The Ziggy Theorem: Toward an Outcomes-Focused Health Psychology

Robert M. Kaplan

The purpose of health care is twofold: to make people live longer and to enhance quality of life in the years before death. These goals are consistent with a Ziggy cartoon that emphasized that the meaning of life was “doin’ stuff.” “Doin’ stuff” requires being alive (survival) and having the capability to perform activities. These objectives are quantifiable and can be represented in indices that combine life expectancy with health-related quality of life. This article emphasizes patient-oriented outcomes as a focal point for health care. This outcomes orientation is referred to as the Ziggy theorem. Examples demonstrate that emphasis on patient-oriented outcomes may redirect conceptualizations of public health indicators and may change the way medical subspecialists make clinical decisions. Furthermore, the Ziggy Theorem may suggest new approaches to the allocation of public health resources.

Key words: outcomes research, quality of life, medical decision making, resource allocation

To be asked to give a presidential address is an honor, an opportunity, and a challenge. Because I had no training for becoming president or for giving the address, I confronted a close colleague and asked, “How do you give a presidential address?” His glib response serves as a blueprint for my comments. His advice was this: First, pick an obscure title. Second, do not tell anybody what the talk is really about because they may not show up. Third, use a few esoteric historical references. Fourth, discuss a lofty philosophical principle, such as “What is the meaning of life?”

My obscure title, “The Ziggy Theorem,” is derived from a conversation with David Orenstein, a friend and collaborator from the University of Pittsburgh. Orenstein told me that he had read about my work—in a joke. Actually, it was not in a joke, but in a Ziggy cartoon by Tom Wilson. In the cartoon Ziggy confronts a wise man and asks him, “Tell me, old wise one, what is the meaning of life?” The wise man replies, “Ah, yes . . . the meaning of life. Life, my boy, is doin’ stuff!” The shocked Ziggy responds, “Life is doin’ stuff? That’s it?” The wise man then reflects, “As opposed to death, which is not doin’ stuff.” Ziggy reacts, “It’s a more elementary theory than I expected, but one you can’t argue with!” (See Figure 1)

For the past 20 years, my colleagues and I have been presenting these arguments. We have suggested that the purpose of health care is twofold: to make people live for a longer period of time and to improve the quality of their lives during the years before death. Quality of life, to a large extent, is defined by behavioral functioning, or being able to “do stuff” (Kaplan 1984, 1990, 1993b; Kaplan & Anderson, 1988a, 1990; Kaplan & Bush, 1982).

These behavioral conceptualizations of outcome help place the objectives of health care into different focus (Kaplan, 1990). The purpose of this article is to suggest that this conceptualization can redirect researchers’ thinking about several different problems. Specifically, the Ziggy theorem may reshape how researchers describe the health of areas or countries (health indicators), outcome measurement for clinical trials, clinical decision making, and resource allocation. To review these contributions, it is necessary to present the model.

General Health Policy Model

To understand health outcomes it is necessary to build a comprehensive theoretical model of health status. This model includes several components. The major aspects of the model include mortality (death) and morbidity (health-related quality of life). 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 (health-related quality of life) at times before death (Kaplan & Anderson, 1988a, 1990).

Over the past 2 decades, a group of investigators at the University of California, San Diego (UCSD), has developed a general health policy model (GHPM). A general conceptualization of health status is central to the general health policy model. The model separates aspects of health status into distinct components. These are life expectancy (mortality), functioning and symptoms (morbidity), preference for observed functional states (utility), and duration of stay in health states (prognosis).

A model of health outcomes necessarily includes a component for mortality. Death is an important outcome that must be included in any comprehensive conceptualization of health. In Ziggy’s terms, death is the most extreme and most permanent
The Quality of Well-Being Scale (QWB; Kaplan & Anderson, 1988b) provides a method for estimating some components of the general model. The QWB questionnaire categorizes individuals according to functioning and symptoms. Other components of the model are obtained from other data sources (Kaplan & Anderson, 1990). Applying the QWB involves several steps. First, patients are classified according to objective levels of functioning. These levels are represented by scales of mobility, physical activity, and social activity. The dimensions and steps for these levels of functioning are shown in Table 1. The reader is cautioned that these steps are not actually the scale, only listings of labels representing the scale steps. Standardized questionnaires have been developed to classify individuals into one of each of these scale steps (Anderson, Bush, & Berry, 1986). In addition to classification into these observable levels of function, individuals are also classified according to the one symptom or problem that is most undesirable (see Table 2). Almost 90% of the population reports at least one symptom during an average week. Symptoms may be severe, such as serious chest pain, or minor, such as the inconvenience of taking medication or following a prescribed diet for health reasons. The functional classification (Table 1) and the accompanying list of symptoms or problems (Table 2) was created after extensive reviews of the medical and public health literature (Kaplan, Bush, & Berry, 1976). Over the past decade, the function classification system and symptom list were repeatedly shortened until my colleagues and I arrived at the current versions. Various methodological studies on the questionnaire have been conducted (Anderson, Kaplan, & DeBon, 1989; Anderson, Kaplan, Bush, & Rumbaut, 1989). With structured questionnaires an interviewer can obtain classifications on these dimensions in 8 to 15 min. The classification of functioning formalizes the measurement of “doin’ stuff” in the Ziggy theorem.

Once observable behavioral levels of functioning have been classified, a second step is required to place each individual on the 0–1.0 scale of wellness. To accomplish this, the observable health states are weighted by quality ratings for the desirability of these conditions. In other words, the model requires the quantification of the relative importance of doin’ stuff. Human value studies have been conducted to place the observable states on a preference continuum with anchors of 0 (death) and 1 (completely well). In several studies, random samples of citizens from a metropolitan community evaluated the desirability of more than 400 case descriptions. Using these ratings, a preference structure that assigned the weights to each combination of an observable state and a symptom or problem has been developed (Kaplan et al., 1976). Cross-validation studies have shown that the model can be used to assign weights to other states of functioning with a high degree of accuracy ($R^2 = .96$). The regression weights obtained in these studies are given in Tables 1 and 2. Studies have shown that the weights are highly stable over a 1-year period and that they are consistent across diverse groups of raters (Kaplan, Bush, & Berry, 1978). Finally, it is necessary to consider the duration of stay in various health states. For example, 1 year in a state that has been assigned the weight of .5 is equivalent to one half of a quality adjusted life year (QALY). The Appendix provides an illustrative example of a calculation. Both reliability (Anderson, Kaplan, Berry, et al., 1989) and validity studies have been published (Kaplan et al., 1976; Kaplan & Anderson, 1990).

The well life expectancy is the current life expectancy adjusted for the diminished quality of life associated with dysfunctional states and the duration of each state. Using the system, it is possible to simultaneously consider mortality, morbidity, and the preference weights for these observable behavioral states of function. When the proper steps have been followed, the model quantifies the health activity or treatment program in terms of the QALYs that it produces or saves. A QALY is defined conceptually as the equivalent of a completely healthy year of life, or a year of life free of any symptoms, problems, or health-related functional limitations.

In summary, this system combines morbidity (the quality of life) and mortality (the duration of life) with prognosis (the duration in state). An example of an individual patient might clarify the application of the system. Consider the hypothetical patient with end state renal disease described in the Appendix. On the day he was assessed he had general tiredness, weakness, and weight loss. His mobility was confined to the hospital because he was on dialysis, and he spent most of the day in a bed or chair. He performed no major social role but did his own self-care. The preference weights associated with the observable state suggests that peers evaluate the state to be about 0.5 on a 0 to 1.0 scale. If the person remains in this state for an entire year, he loses 0.5 well years. Two years in this state equal the loss of about 1 year of health life, or two people in this state for 1 year together lose about 1 year of life. If this situation was maintained over the course of a decade the person would lose the equivalent of 5 well years of life.

In summary, the Ziggy theorem emphasizes that the meaning of life is doin’ stuff. This is consistent with suggestions that the objectives of health care are to make people live longer and to improve the quality of life in years before death (Kaplan & Anderson, 1990). Methods have become available to quantify these outcomes. Although very elementary, the Ziggy theo-
measure its main product, health. Public health analysts have
tested whether greater expenditures would result in better health. X27 Execut

Public Health Indicator

U. S. health care is the biggest industry in world history. In 1995 the United States is expected to spend an estimated $1 trillion on health care. The United States represents about 5% of the world's population; however, according to estimates by the World Bank and the World Health Organization, more than 40% of world health care expenditures occur in the United States (World Bank, 1993). One might expect that these greater expenditures would result in better health. However, the massive health care industry has had no way to measure its main product, health. Public health analysts have traditionally focused on three major outcomes: life expectancy, infant mortality, and disability days.

Mortality remains the major outcome measure in most epidemiologic studies and clinical trials. To make informed

<table>
<thead>
<tr>
<th>Step No.</th>
<th>Step definition</th>
<th>Weight</th>
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<tr>
<td>5</td>
<td>No limitations for health reasons</td>
<td>$-0.000$</td>
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<tr>
<td>4</td>
<td>Did not drive a car, health related; did not ride in a car as usual for age (younger than 15 years), health related, or did not use public transportation, health related; or had or would have used more help than usual for age to use public transportation, health related</td>
<td>$-0.062$</td>
</tr>
<tr>
<td>3</td>
<td>No limitations for health reasons</td>
<td>$-0.060$</td>
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<tr>
<td>2</td>
<td>In hospital, health related</td>
<td>$-0.090$</td>
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<tr>
<td>1</td>
<td>In wheelchair, did not move or control the movement of wheelchair without help from someone else, or in bed, chair, or couch for most or all of the day, health related</td>
<td>$-0.077$</td>
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<th>Step No.</th>
<th>Step definition</th>
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<tr>
<td>5</td>
<td>Limited in other (e.g., recreational) role activity, health related</td>
<td>$-0.061$</td>
</tr>
<tr>
<td>4</td>
<td>Limited in major (primary) role activity, health related</td>
<td>$-0.061$</td>
</tr>
<tr>
<td>3</td>
<td>Performed no major role activity, health related, but did perform self-care activities</td>
<td>$-0.106$</td>
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<tr>
<td>2</td>
<td>Performed no major role activity, health related, and did not perform or had more help than usual in performance of one or more self-care activities, health related</td>
<td>$-0.106$</td>
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<tr>
<th>CPX no.</th>
<th>CPX description</th>
<th>Weight</th>
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<tr>
<td>1</td>
<td>Death (not on respondent's card)</td>
<td>$-0.727$</td>
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<tr>
<td>2</td>
<td>Loss of consciousness such as seizure (fits), fainting, or coma (out cold or knocked out)</td>
<td>$-0.407$</td>
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<tr>
<td>3</td>
<td>Burn over large areas of face, body, arms, or legs</td>
<td>$-0.387$</td>
</tr>
<tr>
<td>4</td>
<td>Pain, bleeding, itching, or discharge (drainage) from sexual organs—does not include normal menstrual (monthly) bleeding</td>
<td>$-0.349$</td>
</tr>
<tr>
<td>5</td>
<td>Trouble learning, remembering, or thinking clearly</td>
<td>$-0.340$</td>
</tr>
<tr>
<td>6</td>
<td>Any combination of one or more hands, feet, arms or legs either missing, deformed (crooked), paralyzed (unable to move), or broken—includes wearing artificial limbs or braces</td>
<td>$-0.333$</td>
</tr>
<tr>
<td>7</td>
<td>Pain, stiffness, weakness, numbness, or other discomfort in chest, stomach (including hernia or rupture), side, neck, back, hips, or any joints or hands, feet, arms, or legs</td>
<td>$-0.292$</td>
</tr>
<tr>
<td>8</td>
<td>Pain, burning, bleeding, itching, or other difficulty with rectum, bowel movements, or urination (passing water)</td>
<td>$-0.290$</td>
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<tr>
<td>9</td>
<td>Sick or upset stomach, vomiting or loose bowel movement, with or without chills, or aching all over</td>
<td>$-0.290$</td>
</tr>
<tr>
<td>10</td>
<td>General tiredness, weakness, or weight loss</td>
<td>$-0.259$</td>
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<tr>
<td>11</td>
<td>Cough, wheezing, or shortness of breath, with or without fever, chills, or aching all over</td>
<td>$-0.257$</td>
</tr>
<tr>
<td>12</td>
<td>Spells of feeling upset, being depressed, or crying</td>
<td>$-0.244$</td>
</tr>
<tr>
<td>13</td>
<td>Headache, or dizziness, or ringing in ears, or spells of feeling hot, nervous or shaky</td>
<td>$-0.240$</td>
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<tr>
<td>14</td>
<td>Burning or itching rash on large areas of face, body, arms, or legs</td>
<td>$-0.237$</td>
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<tr>
<td>15</td>
<td>Trouble talking, such as lisp, stuttering, hoarseness, or being unable to speak</td>
<td>$-0.230$</td>
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<tr>
<td>16</td>
<td>Pain or discomfort in one or both eyes (such as burning or itching) or any trouble seeing after correction</td>
<td>$-0.188$</td>
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<tr>
<td>17</td>
<td>Overweight for age and height or skin defect of face, body, arms, or legs, such as scars, pimples, warts, bruises or changes in color</td>
<td>$-0.170$</td>
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<tr>
<td>18</td>
<td>Pain in ear, tooth, jaw, mouth, lips, tongue; several missing or crooked permanent teeth (includes wearing bridges or false teeth); stuffy, runny nose; or any trouble hearing (includes wearing a hearing aid)</td>
<td>$-0.144$</td>
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<td>19</td>
<td>Taking medication or staying on a prescribed diet for health reasons</td>
<td>$-0.101$</td>
</tr>
<tr>
<td>20</td>
<td>Wore eyeglasses or contact lenses</td>
<td>$-0.101$</td>
</tr>
<tr>
<td>21</td>
<td>Breathing smoog or unpleasant air</td>
<td>$-0.000$</td>
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<tr>
<td>22</td>
<td>No symptoms or problem (not on respondent's card)</td>
<td>$-0.257$</td>
</tr>
<tr>
<td>23</td>
<td>Standard symptom or problem</td>
<td>$-0.257$</td>
</tr>
<tr>
<td>24</td>
<td>Trouble sleeping</td>
<td>$-0.257$</td>
</tr>
<tr>
<td>25</td>
<td>Intoxication</td>
<td>$-0.257$</td>
</tr>
<tr>
<td>26</td>
<td>Problems with sexual interest or performance</td>
<td>$-0.257$</td>
</tr>
<tr>
<td>27</td>
<td>Excessive worry or anxiety</td>
<td>$-0.257$</td>
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Note: X = weight not available at this time, so standardized weight is used.
decisions about the nation's health, the U. S. Congress receives various reports of statistical indicators from the National Center for Health Statistics. These include the crude mortality rate, the infant mortality rate, and years of potential life lost. Although important, each of these measures ignores dysfunction while people are alive. The National Center for Health Statistics reports information on various states of morbidity. For example, it defines disability as a temporary or long-term reduction in activity. Over the past 2 decades, medical and health services researchers have developed new ways to assess health status quantitatively. These measures are often called quality-of-life measures. Because they are used exclusively to evaluate health status, the more descriptive health-related quality of life is preferred (Kaplan & Bush, 1982). Some approaches to the measurement of health-related quality of life combine measures of morbidity and mortality to express health outcomes in units analogous to years of life. The years of life figure, however, is adjusted for the diminished quality of life associated with disease or disability (Kaplan & Anderson, 1988a).

The worldwide pressure to use resources efficiently has created a demand for new health indicators. The QALY serves this purpose because it combines morbidity and mortality. Furthermore, the QALY solves the complex problem of trade-offs between length of life and quality of life. When the concept of a QALY was introduced by our group at UCSD more than 20 years ago, it received neither praise nor criticism. In fact, there was little reaction at all, and it was so foreign that death is asymptomatic irregular heartbeats (Weinstein & Stason, 1977). Nevertheless, the QALY concept was not known outside of a few academic circles until the late 1980s.

More recently, QALYs have experienced a boom in popularity. This was aided by suggestions in England that QALYs serve as the basis for health public policy (Williams, 1988) and by greater recognition of these concepts by the United States government. In the construction of the United States' health care objectives for the year 2000, it became apparent that researchers could not expect significant changes in either life expectancy or infant mortality rates. The QALY concept was advanced as a better way to conceptualize health care objectives. When the Department of Health and Human Services released Healthy People 2000, (1991) the blueprint for U.S. health care policy for the year 2000, the overall objective was to increase the years of healthy life for the United States population. The issue of healthy life is conceptually identical to the QALY, and the baseline data were ascertained by using estimates from the QWB.

Calculating QALYs requires measurement of health status. Other methods have evolved that allow for these estimates from less complete data sources. Most notable is the attempt by the World Bank and the World Health Organization to estimate health needs for the entire world. They have done this using the disability adjusted life year, which is an attempt to combine morbidity and mortality into a unit similar to a year of life (World Bank, 1993). Although the disability adjusted life year is conceptually and methodologically problematic, it does represent a significant advance toward the qualification of world health needs.

The Ziggy theorem can help researchers rethink large problems, such as the conceptualization of health care goals. However, it can also stimulate new thinking about the practice of medical subspecialties. I now address the problems of specialty medicine.

Beyond the Disease-Specific Focus

Medical specialization is not a new phenomenon. In fact, Herodotus described over-specialization in ancient Egypt. He suggested that medicine is practiced among the Egyptians on a plan of separation. Each physician treats a single disorder and no more. Thus, the country swarms with medical practitioners, some undertaking to cure diseases of the eye, others, of the head, others, again, of the teeth, others, of the intestine. (Herodotus, trans. 1942).

Medical specialization has important clinical advantages. In particular, it ensures that the patient will see the provider most familiar with his or her problem. However, there are also disadvantages. Focus on a particular outcome may obscure the total benefit of treatment. This is well illustrated by clinical trials on arrhythmia suppression following heart attacks.

People who survive a heart attack are at elevated risk for sudden death. One of the established risk factors for sudden death is asymptomatic irregular heartbeats (asymptomatic ventricular premature depolarization in cardiologists' terminology). Several drugs have been shown to suppress these irregular heartbeats. Two of the most successful ones are Encaainide and Flecaainide. Although these two drugs were already in widespread use for the treatment of patients with arrhythmia, the National Institutes of Health (Cardiac Arrhythmia Suppression Trial Investigators, 1989) conducted a clinical trial to demonstrate the obvious: that medicines that control the biological problem will normalize the risk of early death. The study was known as the Cardiac Arrhythmia Suppression Trial (CAST) and involved a large number of investigators and medical centers. To be eligible for the study, patients had to achieve significant suppression of their arrhythmia while on medication. Among the 2,309 patients recruited, 1,727 (75%) achieved a benefit from the drug. These patients were then randomly assigned to a group that used one of the drugs or to a placebo group. Many observers believed it was unethical to even conduct the trial. The logic was that patients with arrhythmia were at risk for death—the drugs suppressed the arrhythmia—and therefore, not allowing all patients to use the medications would condemn those in the placebo group to death. Because of a meaningful biological criterion, the treatment worked and there was no need to experiment further.

The Ziggy theorem demands other data. It is indifferent to the electrophysiological changes resulting from the treatment of an asymptomatic condition. Instead, the Ziggy theorem demands that the outcomes be meaningful to patients. In this case the meaningful outcome was life expectancy. There was a significant difference in mortality in the CAST trial, but it was in the wrong direction. Compared with those taking a placebo, patients taking Encaainide and Flecaainide had a significantly
higher chance of dying of cardiac arrest and to have nonfatal cardiac arrests that disrupted their lives (CAST Investigators, 1989). A biological model that focused on arrhythmia suppression would have concluded that the drugs worked. By the Ziggy theorem the drugs were dangerous and should be withheld.

Focus on specific categories can obscure the most important behavioral outcomes. Research directed toward specific disease categories or aspects of a biological process may not capture global concerns about health. That task requires a comprehensive behavioral model.

Clinical Decision Making

The Ziggy theorem may help to refocus some clinical decisions. Physicians who emphasize specific biological processes may miss the total health outcome picture. To illustrate this issue, consider the problem of prostate cancer in older men. Prostate cancer is an extremely common cancer for men age 70 years and older (Holleb, Fink, & Murphy, 1991). The treatment of this disease varies dramatically from country to country and within regions of the United States. For example, surgical removal of the prostate gland 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 (Lu-Yao, McLerran, Wasson, & Wennberg, 1993). The traditional approach to the treatment of prostate cancer was to identify the tumor and to get rid of it through either surgery or radiation therapy. Success is defined either through improved life expectancy or through evidence that the man is tumor free. Formal analysis using QALYs can shed a different light on these approaches.

There are three main options for the treatment of prostate cancer: radical prostatectomy (surgical removal of the prostate gland), external beam radiation therapy, and "watchful waiting." Both radical prostatectomy and radiation therapy carry high risks of complications that may reduce life satisfaction. For example, there are significant increases in the chances of becoming impotent or incontinent. Watchful waiting, however, does not require therapy, but only evaluation and supervision by a physician. The watchful waiting option has been used the least because it does not treat the cancer.

One recent analysis estimated QALYs under these three options. The analysis assumed a cohort of 68-year-old men and used published studies to estimate outcomes under different treatment options. For men diagnosed at this age, the risk of distant metastases is relatively rare: These outcomes occur in 5 of every 100 patient years of observation. The median time to metastasis is 14 years, and during this period 58% of the men would be expected to die of other causes. For those men who do develop metastases, hormonal therapy is available and can efficaciously delay disease progression until a larger percentage of the men die of other causes (Fleming, Wasson, Albertson, Barry, & Wennberg, 1993). Figure 2 summarizes quality adjusted life expectancy under the three treatment options for men with moderately differentiated tumors at different ages. The figure shows the quality adjusted life expectancy is essentially equivalent under the three options. The small differences between approaches are not statistically significant (Fleming et al., 1993). The traditional view emphasizes tumor eradication and aggressive treatment. This analysis

![Quality adjusted life expectancy (QALE) under the three treatment options for men with moderately differentiated tumors at different ages (data from Fleming, Wasson, Albertson, Barry, & Wennberg, 1993).](image)

suggests that the alternatives are equivalent and that the choice should be a matter of patient preference. According to the Ziggy theorem, waiting is a legitimate option.

Provider Payment

Another way that the Ziggy theorem can redirect thinking is in relation to provider payment. Historically, the United States has operated on a fee-for-service system. Physicians and other health care providers are reimbursed for offering services, whether those services cause benefit or harm to the patient. One of the problems in the health care system is that there have been incentives to offer higher cost services or to deliver services when they are unnecessary. Under the growth phase of the Medicare program in the 1960s and 1970s, physicians were reimbursed on the basis of customary community charges. In effect, this allowed physicians to bill the government for essentially any service they wanted to offer to older patients. There was a large increase in the number of services offered and a striking increase in the use of services that were associated with large fees (Enthoven & Kronick, 1990). Although physicians and hospitals profited, there was little evidence that patients benefited.

This problem is not specific to the contemporary United States. In fact, George Bernard Shaw in the preface to his 1911 play The Doctor's Dilemma suggested

"that any sane nation having observed that you could provide for the supply of bread by giving bakers a pecuniary interest in baking for you, should go on to give the surgeon a pecuniary interest in cutting off your leg, is enough to make one despair of political humanity." (p. v)

In contemporary medicine it is clear that pecuniary interests come to influence many medical decisions. Perhaps this is best illustrated in the study by Hillman, Pauly, and Kerstein (1989), who studied the mean cost per episode for the evaluation of four clinical decisions by family physicians (low back pain, difficulty in urinating, upper respiratory infections, and pregnancy). The independent variable in Hillman et al.'s study was whether the family doctor owned his or her own X-ray equipment. For each of these conditions, X-rays are common evaluative tests, and physicians who do not own their own
equipment can refer the case out to a radiologist. Cases in the study were carefully matched for severity. The results demonstrated that there was significantly more expense in each of the four diagnostic categories if the doctor owned his or her own x-ray equipment. It is often argued that the main reason physicians order unnecessary tests is to protect themselves from malpractice lawsuits. However, in the Hillman et al. study, the fear of being sued should have been equal in the two groups of providers because the patients they cared for were matched. What differed was the pecuniary interest in providing the test. According to the Ziggie theorem, physicians should be reimbursed for helping people to live longer and for helping them to do stuff. This may or may not be related to how much providers are now paid for their services.

Recently, Diamond, Denton, and Matloff (1993) suggested that the fee-for-service model be replaced by a fee-for-benefit model. The fee-for-benefit model estimates the QALYs produced by different treatment options for individual patients. Diamond et al. suggested that the expected benefit for each patient can be estimated on the basis of available clinical information. Physicians should then be given maximum reimbursement only if they select the option most likely to benefit the patient.

The system proposed by Diamond et al. (1993) has been worked out most clearly for patients with coronary heart disease. For this illness, a computer model estimates the risk of death for each patient. The model considers measured variables including risk factors for heart disease, such as age, gender, blood pressure, and cholesterol. In addition, the model uses common physiologic perimeters based on laboratory tests and clinical examination.

For each patient, it is possible to estimate the life expectancy under various treatment options. Life expectancy data are summarized in Figure 3. The top line for actuarial survival gives the probability of survival for the general population at the same age. The other two lines summarize the probability of survival expected for those who receive medical or surgical treatment. The goal of therapy is to bring the probability of survival for the patient groups as close to the general population or actuarial curve as possible.

Figure 4 summarizes the same analysis but with quality-adjusted survival replacing survival on the y-axis. There is a significant difference in QALYs between medical and surgical options, with surgical treatment coming closer to the actuarial line. Figure 5 summarizes a similar analysis for a different patient. For this patient a medical option appears superior to surgery. Diamond et al. (1993) suggested that the physician should be reimbursed (or reimbursed) for selecting the surgical option for the patient who will benefit most from surgery and the medical option for the patient who will benefit most from medicine. In other words, provider payment should be structured to maximize patient outcome.

On average, more patients are expected to benefit from medicine than from surgery. However, surgical options are now used more than medical treatments. Thus, the implementation of this system might lead to lower surgical rates. A computer simulation of cost-effectiveness using these data suggested that quality adjusted survival for coronary heart disease patients would increase 12%. Payments to providers would decrease 22%, but cost-effectiveness would increase by 55% (Diamond et al., 1993).

The fee-for-benefit model is both innovative and bold. However, it is not necessarily new or more extreme than ideas proposed in the past. Perhaps the most extreme version was suggested by Hamurabi in ancient Babylon. According to Hamurabi,

> If a surgeon has made a deep incision in the body of a man with a lancet of bronze and has opened an abscess in the eye of a man and has saved his eye, he shall take ten shekels of silver. If a surgeon has made a deep incision in the body of a man with the lancet of bronze and so destroys the man's eye, they shall cut off his forehead. (cited in Rosser, 1993, p. 315.)

The relationships between benefit and provider payment are summarized in Figure 6. The flat line in the figure (labeled hospital) shows the relationship between payment and benefit from the hospital's perspective. Hospitals would prefer to be paid the same rate whether or not they benefit the patient. The

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*Figure 3. Outcomes of treatment options for coronary heart disease. The top line for actuarial survival gives the probability of survival for the general population of the same age. The other two lines summarize the probability of survival expected for those who receive medical or surgical treatment without adjustment for quality of life.*

*Figure 4. Outcomes of treatment for coronary heart disease for specific patient likely to benefit from surgery as analyzed using quality-adjusted survival. QWB = Quality-Well-Being Scale.*
but might be paid increasing amounts as treatment outcomes improve.

The fee-for-benefit notion has important philosophical roots. For example, many argue for an egalitarian system in which the objective is the right to access. Indeed, many proposals for health care reform focus exclusively on the rights to all services (Kaplan, 1993a, 1993b). Another philosophical approach is the libertarian position that argues that the major objective is the right to choice. Diamond et al. (1993) emphasized that right to benefit improves health status and encompasses many of the ideas of right to choice and right to access. The Ziggy notion that doin' stuff is a high priority suggests that physicians should use their resources to help people get better. Change in payment for individual clinical decisions may provide a response to this challenge. In the next section a similar strategy at the public policy level is considered.

**Resource Allocation**

The Ziggy theorem has also been proposed to help resolve the United States' current health care crisis. There are at least three major problems with the current health care system. Elsewhere I have described these as the three As: affordability, access, and accountability (Kaplan, 1993b). The system costs too much, and the accelerating costs have the potential to ruin the entire economy (affordability problem). Despite these high costs, there are significant numbers of people who have too little or no health insurance (access problem), and the United

**Figure 5.** Outcomes of treatment for coronary heart disease for specific patients likely to benefit from medicine as analyzed using quality-adjusted survival. QWB = Quality of Well-Being Scale.

**Figure 6.** Relationship between payment and outcome from multiple perspectives. Hospitals prefer payment independent of outcome. Payers may want to avoid payment if there is no benefit and may be willing to pay a fixed amount for effective treatment. Patients may not want to pay for ineffective treatments, but may pay an increasing amount for more effective treatments. Providers may want compensation for their services, but may accept higher fees for more effective treatments.
States is unable to demonstrate that its high expenditures on health care result in better outcomes for patients (accountability problem). In particular, a significant number of procedures, as many as 30–50%, may have nonsignificant effects on health outcome (Brook & Lohr, 1986). Denying payment for these valueless procedures would save a significant amount of money, perhaps enough to provide basic care for a greater number of people without increasing the cost. To solve the health care crisis the three As must be addressed simultaneously. The state of Oregon offered one such proposal.

Oregon, like nearly all states, rations health care. Yet Oregon is different because it recognizes that rationing is implicit and not open to public scrutiny. Medicaid has a finite budget, and the costs of the program have grown much faster than the available resources. In the late 1980s, the costs of the Oregon Medicaid program grew at a rate of 18% per year. In response to financial pressures, the eligibility criteria needed to be revised. In other words, people were being rationed rather than serviced. Medicaid recognizes only some categories, such as Aid to Families With Dependent Children and those elderly, blind, or disabled individuals receiving supplemental security income. Many individuals in need of care received none because they were in the wrong category. A young woman employed as an hourly worker, for example, may be ineligible for health care, whereas an unemployed twin sister would become eligible if she became pregnant. Thus, the system creates incentives to become pregnant to have a regular source of health care. Because of a change in the criteria for children born after 1983, the system offered Medicaid to 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 as 50% of the poverty line. In 1989 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 per year might have been excluded by the policy even though he or she was at high risk for injury.

These problems were brought to public attention by a grassroots citizens groups known as Oregon Health Decisions. This group brought attention to the problem by organizing more than 300 community meetings throughout the state that were attended by more than 5,000 Oregonians (Crawshaw, Garland, Hines, & Lobitz, 1985). The movement gained the attention of the state legislature and, in particular, that of John Kitzhaber, the physician president of the state senate. In response to this problem, Oregon passed three pieces of legislation, including the controversial Senate Bill 27, that mandated that health services be prioritized using a process similar to the GHPM. The justification for the prioritization was that it would eliminate services that did not provide benefit. The process of creating the prioritized list was extremely difficult. The commission began by creating 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 combinations of conditions and treatments that could be lumped together. For example, the problem of rectal prolapse was paired with the treatment partial colectomy, whereas osteoporosis was paired with medical treatment, which was a generic term for treatment with medication.

The Health Services Commission obtained several sources of information. They 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 in 48 town meetings attended by more than 1,000 people. From these meetings, 13 community values emerged. These values included prevention, cost-effectiveness, quality of life, ability to function, and length of life. One major lesson from the community meetings was that citizens wanted preventive services. Furthermore, the people consistently stated that the state should forgo expensive heroic treatments for individuals or small groups to offer preventive services for everyone.

To pay for preventive services, it was necessary to reduce spending elsewhere. A major portion of the commissioners' activity was to evaluate services with the QWB from the GHPM. The commissioners could not have possibly conducted clinical trials for each of the many condition–treatment pairs. Furthermore, estimation of treatment benefit using the QWB cannot be left to laypersons. Therefore, the commission formed a medical committee that had expertise in essentially all specialty areas and had the participation of nearly all of the major provider groups in the state. Working together, the committee estimated the expected benefit of 709 condition–treatment pairs.

The QWB, which was used to estimate the effect of services, requires subjective judgments to score the importance or desirability of health states. These weights are not medical expert judgments and should be obtained from community peers. The Oregon citizens were particularly concerned about using weights from California to assign 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. In 1990 the commission released a draft copy of its first prioritized list. Unfortunately, many of the rankings seemed counter-intuitive, and the approach drew serious criticism in the popular press. As a result, the system was reorganized according to three basic categories of care: essential, very important, and valuable to certain individuals. Within these major groupings there were 17 subcategories. The commission decided to place the greatest emphasis on problems that were acute and fatal. In these cases treatment prevents death, and there is full recovery. Examples include appendectomy for appendicitis and nonsurgical treatment for whooping cough. By the Ziggy theorem, these services would make great differences in the ability to do stuff. Other categories classified as essential included maternity care, treatment for conditions that prevents death but does not allow full recovery, and preventive care for children. There were nine categories classified as essential. 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 would include hip replacements and cornea trans-
plants. At the bottom of the list were treatments for fatal or nonfatal conditions that did not improve quality of life or extend life; progressive treatments for the end stages of diseases such as cancer and AIDS or care for conditions in which the treatments were known not to be effective were included in this category. In other words, services that did not help people do stuff (or live longer) were given low priority. 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. Unfortunately, the final exercise in Oregon resulted in many deviations from the GHPM. However, the exercise demonstrated an attempt to resolve the health care crisis on the basis of health outcome. After nearly 5 years of debate, a revised Oregon plan was implemented on February 1, 1994.

Summary

The Ziggy theorem argues that the meaning of life is doin’ stuff (and living long enough to do stuff). In many respects, Ziggy has summarized the objectives of health care. This presentation has extended the Ziggy theorem to include quantification. Measurement of quality of life is possible and is well represented in formal analyses such as the QALY. Kaplan, R. M. (1993b). Application of a general health policy model: The Quality of Well-Being Scale: Rationale for a single quality of life index. In S. R. Walker & R. Rosser (Eds.), Quality of life in clinical studies (pp. 131–149). New York: Raven.

Quality-adjusted survival analysis has important applications in clinical decision making, public policy, and clinical trial research. However, this is a new era of investigation. Outcomes research offers a new paradigm that may stimulate different directions in provider payment, resource allocation, and the selection of clinical measures.

References


Appendix

Example QWB Calculation

Formula 1

To obtain the point-in-time well-being score for an individual, \( W \), use

\[
W = 1 + \text{CPX} \times \text{wt} + \text{MOB} \times \text{wt} + \text{PAC} \times \text{wt} + \text{SAC} \times \text{wt},
\]

where \( \text{wt} \) is the preference-weighted measure for each factor, \( \text{CPX} \) is the symptom-problem complex, \( \text{MOB} \) is mobility, \( \text{PAC} \) is physical activity, and \( \text{SAC} \) is social activity. For example, for a person with the following description profile,

State | Description | Weight
--- | --- | ---
CPX-11 | Cough, wheezing or shortness of breath, with or without fever, chills, or aching all over | -0.257
MOB-5 | No limitations | -0.000

the \( W \) score is calculated as

\[
W = 1 + (-0.257) + (-0.000) + (-0.077) + (-0.061) = 0.605.
\]

Formula 2

To obtain well-years (\( \text{WY} \)) or QALY as an output measure, use

\[
\text{WY} = \text{[No. of persons} \times \text{(CPX} \times \text{wt} + \text{MOB} \times \text{wt} + \text{PAC} \times \text{wt} + \text{SAC} \times \text{wt}) \times \text{time}].
\]