clinical care (doctor-patient relationship, competence of nursing staff, etc.); 2) Satisfaction with physical surroundings (medical facilities, organisational structure, etc.); 3) Satisfaction with clinical outcomes (result of treatment, impairment due to side effects, etc.) In the focus groups patients reported that analgesics and their application forms have an impact on acceptance, compliance, and on several areas of life such as sleep and lifestyle. CONCLUSIONS: The results of the focus groups support the assumption, that at least one further dimension of patient’s satisfaction exists: satisfaction with medical treatment. This aspect has not yet been taken up by theoretical or empirical research. Due to this, world wide there is no instrument for recording this dimension today. The need to develop a new questionnaire to establish patients level of acceptance and satisfaction with their medication was specified and suggestions for a 4-dimensional model of patient’s satisfaction were made.

**PMD4**

**WHEN CAN MISSING DATA BE CONSIDERED MISSING AT RANDOM (MAR) IN SUBSTANCE ABUSE TREATMENT OUTCOMES RESEARCH?**

Ciesla JR, Spear SF  
Northern Illinois University, DeKalb, IL, USA

OBJECTIVES: A lot of attention is focused on the outcome effectiveness of substance abuse treatment. The usual method of assessing outcomes is by contacting clients after treatment and querying them on recovery-related behaviors and on drug/alcohol use. Since researchers are not always able to contact every client after treatment, the issue of response bias is important. Missing data is MAR, and thus ignorable, if differences between respondents and nonrespondents can be characterized by variables that are measured for both groups. The objective of this research is to illuminate this issue by using data collected from a U.S. treatment population and to discuss statistical methods for correcting response bias.  

METHODS: The data were collected from treatment records and follow-up interviews of clients completing substance abuse treatment at a facility in the U.S. Appropriate consent was obtained. Each client contacted was administered a questionnaire. Eighty-eight (44.9%) completed the questionnaire; 102 (52.4%) could not be contacted. Since the treatment records for the responders and nonresponders were available, information was extracted on variables related to treatment outcomes so that statistical analysis could be conducted. RESULTS: No differences were found between responders and nonresponders for most variables. Variables measuring demographics, family support/structure, criminality/truancy, psychological comorbidities, treatment attributes, and drug use were not different. Variables with statistically significant differences were: “number of months at current residence” (t = 2.12 p = .037) and the proportion “holding a job” (difference in proportions = .182; 95% CI = .043 to .321). CONCLUSIONS: Missing data are not MAR, and thus not ignorable, when missing variables are the same as or related to variables that determine outcomes. In this case “number of months at current residence” and “holding a job” may predict treatment success. If this is true, some method of control must be used. Weighting adjustments such as post-stratification and likelihood-based methods are considered. Since the variables that predict treatment outcomes are not fully understood, it is difficult to be certain MAR criteria are met.

**METHODOLOGY ISSUES—Economic Study Issues**

**PMD5**

**VALUATION OF NEW DRUG APPLICATIONS OF PHARMACEUTICAL COMPANIES USING COMPOUND OPTION MODELS**

Cassimon D, Engelen PJ, Thomassen L, Van Wouwe M  
University of Antwerp, Antwerpen, Belgium

OBJECTIVES: This paper presents a model based on real option analysis for the valuation of R&D in the pharmaceutical sector both for start-up ventures as well as big conglomerates. We derive a formal compound option model to value New Drug Applications (NDA) and show the valuable contribution of real option analysis compared to conventional DCF-analysis. METHODS: The key understanding is that R&D projects of NDAs can be seen as compound options. The growth option framework looks at pharmaceutical investment projects as a sequence of options, which differs from a conventional DCF-analysis by incorporating the possibility to stop the project when a subsequent phase is not valuable (abandon the option), and only continues with the project (exercising the option) when it is valuable. Traditional valuation techniques as DCF-analysis fail in valuing innovative companies because most of the value of R&D projects is embedded in unexercised real options whose future value is uncertain at this moment. If one considers a company as a portfolio of real options, one can value the projects or the company based on a compound option model. RESULTS: The compound option model reveals that real option analysis can better incorporate the value of a NDA than conventional DCF-analysis would reveal. Real option analysis will better reflect the fundamental value of the project or of the company, which cannot be captured by DCF-analysis. CONCLUSION: The paper presents a new methodology for valuing R&D of pharmaceutical companies based on compound option models.

**PMD6**

**MODIFYING COST-EFFECTIVENESS RATIOS TO BE MAXIMALLY COMPARABLE ACROSS MULTIPLE DISEASES: AN APPLICATION OF MANIFOLD THEORY**

Gold K, Botteman M, Pashos C  
Abt Associates Inc, Cambridge, MA, USA

OBJECTIVE: Develop methodology to create a more globally informative, CE-based “valuation” that is useful
in comparing interventions across diseases. METHODS: Cost effectiveness ratios (CERs), presenting the financial cost per quality-adjusted life year saved, enable decision makers to assess the value of health care products/services in reducing misery as well as extending life. Although CERs are valuable especially in comparing options for a given disease, decision makers have struggled in using them to compare the value of alternatives across diseases. For example, Garvey (2000) noted that the CER use of sildenafil in erectile dysfunction was favorable compared with treatments in other diseases, such as renal dialysis and coronary artery-bypass graft surgery in current literature. Garvey concluded that while the CER comparisons were valid on the “local” (condition-specific) comparisons, they are problematic in “global” comparison across diseases. This could be attributed to the failure of CER to account for different degrees of medical necessity, baseline utility, public health importance, and other relevant issues. Manifold theory helps address the issues arising from global versus local properties from a geometric perspective. Manifold theory provides an excellent mathematical model to develop a global, cost-effective based valuation of interventions that can incorporate dimensions, such as medical necessity while preserving the local functionality of useful condition-specific CER comparisons. RESULTS: Examples of two different manifolds derived under different assumptions are presented. The development of the first manifold is derived via theoretical criteria for rational health resource allocation, while the second manifold is based on empirical data that infer “rules at work” in the decision-making coverage for the U.S. Medicare system. Calculations of global valuations for renal dialysis, cholesterol-lowering medication and coronary artery bypass graft surgery are presented and compared to that of sildenafil. CONCLUSIONS: The resultant values, presented side-by-side with published CER’s present a more globally interpretable “valuation”.

**PMD7**

**VALUATION OF INFORMAL CARE: THE OPPORTUNITY COST METHOD APPLIED IN CAREGIVING FOR STROKE AND RHEUMATOID ARTHRITIS PATIENTS**

Van den Berg B1, Brouwer W2, Van Exel J3, Koopmanschap M4

1Erasmus University and National Institute for Public Health and the Environment, Rotterdam, Netherlands; 2Erasmus University, Rotterdam, Netherlands

OBJECTIVES: Informal care, defined as care provided by family members or friends, plays a substantial role in the total care provided to patients with chronic and terminal diseases. It should be incorporated in any economic evaluation adopting the societal perspective. In practice however, informal care is often neglected. Time is a substantial part of informal care. The time spent on caring should be valued to incorporate it in economic evaluations. It is recommended to value informal care time with the opportunity cost method. We discuss the practical problems of the application of the opportunity cost method in caregiving for stroke and rheumatoid arthritis patients. METHODS: The data for this study are collected by mailed surveys to 217 informal caregivers of stroke patients and to 153 informal caregivers of rheumatoid arthritis patients. RESULTS: We distinguished three types of forgone time: paid work, unpaid work and leisure. Informal care is usually at the cost of leisure (60 percent). In stroke however it is also for a major part at the cost of unpaid work (36 percent). The total amount of time forgone is in both populations approximately 5 hours a week of unpaid work and in case of stroke more than 10 hours a week of paid work. The leisure time forgone in rheumatoid arthritis is twice the leisure time forgone in stroke. It is worth noting that we developed a new instrument to measure the opportunity costs of informal care to rheumatoid arthritis. CONCLUSIONS: Rheumatoid arthritis is an inflammatory progressive chronic disease without a clear reference point. A reference point means that there is a clear period before the incidence of the illness and a clear period after the incidence. This lack of a reference point has important implications for the measurement of time forgone in order to be able to provide informal care.

**PMD8**

**TRENDS IN DATA SOURCES USED FOR ECONOMIC EVALUATION**

Bole A

Heron Evidence Development, Stevenage, United Kingdom

OBJECTIVES: The suitability and the practicality of using different data sources in economic evaluation have been well documented. The objective of this study was to identify any trends in the types of data sources used in these studies over a 6-year period (1995–2000) METHODS: For this preliminary study, the area of heart disease was selected to create a sample of papers for analysis. A simple search strategy was constructed and run on the NHS EED database. The retrieved studies were then sorted by year and type of economic evaluation. The sources of data used to estimate effectiveness, resource use and costs for the interventions or programmes in the studies were then identified for each study. RESULTS: The literature search retrieved 326 economic evaluations published between 1995 and 2000. Data used in the evaluations ranged from solely expert opinion to pragmatic trials where cost and resource use information were collected alongside one another. There is a downward trend in the proportion of studies using a retrospective analysis to establish the effectiveness of interventions and programs. A review of the literature (with no meta-analysis) has remained a constant data source for effectiveness, accounting for approximately a quarter of all evaluations each year. The type of resource utilization data used has not changed over the years, with the majority of information collected alongside trials, with either the whole study population or with smaller cohorts, or a retrospective analysis of case notes. The