be funded, and the savings should be used to extend basic health care benefits to people currently uninsured. The proposed model is consistent with the thinking of several groups, including scholars in the United States (Office of Technology Assessment, 1979; Russell, 1986; Weinstein and Stason, 1976, 1977), the United Kingdom (Drummond et al., 1987; Maynard, 1991; Williams, 1988), Canada (Torrance, 1986, 1987), and Australia (Richardson, 1991). Although the exact methodologies proposed by these different research groups vary slightly, the theory is nearly identical. Patrick and Erickson (1993) offered a detailed account of the methodological steps required to implement the system. Methods are now available to begin guiding policy decisions. However, our information base for the implementation of the model is still incomplete.

The attractiveness of the outcomes model arises from several of its qualities. For example, it makes all choices explicit, so that anyone can evaluate the assumptions used to make decisions. The model requires a large amount of data on health outcomes, much more than what we have available for most health care programs. Little research has been completed that measures outcomes in a manner that would be useful in applying the model. This requires either that we obtain the data directly (through clinical trials or other means) or that the data be estimated. Though there is extensive experience in using estimated data (e.g., Naglie and Detsky, 1992; Weinstein and Stason, 1976), there is evidence that the methods used in this approach may be faulty (Fryback et al., 1993). A second drawback is the effort required to complete an evaluation.
Work is needed on methods to simplify the evaluation without detracting from the strengths of the model.

In conclusion, problems in health care might be characterized by the three A's: affordability, access, and accountability. These three problems are interrelated. Health care became expensive because a traditional biomedical model rewarded providers for doing procedures on the basis of diagnoses. The excessive expense of care made the costs prohibitive, and many people lost access to the system. However, the expensive system has been unable to demonstrate that it provides benefits to patients. An alternative to the biomedical model, known as the outcomes model, emphasizes that health services must be valued in terms of their impact on life expectancy and their effects on patient-reported quality of life. The outcomes model suggests that population health status might be enhanced if resources are shifted away from procedure-based reimbursement and toward primary prevention.

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