TYPES OF ECONOMIC AND HUMANISTIC OUTCOMES ASSESSMENTS

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Outline

Frequent misuse and misunderstandings exist regarding what pharmacoeconomics is and what it encompasses. This chapter will assist readers in clarifying their understanding of pharmacoeconomics and lead to an increased understanding of its principles, methods, and applications.

I. Definitions
   A. Pharmacoeconomics—typically defined as the description and analysis of the costs and consequences of pharmaceuticals and pharmaceutical services and its effects on individuals, health care systems, and society. These costs and consequences typically include both economic and humanistic assessments.
      1. A division of outcomes research. However, not all outcomes research is pharmacoeconomic research.
   B. Outcomes research—more broadly defined as studies that attempt to identify, measure, and evaluate the end results of health care services in general; includes not only clinical effects, but also economic and humanistic outcomes such as functional status, well-being, and satisfaction with care. Proponents of outcomes research believe that all three types of outcomes should be measured. (Reference: Figure 1. Components of Contemporary Clinical Decision Making; Reference: Table 1. Some Economic and Humanistic Pharmacoeconomic Evaluations)

II. A proposed model for outcomes evaluations
   A. Proposed that evaluation of drug therapy and related services should always include assessments of economic, clinical, and humanistic outcomes.
   B. The economic, clinical, and humanistic outcome (ECHO) model organizes outcomes of medical care along three general dimensions: clinical, economic, and humanistic.
      1. Economic outcomes—direct, indirect, and intangible costs compared with the consequences of medical treatment alternatives.
      2. Clinical outcomes—medical events that occur as a result of disease or treatment (outside the scope of this program).
      3. Humanistic outcomes—consequences of disease or treatment on patient functional status, or quality of life, measured along several dimensions, e.g., physical functioning, social functioning, general health perceptions and well-being. (Reference: Figure 2. The Conceptual Model: Economic, Clinical, and Humanistic Outcome [ECHO] Model)
   C. The ECHO model recognizes intermediary outcomes
      1. Economic outcomes have intermediaries introduced from the clinical and humanistic side of the model.
         a. From the clinical side are direct costs of medical care associated with each treatment, not just the direct cost of the pharmaceutical products; laboratory testing, emergency department visits, inpatient hospitalizations, and costs of retreatment from product failure also included.
         b. From humanistic side are the indirect, or productivity costs associated with the time lost from work.

c. Direct nonmedical costs for transportation to the hospital, or physicians office for treatment also included.

2. Humanistic outcomes have intermediaries that affect the individual's subjective evaluation of outcomes.
   a. Examples of the intermediaries are listed here and in Figure 3: side effects; efficacy/effectiveness; patient's willingness or ability to pay; adherence to drug regimen (compliance); patient's knowledge; drug dosing schedules. (Reference: Figure 3. Alternative conceptualizations of the relationship between therapeutic interventions and outcomes)

III. Economic outcomes assessment
   A. Costs
      1. Costs—the resources consumed by a program or treatment alternative. Costs must be identified, relevant to the perspective(s) chosen, prior to measurement and comparison.
         a. Direct medical costs—costs incurred for medical products and services used for the prevention, detection, and treatment of a disease.
            i. Examples: hospitalization, drugs, laboratory testing, supplies
               a) Fixed costs represent overhead costs
               b) Variable costs—vary as a function of volume
         b. Direct nonmedical costs—costs for nonmedical services that are the result of illness or disease, but do not involve purchasing medical services.
            i. Examples: special food, transportation for health care, family care
         c. Indirect costs—costs of morbidity and mortality resulting from illness or disease.
            i. Examples: lost productivity, premature death
               a) Human capital method
               b) Willingness to pay
         d. Intangible costs—costs of pain, suffering, grief, and other nonfinancial outcomes of disease and medical care.
         e. Incremental costs—additional costs incurred to obtain an additional unit of benefit from an alternative strategy.
         f. Opportunity costs—money spent on one resource that cannot be spent for other purposes; the value of the next best use that is forgone.
   B. Consequences
      1. Positive versus negative
         a. Full evaluations must measure both desirable and undesirable outcomes.
      2. Intermediate versus final
         a. Intermediate outcomes are commonly used to demonstrate clinical efficacy because their usage reduces the costs and time required to conduct a clinical trial.
      3. Balancing costs and consequences is the essence of pharmacoeconomic evaluation.
   C. Perspectives: The pharmacoeconomic question being asked usually determines the appropriate perspective or viewpoint to be used. (Reference: Figure 4. Potential Perspectives for Pharmacoeconomic Evaluations)
      1. Patient—the ultimate consumer of health care services. Costs, from patients' perspective, are essentially what they pay for a product or service (the portion not covered by insurance).
      2. Provider—the health care professional or care organization; costs from this perspective are the actual costs of providing a product or service, regardless of the charge.
      3. Payer—insurers, government, or employers; the cost to the payer are the charges for health care products and services allowed (reimbursed) by the payer.
      4. Society—costs include patient morbidity and mortality costs, and the overall costs of giving and receiving medical care.
      5. Controversy in choosing perspective
         a. Many researchers assert that society is the best perspective for all economic evaluations.
   D. Misuse of pharmacoeconomic terms: Many have demonstrated that pharmacoeconomic terminologies are commonly misused.
   E. Economic Assessments: The basic task of economic evaluations is to identify, measure, value, and compare the costs and consequences of the alternatives being considered.
      1. Partial economic evaluation include a simple descriptive tabulation of outcomes or resources consumed.
      2. Full economic evaluation helps to assess the economic benefit of a program, service, or treatment.
         a. Requires two distinguishing features of economic evaluation.
            i. Comparison of two or more treatment alternatives.
            ii. Both costs and consequences of the alternatives are examined.
         b. Limitations of full economic analyses. (Reference: Table 2. Common Economic Evaluation Methodologies)
      3. Cost of illness (COI)

a. Definition—involves identifying all the direct and indirect costs of a particular disease or illness within a health care system.
b. Yields a total cost of a disease that can be compared to the cost of implementing a prevention or treatment strategy.

4. Cost-minimization analysis (CMA)
   a. Definition—compares the costs of two or more treatment alternatives that have a demonstrated equivalence in therapeutic outcome (i.e., therapeutically equivalent alternatives).
   b. Results expressed as a total cost per treatment alternative; allows for separate examination of the relevant cost components.
   c. Used to determine the least costly alternative.
5. Cost-benefit analysis (CBA)
   a. Definition—method to compare the costs and benefits of treatment alternatives or programs; costs and benefits expressed in monetary terms.
   b. Results are expressed as either a cost-to-benefit ratio, or as the net cost or benefit.
   c. Example: if cost for treatment is $100 and value of outcome of treatment is $1000, cost-benefit ratio is: benefit ÷ cost = $1000 ÷ $100 = 10/1 benefit of $1 million and cost of $100,000 also yields cost-benefit ratio of 10/1
   d. Used to compare treatment alternatives or programs, particularly when deciding how to allocate scarce resources.
6. Cost-effectiveness analysis (CEA)
   a. Definition—method to compare treatment alternatives, or programs where cost is measured in monetary terms and consequences in units of effectiveness or natural units.
      i. May be less expensive, and at least as effective as the comparator.
      ii. May be more expensive while providing an additional benefit worth the additional cost.
      iii. May be less expensive and less effective when the extra benefit is not worth the extra cost.
   b. Results are expressed as average cost-effectiveness ratios, or as the incremental cost of using one alternative over another.
   c. For example: drug A has 90 percent cure rate, drug B has 95 percent cure rate; drug A costs $50,000 to treat 100 patients, drug B costs $100,000 to treat 100 patients
   d. Calculation of cost-effectiveness ratios:
      drug A costs $50,000/100 patients ÷ 90 cures/100 patients = $555/cure
      drug B costs $100,000/100 patients ÷ 95 cures/100 patients = $1053/cure
   e. Calculation of incremental cost-effectiveness ratio:
      $100,000 - $50,000
      95 cures - 90 cures
      = $10,000/additional cure with drug B
   f. Used to compare competing programs or treatment alternatives that differ in therapeutic outcome
7. Cost-utility analysis (CUA)
   a. Definition—method to compare treatment alternatives or programs where costs are measured in monetary terms and outcome is expressed in terms of patient preferences or quality of life.
   b. Results are expressed as dollars per quality-adjusted life-year (QALY) gained, or some other patient-weighted utility measure.
   c. Used to compare treatments or programs using terms of patient preference, or quality of health care, or when outcomes cannot be expressed in monetary terms.

IV. Techniques for analysis
   A. Discounting
      1. Definition—an analysis that adjusts (reduces) future costs and consequences to reflect present fiscal value.
      2. Discounting costs—based on the time value of money; because the value of money decreases over time, future costs must be adjusted (discounted) to present time values.
      3. Discount rate—discount rate of 3–8 percent should be used (often reflective of current interest rates used by banking institutions).
   B. Sensitivity analysis
      1. Definition—an analysis that tests robustness of study conclusions; sensitive variables (or assumptions) are varied over a range of plausible results and the impact on study results is observed.
      2. Variables include percent efficacy (or effectiveness), incidence of specific adverse drug reactions, and dominant costs.
   C. Decision analysis
      1. Definition—an explicit, quantitative, and prescriptive approach to choosing between competing treatment alternatives or programs.

2. Tool used in decision analysis is a decision tree; allows for the graphic presentation of treatment alternatives, outcomes, and probabilities. (Reference: Figure 5. Decision Tree)

D. Incremental cost analysis
   1. Definition—an analysis that examines the extra cost of one program or treatment alternative relative to the additional effect provided by that alternative.
   2. formula: $\frac{\text{Cost B} - \text{Cost A}}{\text{Effect B} - \text{Effect A}}$

V. Applied Pharmacoeconomics
   A. Definition—putting pharmacoeconomic principles, methods and theories into practice to assess the value of pharmaceutical products and services used in "real-world" practice settings.
   B. Primary application—to inform local decision making.
      1. Specific applications of economic assessments
         a. Formulary management
         b. Clinical guidelines
         c. Drug use policies
         d. Service or program evaluation
         e. Individual patient treatment decisions

VI. Humanistic Outcomes Assessment
   A. Background
      1. Measurement of health
         a. Case study
   B. Evolution of today's health status outcome measures
      1. During the 1940s, physicians first began to measure patient functioning;
         a. Karnofsky Functional Status for Patients with Cancer
         b. New York Heart Association Classification
      2. When social science methods and clinical expertise came together in the 1970s, the first modern health-status questionnaires emerged.
         a. Quality of Well-Being Scale,
         b. Sickness Impact Profile,
         c. Health Perceptions Questionnaire,
         d. Older Americans Resources and Services (OARS) questionnaire
      3. The next generation developed in the 1980s and 90s
         a. Health Insurance Experiment (HIE) health surveys
         b. Duke-UNC Health Profiles
         c. Nottingham Health Profile
         d. Medical Outcomes Study health surveys, including the SF- 36 Health Survey
      4. Variations in medical care in small areas
         a. Typically traced to the work of John Wennberg, who uncovered a phenomenon known as small-area variation.
         b. Wennberg and colleagues noticed large disparities in the rates of various medical procedures in different geographic areas.
      5. The Rand HIE
         a. In 1990, health expenditures accounted for 12.4 percent of GNP, whereas that proportion was 4 percent in 1980, and the rate of growth was exceeding the rate of inflation, questions surfaced.
         b. This quandary prompted the federal government to support a large-scale controlled trial, now known as HIE.
            i. One purpose of the HIE was to learn whether the direct cost of medical care, when borne by consumers, affects their health.
            ii. Presented one of the first major challenges for measuring health status.
            iii. A consequence of this challenge resulted in one of the most extensive applications of psychometric theory and methods (long used in educational testing), to the development and refinement of health status surveys.
            iv. The measurement goal in the HIE was to construct the best possible scales for measuring a broad array of functioning and well-being concepts.
            v. HIE demonstrated the potential of scales, constructed from self-administered surveys, as reliable and valid tools for assessing changes in health status.
            vi. It left two questions unanswered:
               a) Can methods of data collection and scale construction work in sicker and older populations?
               b) Could scales that are more efficient be constructed?

vii. The answer to these questions was the challenge accepted by the Medical Outcomes Study (MOS) investigators.

6. Medical Outcomes Study
   a. Two-year observational study designed to help understand how specific components of the health care system affected the outcomes of care.
   b. Original purpose was to develop more practical tools for monitoring patient outcomes, and their determinants, in routine practice using state-of-the-art psychometric techniques.
7. Agency for Health Care Policy and Research (AHCPR)/Agency for Healthcare Research and Quality (AHRQ)
   a. To enhance the quality, appropriateness, and effectiveness of health care services and access to services, the federal government established AHCPR (Omnibus Budget Reconciliation Act of 1989).
      i. The act, sometimes referred to as the Patient Outcomes Research Act, called for the establishment of a broad-based, patient-centered outcomes research program.
   b. In 1999, the agency was reauthorized as AHRQ.

C. Evaluating the Quality of Care
1. Structure denotes the attributes of the settings in which care occurs. Evaluations of structure address the relatively stable characteristics of the providers of care, of the tools and resources they have at their disposal, and of the physical and organizational settings in which they work.
2. Process of care denotes what is actually done in giving and receiving care. It includes the patient's activities in seeking care and carrying it out, as well as the practitioner's activities in making a diagnosis and recommending, or implementing, treatment.
3. Outcomes of care denote the effects of care on the health status of patients and populations. Improvements in patients' knowledge and salutary changes in patients' behaviors are included under a broad definition of health status, and so is the degree of each patient's satisfaction with care.

D. Definitions
1. Quality of Life
   a. Quality of life refers to an evaluation of all aspects of our lives, including where and how we live, how we play, and how we work.
2. Health
   a. Health is one of 12 domains of life to be considered when researching and evaluating overall quality of life.
   b. The other 11 domains are listed in Table 3 and include: community; education; family life; friendships; housing; marriage; nation; neighborhood; self; standard of living; and work.
3. Health-related quality of life
   a. Encompasses only those aspects of life that are dominated, or significantly influenced by personal health or activities performed to maintain, or improve health.
   b. Is a specifically focused area of investigation within the larger field of health services and quality-of-life research. Standardized questionnaires are used to capture health-related quality-of-life data.
   c. The term health-related quality of life was adopted by researchers to set their research apart from the more global concept of quality of life, and to more accurately reflect the scope of their research.

E. Measurement
1. Measurement is a set of numbers or rules used to quantify a physical attribute. Examples of measurement devices are rulers, thermometers, and scales.
2. Health has distinct components that must be measured and interpreted individually to fully understand health at a given time, as well as changes over time.
   a. Clues about the components are found in the definitions of health offered by the World Health Organization, as well as in dictionaries.
      i. The World Health Organization has defined health as a state of complete physical, social, and mental well-being, not merely the absence of disease or infirmity.
      ii. Dictionary definitions also identify both physical and mental dimensions of health. The former pertains to the body and bodily needs, the latter to the mind and, particularly, to the emotional and intellectual status of the individual.
      iii. Health connotes completeness, where nothing is missing from the person; it also connotes proper function, where all is working efficiently. The dictionary also suggests well-being, soundness, and vitality as important components of health.
   b. Both World Health Organization and dictionary definitions provide precedents for the dimensionality of health and, specifically, for the distinction between physical and mental health.
   c. Two features of these definitions are crucial
      i. The dimensionality of health.
      ii. The existence of a full range of health states, ranging from disease to well-being.
3. Range of measurement

a. Many measurement scales artificially restrict the range of individual differences enumerated. Consistent with a disease orientation, most disease-specific measures emphasize the negative end of the health continuum.
b. Figure 7 illustrates how both the positive and negative ends of the range might be considered when evaluating mental health status.

F. Measurement strategy
1. To provide an assessment of health-related quality of life, one of three approaches is usually taken.
a. Focus on general health status
b. Disease-specific-focused on specific aspects of the disease under study.
c. Both generic and disease specific.
2. Though measurement strategies may be slightly different, there are some commonly agreed upon and frequently measured general health concepts.
a. Physical functioning
b. Mental functioning
c. Social and role functioning
d. General health perceptions

G. General health status measures
1. Not disease or disorder specific.
2. Relevant to all ages, races, sexes, and socioeconomic backgrounds.
3. Permit examination of treatment benefits in comparable units.
4. Advantages
a. Used for monitoring patients with more than one condition.
b. Can compare patients with different conditions by providing a common yardstick.
c. Used to assess the relative benefits of different treatments.
d. The same measures can be appropriately applied to both general (well) and patient (sick) populations; can be used with people of any age, gender, or race.
5. Disadvantages
a. Do not cover areas of health status that are important to particular groups of patients who may experience specific improvements or disabilities in functioning due to their disease state.
b. Need to use additional questionnaires for disease- or condition-specific set of questions.
c. Not specific to any particular disease state; not able to capture symptoms or domains specifically related to one disease state (e.g., dexterity with arthritis). (Reference: Table 5 lists these key health concepts and indicates how they might be assessed)

VII. Components Common to Many General Health Status Measures
A. Physical functioning
1. Physical functioning as it relates to health-related quality-of-life assessment typically refers to the limitations, or disability, experienced by the patient over a defined period.
2. Questions focus on observable and important physical limitations easily noticed and evaluated by the patient or observer.

B. Social and Role Functioning
1. Social functioning
a. Social functioning is defined as the ability to develop, maintain, and nurture mature social relationships.
i. Frequency of social contacts.
ii. Nature of those contacts within the social network or community.
2. Role functioning
a. Concerned with the impact health has on a person's ability to meet the demands of that person's normal life role. Work for pay, homemaking duties, and schoolwork are all covered by questions asking about this concept.
b. Identify everyday role situations or activities that can be directly affected or limited by disease, illness, or treatment.
c. Whereas most role limitations are due to physical health problems, role limitations are observed both in the presence, and in the absence of, physical limitations.

C. Mental Health
1. Disease often affects behavioral, as well as physical aspects of a person's life. General health status assessments, therefore, usually include questions covering aspects of psychological health.

D. General Health Perceptions
1. General health perceptions address the person's overall beliefs and evaluations about his or her health.

VIII. Disease-Specific Health Status Instruments
A. Some limitations or problems with patients' health are unique to their specific disease state.

B. Batteries of questions were designed for use with specific patient populations, and are used to supplement a general health status instrument.
C. These more narrowly focused disease-specific measures request detailed information about the impact a specific disease, and its treatment, have on the patient, from the patient's perspective.
D. In addition, using disease-specific measures allows inclusion of questions of specific interest.
E. Among some specific areas previously investigated with disease-specific questionnaires are sexual functioning, nausea and vomiting, pain, cancer, arthritis, epilepsy, HIV infection, anxiety and depression, asthma, and rhinitis.

IX. Psychometric Theory
A. The underlying theory that supports the design of health surveys, consisting of scales measuring attributes of a person or a population's health.
B. Same theories that support the creation of educational measurements (e.g., Standardized Achievement Tests).
C. A person who studies these theories and conducts research or measurement of such attributes as intelligence, pain, mental well-being, or functioning is usually a doctorate level research psychologist and can be known as a psychometrician.
D. In recent years has produced, in the health sciences literature devoted to measuring health status, a daunting array of already available scales.
E. Perhaps the most common error committed by clinical researchers is to dismiss the existing scales too lightly, and embark on the development of a new instrument with an unjustifiably optimistic and naïve expectation that they can do better.
F. A comprehensive set of standards, widely used in the assessment of psychology and education, is the manual called Standards for Educational and Psychological Tests, published by the American Psychological Association (1974).

X. Psychometric Considerations
A. Psychometrics is the science of testing questionnaires to measure attributes of individuals.
B. It is used in the field of health assessment to translate people's behavior, feelings, and personal evaluations into quantifiable data.
C. These data, once captured, must be both relevant and correct if they are to provide useful insights into health-related quality of life.
1. Reliability—the relationship between true variation and random error. Evaluations assess the consistency and repeatability of measurement.
2. Validity—refers to the extent to which differences in scale scores reflect the true differences in the individuals studied.
3. Useful scales must be sensitive to change, and be accepted by the investigators and respondents.

XI. Use of Patient-Reported Health Status
A. Monitoring the health of populations.
B. Evaluating health care policy.
C. Conducting clinical trials of alternative treatment.
D. Designing systems for monitoring and improving health care outcomes.
E. Individual Patient Care Decisions
1. Controversies in using health status assessments.
2. Contributions of technology and modern test theory to the use of health status instruments.
3. Advances in using health status assessments for individual patient care decisions.
a. Standardized measures capturing patient perspectives are likely to become more acceptable as a piece of evidence of which providers and their patients can make decisions about treatment and a treatment's efficacy.
b. Mature theoretical models, sophisticated measurement techniques, and enhanced technology for use in measurement, make the routine use of individual patient results in their own care more promising than ever before.
4. Two practical concerns of the critics of use of health-related quality-of-life assessments in individual patient care are:
a. Respondent burden and;
b. Reliability of scores obtained from shorter questionnaires.
5. Modern test theory offers the potential for individualized, comparable assessments for the careful examination and application of different health status measures.
a. One such theory is Item Response Theory (IRT). Researchers report that IRT has a number of potential advantages over the currently used Classical Test Theory in assessing self-reported health outcomes.
b. Applications of the IRT models are ideally suited for implementing computer adaptive testing. IRT methods are also reported to be helpful in developing better health outcome measures, and in assessing change over time.

6. Patients increasingly have more access to computer technology. It is becoming more practical to use assessments using a computer.
    a. Patients answering questions about a health status concept using dynamic assessment technology are requested only to complete the number of questions needed (minimizes response burden) to establish a reliable estimate.
    b. The resulting scores for an individual are estimated to meet the clinical measures of precision.

XII. Case Study Continued

XIII. Patient Satisfaction

A. Another outcome suggested by a popular quality-of-care model for how to evaluate the quality of health care is that of patient satisfaction.

B. Empirical studies show that patients' expressions of dissatisfaction are potent predictors of disenrollment from a physician or a health plan.

C. A consumer's evaluation of the care received, known as consumer evaluation or patient satisfaction, is both similar and different from a patient's assessment of health status.
    1. The same psychometric techniques are used to obtain information, and to evaluate the accuracy of the information.
    2. The science of obtaining the information is similar.
    3. The information is unique and different from what is asked about health status.
    4. Both reports and ratings are used in patient satisfaction surveys.
        a. Reports are descriptions.
        b. Ratings are evaluations that require a judgment by the evaluator (patient).

D. There are many different patient satisfaction surveys available.
    1. Attributes that are commonly evaluated, regardless of the care setting include:
        a. The clinician's scientific knowledge and skill;
        b. The quality of clinician-patient communications;
        c. The provision of humane interpersonal treatment;
        d. And the degree of the patient's trust in the care provider.

E. One setting in which patient satisfaction surveys are becoming increasingly important is that of primary care.
    1. Four distinguishing and shared multiple characteristics are considered essential and unique to this area of health care and provide attributes that can be evaluated by patients. These characteristics include:
        a. Accessibility to care;
        b. Continuity of care;
        c. The comprehensiveness of care and;
        d. How well a patient's care is integrated into a coherent and continuing whole.

XIV Other Measures of Outcomes

A. The concept of work functioning must be included as an outcome to meet the evaluation needs of employers, who have become a significant form in health care.

B. The ability to quantify the constituent parts of the losses in work productivity is growing in importance, and will undoubtedly be an important measured health domain.

XV. Conclusion

Learning Objectives

1. Identify and define the terminology and basic components of health economics, outcomes research, and pharmacoeconomics.
2. Differentiate between full and partial economic evaluations.
3. Define direct, indirect, intangible, incremental, and opportunity costs, and classify them based on the perspective taken.
4. Discuss the controversies related to the perspective taken for an economic analysis.
5. Discuss the controversies related to discounting costs and benefits.
6. Differentiate between the application of outcomes research results to system decisions and individualization of patient therapy.
7. Discuss the identification and measurement of appropriate outcomes in health economics research.
8. Understand the evolution and scientific basis for the use of patient self-reported health status assessments.
9. Characterize contemporary developments in content, measurement, and uses of personal health measures.
10. Distinguish between population-based and individual level measures of health.
11. Understand the basic concepts underlying the measurement of health-related quality of life.
12. Differentiate between generic and disease-specific health-related quality-of-life instruments.
13. Discuss uses of health status assessments with other health care professionals.
14. Understand the technological improvements going on in the field of health status measurement.

Abbreviations in This Chapter

ACER	Average cost-effectiveness ratio
AHCPR	Agency for Health Care Policy and Research
AHRQ	Agency for Healthcare Research and Quality
CBA	Cost-benefit analysis
CEA	Cost-effectiveness analysis
COI	Cost of illness
CMA	Cost-minimization analysis
CUA	Cost-utility analysis
ECHO	Economic, clinical, humanistic outcomes
HIE	Health Insurance Experiment
HRQOL	Health-related quality of life
IRT	Item Response Theory
MOS	Medical Outcomes Study
MOS SF-36	Medical Outcomes Study, short form, 36 items
OARS	Older Americans Resources and Services
QALY	Quality-adjusted life-year

Introduction

Frequent misuse of pharmacoeconomic terms abounds. Misconceptions, such as pharmacoeconomics equals cost-containment, and pharmacoeconomics compromises clinical decision making, have lead to apprehension by many health care professionals as they evaluate the economic and humanistic outcomes of health care products and services. Pharmacoeconomics is not about determining the cheapest health care alternatives, but is about determining those alternatives that provide the best health care outcome per dollar spent. This chapter should assist in clarifying many of these misconceptions, leading to an increased understanding of pharmacoeconomic principles, methods, and its application to health care today.

Definitions

Pharmacoeconomics typically is defined as the description and analysis of the costs and consequences of pharmaceuticals and pharmaceutical services, and its impact on individuals, health care systems, and society. Pharmacoeconomics is a division of outcomes research and, typically, addresses both economic and humanistic outcomes. However, not all outcomes research is pharmacoeconomic research.

Outcomes research is more broadly defined as studies that attempt to identify, measure, and evaluate the end results of health care services. As depicted in Figure 1, not only clinical effects, but also economic and humanistic outcomes are included. Thus, proponents of outcomes research believe in measuring, not only the clinical and cost impacts of health care, but also the outcomes that take the patient's perspective into account. Some of the economic and humanistic outcomes to be addressed are listed in Table 1.

Economic, Clinical, and Humanistic Outcomes Model

It has been proposed that the evaluation of drug therapy and related services should include an assessment of economic, clinical, and humanistic outcomes (ECHO) model

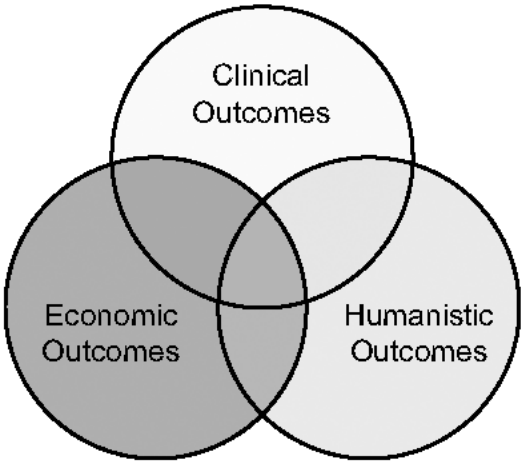

Figure 1. Components of Contemporary Clinical Decision-Making

Table 1. Some Economic and Humanistic Pharmacoeconomic Evaluations

Economic Evaluations	Humanistic Evaluations
Cost-of-illness	Quality of Life
Cost-minimization analysis	Patient preferences
Cost-benefit analysis	Patient Satisfaction
Cost-effectiveness analysis	Willingness-to-pay
Cost-utility analysis	

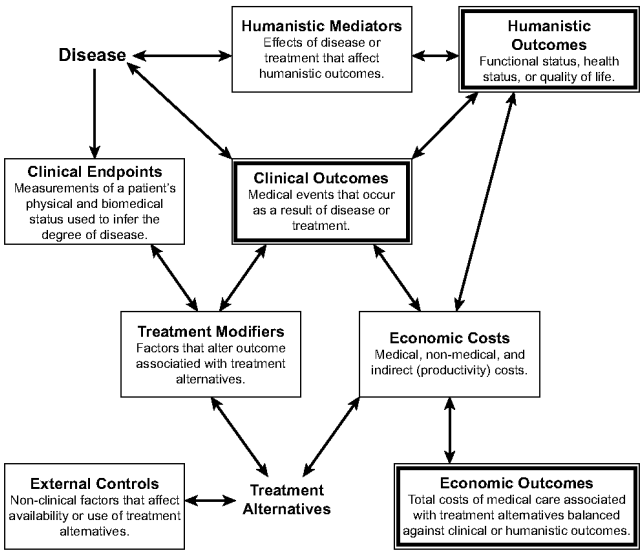

Figure 2. The Conceptual Model: Economic, Clinical, and Humanistic Outcomes (ECHO) Model.
Reprinted with permission from Kozma CM, Reeder CE, Shulz RM. Economic, clinical, and humanistic outcomes: a planning model for pharmacoeconomic research. Clin Ther 1993;15:1121–32.

(see Reference 13). In their proposed model, the ECHO model, depicted in Figure 2, it is assumed that the outcomes of medical care can be classified along these three dimension. Clinical outcomes are defined as medical events that occur as a result of disease or treatment. Economic outcomes are defined as direct, indirect, and intangible costs, compared with the consequences of medical treatment alternatives. Humanistic outcomes are defined as the consequences of disease or treatment on patient functional status, or quality of life. Multiple variables important for understanding the value of alternatives exist within each type of outcome. The authors propose that all three of these outcomes need to be balanced simultaneously to assess value.

Some of the many variables that need to be balanced are intermediate outcomes, or intermediaries. The ECHO model proposes some examples of intermediaries. The economic outcomes have intermediaries introduced from the clinical and humanistic side of the model. The clinical outcomes have intermediaries introduced from the direct costs of medical care associated with each treatment. These intermediaries include the costs of laboratory testing, emergency department visits and inpatient hospitalizations, and costs of retreatment from product failures. As you can see, these costs are more than just the direct costs of pharmaceutical products. Direct nonmedical costs for transportation to the hospital or physician's office for treatment also must be included. Humanistic outcomes have intermediaries, including indirect costs such as time lost from work, that must be added.

Additional humanistic intermediaries are proposed. Examples of these intermediaries include adverse reactions, efficacy or effectiveness of a drug, the patients' willingness or ability to pay, patient compliance, patient knowledge, and dosing requirements such as frequency of administration. Figure 3 depicts a suggested framework for the relationship between the choice of a therapeutic agent and humanistic outcome. Before improvements in health status and patient satisfaction were widely recognized as goals of therapy, the decision about the success of an intervention was based on a favorable balance between the effectiveness and the safety from the clinician's point of view. In this model, effectiveness and safety are no longer the only factors considered to evaluate success. The effects of symptom relief and adverse events, from the patient's perspective, become the main measure of success. For example, even though selective serotonin-reuptake inhibitors are shown to be very effective in the treatment of depression, some patients report insomnia and nightmares. On a depression rating scale, the patient may achieve a score that indicates relief from the symptoms of depression. Patients may simultaneously report in a self-administered health-related quality-of-life (HRQOL) questionnaire they have low vitality and low scores in role-functioning, both indicating poor functioning from the patient's viewpoint. When the patient is questioned about the low scores, it could be discovered that she is a single parent who needs to maintain a job to support her children. Her job requires concentration and alertness during the day, and the drug, although effective and seemingly safe, interferes with her daily functioning, and what is important to her.

Another intermediate factor is the patient's ability, or willingness, to pay for the prescribed therapy. The patient's perception of the effectiveness, or experience, of side effects on health status, as well as financial constraints, can influence willingness to continue to purchase the drug. Nonadherence to therapy, a significant problem with drugs effectiveness, can actually have a positive effect on functional health status as perceived by the patient. The relationship of compliance to outcomes is of growing importance as the study of health status and patient satisfaction matures. It is impossible to establish a relationship between a therapeutic intervention, and its outcome, without the assurance that the patient has taken the prescribed therapy. In addition to willingness to pay and compling, patients' knowledge of their therapy and the dosing schedule influence the humanistic outcomes and each other. Even though many of these relationships are

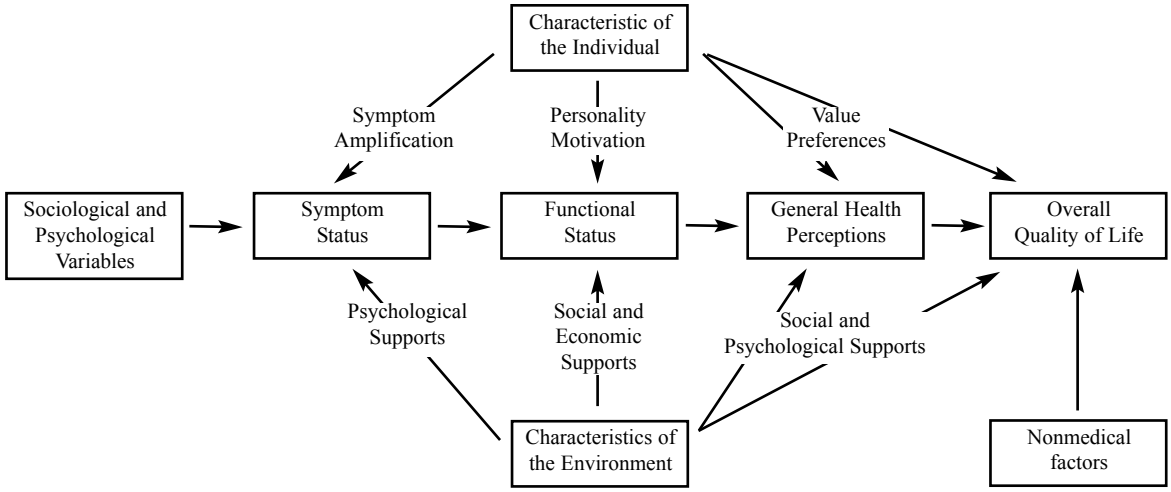

Figure 3. Relationships among measures of patient outcome in a HRQOL conceptual model.
Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. JAMA 1995;273(1):59–65. Reprinted with permission.

studied, there is much room for advancement in understanding the relationships of each of these intermediate variables to humanistic outcomes.

The methods of pharmacoeconomic evaluation strive to assess the value of pharmaceutical products and services, and incorporate several types of outcomes, including those of a clinical, economic, and humanistic nature, in assessing this value to the health care system. This series focuses on the assessment of economic and humanistic outcomes and its applications to patient care. The assessment of clinical outcomes is beyond the scope of the series, and will be addressed in global terms only.

Costs

Traditional cost-containment measures are not always synonymous with improved patient care. Thus, attention has turned toward demonstrating the value of health care. It is critical that the health care products and services used in today's institutions and organizations achieve the highest possible benefit from the dollars spent. Quantification of the value of health care products and services, especially pharmaceuticals, is critical today.

Before a full discussion of the methods of economic evaluation can take place, it is important to examine closely the various categories of costs and consequences that can be included in an economic evaluation. A full evaluation of the relevant costs and consequences differentiates pharmacoeconomics from traditional cost-containment strategies and drug use evaluations. Costs are defined as the value of the resources consumed by a program or treatment alternative. Consequences are defined as the effects, outputs, and outcomes of the program or treatment alternative. This section focuses on identifying, measuring, and comparing the costs, or economic outcomes of health care interventions.

A comparison of two or more treatment alternatives should extend beyond a simple comparison of drug acquisition costs. Cost categories that need to be considered include direct, indirect, and intangible costs. Other costs often discussed in pharmacoeconomic evaluations include opportunity and incremental costs. Including these various cost categories, when appropriate, will provide a more accurate estimate of the total economic impact of a health care program, or treatment alternative, on a specific population, organization, or patient. Each of these types of cost categories are discussed in greater detail.

Direct Costs

Direct costs are the resources consumed in the prevention, detection, or treatment of a disease or illness. These costs can be divided into direct medical and direct nonmedical costs. Direct medical costs quantify the fundamental transactions associated with medical care, and are the costs that contribute to the portion of gross national product spent on health care. An example of costs associated directly with health care interventions include hospitalizations, drugs, medical supplies and equipment, laboratory and diagnostic testing, and physician visits.

Direct medical costs can be further subdivided into fixed and variable costs. Fixed costs represent the overhead costs that are relatively constant and not readily influenced at the treatment level. Thus, they are typically not included in most pharmacoeconomic evaluations. Some examples of fixed costs are those incurred for heat, rent, and lighting. Variable costs, on the other hand, vary as a function of volume and include drugs, fees for a professional service, and supplies. Thus, as a greater number of services are used, more funding must be consumed to provide these services. Shifts in variable costs are particularly important as a means of assessing the cost-effectiveness of a treatment alternative.

Some controversy exists as to whether personnel costs should be considered as fixed or variable costs. For example, in a hospital setting, one might ask whether

switching from a treatment that requires administration 4 times daily to one administered once daily truly saves time for pharmacy technicians, pharmacists, and nurses. Some argue that staffing of these personnel is relatively constant, regardless of the number of patients or number of doses, and that such a change would not cause the hospital to lay off personnel. Others feel that an intervention, such as the one described, frees time for these personnel to perform other activities that provide value and, thus, should be treated as a variable cost. Certainly in this time of "downsizing" or "rightsizing," personnel are often viewed as variable costs by administrators.

Direct nonmedical costs also contribute a significant portion to the total direct cost of a treatment alternative. These are the costs for nonmedical services that are the result of illness or disease, but do not involve the purchase of medical services. Thus, these costs are consumed to purchase services other than medical care, and include resource expenditures borne by patients in seeking care. For example, direct nonmedical costs may include transportation to and from health care facilities, extra trips to the emergency department, attendant child or family care expenses, special diets or clothes, and various other out-of-pocket expenses.

Indirect Costs

Indirect costs are also necessary to consider in the full economic evaluation of a program or treatment alternative. Indirect costs are a less obvious, but no less important source of resource consumption, especially from the perspective of the patients. Indirect costs are those costs that result from morbidity and mortality. These costs are related to changes in production capacity that result from disease or health care interventions. Morbidity costs are costs incurred from missing work, that is, lost productivity. Mortality costs are the costs incurred due to premature death.

To estimate indirect costs, two techniques typically used are the human capital method, and the willingness-to-pay method. Each method attempts to estimate different types of costs. The human capital approach attempts to value morbidity and mortality losses based on an individual's earning capacity. Thus, the value of a life is directly related to income. To estimate the earnings foregone or gained as a result of the illness, the human capital approach uses standard labor wage rates. Because all segments of the population do not have the same level of earnings, using this approach raises an ethical dilemma. Some individual groups such as the elderly, children, and the homeless earn virtually nothing at all. Thus, valuing "imputed" wages of some segments of the population may be an acceptable means of more fairly assigning a value to indirect costs.

In the willingness-to-pay approach, patients are explicitly asked how much money they would be willing to spend to reduce the likelihood of illness. The values obtained through this method are often unreliable because there may be up to 200-fold differences in valuations of life due to pay estimates that are not realistic relative to ones ability. It should be noted that while the willingness-to-pay approach incorporates indirect and intangible costs, the human capital approach considers only changes in work loss and productivity due to morbidity and mortality.

Intangible Costs

Intangible costs are probably the most difficult costs to measure. Intangible costs are those costs incurred that represent nonfinancial outcomes of disease and medical care, and which are not properly expressed in monetary terms. Examples of intangible costs include pain, suffering, inconvenience and grief. Typically, these types of costs are identified in an economic analysis, but often not formally quantified. These costs can either be presented as a caveat in the discussion of the results of an economic evaluation or converted into a common unit of outcome measurement such as a quality-adjusted life-year (QALY).

Incremental Costs

As medical interventions become increasingly intense, costs typically increase. However, due to the economic principle of decreasing incremental returns, the additional outcome gained per additional dollar spent typically decreases. At some point of increasing expenditures, there may be no additional benefits, or even a reduction in outcome. Thus, incremental costs may be another way to assess the economic impact of a program or treatment alternative on a population. Incremental costs represent the additional cost that a program or treatment alternative imposes over another, compared to the additional effect, benefit, or outcome it provides. In other words, incremental costs are the extra costs required to purchase an additional unit of effect.

Opportunity Costs

If a resource is used to purchase a program or treatment alternative, then the opportunity to use it for another purpose is lost. This is referred to as an opportunity cost. This cost represents what could have been produced or purchased with the same resources if the treatment alternative in question was not purchased. In other words, opportunity cost is the value of the alternative that was forgone.

Consequences

Full pharmacoeconomic analyses provide an assessment of the efficiency, and are determined according to the amount of output per unit of input, of one alternative versus another. Compared to the costs of the inputs, the outcomes, or consequences of a disease and its treatment, comprises an equally important component of this research. Although the assessment of costs is relatively similar across the various methods, the manner in which consequences are assessed represents the key distinction among these techniques. Regardless of the method used, good assessments of relative consequences of competing alternatives allows researchers to balance the costs of a program or treatment with their consequences or benefits.

Positive versus Negative Consequences

Most often, benefits of drug therapy are characterized in terms of beneficial effects to the patient. However, a comprehensive assessment of benefits will address both

positive and negative effects of competing alternatives. Positive consequences may translate into life-years gained, cases cured, disability days avoided, and improved functional status and well-being. Conversely, because drug products are not devoid of adverse effects, negative consequences also may result. Negative consequences can include harmful side effects, exacerbation of disease, drug toxicity, treatment failure, or even death. Thus, the balancing of positive and negative consequences is critical. For example, the consequences component of an analysis of an aminoglycoside would reflect not only the positive consequences associated with curing an infection, but the potential negative consequences associated with drug toxicities, such as nephrotoxicity.

Intermediate versus Final Consequences

Intermediate consequences are commonly used in clinical trials to demonstrate clinical efficacy because their use reduces the cost and time required to conduct a clinical trial. For example, achieving a decrease in low-density lipoprotein cholesterol levels achieved with a lipid-lowering agent is an intermediate consequence. This intermediate outcome serves as a proxy for more relevant final outcomes, or consequences, expressed as a decrease in myocardial infarction rate and an increase in lives saved. Intermediate consequences are used often in cost-effectiveness analyses as proxies predictive of final consequences of interest. The challenge lies in finding intermediate outcome indicators that can reliably predict long-term effects.

Balancing Costs and Consequences

Balancing costs and consequences is the essence of pharmacoeconomic evaluation. Regardless of the method of economic evaluation used, the objective of pharmacoeconomic research is to provide information regarding the relative value of treatment alternatives through an explicit attempt to balance the costs and consequences of each alternative. Typically, results of this approach will be reported in terms of a cost per unit of effect. The primary distinction among the various methods of economic evaluation rests in the valuation of the consequence side of the equation. This chapter summarizes specific methodological approaches of balancing costs and consequences. Subsequent chapters describe each method in greater detail.

Perspectives

Many perspectives are possible in the economic and humanistic evaluation of medical care. Perspective refers to the point of view from which the economic analysis is performed. These perspectives, or viewpoints, will influence the costs and consequences identified, measured, and compared for a program or treatment alternative. An economic evaluation can be conducted from a single perspective, or multiple perspectives. Common perspectives include those of the patient, provider, payer, and society. The value of a treatment alternative will be heavily dependent on the point of view taken. A variety of perspectives are shown in Figure 4.

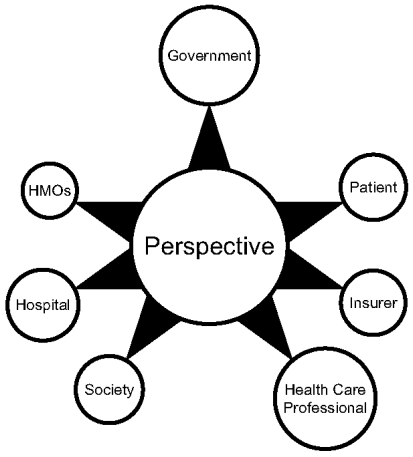

Figure 4. Potential Perspectives for Pharmacoeconoic Evaluations

Patient Perspective

Patients are the ultimate consumers of health care services. Costs from the perspective of patients are essentially what they pay for a product or service, that is, the portion not covered by insurance. Other costs incurred due to illness or treatment, including morbidity and mortality costs, may be captured using this perspective. Consequences from a patient's perspective are the clinical effects of a program or treatment alternative. Costs from a patient's perspective might include insurance co-payments and out-of-pocket drug costs. Also, indirect costs, in terms of health-related work and living limitations are also important from the patient perspective. Additionally, patients are concerned with the positive and negative consequences of a given treatment. The patient's perspective should be considered when assessing the impact of drug therapy on quality of life, or if a patient will pay out-of-pocket expenses for a health care service.

Provider Perspective

Costs from the provider's perspective are the true expense of providing a product or service, regardless of the charge. Few providers are prepared to identify and measure their true economic costs. Charge data may be more readily available, but are usually not reflective of the true costs of health care. Providers can be hospitals, managed care organizations, or private practice physicians. The primary costs from a provider's perspective are of a direct nature. For example, drugs, hospitalization, laboratory tests, supplies, and salaries of health care professionals may be appropriately identified and measured from a provider's perspective. Indirect costs, on the other hand, may be less important from the provider perspective since these expenses are not realized by the provider. When making formulary management, or drug use policy decisions, the viewpoint of the health care organization should dominate. The exception would be when making decisions for a Medicaid or Medicare formulary where the government, or societal perspectives, should dominate.

Payer Perspective

Payers include insurance companies, the government, or employers. Medicare, Blue Cross/Blue Shield, and Motorola are all examples of payers. The costs to the payer are those charges for health care products and services allowed, or reimbursed, by the payer. Again, the primary cost from a payer's perspective are direct costs. However, indirect costs, such as lost workdays and decreased productivity also may contribute to the total cost of health care to the payer. For example, if a patient has peptic ulcer disease, his or her employer may lose the patient's services for 30 days out of the work year. This represents an indirect cost to the employer, who incurs the loss of 30 productive days for this employee. The payer's perspective should be used when insurance companies and employers are contracting with managed care organizations, or selecting employee health care benefits.

Societal Perspective

Society is another potential perspective for pharmacoeconomic evaluations. This perspective is the broadest of all perspectives because it is the only one that considers the benefit to society as a whole. Many researchers assert that society is the best perspective for all economic evaluations. In general, all direct and indirect costs are included in an economic evaluation performed from a societal perspective. Costs from a societal perspective include patient morbidity and mortality costs, and the overall costs of giving and receiving medical care. Also, the perspective that dominates in the health economic literature is that of society. From a societal perspective, all of the important costs and consequences an individual member of society could experience may be included in a complete evaluation of a health care program or treatment alternative. In countries with nationalized medical systems, society is the predominant perspective.

Controversy in Choosing a Perspective

There is some controversy surrounding the issue of a study perspective. Many researchers assert that society is the only relevant, as well as the best perspective from which to conduct an economic analyses from. However, in the United States these studies can be very resource intensive, in terms of time and money. Further, in the real world, organizations may need to focus solely on a single perspective to obtain the data necessary to inform timely decision-making on a local level. Regardless of the perspective chosen, perspective is fundamental because all costs and consequences identified, measured and compared will depend on it.

Misuse of Pharmacoeconomic Terms

No phenomenon has contributed more to the confusion surrounding pharmacoeconomic terminology than the indiscriminate use of these terms in the health care literature. Several studies were conducted in recent years documenting this misuse of economic terminology. Undoubtedly, the most commonly misused term is "cost-effective." The issue was first raised when in 1986 when various misinterpretations of the term cost-effective were reported in the New England Journal of Medicine (see Reference 6). Once common misinterpretation equates cost-effectiveness with "cost-savings." A second misinterpretation equates cost-effectiveness with being "most effective." Both of these interpretations are incorrect, as each considers only one-half of the cost versus consequences.

Economic Assessments

The fundamental task of economic evaluations is to identify, measure, value, and compare the costs and consequences of the alternatives being considered. The two distinguishing features of economic evaluations are that there is a comparison of two or more treatment alternatives, and that both costs and consequences of the alternatives are examined. Pharmacoeconomic evaluations may consist of either partial or full economic evaluations. In general, a full economic evaluation encompasses both of these important features, whereas a partial economic evaluation addresses only one of these features.

Full Evaluations

Full economic evaluations are necessary to comprehensively assess the economic costs and benefits of program and treatment alternatives. Full economic evaluations include cost-minimization analysis (CMA), cost-benefit analysis (CBA), cost-effectiveness (CEA), and cost-utility analysis (CUA). Although each of these methods vary in several important ways, they can all provide a comprehensive analysis of both the costs and consequences of evaluated alternatives. Full economic evaluations are necessary for evaluating an intervention as part of a resource allocation decision. They are also useful for determining what drugs to include, or exclude, to or from a formulary list, or as part of a disease management program.

Limitations of Full Economic Analyses

Full economic evaluations do have some limitations. Each method for comparing costs and consequences has its own distinct limitations and assumptions associated with it, thus, practitioners must be aware of these. Further, although the quality and usefulness of the information is much greater with a full economic evaluation, the amount of time and effort necessary to conduct the evaluation is also much greater.

Various methods of economic evaluation are listed in Table 2 and include cost-of-illness (COI) evaluation, CMA, CBA, CEA, and CUA. Each method, except COI, is used to compare competing programs or treatment alternatives. Also, they are similar in that they measure cost in dollars, but differ in their measurements of outcomes and applications. The purpose of this section is to introduce

Table 2. Common Economic Evaluation Methodologies

Methodology	Cost Unit	Outcome Unit
Cost-of-illness	Dollars	Not assessed
Cost-minimization	Dollars	Assumed to be equivalent in comparative groups
Cost-benefit	Dollars	Dollars
Cost-effectiveness	Dollars	Natural units or units of effect
Cost-utility	Dollars	Quality-adjusted life years or other utility

these methods to readers. A more complete in-depth discussion of each of these methodologies is presented in upcoming chapters.

Partial Evaluations

Partial economic evaluations examine only a portion of the costs versus the consequences question. They may include only a simple descriptive tabulation of outcomes or resources consumed. If only consequences or costs of a program's service or treatment are described, then the evaluation illustrates a simple outcome or cost description and is not considered a full evaluation (which evaluates both costs and consequences and compares them to other treatment options). For example, a study in which the costs and consequences are described, but not compared to alternative options, is referred to as a cost-outcome analysis. Other examples of partial evaluations include efficacy evaluations and cost analyses. A cost analysis compares the costs of two or more alternatives without regard to outcome.

Cost of Illness

A COI evaluation identifies and estimates the overall cost of a particular disease in a defined population. This method, often referred to as burden of illness, measures the direct and indirect costs associated with a specific disease or illness. The costs of many diseases in the United States are estimated, including diabetes mellitus, peptic ulcer disease, and cancer.

By identifying the direct and indirect costs of an illness, one can determine the relative value of a treatment or prevention strategy. For example, by determining the cost of a particular disease to society, the costs of a prevention strategy could be subtracted to yield the cost-benefit of implementing this strategy nationwide. Cost-of-illness is not used to compare competing treatment alternatives, but to provide an estimation of the financial burden of a disease. Thus, the value of prevention and treatment strategies can be measured against this illness cost. This economic evaluation methodology is further examined and described in Chapter 6.

Cost-minimization Analysis

Cost-minimization analysis is a tool used to compare two or more treatment alternatives that are equal in efficacy. Cost-minimization analysis compares the costs of treatment alternatives in dollars. Outcomes are not compared because of the underlying assumption that the treatment alternatives are therapeutically equivalent. Thus, the primary focus of this analysis is to determine the least costly alternative.

Cost-minimization analysis is a relatively straightforward and simple method for comparing competing programs or treatment alternatives. However, if no evidence exists to support the therapeutic equivalence of the alternatives being compared, another method should be used. It should be noted that CMA only shows a cost-savings of one treatment or program over another. An example of the appropriate use of CMA would be to compare a brand-name product to a generic equivalent. Because the outcomes associated with the two drugs are equivalent, costs alone can be compared. Cost-minimization analysis also may be useful when comparing therapeutic agents in the same therapeutic class, assuming that they have demonstrated equivalency in safety and efficacy. The costs of these agents would be identified, measured, and compared. However, the costs must extend beyond those for drug acquisition, and should include all relevant costs incurred for preparing, administering, and monitoring the drugs. This economic evaluation methodology is further examined and discussed in Chapter 7.

Cost-benefit Analysis

Costs and outcomes, or benefits, are both valued in monetary units when performing a CBA. In a CBA, the benefits accrued from a program or intervention, and all of the costs of providing a program or intervention, are identified and converted into equivalent dollars in the year they will occur.

Results of these analyses are typically expressed as either a cost-benefit ratio, or a net cost or benefit. For example, if the cost associated with a treatment is $100, and the outcome resulting from the treatment is valued at $1000, then the cost-benefit ratio, would be expressed as the benefit ($1000) divided by the cost ($100) or as 10:1. This ratio could be interpreted as a treatment alternative that produces $10 of benefit for every $1 spent. Alternatively, by subtracting the costs, $100, from the benefits, $1000, these results could be expressed as a $900 net benefit. Thus, when comparing two treatment alternatives, the alternative with the greatest cost-benefit ratio, or net benefit, would be considered the most efficient use of resources. It should be noted that the results of a CBA are most commonly expressed as a net cost or benefit, because it is sometimes misleading to simply compare ratios. A program that costs $100,000 and results in a benefit of $1,000,000 also yields a cost-benefit ratio of 10:1. However, the relative magnitude of these costs and benefits are dramatically different from others that yields 10:1.

The appropriate time to use CBA is when comparing treatment alternatives or programs where outcome can be expressed in monetary terms. Using CBA, treatment alternatives with different outcomes also can be compared because they are converted into the common denominator of dollars. Cost-benefit analysis may be an appropriate method to use when justifying and documenting the value of an existing pharmacy service, or the potential worth of a new one. Cost-benefit analysis may be particularly useful when

allocating scarce funds to competing programs. This economic evaluation methodology is further examined and discussed in Chapter 8.

Cost-effectiveness Analysis

When treatment alternatives are not therapeutically equivalent, or when it is not desirable to express outcomes in monetary units, CEA may provide a more comprehensive evaluation method. Cost is measured in monetary units and outcomes are expressed in terms of obtaining a specific therapeutic objective. These outcomes are expressed in physical, natural, or nondollar units such as cases cured, lives saved, or mm Hg drop in blood pressure. Cost-effectiveness analysis allows researchers to summarize the health benefits and resources used by competing programs so that policy-makers can choose among them. The difference between a cost-effective alternative and one with cost-savings is that cost-savings refers to a competing alternative that is less expensive. However, a cost-effective alternative does not always mean the comparator is less expensive. In fact, a product or service may be considered cost-effective compared to competing alternatives if one of the following three conditions are met. First, a cost-effective alternative may be less expensive, and at least as effective as its comparator. Second, a cost-effective alternative may be more expensive while providing an additional benefit that is worth the additional cost. Third, a cost-effective alternative may be less expensive and less effective in those cases where the extra benefit is not worth the extra cost.

Cost-effectiveness analysis attempts to reveal the optimal alternative, which may not always be the least costly alternative, for accomplishing a desired objective. In this regard, cost-effectiveness need not be cost reduction, but instead should be considered as cost optimization. Cost-effectiveness analysis provides the means to determine and promote the most efficient drug therapy. Another way to say this is that CEA seeks to identify the alternatives that yield the best health care outcome per dollar spent.

The results of a CEA can be expressed either as the average cost-effectiveness ratio (ACER), or as the incremental cost-effectiveness ratio. Average cost-effectiveness ratios represent the average cost of obtaining a specific therapeutic outcome, spread over a large population. An incremental cost-effectiveness ratio represents the additional cost, and additional benefit, when one option is compared to the next most expensive or intensive option.

The decision to use average versus incremental cost-effectiveness ratios is controversial. An ACER reflects the cost per benefit of a new strategy independent of other alternatives, whereas an incremental cost-effectiveness ratio reveals the cost per unit of benefit of switching from one treatment strategy that may already be in operation to another treatment strategy.

Making a formulary management decision regarding whether to add drug A or drug B to the formulary can best illustrate this concept. Imagine drug A is an antibiotic with a 90 percent efficacy, or cure rate, with a total treatment cost for 100 patients of $50,000. The ACER of drug A is calculated by dividing the cost, $50,000, by the outcome, 90 cures, to yield an ACER of $555 per cure. Drug B has a 95 percent cure rate and costs $100,000 to treat 100 patients, yielding an ACER of $1053 per cure.

To determine the incremental cost-effectiveness ratio, or additional cost required to obtain additional cures with drug B, the cost of drug A, $50,000, is subtracted from the cost of drug B, $100,000, and this is then divided by the cures from drug A, 90, subtracted from the cures resulting from drug B, 95. Thus, the incremental cost for each additional cure with drug B is $50,000 divided by five cures or $10,000 per cure.

($100,000 - $50,000)
(95 - 90 cures)
= $10,000 per cure

Using the ACER, it appears that the additional benefit gained by using drug B costs $498 per cure, which is the difference between the ACERs of drug B and drug A. However, this cost represents the difference per patient, spread over the 100 patients that were treated. Only the incremental cost-effectiveness ratio allows you to pose the question of whether one additional cure is worth spending $10,000 when a cure with drug A can be achieved for $555. The decision to use drug A or B is often dependent on the severity of the infection. A cost of $10,000 to cure one case of otitis media may be deemed excessive by a pharmacy and therapeutics committee, but it may be acceptable to use drug B in cases of life-threatening sepsis.

Cost-effectiveness analysis is useful when comparing competing programs or treatment alternatives that differ in therapeutic or clinical outcome. By calculating a summary measurement of efficiency, alternatives with different costs, efficacy rates, and safety rates can be fairly compared along a level playing field. This economic evaluation methodology is further examined and discussed in the Cost-Effectiveness Analysis chapter.

Cost-utility Analysis

At times, it is desirable to include a measure of patient preference, or quality of life, when comparing competing treatment alternatives. Using CUA, the costs of a treatment alternative are expressed in monetary terms and outcomes or consequences are expressed in terms of patient preference or quality-adjusted life-years. Cost-utility analyses can compare cost, quality, and the quantity of patient years. This method is useful when evaluating programs or alternatives that are life-extending, yet with significant side effects, such as cancer chemotherapy, and those that produce reductions in morbidity, rather than mortality, such as occurs with the treatment or arthritis.

The results of a CUA are most often expressed as a cost per QALY gained, or some other health state utility measurement. Quality-adjusted life-years represent the number of full years at full health that are valued equivalently to the number of years as experienced. For example, a full year of health in a disease-free patient would equal 1.0 QALY, while a year spent receiving dialysis might be valued significantly lower, perhaps as a 0.5 QALY.

Because QALYs and other utility measures are highly subjective measurements, there is a lack of agreement on which scales should be used to measure utility. Also, quantifying patient preferences or quality of health care

outcomes is complex; thus, CUA may be limited in scope of application from a managed care or institutional perspective. However, when quality of life is the most important health outcome being examined, CUA is a method one may consider to use. This economic evaluation methodology is further examined and described in Chapter 10.

Techniques for Analysis

Discounting

Discounting, or adjusting for differential timing, should be performed if the costs and consequences of program and treatment alternatives accrue during different periods of at least 1 year in duration. To be fair and for accurate comparison, the costs and consequences of various alternatives should be evaluated at the same point in time. Discounting will assist in ensuring a fair and complete comparison is possible.

When costs, or consequences of a program or treatment alternative, will occur in the future, these costs and consequences should be reduced or discounted to be more reflective of current fiscal values. Many investigators will repeat the analyses, varying the discount rates, to examine the effects on costs and consequences. Although, there is no standard discount rate specifically recommended for pharmacoeconomic evaluations, current banking interest rates are often viewed as a benchmark. Many investigators recommend that net costs should be discounted to their present value using a rate of 3–8 percent per annum. However, the modal rates used in economic evaluation of health care products and services appear to be about 5 percent.

Sensitivity Analysis

A standard approach for managing uncertainty in an economic evaluation is to perform a sensitivity analysis. Because of the methodological controversies and the almost universal need to make assumptions when conducting economic evaluations, sensitivity analysis is an essential component of any pharmacoeconomic evaluation. Sensitivity analysis is a tool that tests the robustness of economic evaluation results and conclusions. Underlying assumptions or sensitive variables are varied over a range of plausible results. Holding other evaluation parameters constant, the study results are then recalculated. If changing the values of specific variables does not substantially alter the results, one has more confidence in the original findings. Thus, sensitivity analysis provides a measure of robustness, which also may enhance extrapolation of the results.

Variables include those that are clinically relevant. For example, a drug's rate of efficacy, incidence of adverse drug reactions, and dominant cost values may be varied. A sensitivity analysis may reveal at what point one drug gains or loses a cost-effective advantage and due to what variables. Also, the threshold value for changing a drug-use decision may be revealed through sensitivity analysis.

Decision Analysis

Decision analysis is a technique often used in pharmacoeconomic evaluations to structure the logical and chronological order of the analysis. This technique represents an explicit, quantitative, and prescriptive approach to choosing among treatment alternatives. Decision analysis is a systematic, quantitative method of describing clinical problems, identifying possible courses of action, assessing the probability and value of outcomes, and finally making a calculation to select the optimum course of action. Because making drug therapy decisions usually involves these steps, a decision analysis approach often provides a valuable way of structuring many pharmacoeconomic evaluations, especially CEAs.

The tool used in decision analysis is a decision table or decision tree. A decision tree, shown in Figure 5, allows investigators to graphically display all treatment alternatives being compared, the relevant outcomes associated with these alternatives, and the probabilities of these outcomes occurring in a patient population. This tree can allow for the algebraic conversion of all of these variables into one summary measurement, often a cost-effectiveness ratio, to allow for a meaningful comparison of two or more treatment alternatives.

Incremental Cost Analysis

Although the results of economic evaluations are often expressed as averages, it is often more instructive and informative to assess the incremental costs. Incremental cost analysis assesses the additional cost that one treatment, service, or program imposes over another compared with the additional benefits or successes it provides. Thus, incremental analysis focus on the additional costs and additional clinical outcomes of alternative strategies. Incremental cost analysis should be considered for any

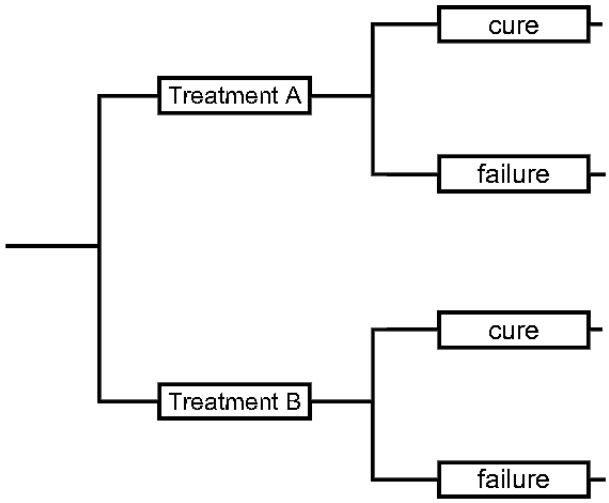

Figure 5. Decision Tree

economic assessment method as a further means of evaluating the data.

Incremental cost analysis is useful when prioritizing health care programs or services for policy decision making. This analysis also may be more useful than average summary measures of efficiency when assessing the value of an alternative that is more expensive but has a greater effect. Thus, incremental cost analysis can be used to answer the question "Is the extra effect worth the extra cost?"

Applied Pharmacoeconomics

Much of the focus of pharmacoeconomics to date is on defining terminology and refining methods and techniques of analyses. Unfortunately, not as much effort is placed on how to apply these methods in the real world to assist pharmacy practitioners and administrators to inform decisions at a local level. Applied pharmacoeconomics is defined as putting pharmacoeconomic principles, methods, and theories into practice to quantify the "value" of pharmacy products and pharmaceutical care services used in "real-world" environments.

There are many benefits that can be realized by applying pharmacoeconomic principles and methods to pharmacy and medical practices. Economic assessments can assist in balancing cost and outcome when determining the most efficient use of health care products and services. When assessing the value of an existing health care service, or the potential worth of implementing a new one, these methods are useful. In general, the application of pharmacoeconomic principles is viewed as a tool to assist health care decision-makers to make better health care decisions. The appropriate application of pharmacoeconomic principles and methods facilitates systematic quantification of the value of health care products and services.

Primary Application of Pharmacoeconomics

The primary application of economic assessments is for contemporary clinical decision making. Common drug use decisions, including formulary management, practice guidelines, drug policy, individual patient treatment, and resource allocation, can be supported using pharmacoeconomic techniques. Economic outcomes data can be powerful tools in determining and promoting the most efficient use of drugs in institutions and organizations. The use of pharmacoeconomics to support each of these decision types is discussed further.

Specific Applications of Economic Evaluations

Formulary Management

Although a formulary is often viewed as a cost-containment tool, it does not always represent a list of the least expensive alternatives. In fact, the purpose of many formularies today is to optimize therapeutic outcomes while controlling costs. Therefore, formulary management decisions should extend beyond evaluating only safety and efficacy, or drug acquisition costs, and include an assessment of the value of health care products and services.

Pharmacoeconomics can assist in determining and supporting various formulary management decisions by providing data regarding which agents are the most efficient for a particular hospital or managed care organization. These data can influence the following formulary decision options:

- Inclusion of newly marketed or other target drugs;
- Exclusion of newly marketed or other target drugs;
- Inclusion, with restriction, of newly marketed or other agents;
- Deletion of drugs from the formulary;
- Curtailing the use of nonformulary items;
- Influencing physician prescribing patterns.

Economic outcomes data can provide critical support for these various formulary decision options.

Practice/Clinical Guidelines

In our current cost-conscious health care environment, it may not be sufficient to determine the treatment alternatives that are the best value, or the most cost-effective. It is also important to determine the best way to use these treatment alternatives in hospitals and managed care organizations. Development of drug use guidelines, policies, or protocols can assist in influencing prescribing and promoting the most cost-effective and desirable use of drugs.

The recent expansion of the outcomes movement fostered by the Agency for Health Care Policy and Research (AHCPR) has sought to standardize the parameters of medical care nationally though decreasing procedural variance, improving therapeutic outcomes, and increasing the appropriateness of medical services paid for by third-party insurers. Although there are many diseases and conditions that have no guideline initiatives, many hospitals and managed care organizations are working to develop guidelines specific to their setting. Pharmacoeconomic principles and methods can be used to determine the treatment alternatives and dosing regimens that are the best value for patients, hospitals, organizations, and payers. A drug use guideline based on a rigorous pharmacoeconomic evaluation may have increased acceptance by other health care practitioners.

Drug Use Policy

At an institution, organization, or government level, policies regarding the appropriate use of health care products and services are made. These policies may be implemented to promote the most efficient use of health care products and services, especially pharmaceuticals. Successful policies can have a significant impact on influencing physician prescribing patterns and the provision of high-quality patient care for the resources available.

A successful drug policy should use the results of pharmacoeconomic evaluations for its development. The health care professionals who may be affected by this policy should be consulted in the policy development phase. Adequate time and resources must be spent on the strategic implementation of the policy. Furthermore, educational strategies should be used, including verbal, written, and on-line communication. However, a policy will only be as

successful as the pharmacoeconomic data, implementation, and educational strategies chosen.

Service or Program Resource Evaluation

The principles and methods of pharmacoeconomics can be useful in determining the value of an existing pharmacy or medical service, or estimating the potential worth of implementing a new service. With fewer health care resources available at most hospitals and managed care organizations, competition for these resources has increased. The determination of economic outcomes can provide the means to demonstrate that a specific pharmacy service maximizes the resources allocated to it by hospital administration.

Through the use of pharmacoeconomic methods like CBA, the return on investment, or other benefits produced by one service, can be compared to another service. Practitioners and administrators can use these data to make more informed resource allocation decisions.

Individual Patient Treatment

When applying the principles and methods of economic outcomes assessment to practice, the most important, but also the most difficult application, is the decision about an individual patient's therapy. Most pharmacoeconomic studies, by design, evaluate different patient groups. Thus, it can be difficult to translate the results to an individual who may not exactly parallel the study group's characteristics. Traditionally, clinical decisions have included assessments of the safety and efficacy, or the clinical outcomes, of drug therapy. Today's decisions also should consider economic and humanistic outcomes of drug therapy.

As our awareness expands from considering just safety, efficacy, and cost in clinical decision making, we also should begin to account for the human consequences. Many researchers, pharmaceutical manufacturers, insurers, employer groups, government agencies, physician groups, and clinicians are now taking an active interest in using pharmacoeconomic principles to measure and monitor humanistic outcomes of health care.

Humanistic Outcome Assessments

In the past decade or so, the situation in clinical research has become more complex. The effects of new drugs or surgical procedures on quantity of life are likely to be marginal. Conversely, there is an increased awareness of the impact of health care on the quality of human life. Therapeutic efforts in many disciplines of medicine, especially those increasing numbers who care for patients with chronic, long-term disease states, are directed equally, if not primarily, to improvement of the quality life, not the quantity of life.

With therapeutic efforts focusing more on improving patient function and well-being, the need increases to understand the relationships between traditional clinical and HRQOL, especially since it is increasingly used as an outcome in clinical trials, effectiveness research, and research on the quality of care. Factors that have facilitated this increased usage include the accumulating evidence that measures of health status are valid and reliable. In an effort to promote a better understanding of linking clinical variables to HRQOL, a valuable distinction between basic clinical medicine and social science approaches to patients' health has been published (see Reference 31). Their model linking clinical variables with HRQOL, includes five levels or subdivisions: biological and physiological factors; symptoms; functioning; general health perceptions; and overall quality of life.

Case Study

A 72-year-old white male with a history of diabetes mellitus, coronary artery disease, hypertension, and emphysema is seen in a general medicine clinic with complaints of increasing shortness of breath and chest pressure. He was seen 8 weeks previously for similar complaints, at which time verapamil 80 mg/3 times/day was prescribed. The patient stated that he took the verapamil for about 10 days, but discontinued therapy because "it was not working." Since then, he noted a gradual decline in his exercise tolerance. He had previously been able to walk one city block without symptoms, but he now becomes short of breath and feels "chest heaviness" when walking across the room. The patient denies palpitations and orthopnea, but does state that he has not been sleeping well lately. His social history is that of a widower who lives with his daughter and one grandson. He denies alcohol use and he quit smoking 5 years ago. Physical examination reveals an elderly, pale, thin male sitting comfortably in a chair. His blood pressure is 135/90 mm Hg, his heart rate is 80 beats per minute, and his respiratory rate is 16 breaths per minute. His lungs are clear and his cardiac examination is normal. There is no evidence of ascites or pedal edema.

Take a few minutes to think about what is missing from the case that would improve your understanding of this patient and his health.

Common to all of health status assessment tools is a theoretical framework that views the measurement of biologic functioning as an essential, but inadequate component for comprehensively evaluating health. Beyond the documentation of organ system function lies the need to assess general well-being and behavioral functioning. This broader assessment of health is seen as necessary because basic biologic abnormalities can extend into a person's behavioral functioning and sense of well-being, disrupting the person's HRQOL. The impact a disease can have on a person's life can be likened to a rock dropped into the center of a still pond as depicted in Figure 6. Ripples are sent out over the entire surface of the water or the entirety of life, extending far beyond central organ dysfunction. All of the outer circles are eventually affected and need to be addressed in a HRQOL assessment to have a comprehensive understanding of a patient's condition.

Missing from the case, as presented, is information about this patient's functioning, how he is doing, how he gets around, how he feels, what his social situation and support system consists of, and level of functioning to which he expects to return.

Evolution of Today's Health Status Outcome Measures

During the 1940s, physicians first began to measure patient functioning; the Karnofsky Functional Status for Patients with Cancer and the New York Heart Association Classification were among the instruments developed during that period. The first health-status measures distinguished among functional states and included symptoms, anatomic findings, occupational status, and daily living activities. Studies began in the 1950s when clinicians examined the functional status of patients with severe disabilities. When social science methods and clinical expertise came together in the 1970s, the first modern health-status questionnaires emerged. The early tools were quite long, but the data they captured were valid, reproducible, and relevant. The focus was multidimensional, providing assessments of physical, psychological, and social health. The development, refinement, and use of the early instruments helped to establish the foundation for today's studies. Typical measures of this period include the Quality of Well-Being Scale, the Sickness Impact Profile, the Health Perceptions Questionnaire, and the Older Americans Resources and Services (OARS) questionnaire; they were used in health services and clinical research as outcome measures. The next generation developed in the 1980s and 90s were the Rand Health Insurance Experiment (HIE) health surveys, the Duke-UNC Health Profiles, the Nottingham Health Profile, and the Medical Outcomes Study (MOS) health surveys, including the SF- 36 Health Survey. For a more detailed discussion of the history and development of health status assessment, see the *Proceedings of the Advances in Health Assessment Conference:* Palm Springs, California. For a more exhaustive list of questionnaires, readers are directed to Spilker.

Variations in Medical Care in Small Areas

The impetus for research on rationality of processes in health care delivery, an issue that the field of outcomes research and guidelines development are meant to address, typically is traced to the work of John Wennberg, who uncovered a phenomenon known as small-area variation. In brief, Wennberg and colleagues noticed large disparities in the rates of various medical procedures in different geographic areas. The differences could not be attributed to differences in the populations, but instead appeared to indicate differences in physician cultures of different regions, where certain treatment strategies became the norm. For example, a 10-fold difference in rates of tonsillectomy was observed just within the six New England states.

The Rand HIE

When it became apparent in the United States, in 1990, that health expenditures accounted for 12.4 percent of the GNP, whereas that proportion was 4 percent, in 1980, and that the rate of growth of health care expenditures was exceeding the rate of inflation, as well as growth in our economy, questions surfaced. Does spending more buy better health? In individual cases, the answer may be an obvious yes or no, but in the population as a whole as of 1983, the point of diminishing (or absent) returns was difficult to identify. This quandary prompted the federal government to support a large-scale controlled trial, now known as the HIE.

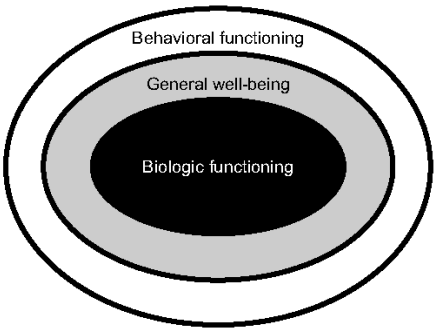

Figure 6. Health Status Concepts
Reprinted with permission from Ware JE.
Conceptualizing and measuring generic health outcomes. Cancer 1991;67(suppl 3):774–9.

One purpose of the HIE was to learn whether the direct cost of medical care, when borne by consumers, affects their health. The researchers found that the more people had to pay for medical care, the less of it they used. Free care had no effect on major health habits that are associated with cardiovascular disease and some types of cancer. Secondly, the study detected no effects of free care for the average enrollee on any of the five general self-assessed health measures.

In addition to these remarkable findings, the HIE presented one of the first major challenges for measuring health status. A consequence of this challenge resulted in one of the most extensive applications of psychometric theory and methods (long used in educational testing), to the development and refinement of health status surveys. Researchers developed or adapted measures to evaluate the effect of cost sharing on health status. At that time, the comprehensive set included four distinct categories—general health, health habits, physiological health, and the risk of dying from any cause related to risk factors. General health was operationally defined as—physical functioning, role functioning, mental health, social contacts, and health perceptions.

The measurement goal in the HIE was to construct the best possible scales for measuring a broad array of functioning and well-being concepts; it demonstrated the potential of scales, constructed from self-administered surveys, as reliable and valid tools for assessing changes in health status. However, it left two questions unanswered: Can methods of data collection and scale construction work in sicker and older populations? In addition, could scales that are more efficient be constructed? The answer to these questions was the challenge accepted by the MOS investigators.

Medical Outcomes Study

The MOS was a 2-year observational study designed to help understand how specific components of the health care system affected the outcomes of care. One of the two original purposes of the MOS was to develop more practical tools for monitoring patient outcomes, and their determinants, in routine practice using state-of-the-art

psychometric techniques. The study, and its many implications and conclusions, are mentioned here for completeness, but any of the multiple publications resulting from this study should be consulted for further details.

Agency for Health Care Policy and Research Agency for Healthcare Research and Quality

To enhance the quality, appropriateness, and effectiveness of health care services and access to these services the federal government in Public Law 101-239 (Omnibus Budget Reconciliation Act of 1989) established the Agency for Health Care Policy and Research (AHCPR). The act, sometimes referred to as the Patient Outcome Research Act, called for the establishment of a broad based, patient-centered outcomes research program. In addition to the traditional measures of survival, clinical endpoints and disease–and treatment-specific symptoms and problems, the law mandated measures of "functional status and well-being and patient satisfaction." In 1999, then President Clinton signed the Health Care Research and Quality Act, reauthorizing AHCPR as the Agency for Healthcare Research and Quality (AHRQ) until the end of fiscal year 2005. Presently, its mission is to improve the outcomes and quality of health care, reduce its costs, address patient safety and medical errors, and broaden access to effective services and improve the quality of health care services.

However, there is a difference between quality-of-life assessment and quality of care assessment. Evaluating and improving the quality of health care services includes improving a patient's health status, but the two are not synonymous. Quality health status outcomes are one facet of defining quality health care, though arguably an ultimate outcome.

Evaluating the Quality of Care

The best measure of quality is not how well or how frequently a medical service is given, but how closely the result approaches the fundamental objectives of prolonging life, relieving distress, restoring functioning, and preventing disability. Lembeche PA. Am J Public Health 1952;42:276–86.

Before attempting to assess the quality of care, either in general, or in any particular situation, it is necessary to come to an agreement on what constitutes quality. To measure quality without a firm foundation of prior agreement on how to define it is to court disaster. The author of a well-established conceptual model suggests measuring quality by observing the performance of other health professionals (see Reference 5). The health professional's management of a clearly definable episode of illness in a given patient is defined as the simplest unit of care. It is possible to divide this management into two domains: the technical and the interpersonal. Technical care is the application of the science and technology of medicine and other health sciences, to the management of a personal health problem. Its accompaniment is the management of the social and psychological interactions between the client and the practitioner. Technical care has been called "the science of medicine" and its counterpart, interpersonal care, is often referred to as "the art of medicine." Assessment of the quality of health care has been classified into three categories. They are structure, process, and outcome. The following section will describe what each of these categories represents, who is involved in the evaluation, and what methods are used to monitor each. Each will be illustrated using an example from a pharmacy practice setting.

Structure of Care

Structure denotes the attributes of the settings in which care occurs. Evaluations of structure address the relatively stable characteristics of the providers of care, of the tools and resources they have at their disposal, and of the physical and organizational settings in which they work. This includes the attributes of material resources, such as facilities, equipment, and money; of human resources such as the number and qualifications of personnel; and of organizational structure such as medical staff organization, methods of peer review, and methods of reimbursement. The concept of structure includes the human, physical, and financial resources that are needed to provide medical care. The term embraces the number, distribution, and qualifications of professional personnel, and so too the number, size, equipment, and geographic disposition of hospitals and other facilities. But the concept also goes beyond the factors of production to include the ways in which the financing and delivery of health services are organized, both formally and informally. The presence of health insurance is an aspect of structure. Structure includes the organization of the medical staff in a hospital, and the presence or absence of a quality review effort. To summarize, the basic characteristics of structure are that it is relatively stable, that it functions to produce care, or is a feature of the environment of care, and that it influences the kind of care provided. Inspectors, engineers, architects, national licensing boards, and medical boards complete evaluation of the quality of the structure of a health system. The measurement of structure has many different units. For example, the number of licensed physicians, assurance that all practicing physicians are licensed, and that the building conforms to fire and safety codes are all measures of structure. Researchers have proposed examples of structure criteria by which to evaluate the quality of pharmaceutical care (see Reference 9). These criteria are numerous and include a variety of characteristics, some of which are the presence of appropriate drug information references, having sufficient inventory and record-keeping capabilities, having adequate physical space, availability of trained technicians, and financial stability.

Process of Care

The *process* of care denotes what is actually done in giving and receiving care. It includes the patient's activities in seeking care and carrying it out, as well as the practitioner's activities in making a diagnosis and recommending or implementing treatment. The primary objective of evaluation is to examine a set of activities that go on within and between practitioners and patients. Quality of the process of care is viewed as normative behavior. The norms are derived either from the science of medicine, or the ethics and values of society. Measurements of process are determined by previous scientific research and discoveries and through published literature that defines accepted standards. Most evaluations of the process of care

have roots in peer review. One example of how the system monitors processes through the use of Peer Review Standard Organizations for physician peer review. In this system, peers have developed, discovered, or otherwise set precedents for practice standards that become accepted by the medical community. The evaluation of process is then conducted by applying those accepted practice standards to the applicable health care professionals. A judgment concerning the quality of the process is made either by direct observation or by review of recorded information. Dispensing drugs to a patient is one measure of the process of pharmaceutical care. In one proposed strategy, there are both technical and interpersonal aspects to this process of care (see Reference 5). The technical responsibilities of the pharmacist include gathering prescription information, entering the prescription into a computer, reviewing the patient's profile, obtaining the drug from stock, labeling the drug container, assessing if the correct drug and dosage is prescribed, checking for drug allergies and drug interactions, monitoring for adverse events, and assessing if the patient is adherent to their regimen. In this example, the interpersonal skills of listening, being empathetic to the patient, being friendly, and showing concern and consideration are equally important elements of the process of dispensing a drug.

Outcomes of Care

The *outcomes* of care denote the effects of care on the health status of patients and populations. Improvements in patients' knowledge and salutary changes in patients' behaviors are included under a broad definition of health status, and so is the degree of each patient's satisfaction with care. Although most health professionals agree that quality outcomes are a goal of care, little emphasis is placed on their evaluation, and even less on documenting achievement of success. Because patient knowledge, behaviors, and satisfaction are the outcomes of interest, patients are the best sources of information for evaluating these outcomes. These patient-based evaluations are accomplished by using surveys that are scientifically designed and tested for reliability and validity. Surveys also may be interviewer administered or take place by telephone. The use of patients' assessments of their care and their health has received increased attention over the past few decades. Currently, patient self-administered questionnaires are used for making health care policy decisions as well as in clinical practice. However, the methods used to create these questionnaires predate the current awareness in the health care community.

Definitions

Quality of Life refers to an evaluation of all aspects of our lives, including such things as where we live, how we live, how we play, and how we work. Health-related quality of life encompasses only those aspects of life that are dominated or significantly influenced by personal health or activities performed to maintain or improve health.

Health-related quality of life1 is a specifically focused area of investigation within the larger field of health services and quality of life research. Standardized questionnaires are used to capture health-related quality of life data in a variety of research settings. These standardized questionnaires may be self-administered, or completed via telephone or personal interview, by observation, or by postal survey. More recently, computers and Internet technology have become a mode of administration. Health is just one of 12 domains of life that are considered when researching and evaluating a person's overall quality of life. The other 11 domains are listed in Table 3 and include community, education, family life, friendships, housing, marriage, nation, neighborhood, self, standard of living, and work. The term HRQOL was adopted by researchers to set their research apart from the more global concept of quality of life and to more accurately reflect the scope of their research.

Measurement

Now that we have defined HRQOL, and know what it is that we want to measure, we need to discuss a mechanism for achieving this goal. *Measurement* is a set of numbers or rules used to quantify a physical attribute. Examples of measurement devices are rulers, thermometers, and scales. Think for a moment how you might go about measuring a table. To measure a table, you need to measure the attributes of that table so you can describe it to someone who has never seen it. You would say that it has four legs, that each leg is 10 inches high, and that the table is 4 feet long and 3 feet wide. Width, length, and height are all attributes of the table. In the same way, physical functioning and mental health are attributes of health. One cannot just expect to be able to measure health—you need to measure the attributes of health. An important feature of health is its dimensionality.

Health has distinct components that must be measured and interpreted individually to fully understand health at a given point in time, as well as changes over time. Clues about the components can be found in the definitions of health offered by the World Health Organization as well as in dictionaries. The World Health Organization has defined *health* as a state of complete physical, social, and mental well-being, not merely the absence of disease or infirmity. Dictionary definitions also identify both physical and mental dimensions of health. The former pertains to the body and bodily needs, the latter to the mind, and particularly, to the emotional and intellectual status of the individual. Health connotes completeness, where nothing is missing from the

Table 3. Twelve Domains of Life

Community	Marriage
Education	Nation
Family Life	Neighborhood
Friendships	Self
Health	Standard of Living
Housing	Work

person; it also connotes proper function, where all is working efficiently. The dictionary also suggests well-being, soundness, and vitality as important components of health. Thus, both the World Health Organization and dictionary definitions provide clear precedents for the dimensionality of health and, specifically, for the distinction between physical and mental health. Empiric evidence in support of this distinction is also quite convincing. To summarize, two features of these definitions are crucial; namely, the dimensionality of health and the existence of a full range of health states ranging from disease to well-being.

Many measurement scales artificially restrict the range of individual differences enumerated. Consistent with a disease orientation, most disease specific measures emphasize the negative end of the health continuum. The result is a substantial loss of information. The situation is analogous to a scale for measuring weight that ends at 100 pounds. All objects weighing more are assigned the same score. This would be satisfactory in a world where nothing weighed more than 100 pounds or where differences greater than 100 pounds were irrelevant. Figure 7 illustrates how both the positive and negative ends of the range might be considered when evaluating mental health status. In measuring health, just as in measuring the table, it is important to be able to express each attribute in relationship to the others. To do this, a complete strategy is needed.

Measurement Strategy

To provide an assessment of HRQOL, one of three approaches is usually taken. Researchers can either select tools that focus on general health status, or they can chose tools that are more narrowly focused on specific aspects of the disease under study. For a comprehensive picture of patients' HRQOL, it is often desirable to include both types of assessment tools in research projects having a HRQOL objective. As mentioned, it is important to remember that health is a multidimensional concept that extends over a wide range of a continuum. For example, measurement of mental health necessitates inclusion of both negative and positive ends of the spectrum. Measurement of physical health should include elucidation of vigorous activities as well as basic functions such as bathing and dressing oneself.

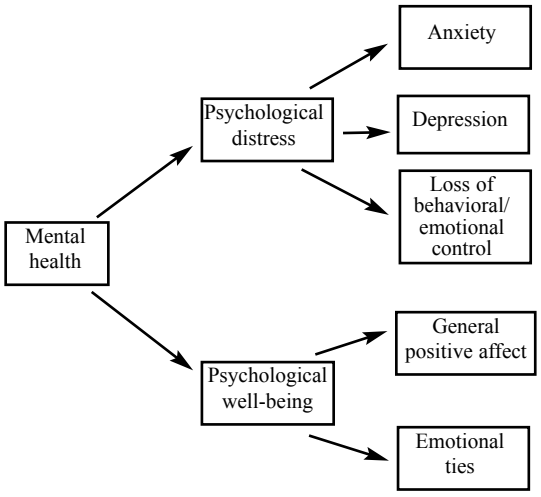

Figure 7. Positive and negative ends of mental health status

Though measurement strategies for different health status instruments may be slightly different, there are some commonly agreed upon and frequently measured general health concepts that can be identified and discussed. These concepts are 1) physical functioning; 2) mental functioning; 3) social and role functioning; and 4) general health perceptions. By denoting a measure as a general health status measure, it is understood that the questions are not disease or disorder specific, and they cover a range of health states from a life-threatening condition to an overall sense of well-being. General measures evaluate aspects of health relevant to all ages, races, sexes, and socioeconomic backgrounds and permit examination of treatment benefits in comparable units.

Medical outcomes study researchers compared and reported the functional status and well-being of patients with chronic conditions using general health measures (see Reference 27). The authors reported the usefulness of generic (nondisease specific) health measures for monitoring progress and for use as outcomes in studies of patients with chronic conditions. The authors maintain that there are several advantages of general measures of functional status and well-being over disease specific measures. Among these, they note, first, they are useful for monitoring patients with more than one condition, and secondly, for comparing patients with different conditions by providing a common yardstick. Lastly, the same measures can be appropriately applied to both general (well) and patient (sick) populations with the advantage of comparing patient groups (sicker) against the healthy standard of a general population.

Commonly Measured Domains of Health in General Health Status Assessment

General health status instruments evaluate aspects of health relevant to all ages, races, sexes, and socioeconomic backgrounds. Questions in a general health status questionnaire are not defined by the disease or disorder under study. These questions have historically covered the full range of the state of disease or illness, and have therefore emphasized the negative end of the health continuum. Increasingly, this limitation in older general health status instruments is being recognized and outcomes researchers are now constructing general health status tools that extend measurements into the well-being end of the health spectrum. General health status tools are, by definition, multidimensional and evaluate at least four key health concepts, which include physical functioning, social and role functioning, mental health, and general health perceptions. Table 4 lists these key health concepts and indicates how they might be assessed.

Physical Functioning

Physical functioning, as it relates to HRQOL assessment, typically refers to the limitations, or disability, experienced by the patient over a defined period. The questions focus on observable and important physical limitations easily noticed and evaluated by the patient or observer. Among such limitations are difficulties in walking, eating, or dressing. In the past, questions concentrated on the negative end of the physical functioning continuum and provided no insight into the well range of physical functioning where activities such as playing sports and running might be noted. Measures of physical functioning should not be confined only to limitations and disabilities. Rather, these measures also should include questions regarding activities of daily living, energy level, satisfaction with physical condition, and ability to perform all levels of activities ranging from the most basic to the most vigorous. Without questions covering the entire continuum of this domain, only those people with physical limitations or disabilities will be identified, evaluated, and segmented for research purposes; any differences among respondents without significant physical limitations or disabilities will be lost by assessments that do not include the well end of the range. In addition to physical limitations, specific concepts often included in general health status questions about physical abilities, days in bed, bodily pain, and more recently, physical well-being. Table 5 delineates these components of the physical domain, and how they are incorporated into a variety of general health assessment instruments.

Social and Role Functioning

Although social and role functioning are often thought of as a single entity and used interchangeably, they are distinct concepts in terms of HRQOL. Social functioning questions address the extent to which a person participates in social interactions, and also the satisfaction derived from these interactions and from the social network that person has established. Role functioning questions are concerned with those duties and responsibilities that are limited by an individual's health.

Social Functioning

Social functioning is defined as the ability to develop, maintain, and nurture mature social relationships. Social well-being is separated into two areas that include the frequency of social contacts and the nature of those contacts within the social network or community. Both of these areas must be considered together. Evaluating only the frequency of contacts in isolation from the nature of those contacts may offer no insight or the wrong insight into the person's state of social functioning; therefore, including a person's assessment of the adequacy of his or her social network is essential when evaluating social functioning in the context of HRQOL. It is known that belonging to a community, family, or neighborhood provides a strong sense of being wanted, loved, and valued, and has significant influence on assessments of mental health, as well as on social health.

Role Functioning

Role functioning as a component of health is concerned with the impact health has on a person's ability to meet the demands of that person's normal life role. Work for pay, homemaking duties, and schoolwork are all covered by questions asking about this concept. A role function assessment should identify everyday role situations or activities that can be directly affected or limited by disease, illness, or treatment. Whereas most role limitations are due to physical health problems, it has been noted that role limitations are observed both in the presence and in the absence of physical limitations.

Mental Health

Disease often affects the behavior, as well as the physical aspects of a person's life. General health status assessments, therefore, usually include questions covering aspects of psychological health. These questions typically focus on the frequency and intensity of symptoms of psychological distress. Anxiety and depression are common themes in mental health components of general health status instruments, but scales focusing only on these two concepts do not adequately cover the full mental health continuum. Perceptions of psychological well-being, life satisfaction, and cognitive functioning are also needed if a comprehensive assessment of the mental health domain by a health-related quality of life instrument is to be achieved. Although general health status questionnaires covering the mental health domain are not intended for use as diagnostic tools, some questions are used as screens for certain disorders such as depression.

General Health Perceptions

General health perceptions address the person's overall beliefs and evaluations about his or her health. Questions covered in this area focus on each person's health preferences, values needs, and attitudes. Assessments of general health perceptions are necessary because they allow consideration of individual differences in reactions to pain, perceptions of difficulty, the level of effort required, or the degree of worry or concern about health. Unlike questions that focus on measures of limitations, pain, and dysfunction to assess other health domains of interest, questions covering general health perceptions address positive feelings. These questions can be positively framed, thereby allowing the full spectrum of HRQOL to be evaluated.

Advantages of generic health status measures are that they can be used to assess the relative burden of different conditions, and to assess the relative benefits of different treatments. The questionnaires can be used with people of any age, gender, or race. For example, elderly patients with arthritis and young patients with hypertension can be asked the same questions without suspicion that their age or disease state differences will confound their answers. In a general health status instrument, patients may be asked if they believe their health is excellent, very good, good, fair, or poor. A general questionnaire would not ask about nausea related to cancer chemotherapy treatment, but may ask if the patient is less energetic, or more calm and peaceful.

Disadvantages of generic instruments are that, by design, they do not cover areas of health status that are important to

Table 4. Summary of Information About Widely Used General Health Surveys

	QWB	SIP	HIE	NHP	QLI	COOP	EURO-QOL	DUKE	MOS FWBP	MOS SF-36
CONCEPTS										
Physical functioning	•	•	•	•	•	•	•	•	•	•
Social functioning	•	•	•	•	•	•	•	•	•	•
Role functioning	•	•	•	•	•	•	•	•	•	•
Psychological distress		•	•	•	•	•	•	•	•	•
Health perceptions (general)			•	•	•	•	•	•	•	•
Pain (bodily)		•	•	•		•	•	•	•	•
Energy/fatigue	•		•	•				•	•	•
Psychological well-being			•					•	•	•
Sleep		•		•				•	•	
Cognitive functioning		•						•	•	
Quality of Life						•			•	
Reported health transition						•			•	
CHARACTERISTICS										
Administration method (S = self, I = interviewer, P = proxy)	I, P	S, I, P	S, P	S, I	S, P	S, I	S	S, I	S, I	S, I, P
Scaling method (L = Likert, R = Rasch, T = Thurstone, U = utility)	U	T	I	T	L	L	U	L	L	L, P
Number of questions	107	136	86	38	5	9	9	17	149	36
Scoring options (p = profile, SS = summary scores, SI = single index)	SI	P,SS,SI	P	P	SI	P	SI	P, SI	P	P, SS

QWB = Quality of Well-Being Scale (1973)

SIP = Sickness Impact Profile (1976)

HIE = Health Insurance Experiment surveys (1979)

NHP = Nottingham Health Profile (1980)

QLI = Quality of Life Index (1981)

COOP = Dartmouth Function Charts (1987)

EUROQOL = European Quality of Life Index (1990)

DUKE = Duke Health Profile (1990)

MOS FWBP = MOS Functioning and Well Being Profile (1992)

MOS SF-36 = MOS 36-Item Short -Form Health Survey (1992)

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specific groups of patients who may experience specific improvements, or disabilities, in functioning due to their disease state. For instance, general health status questionnaires do not include self-esteem, a concept that is very important to patients with cystic fibrosis. For this reason, additional types of questionnaires that consider a disease- or condition-specific set of questions were designed for many disease states.

Disease-specific Health Status Instruments

Some limitations or problems with patients' health are unique to their specific disease state. For this reason, batteries of questions were designed for use with specific patient populations, and are used to supplement a general health status instrument. These more narrowly focused disease-specific measures request detailed information about the impact of a specific disease and the effect of treatment on the patient, from the patient's perspective. While items in both general health status measures and in disease-specific measures may appear to ask the same question, those in a disease-specific tool are phrased to direct patients to think about their disease, its symptoms, or its treatment, rather than the disease or limitations in general. In addition, using disease-specific measures allows inclusion of questions of specific interest. Among some specific areas previously investigated with disease-specific questionnaires are: sexual functioning; nausea and vomiting; pain; cancer; arthritis; epilepsy; HIV infection; anxiety and depression; asthma, and rhinitis.

Psychometric Theory

The design of health surveys, consisting of scales measuring the attributes of a person or a population's health, are supported by an underlying theory known as psychometric theory. Health status scales development also can be viewed as a unique application of the design and theory that support the creation of educational measurements for instance, Standardized Achievement Tests. A person who studies these theories and conducts research or measurement of such attributes as intelligence, pain, mental well-being, or functioning, is usually a doctorate level research psychologist and can be known as a *psychometrician.*

One readily apparent feature of health sciences literature devoted to measuring health status is the daunting array of already available scales. Paradoxically, if you proceed a little further to find an instrument for your intended purpose, you may conclude that none of the existing scales is quite right. Many researchers tend to magnify the deficiencies of existing measures and underestimate the effort required to develop an adequate new measure. Perhaps the most common error committed by clinical researchers is to dismiss the existing scales too lightly, and embark on the development of a new instrument with an unjustifiably optimistic and naïve expectation that they can do better. The development of scales requires considerable investment of both mental and fiscal resources. A comprehensive set of standards, widely used in the assessment of psychology and education, is the manual called Standards for Educational and Psychological Tests, published by the American Psychological Association (1974). In addition to these standards, there are a number of compendia of measuring scales.

Psychometric Considerations

The literature is ever expanding with reports of general health and disease-specific, HRQOL research. As with any field of research, the studies reported in the literature meet various levels of scientific rigor. Readers of these reports must have a basic understanding of psychometrics to draw proper conclusions from HRQOL findings.

Psychometrics is the science of testing questionnaires to measure attributes of individuals. It is used in the field of health assessment to translate people's behavior, feelings, and personal evaluations into quantifiable data. These data, once captured, must be both relevant and correct if they are to provide useful insights into HRQOL. Two psychometric properties that any measurement scale or instrument must possess include reliability and validity. In addition, useful scales must be sensitive to change and be accepted by the investigators and respondents. When measuring reliability, the scientist is concerned with the relationship between true variation and random error. Evaluations assess the consistency and repeatability of measurement. Validity refers to the extent to which differences in scale scores reflect the true differences in the individuals studied. Whereas the goal is to elicit observed differences that are indeed true differences among respondents, factors such as how the measure is administered, who administers the form, where it is administered, and when it is administered, can affect responses across groups of study participants, and, therefore, can add a degree of uncertainty to the findings of a HRQOL assessment.

Use of Patient-reported Health Status

Applications of general health surveys are numerous, and include monitoring the health of general populations, evaluating health care policy, conducting clinical trials of alternative treatments, designing systems for monitoring and improving health care outcomes, and making clinical decisions in medical practice. Standardized health surveys have the potential to become new laboratory tests in medical practice. Without these tests, patient functioning, and well-being affected by disease and treatment, are unlikely to be discussed during a typical medical visit. Two-thirds to three-fourths of adults in the United States have reported that physicians rarely, or never, ask about the extent of their limitations in performing everyday activities, even in the presence of chronic conditions. As a result, clinicians may

not be well-informed about their patient's functional status, well-being, or changes over time. Scientists have proposed that one solution might be to standardize functional and well-being assessments for every medical practice. Such routine assessments could be useful for a number of reasons. They would ensure that all important dimensions of functional status and well-being are considered consistently. They would detect, explain, and track changes in functional capacity over time. Third, their use would make it possible to better consider the patient's total functioning when choosing among therapies. They would guide the efficient use of community resources and social services, and fifth, they could more accurately predict the course of chronic disease. Such data would make it possible for clinicians to better inform patients about the tradeoffs involved in alternative treatments. A great potential exists for standardized measures of functional status and well-being administered routinely and incorporated into existing clinical databases. Meyer and associates published an example of experiences with the use of a short-form general health status measure in a dialysis unit. The clinicians involved in this project related that patients' scores enhance, rather than simply summarize, the collective understanding of a conscientious dialysis team.

In the dialysis unit, health status surveillance revealed new information that was qualitatively different from other assessments made in the care of these patients. The authors suggested that patient-based health status assessment can

Table 5. Items Measuring Generic Health Concepts

Concepts	Definition	Abbreviated items*
Physical		
Physical limitations	Limitations in performance of self-care, mobility, and physical activities	Needs help with bathing, dressing, in bed chair, couch, for most of day Does not walk at all
Physical abilities	Ability to perform everyday activities	Able to walk uphill, up stairs Able to participate in sports, strenuous activities
Days in bed	Confinement to bed due to health problems	During past 30 days, number of days health keeps one in bed all day or most of day
Bodily pain	Ratings of the intensity, duration frequency of bodily pain and limitations in usual activities due to pain	During the past 3 months, how much pain one has had How much pain interfered with thing
Physical well-being	Personal evaluation of physical condition	Ratings of physical shape or condition
Mental		
Anxiety/depression	Feelings of anxiety, nervousness, tenseness, depression, moodiness, downheartedness	Depressed or very unhappy Bothered by nervousness, or nerves
Psychological well-being	Frequency and intensity of general positive affect	Happy, pleased, satisfied with life Wakes up expecting an interesting day Feels cheerful, lighthearted
Behavioral/emotional control	Control of behavior, thoughts, and feelings during specified period	Feels emotionally stable Loses control of behavior, thoughts, feelings Laughs or cries suddenly
Cognitive functioning	Orientation to time and place, memory, attention span, and alertness	Feels confused, forgets a lot, makes more mistakes than usual
Social and role		
Interpersonal contacts	Frequency of visits with friends and relatives Frequency of telephone contacts with close friends or relatives during specific periods of time	Number of friends visited Going out less often to visit people How often on telephone with close friends/relatives in past month
Social resources	Quantity and quality of social ties, network	Number of close friends, people to talk with
Role functioning	Freedom from limitations in performance of usual role activies (e.g., work, housework, school) due to poor health	Limited in kind or amount of major role activity Working shorter hours Health causes problems at work Unable to work because of health
General health perceptions		
Current health	Self-rating of health at present	In general, is health excellent, good, fair or poor?
Health outlook	Expectations regarding health in the future	I expect to have a very healthy life

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improve the management of individual patients, and can contribute to the epidemiology of treatment of endstage renal disease. Health status assessment offers a language in which to phrase experiences that the individual patient may find difficult to express, or may not even think to formulate, or remember, unless prompted. It provides a thread along which to reconstruct experiences. By objectifying the patient's subjective experiences, health status assessment makes the experience more accessible to the staff who shares responsibility for care. It puts the patient's experience on their agenda for discussion, even when the technical aspects of care do not compete for attention.

Advantage of Health Status Assessment Information

Self-administered surveys allow patients a voice in their care. It permits the patient to communicate to those caring for them, about what matters most. This may be information that one needs to know, but does not have time to elicit. Analogously to providing a common language for patients and health professionals, the general HRQOL information also can provide a standard, or a common language, for different disciplines of health professionals. For example, a Nephrologist and a Psychiatrist can use a common metric to discuss a dialysis patient's emotional health. A standardized method of asking patients about their functioning and well-being can be efficiently used in treatment decisions, and as a monitoring parameter for efficacy and toxicity. The information also may be a tool, or indicator, for compliance assessments.

Health-related quality of life can be used to add important information to the evaluation of the effectiveness of an intervention. For example, does the 34-year-old otherwise healthy woman, diagnosed with depression, who just started an antidepressant feel better or worse? One could just simply ask her that question when you see her 4 weeks after the start of her therapy. As pharmacists, we commonly ask, "Are you having any side effects?" If the patient tells you she has diarrhea, you may form an impression of that diarrhea, which seems like a mild side effect. However, having her answer survey questions about her functioning can reveal how trivial or nontrivial the impact of her diarrhea is to her everyday activities. What would happen if her diarrhea limits her ability to function as the checkout person in the grocery store? She cannot leave her post frequently to go to the bathroom, and if she does, she could be fired and not be able to provide for her two young children that she is raising alone. The patient sees the limitation imposed by diarrhea as considerable, and knowing a little more about her functioning conveys a bit of a different message to us than just knowing she is having diarrhea. A discussion using information from a patient self-administered health status survey also could lead to the patient revealing that she has decided to stop taking her drugs. She did not think it was working, and the diarrhea was not worth the hassle.

Advances in Health Status Assessments for Individual Patient Care Decisions

Standardized measures capturing patient perspectives on their physical functioning, social and role functioning, mental health, and general health perceptions are likely to become more acceptable as an additional piece of evidence on which providers, and their patients, can make decisions about treatment and the treatment's efficacy. Mature theoretical models, sophisticated measurement techniques, and enhanced technology for use in measurement, make the routine use of individual patients results in their own care more promising than ever before.

Two practical concerns of the critics of use of HRQOL assessments in individual patient care are: 1) respondent burden; and 2) reliability of scores obtained from shorter questionnaires. Current researchers struggle with the competing demands invoked by the everyday use requiring shorter forms and the reliability of a result obtained from fewer questions. Specifically, concerns are raised about the reliability of the result, and the interpretation, since with popular outcomes measures the standard error around a single person estimate is large and not satisfying enough to ensure stable conclusions.

Modern test theory offers the potential for individualized, comparable assessments for the careful examination and application of different health status measures. One such theory is Item Response Theory (IRT). Researchers report that IRT has a number of potential advantages over the currently used Classical Test Theory in assessing self-reported health outcomes. Applications of the IRT models are ideally suited for implementing computer adaptive testing. IRT methods are also reported to be helpful in developing better health outcome measures, and in assessing change over time.

Patients increasingly have more access to computer technology. It is becoming more practical to use assessments using a computer. Patients answering questions about a health status concept, using dynamic assessment technology, are requested only to complete the number of questions needed (minimizes response burden) to establish a reliable estimate. The resulting scores for an individual are estimated to meet the clinical measures of precision.

In summary, the study of HRQOL requires a multidimensional approach. Assessments should include components that evaluate, at a minimum, the health concepts of physical, social and role functioning, mental health, and perception of general health. Additionally, the full continuum of these concepts should be included, from the most limited, to the healthiest. Approaches to capture HRQOL data include the self-administered questionnaire (paper and pencil, or computer), personal and telephone interviews, observation, and a postal survey. The assessment instruments must possess acceptable reliability, validity, and sensitivity, and the investigators, as well as the participants, must accept them. Psychometrics is an essential part of HRQOL research, especially in today's research environment that requires shorter, more focused measures.

Existing health outcomes measures, drawn from classic test theory and emerging approaches based on item response theory, offer exciting opportunities for appreciably expanded applications in biomedical and health services research, clinical practice, decision making, and policy development. The research agenda of measurement scientists includes challenges to: 1) refine and expand measurement techniques that rely on IRT; 2) improve

measurement tools to make them more culturally appropriate for diverse populations, and more conceptually and psychometrically equivalent across such groups; 3) address long standing issues in preference- and utility-based approaches, particularly in the elicitation of preference responses and scoring instruments; and 4) enhance the ways in which data from outcomes measurement tools are calibrated against commonly understood clinical and lay metrics, are interpreted, and are made useable for different decision-makers.

With the advances in measurement that promise to continue, knowledgeable clinicians will become the transportation for these measures to include in patient care. It is suggested interpretation is, in part, an issue of familiarity, and repeated applications of measures can lead to a better understanding. Ideally, a better understanding of what patients tell their providers about their health status can be used for decision making, which require the patients to more actively and routinely participate in their own care.

Case Study Continued

Now back to the case of Mr. A to consider the following questions. You have stumbled on the results of a questionnaire filed in the outpatient chart. Apparently, the patient filled one out at his last visit in the clinic, about 8 weeks ago, dated Oct. 1, 1995. There was another questionnaire filled out earlier today, Dec. 7, 1995, in the clinic. The results of these questionnaires are listed at the end of this section, as Appendices A and B. Please look at the scores for each of the scales and the changes in the scores. There is a brief interpretation guide attached as Appendix C. For another point of comparison of this patient's scores, you also can use the normative values supplied in Appendix D. There are three sets of values listed. The first set is for the general United States population, the second is for the population in Mr. A's age range, and the third is for patients with similar medical conditions. Take some time now to interpret the results of these questionnaires. What other questions do you have for this patient? Think of at least four additional questions. Reflect on the differences between your questions earlier in this section and those you are asking now.

After questioning Mr. A, you find that this month is the second anniversary of his wife's death. He is very sad about this, and is feeling that he wants to give up now. How does this information change your original plan and problem list? Appendix E gives Mr. A's scores 1 year after this clinic visit, dated December 5, 1996, for comparison.

Patient Satisfaction

Another outcome suggested by a well-accepted model for how to evaluate the quality of health care, is that of patient satisfaction (see Reference 5). During the last decade, organization-wide quality improvement efforts in both service and manufacturing sectors of the United States have embraced consumer evaluations of goods and services as a way to monitor product quality. In the health care setting, consumer satisfaction surveys have evolved, from marketing tools, to measures of quality of the product or service delivered. Empirical studies show that patients' expressions of dissatisfaction are potent predictors of disenrollment from a physician or a health plan. Studies of satisfaction with physicians have documented the importance of access, communication, technical quality, and interpersonal quality of care. The concept of assessing patient satisfaction is introduced here and explored further in Chapter 16.

A consumer's evaluation of the care received, known as *consumer evaluation*, or *patient satisfaction*, is both similar and different from a patient's assessment of health status. The same psychometric techniques are used to obtain information, and to evaluate the accuracy of the information. The science of obtaining the information is similar. However, the information that is requested of the patients, that is, the consumers, is unique and very different from what is asked about health status. Both reports and ratings are used in patient satisfaction surveys. Reports are descriptions, whereas ratings are evaluations that require a judgment by the evaluator. For instance, a patient may be asked how long the wait was before being seen by the physician, which is a report; the patient also may be asked if the wait was too long, requiring a judgment.

There are many different patient satisfaction surveys available. Attributes that are commonly evaluated, regardless of the care setting, include the clinician's scientific knowledge and skill, the quality of clinician-patient communications, the provision of humane interpersonal treatment, and the degree of the patient's trust in the care provider. One setting in which patient satisfaction surveys are becoming increasingly important is that of primary care. Four distinguishing and shared multiple characteristics are considered essential and unique to this area of health care, and provide attributes that can be evaluated by patients. These characteristics include accessibility to care, continuity of care, the comprehensiveness of care, and how well a patient's care is integrated into a coherent and continuing whole. As competition in the health care market has increased, many health care delivery organizations have come to view patient satisfaction as an important consumer supplied indicator of quality and a potential benchmarking device when studied over time.

Other Measures of Outcomes

Those seeking to evaluate the impact of the health care system on the health of an individual or population are forced to include multiple outcomes to accommodate both external and internal needs. So far this chapter has focused on economic outcomes and humanistic outcomes. Within the humanistic outcomes category, the basic concepts included in assessments of health status and patient satisfaction were identified. However, as noted, the identification of perspective is important. In the restructuring of health care, the perspective of the employer has become a significant force. To meet the evaluation needs of employers, the concept of work functioning must be included as an outcome. For example, in 1990, the cost of depression to society was estimated to be $44 billion. Of this, $11.7 billion was attributed to reductions in productive

capacity, due to excess absenteeism. The ability to quantify the constituent parts of the losses in work productivity is developmental. However, it is growing in importance, and will undoubtedly be an important measured health domain.

Traditionally, simple measures that ask the patient about lost days from work and days in bed were used to measure work functioning. Many popular health status measures include questions on limitations in daily work activities. However, these concepts are still in need of further development. A conceptual basis for measuring the ability to function in work roles may be found in the recent disability literature. Within this literature, disability encompasses the total inability to work, as well as the less severe limitations in work-role functioning. The Institute of Medicine and the World Health Organization, in the development of terminology and classification systems for disability and functional limitations, have established a fundamental instrument development guideline. They suggest that a person's ability to function in work roles will result from two sets of variables: 1) the characteristics of that person's illness or impairment; 2) the requirements of the work situation. Both of these areas are presently under study.

Conclusion

The methods of pharmacoeconomic evaluation strive to assess the value of health care in terms of outcomes of a clinical, economic, and humanistic nature. This chapter has provided several key definitions and concepts that will be built on in later chapters of this book. Further discussion of how to actually perform and apply the results of economic methodologies will be presented in detail as well. Detailed information regarding the conduct and application of humanistic outcomes assessments will be presented in Chapters 14 and 18.

Because "quality-of-life" represents the broadest range of human experiences, use of this general term in the health field has led to considerable confusion, particularly because of the overlap with the more specific concept, health status. To make the meaning more specific and retain the important aspects of life quality, the term "health-related "quality-of-life" is both useful and important.

Annotated Bibliography

1. Barr JT, Schumacher GE. Applying decision analysis to pharmacy management and practice decisions. Top Hosp Pharm Manage 1994;13:60–71.

   In this paper, decision analysis is presented and applied to a typical management situation. Decision analysis is an explicit, quantitative, and prescriptive approach for choosing among alternative outcomes. Literature examples of using pharmacy-related decision analysis are provided, including its use in formulary additions, cost-effectiveness analysis, drug therapy evaluation, therapeutic drug monitoring, and health policy issues.

2. Bootman JL, Townsend RJ, McGhan WF. Principles of pharmacoeconomics, 2nd ed. Cincinnati: Harvey Whitney Books Company, 1996.

   Designed principally for the student as an introduction to pharmacoeconomics, the authors present various techniques, tools, and strategies used to evaluate the economic contribution of specific drug therapies at a policy level and for individual patients. Chapters 6 and 7 will be of particular interest to readers seeking information on outcomes measurement, as overviews of cost-utility analysis and health-related quality of life (HRQOL) measurement, respectively, are presented. The bibliographies in these chapters include many of the key theoretical and empiric citations for these two approaches to measurement. This book is a good starting point for those who wish to read further.

3. Crane VS. Economic aspects of clinical decision-making: applications of clinical decision analysis. Am J Hosp Pharm 1988;45:548–53.

   Clinical decision analysis as a basic tool for decision making is described, and potential applications of decision analysis in six areas of clinical practice are identified in this paper. Applications of clinical decision analysis in the areas of diagnostic testing, patient management, product and program selection, research and education, patient preferences, and health care-policy evaluation are described. Decision analysis offers health professionals a tool for making quantifiable, cost-effective clinical decisions, especially in terms of clinical outcomes.

4. Detsky AS, Nagiie IG. A clinician's guide to cost-effectiveness analysis. Ann Intern Med 1990;113:147–54.

   The authors describe how cost-effectiveness analysis can be used to help set priorities for funding health care programs. For each intervention, the costs and clinical outcomes associated with that strategy must be compared with an alternate strategy for treating the same patients. This paper also discusses the distinction between cost-effectiveness analysis and incremental cost-effectiveness analysis. If an intervention results in improved outcomes, but also costs more, the incremental cost per incremental unit of clinical outcome should be calculated and the incremental cost-effectiveness ratios ranked to set funding priorities. By using this list, the authors maintain the person responsible for allocating resources can maximize the net health benefit for a target population derived from a fixed budget. Because clinicians should participate in policy-making, they must understand the role of this technique in setting funding priorities and allocating health care resources.

5. Donnabedian A. The quality of care: how can it be assessed? JAMA 1988;260:1743–8.

   The author states that although much is known about assessing quality, much remains to be known. Before assessment can begin, one must decide how quality is to be defined. It is further asserted that quality depends on a number of factors: 1) whether one assesses only the performance of practitioners or also the contributions of patients and of the health care system; 2) how broadly health and responsibility for health are defined; 3) whether the maximally effective or optimally effective care is sought; and 4) whether individual or social preferences define the optimum. The need for more detailed information about the causal linkages among structural attributes of health care settings, the processes of care, and the outcomes of care is discussed. The author states the components or outcomes of care to be sampled must be specified, appropriate criteria and standards formulated, and the necessary information obtained to assess quality. Definitions of structure, process, and outcomes are given.

6. Doubilet P. The use and misuse of the term "cost-effective" in medicine. N Engl J Med 1986;314:253–6.

This paper describes the inconsistencies in the definitions and interpretations of the term cost-effectiveness by authors in medical literature sources. Cost-effectiveness criteria vary considerably and the following interpretations are discussed: 1) cost-effectiveness is equivalent to "cost-savings;" 2) the more effective therapy is also the most cost-effective therapy; 3) cost-effectiveness is the option that is cost-saving while providing equal or better health; 4) cost-effective therapy is that having an outcome worth its corresponding cost relative to competing alternatives. The first two interpretations are incorrect because they only examine one side of the cost-effectiveness equation. The third and fourth interpretations can both be considered correct interpretations of the term. The authors stress it is imperative to standardize terms, such as cost-effectiveness to enhance its usefulness and application to health care policy and clinical decision-making.

7. Drummond MF, Stoddart GL, Torrance GW. Methods for the economic evaluation of health care programmes, 2nd Ed. Oxford: Oxford University Press, 1997.

This second edition of a landmark textbook, originally published in 1986, discusses in detail the methodological principles of economic evaluation in health care and has been used in courses teaching economic evaluation. The text is not structured like a standard textbook, with detailed discussion of theoretical concepts, but rather concentrates on practical methodological issues that evaluators need to resolve in undertaking an economic evaluation.

8. Eisenberg JM. Clinical economics: a guide to the economic analysis of clinical practices. JAMA 1989;262:2879–86.

This paper discusses the tools of economics that can be applied to the analysis of medical practice. The focus of the analysis is to improve physicians' choices of ways to use social and individual resources for clinical interventions in the hope of improved health. Types of economic evaluations including cost-identification, cost-effectiveness, cost-benefit, and cost-utility analyses are presented. In addition, useful discussions on study perspectives and determination of health care costs are provided.

9. Farris KB, Kirking DM. Assessing the quality of pharmaceutical care II: applications of concepts of quality assessment from medical care. Ann Pharmacother 1993;27:215-23. Bungay KM, Wagner AK. Comment: assessing the quality of pharmaceutical care. Ann Pharmacother 1993;27:1542.

The authors propose a framework to facilitate quality assessment of pharmaceutical care. The structure-process-outcome paradigm is presented as a framework for quality assessment of pharmaceutical care. It is recommended that structure be assessed at periodic intervals because it identifies the potential for the provision of quality care. The process of care should be documented, and it is recommended that these variables be linked to outcomes before either structure or process is used to make inferences about the quality of pharmaceutical care. Outcomes assessment will require an interdisciplinary approach. Examples of structure and process criteria are provided for use as a model to integrate pharmaceutical care into a health care system. The editorial comments discuss possible additions to the author's published choices of health outcomes variables.

10. Freund DA, Dittus RS. Principles of pharmacoeconomic analysis of drug therapy. PharmacoEconomics 1992;1:20–32.

This paper outlines some of the basic principles of pharmacoeconomic analysis. The authors recommend that every analysis should have an explicitly stated perspective, which, unless otherwise justified, should be a societal perspective. Various methods of economic evaluations are reviewed. A discussion of modeling frameworks, such as influence diagrams and decision trees, is also included.

11. Hatoum HT, Freeman RA. The use of pharmacoeconomic data in formulary selection. Top Hosp Pharm Manage 1994;13:47–53.

This paper encourages pharmacists to improve their knowledge and use of pharmacoeconomic data in formulary selection. Changes in the formulary selection process, particularly concerning use of cost-containment strategies, are described. An overview is presented of the origin, as well as the potential impact of pharmacoeconomic data upon formulary management. The need to balance the economic benefit with the clinical advantages for any proposed new drug for formulary inclusion remains the most critical decision to be made by pharmacists.

12. Katz DA, Welch HG. Discounting in cost-effectiveness analysis of healthcare programmes. PharmacoEconomics 1993; 3:276–85.

This paper discusses the application of discounting to economic evaluations. Discounting is described as a technique used to make fair comparisons of programs whose costs and outcomes occur at different times. The agreements and disagreements among health economists regarding the need for discounting, and the procedures for discounting costs and benefits are presented. The authors also describe the method of constant rate discounting, which uses the same rate to discount costs and benefits.

13. Kozma CM, Reeder CE, Shulz RM. Economic, clinical, and humanistic outcomes: a planning model for pharmacoeconomic research. Clin Ther 1993;15:1121–32.

This paper describes a theoretical framework for identifying, collecting, and using outcomes data to assess the value of pharmaceutical treatment alternatives. The Economic, Clinical, and Humanistic Outcomes model depicts the value of a pharmaceutical product or service as a combination of traditional clinical-based outcomes with more contemporary measures of economic efficiency and quality. The model should assist health services researchers in planning, conducting, and evaluating pharmaceutical products and services from a multidimensional perspective. This framework represents a comprehensive framework for medical decision-making.

14. Lee JT, Sanchez LA. Interpretation of "cost-effective" and soundness of economic evaluations in pharmacy literature. Am J Hosp Pharm 1992;48:2622–7.

Interpretations of the term "cost-effective" in the pharmacy literature are discussed. Sixty-five studies evaluating cost issues were identified in the pharmacy literature. The adequacy of these studies was evaluated according to ten methodologic criteria. In 36 (55 percent) articles, "cost-savings" was incorrectly equated to "cost-effectiveness." Of the 10 criteria, only 50 percent or more of the studies evaluated satisfied three. Criteria least often satisfied dealt with the identification of relevant costs and consequences of each

strategy, discounting, incremental analysis, and sensitivity analysis. The authors conclude that many pharmacoeconomic studies incorrectly used the term cost-effective and inadequately addressed basic methodologic components.

15. Meyer KM, Espindle DM, DeGiacomo JM, Jenuleson CS, Kurtin PS, Davies AR. Monitoring dialysis patients' health status. Am J Kidney Dis 1994;24:267–79.

The authors report 3 years experience with quarterly assessments of self-reported health of dialysis outpatients using the Medical Outcomes Study, short form, 36 items (MOS SF-36). Program logistics and results are described, including reliability coefficients, standard deviations, and standard errors of measurement for the MOS SF-36 in this patient population. Two case reports compare information obtained from the MOS SF-36 with the dialysis team's assessments of the patient, as recorded in the medical record. The comments of two patients on reviewing their MOS SF-36 results are also summarized. Patient reactions to the health status assessment program are explored, and potential benefits and areas for further work are outlined. The authors report that serial measurement of dialysis patients' health status allowed for recognition of clear patterns in individual patient's responses. Patterns sometimes suggested that the patient was either substantially more or less impaired than the dialysis team had thought. Changes in these patterns, both transient and protracted, frequently exceeded 95 percent confidence intervals for patient-level scores.

16. Pathak DS, MacKegian LD. Assessment of quality of life and health status selected observations. J Res Pharm Econ 1992;9:31–52.

This paper focuses on conceptual and methodological issues involved in the definition and measurement of the construct of HRQOL. Conceptual issues discussed include quality of life versus HRQOL, defining HRQOL, need for a comprehensive framework to investigate the construct HRQOL, and demographic characteristics as determinants of HRQOL. Methodological issues discussed are new psychometric terms versus traditional terms, multi-attribute utility measurement and external validation, measurement of value versus utility, and time-related phenomena and the assessment of temporary and cyclical health states. Because these conceptual and methodological issues remain unresolved, caution is recommended in applying current assessment methods to set health care priorities. It is proposed that the true value of HRQOL assessments resides not in the final values obtained through such assessments, but in the explication of the process used in the valuation of subjective outcomes that cannot be adequately captured by objective measure.

17. Sanchez LA. Pharmacoeconomics and formulary decision-making. Pharmaco-Economics 1996;8(Suppl 2):S16–25.

This paper describes how pharmacoeconomic data can be used to support various formulary management decisions. For example, these data can support the inclusion or exclusion of a drug on, or from, the formulary and support practice guidelines that promote the most cost-effective, or optimal use, of pharmaceutical products. Various strategies, including using published pharmacoeconomic studies, using economic modeling techniques, and conducting local pharmacoeconomic research, can be used to incorporate pharmacoeconomics into formulary decision making. Criteria for evaluating the pharmacoeconomic literature, suggestions for using economic models and suggested guidelines for conducting pharmacoeconomic projects are discussed. Furthermore, the process for formulary action and the influence of pharmacoeconomics on formulary management in a United States hospital are presented in this paper.

18. Sanchez LA. Expanding the role of pharmacists in pharmacoeconomics: how and why? PharmacoEconomics 1994; 5:367–75.

The purpose of this paper is to illustrate the value of pharmacoeconomics in modern, pharmacy-practice settings, motivate pharmacists to expand their current roles to include pharmacoeconomics, and provide strategies for incorporating pharmacoeconomics into traditional pharmacy roles. Strategies, including use of published pharmacoeconomic literature, economic modeling and local pharmacoeconomic research, are presented.

19. Sanchez LA, Lee JT. Use and misuse of pharmacoeconomic terms: a definitions primer. Top Hosp Pharm Manage 1994;13:11–22.

Given the current cost-conscious health care environment, pharmacists must now be able to assess the effect of an agent from safety, efficacy, and value considerations. This article describes the various methodologies that may be used in performing pharmacoeconomic analyses and highlights the use and misuse of pharmacoeconomic terminology. Case studies relating the use of these methods to the pharmacy practice setting are presented. The technical nuances of the various methods are explained to promote a better understanding of the appropriate use of these techniques and the terminology used to describe them.

20. Schrogie JJ, Nash DB. Relationship between practice guidelines, formulary management, and pharmacoeconomic studies. Top Hosp Pharm Manage 1994;13:38–46.

This paper describes how pharmacy and therapeutics committees can use pharmaco-economic and outcomes studies as tools to evaluate and implement clinical guidelines for patient care. Ways in which the results of studies can help optimize the clinical effects and control the costs of drug therapy are discussed. The use of these data to assist in positioning products in competitive environments is described. A four-part classification of research studies is offered as an aid to strategic research planning.

21. Spilker B, ed. Quality of life and Pharmacoeconomics in Clinical Trials 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins Publishers, 1996. Revised edition of Quality of Life Assessment in Clinical Trials (1990).

A comprehensive reference for clinical investigators who conduct quality of life assessments. The volume is divided into 11 sections: introduction to the field; standard scales, tests, and approaches; specific scales, tests, and measures; choosing and administering tests and treatments; analyzing, interpreting, and presenting data; special perspectives on quality of life issues; cross-cultural and cross-national issues; health policy issues; special populations to assess quality of life; specific problems and diseases; and pharmacoeconomics. Expanded to four times its predecessor's size and scope, the Second Edition reflects the rapid progress made worldwide in quality of life assessment and the growing importance of quality of life issues and pharmacoeconomics in health care decision-making. The editor has assembled more than 200 experts from diverse clinical, research, and social science disciplines to provide a comprehensive reference on the

methodology, interpretation, and use of quality of life and pharmacoeconomic studies. The Second Edition features all-new sections on pharmacoeconomics and on crucial health policy issues such as outcomes research. The greatly expanded coverage of quality of life assessment includes a new section on cross-cultural and cross-national issues, more detailed information on specific tests, scales, and measures, and more comprehensive guidelines on choosing and administering tests and treatments and analyzing, interpreting, and presenting data.

22. Streiner DL, Norman GR. Health measurement scales: a practical guide to their development and use. 2nd ed. New York: Oxford University Press, 1999.

    This is the second edition initiated in recognition of significant developments in the field of measurement since its first printing. This book is organized in chronological sequence according to the order that someone faced with the problem of developing a new instrument might encounter topics. Chapter 2 provides an overview of the criteria that the authors recommend be used to assess any measurement instrument. By reviewing this section, the reader should be able to peruse the literature to see if any available instrument is suitable. In the remaining chapters, the authors assume an unsuccessful search, and provide detailed information regarding the steps involved in developing a new scale. Finally, the appendices provide additional resources for locating further information about health status measurement, including an annotated bibliography of references for existing scales.

23. Udvarhelyi S, Colditz GA, Rai A, et al. Cost-effectiveness and cost-benefit analyses in the medical literature. Ann Intern Med 1992;116:238–44.

    The objective of this paper was to determine whether published cost-effectiveness and cost-benefit analyses have adhered to basic analytic principles. Seventy-seven articles published either from 1978-1980 or 1985-1987 in general medical, surgical, and medical subspecialty journals were reviewed based on six fundamental principles of economic evaluations. The study results revealed that only three of the 77 articles reviewed met all six principles. Articles in general medical journals were more likely to use analytic methods appropriately. The authors concluded that greater attention should be devoted to ensuring the appropriate use of analytic methods for economic analyses, and readers should make note of the methods used when interpreting the results of economic analyses.

24. Katz S, Akpom CA, Papsidero JA, Weiss ST. Measuring the health status of populations. In: Berg RL, ed. Health status indexes: proceedings of a conference conducted by Health Services Research. Chicago: Hospital Research and Educational Trust, 1972:39.

    In this article, the history of population and individual-level health measurement is reviewed. Key issues facing the field in the early 1970s are examined.

25. McDowell I, Newell C. Measuring health: a guide to rating scales and questionnaires, 2nd ed. New York: Oxford University Press, 1996.

    An update of the 1987 edition, this text provides an overview of the field of health status assessment, including the history, techniques, and future directions of measurement. The authors review 88 rating scales and questionnaires that measure physical disability, social health, psychological well-being, depression, mental status, pain, general health status, and quality of life. The description of each scale or questionnaire includes its purpose, conceptual basis, reliability, validity, and a copy of the measure.

26. Patrick DL, Erickson P. Health status and health policy: allocating resources to health care. New York: Oxford University Press, 1993.

    Patrick and Erickson propose and explicate the Health Resource Allocation Strategy as a process for comparing costs and outcomes of alternative options when selecting medical and health care interventions with the greatest benefit in relation to cost. They provide a guide to the development and application of health status and quality of life measures, emphasizing those based on utility theory, and they examine contemporary uses of such measures, including preventing disease and promoting health, assessing the cost-benefit of technology, and improving access to care. A compilation of disease-specific measures appears in Chapter 5; the appendix illustrates four utility-based indexes: Disability/Distress Index; Health Utilities Index; Quality of Well-Being Scale; and the EuroQol instrument. The glossary defines key terms.

27. Stewart AL, Ware JE Jr., eds. Measuring functioning and well-being: the Medical Outcomes Study approach. Durham, NC: Duke University Press, 1992.

    In this book, the authors provide a comprehensive account of a broad range of self-reported measures of functioning and well-being developed for the Medical Outcomes Study, a large-scale investigation of how patients fare with health care in the United States. Many of these measures were derived from those used in earlier health policy research, including the Health Insurance Experiment (HIE). The authors address conceptual and methodologic issues involved in measuring physical, social, and role functioning; psychological distress and well-being; general health perceptions; energy and fatigue; sleep; and pain. Information is also presented on the construction, reliability, and validity of each measure, along with administration, scoring, and interpretation guidelines. The appendix includes copies of each measure; a glossary defines key terms; and the bibliography offers citations for most of the articles and books in health status assessment and related measurement methods for the past 50 years.

28. Testa MA, Simonson DC. Assessment of quality-of-life outcomes. N Engl J Med 1996;334:835–40.

    Quality of life assessments and a conceptual scheme of quality of life are reviewed in this article. The article also addresses properties of measurement scales, selecting an assessment instrument, and interpreting quality of life effects.

29. Manning WG, Leibowitz A, Goldberg G, et al. A controlled trial of the effect of a prepaid group practice on use of services. N Engl J Med 1984; 310:1505–10.

    This is an important paper, reporting results of the Rand HIE. The HIE was the first, and still the largest, randomized health services research study ever conducted. Patients were randomly assigned to fee-for-service or health maintenance organization plans to study differences in service use and health outcomes associated with these systems. The article reports the findings with respect to use. Overall expenditures on services were lower in the health maintenance organizations, attributable primarily to differences in rates of hospitalization. The study found that health maintenance organization patients

were hospitalized 40 percent less than equivalent fee-for-service patients. Ambulatory care use was similar in the two systems. Subsequent research has validated these findings, both the magnitude and nature of the use differences.

30. Ware JE, Rogers WH, Davies AR, et al. Comparison of health outcomes at a health maintenance organization with those of fee-for service care. Lancet 1986;1:1017–22.

This landmark article from the Rand HIE shows that the health outcomes associated with managed care differ for patients at different levels of illness and socioeconomic status. In particular, the authors report that outcomes in managed care were worse for patients who were poor and sick at the outset of the study. For nonpoor and/or well patients, managed care had beneficial health effect.

31. Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. JAMA 1995; 273(1):59–65.

This article provides the clinician with an introduction to health services research concepts. In this article, the authors present a conceptual model, a taxonomy of patients outcomes that categorizes measures of patient outcome according to the underlying health concepts they represent and porpoises specific causal relationships between different health concepts, thereby integrating the two models of health described. This article is valuable to clinicians in practice, and in research settings since it discusses the conceptual intersection of those two worlds.

32. Wennberg J, Gittelson A. Variations in medical care among small areas. Sci Am 1982;246:120–34.

This is a valuable paper in which the phenomenon of small-area variation associated with six surgical procedures are described. It is one of the first empiric studies of small-area variation in the United States. The authors studied the rates of selected procedures in the six New England states. The results provide powerful evidence that area norms, rather than universally shared scientific criteria, determine medical treatments provided to patients. This field of work led to the call for research, including clinical practice guideline development, health outcomes research, and cost-effectiveness analysis of medical interventions, to try to bring greater rationality to medical care.

Conferences

A variety of conferences have been convened since the early 1970s to address issues of health status measurement—theoretical, conceptual, empiric, and historical. The published proceedings from these conferences include many of the now-classic articles in the health measurement field, and their citation lists contain many others. The following publications direct the interested reader to these sources.

1. Berg RL, ed. Health status indexes: proceedings of a conference conducted by health services research. Chicago: Hospital Research and Educational Trust, 1973.
2. Fowler FJ, ed. The proceedings of the Conference of Measuring the Effects of Medical Treatment. Med Care 1995;33(4): supplement.
3. Health status indexes: work in progress. Health Services Res 1976; 11(4): special issue.
4. Katz S, ed. The Portugal conference: measuring quality of life and functional status in clinical and epidemiological research. J Chronic Dis 1987;40(6): special issue.
5. Lohr KN, ed. Advances in health status assessment: conference proceedings. Med Care 1989;27(3): supplement.
6. Lohr KN, ed. Advances in health status assessment: fostering the application of health status measures in clinical settings—proceedings of a conference. Med Care 1992:30(5): supplement.
7. Lohr KN, Ware Jr JE, eds. Proceedings of the advances in health assessment conference. J Chronic Dis 1987;40: supplement 1.
8. Patrick DL, Chiang YP, eds. Health Outcomes Methodology: Symposium Proceedings. Med Care 2000;38(9): supplement II.

Self-Assessment Questions

1. Proponents of outcomes research believe that which one of the following is true?
   A. Outcomes research is synonymous with pharmacoeconomics.
   B We should measure not only the clinical and cost impacts of health care, but also the outcomes that take the patients perspective into account.
   C. Only clinical effects, and not functional status or well-being, should be included as outcomes.
   D. All outcomes research is pharmacoeconomic research.

2. The economic, clinical, and humanistic outcomes (ECHO) model recognizes the existence of intermediate outcomes. Which one of the following is an example of an intermediate outcome?
   A. A patient's physical functioning or mental well-being.
   B. A specific laboratory value.
   C. The total cost of hospitalization.
   D. Adherence to a drug regimen.

3. Which one of the following statements best describes economic outcomes?
   A. The direct, indirect, and intangible costs compared with the consequences of medical treatment alternatives.
   B. The medical events that occur as a result of a disease or treatment.
   C. The consequences of a disease or treatment on a patient's functional status or quality of life.
   D. The cost-savings associated with a disease or treatment alternative.

4. Which one of the following best represents a direct medical cost?
   A. Pain.
   B. Transportation.
   C. Mortality.
   D. Medical professional time.

5. Lost productivity is an example of which one of the following cost categories?
   A. Direct medical cost.
   B. Direct nonmedical cost.
   C. Indirect cost.
   D. Intangible cost.

6. Which one of the following statements regarding the perspective of economic evaluations is true?
   A. Economic evaluations are valid only if conducted from a single perspective.
   B. Economic evaluations can be conducted from multiple perspectives.
   C. Economic evaluations should only be conducted from the perspective of the patient.
   D. Society is the only valid perspective for economic evaluations.

7. From the perspective of a provider, which one of the following is a direct cost of health care?
   A. The amount paid out-of-pocket by patients directly to their physicians for a clinic visit.
   B. The patient charge for a visit to an emergency department.
   C. The prescription cost of insulin at the community pharmacy.
   D. The salary of the clinical pharmacist who monitors a patient's therapy.

8. From the perspective of an employer, indirect costs are best described by which one of the following?
   A. Hospitalization costs borne by the patient.
   B. Drug effects on patient functioning.
   C. Loss of patient income associated with missed workdays.
   D. Family caregiving costs.

9. The costs and consequences of health care can be different depending on the perspective of the evaluation. Costs from a patient's perspective are best described as which one of the following?
   A. Essentially, what patients are charged for a product or service.
   B. Essentially, the true cost of providing a product or service, regardless of the charge.
   C. Essentially, the charges allowed for a health care product or service.
   D. Essentially, the cost of giving and receiving medical care, including patient morbidity and mortality.

10. Which one of the following constitutes a full economic evaluation?
    A. Two antibiotics are compared and relative cure rates are determined.
    B. The costs for treatment of hypertension by general practice physicians, versus pharmacists, are considered in light of the blood pressure control achieved.
    C. The costs and efficiency of treatment of hypercholesterolemia with a new HMG-CoA reductase inhibitor are determined.
    D. The acquisition costs of two therapeutically equivalent antihypertensive agents are compared.

11. Which one of the following is an example of a partial economic evaluation?
    A. A comparison of the costs and consequences of two alternatives.
    B. A cost-utility analysis.
    C. A comparison of the costs of two equally effective alternatives.
    D. A quality of life comparison of multiple treatment alternatives.

12. Which one of the following is true of partial economic evaluations?
    A. Partial evaluations should be performed as components of full economic evaluations.
    B. Partial evaluations assess all important components necessary for a complete economic analysis.
    C. Partial evaluations may provide a description of the costs, or consequences, of competing alternatives.
    D. Partial evaluations compare the costs and consequences of two treatments.

13. Which one of the following statements is *not* true about cost-minimization analysis?
    A. Cost-minimization analysis is a tool used to compare the costs of two or more treatment alternatives.
    B. Cost-minimization analysis shows only a cost-savings of one treatment alternative over another.
    C. Cost-minimization analysis measures costs of treatment alternatives in dollars and a assumes comparable efficacy.
    D. Cost-minimization analysis is a method to be used when no evidence exists to support the therapeutic equivalence of two or more treatment alternatives.

14. When conducting a cost-benefit analysis (CBA), the results are best expressed as which one of the following?
    A. Cost-benefit ratio.
    B. Average cost per utility.
    C. cost-savings.
    D. Incremental cost ratio.

15. When quantifying the value of a clinical pharmacy service, which one of the following economic evaluation methods is the best to use?
    A. Cost-benefit analysis.
    B. Cost-effectiveness analysis.
    C. Cost-minimization analysis.
    D. Cost-utility analysis.

16. Which one of the following statements does not describe a cost-effective treatment alternative?

A. Less expensive and less effective, where the lost benefit was worth the extra cost.
B. Less expensive and at least as effective.
C. More expensive with an additional benefit worth the additional cost.
D. Less expensive and less effective, where the extra benefit is not worth the extra cost.

17. A cost-effectiveness analysis would be best applied to which one of the following situations?
A. When comparing two or more treatment alternatives that differ in clinical outcome.
B. When comparing two or more treatment alternatives that are equal in clinical outcome.
C. When comparing two or more treatment alternatives that differ in humanistic outcome.
D. When comparing two or more treatment alternatives that differ in cost.

18. Which one of the following statements best describes an incremental cost-effectiveness ratio?
A. A summary measurement of efficiency.
B. The cost per benefit of a new strategy, independent of other treatment alternatives.
C. The cost to obtain an extra benefit realized when switching from one strategy to another.
D. The cost per quality-adjusted life-year (QALY) gained.

19. When comparing treatment alternatives, which one of the following is the most correct application for cost-utility analysis?
A. Alternatives that are life-extending with serious side effects.
B. Alternatives that differ in cost.
C. Alternatives that differ in efficacy and safety.
D. Alternatives that are similar in clinical and humanistic outcomes.

20. Which one of the following statements about discounting is not true?
A. When costs and consequences of a treatment alternative occur in the future, they should be reduced to reflect current fiscal value.
B. Discounting is the process of adjusting for differential timing.
C. There is one standard discount rate that should be used in pharmacoeconomic analyses.
D. Comparisons of programs or treatment alternatives should be made at the same time.

21. Which one of the following statements regarding discounting is true?
A. Researchers should always use a 5 percent discount rate.
B. Costs incurred today to initiate a new program should be discounted.
C. Discounting can be useful when comparing acute and long-term treatment strategies.
D. Benefits should not be discounted.

22. The primary reason to perform a sensitivity analysis is to accomplish which one of the following?
A. Test the robustness of the economic evaluation conclusions.
B. Reveal sensitive variables of the economic evaluation.
C. Uncover the range of plausible values.
D. Allow for a meaningful comparison of treatment alternatives.

23. Which one of the following statements is *not* true regarding the application of pharmacoeconomics to pharmacy practice?
A. Pharmacoeconomics can be a powerful tool for determining the most efficient use of drugs.
B. Pharmacoeconomics can assist pharmacy and therapeutics committees in incorporating clinical, economic, and humanistic outcomes of drug therapy into formulary management decisions.
C. Pharmacoeconomics can provide data to support individual patient treatment and resource allocation decisions.
D. Use of pharmacoeconomic data ensures that organizational drug-use policies will influence physician prescribing patterns.

24. Which one of the following formulary decision options would be *least* influenced by the inclusion of pharmacoeconomic data?
A. Inclusion or exclusion of newly marketed agents.
B. Inclusion with restriction of newly marketed agents.
C. Deletion of drugs from the formulary.
D. Determination of the least expensive to purchase alternative.

25. Which one of the following is true regarding health and quality of life?
A. Quality of life is encompassed by a person's lifestyle, including work and economic status.
B. Health or HRQOL refers only to those aspects of life dominated, or significantly influenced, by personal health or activities performed to maintain health.
C. Quality of life is divided into physical and mental dimensions of functioning and well-being.
D. The concept of health includes marital status, education, and religious beliefs.

26. Which one of the following activities is a dimension of general health status measurement?
A. Carrying a bag of groceries.
B. Physical functioning.
C. Playing sports.
D. Bathing or dressing.

27. Which one of the following pairs illustrates two opposite extremes of mental well-being? These two attributes can be used to describe the range of a mental health continuum.
A. Psychological distress and physical distress.
B. Physical distress and psychological well-being.

C. Psychological well-being and psychological distress.
D. High physical energy and physical weariness.

28. Which one of the following features could be described as one of the most striking differences between traditional clinical measures of a patient's health and measures of health status?
    A. The source of the data is patient self-administered questionnaires.
    B. The collection of data from patients is a new phenomenon, whereas collection of laboratory data dates back many years.
    C. Clinicians can use the clinical data, but not health status data, in decision-making.
    D. Clinical data are "hard data", whereas, health status data are not as scientifically rigorous in their standards of measurement.

29. The following are characteristics of a good scale for measuring health status. Which one of the following is true of generic/general health status measures, but *not* true of disease specific measures?
    A. The concepts can be measured in patients of all ages, races, and socio-demographic characteristics.
    B. The concepts being measured include all possible dimensions of health for a patient population.
    C. The measurement framework extends across the entire range of a dimension, from disease to well-being.
    D. The measurement must be sensitive to change over time to be used in clinical practice.

30. The categorization of structure, process, and outcome published in the early 1960s (see Reference 5) was designed to evaluate which one of the following?
    A. Patients satisfaction with care.
    B. The quality of health care.
    C. Health policy changes.
    D A patients self-assessment of the health care system.

31. Which one of the following best describes a difference between patient satisfaction and health status?
    A. Patient satisfaction results are required for accreditation by JCAHO; health status results are not.
    B. Health status measurements of functioning and well-being are required by law for drug approval; patient satisfaction results are not.
    C. Patient satisfaction is measured with a combination of reports and ratings; health status doesn't use ratings.
    D. Health status is measured using psychometric techniques; patient satisfaction is not.

32. It has been proposed that one solution to increase clinicians' information about the functional status, well-being, and changes over time of their patients might be to standardize these assessments in everyday medical practice. Such routine assessments could be useful for all except which one of the following purposes?
    A. To replace the need for referral to specialists in assessment of functional or emotional problems.
    B. To detect, explain, and track changes in functional capacity over time.
    C. To make it possible to better consider the patients total functioning when choosing among therapies.
    D. As guidance for efficient use of community resources and social services.

33. Which one of the following are *not* characteristics of the measurement and use of individual level patient self-reported health status information?
    A. Standardized method of asking patients about their functioning and well being can be efficiently used in treatment decisions and as a monitoring parameter for efficacy and toxicity of treatment.
    B. Concerns have been raised about the reliability and interpretation of the results from individual, patient-level, health status information.
    C. Modern psychometric test theory, such as Item Response Theory, offers potential for individual patient-level, health status assessment, and use in clinical care.
    D. Existing health outcome assessments drawn from classic test theory can no longer be used.

Appendix A

MOS SF-36™ HEALTH SURVEY

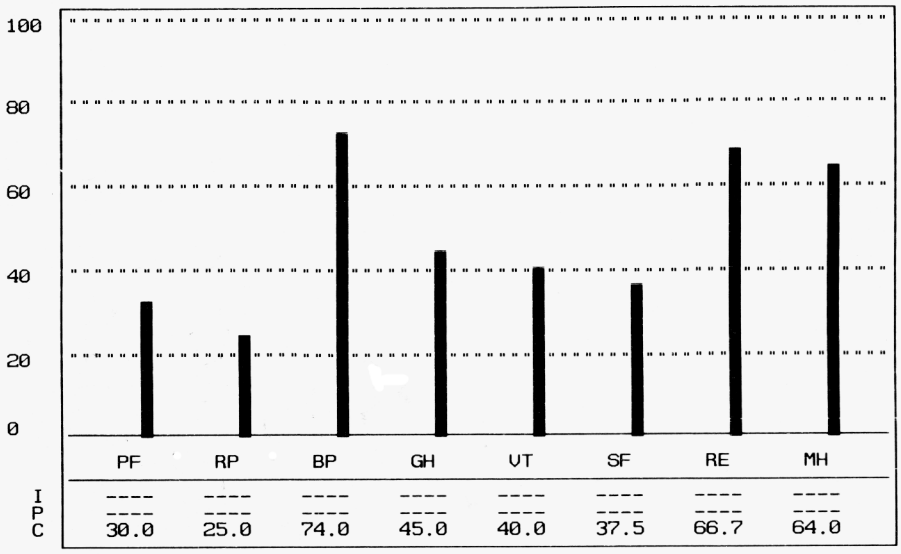
SITE: 1 DATE: 10-01-1995

ID: 12345986500 SEX: Male AGE: 65-74

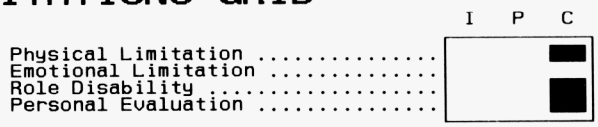
HEALTH SCORES

Physical Functioning	(PF)	Vitality	(VT)
Role Physical	(RP)	Social Functioning	(SF)
Bodily Pain	(BP)	Role Emotional	(RE)
General Health	(GH)	Mental Health	(MH)

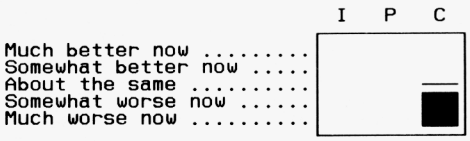
■ = INITIAL (I) ▒ = PREVIOUS (P) ■ = CURRENT (C) 10-01-1995



LIMITATIONS GRID



REPORTED CHANGE IN HEALTH



DATA QUALITY

	INITIAL	PREVIOUS	CURRENT 10-01-1995
VERSION USED	----	----	STANDARD
OVERALL QUALITY	----	----	EXCELLENT
ITEMS COMPLETE (%)	----	----	100.0
CONSISTENCY OF RESPONSES (%)	----	----	100.0

Ware, J.E., Snow, K.K., Kosinski, M. SF-36(R) Health Survey: Manual and Interpretation Guide. Lincoln, RI: QualityMetric Incorporated, 1993, 2000.

Appendix B

MOS SF-36™ HEALTH SURVEY

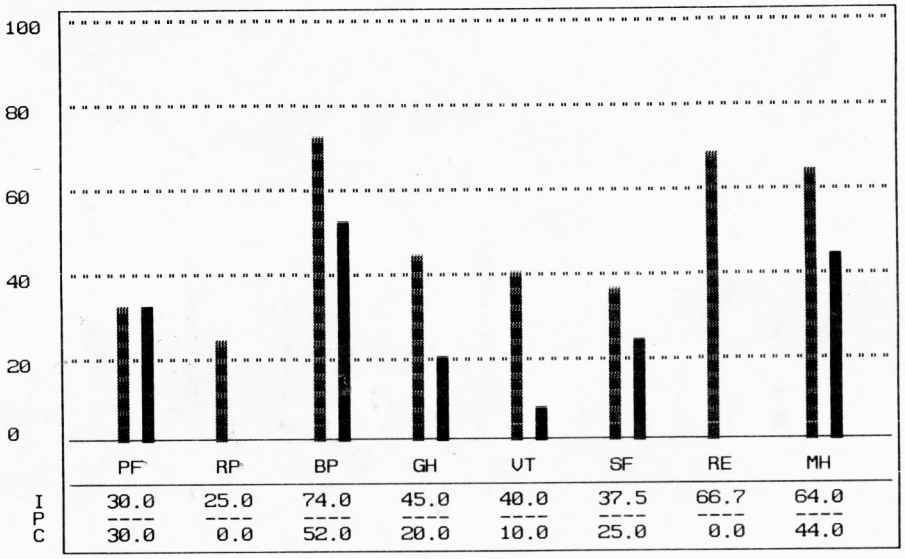
SITE: 1 DATE: 12-07-1995

ID: 12345986500 SEX: Male AGE: 65-74

HEALTH SCORES

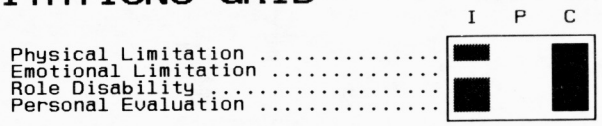
Physical Functioning	(PF)	Vitality	(VT)
Role Physical	(RP)	Social Functioning	(SF)
Bodily Pain	(BP)	Role Emotional	(RE)
General Health	(GH)	Mental Health	(MH)

■ = INITIAL (I) 10-01-1995 ▒ = PREVIOUS (P) ■ = CURRENT (C) 12-07-1995

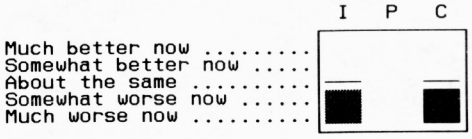


	PF	RP	BP	GH	VT	SF	RE	MH
I	30.0	25.0	74.0	45.0	40.0	37.5	66.7	64.0
P	----	----	----	----	----	----	----	----
C	30.0	0.0	52.0	20.0	10.0	25.0	0.0	44.0

LIMITATIONS GRID



REPORTED CHANGE IN HEALTH



DATA QUALITY

	INITIAL 10-01-1995	PREVIOUS	CURRENT 12-07-1995
VERSION USED	STANDARD	----	STANDARD
OVERALL QUALITY	EXCELLENT	----	SATISFACT
ITEMS COMPLETE (%)	100.0	----	100.0
CONSISTENCY OF RESPONSES (%)	100.0	----	93.3

Appendix C

SF-36 HEALTH STATUS SURVEY RESULTS:
INTERPRETATION GUIDE FOR INDIVIDUAL PATIENT REPORTS (RT Version 1.0)

About the SF-36

The SF-36 (Short-Form, 36 Item) Health Survey is a patient-based, generic health status assessment survey that obtains patients' assessments of their functioning and well-being (how they feel), and perceptions of their health in general. The SF-36 has been used to assess the health status of both general and chronic disease populations. Its reliability in these populations has been documented, and its validity in relation to such clinical indicators as presence or absence of disease, severity within disease category, and changes in disease-related symptoms over time has been demonstrated by investigators.

The information about a patient's functional status and well-being obtained with the SF-36 can be useful in assessing and obtaining a better understanding of a patient's overall health status. Data obtained with the SF-36 should be interpreted within the context of all other information available about the patient.

SF-36 Scoring

The SF-36 measures eight different health concepts, each of which is scored on a scale from 0 to 100. Points in between are percentages of the total possible score. All scales are scored so that a higher score indicates better health. For instance, on the Bodily Pain scale, a higher score indicates less pain, and on the Physical Functioning scale, a higher score indicates better physical functioning. Each item in the SF-36 belongs to, and is used in the scoring of, only one of the eight scales. The table below lists each health concept and indicates the meaning of low and high scores for each concept.

Interpreting the Report

Background

The patient's ID (medical record or encounter) number, gender and age range, and the date on which the patient completed the SF-36, are indicated just below the report title *(MOS SF-36 Health Survey).*

Health Scores

This section reports the patient's scores on each of the eight health concepts (commonly referred to as the eight SF-36 *scales*). Scale scores for each of three possible time points are displayed. A histogram format is used to indicate the eight scale scores at each point in time.

- The scale names (and their corresponding abbreviations in parentheses) are indicated above the graph. Scale abbreviations are used to indicate the corresponding bar in the histogram.
- Initial (I), previous (P), and current (C) dates of survey completion are shown underneath the time point legend. Previous date indicates the most recent date of survey completion before the current administration.
- The vertical axis ranges from 0 to 100 (the range for each SF-36 scale). The horizontal axis lists each scale (by its abbreviation).
- Initial, previous, and current scale scores are listed below the bar(s) corresponding to that scale. "NA" is indicated if a score could not be calculated for a scale on a particular date (scale scores cannot be calculated for a given scale if less than half of the items comprising that scale are completed). **NOTE:** "0.0" is a possible scale score.

Confidence Intervals

Confidence intervals are particularly useful in evaluating changes in SF-36 scores over time and in comparing a patient's scores to benchmark scores. The size of the 90 percent confidence interval (CI) around an individual patient's score ranges between +/- 10 points for the Physical Functioning scale and +/- 23 points for the Role Emotional scale. For any one scale, one would be correct 90 percent of the time or more in concluding that a change truly occurred or a difference truly exists if the difference between the scores being compared exceeds the 90 percent CI for that scale.

Health Concept (Scale Name Bolded)	Lowest Possible Score (0)	Highest Possible Score (100)	Confidence Interval*
Physical Functioning	Limited a lot in performing all physical activities including bathing or dressing	Performs all types of physical activities including the most vigorous without limitations due to health	+/- 10
Role limitations due to physical problems	Problem with work or other daily activities as a result of physical health	No problems with work or other daily activities as a result of physical health	+/- 19
Bodily Pain	Very severe and extremely limiting pain	No pain or limitations due to pain	+/- 12
General Health	Believes personal health is poor and likely to get worse	Believes personal health is excellent	+/- 15
Vitality	Feels tired and worn out all of the time	Feels full of pep and energy all of the time	+/- 13
Social Functioning	Extreme and frequent interference with normal social activities due to physical and emotional problems	Performs normal social activities without interference due to physical or emotional problems	+/- 21
Role limitations due to Emotional problems	Problems with work or other daily activities as a result of emotional problems	No problems with work or other daily activities as a result of emotional problems	+/- 23
General Mental Health	Feelings of nervousness and depression all of the time	Feels peaceful, happy, and calm all of the time	+/- 12

Limitations Grid

This grid is a visual representation of four dichotomous summary limitation indicators. The indicators identify limitations patients reported in four different health categories. The limitation indicators and their criteria for activation are: Physical Limitation (PF<100), Emotional Limitation (MH<53), Role Disability (RP<100 or RE<100) and Personal Evaluation (GH<56). When an indicator is "activated," a black box appears across from the indicator name, under the appropriate date of survey administration.

Reported Change in Health

This section of the report reports how a patient rates their general health in comparison to a year ago (if the standard version of the SF-36 is used) or a week ago if the acute version is used). (See discussion of the Standard and Acute versions in the Data Quality section, below.) Response options appear on the left, and responses on initial, previous, and current administrations are indicated in a box on the right. The length of the bar corresponds to the degree to which the patient rates his or her general health compared to the past: a longer bar above the "about the same" line indicates greater improvement, while a longer bar below the line indicates greater worsening of general health. If the patient reported that their health is "about the same", an asterisk appears across from this response option.

Data Quality

This section indicates the SF-36 version administered during the current administration (standard or acute). The two versions differ in the recall period used in the items included in the RP, BP, VT, SF, RE, and MH scales. The standard version uses a 4 week recall period, whereas the acute version uses a 1 week recall period. The standard version is most frequently used. General population norms and confidence intervals are available on the standard version only.

The Data Quality section also indicates a rating of the overall quality of the data, the percent of items complete and the percent consistency of responses based on the current administration. *Item completeness* and *response consistency*, two indicators of data quality, are assessed each time a patient completes the SF-36. The closer each of these percentages is to 100 percent, the better the data quality. Item completeness is assessed by calculating the percent of items completed by the patient. Response consistency is assessed by evaluating 15 pairs of items for agreement in the pattern of responses. Taking these two indicators into account, the data quality of each SF-36 form is assigned a rating of *Excellent, Satisfactory, or Problematic*. (See next column for interpretation of problematic data.)

Missing / Double Marks and Inconsistency Report

If there are any missing data (percent items complete<100) or inconsistent responses (percent consistency<100), then a second page is printed. The top of the page notes which questions were not answered or had multiple responses (and are therefore considered missing). The bottom of the page indicates which of the 15 consistency checks were failed. The numbers listed above the inconsistency check box represent the questions involved in the consistency check. For example, if a patient responds "all of the time" to both questions 9a ("Did you feel full of pep?") and 9i ("Did you feel tired?"), then a check mark is listed under "9a vs 9i" because these responses are inconsistent.

Interpreting Problematic Data

- On a given date for a given patient, any of the following conditions result in a data quality rating of Problematic:
  1. Less than half of the items were completed for one or more of the scales, resulting in one or more missing scale scores.
  2. Inconsistent response pattern (response consistency ≤85 percent).
  3. Combination of both 1 and 2.
- A low response consistency (percent) could mean two things:
  1. The patient had difficulty understanding the questions.
  2. The patient was not paying attention to the way he/she responded to some or all of the questions (random answers).
- Items complete (percent) and response consistency (percent) can help identify patients who repeatedly have trouble completing the form and/or have trouble responding in a consistent manner.

Treat Problematic Data with Caution

Problematic data are by nature less reliable. This is especially true if there is a problem with response consistency. It is often useful to examine the individual items causing the inconsistent responses for individual patients.

References

1. Ware JE, Jr., Sherbourne C. A 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. Med Care 1992, 30:6.
2. Ware JE. SF-36 Health Survey Manual and Interpretation Guide. The Health Institute, New England Medical Center, Boston MA, 1993.
3. Response Technologies, Inc. The RT 2000/SF-36 Report Formats. © 1992 Response Technologies, Inc.

Appendix D
Normative Values

NORMS FOR THE GENERAL U.S. POPULATION, TOTAL SAMPLE

Total Sample
(N=2,474)

	PF	RP	BP	GH	VT	SF	RE	MH
Mean	84.15	80.96	75.15	71.95	60.86	83.28	81.26	74.74
25th Percentile	70.00	50.00	61.00	57.00	45.00	75.00	66.67	64.00
50th Percentile *(median)*	90.00	100.00	74.00	72.00	65.00	100.00	100.00	80.00
75th Percentile	100.00	100.00	100.00	85.00	75.00	700.00	100.00	88.00
Standard Deviation	23.28	34.00	23.69	20.34	20.96	22.69	33.04	18.05
Range	0-100	0-100	0-100	5-100	0-100	0-100	0-100	0-100
% Ceiling	38.79	70.85	31.85	7.40	1.50	52.32	71.01	3.91
% Floor	0.84	10.33	0.58	0.00	0.52	0.64	9.61	0.00

Ages 65 & over
Males (N=293)

	PF	RP	BP	GH	VT	SF	RE	MH
Mean	65.79	59.72	68.76	58.62	57.80	79.66	76.94	77.37
25th Percentile	45.00	25.00	51.00	47.00	40.00	62.50	66.67	68.00
50th Percentile *(median)*	75.00	75.00	72.00	62.00	60.00	100.00	100.00	84.00
75th Percentile	90.00	100.00	84.00	77.00	75.00	100.00	100.00	92.00
Standard Deviation	28.31	42.51	25.37	22.05	22.55	26.00	37.48	17.42
Range	0-100	0-100	0-100	5-100	0-100	0-100	0-100	16-100
% Ceiling	6.6	45.9	22.8	1.8	1.7	50.7	68.3	7.6
% Floor	3.0	24.4	0.9	0.0	1.0	1.5	14.9	0.0

NORMS FOR COMORBID CONDITIONS: CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) WITH HYPERTENSION

	PF	RP	BP	GH	VT	SF	RE	MH
Mean	56.91	34.38	54.82	45.29	44.95	71.82	59.73	68.06
25th Percentile	35.00	0.00	31.00	35.00	30.00	62.50	0.00	56.00
50th Percentile *(median)*	61.11	25.00	52.00	42.00	50.00	75.00	66.67	72.00
75th Percentile	80.00	75.00	72.00	60.00	55.00	100.00	100.00	84.00
Standard Deviation	29.14	38.73	26.14	18.94	19.55	31.40	44.61	19.68
Range	0-100	0-100	10-100	5-87	0-90	0-100	0-100	13-100
% Ceiling	5.88	14.12	10.59	0.00	0.00	32.94	48.24	2.35
% Floor	2.35	42.35	0.00	0.00	1.18	2.35	27.06	0.00

Appendix E

MOS SF-36™ HEALTH SURVEY

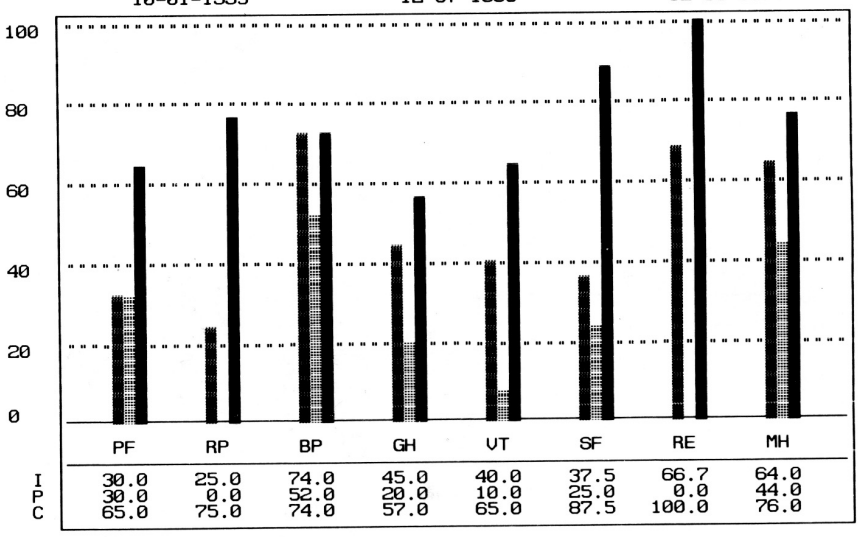
SITE: 1 DATE: 12-05-1996

ID: 12345986500 SEX: Male AGE: 65-74

HEALTH SCORES

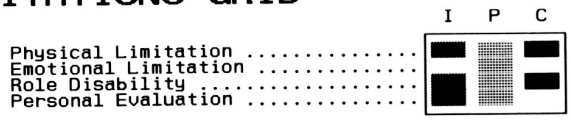
Physical Functioning	(PF)	Vitality	(VT)
Role Physical	(RP)	Social Functioning	(SF)
Bodily Pain	(BP)	Role Emotional	(RE)
General Health	(GH)	Mental Health	(MH)

■ = INITIAL (I) 10-01-1995 ▒ = PREVIOUS (P) 12-07-1995 ■ = CURRENT (C) 12-05-1996

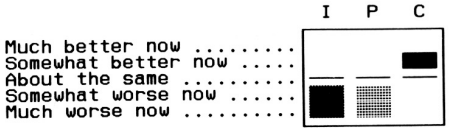


	PF	RP	BP	GH	VT	SF	RE	MH
I	30.0	25.0	74.0	45.0	40.0	37.5	66.7	64.0
P	30.0	0.0	52.0	20.0	10.0	25.0	0.0	44.0
C	65.0	75.0	74.0	57.0	65.0	87.5	100.0	76.0

LIMITATIONS GRID



REPORTED CHANGE IN HEALTH



DATA QUALITY

	INITIAL 10-01-1995	PREVIOUS 12-07-1995	CURRENT 12-05-1996
VERSION USED	STANDARD	STANDARD	STANDARD
OVERALL QUALITY	EXCELLENT	SATISFACT	EXCELLENT
ITEMS COMPLETE (%)	100.0	100.0	100.0
CONSISTENCY OF RESPONSES (%)	100.0	93.3	100.0

TYPES OF ECONOMIC AND HUMANISTIC OUTCOMES ASSESSMENTS

Answers to Self-Assessment Questions

1. Answer: B

Pharmacoeconomics is part of the larger area of research known as outcomes research. The two are not synonymous; therefore, Answer A is incorrect. Not all outcomes research is pharmacoeconomic research (Answer D). Proponents of outcomes research include clinical, economic, and humanistic variables as dependent or as the outcome variables. Outcomes research includes clinical assessments, the patient's perspective about their functioning and wellbeing, as well as the economics of the intervention; therefore, Answer C is incorrect.

2. Answer: D

The economic, clinical, and humanistic outcomes (ECHO) model represents economic, clinical, and humanistic outcomes. Each of these endpoints involves intermediate steps or intermediate outcomes. Humanistic intermediaries can include specific behaviors of an individual or a group of people. The behaviors themselves are not outcomes in this model. One example is the behavior of patients' adherence to their drug regimen. Compliance can be affected by nonbehavioral factors also, such as the cost of the drug or the patient's belief system, or attitude toward taking drugs. All of these influences can have an impact on the outcome and the patients assessment of the outcome. In a statistical model, adherence to drug regimens is considered both a dependent and an independent variable. As an independent variable, adherence can be evaluated for its effect on the dependent variable of humanistic outcomes. In this way, it is an intermediary, or an intermediate step.

3. Answer: A

Economic outcomes have been defined as the total costs of medical care associated with treatment alternatives balanced against clinical or humanistic outcomes (see Reference 13). Clinical outcomes are defined as medical events that occur as a result of a disease or treatment (Answer B). Humanistic outcomes are defined as the consequences of disease or treatment on patient functional status or quality of life (Answer C). Researchers have proposed that the evaluation of pharmaceutical products should include an assessment of each of these three outcome types.

4. Answer: D

Direct medical costs are the costs incurred for medical products and services used for the prevention, detection, and treatment of a disease, such as transportation. Examples of other direct costs include drugs, supplies, and hospitalizations. Pain (Answer A) is an example of an intangible cost. Mortality (Answer C) is an example of an indirect cost. Transportation (Answer B) is a direct nonmedical cost.

5. Answer: C

Indirect costs are those costs resulting from morbidity and mortality. They are costs valued as real money that are not directly paid for the treatment of an illness or disease, such as transportation. Morbidity costs are incurred from missing work (lost productivity), whereas mortality costs are the costs incurred due to premature death.

6. Answer: B

Economic evaluations can be conducted from single (Answer A) or multiple perspectives, as long as it is clear what the perspective(s) is and the costs and consequences are relevant to the perspective(s) chosen. Popular perspectives for conducting economic evaluations include the patient (Answer C), provider, payer, and society. In countries with nationalized medicine, society is the predominate perspective; however, it is not the only valid perspective (Answer D).

7. Answer: D

Direct costs of importance to providers are expenses paid by the provider to care for patients. The amount paid out-of-pocket by patients directly to their physicians for a clinic visit is a direct expense to patients (Answer A). Patient charges for visits to an emergency department (Answer B) and the prescription cost of insulin at the community pharmacy (Answer C) both are direct expenses to third-party payers and to patients (for the amount of their co-payment). Salaries of clinical pharmacists who monitor patients' therapies are direct expenses from the perspective of the provider.

8. Answer: B

Indirect costs are composed of costs due to work loss and decreased productivity due to illness. From the perspective of an employer, costs related to lost days of work and decreased functioning of employees are pertinent indirect costs. A drug that reduces an employee's ability to function certainly falls into this category. Loss of income (Answer C) is an indirect cost from the perspective of the patient, whereas family care-giving expenses (Answer D) are direct nonmedical costs. The patient's share of hospitalization costs (Answer A) are a direct cost from the patient perspective.

9. Answer: A

Costs from a patient's perspective are essentially the uninsured portion of what they pay, or are charged, for a product or service. The provider's perspective is represented

by the true cost of providing a service (Answer B). The charges allowed for a health care product or service (Answer C) represent cost from the perspective of a payer. Cost from a societal perspective includes the cost of giving and receiving medical care, including morbidity and mortality (Answer D).

10. Answer: B

A full economic evaluation is one that encompasses two basic characteristics: 1) a comparison of two or more treatment alternatives is made; and 2) both the costs and the consequences of the alternatives are examined (see Reference 7). A partial economic evaluation encompasses only one of these characteristics. A complete evaluation should identify, measure, and compare the costs and consequences associated with competing programs or treatment alternatives.

11. Answer: D

A partial economic evaluation provides a descriptive assessment of resource use or outcome. By definition, partial evaluations do not provide both a comprehensive assessment and comparison of the costs and consequences of competing alternatives; therefore, Answer A is incorrect. A simple cost comparison without regard for outcomes, as well as comparison of only outcomes without regard for costs, are both examples of partial economic assessments. A third example of partial economic assessment is the description of costs and outcomes for a single treatment alternative.

12. Answer: C

Although partial economic evaluations may serve as a useful starting point in outlining or describing the costs or consequences of drug therapy, they are not a component of a full assessment (Answer A). A full economic assessment necessitates evaluation of both the costs and consequences of competing alternatives. In the absence of a full evaluation, a partial evaluation may provide some insight into important cost and outcome parameters for a given disease state, but should never serve as the basis for selection of an alternative.

13. Answer: D

Cost-minimization analysis should not be used if there is any doubt regarding the therapeutic equivalence of two or more treatment alternatives being compared. This methodology does not take into account differences in clinical outcomes between agents. The appropriate use of this method could be to compare agents in the same therapeutic class with documented equivalence in safety and efficacy. Although the costs of these agents would be identified, measured, and compared, the analysis should extend beyond drug acquisition costs, and include all relevant costs incurred for administering, monitoring, and preparing the agent.

14. Answer: A

The results of a cost-benefit analysis are typically expressed as either a cost-benefit ratio, or as net cost or net benefit. When comparing two or more treatment alternatives, the alternative with the greatest cost-benefit ratio, or net benefit, is considered the most efficient use of resources. However, caution must be exercised when using cost-benefit ratios. The values can be misleading; therefore, the relative magnitude of the cost-benefit ratio must be considered. The net benefit associated with a program or treatment alternative is often the preferred expression of study results.

15. Answer: A

A cost-benefit analysis is the best economic evaluation method to compare two or more programs when it is best to translate benefits into a dollar value. For example, if quantifying the value of a new pharmacy service, such as a Therapeutic Drug Monitoring Service, the cost of implementing and managing the program (the pharmacist's salary, laboratory tests), and the benefit of the program (decreased drug costs, decreased patient lengths of stay), can both be translated into dollar values.

16. Answer: A

A product or service may be considered cost-effective compared to a competing alternative when any of the following three conditions are met: 1) the alternative is less expensive and at least as effective as the comparator; 2) the alternative is more expensive and provides an additional benefit that is worth the additional cost; or 3) the alternative is less expensive and less effective and the lost benefit was not worth the extra cost of the comparator. Cost-effectiveness analysis attempts to determine the optimal alternative, which is not always the least expensive alternative, for obtaining a desired effect.

17. Answer: A

Cost-effectiveness analysis is the best economic evaluation method to apply when two or more treatment alternatives have different efficacy and safety profiles. An appropriate application of this method could be to compare treatment alternatives from different therapeutic categories that are used to treat the same disease. A complete evaluation would identify, measure, and compare all of the costs and consequences relative to the perspective(s) chosen. Relevant costs assessed in this evaluation should extend beyond drug treatment costs, and include the costs of treatment failures and adverse drug reactions.

18. Answer: C

The incremental cost-effectiveness ratio represents the incremental or additional cost required to obtain an incremental or additional benefit when comparing a treatment alternative to the next most intensive or expensive

treatment option. Summary measurements of efficiency (Answer A) typically describe cost-effectiveness ratios. The cost per benefit of a new strategy independent of other alternatives (Answer B) describes the classic average cost-effectiveness ratio, where the average cost to obtain a specific therapeutic objective is spread over a large population. The cost per quality-adjusted life-year gained (Answer D) is a description of a cost-utility ratio.

19. Answer: A

Cost-utility analyses can compare cost, quality, and quantity of patient-years. Thus, when evaluating treatment alternatives that are life-extending with serious side effects, such as cancer chemotherapy, is the best economic evaluation technique. Cost-utility analysis is also an appropriate methodology to use when evaluating alternatives that produce reductions in morbidity instead of mortality, such as arthritis treatments.

20. Answer: C

The primary role of discounting in economic evaluation is to incorporate the effects of differential timing into the decision process. Whenever a cost or benefit is realized more than 1 year into the future, discounting should be performed. There is no standard discount rate to use, although 5 percent is commonly used.

21. Answer: C

There is no one standard discount rate for use in pharmacoeconomic analyses. Many investigators recommend that costs should be discounted to their present value using a rate of 3–8 percent per annum. However, a commonly used rate in recently published evaluations is 5 percent.

22. Answer: A

Sensitivity analysis is a standard approach to manage uncertainty in an economic evaluation. Due to the almost universal need to make assumptions when conducting economic evaluations, it is critical to perform sensitivity analyses. By varying sensitive variables over a range of plausible results, one can test the robustness of the study conclusions.

23. Answer: D

No one single factor can absolutely ensure that drug-use policies will have a positive effect on prescribing patterns. However, having pharmacoeconomic data to support the appropriate and cost-effective use of a pharmaceutical product typically increases its acceptance by health care providers and society. Strategic implementation of strategies using verbal, written, and on-line communication, based on sound pharmacoeconomic data, will also enhance the success of these policies in a health care organization.

24. Answer: D

For formulary management, the best uses of pharmacoeconomic data are for formulary decisions regarding the inclusion or exclusion of treatment options. Although a formulary is often viewed as a cost-containment tool, a formulary should not be a list of the cheapest alternatives. The purpose of today's formulary should be to optimize therapeutic outcomes while controlling the cost of pharmaceutical products. Contemporary formulary management decisions have begun to extend beyond an evaluation of only safety and efficacy, or only cost, and include an assessment of the pharmacoeconomic value of pharmaceutical products and services.

25. Answer: B

Health-related quality of life refers to those aspects of life dominated, or significantly influenced, by personal health and activities performed to maintain health. Health is only one aspect of quality of life. Quality of life encompasses more than a person's lifestyle (Answer A). There are 12 different domains of life proposed in the literature. Marital status, education, and religious beliefs more accurately describe quality of life, rather than health; therefore, Answer D is incorrect.

26. Answer: B

Only physical functioning is a dimension of health. Activities such as the ability to carry a bag of groceries (Answer A), playing sports (Answer C), and bathing and dressing (Answer D), are all items used to inquire about a degree or state of physical functioning. Knowing that a patient has no limitations in bathing or dressing, but has some limitations in playing sports, gives one information to describe a range of physical functions that the person can perform.

27. Answer: C

Distress and well-being describe two extreme points, or boundaries, in the range of mental health states. To be complete, it is recommended that the dimensions included within health status questionnaires go beyond the absence of the negative health state. For example, a patient who experiences relief of his psychological distress would not necessarily have achieved his ultimate health goal unless he achieved an experience of psychological well-being, or was happy, and not just not sad.

28. Answer: A

Traditional means of collecting clinical data, such as laboratory tests, radiographs, and physical examinations, are

usually performed by a technician, a machine, or a clinician. Health status assessments, as described in this module, are patient self-administered questionnaires. Collection of information from patients is not a new phenomenon; what is new are the attempts to standardize the collection of this information; therefore, Answer B is incorrect. Clinicians can use the information from health status assessments in clinical decision-making; therefore, Answer C is incorrect. Although there is some controversy surrounding the application of the results of the questionnaires, the results are being used. The methods of assessing health status use the discipline of psychometrics, enabling one to assess objectively the subjective aspects of health. Thus, an argument can be made that health status measures are also "hard data;" therefore, Answer D is incorrect.

29. Answer: A

Measurement of health status across the spectrum of patient age, race, and socio-demographics is unique when using generic measures. If generic status measurements were applied to a disease population, the measurement would be too burdensome to the patient and include concepts that were not applicable to some patients in the population. The dimensions of health addressed in the measurement definitely need to be comprehensive, but cannot contain too many questions that would overburden the patient. Measurement frameworks (Answer C) should extend across the entire range of a dimension for *both* general and disease-specific assessments. In addition, measurements must be sensitive to change over time for *both* types of assessments; therefore, Answer D is incorrect.

30. Answer: B

Quality of care can be evaluated in areas of structure, process, and outcome (see Reference 5). This can be a confusing concept because one can achieve quality in the structure of a care setting, in the process of care, or in the outcome of care; however, Donnabedian proposed that to achieve true quality of care, quality must be achieved in all three areas. Although the categories are intimately related, success in one area does not imply success in another. Until the recent attention to outcomes assessment, the system had focused on achieving quality in structure and process only. Patient satisfaction with care (Answer A) is a component of quality outcomes, as is patient self-assessment of the health care system (Answer D). Although the information gained from knowing about the structure, the process, and the outcomes of a health care delivery system can give a representation of the quality of care, it is really only a starting point for changes in health policy (Answer C).

31. Answer: C

There are no national regulations for the use of patient-based assessments. The Joint Commission on Accreditation of Healthcare Organizations recommends patient satisfaction be assessed for accreditation; however, it is not a mandate; therefore, Answer A is incorrect. To date, there is no regulatory body that requires health-related quality-of-life measures for drug approval (Answer B); however, manufacturers must now provide evidence of scientifically valid conclusions to make labeling claims about quality of life. *Both* patient satisfaction and health status are measured using psychometric techniques; therefore, Answer D is incorrect.

32. Answer: A

Ware has proposed that everyday use of health status assessments could ensure that all important dimensions of functional status and well-being are considered consistently to detect, explain, and track changes over time (Answer B). Their use would make it possible to better consider the patients total functioning when choosing among therapies (Answer C). Health status assessments also could guide the efficient use of community resources and social services (Answer D), as well as more accurately predict the course of chronic disease. Although health status assessments have great potential to improve care, they are not meant to serve as a replacement for current, more detailed assessments of function, such as that used by physical therapists, or of emotional well being, such as is assessed by psychiatrists and social workers.

33. Answer: D

Existing health outcome assessments drawn from classic test theory, along with item response theory, offer exciting opportunities for appreciably expanding applications of patient based health assessments in biomedical and health services research, clinical practice, and decision-making, and policy developments. Answers A, B, and C all discuss true characteristics of the measurement and use of individual level patient self-reported health status information.