

National Institute on Drug Abuse

**Measuring and
Improving Cost,
Cost-Effectiveness,
and Cost-Benefit
for Substance
Abuse Treatment
Programs**

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National Institutes of Health



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Measuring and Improving Cost, Cost-Effectiveness, and Cost-Benefit for Substance Abuse Treatment Programs

A Manual

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Foreword

Measuring and Improving Cost, Cost-Effectiveness, and Cost-Benefit for Substance Abuse Treatment Programs: A Manual takes the mystery out of cost accounting. Treatment programs, regardless of their funding sources, are faced with constant pressures to keep costs to a minimum and to justify every expenditure. Yet accounting for costs takes time that might better be spent on treatment itself. Also, program staff trained in helping people may not be proficient in tracking money.

The National Institute on Drug Abuse, as part of its mission to assist programs that treat substance abusers, has sponsored research related to cost issues. The results of these studies are available to treatment programs at no cost as part of NIDA's policy of transferring technology as soon as possible. One example of this is *Measuring and Improving Cost, Cost-Effectiveness, and Cost-Benefit for Substance Abuse Treatment Programs: A Manual*.

The *manual* describes several ways to determine cost effectiveness and benefits, ranging from simple educated estimates to sophisticated, computerized methods. It even shows you how to find people at little or no cost to help you collect and analyze the data.

No background in accounting or research is needed to use the methods described in the *manual*. The hands-on format and step-by-step instructions, exercises, and worksheets are designed to guide professionals from a variety of disciplines and educational backgrounds through the collection and analysis of data on costs, procedures, effectiveness, and benefits. Most of these data are already being collected for other purposes, such as billing or evaluating patient progress.

What Does the Manual Contain

The methodology used in this manual is based on a cost-procedure-process-outcome analysis (CPPOA) model that has been well researched and tested with substance abuse treatment programs.

The *manual* itself consists of 12 chapters, starting with definitions of various cost analyses and explaining their importance. A suggested timetable breaks the measurement process into specific tasks, identifies

who needs to be involved, and presents concrete assignments for each person on the data collection and analysis team.

Then the *manual* explains the model on which it is based and helps you define your own program in terms of your resources, procedures, processes, and outcomes. This exercise alone can reveal many things about your program, both its strengths and its weaknesses.

- Detailed, step-by-step instructions and suggestions are given for—
- Collecting and analyzing cost data.
- Collecting patient data.
- Finding the cost-effectiveness of your procedures and processes.
- Exploring cost benefits.
- Using your findings to improve your program.

Collecting and Analyzing Cost Data

The *manual* defines various categories of costs and spells out strategies for collecting data. Most costs are already known to someone in the program; your task is to get all the information in one place. Provider time may need to be taken from individual patient records. Personnel will know salaries and wages. Your administrator will probably have records on the cost of space and utilities. Whoever pays the bills will know the cost of medications, transportation, and so forth.

The *manual* provides sample forms and formats for putting these data together for easy analysis. When your data collection plan is in place, the actual time required to implement it will be minimal.

Analyzing the data is simply finding the cost of each procedure for each patient for the month or quarter. With all the numbers in one place, this can be done by hand or using a calculator, although a computer spreadsheet program might be more efficient.

Collecting Patient Data

The *manual* describes the types of data you will want to collect for each patient. Again, most of this is already available from intake forms and progress reports. Several ways of coding patient progress are suggested.

Finding the Cost-Effectiveness of Your Procedures and Processes

The measures of patient progress show the effectiveness of your procedures. The manual provides several ways to turn measures of effectiveness into measures of monetary benefits.

Methods for analyzing data with graphs and spreadsheets are explained

using examples from substance abuse programs. Sample tables, charts, and report outlines describe ways to present the findings to others.

Exploring Cost Benefits

The *manual* also discusses ways to show the cost benefits of your program. These include the many savings for the community related to the costs of crime, unemployment, and health services for untreated substance abusers. It also shows how treatment increases community income.

Using Your Findings To Improve Your Program

Determining the cost and effectiveness of your procedures gives you the necessary information for improving your program. The *manual* explains several ways to compare your program to other programs and to compare procedures within your program. It also points out the pitfalls of certain comparisons.

The *manual* suggests a variety of changes you might try that could save money without jeopardizing your program. It even suggests ways to save time and money on measuring costs.

Is This Method Realistic for a Clinical Program?

The last chapter of the *manual* gives a detailed illustration of how the CPPOA model was used by the staff and administrators of an actual substance abuse treatment program. It takes you step by step through their experience, showing how they made decisions, how their view of their program changed during the process, what they learned, and how they applied their findings to improving their program.

You will find that the greatest expenditure of time is in the early planning stages when you are defining your program and what you want to know about it – or what your funders want. Once these decisions are made, data collection requires very little time. It can be part of the daily routine for everyone or a periodic job for one person.

Once a month or quarter, analyzing the data and preparing usable reports may take one person several hours or a couple of days, depending on your method. You will probably spend just as much time reviewing your program and looking for ways to improve it as before, but armed with your cost-effectiveness reports, you can make better informed decisions and be assured of more predictable results.

The ability to show concrete evidence of your contribution to the community through cost-benefit analysis will also help you raise additional funds. Can you afford not to thoroughly examine the relationship of your costs to your program's results?



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Introduction

Why Analyze Costs and Benefits?

Intense competition for limited substance abuse program funds, combined with increased scrutiny of program costs and outcomes, has created a need for better understanding of how costs and outcomes are related in substance abuse treatment. Programs are increasingly called on to show that their treatment of substance-abusing patients is a good investment of public and private funds. Program costs must be justified relative to program outcomes (and vice versa).

There are several advantages to analyzing costs, cost-effectiveness, and cost-benefits. Concise but accurate reports of how much a service costs can help raise funds. Potential contributors may be impressed that you know both where the money is going and how much it takes to run different parts of the program. Having solid reports of the effectiveness and cost-effectiveness of your program will assure donors that their contributions will have the maximum impact possible.

Critics will find it harder to dismiss funding requests as being too high when a careful and complete accounting of all resources used by the program shows their true value and the true cost of providing the services. Critics also will find it more difficult to dismiss your funding requests as wasted money when you can show what is achieved as well as what is done with the funds.

Some funding agencies require regular cost analyses to justify reimbursement for services provided. They may require that you verify your implementation of treatment procedures to account for your expenses. Many agencies set a ceiling on costs. A few agencies may even require that you demonstrate at least minimum levels of effectiveness for no more than a maximum allowable cost. These agencies and critics may be more impressed if you can show that your program not only understands the relationship between funds spent and effectiveness achieved, but also attempts to measure the social and other monetary benefits of treatment.

Acknowledging that substance abuse treatment benefits society by reducing the burden of substance-abusing patients on health care and

other social service and criminal justice systems helps to ensure continued funding for your program. One of the most powerful ways to acknowledge this purpose is to measure your program's savings in health care and other services. If your program saves substantially more money than it consumes, it will be easier to defend as a form of social investment that may deserve more attention and additional funds.

Do not worry that analyzing the cost-effectiveness and cost-benefit of your substance abuse program will produce negative findings. Programs and researchers have conducted cost-related analyses since the 1970s. Some of their findings are included in this manual, along with some of the methods they used to attain them. Program evaluators generally have answered the question, Is treatment of substance abuse cost-effective or cost-beneficial? with a qualified or resounding yes.

A review of research by Jones and Vischi (1979), for example, concluded that "the studies are nearly unanimous in finding that subsequent to treatment for ADM [alcoholism, drug abuse, and mental illness] disorders there is a reduction in the utilization of general health care services" (p. iii). Also, Hubbard and French (1991) reviewed research showing that "there was a four-to-one return on the investment of tax dollars for law-abiding citizens for methadone and residential programs" and "the crime-reduction impact estimated here represents only a portion of the potential savings attributable to drug abuse treatment" (p. 98). A study conducted by the State of Oregon concluded, "Thus, every tax dollar spent on treatment produced \$5.60 in avoided costs to the taxpayer" (Finigan 1996, p. ii).

Definitions of Terms

We begin by defining important terms. Program funders, patients, and evaluators often confuse the terms *cost analysis*, *cost-effectiveness analysis*, and *cost-benefit analysis*. This section explains what each type of analysis involves and why it is important.

Cost Analysis

A thorough description of the type and amount of all resources used to produce substance abuse treatment services. Cost analyses are critically important for deciding how to allocate funds within a program and for understanding the relationships between costs and outcomes.

Examining cost figures for the program as a whole (or for parts of it) is a basic form of cost analysis. Most accounting services provide cost analyses in the form of a monthly or quarterly report. Costs typically are provided at several levels, from the total cost of the program for the entire period to the cost of each part of the program each day. Costs generally vary over time.

Costs also can be tallied for each patient and for each month for each patient. This is often done for billing or reimbursement. For example, a program's cost records might show that \$355 was spent to treat the average patient during a month. Cost per patient per month can vary over time and depends on a host of factors from type of treatment to program size.

Cost-Effectiveness Analysis

The relationship between program costs and program effectiveness, that is, patient outcome. Costs are measured as dollars spent, whereas effectiveness or outcome is measured as changes in patients' behaviors, thoughts, feelings, or biology. For example, the cost-effectiveness of an opiate treatment program might be measured as the cost of generating an opiate-free month for the average patient.

There is no single standard for "cost-effective." Generally, the term is used loosely as a way of saying that something probably costs less, or is more effective, than something else. Cost-effectiveness indices can be compared for different programs, different treatment modalities (such as residential versus outpatient clinics), and different treatment techniques (such as drug-free with or without acupuncture or drug-free versus methadone maintenance).

The overall cost-effectiveness of a program can be improved by first finding which parts of the program contribute most to effectiveness and then discovering which of those program components have the lowest cost. Although substance abuse treatment programs are complex, it may be possible to improve cost-effectiveness by enhancing use of these more effective and less expensive components while decreasing use of less effective and more expensive components.

However, cost-effectiveness indicators vary somewhat over time and over patients because of many factors, not all of which are controlled by the program. It is easy to find an apparent difference in the cost-effectiveness of different program components or different programs. It is harder to show that the difference is real—for example, that it occurs reliably over months and for most patients and therefore should be used in program management decisions.

Cost-Benefit Analysis

The measurement of both costs and outcomes in monetary terms. Costs and benefits can be compared between programs or contrasted within a single program. Cost-benefit analysis can also discover whether program expenditures are less than, similar to, or greater than program benefits. The time it takes for program benefits to exceed program costs is also measured in some cost-benefit analyses. Cost-benefit findings can often stand alone. For example, consider the inherent value of finding that every \$1 spent for a particular substance abuse treatment program results in average savings of \$4.96 to the taxpayer.

Some drug treatment programs produce measurable monetary outcomes, like increased days of legitimate employment and decreased job absences. Increased employment can yield increased income, which yields increased tax revenues. In addition, drug treatment programs may reduce patients' use of food stamps, public health services, and other public assistance—a potentially huge cost savings.

These cost savings may not occur as soon as patients begin treatment. Social service costs may actually rise as patients are guided to social services they need for recovery. In a few months or years, however, social service costs may decrease, whereas patient income and taxes paid by patients may increase.

Other major benefits of substance abuse treatment programs are indirect or secondary, such as reduction in crime-related costs, including property losses, medical services required by victims, time taken off from work by victims, and costs of apprehending, trying, and incarcerating offenders. All of these income increments, tax payments, and cost savings can add up to a considerable total benefit that exceeds the cost of treatment several times over.

There are several ways to report the relationships between costs and benefits:

- The *net benefit* of a program can be shown by subtracting the costs of a program from its benefits. For example, if a substance abuse treatment program cost \$100,000 per year but generated in the same year \$500,000 in increased patient income, increased tax payments by patients, and reduced expenditures for social and criminal justice services, the net benefit of the program would be \$500,000 minus \$100,000, or \$400,000, for that year.
- The *ratio* of benefits to costs is found by dividing total program benefits by total program costs. For example, dividing the \$500,000 benefit of the program by its \$100,000 costs yields a cost-benefit ratio of 5:1.
- Because neither net benefits nor cost-benefit ratios indicate the size of the cost (*initial investment*) required for treatment to yield the observed benefits, it is important to report this as well. We cannot assume that the same exact relationships between costs and benefits will exist at different levels of investment. Sometimes an increase in cost allows new, more productive procedures to be used for treatment, increasing benefits dramatically. For example, increasing a program budget to allow hiring of a community liaison, vocational counselor, or physician might dramatically increase patient outcome. Therefore, it often is best to report the initial investment, the net benefit, and the cost-benefit ratio.

- The *time to return on investment* (the time it takes for program benefits to equal program costs) is yet another indicator used in cost-benefit analysis. For programs, benefits and costs occur at the same time, or at least in the same year. For individual patients, however, the investment in treatment may pay off substantially only after several months or years. Costs usually occur up front, but program benefits may take time to reach the point where they exceed costs.
- The decreasing value of benefits attained in the distant future can be calculated as the *present value* of benefits. When most of the cost of treatment occurs in the first year of treatment but most benefits occur only several years after treatment, the value of those delayed benefits needs to be adjusted (decreased) to reflect the delay.

Analyses of cost, cost-effectiveness, and cost-benefit relationships can provide valuable insights into how a program operates and how its operations could be improved to serve more people better for less. Analyses of costs, cost-effectiveness, and cost-benefit also show funders that program managers are aware of the importance of accountability—accountability for how funds are used and what they are used to achieve.

Additional Resources

Collecting information on costs, procedures, effectiveness, and benefits and analyzing these data is a lot of work. Help may be available to you from several sources.

Literature

Recommendations for how to measure the cost and cost-effectiveness of substance abuse treatment are available from several sources other than this manual (e.g., Apsler and Harding 1991). Cartwright and Kaple (1991) provide a sophisticated discussion of issues and initial findings of large-scale cost and cost-effectiveness analyses of substance abuse treatments.

Cost assessment methods for a variety of substance abuse treatment settings are detailed by Anderson and colleagues (in press), Bradley and associates (1994), and French and colleagues (1994). Nas (1996) provides a sophisticated, detailed description of multiple methods of cost-benefit analysis for a variety of human services. French and associates (1996) propose detailed steps for converting the outcomes of substance abuse treatment programs into monetary units. Yates (1980, 1995, 1996) describes the model used in this manual to conduct improvement-oriented analyses of cost-effectiveness and cost-benefit.

Other Programs

Other programs similar to yours probably have measured their effectiveness and perhaps their costs and benefits. Directors of those programs may be willing to describe their experiences and advise you about which measures and types of analyses worked for them.

Universities

Almost every university and 4-year college has faculty who are knowledgeable about measurement issues in real-world settings such as yours. You are most likely to find these faculty in schools or departments of accounting, business, economics, education, political science, psychology, public health, social work, and sociology. Graduate and undergraduate students in these departments often must collect and analyze data for their theses. Professors also must analyze data and publish findings to advance in their careers. If you can supply access to your program, some professors and students may be able to provide you with data and analyses of costs, effectiveness, and benefits.

High schools also may have teachers and advanced students who can assist. Using these resources not only can save you time and money, but also can build or reinforce ties between your program and the community.

Businesses

Computer spreadsheet software might be donated by local businesses and agencies that are upgrading their software. Older computers that still work well and run good spreadsheet software also may be available as donations from local businesses and agencies.

Governments

This manual is an example of the help that you can get from local, State, and Federal Government agencies at little or no cost. These government resources may have programs that provide technical assistance in program evaluation or program management. Additional funds sometimes are available to conduct the analyses described here. Local and State agencies may be eager to help once they realize that continued funding of your program by Federal agencies or other funders may be a smoother process if you have begun conducting cost, cost-effectiveness, and cost-benefit analyses.

Getting Started

Planning is essential for analyses of costs, cost-effectiveness, and cost-benefit. Building from one basic measure to a few, and from one simple analysis to several, makes the process less disruptive to treatment as well as more complete and, therefore, more accurate.

Timetable

A suggested timetable for developing cost-related analyses for your program is presented in table 1. Each step begins where the arrow line starts and ends at the tip of the arrowhead. Small, brief initial steps eventually give way to longer subsequent steps.

Data Collection

Measures for cost, treatment procedures, effectiveness, and benefits are developed and tested over several weeks. The timetable includes measures to detect whether and to what extent the specific procedures of treatment were put into effect. Two weeks are allotted for development and testing of effectiveness measures because these measures are crucial to the rest of the process, because most staff want to contribute to this part of the analysis, and because there are so many measures of effectiveness.

Data collection continues for the duration of the program in order to gain a complete and accurate picture of program costs, effectiveness, and benefits.

Data Analysis

After data collection starts for each set of measures, analysis begins. Cost analysis provides the basis for the subsequent cost-effectiveness and cost-benefit analyses. Effectiveness and benefits are analyzed in separate weeks following cost analysis. Then cost and outcome data are combined for an initial cost-effectiveness analysis (during week 13) and an initial cost-benefit analysis (week 14). In week 15, monthly analyses of cost, cost-effectiveness, and cost-benefit commence.

Both cost-effectiveness analysis and cost-benefit analysis are useful. Often, benefit information can be derived directly from effectiveness findings. Deriving benefits from effectiveness measures makes cost-ben-

Table 1. Sample timetable for cost, cost-effectiveness, and cost-benefit analysis of a substance abuse treatment program

Steps	Weeks														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Identify key players, interest groups, and a coordinator	▶														
2. Assign responsibilities for each step	→														
3. Tailor this timetable to your program	→														
4. Develop or refine a reporting plan	→														
5. Describe program components and desired outcomes		→													
6. Choose and test cost measures			→												
7. Develop and test effectiveness measures				→											
8. Choose and test benefit measures						→									
9. Implement regular collection and reporting of cost measures							→	→	→	→	→	→	→	→	→
10. Regularly collect and report effectiveness measures								→	→	→	→	→	→	→	→
11. Regularly collect and report benefit measures									→	→	→	→	→	→	→
12. Perform first cost analysis										→					
13. Perform first effectiveness analysis											→				
14. Perform first benefit analysis												→			
15. Perform first cost-effectiveness analysis													→		
16. Perform first cost-benefit analysis														→	
17. Perform monthly analyses of cost, cost-effectiveness, and cost-benefit															→

efit analysis a straightforward addition to cost-effectiveness analysis. If the monetary value of your program's outcomes is relatively easy to derive from information on program effectiveness, or if direct measures of benefits are easy to come by, you may want to make the extra effort to do a cost-benefit analysis in addition to your cost-effectiveness analysis.

Progress Assessment

In your evaluation of the cost assessment process, there should be regular reconsideration of measures used, analyses performed, and reports compiled. These reconsiderations are a normal response to monthly analyses and monthly reports. This is a dynamic process that continuously produces new information. A response to the reports of cost-related analyses should include a discussion of ways to improve effectiveness and benefits while reducing costs.

Initial Steps

Identify Key Players, Interest Groups, and a Coordinator

Key players include therapists, program managers, and office staff. Your funders also should be informed of this project. Interest groups include patients and their representatives or guardians; the local police and court systems; the local primary, secondary, and higher education systems; and public health and other human services in your area. These groups may have information that you need to measure costs, effectiveness, and benefits.

The ideal coordinator for this effort may be difficult to find. Although the program manager or fiscal manager would be a natural coordinator, program politics or funding pressures may require that someone outside the treatment program coordinate the data collection and analysis effort. An outside coordinator needs special skills because some program personnel might see the collection and analysis of information on costs, cost-effectiveness, and cost-benefit as an unwarranted intrusion.

Programs with only a few staff might need to hire personnel for several hours a week to begin cost analysis and to keep it active until it becomes a routine part of the program. Larger programs may be able to distribute this work over their staff. Both small and large programs might consider hiring part-time counselors to reduce new patient load for regular staff who are assigned responsibilities for the project. Consultants also may facilitate establishment of cost, cost-effectiveness, and cost-benefit analyses as part of program operations.

The more people the work is distributed over from the beginning, the less the burden will be to everyone (and the more likely the project will keep on track when the inevitable illnesses, vacations, and departures occur).

Assign Responsibilities for Each Step

Individuals must be assigned responsibility for each step. A common mistake is to load too much responsibility on one person, usually the manager or the coordinator. We suggest that the coordinator only coordinate. Different people should be in charge of the various steps, and all individuals should report to the coordinator.

Responsibilities for each step are assigned early in the first week. Who takes which responsibility will depend on the capabilities and workloads of program staff.

Tailor the Timetable to Your Program

Some programs may not be able to move as fast as suggested in the sample timetable, and a few programs may be able to move faster. We encourage you to adapt this timetable to your own needs and capabilities. Some flexibility with deadlines also may be necessary; designing measures and testing them usually uncovers real problems and interpersonal and programmatic issues that may take time to resolve.

It is important, once you get started, to revise the timetable to match your pace. A revised timetable will decrease frustration with missed deadlines and a schedule that is not feasible. It will also reduce the chances of abandoning the project.

Develop or Refine a Reporting Plan

A plan for reporting progress on individual assignments provides a paper trail by which the development of your program analysis can be tracked. The paper trail makes it easy to pick up tasks if an unexpected delay arises. It also encourages progress and continued commitment from everyone.

We recommend that a report be submitted a day before the end of the week by each person who has been assigned a responsibility. The report should summarize the accomplishments of the week, with appendices providing any proposed instruments and other details. The reports could be reviewed by the coordinator and other key players and discussed at the end-of-the-week meeting. This is only one of several possible reporting formats for the earlier steps of the program.

Monthly reports summarizing the weekly reports might be made by the coordinator to the board of directors or other governing organization. Setting realistic weekly and monthly goals for progress makes the process feasible while sending the message that you expect regular progress.

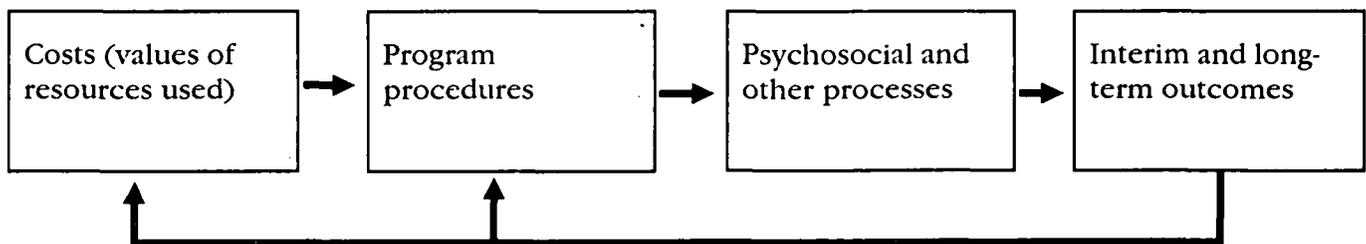
Procedures, Processes, and Outcomes

Before you can analyze your program, you need to define the outcomes you are seeking and the program components that contribute to the patient outcomes. Before you can change your program based on your analysis, all interested parties must share a common understanding of what treatment is and what it is trying to do. To that end, it may be useful for the major interest groups to construct a model of the service system. The worksheets at the end of the chapter may help you in discussions with program staff and other interest groups.

Cost-Procedure-Process-Outcome Analysis Model

Tables 2 and 3 outline a model for cost-procedure-process-outcome analysis (CPPOA) (Yates 1996). Table 2 shows the basic model in a simple flowchart with arrows representing which parts of the model influence which other parts in ongoing treatment. These arrows show the primary direction of action. Feedback from outcomes back to procedures is characteristic of good program management and could be represented by a loop from the box "Interim and Long-Term Outcomes" to "Program Procedures." There also is a feedback loop between outcomes and costs: If outcomes are positive, expenditure of additional resources is justified.

Table 2. Basic CPPOA model



The CPPOA model in table 3 is more detailed. It lists several possible measures for each of the major parts of the model. For example, individual therapy, group therapy, and health education are listed under procedures. Measures such as employment and independent living appear under outcomes.

Treatment programs and therapists have their own theories about what are and are not the important psychosocial processes to address in substance abusers; they also have their own treatment procedures for changing those processes. Because of this, a universal set of processes and procedures is difficult to establish for CPPOA. The following processes and procedures only illustrate how the ideas of processes and procedure-process relationships can be used to understand, evaluate, and improve a treatment program. You will want to select your own procedures and processes to describe your program.

Table 3. Detailed CPPOA model

Costs (values of resources used)	Program procedures	Psychosocial processes	Other processes related to:	Interim outcomes	Long-term outcomes
Temporal Direct service Paid Volunteer Administrative Other indirect MIS Material Equipment Direct service Indirect Supplies Medicines Psychometric tests Office supplies Spatial Direct service Administrative Other indirect Transportation Communications Financing	Individual therapy With therapist Medical Group therapy Women's Men's Prevocational Relapse prevention Education Drug abuse Health and nutrition Referrals Health Social services Legal aid Vocational Extra-program	Skill acquisition Self-control Social Job-seeking Vocational Relapse prevention Expectancies Self-efficacy Outcome Compliance Difficulty of treatment Relationships and social support Therapist Family Peers Employers Spouse/mate Others	Client characteristics Age Gender Race Prior treatment Employment Physically challenged Medical complications Psychological complications Therapist characteristics Training Experience History Age Gender Race Addiction physiology	Relations with Peers Children Spouse/mate Relatives Employer Others Employment Independent living Cessation of substance abuse Preferred drug Other drugs HIV transmission behaviors Physical health Mental health	Continuation of interim outcomes Cost savings in Health services Mental health services Welfare Employee Assistance Program operation Training of new employees Benefits accrued Tax revenues Positive modeling for others (Prevention) Improved family and social climate

Procedures

The major procedures used in providing substance abuse treatment to patients include—

- Individual counseling.
- Group counseling.
- Acupuncture.
- Pharmacotherapy.
- Education about human immunodeficiency virus and sexually transmitted diseases.
- Vocational counseling.

Dividing your treatment program into specific procedures is one of the most important steps in your cost-effectiveness analysis. These are the activities that you will later decide to retain, to enhance, to diminish, or to drop altogether. For this purpose, we suggest that you consider at least four different treatment procedures. For manageability, however, do not record more than 15 or 20 procedures.

It is especially important to consult with direct service staff when defining program procedures. As a first step, consider what sets of actions make separate contributions to patient outcomes. For instance, it seems likely that individual counseling and group counseling make separate contributions.

Definitions are needed for each procedure. The definitions should be clear enough that program staff can reliably agree when one procedure or another is being performed. Some procedures (such as individual counseling) will be easier to define reliably than other procedures (e.g., confrontational counseling). Specific program components should also be defined. For example, a confrontational group may be defined as a therapeutic intervention where 8 to 12 patients address another patient on inappropriate behavior in a group setting facilitated and monitored by one or more counselors.

Your cost-related analysis will be most useful if the procedure definitions used in your program also correspond closely to procedures used in similar programs. A publication by the Center for Substance Abuse (Crowe and Reeves 1995) defines treatment modalities and program components for substance abuse programs. For instance, pharmacotherapy is typically defined as a treatment using approved medications to reduce substance abuse.

Most procedures can be divided into more specific procedures. There are many types of individual counseling, for example. If reflective,

analytic, behavioral, and other types of counseling are practiced in your program and contribute to program outcomes to different degrees, you probably should establish each form of counseling as a separate procedure. Some programs use confrontational as well as supportive and educational forms of group counseling, which also can be denoted as different procedures.

Also, if different staffing levels or qualifications are necessary for some procedures, those procedures should be considered separately (because their costs will probably differ). For instance, if a feelings group is facilitated by a paraprofessional while a psychotherapy group is conducted by a licensed psychologist, these two types of groups should be considered separately.

The defined procedures should be all-inclusive; when considered together, they should constitute the entire program. To do this, you may need to add to a list of specific therapeutic procedures a catch-all category such as "other treatment activities." Be sure, however, that this category does not become a dumping ground. It should include only procedures used one time or infrequently.

Processes

The same treatment procedures work for some people but not others because a moderating *process* either facilitates or inhibits the impact of treatment procedures on outcome. A process internal to the patient can be created or encouraged by treatment procedures. For example, some counselors believe that personal growth and responsibility are crucial processes that treatment must foster. Other processes internal to the patient may be targets of treatment procedures designed to blunt or even eliminate them. For instance, some treatment procedures attempt to reduce self-destructive impulses and highly selfish, manipulative processes in patients.

Therapists often believe that outcomes are the product of changes in patient processes that are themselves the product of treatment procedures. Unfortunately, we cannot assume that these processes are the ones that were at work. The outcomes of treatment could have been due to entirely different processes. Also, the procedure could have changed different processes than those intended. The processes that actually were changed may or may not have then produced the outcomes.

To get a clearer picture of which links are active between procedures and processes, and between processes and outcomes, you need to measure the procedures, the likely processes changed by those procedures, and the targeted outcomes.

The most important processes to measure are those that counselors and other treatment providers believe to be the crucial determinants of program outcome. In some cases, these will correspond to psychological or other processes for which reliable instruments have been developed. In other cases, the processes active in the patient that determine whether treatment succeeds or fails may have to be measured by instruments you develop.

The first step in selecting or developing instruments to measure processes is to ask therapists to explain their theories of what processes need to occur for treatment to succeed and what other processes can prevent this. The following sections discuss common processes involved in substance abuse treatment.

Psychological Disorders

Because persons who have psychological disorders may be more likely to abuse substances, psychological problems are addressed in most substance abuse treatments. Mental illness is more common in substance abusers than in nonsubstance abusers according to a number of studies (e.g., Ross et al. 1988).

The presence of psychological problems may moderate the impact of treatment. The problems may impede treatment or, if psychological processes are at a severe phase at the beginning of treatment, *more* rather than less improvement may result (Friedman and Glickman 1987).

Some treatment providers hope that reducing negative mental processes will subsequently reduce or stop substance abuse. Common psychological disorders in substance abusers that may be the focus of treatment procedures include—

- Antisocial personality disorder.
- Phobias.
- Psychosexual dysfunction.
- Major depression.
- Dysthymia (moderate depression).

Other Biopsychosocial Processes

Some substance abuse programs believe that one or more of the following processes within the patient must change to achieve outcome goals:

- Expectancies of reinforcement or punishment
- Certain attitudes and belief systems
- Destructive or self-centered interpersonal dynamics

These treatment programs believe that psychological, social, and perhaps biological processes must be changed before patients successfully and permanently cease substance abuse.

Readiness to Change

Yet another way to conceptualize the biopsychosocial processes involved in substance abuse cessation is to say that the processes that need to be addressed by treatment procedures are determined by how ready the patient is to change. This approach to understanding the process of change says that most patients are, at any moment in treatment, in one of several distinct stages of increasing *readiness to change*. To move the patient to the next stage, certain biopsychosocial processes need to occur. These crucial processes are evoked by specific treatment interventions or procedures. The different processes necessary for transition between stages may require different treatment procedures (DiClemente 1993; Prochaska and DiClemente 1986).

Procedure-Process Links

The next step is to define the specific relationships between the treatment procedures and the processes they are designed to either encourage or discourage. Asking for all the procedure-process links also provides a check on the completeness of the process list. If some procedures remain for which no processes are specified, either additional processes need to be described or the procedure may be unnecessary.

Table 4 gives a sample matrix of a program's processes and procedures. The cells of this matrix indicate each possible combination of procedures and processes in the treatment program. The cells in the table are filled in with numbers indicating the strength of the relationship between each procedure and each process. Working with the program staff to specify the procedure-process links helps build a better cost-procedure-process-outcome model that is easier to analyze later.

It is extremely important to be very tactful when you ask therapists for information or suggest changes. Most treatment providers develop their procedures for substance abuse treatment over long periods of intense training. They have accumulated considerable experience in and wisdom about what works for which patients, how well, and when. It is important to work *with* the staff to find the best way to describe the presence, strength, or absence of critical psychosocial processes. These descriptions usually lead to methods of measuring the processes.

Tailor Procedure-Process Links to Your Setting

Suppose, for example, that the majority of counselors at a clinic express a firm belief that substance abuse is caused by (a) a strong desire to escape a deplorable situation, (b) a reluctance to face adult responsibil-

Table 4. Sample procedure x process matrix

Procedures	Processes					
	Self-efficacy expectancies	Skill acquisition			Bonding	
		Relapse prevention	Support access	Service access	With addicts and ex-offenders	With counselors
Group counseling	33 %				33 %	33 %
Relapse prevention	20 %	20 %	20 %		20 %	20 %
Individual counseling	50 %					50 %
Case management				75 %	12.5 %	12.5 %

ities, and (c) a wish to harm or kill oneself. Moreover, suppose that these counselors believe that, for the patient to cease and maintain cessation of substance abuse, each of these causes must be moderated or worked around while abstinence is maintained. Your task, then, is to find or develop measures of processes (a), (b), and (c) above. The counselors also should be able to specify the treatment procedures that they use to address processes (a) through (c), so you can help them measure the occurrence of each procedure for each patient.

Process (b), a reluctance to face adult responsibilities, might produce the following list of results that counselors expect their procedures to yield:

- Patient keeps treatment and other appointments.
- Patient does not miss work.
- Patient pays bills on time.
- Patient resolves outstanding legal issues.

The counselors then would identify the procedures used to change the process: individual counseling, daily scheduling, monthly budget development, and role modeling. The final step is to measure the process. In this example, a monthly checklist can measure the number of days missed at work, the number of missed appointments, the number of bills paid, and so on—all signs that the desired process is occurring. That documentation charts the patient changes related to the process.

Outcomes

Measuring the impact of treatment procedures is key to analyzing and improving cost-effectiveness and cost benefits. While the primary outcome desired by all substance abuse treatment programs is total, permanent abstinence from illicit drugs, achieving that goal requires patients to make many major changes in lifestyle, attitudes, friends, skills, and so forth. A patient who has not made the necessary adjustments to a drug-free life has a high probability of relapse.

These changes thus become desirable outcomes in themselves. Some programs may consider them interim outcomes while others may see them as final outcomes. Choosing which outcomes represent success in a substance abuse treatment program depends greatly on the theoretical basis of the treatment approach.

Objective Effectiveness Measures

Outcome measurement has a relatively long history in substance abuse treatment. The focus has long been on "real results" rather than on measures that seem indirectly related to the problems that initiated treatment in the first place. Such objective measures of effectiveness include—

- Biological measures of drug use: analyses of urine, blood, breath, hair.
- Biological measures of infections related partially or fully to drug use: HIV tests (negative or positive, and immune system cell counts), hepatitis status, sexually transmitted disease infection status.
- Criminal convictions, arrests.

Objective measures are important because their validity is high, as is their acceptance by a broad range of interest groups. It is therefore crucial for treatment programs to collect objective measures, whether they are the ultimate goals of substance abuse treatment or the means to other ends.

Subjective Effectiveness Measures

Certain interest groups believe that subjective measures are unimportant. For example, a questionnaire designed to tap an individual's level of maturity or personal development strikes some funders as rather different from what "really counts"—the number of assaults and thefts committed during or after treatment. Nevertheless, many therapists, patients, patient associates, and researchers are concerned with such measures of treatment effectiveness as—

- Self-reports of illicit drug use.
- Self-reports of alcohol and tobacco use.

- Productivity on the job.
- Depression, anxiety.
- Patient functioning in different areas, such as family living, employment, education.
- Physical health.
- Psychological well-being.

Each program must define its goals for patients in ways that can be measured. Most of these will be improvements along a continuum. Some may be staff estimates of change. Whenever possible, objective or external measures should be used; staff reports may be perceived as biased in favor of the program.

Benefits

Objective monetary benefits of substance abuse treatment include the following:

- Financial records from accountants, funders, and tax agencies of legal employment during and after, versus before, substance abuse treatment.
- Records of welfare benefits paid during and after, versus before, substance abuse treatment.
- Records of public health services used during and after, versus before, substance abuse treatment.
- Records of funds spent on arrests, convictions, and other interactions of the patient with the criminal justice system during and after, versus before, substance abuse treatment.

Process-Outcome Links

Individual processes can also be linked to outcomes for a more refined analysis of your program effectiveness. Table 5 shows a sample matrix with the estimated contribution of each process to each outcome.

Processes Versus Interim Outcomes

As you work with program staff to define outcomes and processes, you may find that overall outcomes are easy to define (e.g., permanent cessation of all addictive behaviors), but that many intermediary outcomes are being proposed (e.g., recovery from a brief relapse). There is a point at which processes stop and outcomes begin. Events occurring inside the patient, whether psychological or biological, usually are *processes*. Events occurring outside the patient usually are *outcomes*.

For example, enhanced self-efficacy for substance abuse cessation may be the result of treatment procedures, but it is rarely an end in itself.

Table 5. Sample process x outcome matrix

Outcomes	Processes					
	Self-efficacy expectancies	Skill acquisition			Bonding	
		Relapse prevention	Support access	Service access	With addicts and ex-offenders	With counselors
Drug free (complete abstinence)	40 %	100 %	25 %		32 %	10 %
Stable employment	20 %		25 %	80 %	4 %	40 %
Crime free (avoidance of all criminal behavior)	40 %		25 %		32 %	10 %
Compliance with probation and parole			25 %	20 %	32 %	40 %

Self-efficacy for substance abuse cessation is enhanced by treatment procedures as a *means* to an end—permanent cessation of substance abuse.

Treatment programs may put certain outcomes before others. These intermediary outcomes may include patient compliance with a regimen of weekly counseling sessions, daily methadone maintenance, legal employment, or a combination of these and other outcomes. These outcomes occur outside the patient and are themselves the result of changes in processes (e.g., expectations of rewards for compliance with the regimen). They are intermediate or interim outcomes, however, because they are not the outcome for which treatment is designed and funded. That ultimate or final outcome is cessation of drug use.

Interest Group Differences

Sometimes, one person’s process measure is another person’s final outcome measure. For certain researchers, therapists, and patients, the goal of treatment is to change the patients’ internal state—to make them mentally and physically healthy. For other interest groups, including much of the tax-paying public, mental and physical health are intervening processes at best. For these interest groups, the goals of treatment are to get patients off drugs, to keep them off drugs, to stop them from committing criminal acts, and to help them become net benefits rather than net costs to society.

A potentially useful strategy for dealing with interest groups advocating different procedures, processes, and outcomes is to acknowledge the

importance of each measure and to structure the analyses so that all measures are included. Some analyses can show how well different treatment procedures produce the different process measures. Additional analyses can find out how well the same procedures produce the various outcome measures. Further analyses can see whether there was a relationship between producing the process measures and attaining the outcomes.

For example, the extent to which different treatment procedures improved patient functioning, patient health, and patient depression and anxiety can be tested in one set of analyses. Another set of analyses can examine how different treatment procedures affected patient use of drugs, criminal acts, and job productivity.

Using the Worksheets

The following worksheets are provided to help you develop a model of your program—what it does, how it does it, and the outcomes it expects to produce. Working with all interested parties and staff members is important to assure that everyone has the same concept of the program and the same perspective on proposed changes.

Resources

To make a complete list of the crucial resources invested in treatment (worksheet A) and to assess their value (their cost) accurately, ask different interested parties what they contribute to treatment and the value of those contributed resources.

After the list of procedures is available, you can check the completeness and accuracy of the resource list by mapping resources onto procedures. Make sure that there are sufficient amounts of each type of resource listed to put each of the procedures into effect. Worksheet B can facilitate this cost-procedure mapping and the review for completeness and accuracy.

Procedures

Procedures can be classified by theoretical perspectives or by the parties responsible for delivering the procedures. The latter generally provide a more concrete list of what was done to whom, by whom, and when.

Just as many interest groups may need to be consulted to obtain a complete and accurate list of resources that make treatment possible, a variety of parties may take part in the delivery of procedures that facilitate patient recovery and other outcomes (worksheet C).

Processes

This part of the service system model often is the most challenging to

construct. Direct service providers, such as counselors, aim their treatment procedures at a variety of processes internal to the patient. Because these processes are difficult to observe or detect with psychological tests and other measures, serious disagreements may result about what is being changed by treatment procedures. Providers' strong beliefs in their own favorite treatment procedures may further complicate discussion of procedures and procedure-process-outcome linkages.

A minimal check on the completeness of the process list (worksheet D) is possible. Each procedure listed earlier should be targeted at one or more processes. If a procedure exists for which no process can be named, it is likely that another process needs to be made explicit. If a process exists for which no treatment procedure is identified, the process may involve community economics or politics. If, however, a crucial process is identified for which no procedure is present in the treatment program, introducing a procedure for this process could result in superior outcomes. Worksheet E can facilitate this procedure-process checking.

Another way to check on the completeness of the process listing is to make sure that there is at least one process mapped to each outcome (worksheet F).

Outcomes

You may wish to distinguish between interim and long-term outcomes. You also may find it useful to list separate outcomes that are and are not monetary. Of the outcomes that are not monetary, you also may want to distinguish between those that can and cannot be readily monetized (worksheet G).

CPPOA Model

To help describe your program, summaries of direct cost-outcome relationships may be useful. Worksheet H can be used to make this analysis easier.

The preceding analyses need to be integrated, so that the links between resources and procedures, procedures and processes, and processes and outcomes can reveal the most cost-effective and cost-beneficial path to outcomes. The steps and diagrams in worksheet I can help you settle on several ways to improve the outcomes and/or reduce the costs of your program.

Summary

You may not be able to collect detailed information on all the psychological, social, and neurological processes that can moderate relationships between procedures and outcomes. You may barely have room

and time to record basic demographic characteristics of patients, such as gender, race, and age, that may influence procedure effects. Even if you cannot measure and analyze each cost, procedure, process, and outcome variable that might be important, thinking and talking about them sometimes can set the stage for systematic improvement of program outcomes within cost constraints. These discussions also help you identify what procedures and processes make up your program. A clear understanding of what your program really is, how it works, and what changes it can prompt is essential in making decisions about program changes.

Worksheet A. Resources used in treatment

Temporal (personnel)

Temporal (client, other)

Spatial (facilities)

Material

Communications

Financing

Liability

Other

Worksheet C. Procedures implemented by treatment

Initiated or directed by:

Therapists

Patient's family

Patient

Employers

Other change agents

Worksheet D. Processes experienced by patients, possibly as the result of treatment procedures

Psychological: Cognitive

Psychological: Affective (emotional)

Psychological: Behavioral

Dyadic (with one other person)

Social

Biological

Other processes

Worksheet F. Procedure-outcome analysis plans

1. List the outcomes that are most important.
2. List the processes that enable those outcomes.
3. Estimate the strength of the relationships between each process and each outcome.

Outcomes → Processes ↓					

If you collected data on these process-outcome relationships, which would you expect to be strongest, be weakest, need more information?

Worksheet G. Outcomes produced by processes

Interim

Long-term

Monetizable or monetary benefits

Nonmonetizable outcomes

Worksheet H. Resource-outcome analysis plans

1. List the outcomes that seem essential.
2. List the resources (costs) that make those outcomes possible.
3. Estimate the strength of the relationship between each resource and each outcome.

Outcomes → Resources ↓					

If you collected data on these resource-outcome relationships, which would you expect to be strongest, be weakest, need more information?

Worksheet I. Resource-procedure-process-outcome analysis plans

1. Using the blank CPPOA model on the next page, list resources, procedures, processes, and outcomes that still seem essential.
2. Use lines to connect those resources and procedures, procedures and processes, and processes and outcomes that represent the enduring, crucial links between the components of your service system. Summarize these linkages.

3. Estimate the strength of the relationships by darkening the connecting lines that represent the strongest relationships. Which relationships are strongest and on which do you need more information?

4. Working backward from outcomes, identify the critical, causal paths for the process-outcome, procedure-process, and resource-procedure linkages. Describe this critical path:

5. Examine the strong relationships that are not now on the critical path. Could programmatic change add these relationships to the critical path?

Worksheet J. CPPOA Model

Costs (values of resources used)	Program procedures	Psychological processes	Other processes related to:	Interim outcomes	Long-term outcomes

Overview of Costs

- Cost:** 1. An amount paid or required in payment for a purchase; a price.
2. The expenditure of something, such as time or labor, necessary for the attainment of a goal.

*The American Heritage® Dictionary of the English Language,
Third Edition © 1992*

The first definition of *cost* above is what most people use when they start planning for a cost-related analysis. The second definition, however, is more useful because it allows for a much broader and more accurate accounting of the efforts necessary to change behavior. The amount of money paid, reimbursed, or requested for reimbursement for drug treatment varies depending on the national and local economic climate, the rate of inflation, and many other factors. To gain an accurate picture of costs, we must look beyond the simple lump sum totals allocated for a program.

Although accounting records for cost assessment are useful in figuring costs, they usually do not supply the information needed to determine all expenditures. This manual shows how to figure costs once cost data have been collected and describes strategies for collecting information on the specific costs of treatment.

Cost Measures

When used in most treatment programs, cost, cost-effectiveness, and cost-benefit analyses are more complicated than in business because the money spent for treatment rarely is a complete and accurate measure of total treatment costs. To truly understand how a program operates and to find ways to improve its outcomes and reduce its costs, *all* the resources it uses need to be described and related to outcomes.

Basic Cost Categories

In choosing and recording cost data, it is helpful to categorize expenditures. Most treatment programs pay for—

- Treatment personnel (such as counselors, nurses, physicians, social workers, and psychologists).

- Administrators and office personnel (including managers, human resources, and payroll).
- Space.
- Furniture.
- Equipment.
- Transportation.
- Communication services (including telephone, e-mail, and Internet services).
- Vendor services (including drug tests, accounting, security).
- Insurance (including professional liability) and finance (including costs of corporate accounts).

Donated Resources

Volunteered time and services, donated facilities, space shared with other programs for which the treatment program may pay little or no cost, and donated equipment, supplies, and other resources rarely show up in a program's accounting records. These donated or undervalued resources, however, may be crucial to program operations. "Free" resources and their value need to be included in comprehensive descriptions of program costs.

Although programs should not be penalized for obtaining services, space, and other resources without having to pay money for them, it would not be accurate to say that a program cost \$80,000 when an additional \$20,000 of time, space, equipment, and supplies went into treating patients. It also would be difficult to replicate a program unless all the resources it used—including those volunteered by the community—were included in program descriptions.

Indirect Costs

Indirect costs, such as overhead, or shared costs must also be included to give a fair assessment of your program. This is particularly important in figuring costs of a single program in a much larger organization, such as the hospital detoxification component of a multiprogram organization where the fiscal and medical directors may be shared across components.

The Need for Cost per Patient

Determining all of the costs for your program, both paid and unpaid, is relatively simple, and you probably categorize them to some extent already. However, to evaluate your program, you need to consider your costs at the level of the individual patient, not just the treatment program as a whole. Although some programs also aim their interven-

tions at the family and the community, if the primary focus of treatment is on the substance abuser, then the primary focus of measurement should also be on the substance abuser.

A simple approach to finding the cost per patient is to divide the total cost of a program for a particular period by the total number of patients the program treats during the same period. This calculation assigns the same cost to treatment for each patient, no matter how many or few program resources were devoted to treatment of the patient. The problem is that not all patients use the same amount of resources. Some use more, a few use a *lot* more, and many use less.

Most programs tailor treatment to the needs of each patient, and most patients use treatment resources to different degrees. For example, patients may show up for some but not all appointments. Some patients also leave treatment after the first or second contact, whereas others stay throughout the period (e.g., a month) during which costs are assessed. All of these factors make the cost per patient different for different patients.

In addition, the outcomes or behavior change associated with the resources expended varies. Some patients change a lot with a lot of resources, some change a little with a lot of resources, and a few change a lot with a few resources. To analyze cost-effectiveness and cost-benefit accurately, cost as well as effectiveness and benefit must be measured separately for each patient.

Standardized Costs

Using someone else's estimate of treatment costs is not advised. Some standardized treatment costs are not specific enough. To improve the cost-effectiveness and cost-benefit of treatment by adding or dropping treatment procedures, the cost of each procedure needs to be known. Because standardized cost estimates do not always list costs of specific procedures, it would be difficult to determine whether the effectiveness of a procedure justified the cost.

Procedure costs also need to be measured separately for each patient. Costs of performing the same basic procedure may vary between patients according to patient age, substance abuse history, and many other factors. The cost of individual therapy may be the same for each patient if the provider and the duration and number of sessions are all dictated by a third party. Even within highly standardized treatment delivery systems, however, patient participation (and thus resources actually used) will vary significantly and thus affect cost.

Also, most standardized treatment costs are not broken down by type of resource. For example, Anderson and associates (in press) provide

detailed cost statistics for a variety of treatment procedures at several levels of specificity. The amount and value (cost) of each resource that made the procedure possible is not, however, mentioned. Information on the types and amounts of resources currently used can be especially valuable when trying to decrease costs while maintaining program outcomes. For example, it may be possible to implement the same procedures (e.g., individual therapy) using less expensive resources (e.g., paraprofessional counselors instead of clinical psychologists) while achieving similar outcomes. A breakdown of treatment procedure costs by type of resource could help managers decide what substitutions might be possible with minimal impact on outcomes.

In addition, standardized estimates of treatment cost may not be generalizable to your program. Different regions, even different parts of the same city, have vastly different economic and professional environments, which affect cost in complex ways.

Finally, measuring costs for specific procedures can generate useful insights into program operations. Recording how one spends time in different treatment-related activities may have a positive effect on one's efficiency in those activities. In fact, it is a good idea to collect cost data for a week or two before starting to collect the cost data that will be used in CPPOA, because those data may change as habits are modified.

Collect Cost Data

Personnel Costs

Typically, personnel accounts for the largest segment of program costs. Finding the personnel costs of treating each patient involves two basic tasks:

- Measuring the cost of services provided directly to the patient (direct service). Direct service personnel are counselors, social workers, nurses, physicians, and psychologists who spend the majority of their time working directly with patients.
- Dividing among patients the costs of treatment resources that are not used to treat individual patients but are necessary to run the program (indirect service). Indirect service personnel typically are managers, clerical staff, maintenance workers, accountants, and others who do not usually work directly with patients.

The distinction between direct and indirect is critical in calculating costs and may be different for cost analyses than for current billing practices. For instance, many programs are unable to bill for services when the patient is not present, such as telephone calls or case planning meetings with other service providers, even though these activities may be essential to change patients' behavior. The resources that make these potentially crucial procedures possible need to be included and measured as direct costs for individual patients.

Direct Service Personnel

Time spent by personnel providing services to a patient is a cost that can be assigned immediately to that patient. This includes time spent in direct contact with the patient (e.g., during a counseling session) and time spent doing other things for that patient (e.g., calling an attorney who is arguing the patient's case or meeting with a supervisor about the patient).

Because different program personnel may have their time valued differently, receiving different salaries or wages, you need to collect this information in terms of hours; the data are translated into dollars at a later stage.

Each member of the staff should complete a daily timesheet recording time spent by patient and by activity. Activities include direct patient services subdivided into specific procedures, direct services on behalf of individual patients, and indirect services in support of the program.

Other Direct Services All patient contacts should be recorded as direct costs for that particular patient. However, not all contacts are treatment. For example, intake interviews, screening, and psychological testing, which may involve direct service staff, are not treatment procedures. Such activities are used with all patients regardless of treatment procedure and are not directly related to patient outcome. This time should be recorded on the timesheet under the appropriate activity and patient codes.

Indirect Services Indirect service activities, such as doing paperwork, attending meetings, or participating in training workshops, also need to be recorded by direct service staff. Specific categories of indirect services are only necessary to track if you want to analyze the costs of those services separately. Otherwise, a simple "indirect services" category should suffice.

Indirect Service Personnel

Time spent by personnel in activities related to the operation of the program, but not related to treatment of individual patients, needs to be included in the cost of treating a patient. If the value of this indirect service time is not included in treatment costs, the real cost of treatment will be underestimated. Activities ranging from weekly staff meetings to mass urine screenings to supervision are essential in maintaining the program and, thus, serving patient needs.

Some staff may have direct contact with patients yet not be involved in treatment, such as the receptionist or the staff member who collects urine. The receptionist's time should probably all be recorded as indirect, but you might consider the time involved in urine collection as a direct cost for the individual patient, depending on your program.

You can ask administrators and other personnel who provide the balance of indirect services to record the activities they perform, or you can simply assign all their work to indirect services, depending on what costs you are interested in analyzing. For example, you might want to collect data on the cost of performing your cost analyses.

Some administrators and office staff may split their time between different programs, or between treatment programs, research, and teaching at other institutions. To determine the portion of these individuals' time and salary that should be allocated to the program for which costs are being assessed, you need detailed records of how much time the individuals actually spend in program-related activities. They, too, should fill out a daily timesheet.

Volunteers

All individuals who contribute to the running of your program should fill out a timesheet, even if they are not paid. If they provide assistance that you would otherwise either pay someone to do or be forced to cut back on your services, they should record their time. This includes interns, community volunteers, family members, and in some cases, patients.

Other Direct Patient Costs

Space

The second largest cost of a program is payment for (or the equivalent cost of) working space. This cost should also be allocated by patient. Simply dividing the total cost by total number of patients does not give an accurate measure. Rather, the time that a given space (say, a counselor's office) was used for a particular procedure with a particular patient should be recorded.

Since different rooms and areas of a facility differ in size (and therefore in cost), it will be necessary to also specify which office or room was used. If offices are all the same size, 'office' would be sufficient designation. If offices vary appreciably in size, it may be necessary to use categories like 'office 1,' 'office 2,' and so forth. Rooms for group meetings could be designated as just that, and other spaces could have similar usage definitions.

Other Resources

To the extent that administering a specific treatment procedure to a particular patient involves expenditure of resources other than personnel and space, the amount of those resources spent should be recorded for that patient. This is especially important for resources that may vary between patients in ways not proportional to the amount of direct services they receive.

For instance, it is conceivable that some patients but not others would be transported to the substance abuse treatment and related programs. Patients also may differ in how much it costs *them* to get to and from your program.

It is possible that some other categories of resources, such as medical supplies or communications expenditures, are used more for some patients than others. Naltrexone or methadone, for example, might be used for some patients and might vary between those patients in dosage amount and frequency. Similarly, telecommunications charges might be higher for patients who live farther from the clinic, or who receive remote treatment procedures such as therapy contacts via phone or over Internet connections. Petty cash expenses and assistance provided to patients also may differ dramatically between patients.

Vendor services also may be prescribed for some patients and not others. Consider, for example, the need for some patients to have urinalyses that detect not just presence or absence of drug metabolites but concentrations that allow estimates of time since last substance use.

Know When to Stop Enumerating Direct Service Costs

At some point, one has to stop listing specific costs and let them be part of the overhead cost. Although there are no hard and fast rules for determining this point, cost accounting should not become so cumbersome as to lead to staff rebellion. If a cost cannot easily be entered on a standard form by the person performing that service, it may not be worth recording.

Forms and Formats

Personnel Time

Measuring who provided what services to which patients for how long should be done soon after the service is provided to preserve accuracy. Most programs already record this information for licensing or accreditation. Much of the cost data needed for cost-effectiveness and cost-benefit analysis can be derived readily from information collected routinely in many service systems. Additional information needed for specific cost analyses may simply need to be added to existing forms.

Ultimately, the information needs to be recorded on a form that shows—

- The *date* and *time* the service was delivered.
- The *patient(s)* who received the service.
- The *person who provided the service*.
- The nature of the service (the *procedure*).
- The *amount of each resource* used when providing the service.

A form can be created to remind personnel to record this information. The form can show a blank for each item that needs to be filled in, as shown in table 6. This is a service- or procedure-driven form similar to patient-driven forms used by many programs where services are recorded per patient and then kept in patient records. The patient-driven forms are appropriate for deriving cost data as long as they include the information above.

Whatever recording method is used, services provided on behalf of a particular patient when that patient was not present (such as telephone calls, case meetings, and paperwork) should be included with specific time allocations for each procedure for that patient.

When paperwork, supervision, or meetings are not related to specific patients, the activity code would be entered with no patient code. To ensure that the patient code was not omitted through oversight, patient code 000 could represent "not patient related" on timesheets for direct service providers.

Codes should be created for all indirect activities of interest to the program, such as staff meetings, training, community meetings, site preparation, financial report analysis, and administrative meetings. If you do not expect to analyze the costs or benefits of specific indirect activities, do not burden staff with unnecessary time breakdowns.

A good pilot-test of time recording is essential. Ask for extensive staff feedback on ease of use, activities selected, clarity, and relevance.

Other Expenditures

The amount of each resource expended when providing direct services to each patient may have to be recorded according to Federal law (e.g., methadone dose). Other resources, such as patient transportation or long-distance phone use, may not be recorded by accounting or billing procedures in a way that allows expenditure of the resource to be traced back to a particular counselor, procedure, or patient. Where feasible, these expenses should be recorded on the timesheet of the person performing the service or authorizing the expenditure.

In some cases, it may be easier to use a separate cost-tracking form (table 7). The results need to be entered in separate rows for each resource and in appropriate columns for procedures and patients. If a resource such as transportation enables several procedures, such as individual therapy and HIV/STD education provided during the same visit to the program, that resource should be distributed among the procedures according to the relative cost of the other resources spent on those procedures, such as counselor time. In some cases, depending on the proposed level of analysis, it may suffice to divide a cost such as transportation equally among associated procedures.

Other Forms

Although forms on paper or computers are the most common methods of data collection, your staff may find it more convenient to record essential cost information by speaking into a tape recorder. Mark-sensitive forms also can be developed and used to record and input information quickly.

Some human service programs have had success with bar code readers. A wand or small card is moved over different bar code patterns to record the date, time, patient, service type, service duration, and other information. The wand inputs the codes directly into a computer. The card can store one or more days of information for later downloading to a computer. Personal information managers (PIMs) or personal digital

Table 7. Sample cost recording form

Cost code	Amount	Patient code	Activity code	Explanation

If a single cost applies to more than one patient or more than one activity, please list all appropriate codes in same row as the amount.

assistants (PDAs) also can be programmed to prompt staff to record information about program activities and to transfer those data to computers at the end of the day.

Electronic forms can be filled out on a computer and then sent to a spreadsheet file or other cost information data base on the computer network. These "on-line forms" allow information to be communicated directly from the service provider to the computer data base. You may want to store this information in a temporary file and review it for accuracy and completeness before depositing it in the cost data base.

Train Staff to Record Data

Once the recording forms have been developed, pilot-tested, and adapted, staff must be trained in their use. This important step is frequently skipped because of time pressures and because the forms may appear self-explanatory. Too often, however, the information to be entered can be interpreted in many ways. To ensure that the information recorded is the same across all staff, take the time to train staff on how to use forms and what is to be recorded. Remember to also train all new staff members and volunteers as they enter your program.

Ensure Complete Data Collection

The forms above tell you what information is needed but not exactly how to get it. Although some people are conscientious about completing and turning in forms on time, others avoid or neglect the task.

The following sections present strategies for ensuring a steady flow of complete and accurate cost information. Similar strategies may be needed to obtain information on program effectiveness and benefits, although the providers of *that* information are more likely to be patients.

Assign Daily Deadlines

Experience has shown that simply giving providers forms does not produce a high rate of return. Providers often forget to fill out the forms or they leave them until the end of the week or month. The delay usually results in guesswork and haphazard form completion just before the deadline.

To produce a high rate of form return, allow time daily for record completion and require that the forms be submitted before the providers leave work. In addition, a supervisor needs to check forms on an ongoing basis (daily, preferably). Accurate and timely data are key to passing an audit, passing a license review, withstanding a liability claim, and conducting cost-related analyses. Inaccurate or delayed record completion should be addressed in staff or supervision meetings.

Validate Information

Neither completeness nor accuracy is guaranteed, however, by a daily deadline. Only someone who checks the forms against other service records, such as clinical case notes, can determine *completeness* (Did services get recorded for all patients who received them?) and *accuracy* (Did the amount of services, such as session duration, get recorded for each service the patient received?). Receptionist records or some other archive needs to be compared every week against direct service providers' timesheets to make sure that the forms are complete.

However, do not assume that timesheets must match payroll records. Some research has found that highly paid, salaried professionals occasionally spend less time in treatment activities than they are paid for, while staff on the low end of the pay scale sometimes work many more hours than they are paid for (Yates et al. 1979).

The individual responsible for combining the data from all personnel into a monthly spreadsheet or data base would do well to combine the data weekly. Missing data could then be sought before it is forgotten. The weekly spreadsheets could be combined into the monthly report without entailing additional work.

Motivate Providers

One way to motivate providers to submit cost information forms on time is to make pay contingent on accurate record completion by the deadline. The program administrator must be willing and able to deny pay if records are not submitted for work; otherwise, the contingency will rapidly lose its effectiveness. Another method of encouraging prompt submission of time records is to insist politely that records be completed before the provider leaves for the day and to reward staff who have the highest completion rates.

Monitor Completeness and Accuracy

Whoever is in charge of cost data collection could develop tables and graphs to monitor form completion by providers. These could be used to give providers weekly feedback, encouragement, and rewards for record submission.

Two factors could be charted: the percentage of patients for whom the counselor submitted cost forms on time and the percentage of patients for whom the counselor submitted forms that were later judged valid by comparing sessions recorded in clinical notes to sessions recorded on forms.



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Find the Cost per Resource per Procedure per Patient

When you have all the records from all direct service providers and you are satisfied with the validity of these records, it is time to analyze the cost numbers. The hardest work is done: The data are in! These data are essential for the cost calculations described in this chapter or for almost any other approach to allocating the cost of each resource to each treatment procedure.

Establish a Reporting Period

The first step is to determine the period you want to analyze. A week is probably too short (except for testing your procedures). One month is a typical period—long enough so that analyses are sufficiently spaced yet short enough that the accumulated data are not overwhelming.

Transform Direct Staff Time Into Costs

The next step is to gather and organize all the personnel time for the selected period. A spreadsheet of rows and columns, on a computer or a large sheet of paper, will help you assemble the time data. The sample spreadsheet in table 8 provides the foundation for calculating costs and is built on throughout this chapter. The basic premise on all the spreadsheets is that the greater the detail with which you describe your data now, the more you will be able to do with the data later.

The sample spreadsheet shows only the first two patients. More patients and other service providers can be added with additional columns and rows. Most computer spreadsheets can hold hundreds of columns, many more than can be seen on the screen at one time.

While all the calculations described here can be done by hand, using a computer spreadsheet, like Microsoft Excel[®] or Lotus 123[®] will save time copying and calculating. Computer spreadsheets make it easier to transform time data into cost data and to distribute indirect costs over patients and procedures. Also, once you enter the data into a computer

spreadsheet, you never have to enter it again. The information can be manipulated many times without having to pull out a calculator or eraser.

Whether on a computer or long sheets of paper, the spreadsheet should list all resources (in rows), all patients (in columns), and all procedures (in columns, repeated under each patient's column). All treatment procedures that are provided at the clinic should be listed under each patient even though some patients will not receive all procedures. For example, some might receive drug-free therapy, some might receive acupuncture, and some might receive methadone, while all might participate in individual and group therapy.

Separate sets of rows should be made for each type of resource (Direct Service Providers, Space, etc.). Different direct service personnel (Counselor X, Counselor Y, Physician Z) should be listed in separate rows. Different spaces (Office 1, Office 2, Group meeting area) should be listed in separate rows as well.

Record Hours per Procedure per Patient

Direct Service Time Working from the forms used to collect time data, add up the numbers (or fractions) of hours spent by each provider performing each procedure for each patient for the reporting period. Enter this number in the appropriate cell, that is, where provider, patient, and procedure come together on the spreadsheet.

For group counseling, where several patients are involved at the same time, it will be necessary to divide the meeting time equally among the patients attending the meeting. This can become a little complicated when some patients skip a meeting or new ones enter, or when the same group of patients has different co-leaders during the reporting period. Table 9 gives an example of finding the numbers to enter on the spreadsheet.

Indirect Service Time When indirect time is not broken down into categories, the total indirect time for each staff person for the period is entered in the row for that person in the total column. This applies to direct service staff, indirect staff, and volunteers. Indirect time that is categorized should be entered in the appropriate cell.

Continue entering time for all personnel until you have entered all the information collected for the month.

This is the first step in creating a *Resource Use Spreadsheet*. It stores the information others will need to replicate your program. The infor-

Find the Cost per Resource per Procedure per Patient

Table 9. Assigning patient and provider time for group meetings per period

Patients 1 through 8 attended the first 1-hour group meeting of the month, led by Counselor X and Intern C. (1 hour divided by 8 patients for each leader)

Patient 2 skipped the second group meeting, which was led by Counselor X and Intern A. (1 hour divided by 7 patients for each leader)

Patient 6 and Counselor X had the flu during the third week; the meeting was co-led by Counselor Y and Intern C. (1 hour divided by 7 for each leader)

Patients 2 and 6 were both absent the fourth week; the meeting was led by Counselor X and Intern A. (1 hour divided by 6 patients for each leader)

Provider	Patient								Total hours (Do not enter in spreadsheet)
	001	002	003	004	005	006	007	008	
First week									
Counselor X	.125	.125	.125	.125	.125	.125	.125	.125	1
Counselor Y									
Intern A									
Intern C	.125	.125	.125	.125	.125	.125	.125	.125	1
Second week									
Counselor X	.1429		.1429	.1429	.1429	.1429	.1429	.1429	1.0003
Counselor Y									
Intern A	.1429		.1429	.1429	.1429	.1429	.1429	.1429	1.0003
Intern C									
Third week									
Counselor X									
Counselor Y	.1429	.1429	.1429	.1429	.1429		.1429	.1429	1.0003
Intern A									
Intern C	.1429	.1429	.1429	.1429	.1429		.1429	.1429	1.0003
Fourth week									
Counselor X	.1667		.1667	.1667	.1667		.1667	.1667	1.0002
Counselor Y									
Intern A	.1667		.1667	.1667	.1667		.1667	.1667	1.0002
Intern C									
Monthly totals (enter in Resource Use spreadsheet)									
Counselor X	.4346	.125	.4346	.4346	.4346	.2679	.4346	.4346	3.0005
Counselor Y	.1429	.1429	.1429	.1429	.1429		.1429	.1429	1.0003
Intern A	.3096		.3096	.3096	.3096	.1429	.3096	.3096	2.0005
Intern C	.2679	.2679	.2679	.2679	.2679	.125	.2679	.2679	2.0003

mation will remain useful to others after monetary cost data have become obsolete due to inflation or other changes in monetary units.

Record Hourly Rates

Next, create another spreadsheet, the *Cost per Unit Resource* spreadsheet. This spreadsheet is exactly like the Resource Use spreadsheet except that instead of time in each cell, it lists the rate per hour for each staff member for each procedure performed for each patient or for indirect activities.

Direct Service Staff

Among direct providers, this rate may be set by contract at so many dollars per hour. On the other hand, individual rates may be set for different procedures performed by the same person. For example, one counselor might be paid \$30 for each hour of individual therapy, \$40 for each hour of group therapy, and \$35 for each hour of group HIV education. Another counselor with different training might be paid at different rates for the same procedures. If these rates are available, they can be entered directly into the spreadsheet. Hourly rates for salaried staff can be computed as shown in table 10.

This cost per unit resource often is the same for each patient, but sliding scales and peculiarities of providing the same procedures to patients with different needs may produce different costs per resource unit expended. These differences should be recorded in the spreadsheet.

Indirect Service Staff

When staff members are on salary, hourly rates should be calculated from the annual salary as in table 10. Once computed, these hourly rates should be entered on the *Cost per Unit Resource* spreadsheet in the row for that staff member in the cells for indirect activities

Volunteers

Volunteers' time is a valuable resource that should be included in cost assessments. Direct service volunteers, such as counselor interns, can record time spent in program activities in the same way that other direct service providers record their time. The pay rate for their time can be set at what would be paid if someone with similar education, training, and background had to be hired to replace the volunteer.

The pay rate for volunteers who provide exclusively indirect service, such as a patient's family member working in the office, also can be assessed by what it would cost if a replacement had to be hired to do the work.

Compute the Cost of Procedures per Patient

Once the hourly pay rate for each provider is calculated, it can be multiplied by the number of hours spent providing direct service to a patient to figure the cost of administering each procedure to each patient. This amounts to multiplying each of the entries in the Resource Use spreadsheet by the corresponding entries in the Cost per Unit Resource Spreadsheet and entering these new numbers in a third

Table 10. Computing hourly rates from annual salaries

1. Multiply the number of workdays per week (e.g., 5) by 52 (the number of weeks in a year) to obtain the total workdays per year.

Example: 5 days x 52 weeks = 260 workdays per year

2. From the total workdays per year, subtract the number of days allowed for leave, vacation, and other nonworking activity (e.g., 25).

Example: 260 workdays per year - 25 days leave/vacation = 235 workdays per year

3. Multiply the workdays per year by the work hours per day to obtain the total hours worked per year.

Example: 235 workdays x 8 work hours per day = 1,880 work hours per year

4. Add the annual fringe benefits to the annual salary.

Example: \$40,000 annual salary + \$4000 (10%) fringe benefits = \$44,000

5. Divide the total of salary and fringe benefits by the work hours per year to obtain the hourly rate.

Example: \$44,000 ÷ 1,880 = \$23.40 per hour

spreadsheet, the *Resource Cost* spreadsheet that has the same columns and rows as the other two.

Using computer spreadsheets, it is easy to copy the spreadsheet structure to create the second and third spreadsheets from the first. (To make things more convenient, these three spreadsheets can be grouped in the same *workbook*—a single file on the computer that includes multiple spreadsheets.) It is especially easy then to tell the computer to put in the third spreadsheet's cells the results of multiplying the corresponding cells in the two other spreadsheets.

Summary

At this point, you have completed recording all personnel costs for the chosen period on three spreadsheets:

- *Resource Use* shows the time each person spent with each patient performing each procedure, the time spent in other direct activities, and time spent in indirect activities.

- *Cost per Unit* shows the hourly rate for each person and any variability in rate for specific procedures or specific patients.
- *Resource Cost* shows the personnel time multiplied by the appropriate hourly rate for each procedure for each patient as well as for other direct and indirect activities.

All three spreadsheets should be included as tables or appendices in reports of cost-related analyses. Reporting only Resource Cost data will make findings progressively less useful as years go by and monetary units change due to inflation and other economic phenomena. Cost per Unit Resource data describe many of the assumptions used in the cost assessment and facilitate replication of the cost assessment. The Resource Use spreadsheet provides information particularly useful for replicating the program and its specific procedures.

Calculate the Cost of Space

Personnel is not the only resource used to provide services to patients. The cost of office space used when administering a treatment procedure to a patient also needs to be included, along with the cost of utilities, furnishings, and equipment.

Record Usage Time

The cost of space used to deliver individual therapy or other procedures to a patient can be measured in a manner similar to personnel costs. Enter the time that the particular space was used for a particular procedure and patient on the Resource Use spreadsheet in the row provided and the appropriate cell for that procedure and patient.

If the total cost of specific indirect services is to be calculated, also enter the time that a specific space was used in the appropriate row in the column for the designated indirect activity. Otherwise, the total space cost minus the cost for space used for direct patient services will be assigned to general indirect services.

Find the Total Cost per Hour

Just as for personnel, the next step is to find the hourly rate for each defined space and enter it in the Cost per Unit Resource spreadsheet.

Begin by determining the annual cost of the following:

- *Lease or Rent.* An accountant or administrator should know the cost of leasing the total clinic space. However, this lease cost may not reflect the value of the space used by the clinic if your program uses space given to you at low or no cost by a hospital, government agency, or private firm.

In that case, the value of that space on the open market (the

opportunity value of the space) is what you will need to use as your space cost. The highest amount of money that would be paid for that same space, in that same location or town, by a private enterprise probably is your best estimate of the opportunity value of the space. You can find that value by average rates quoted for that space, or very similar space in the same locale, by local real estate agencies (Yates et al. 1979).

- *Utilities and Maintenance.* Add the annual utility and maintenance costs to the total cost of your space.
- *Office Furniture and Equipment.* If the space is fully furnished and equipped by the leaser, these expenses probably are already included in the lease payment. If not, furniture and equipment expenses need to be included in cost calculations.

The cost of furniture, office equipment, and similar resources should be spread out over their useful lifetime. Standard lifetimes often can be found in Federal tax or accounting guidelines. The cost of a desk, for example, might be \$1,200, but its monthly cost might be only \$10 over its useful lifetime. Also, to figure the value of the desk, *discounting* should be applied to the monthly cost. *Discounting* is described later in the manual.

- *Donated Resources.* Significant amounts of donated space, furniture, equipment, supplies, and other resources should be considered. The market value of these resources often can be determined with a few calls to neighborhood stores or commercial providers of similar space or services. The market value should be used in cost assessments just as if it had been paid. Costs associated with donated resources can be tagged for later removal to contrast the "actual cost, with donated resources not paid for" with the "expected cost, if every resource had to be paid for."
- *Renovations.* Renovation costs for an entire facility should be spread out over the expected life of those renovations. For example, if building renovations are expected to last for 10 years, one-tenth of the total cost of the renovation should be added to the annual cost of the space.

To determine the hourly cost of your facility, divide the total space cost by the number of hours it can be used for all procedures, including indirect as well as direct services. This probably would be the number of hours the clinic is open (table 11).

The same procedure can be used to calculate the cost of space in residential programs. Procedures can be delivered 24 hours a day, 7 days a week, in some residential programs. Other residential programs may limit treatment activities to 6:00 a.m. through midnight. In either

case, the above procedure can be used to calculate the hourly cost of space in residential programs.

Table 11. Calculating the hourly cost of space

1. Find the total annual cost of the entire facility: lease payment or equivalent, utilities, maintenance, and pro rated furniture, equipment, and renovations.

Example: \$18,000 (lease) + \$2,000 (utilities/maintenance) + \$1,800 (furniture, equipment, and renovations) = \$21,800 (total annual cost)

2. Determine the number of hours that the facility is open during the year: hours per day, days per year.

Example: 16 (hours per day) x 7 (days per week) x 52 (weeks per year) - 2 (holidays) = 5,822 hours per year

3. Divide the total annual cost by the hours open per year to obtain cost per hour.

Example: \$21,800 (total cost) ÷ 5,822 (hours) = \$3.74 per hour

Find the Hourly Cost of a Designated Space

It is incorrect to assign all areas of a facility the same cost. For example, therapy for an individual patient in an office measuring 8 x 10 feet would not cost the same, in terms of space, as therapy in an office measuring 10 x 15 feet. Rather, the cost of different areas should be proportional to their share of the total space. Thus, an 8 x 10 foot office (80 square feet) would account for 10 percent of the total area of an 800 square foot facility (including hallways and other areas that cannot be assigned to a direct service). If the hourly cost for the entire facility were \$3.74, the office space in question would cost \$0.37 per hour.

However, if there is a marked difference in the quality of different areas within the same facility, simply assigning costs as percentages of space is not adequate. Instead, determine the costs of those resources (e.g., furnishings, equipment, utilities) that differ and apportion the costs by direct treatment spaces and areas used for indirect activities. For example, specific renovations performed on a particular office—say, adding walnut paneling or a skylight—should be charged to that office only. Then compute the hourly cost as above.

Alternatively, special equipment or furnishings could be listed separately in rows added to the spreadsheet, and the time spent using them would be placed in the appropriate column for procedure and patient.

The hourly cost for their use would be shown in the proper cell in the Cost per Unit spreadsheet, and the cost would be computed for the Resource Cost spreadsheet.

Record Hourly Rates

The final step is to calculate the space cost for each procedure and patient. Multiply the time that the procedure was performed by the provider for the patient in that space (entered in the Resource Use spreadsheet) by the hourly cost of the space (entered in the Cost per Unit Resource spreadsheet). The spreadsheet column totals will yield the total direct service cost of the space in the Resource Cost spreadsheet.

Other Direct Costs

Some costs are entered directly in the Resource Use spreadsheet and can be transferred directly to the Resource Cost spreadsheet. Other costs may have to be calculated. For example, you may decide to record number of doses of methadone per patient for the month on the Resource Use spreadsheet. The cost per dose would then be entered on the Cost per Unit Resource spreadsheet. The result of multiplying the two entries would appear on the Resource Cost spreadsheet.

Fortunately, mileage and phone rates are readily available from billing receipts and can be used to complete the Cost per Unit Resource spreadsheet. Multiplication of these rates by the total amount of transportation miles, phone use, and so on results in total costs, which are entered on the Resource Cost spreadsheet.

Divide Indirect Service Costs Among Patients

Deciding how to distribute indirect costs provides an overview of the cost assessment and shows how important it is to measure direct service costs accurately.

One way to distribute indirect costs is to “charge” all patients the same fraction of indirect service costs. This flat rate approach to assigning costs is fair and accurate only if all patients use the same amount of direct service resources. Because patients use varying amounts of resources, gross distribution of indirect costs across patients rarely presents an accurate cost per patient.

A more accurate description of the value of resources actually used (rather than available for use) is generated by finding the percentage of direct service resources used by the patient and assigning the same percentage of indirect resource costs to the patient. Because patients’

use of direct service resources changes over time, the percentage should be calculated for each basic reporting period.

Indirect resources can be distributed over patients according to criteria other than the total direct costs of serving the patient. For example, the number of hours the patient spent in treatment, or the number of visits, could be used instead of total costs. It seems likely, however, that during a visit some patients will use more treatment resources than will other patients. These additional treatment services may well require consumption of additional indirect resources such as more space or administrator time.

For example, although it is possible that patients who see higher priced therapists (such as psychiatrists) use the same amount of space, equipment, and other materials as are used by patients who see less expensive therapists (such as paraprofessional counselors), experience suggests that higher priced therapists have nicer, larger offices, more up-to-date equipment, and more of other resources. For similar reasons, it seems likely that patients who spend the same amount of time receiving treatment services may receive services that differ in indirect as well as direct costs. Thus, the procedure used in this manual to distribute indirect costs over patients is based on the value of resources directly consumed in treatment, that is, direct service costs.

Determine Total Direct Costs and Patients' Shares

Using the Resource Cost spreadsheet, find the total for each column (except indirect activities) and enter it in the row for total direct service resources. Then add up the column totals for each patient and enter that in the TOTAL column for that patient. Next, add up all the patient totals and enter that number in the TOTAL FOR ALL PATIENTS column. That will be your total direct costs.

Next, calculate the proportion of direct services used by each patient by dividing the TOTAL for the patient by the TOTAL FOR ALL PATIENTS. If you are using computer spreadsheets, you can simply copy the formula developed for one patient and use it for all other patients. Be careful to type in the formula so that it always refers to the same total cost for all patients.

Similarly, compute the proportion of direct resources used by each patient for each procedure. That is, take the total from one procedure column for a given patient and divide it by the total cost for all patients. Enter that proportion, then calculate the proportion for the next procedure for that patient, and so forth.

Enter the proportions in the appropriate row on the Resource Cost spreadsheet. Every column with a total should have a percentage in the row below it, except the columns for indirect costs.

Determine Total Indirect Costs

Next, find the total indirect costs of your program. Start by totaling the columns under Indirect activities. All personnel costs should be accounted for here or in direct costs, but other resources may require further calculations. For example, all costs for space must be included. Some space will have been listed under direct costs (and some may have been designated for indirect activities).

- Total the rows for each designated space and add these totals together.
- Subtract these allocated costs from the total cost of your space and enter that number in the space row and the total indirect activities column.
- To check your accuracy, retotal the space rows and add these row totals together; this should give you the total cost of your space.

In the same way, total each 'other resources' row where costs have been allocated and subtract the total from the total cost of that resource. Enter this number in the total column for that resource. An exception would be resources that are used entirely for direct treatment, such as methadone.

Enter the monthly costs of all other resources not otherwise accounted for in the appropriate row in the TOTAL column under Indirect Activities. When all numbers are entered, retotal the columns for Indirect activities and enter the numbers in the row for Total indirect service resources. Then add these column totals together and enter the total in the same row in the TOTAL FOR ALL PATIENTS column.

Assign Indirect Costs

The next step is to multiply the proportion of direct costs used in each column by the total of indirect costs as entered in the TOTAL FOR ALL PATIENTS column. Enter that number in the Total Indirect Service Resources row.

Combine Indirect and Direct Costs

The final steps in cost assessment are to combine the indirect and direct costs for each procedure and for each patient. This amounts to adding up the indirect and direct costs for each procedure, then for each patient, and finally for the program as a whole. Computer spreadsheets make this easy, and it is especially easy to repeat each month as new cost data come in.

Sample Resource Sheets

Tables 12 through 14 give examples of the three spreadsheets described here. In order to show the calculations and indirect cost distributions,

the figures unrealistically assume that only two patients are sharing all resources, including group counseling, and that space and other indirect costs are only large enough to accommodate two patients.

Keeping Down the Cost of Measuring Costs

Although continual measurement of costs for all patients and procedures usually is best from a measurement perspective, there are several other ways to measure costs per resource per procedure per patient that may be less expensive. You may want to consider these if your cost assessment budget is small. Keep in mind, however, that the most time-consuming and, in turn, most costly efforts are in the beginning. Once you have a process in place with all the necessary pieces, it is fairly easy to replicate, update, and reassess costs at different times.

One approach to reducing the cost of cost measurement while maintaining its potential to contribute to cost-effectiveness and cost-benefit analysis is to *sample*. If costs are measured for a representative few months instead of a whole year, and if a representative group of patients is followed, the costs of measuring costs for the rest of the year for the remainder of the patients can be saved.

It is important that the months used not be ones during which patient load was particularly high or low or when average patient length of stay was atypically long or short. A random sample of patients would be crucial, too, for generalizing cost findings to other patients. To avoid selecting time periods that are not representative, you may want to choose several different time periods, such as one month out of each quarter.

Another way to make cost assessment easier is to divide up the tasks. It would be natural to divide up cost assessment into data collection and data analysis tasks and let different people be responsible for the collection and analysis. These methods of cost measurement reduction deserve attention. You might also consider sharing cost measurement efforts with similar programs in your area, pooling your cost data, and sharing your solutions to cost measurement problems.

Finding Information on Cost Measurement

Cost measurement at the level of detail described in this manual is relatively new to human services. Most cost-measurement methods have been more global; they have been used for purposes of judging a program's overall cost rather than finding specific ways to improve cost-effectiveness and cost-benefit by adding, deleting, or modifying treatment procedures.

Table 13. Sample cost per unit spreadsheet

	Indirect activities				Patient 0123					Patient 0124					TOTAL FOR ALL PATIENTS
	Meetings	Cost accounting	All other	TOTAL	Individual counseling	Group counseling	Drug education	Other treatment procedures	TOTAL	Individual counseling	Group counseling	Drug education	Other treatment procedures	TOTAL	
Direct service															
Counselors – A	\$35	\$35				\$35				\$35	\$35		\$35		
B	\$20	\$20			\$20		\$20								
Psychiatrist	\$45				\$45								\$45		
Nurse						\$25	\$25	\$25			\$25	\$25			
Indirect staff															
Program director	\$30	\$30	\$30												
Office manager		\$20	\$20				\$20								
Accounting assistant		\$15	\$15												
Other resources															
Space			\$1.74					\$1.74					\$1.74		
Office 1	\$0.37				\$0.37					\$0.37					
Group meeting room	\$0.50					\$0.50	\$0.50				\$0.50	\$0.50			
Supplies—Urinalysis					\$5.60	\$5.60	\$5.60	\$5.60		\$5.60	\$5.60	\$5.60			
Methadone							\$0.32								
Transportation			\$0.95							\$1.25	\$1.25	\$1.25			
Total direct service resources															
Proportion of direct costs used															
Total indirect service resources															
Total service resources															

Table 14. Sample monthly resource cost spreadsheet

	Indirect activities				Patient 0123					Patient 0124					TOTAL FOR ALL PATIENTS
	Meetings	Cost accounting	All other	TOTAL	Individual counseling	Group counseling	Drug education	Other treatment procedures	TOTAL	Individual counseling	Group counseling	Drug education	Other treatment procedures	TOTAL	
Direct service															
Counselors – A	\$70	\$8.75		\$78.75		\$17.50			\$17.50	\$140	\$17.50		\$35	\$192.50	\$210.00
B	\$40	\$10		\$50	\$60			\$15	\$75						\$75.00
Psychiatrist	\$90			\$90	\$90				\$90				\$45	\$45	\$135.00
Nurse						\$12.50	\$12.50	\$62.50	\$87.50		\$12.50	\$12.50		\$25	\$112.50
Indirect staff															
Program director	\$60	\$15	\$300	\$375											
Office manager		\$30	\$360	\$390				\$10	\$10						\$10.00
Accounting assistant		\$150	\$30	\$180											
Other resources															
Space – all other			\$454.56	\$454.56				\$5.66	\$5.66				\$1.74	\$1.74	\$7.40
Office 1	\$0.37		\$60.63	\$61.00	\$1.48				\$1.48	\$1.48				\$1.48	\$2.96
Group meeting room	\$1.00		\$82.60	\$83.60		\$0.25	\$0.25		\$0.50		\$0.25	\$0.25		\$0.50	\$1.00
Supplies—Urinalysis					\$28	\$5.60	\$5.60	\$28	\$67.20	\$22.60	\$11.20	\$11.20		\$45.00	\$112.20
Methadone								\$9.60	\$9.60						\$9.60
Transportation			\$2.85	\$2.85						\$10	\$2.50	\$1.25	\$1.25	\$15	\$15.00
Total direct service resources					\$179.48	\$35.85	\$18.35	\$130.76	\$364.44	\$174.08	\$43.95	\$25.20	\$82.99	\$326.22	\$690.66
Proportion of direct costs used					0.2599	0.0519	0.0266	0.1893	0.5277	0.2520	0.0636	0.0365	0.1202	0.4723	1.00
Total indirect service resources	\$261.37	\$213.75	\$1290.64	\$1765.76	\$458.92	\$91.64	\$46.97	\$334.26	\$931.79	\$444.98	\$112.30	\$64.45	\$212.24	\$833.97	\$1765.76
Total service resources					\$638.40	\$127.49	\$65.32	\$465.02	\$1296.23	\$619.06	\$156.25	\$89.65	\$295.23	\$1160.19	\$2456.42

Some additional sources of information, cost measurement methods, and case studies are available in the professional literature. These include the following:

A Client-Oriented System of Mental Health Service Delivery and Program Management: A Workbook and Guide by D.E. Carter and F.L. Newman, 1976.

Integrated Clinical and Fiscal Management in Mental Health: A Guidebook by F.L. Newman and J.E. Sorensen, 1985.

Improving Effectiveness and Reducing Costs in Mental Health by B.T. Yates, 1980.

Cost-Effectiveness Analysis and Cost-Benefit Analysis: An Introduction by B.T. Yates, 1985.

Cost-Effectiveness Analysis, Cost-Benefit Analysis, and Beyond: Evolving Models for the Scientist-Manager-Practitioner by B.T. Yates, 1995.

Analyzing Costs, Procedures, Processes, and Outcomes in Human Services by B.T. Yates, 1996.



Collect Patient Data

Simply comparing outcomes to costs for an entire program does not provide enough information to allow for systematic improvement of a treatment program for several reasons:

- At any given time, patients will have been exposed to varying amounts of treatment.
- Patients respond differently to different treatment procedures.
- Patients with different backgrounds and drug abuse histories may respond differently to the same treatment procedure.
- Differences in backgrounds between therapists and patients may influence the response to treatment.

What is needed is a record, for each patient separately, of the patient's characteristics, types and amounts of outcomes achieved, treatment procedures used, and resources expended. These individual findings can then be combined to show the effectiveness of the program as a whole and of its individual parts.

To understand whether and how a treatment procedure is responsible for outcomes observed, it is also useful to collect data on psychological, social, and possibly biological processes that occur within individual patients. Although difficult to observe directly, these biopsychosocial processes translate what is done in treatment—the procedures enacted by counselors and others—into the end results of treatment—the outcomes.

Before Treatment Begins

Patient Characteristics

Most of the data on patient characteristics such as the following are collected during the intake process:

- Date of birth
- Gender
- Ethnic background

- Employment status
- Marital status
- Drugs abused
- Physical health
- Severity of the abuse problem—the Addiction Severity Index is commonly used to measure this.
- Contacts with the criminal justice system
- Date treatment begins

This information is kept in the patient's file. In a large program with many patients, especially if computerized, the data could be recorded on a Patient spreadsheet similar to the spreadsheets developed to track costs, with characteristics as rows and patients as columns.

Provider Characteristics

To be able to determine whether patient outcomes are related to characteristics of the program staff, record date of birth, gender, marital status, ethnic background, experience, and training for all therapists and staff members who interact with patients. These can be coded as provider data and entered on the Patient spreadsheet, if used.

Prescribed Treatment

Some measure of amount of treatment that the patient has received should be developed. This could be time in treatment, percentage of prescribed treatment completed, or some other measure, depending on the type of program. A patient who has finished only half the program cannot fairly be compared with patients who have completed all their treatment.

In order to determine the proportion of treatment received, you will need to know the amount of treatment prescribed. In most cases, this can be recorded as hours per procedure. In all cases, amount of treatment recommended should be expressed numerically, if possible.

Process Measures

Several well-tested instruments for assessing specific problem areas are available:

- General brain functioning
 - Trail Making Test
- Neurological impairment
 - Porteus Maze
- Depression
 - Beck Depression Inventory (BDI) (Beck and Steer 1988)

- Anxiety
 - Taylor Manifest Anxiety Scale
 - State-Trait Anger Expression Inventory (STAXI)
- Health functioning
 - SF-36
- Motivation
 - Addiction Severity Index (ASI) (McLellan et al. 1985*a, b*)
 - CMRS (Circumstances, Motivation, Readiness and Suitability) (DeLeon and Jainchill 1986)

One instrument, the Symptom Check List, 90-item version, revised (SCL-90-R) (Derogatis 1979), is designed for diagnosis of multiple mental health problems and collection of related demographic data. It can be used to measure the following processes that should change during substance abuse treatment:

- Somatization
- Obsessive-compulsive
- Interpersonal sensitivity
- Depression
- Anxiety
- Hostility
- Phobic anxiety
- Paranoid ideation
- Psychoticism
- Global Severity Index
- Positive Symptom Distress Index
- Positive Symptom Total

Some instruments have been developed that, although more time-consuming than those listed above, provide measures of almost any process that could be posited as active in substance abusers:

- Minnesota Multiphasic Personality Inventory, version 2 (MMPI-2)
- Millon Clinical Multiaxial Inventory-II (MCMI-II)
- Structured Clinical Interview for the Diagnostic and Statistical

Manual of the American Psychiatric Association, version IV (SCID)

In addition, some comprehensive process assessment instruments have been developed specifically for substance abuse treatment. One such instrument is the Individual Assessment Profile (IAP) (Flynn et al., 1995).

Researchers have found that some personality factors measured by process assessment instruments are indeed related to drug preferences (Craig 1979; Flynn et al. 1995; Mirin et al. 1988); however, diagnoses are not reliably related to treatment outcomes.

Standardized tests yield scores or ratings that can be entered in the patient's file or on a Patient spreadsheet. These before-treatment scores provide a baseline for comparison later in treatment.

During and After Treatment

Most clinical researchers and program evaluators begin outcome measurement when a program has ended. Drug treatment is, however, different from many other programs: Patients typically begin dropping out soon after treatment begins. Other patients are excluded early from many drug treatments. If counseling sessions, medication, and other procedures are interim outcomes, then outcome measures and followup on treatment effects begin as soon as treatment begins.

Standardized Effectiveness Measures

There are many ways to record patient progress. Standardized measures give you the flexibility to look at each measure separately or to combine all measures for an overall cost-effectiveness analysis.

To standardize different outcome measures, find a common unit in which they can be measured or a common scale for all measures. This may not be as impossible as you might first think. A common unit for different measures, such as drug abstinence and employment, could be days, where drug-free days and days of employment are treated as equivalent, positive outcomes.

A common scale could be used for less observable measures, such as emotional maturity and quality of relationships with others, where "1" on the scale means "much less than desirable for recovery" and "10" on the same scale means "as much as is desirable for recovery."

Another way to standardize measures is to measure them at the beginning and end of treatment (or at least earlier and later in treatment). Calculate the percentage change in the measure, and the effectiveness of the program on all measures will be in the same units. For example,

if days employed per month increased from 5 to 10, a 100-percent improvement occurred. If drug-free days per month increased from 5 to 20, a 300-percent change occurred.

Followup

How long does one have to follow a patient to determine whether the cessation of substance abuse is permanent? This is a very difficult question to answer conclusively. Relapses to drug use have been recorded 5 and even 10 years after the last use of the substance. One way to determine the length of followup is to specify an interval that is convenient, affordable, or typical. The typical interval is between 1 and 2 years, although longer periods are desirable.

Another way to answer the question "When will we know for sure that the patient has or has not succeeded in kicking the habit?" is to challenge the validity of the question. A number of therapists and researchers believe that addiction is a lifelong process that may never end completely. Instead, the interval between uses of the addictive substance may be increased markedly by treatment. The duration of the relapse and the dose of the substance may be decreased by treatment. The addiction, however, may continue forever.

If this is the approach to treatment outcome, followup becomes a potentially perpetual process; however, budget limits and evaluator interest typically limit duration of followup in these programs to a few years.

Should Dropouts Be Included?

It is tempting to exclude from evaluations of treatment outcomes data for patients who have dropped out of treatment. Counselors may rightly feel that behaviors exhibited by patients who quit treatment in the first month or two do not represent the real effectiveness of treatment. Indeed, these patients have not received the minimum necessary "dose" of treatment and probably do not show how effective it can be.

Nevertheless, patients who dropped out *did* consume resources during treatment. Because intake is an expensive procedure in most substance abuse programs, it would be inaccurate to distribute those intake costs across patients who stay in treatment. When costs are examined, that approach would penalize programs that have higher dropout rates.

Also, if dropouts are excluded from analyses of program outcomes, and if the costs of treating dropouts are excluded as well, treatments that exclude all patients except those who succeeded will appear more successful than treatments that persist in trying to help patients with more serious problems. This creaming (as it is called by program evaluators) can produce findings of apparent effectiveness, cost-effec-

tiveness, and cost-benefit that cannot be generalized to most other programs. The problems of ignoring dropouts become severe if the early dropout rate is a significant percentage of the total number of patients who seek treatment from the program.

Of several resolutions possible for the issue of what one does with outcome and cost data for dropouts, the most satisfactory for most programs is to include the cost of treatment for dropouts and to think of staying in treatment as a crucial interim outcome.

The perspective from which outcomes are being assessed also suggests including dropouts in outcome measurement. The dominant perspective in most substance abuse treatment is that of the community or society. This is due to the widespread effects that substance abuse can have on the public as well as the public nature of much funding for substance abuse treatment.

From this perspective, the question that outcome and cost measures should answer is not, "How effective and inexpensive *can* treatment be?" It also is not, "How effective and inexpensive was treatment *for those who finished* the basic course of treatment procedures?" From the perspective of the community and of society at large, the question of outcome is, "How many of those who needed to cease their addictive behavior actually *did so*, did so permanently, and at what actual cost?"

Another way to look at this is to ask, "How much does it cost to operate our program and what do we get from those costs?" From this perspective, serving dropouts, for even a short time, is part of what the program does. Costs are associated with this service. Further, using the CPPOA model allows for associating costs and resources as well as procedures specific to dropouts so that ways to reduce these costs or change procedures to reduce dropout rates can be adopted.

Find Cost-Effectiveness

There are many ways to assemble numbers about your costs and outcomes (effectiveness and benefits). Some may be more useful than others, depending on your program and your funding situation. Each method of assembling cost and outcome data, together with its possible determinants, serves a slightly different purpose. Graphs usually show the best picture of the costs paid for treatment and the results of treatment. Tables and ratios give a simpler picture but may bury or eliminate important information that could change your decision about which treatment procedures to use or which programs to fund. Mathematical models, which are wonderfully complex, are beyond the scope of this manual.

Measure Effectiveness

Traditionally, effectiveness is analyzed one measure at a time to provide a comprehensive picture of what a program is doing with its resources. To analyze overall effectiveness, standardized outcome measures can be multiplied by a weighting to show their relative importance. These standardized, importance-weighted measures of effectiveness then can be combined into an overall measure of effectiveness. This method of integrating specific measures of effectiveness into one overall measure was described by Yates and associates (1979) in a cost-effectiveness analysis of residential treatments for predelinquent youth.

Weight Effectiveness Measures

Even with the same units or same scale, the same improvement on two measures may not be valued the same. For example, many counselors would view a 50-percent improvement in drug-free days to be more important than a 50-percent improvement in gainfully employed days.

The importance of each measure can be rated by persons involved in funding decisions. For instance, eight staff and two community representatives could rate each measure of effectiveness for importance on a 10-point scale, with "1" meaning "much *less* important than the other measures" and "10" meaning "much *more* important than the other measures." A 10-point scale has the advantage of not providing a midpoint that can be used to say "as important as other measures."

Table 15. Importance ratings on two outcome measures

Rater	Outcome measure	Importance rating (1-10)
A	Drug-free days	10
	Employed days	6
B	Drug-free days	8
	Employed days	4

Having an even number of rating points forces raters to decide whether a measure is less or more important than the other measures. Table 15 shows a simple example with two measures of outcome and two raters.

Because some raters might use one part of the scale more than others, the first step in standardizing the ratings is to standardize ratings between raters. This sounds more complicated than it is. Find the average rating for a rater, and then divide each rater's ratings by his or her average rating. The result will be numbers slightly greater or less than 1.00 (table 16). An importance number (weighting) greater than 1.00 indicates that the measure is considered more important than the other measures. An importance weighting less than 1.00 indicates that the measure is considered less important than the other measures.

Do the same calculations for each rater. Now average these importance ratings for all raters. The result is the average importance weighting—a numeric consensus on how important each measure is (table 17).

Table 16. Importance weighting index

Rater	Outcome measure	Importance rating (1-10)	Importance weighting
A	Drug-free days	10	$10 \div 8 = 1.25$
	Employed days	6	$6 \div 8 = 0.75$
	Average	$(10 + 6) \div 2 = 8$	$(1.25 + .75) \div 2 = 1.00$
B	Drug-free days	8	$8 \div 6 = 1.33$
	Employed days	4	$4 \div 6 = 0.67$
	Average	$(8 + 4) \div 2 = 6$	$(1.33 + 0.67) \div 2 = 1.00$

Table 17. Average importance weighting

Rater	Outcome measure	Importance weighting
A	Drug-free days	1.25
	Employed days	0.75
B	Drug-free days	1.33
	Employed days	0.67
Average for all raters	Drug-free days	$(1.25 + 1.33) \div 2 = 1.29$
	Employed days	$(0.75 + 0.67) \div 2 = 0.71$

You are now ready to calculate the composite measure of overall effectiveness. Multiply the average importance rating for a measure by the effectiveness value for that measure, and add up the products (table 18). The result is a single composite index of program effectiveness for the patient. You can then average across patients to describe the effectiveness of the program as a whole.

Table 18 shows that without importance weightings, Patients A and B would show the same improvement. With importance weightings, Patient A's improvement on the more important outcome measure becomes clear. Table 18 also shows that, after averaging across patients and outcome measures, the original average percentage change in outcome measures (60 percent) reappears. The effect of averaging across outcome measures is to cancel out the effects of importance weightings. So, why did we do all those weightings to begin with? These importance-weighted outcome measures are important to retain when

Table 18. Composite index of program effectiveness

Patient	Outcome measure	Percentage change	Average importance weighting	Importance-weighted percent change
A	Drug-free days	110 %	1.29	141.9 %
	Employed days	10 %	0.71	7.1 %
	Average	60 %	1.00	74.5 %
B	Drug-free days	10 %	1.29	12.9 %
	Employed days	110 %	0.71	78.1 %
	Average	60 %	1.00	45.5 %
Average for program	Drug-free days	60 %	1.29	77.4 %
	Employed days	60 %	0.71	42.6 %
	Average across outcome measures	60 %	1.00	60 % [(77.4 + 42.6) ÷ 2]
	Average across patients			60 % [(74.5 + 45.5) ÷ 2]

examining cost-outcome relationships per patient. That way, the processes, procedures, and resources that increase the more important outcome of drug-free days will be given more weight.

These importance weights are, of course, subjective. They are no more subjective, however, than most psychological measures. "Subjective" does not mean that these measures are inherently bad or that they cannot be used. Importance weights simply describe what most people do when they read program evaluation reports with several measures of effectiveness, according to psychological theory backed by laboratory research (Anderson and Shanteau 1970). Most people do not attach equal importance to each of the many effectiveness measures available in most program evaluations. The ratings recommended here just make explicit the psychology of the readers of an evaluation report. If one measure of effectiveness is being ignored, that will be apparent in the ratings.

Within specific interest groups, these importance weights may be quite similar. If a policymaker wishes to use a particular set of importance weights, that certainly can be done. Or, representatives of the various interest groups each can be polled for their weightings of the importance of different measures. Better yet, perhaps the different degrees to which each of these outcomes predicts long-term abstinence from substance abuse or long-lived contributions to society could be measured by statistical analyses of large data sets and then applied as importance weights here. Cost-effectiveness analyses, such as those reported by Yates and associates (1979), have included these importance weights obtained by surveying treatment staff for ratings of the relative importance of different outcome measures.

Newman Tables

One way to measure outcomes so that they reflect the contribution of the program is to compare outcome measures before versus after treatment, or before versus after treatment begins. For example, the number of criminal acts could be compared for 1-year periods before and after treatment begins. Another way is to construct a Newman table that displays the number of patients who began treatment at one level of functioning (or other outcome measure) and ended treatment at another level.

A basic form of the Newman table is displayed in table 19. The numbers in the table show the number of patients who began treatment at one level of functioning (indicated by the labels in the rows) and ended treatment at another level of functioning (indicated by the labels in the columns). The numbers in parentheses show the percentages of all 90 patients that are in each cell of the table.

Table 19. Sample Newman table

Pretreatment functioning	Posttreatment functioning		
	Poor	OK	Great
Poor	11 (12%)	45 (50%)	9 (10%)
OK	2 (2%)	5 (6%)	17 (19%)
Great	0	0	1 (1%)

Table 19 shows that 11 patients who began treatment at the "Poor" level ended treatment at the same level and 2 patients got worse. Functioning improved for 71 (45 + 9 + 17) patients. Generally, Newman tables segment outcome measures into more levels (5 to 10) both before and after treatment. These more detailed tables provide many more cells, enabling a more specific analysis of the effects of treatment for patients who begin treatment at different levels of functioning (Carter and Newman 1976; Davis and Yates 1982).

Before-after comparisons of outcome measures may exaggerate the impact of treatment, since treatment often is started because patient behavior is becoming progressively more severe. Without treatment, patient behavior might have continued to worsen, of course, but it also could have ebbed in severity because of processes unrelated to treatment. Criminal behavior, for example, seems to decline as patients grow older. Before-after comparisons of the same outcome measures for individuals who did not receive treatment, but who are as similar as possible to the patients, can help discern how much of the apparent improvement in patient behavior is due to other factors.

Calculate Procedure Dose

By examining the time and other resources used for each procedure, it may be possible to assess the degree to which a procedure was implemented. Some procedures, such as certain individual and group therapies, may have no set criteria that indicate whether the procedure was fully implemented. The extent to which these procedures are implemented is indeterminate. The dose for open-ended procedures can be calculated for the month by minutes of implementation or number of sessions (of standard duration). More hours spent in individual therapy indicates a larger dose of that therapy.

If a set duration or set number of sessions is prescribed as the desired, complete implementation of the procedure, the dose of the procedure actually received by the patient can be captured as a percentage. The percentage of procedure implementation can be calculated for each patient by dividing the total time (or other measure of procedure implementation) by the amount of time the procedure was supposed to be implemented.

Other procedures, such as drug education and more formally prescribed therapies, may be characterized with checklists of specific steps, points, presentations, demonstrations, or other specific operations to be performed by service providers. The degree to which an operations-based procedure actually was implemented can be calculated according to the percentage of points on the checklist that were addressed or the number or duration of presentations delivered versus desired. This requires a carefully operationalized description of the procedure.

Some procedures, such as methadone maintenance, can be described in absolute terms according to the total dose received for the month. Some providers may find it more useful to specify the extent to which methadone maintenance was delivered according to the actual versus ideal number of days that methadone was received.

Even if patients are prescribed different amounts of specific treatment procedures, the percentage implementation of each procedure can be calculated easily for each patient and then averaged across patients for each procedure. Sample calculations for these procedures are described in table 20.

There are other ways to calculate the average implementation of a procedure. The averaging shown in table 20 considered each procedure to be equal. The percentages shown in the rightmost column in the last four rows of the table could be weighted by the amount of time that patients were supposed to spend in the procedure.

Table 20. Sample calculations for dose of operations-based procedures

Patient	Procedure	Prescribed hours	Actual hours	Percent procedure implemented
A	Group counseling	10	9	90 % (9 ÷ 10 x 100)
	Relapse prevention	10	6	60 % (6 ÷ 10 x 100)
	Individual counseling	4	4	100 % (4 ÷ 4 x 100)
	Case management	2	2	100 % (2 ÷ 2 x 100)
B	Group counseling	10	11	110 % (11 ÷ 10 x 100)
	Relapse prevention	5	3	60 % (3 ÷ 5 x 100)
	Individual counseling	5	4	90 % (4 ÷ 5 x 100)
	Case management	2	2	100 % (2 ÷ 2 x 100)
Average	Group counseling	10 [(10 + 10) ÷ 2]	10 [(9 + 11) ÷ 2]	100 % [(90% + 110%) ÷ 2]
	Relapse prevention	7.5 [(10 + 5) ÷ 2]	4.5 [(6 + 3) ÷ 2]	60 % [(60% + 60%) ÷ 2]
	Individual counseling	4.5 [(4 + 5) ÷ 2]	4 [(4 + 4) ÷ 2]	95% [(199% + 90%) ÷ 2]
	Case management	2 [(2 + 2) ÷ 2]	2 [(2 + 2) ÷ 2]	100 % [(100% + 100%) ÷ 2]

To do this, multiply the number of hours prescribed for a procedure by the percentage implementation of the procedure and divide by the total number of hours that procedures were prescribed. Working with the averages for Patients A and B, shown in the bottom four rows of table 14, the weighted average for percentage implementation of the procedures would be:

$$\frac{(100\% \times 10 \text{ h}) + (60\% \times 7.5 \text{ h}) + (95\% \times 4.5 \text{ h}) + (100\% \times 2 \text{ h})}{10 \text{ h} + 7.5 \text{ h} + 4.5 \text{ h} + 2 \text{ h}} = 86.56\%$$

The monetary cost of the procedures also could be used for weighting the implementation percentages for the various procedures.

Link Costs to Outcomes

Graphs show the straight-line relationship between costs and outcomes in a program. Although you can make graphs with paper and a ruler, it is easier and more accurate to use graph paper. The *easiest* way to graph cost-outcome relationships is to use a spreadsheet program (like Microsoft Excel[®] or Lotus 123[®]) on a computer. There are graphing

Table 21. Treatment cost and drug-free days per patient

Patient	Cost of treatment for February	Drug-free days in February
A	\$512	23
B	\$716	19
C	\$632	20
etc.		

programs, too, but most spreadsheet programs now include graph "wizards" or assistants that make graphs easily.

You could begin using graphs to explore cost-outcome relationships by graphing data for individual patients for one time period. Outcomes are on the vertical axis because that, traditionally, is the place for the variable of primary interest. Costs are on the horizontal axis because that, traditionally, is the axis for the variable that is thought to determine the variable of primary interest. Cost and outcome data can be assembled in a table or spreadsheet with columns for costs and outcomes and rows for each patient (table 21).

Cost-Outcome Newman Tables

Cost information also can be combined with outcome data in a Newman table. Generally, the total or average cost of moving patients from one level of functioning to another one (or to maintaining the same level of functioning) is displayed as shown in table 22.

These cost-outcome indices do not reflect what could be high variability among individuals in the value of resources that were devoted to their treatment. Within each outcome cell, there may be considerable variability in patients' responses to treatment. Having only three levels of functioning also is a problem. For instance, a patient might begin treatment at the low end of the "OK" level of functioning, end at the high end of the "OK" level of functioning, and be tallied in table 22 as "no change."

Table 22. Cost-outcome Newman table

Pretreatment functioning	Posttreatment functioning		
	Poor	OK	Great
Poor	11 (\$798)	45 (\$643)	9 (\$890)
OK	2 (\$152)	5 (\$672)	17 (\$801)
Great	0	0	1 (\$139)

Including cost information in a Newman table may confuse some funders or lead them to hasty and erroneous decisions. A funder might, for example, express amazement that an average of \$672 was spent on the five patients who began and ended treatment at the same "OK" level. Why, it might be asked, was all that money spent yet no change was produced?

Several answers are possible. One alluded to earlier is that change *did* occur, but the outcome measure was not sensitive enough to detect the change. Another answer is that, without treatment, these patients' functioning would have deteriorated. A control group might allow for a more direct test of this explanation, although the typical course of patients' addictive behavior may suggest that most will get worse without treatment.

Yet another answer is that it may indeed be possible that treatment did not work for these five patients. Although definite costs were involved, the outcomes of treatment cannot be guaranteed. Many other factors affect patient functioning. Should treatment be responsible for factors that are beyond the reach of treatment to change?

A final, possibly more constructive answer to hard questions about funds spent with no apparent clear result is, although most patients seem to benefit from treatment, we need to find out what procedures and processes combined to produce outcomes that were less than what we wanted.

Cost-Outcome Ratios: Patient Level

Several types of ratios can be calculated for programs, all of which may be interesting but which represent with varying degrees of accuracy the cost-effectiveness or cost-benefit of the program.

At the patient level, cost-outcome ratios can be formed by dividing the total cost of treating the patient by the one outcome measure, or by a composite outcome measure. For example, if the cost of treatment for Patient A for one month is \$80 and the change in drug-free days is 110 percent, the simple cost per percentage change in drug-free days is $\$80 \div 110\% = \0.73 per month.

If we had divided the cost of a month of treatment by the number of drug-free days during the month (say, 23 verified drug-free days), we would have another type of cost/outcome ratio ($\$80 \div 23 = \3.48 per drug-free day). This would probably underestimate the cost of a drug-free day, unless it can be assumed that there could be no drug-free days without treatment.

These ratios can be calculated for each patient for a specific period of treatment, such as the first 3 months, or for the entire treatment. They also can be averaged for patients, like any other statistic. However, the ratios do not describe the cost-outcome relationship over a wide range of costs. For example, finding a cost-outcome ratio of \$0.73 per percentage change in drug-free days for Patient A might make some people think that $\$0.73 \times 100 = \73 per month would produce a 100-percent change in drug-free days for Patient A. This is unlikely to be the case.

A patient-level benefit/cost ratio also could be calculated by dividing

the total value of criminal behaviors and social services avoided by the cost of treatment during an appropriate period. If the sum of benefits for these cost savings was \$160 for Patient A, and the cost of treatment was \$80, the benefit/cost ratio would be 2.0. The question of what an appropriate period is requires discussion. Basically, the cost should be for the period of treatment to which the cost-savings outcomes can be attributed.

Cost-Outcome Ratios: Program Level

The average patient-level cost-effectiveness ratio is a measure of program cost-effectiveness. Sometimes, however, a few patients may have especially low or high cost-effectiveness ratios that may throw off the average. In such cases, other statistics, such as the middle cost-effectiveness ratio for all patients (the *median*) or the most common cost-effectiveness ratio for patients (the *mode*) might represent the cost-effectiveness of the program better than the average.

Another approach to measuring the cost-effectiveness of a program is to divide the total cost of the program by an outcome measure, or a composite outcome measure. For example, if the total cost of the aftercare substance abuse treatment program is \$5,400 and the total drug-free days generated for all patients during that period was 100, the cost per drug-free days would be \$54 per drug-free day.

Cost-effectiveness ratios could be calculated for the other outcome measures as well by dividing the program cost by the effectiveness measure. That assumes, however, that the total cost of treatment was devoted to drug-free days. It would be far more accurate to calculate the portion of program resources that were directed specifically toward the generation of drug-free days. Cost-procedure-process-outcome analysis does this. A composite cost-effectiveness ratio *could*, however, be calculated by dividing the total program cost by the composite effectiveness index.

As the past few paragraphs implied, calculation of cost-effectiveness ratios is not always simple, and the results can be misleading. Table 23 describes these ratios, notes whether they are true cost-outcome ratios or another type of ratio, and also notes their sensitivity to how cost and outcome are defined and measured.

Many of these ratios also can be calculated for individual patients, and then summed. Generally, a cost-outcome ratio is more accurate and more representative of program functioning if it is calculated for individual patients and then averaged. Mathematically, the results *can* be different than will result from calculating the average cost for individual patients and dividing that by the average outcome for individual patients.

Table 23. Cost-outcome ratios

Cost measure	Outcome measure	Resulting ratio	A cost-outcome ratio? Sensitivities
Program level of specificity			
Cost of treating all patients who began treatment during a particular period (say, the second year of operations)	Number of patients who stayed drug free for a specific period after treatment and who began treatment during the same period for which the costs are measured	Average cost per successfully treated patient. (Criterion for success: staying drug free for the specific period)	Yes Very sensitive to length of drug-free period and definition of after treatment
Cost of treating all patients who began treatment during a particular period (say, the second year of program operations)	Drug-free day. Does not distinguish between one patient being drug free for a long period and many patients being drug free for short periods	Average cost per drug-free day	Yes Sensitive to definition of drug-free day and when outcome measurement begins
Cost of treating all patients who began treatment during a particular period (say, the second year of program operations)	Monetary benefits (cost savings, income production) of treatment	Total benefit/cost ratios	Yes Sensitive to assumptions made when estimating monetary value of different outcomes (e.g., cost of a theft)
Individual patient level of specificity			
Cost of treatment for individual patients	Number of drug-free days for individual patients	Average cost per drug-free day, calculated separately for each patient, then averaged across patients	Yes Does not distinguish between long and short periods of abstinence Does not indicate variability of treatment cost-effectiveness between patients
Cost of treatment for individual patients	Total monetary value of treatment outcomes for individual patients	Dollars spent per dollar produced	Yes Sensitive to assumptions made when estimating monetary value of different outcomes
False cost-outcome ratios			
Cost of treating all patients who began treatment	Number of patients beginning treatment	Average cost per patient of all patients who began treatment	No This is a useful measure of cost but is not of outcome.
Cost of treating all patients who completed treatment	Number of patients who completed treatment	Average cost per successful patient	No Including only the cost for patients who completed treatment underestimates the cost
Cost of operating the treatment program for a short period, say one month	Number of patients seen one or more times by the program during the same short period	Average cost per patient per short period	No This is a potentially useful measure of cost, sometimes called slot cost, but it involves no outcome data.

Costs per Procedure or Process

The most complete and useful cost-outcome analysis includes information about treatment procedures and about internal patient processes that occur between costs and outcomes. These analyses necessarily are performed at the level of individual patients. This level of detail enables us to see clearly what treatment interventions affect which processes in which patients. This information can help you decide how to deliver the most effective treatment to the most people given your budget constraints.



Explore Cost Benefits

Most interested parties agree that they seek to help patients become less destructive and more productive members of society. In our society, an individual's contribution often is measured in monetary terms—which is why transforming measures of effectiveness into measures of monetary benefits is so important, and why cost-benefit analysis can be so useful for decisionmakers.

According to research by Ball and Ross (1991) and Gerstein et al. (1994), substance abuse treatment can be expected to both save money and produce new income. In California, various drug treatments were estimated to save between \$245 million and \$1,284 million after subtracting the cost of treatment from cost savings and income generated in a single year in the early 1990s (Gerstein et al. 1994, p. 82). Of course, every treatment program differs in how much (and how quickly) this return on investment occurs, which is one reason to measure the benefits as well as the costs of individual programs.

Typical Benefits of Substance Abuse Treatment

New Income

Real income may be generated by substance abuse treatment due to increased productivity and employment of patients. This does not always occur, however. Researchers have found that employment prospects may not be as positive for former substance abusers as might be hoped (cf. Gerstein et al. 1994). This may be due to the stigma of being a former substance abuser as well as difficulties posed by criminal records. Also, the behavior patterns sometimes acquired in drug abuse lifestyles may need to change radically to meet expectations of potential employers (such as getting to work on time every day and following directives).

Cost Savings

Another benefit of substance abuse treatment is cost savings to society or taxpayers. These cost savings include—

- Funds that otherwise would have been spent in the illicit economy for drugs.
- Criminal justice services not required.

- Social and health services no longer required.

These cost-savings benefits are real and can be quite substantial. Substance abuse researchers (Langenbucher et al. 1993) have found profound reductions in a number of costly events after treatment, including the following decreases:

- Patients involved in driving while intoxicated/driving under the influence arrests decreased from 18 percent (pretreatment) to 3 percent (posttreatment).
- Patients involved in accidents decreased from 14 to 1 percent.
- Patients' families who sought counseling decreased from 31 to 5 percent.
- Patients' children who missed school decreased from 5 to 1 percent.
- Patients' spouses who missed work decreased from 10 to 1 percent.

Although different jurisdictions and different methods of assessment may provide different figures, the level of criminal activity patients exhibit can be expected to decrease by roughly two-thirds (Gerstein et al. 1994). Not every program produces a two-thirds reduction, however, so it is essential to measure how much criminal activity changes for each patient.

The reduction in criminal activity following substance abuse treatment may not produce a corresponding reduction in actual costs to society. Although costs to citizens drop in direct proportion to reductions in criminal acts perpetrated on those citizens, public expenses for criminal justice services may not decline in a similar manner. Typically, police, courts, and other components of the criminal justice system are on limited and fixed budgets, while the need for criminal justice services greatly surpasses the ability to deliver those services. For this reason, the impact of substance abuse treatment on criminal behaviors may not result in an actual reduction in criminal justice expenditures. Instead, criminal justice resources saved because of a reduction in crimes committed by former substance abusers may be diverted to other criminal justice services. The entire budget for criminal services probably will still be spent.

Similar problems may occur when cost savings benefits are measured for reduced health, mental health, and future drug treatment services. Because resources in these services typically are very limited, the actual reduction in expenditures may not be as much as might be expected from the reduction in patient use of services.

Nevertheless, transforming effectiveness findings into estimated cost

savings still may have considerable value for a program evaluation. In particular, cost savings estimates can show the magnitude of criminal justice and treatment resources that are now available to help other drug abusers who previously could not be helped because of budget restrictions.

***Crime-Related
Cost Savings***

Other research provides evidence for numerous cost savings that result from drug abuse treatment. For example, Rajkumar and French (1996) found that although total costs of crime averaged \$47,971 per patient in the year prior to treatment, that figure dropped to an average of \$28,657 per patient in the year following treatment. That drop of \$19,314 was far more than the cost of treatment, making cost savings in terms of crime alone worth the cost of treatment: \$2,828 for methadone maintenance, \$8,920 for residential treatment, and \$2,908 for outpatient treatment (Rajkumar and French 1996).

***Employment-
Related Cost
Savings***

French and associates (1990) found that drug treatment improved the employment and earning potential of drug abusers. Although only 31 percent of drug abusers were employed at the start of treatment, almost 45 percent were employed after treatment. There was a similar increase in the number of patients seeking work (from 9 to 13 percent). And, employed patients earned more after treatment. French and colleagues (1990) found that average personal earnings for employed patients rose from \$6,158 during the year before treatment to \$7,120 during the year after treatment.

The legality of employment and income also can be positively affected by drug treatment. French and Zarkin (1992) found that increasing time spent in methadone treatment by just 10 percent increases legal earnings by 1.5 percent and decreases illegal earnings by 3.2 percent. A 10-percent increase in time spent in residential programs increases legal earnings 2.4 percent and decreases illegal earnings 4.1 percent.

***Health Service-
Related Cost
Savings***

French and colleagues (1996) estimated the cost savings if one case of the following health problems could be avoided:

- \$1,100 for avoiding a case of severe venereal disease
- \$74,513 for avoiding a case of severe hypertension
- \$96,005 for avoiding a case of severe tuberculosis
- \$114,796 for avoiding a case of AIDS

**Caveats on Benefit
Assumptions and
Calculations**

Reductions in each of the above events are notable in their own right, as well as in terms of monetary savings to the individual and society. For your program, the average cost of each event can be requested from those providing criminal justice, health, or social services locally. It also

may be possible to glean this cost information directly from records of expenditures of public funds. The cost savings benefit then can be calculated for each patient as the reduction directly experienced in these events.

Some important changes may be impossible to monetize. For example, patients who interrupted their education decreased from 12 to 4 percent. Although this is a substantial decrease, it is impossible to determine the monetary value of this reduction. Other changes may not occur during the time period used to collect outcome data. For example, patients' financial problems may continue to occur for years after treatment because of the length of time necessary to compensate victims and pay off accumulated debt.

Increased Expenditures From Outcomes

Substance abuse treatment can temporarily increase patients' use of social services, including welfare support, disability payments, and health services. Patients may become well enough to seek help for health problems and to seek financial support from licit as opposed to illicit sources.

According to the CALDATA study (Gerstein et al. 1994), enrollment and payments received from various social services (other than health services) increased 17 to 50 percent during treatment. Being in treatment also may increase eligibility to receive a variety of social support services.

These increases in expenditures need to be included in treatment outcome reports. They should not be excluded simply because they do not seem like benefits. They are monetary outcomes and must be considered. They will likely be canceled out by the cost savings and income generated after treatment.

A case in point: In the CALDATA study, the costs of health services decreased between 1-year periods prior and subsequent to treatment from a mean \$3,227 to a mean \$2,469 per person. Also, in a study reported by Holder and Hallan (1986), private health insurance costs dropped from approximately \$100 per month per patient in the 2 years preceding treatment to less than \$14 per month per patient in the fifth year following treatment (which is when most health sequelae of substance abuse should have subsided).

Cost savings and other benefits may vary considerably depending on the type of treatment. In the CALDATA study, residential treatment was associated with a 58-percent reduction in costs to taxpayers, whereas methadone discharge was associated with a 17-percent reduction in

costs to taxpayers. Also, longer treatment generally corresponded to greater cost savings, although not for methadone maintenance.

Transform Effectiveness Findings Into Benefits

Effectiveness findings often can be transformed into benefit findings by multiplying effectiveness data by a cost value. For example, to estimate cost savings after treatment, the change in the number of thefts before versus after treatment can be multiplied by the average cost of drug-related thefts in terms of property loss, victim losses, and criminal justice expenses. Statistical analysis of data collected in an experimental design is the best way to determine whether these cost savings are significant and can be ascribed to treatment. Other research designs, including correlational methods, provide guidance and useful estimates. The transformation procedure for figuring benefits from effectiveness findings remains relatively straightforward.

The exact cost value used to transform effectiveness findings into benefit findings is ascertained by surveying local criminal justice and social and health service agencies. Ideally, you would find the cost of each criminal act, the cost of each health service used, and so on, for each patient individually. If you cannot get that information, you may be able to use estimates of average costs per patient for these effectiveness variables.

For example, suppose you know that the number of theft convictions for a patient dropped from three in the year preceding treatment to one in the year following treatment. Suppose, too, that the estimated cost of a theft totaled \$1,200 after adding costs of arrest, holding, and conviction to the cost to citizens of lost property and mental anguish. The total savings that could be attributed to treatment would be the cost of thefts during a period prior to treatment, minus the cost of thefts during a similar period following treatment. For this patient, that would be:

$$(3 \times \$1,200) - (1 \times \$1,200) = \$3,600 - \$1,200 = \$2,400 \text{ in cost savings.}$$

It would be more accurate to find the actual cost of each theft. It is conceivable that the one theft following treatment was quite minor compared to the thefts preceding treatment. On the other hand, that one theft after treatment could have cost more than all the thefts before treatment.

There also may be too much variation between jurisdictions (and over years) to allow a set cost for social services, health services, criminal justice services, and other cost items to be established for all drug treatment programs throughout the country for all time.

When cost savings and benefits involve health services, welfare, and other services for which cost data are available for individual patients, the cost for each patient needs to be contrasted for different periods of treatment. These services can vary greatly between patients; an estimate of the average health care cost per patient could result in over- or underestimation of cost-savings benefits.

Table 24 lists examples of the types of costs and potential cost savings that can be included in the survey. It is not meant to be complete. Note also that room for a range of estimates is provided, in recognition of the variability in costs of these services between patients and over time for the same patient. Costs of the specific criminal behaviors of individual patients then can be contrasted for the periods—

- Before versus after treatment.
- Before versus during treatment.
- During versus after treatment.

Table 24. Types of costs and potential cost savings

	Effectiveness measure	Effectiveness-benefit transformation	Benefit measures
Possible cost savings	Criminal acts not performed	Thefts at \$___ / misdemeanor \$___ / felony Assaults at \$___	Savings to potential victims due to income loss avoided, property not damaged or lost, and health and mental health services not needed
	Drugs not purchased	Opiates at \$___ to \$___/day Cocaine and crack at \$___ to \$___/day Other at \$___ to \$___/day	Money not spent on drug purchases
	Criminal justice services not used	Arrests at \$___/ arrest Jail at \$___/day Prosecution at \$___/ day	Expense of criminal justice services avoided
	Drug treatment no longer needed	\$__ per patient per day for the mixture of treatments provided	Cost of drug treatment no longer needed
	Welfare payments not provided	\$__ per patient per day in welfare payments	Amount of welfare payments not provided
	Disability payments not made	\$__ per patient per day in disability payments	Size of disability payments not made
	Health services not used	Sum health care cost use for 6–12 months before treatment and 6–12 months after treatment	Cost of health services not used
Possible benefits produced	Employment (licit)		Income earned from licit sources
	Entrepreneurship (licit)		New income (profit) from enterprise
	Income taxes paid on licit income		Amount of Federal, State, and local taxes paid on licit income
	Increased productivity in an existing job		Increased profit for employer, company, and sole proprietorship

These costs can be examined separately for each category of potential cost savings or actual income produced and then summed across all categories to find the total benefit.

Net Benefit

Cost-benefit analysis answers the question of whether the outcomes of a program are worth the costs by—

- Measuring outcomes in the same units—dollars, usually—as costs.
- Seeing whether the value of outcomes exceeds the value of costs (by subtracting total costs from total benefits, which is called the net benefit).

To calculate the total benefit per patient for a program, simply add up the benefit figures for each of the specific measures. Similarly, to calculate the total cost per patient for a program, add up the cost figures for each procedure. Then you can calculate the net benefit (total benefits minus total costs) for the patient. Add these up for all patients to find the net benefit for the treatment program.

To make cost-benefit analysis more specific, list the specific costs of achieving the benefits on each measure. Instead of adding up benefits for all measures for one patient, and then summing or averaging across patients, add up or average for all patients the benefits attained by a program for one measure.

Present-Value Benefits

Immediate positive outcomes are more valuable than delayed positive outcomes. Nonmonetary outcomes rarely are adjusted for the amount they are delayed, but monetary benefits often are. If costs and benefits are to be compared, monetary benefits delayed by more than a year from the time that costs occur can be adjusted for their delayed value.

The adjustment divides benefits by the sum of 1 plus a discount rate (often 0.08, 0.10, or 0.14). The discount rate closely resembles the interest rate that could be earned if the money spent on treatment were invested in another activity (such as a money market fund). Benefits delayed by 2 years are adjusted by dividing them by the result of multiplying the sum $1 + (\text{discount rate})$ by itself once (squared). Benefits delayed by 3 years are adjusted by dividing them by the result of multiplying the sum $1 + (\text{discount rate})$ by itself and then by itself again, and so on.

The result of applying net present value to delayed benefits can be striking. Consider, for example, a stream of cost-savings benefits of \$10,000 that occur at the end of the year for each of 3 years and a discount rate of 0.10. It is tempting simply to sum the benefits for a total of \$30,000. The net present value of the first end-of-the-year return

is, however, $\$10,000 \div (1 + .10) = \$10,000 \div 1.10 = \$9,091$ following the calculation guidelines given above.

The net present value of the second year's cost-savings benefit is $\$10,000 \div [(1 + .10) \times (1 + .10)] = \$10,000 \div [1.10 \times 1.10] = \$10,000 \div 1.21 = \$8,264$. The net present value of the third year's cost-saving benefit is $\$10,000 \div [(1 + .10) \times (1 + .10) \times (1 + .10)] = \$10,000 \div [1.10 \times 1.10 \times 1.10] = \$10,000 \div 1.331 = \$7,513$. The total of these net-present-value benefits is far less than \$30,000. It is only \$24,868.

The resulting present-value benefits reflect the declining value of benefits that take longer to occur. The difficulties of making this adjustment are minor, although two to three discount rates (say, 0.08, 0.10, and 0.14) should be used. The resulting benefit adjustments provide a quantitative advantage of alternative procedures (and alternative treatment programs) that produce benefits more rapidly.

Time to Return on Investment

Net benefit is the result of subtracting costs from benefits. Present valuing benefits reduces the value of benefits. Using present-value benefits gives an appropriate advantage to programs that achieve their benefits sooner. Present valuing benefits still, however, gives an advantage (appropriately) to programs that take longer but achieve better benefits than programs that produce quick but small benefits.

Time to return on investment is the time at which investment equals monetary outcomes. The time it takes benefits to begin to exceed costs for substance abuse treatment is of concern to funders and other interest groups. Each patient can be monitored for the time actually elapsed before the monetary value of the outcomes achieved equals the monetary value of the resources used. The average time to return on investment then can be computed for all patients.

One way to do this is to keep each patient's figurative "bill" on a lined piece of paper or on a spreadsheet, such as the one shown in table 25. "Investment" is the cost of treatment services delivered. "Return on Investment" is the monetary or monetized benefit resulting from treatment services. "Cumulative Investment" is the running total of all treatment and other service costs. "Cumulative Return on Investment" is the continuous total of all benefits (monetary and monetized) resulting from treatment. "Net Benefit" is the result of subtracting the Cumulative Investment from the Cumulative Return on Investment. An advantage of keeping these data on a computer spreadsheet is that the cumulative total and the net benefit can be automatically updated by the computer each time you enter new cost (investment) or benefit data.

Table 25 could be completed just from the perspective of the present treatment program, or from the perspective of past as well as present

Table 25. Sample cumulative costs and benefits and net benefit

Time	Investment	Return on investment	Cumulative investment	Cumulative return on investment	Net benefit
Date	Cost of treatment services delivered	Benefit to society, patient, or other individual	Running total of all treatment costs	Running total of all benefits of treatment	Cumulative return minus cumulative investment
1/3 start	\$376 (screening)		\$376	0	-\$376
1/5	\$145 (session)	\$21 (drug-free day)	\$521	\$21	-\$500
1/6		\$21 (drug-free day)	\$521	\$42	-\$479
1/8	\$95 (group)	\$21 (drug-free day)	\$616	\$63	-\$458
1/8	\$145 (session)		\$761	\$63	-\$698
1/9		\$124 (income for employed day)	\$761	\$187	-\$574
1/9		\$21 (drug-free day)	\$761	\$208	-\$553

treatments, or for society as a whole. In the "Return on Investment" column, one could add the patient's debt to society—restitution owed victims or the cost of criminal justice services. The balance unpaid from previous treatment programs also could be added here.

Total investment in treatment expenses can be compared to the total monetary value of outcomes achieved for a cohort of patients (say, the first 100 patients entering the clinic following the first year of startup and operation).

Time to return on investment can be contrasted for different groups of patients, such as those receiving different procedures or exhibiting different processes. The cost-benefit of different procedures also can be compared by contrasting time to return on investment for patients treated by the different procedures.

Just as calculations of time to return on investment should include present-value benefits, more delayed costs also should be adjusted for present value. The latter procedure quantifies the judgment that programs that delay some costs are preferred over programs that require all expenditures up front.

Potential Problems With Cost-Benefit Analysis

Erroneous Assumptions of Linearity

The strength of cost-benefit analysis also is its weakness or, more accurately, its problem. Because ratios can be calculated very readily (since costs and outcomes are in the same monetary units in most cost-benefit analyses), funders may make all the erroneous assumptions noted earlier that are encouraged by cost-outcome ratios.

Net benefit and time to return on investment forms of cost-benefit analysis encourage similar, and similarly erroneous, assumptions. For example, funders may incorrectly assume that because the benefit for an investment of \$100,000 in a substance abuse treatment program is \$50,000, doubling the investment to \$200,000 will double the benefit to \$100,000.

The common pattern of diminishing returns on investment would diminish this anticipated benefit to less than double. It also is possible that increasing the initial investment so much would allow entirely different (and much more effective and beneficial) treatment procedures to be used.

Some funders also may believe that increasing the investment in treatment might yield a quicker return on investment, which might not occur given limitations on how rapidly current treatment technology can modify the behaviors, life skills, and lifestyles associated with substance abuse.

Overemphasis on Monetary and Monetized Outcomes

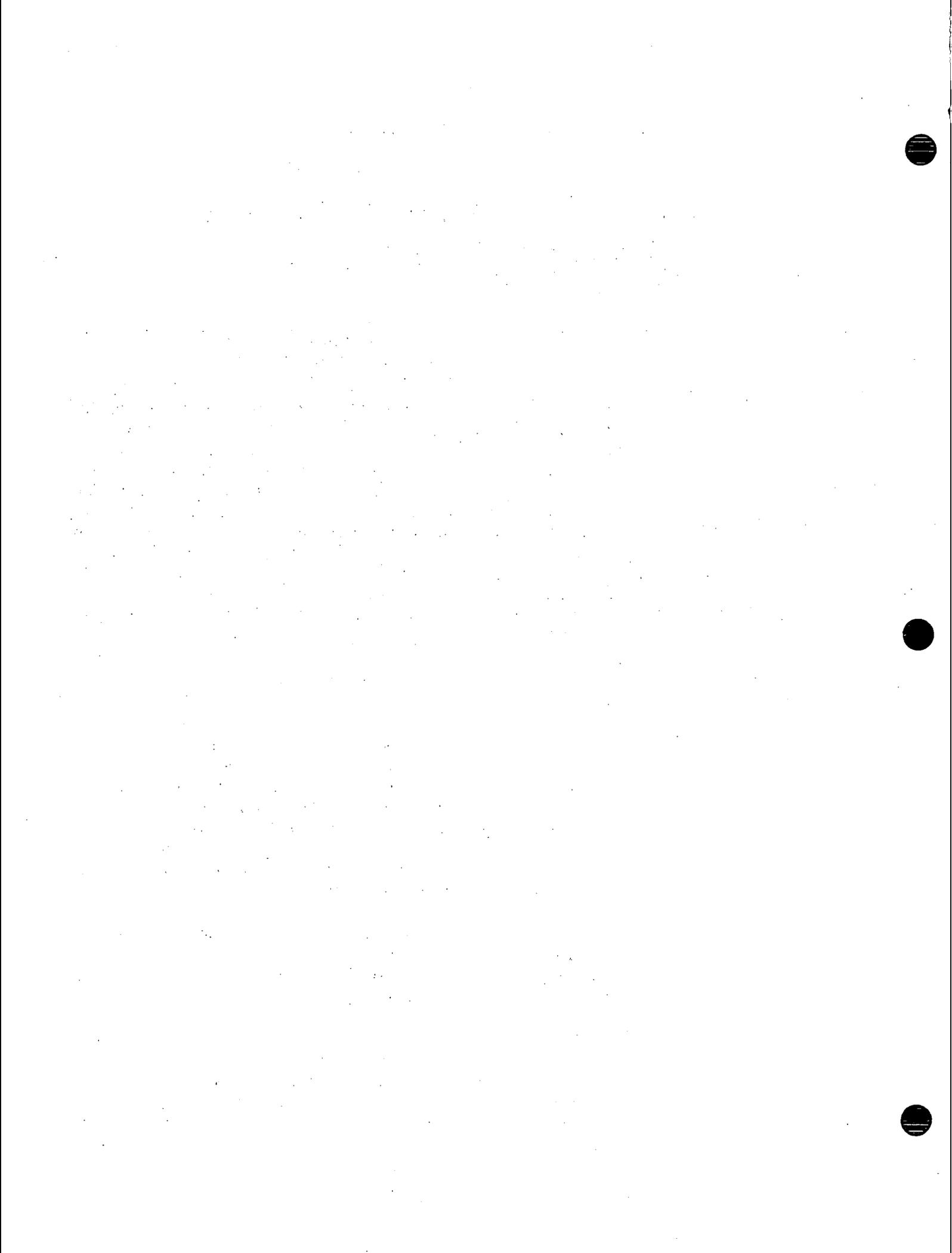
The major problem with all forms of cost-benefit analysis is that monetary outcomes are the only outcomes considered. Most service providers, many patients, and some other interested parties believe that the most important outcomes of substance abuse treatment can hardly be quantified, much less monetized (translated into monetary outcomes). To note that some nonmonetary outcomes, such as reduced crime, can be monetized does not eliminate, but only reduces, this problem. Many providers are unwilling to consider placing a monetary value on the outcomes of their services. These providers often resent attempts by persons outside the treatment program to monetize their outcomes.

Critics also note that cost-benefit analysis has been used to justify a number of decisions that proved to be not only erroneous but disastrously so. For example, cost-benefit analyses conducted by State mental health hospitals in the 1980s apparently were used to justify sudden deinstitutionalization without preparation of the patient or the community. This removal of many mental patients from hospitals and placement into communities that were not prepared to provide necessary services exacerbated homelessness and amounted to abandonment of some patients.

This unwise decision does not necessarily mean that cost-benefit analysis is itself unwise. Problems arise when only one perspective is considered; it is important to adopt multiple perspectives in cost-outcome analyses. For example, in the deinstitutionalization analysis, only the perspective of the State mental hospital was considered.

Resources for Cost-Benefit Analysis

Several good books discuss the value of using cost-benefit analysis to evaluate programs (Nas 1996; Thompson 1980). A classic cost-benefit analysis performed in mental health (deinstitutionalization of schizophrenic patients) is provided by Weisbrod (1983). The much-discussed CALDATA study (Gerstein et al. 1994) also deserves your attention, as it is directly related to substance abuse treatment.



Compare Programs and Program Components

The preceding chapters explained how and why to collect information on costs, procedures, processes, and outcomes (effectiveness and monetary benefits) of substance abuse treatment programs. This chapter provides strategies for deciding on changes in program operations that should improve program cost-effectiveness and cost-benefit. They are rooted in a common sense (and quantitative) approach to managing treatment programs called *operations research*. These steps can be accomplished with simple graphs or complex mathematical equations. (See Yates 1980, 1996, for more complex examples and more mathematical strategies.) As with most endeavors, the more effort and time you devote to cost-effectiveness and cost-benefit, the greater the potential rewards.

Cost-Outcome Decisions

Sometimes cost-outcome analysis is simple. If the question is "Which of these two programs should be funded?" a quick decision may be possible. If, for example, Program A has much better outcomes than Program B, and Program A clearly costs much less than Program B, the decision is clear-cut. Program A is more effective or more beneficial (or both) and is less costly. Table 26 presents (a) the ways in which two programs can differ or be similar to each other in outcomes and costs and (b) the cost-outcome decisions that result.

The same simple decision rules can be applied to two different treatment procedures or even two therapists. These rules are summarized in table 26, which is called a Fishman table in honor of the researcher who first applied this table to cost-outcome analysis.

However, the simple phrases "Program A costs less than Program B" and "Program A has better outcomes than Program B" hide a dilemma: How does one decide when one program costs less than another, or when one program has better outcomes than another?

Once adjustments have been made for differences in the number of

Table 26. Cost-outcome decision: Program A or Program B?

Cost	Outcomes		
	A has better outcomes than B	A and B have similar outcomes	A has worse outcomes than B
A has lower costs than B	Choose A	Choose A	Uncertain
A and B have similar costs	Choose A	Choose either	Choose B
A has higher costs than B	Uncertain	Choose B	Choose B

patients served in competing programs, statistical analyses can answer the question of whether a difference in costs or outcomes is real and not just due to chance variations in the cost or outcome numbers that were generated by the competing programs. Most spreadsheets come with add-in programs or macros that perform *t* tests and several other statistical tests. You have to show which columns of numbers (e.g., outcome data for Programs A and B) you want to compare to see if the apparent difference is real.

Statistical tests do not, however, answer how big or how important a difference is. Statistical tests tell whether an apparent difference is not just due to chance. The size of a difference can be described with average costs and other numbers. The importance of a difference is a judgment that can be made by surveying community and patient representatives.

The Fishman table also illustrates another problem with simple comparisons of outcomes and costs. Even if there are only two programs, a Fishman table does not indicate which decision is correct if Program A has better outcomes than Program B but also costs more than Program B.

Cost-Benefit Ratios

Even if Program A's benefits exceed its costs, the question of which should be funded still is not answered. It is possible that Program B's benefits exceed *its* costs as well. Should both B and A be funded? Maybe, but only if their net benefits are similar. You could compare the net benefit of Programs A and B to see which is bigger, and then choose the program that has the bigger net benefit.

Check that the bigger net benefit of, say, Program B is not just a result of Program B serving more patients at the same level of effectiveness as Program A. Serving more patients can result in a bigger benefit, and a bigger cost and a bigger net benefit, without the program being any better than a smaller program.

Suppose Programs A and B both double the value of cost—they both generate the same ratio of benefits-to-costs of 2 to 1. Suppose, too, that Program A gets funded at \$100,000 a year to serve 100 patients from its district of 100,000 people while Program B gets funded at \$500,000 a year to serve 500 patients from district of 500,000 people. (Note that Program A and Program B have the same rates of being funded at \$1,000 per patient. They also draw patients at the same rate of 1 per 1,000 persons residing in their districts.)

Reflecting the programs' identical benefit/cost ratios, Program A produces benefits that are double its cost for a net benefit of \$100,000. Program B produces benefits that are double *its* cost for a net benefit of \$500,000. Which program is better? Neither. Program B just has a bigger funding base and thus appears better. Its performance is no better or worse than Program A's. That's easy to see if the net benefit per patient is calculated. Dividing the net benefit for Program A results in the same net benefit per patient as for Program B:

$\$100,000 \text{ net benefit} \div 100 \text{ patients} = \$1,000 \text{ net benefit per patient.}$

$\$500,000 \text{ net benefit} \div 500 \text{ patients} = \$1,000 \text{ net benefit per patient.}$

Cost-Effectiveness Ratios

Problems due to large differences in funding base or patient load are less likely to distort cost-outcome analyses that use nonmonetary measures of outcome. When the effectiveness of a program is measured, it usually is measured for each patient individually. Effectiveness measures usually retain their per patient units, as in average drug-free days per patient. Once the cost of treating a patient is figured out, it is easy to divide the cost of treating the patient by the effectiveness measure to arrive at a ratio of cost to effectiveness. These cost-effectiveness ratios can be calculated for each patient in a program and averaged to describe the typical cost-effectiveness of treatment.

Cost-effectiveness ratios are most useful in decisionmaking when compared to cost-effectiveness ratios for other programs. If Program A requires an average \$27.43 per drug-free day produced, whereas Program B requires an average \$30.71 per drug-free day produced, then Program A appears to be preferable because it is more cost-effective than Program B—at least on this one measure of effectiveness.

Cost per drug-free day is a cost-effectiveness ratio that has a number of useful characteristics. A day free of drugs is something concrete that most people understand. Many people can appreciate a day free of drugs as a challenging endeavor and an important achievement. Because of this, and because of the concrete value of money, the cost of producing this day free of drugs also becomes more tangible.

Cost per drug-free day suggests a standard metric that will be better (lower cost per drug-free day) if either (a) less money is spent per patient, (b) more patients are free of drugs for a day, or (c) an individual patient is free of drugs for more days. The problem with this cost-effectiveness ratio is that you do not know whether condition (a), (b), or (c) has occurred. In truth, probably each of these three conditions occurred for different patients within the program.

Cost-Effectiveness Ratios Versus Cost-Benefit Ratios

You might ask yourself "How could Program A be more cost-effective than Program B, when they were equal in terms of cost-benefit? Because benefit measures usually are derived from effectiveness measures by multiplying the effectiveness data by a monetary amount, shouldn't cost-effectiveness and cost-benefit be the same? In fact, why do we need both? Why not just use the cost-benefit findings?"

Program A could be more cost-effective than Program B according to one measure of effectiveness (patient drug-free days) because Program A did a better job of changing patient behaviors related to that measure of effectiveness. Or, maybe Program A used less costly procedures to change the patient behavior. Program A might also be *less* cost-effective than Program B on another measure of effectiveness (e.g., employment of patients). The superiority of Program A in terms of the monetary value of more drug-free days might be canceled out by the superiority of Program B in terms of the monetary value of more employment for patients. So, the overall cost-benefit of Programs A and B could be the same even though they differed on specific measures of effectiveness.

This discussion points out an advantage of cost-benefit analysis, whether done with ratios or net benefit calculations: Cost-benefit analysis gives a single answer (as long as one measure of cost and one measure of benefit are used). That makes decisions easier. Cost-effectiveness analysis, whether done with ratios or other methods, shows how programs differ on specific measures of outcome. This is better if you want to focus on one or two measures, or if you do not agree with the way that placing a money value on an effectiveness measure biases the overall evaluation toward one measure or another.

When Cost-Effectiveness and Cost-Benefit Converge

Cost-effectiveness and cost-benefit analyses can both generate overall measures that describe how well a program uses its resources to achieve its goals. Calculating the cost-effectiveness index seems like a lot of work, but, if you'll recall the calculations needed to turn effectiveness measures into monetary benefit measures, there was a lot of work in

the cost-benefit analysis, too. The benefit calculations weighted for importance each effectiveness measure in terms of money saved or money produced. The calculations involved in generating the overall effectiveness index substituted the importance weightings for the different monetary rates used in the benefits calculations.

You may prefer to use the importance weightings inherent in the different monetary values assigned to a "drug-free day" or "employed days." These values will change over time as the value of money changes through inflation, deflation, or currency adjustments. Also, as the market changes, the value of a drug-free day and the amount one is paid for a day of employment will change. Actual measures of program effectiveness, such as drug-free days and days employed, seem more constant. Their importance also may change over time, however, as a result of changes in community norms.

The best advice probably is to conduct a cost-effectiveness analysis *and* a cost-benefit analysis for each measure and each patient as well as for all measures and all patients. That way, you'll have answers to a host of questions. You'll also have more opportunities to find solutions to the problems of how to get even better outcomes out of your programs.

When Net Benefit and Ratios Fail

Net benefit and ratios of benefit over cost and of cost over effectiveness are informative because they reduce information on two sets of variables—costs and outcomes—to a single cost-outcome number. That advantage can be a disadvantage, too: When information is reduced, the cost-outcome number is more readily understood, but its context and limitations are more readily ignored.

Consider the situation in which Program A has better outcomes than Program B but also costs more than Program B. In this context, a decision to prefer the program with the higher net benefit per patient, or the higher ratios of benefit divided by cost or cost divided by effectiveness, could be incorrect for several reasons.

It is possible that the higher cost of Program A is too high. The net benefit and the ratios provide no information on budget limits. Worse yet, they do not tell you how much the program costs. That information was discarded when costs were either subtracted from benefits, or divided into benefits, or divided by effectiveness.

It is also possible that the poorer outcomes of Program B are too poor to meet minimum criteria. Funding policy, community standards, or law may dictate a certain minimum level of effectiveness or benefit, below which a program should be closed. Information about minimal effectiveness or benefits is not included in the net benefit or ratio

calculations. And, as was the case with cost, information about the actual benefits and effectiveness of Program B has been discarded, replaced again by a difference or a ratio.

Cost-outcome ratios and net benefit also can obscure effects that level of funding (and size of patient load) can have on the relationship between costs and outcomes. These relationships are easier to see if information about costs and outcomes is preserved. One way to do this is with tables contrasting costs for different outcomes. Another way is with graphs.

Cost-Outcome Graphs

A decision about Programs A and B is possible, and collecting data on costs and outcomes is an important step toward making the decision. You need more information about acceptable costs and outcomes. In particular, you need to know “where the line is”—literally, as you’ll see in a moment—on both costs and outcomes. Making cost-outcome decisions usually requires knowing the budget limit on costs. Some cost-outcome decisions also require knowing what basic outcomes must be achieved, at a minimum, by a program if it is to be funded. These decisions may not require all the mathematical machinations described in the preceding pages. Instead of calculating information on costs and outcomes, graph them. Graphing outcomes on the vertical axis and costs on the horizontal axis preserves information on both costs and outcomes while also helping you see how the two may be related.

In the following graphs, the values on the outcome measure would be exactly what is observed by researchers. Change, if it is to be represented on the graph, can be shown as two dots labeled “pre” and “post” for the same program, connected by a line to show their association. By doing this, differences between different programs in “pre” values are made explicit. Graphing the difference score could hide serious pretreatment differences in severity of substance abuse between programs.

Add Limits

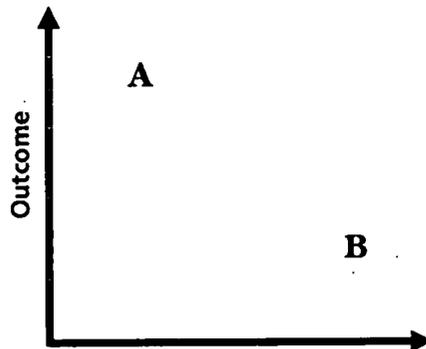
Knowing the maximum tolerable cost (the budget limit) and the minimum tolerable outcome (minimal outcome criteria) can help in decisionmaking when the Fishman table fails to identify clearly which program (or procedure or therapist) should be chosen. Graphs of outcomes against costs help illustrate this point. Consider, for example, the following cost-outcome situations.

In graph 1, Program A clearly is the better of the two: It has a better outcome, and it costs less. The letter “A” is higher than “B” on the vertical axis, showing how good the outcomes were. The letter “A” also

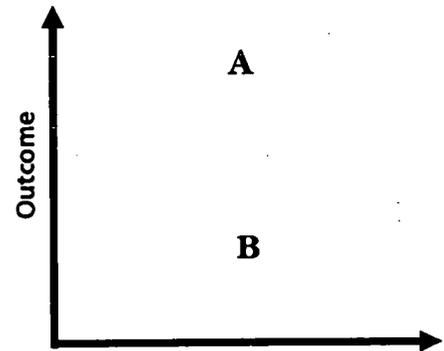
is to the left of "B" on the horizontal axis, showing how costly the programs were.

Likewise, in graph 2, Program A clearly is the better of the two: It has better outcomes, and it costs the same as Program B.

Graph 1. A is less costly and more effective or beneficial than B

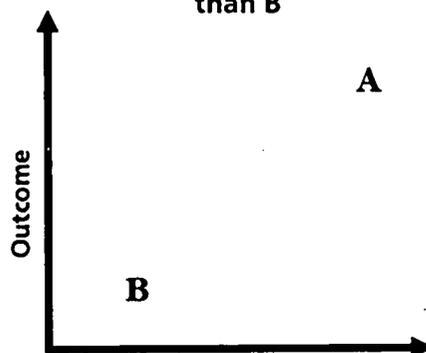


Graph 2. For the same cost, A is more effective or beneficial than B

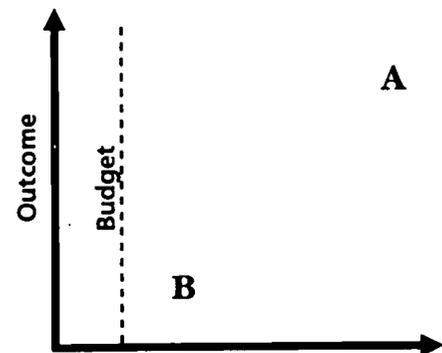


Graph 3 poses a problem: A has better outcomes than B, but A also costs more than B. Is A worth it? Should A be chosen and funded rather than B? Only information about budget limits and outcome criteria will answer the question. The answer even may be that *neither* Program A nor Program B should be funded. Both might exceed budget limits, as shown in graph 4.

Graph 3. A is more effective or beneficial, but also more costly than B

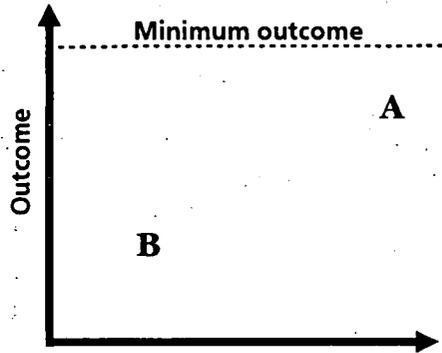


Graph 4. Budget limits in a cost-outcome graph

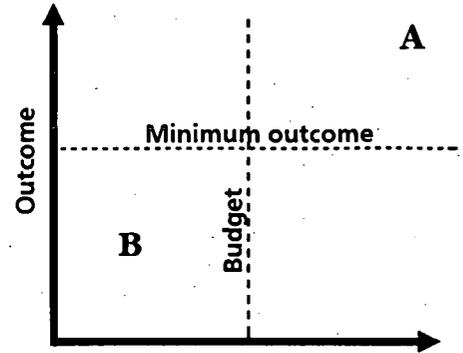


Both Programs A and B might not achieve minimum levels of outcome, as shown in graph 5, which also would recommend choosing neither program. A more likely scenario is that Program A exceeds the minimum acceptable outcomes, but at unacceptable cost, whereas Program B keeps costs below the budget limit but does not achieve minimum acceptable outcomes. This situation is depicted in graph 6.

Graph 5. minimum outcome criteria in a cost-outcome graph

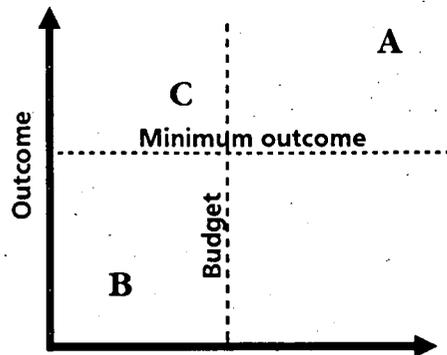


Graph 6. Both A and B are infeasible



Note that Program A could have benefits that exceed costs, as could Program B, but neither might meet the budget and outcome criteria. It is not necessary to increase cost maxima or lower outcome minima. What is needed, and what is likely possible, is a new program that has adequate outcomes at tolerable costs. This is Program C, shown in graph 7. Program C has a cost-outcome relationship that is positioned below the maximum cost *and* above the minimum outcome.

Graph 7. Only C is feasible



More Than Two Programs

Sometimes cost-outcome analysis is not simple. If a decisionmaker is offered the sort of Program A versus Program B choice described earlier, it is possible that someone has limited the choice so A is always chosen. Usually, alternative programs are possible, if not currently in operation. Often, there are more than two procedures or therapists. As the number of programs, procedures, and therapists increases, the likelihood that one program, procedure, or therapist will be the most effective or beneficial, and the least costly of them all, decreases. The decision becomes one of tradeoffs: At what point is better drug treatment not worth the additional cost? Graphs of cost-outcome relationships are helpful in these situations.

Assumptions Encouraged by Cost-Outcome Ratios and Revealed by Cost-Outcome Graphs

Ratios of cost to outcome provide a succinct index of program performance that obviously includes information on outcomes and cost. By dividing cost by effectiveness (or benefit by cost), though, potentially valuable information is lost on the actual amount of resources consumed and the amount of outcome achieved. Suppose, for example, that a program generates an average 500 drug-free days per patient for \$5,000 per patient. The resulting ratio is \$10 per drug-free day per patient. This ratio encourages an assumption that if more money could be spent, more drug-free days would be produced.

This is not necessarily the case. It is more likely that investing more money in treatment of each patient (say, doubling expenditures to \$10,000 per patient) would result in an increase in drug-free days, but less than a doubling to 1,000 drug-free days.

It is possible, too, that doubling the funding of a program might allow it to see double the number of patients. Suppose that the cost-outcome ratio shows the cost per successfully treated patient. It is possible that the same level of effective treatment would be provided, doubling the number of successfully treated patients. One factor that works against this is the limited flexibility of many human service systems, including drug treatment systems. There simply might not be enough space and counselors to see double the number of patients. Of course, additional space could be rented and more counselors could be hired. Administrative costs would have to increase as well, in light of the increased resources being devoted to treatment.

If there is enough extra space in the program facility, and if program administrators have extra time, then double the number of patients can be seen at even less than double the cost. It is more likely, however, that limitations in the flexibility of program resources will increase the cost of adding each additional patient (sometimes called the marginal cost). This means that the return (in terms of number of successfully treated patients) on investment in treatment diminishes as more patients are added—the classic diminishing returns on investment.

Cost-outcome ratios also encourage the belief that a decrease in program funding would decrease the number of successfully treated patients by the amount indicated by the ratio. If a program's funding is decreased by 20 percent, for example, from \$100,000 to \$80,000 per quarter, one should not assume that outcome also will decline by 20 percent. Some programs experiencing a 20-percent budget cut might well survive and produce outcomes that decline only 5 to 15 percent. The programs might find more effective procedures (such as more group therapy and less individual therapy). Other programs might have

to close their doors if their budgets are reduced by 20 percent, creating a rather sharp decline in the number of successfully treated patients.

In sum, ratios encourage funders of treatment to assume that there is a straight-line or linear relationship between costs and outcomes. The ratio is, essentially, the slope on a graph of costs and outcomes.

The preceding examples argue that it is rare to find a straight-line relationship between costs and outcomes that lasts for a significant range of costs or outcomes. This observation recommends that a better understanding of possible cost-outcome relationships could be gained by graphing costs against outcomes for a variety of programs (or program funding levels).

If you want to go beyond graphs, the next major step in understanding and improving cost-effectiveness and cost-benefit is delving into the more mathematical techniques of linear programming and other forms of quantitative operations research. As detailed in a book by Yates (1980), operations research involves the construction and solution of equations that express mathematically the relationships among costs, procedures, processes, and outcomes. Budget constraints and outcome goals are included in the mathematical expressions.

The quantitative model of the treatment system that is constructed with these equations can be solved using linear programming either to maximize outcomes that can be achieved within budget (cost) constraints, or minimize the costs of achieving set levels of outcome. Operations research provides a variety of models and solution procedures that are potentially useful for many problems facing substance abuse services.

Improving Program Cost-Effectiveness and Cost-Benefit

The many actions and discussions involved in collecting information on costs, procedures, processes, and outcomes of a treatment program usually suggest several ways to improve the cost-effectiveness and cost-benefit of the program. Common strategies are provided below.

Cost-Procedure Relationships

- Use less expensive resources that enable the same procedures to be used in treatment, with the same effects on processes and thus the same outcomes (such as providing the same individual therapy using master's-level counselors rather than doctoral-level psychologists).
- Use different treatment procedures—procedures that are less expensive than current treatment procedures but that produce about the same outcomes (such as nonresidential rather than residential treatment).

Procedure-Outcome Relationships

- Use treatment procedures that yield better or quicker outcomes, or both, but cost about the same as current treatment procedures.
- Reduce the “dose” of treatment procedures to (but not beyond) the point that the same outcomes are achieved with substantially less intensive treatment procedures.

Cost-Procedure-Outcome Relationships

- Use treatment procedures that, although more expensive than

current procedures, are so much more beneficial that they justify the additional costs.

Consider Different Perspectives

Additional perspectives may need to be considered in your cost-effectiveness and cost-benefit analyses. For example, if you are considering reducing a 12-month residential program to one of 6 months of residence followed by 6 months of gradually less structured life in the community, have you considered the cost of this change for other social services in your community? They may have to provide additional services for patients who no longer are under your roof continually. Can they afford to do so and maintain their current level of effectiveness or benefit?

Often neglected, too, is the patient's perspective on costs and outcomes. Programs often don't consider the money and time nonresidential patients spend getting to and from the treatment program. Childcare issues and time taken off from work to attend sessions and to follow up on referrals also may not be considered. It might be helpful to ask patients what problems might arise as a result of changes in program procedures.

Experiment With Change

Cost-effectiveness and cost-benefit analyses usually generate a variety of suggestions for program changes that might, or might not, work. Rather than trying to change program operations overnight, it is usually wiser to try out the changes on a small-scale pilot basis. Changes in resources and procedures that appear to work can be implemented broadly. Changes that do not produce the expected better outcomes or lower costs (or both) can be revised.

You might create a schedule for implementation of each type of change on a trial basis. The schedule should also indicate a final date for a decision about whether the change should be continued, expanded, or stopped.

Developing a quantitative feedback loop is key to CPPOA. That is, after data-based changes are made to improve cost-effectiveness and cost-benefit, more data should be collected to monitor the results of those changes. A good system for collecting, managing, and feeding back information on costs, procedures, processes, and outcomes integrates measurement and analysis of cost, effectiveness, and cost-effectiveness into routine program administration.

Develop Regular Reports

Experimenting with different ways of improving outcomes or reducing costs (or both) requires that information on the possible results of changes be available quickly. Regular (perhaps monthly) reports are needed on the costs and implementation of different program procedures and on the results of those procedures in changing patient processes and producing outcomes.

Minimize the Cost

You don't need special or expensive software to make these reports. The spreadsheet software used to collect and analyze cost and other data can be used to automate reports. After all, the reports are compilations of the data you have already collected. Most spreadsheet programs allow one spreadsheet to summarize data from other spreadsheets, which allows you to construct spreadsheets—

- For *counselors*, summarizing cost, procedure, process, and outcome data for their patients.
- For *supervisors of counselors*, summarizing cost, procedure, process, and outcome data for (the patients of) the counselors they supervise.
- For *program managers*, summarizing data for (patients of counselors of) different supervisors.

After you have developed these summary spreadsheets, you can use them again and again to generate the same type of reports. For a new month, just change the cost, procedure, process, and outcome data in the base spreadsheets. These changes will ripple through the spreadsheets that consolidate data for counselors, supervisors, and managers.

To make it easier to show findings, you can add graphs to the spreadsheets for each level of reporting. Simple bar graphs can show which patients, counselors, or supervisors are experiencing better or worse outcomes, procedure implementation, process modification, and costs. Line graphs of the same data for successive months show change trends over time. Once you create these graphs and save them along with the spreadsheets, adding a new month of data for individual patients will automatically update all the graphs.

Tailor Reports to Their Audience

Regular reports on costs, procedures, processes, and outcomes can be useful to counselors, counseling supervisors, program administrators, and patient representatives and advocates. A successful reporting format presents information tailored to the reader. This involves integrating information at three or more levels of specificity and presenting different reports to the persons who operate at each level.

Program managers, for example, need summary information on the costs and outcomes of the program as a whole. Supervisors of direct service staff need outcome and cost information for patients of those staff who report directly to them. Counselor supervisors also need information on what procedures each counselor administered to each patient and what results these procedures had on patient processes. Counselors need information on costs, procedures, processes, and outcomes specific to their patients.

If counselors want to compare their outcomes, costs, procedures, or processes to those of other counselors, they can ask their supervisor for that information. The reporting system can provide supervisors with average counselor statistics to make the comparison easier. (It might be even more useful to provide supervisors with average counselor statistics specific to each counselor. These comparison data would first remove the costs, procedures, processes, and outcomes for the counselor who is being compared.)

Similarly, if supervisors want to compare their performance, they can ask the program manager for comparison statistics. All program personnel who wish to compare their work to that of others can consult persons operating at the next higher level of administration. Persons at higher levels of administration can consult the staff who report to them to get more specific cost, procedure, process, and outcome information.

The CPPOA Model—An Illustration

The following example illustrates how cost data can be collected and analyzed for specific resource-procedure combinations for individual patients. These data were obtained from an aftercare program that was required of patients as part of their probation.

Program Context

The aftercare program usually included 3 months of participation in a therapeutic community. The aftercare component was administered in an office of the therapeutic community facility. A single counselor ran the aftercare component with minimal support from a secretary and supervision from the director of the program. The caseload usually was 30, all of whom were in a work release therapeutic community. Patients attended one group counseling session and one relapse prevention group per week. Patients also participated in one individual counseling session per month. The counselor provided case management services such as referrals, employment monitoring, and coordination with probation and parole officers.

Cost data were collected directly from staff—their best estimates of which relationships existed among all the different resources, procedures, processes, and outcomes.

After defining the essential resource, procedure, process, and outcome variables of the drug treatment program, the evaluator, the program director, and the aftercare worker estimated the relative strength of each possible relationship between each resource, procedure, process, and outcome. The existence and strength of these resource-procedure, procedure-process, and process-outcome relationships were estimated, rather than measured empirically, to conserve time and money.

The strength of these links need not be expressed in monetary units or percentages, but the staff of this program were comfortable doing this. The result carried forward costs from resources all the way through outcomes, making for a unique cost-effectiveness analysis.

Although the numbers the staff provided could have been simplified to make this example easier to calculate, it would have removed the realism of this analysis. Also, the example retains the actual (and perhaps idiosyncratic) resources, procedures, processes, and outcomes that the staff listed for their programs.

Resource-Procedure Relationships

Resources and procedures were easy for staff to specify: Resources were what were consumed in treatment procedures, and procedures were the actions performed on patients.

Resources and Their Costs

Staff seemed surprisingly comfortable with estimating costs. Table 27 shows the estimated costs for 1 month for each major resource type.

Table 27. Staff estimates of resources and costs for one month

Resource	Total cost
Direct service staff	\$2,500
Administrative staff	\$250
Facilities rent	\$500
Utilities	\$150
Support staff	\$500
Supplies	\$500
Urine testing	\$1,000
Total resource cost	\$5,400

Treatment Procedures

The next step was to ask staff what procedures usually were administered to patients. The procedures the staff listed were—

- Group counseling.
- Relapse prevention.
- Individual counseling.
- Case management.

To provide a structure for putting numbers on resource-procedure relationships, each possible combination of a resource and a procedure was listed in a resource x procedure matrix (table 28).

Amount of Each Resource Used in Each Procedure

The final step in translating resource-procedure relationships into numbers was to put numbers in each cell of the resource x procedure matrix. These numbers were found in two basic steps. First, the time of direct service staff, the time of support staff, and the costs of supplies and of urine testing were distributed among procedures according to estimated use in the procedures. The entire \$1,000 cost of urine testing was allocated to relapse prevention because it was not used in any other treatment procedures. Because support staff assisted primarily with relapse prevention and case management, support staff costs were divided equally between these two procedures.

Next, costs of the remaining resources were allocated among all four treatment procedures according to the percentage of time direct staff spent on each procedure:

- 18 percent for group counseling
- 23 percent for relapse prevention
- 23 percent for individual counseling
- 36 percent for case management

These percentages were based on careful estimates made by the program administrator.

Table 28. Resource x procedure matrix with cost estimates for each procedure

Resources	Procedures			
	Group counseling	Relapse prevention	Individual counseling	Case management
Direct service staff (\$2,500)	18% = \$612	23% = \$782	23% = \$782	36% = \$1,224
Administrative staff (\$250)				
Facilities (\$500 rent)				
Utilities (\$150)				
Support staff (\$500)		50% = \$250		50% = \$250
Supplies (\$500)	\$100	\$150	\$100	\$150
Urine testing (\$1,000)		\$1,000		
Total (\$5,400)	\$712	\$2,182	\$882	\$1,624

Change in Processes for Individual Patients

One of the people conducting this CPPOA, the program director, and the aftercare worker described three types of psychosocial process that were the focus of treatment procedures:

- Self-efficacy expectancies
- The acquisition of necessary skills, specifically:
 - Relapse prevention skills
 - Support access skills
 - Services access skills
- Bonding with:
 - Addicts and ex-offenders
 - Counselors

Illustrative, hypothetical numbers were created for Patients A and B before and after participation in the program's treatment procedures. For example, according to the questionnaire that measured patients' self-efficacy expectancies, Patient A and Patient B scored an 8 before treatment began. After treatment, Patient A scored 12 and Patient B scored 16. Percentage change was used to examine how much processes changed during treatment (table 29).

Data were preserved at this individual patient level, as well as being averaged, because process data is combined with outcome data in the

Table 29. Percentage change of psychosocial processes for patients A and B

Processes		Patient A			Patient B			Average % change
		Before	After	% change	Before	After	% change	
Self-efficacy expectancies		8	12	50%	8	16	100%	75%
Skill acquisition	Relapse prevention	10	12	20%	2	6	200%	110%
	Support access	3	3	0%	3	6	100%	50%
	Service access	30	45	50%	20	40	100%	75%
Bonding	With addicts and ex-offenders	7	7	0%	10	5	-50%	-25%
	With counselors	5	15	200%	4	12	200%	200%
Average		53.33%			41.67%			80.83%

analysis of cost-procedure-process-outcome relationships. The following hypothetical data are simplified to make the calculation procedures more obvious.

Procedure-Process Relationships: Patient Level

Table 30 illustrates how the strength of relationships between (a) the degree to which procedures were implemented and (b) the extent to which psychosocial process changed could be described for individual patients. The percentages in the cells of Patient A's procedure x process matrix are the same percentages calculated in table 29 for change in processes. For example, 50 percent was entered in each cell in the self-efficacy expectancies column. These data would be even more precise if the portion of each procedure that was devoted to changing each process were specified. This, however, may be difficult to measure. Some correlational statistical techniques, such as multiple regression, may help to do this.

Table 30. Procedure x process matrix for Patient A

Procedures	Processes					
	Self-efficacy expectancies	Skill acquisition			Bonding	
		Relapse prevention	Support access	Service access	With addicts and ex-offenders	With counselors
Group counseling	50%	20%	0	50%	0	200%
Relapse prevention	50%	20%	0	50%	0	200%
Individual counseling	50%	20%	0	50%	0	200%
Case management	50%	20%	0	50%	0	200%

Procedure-Process Relationships: Program Level

Staff of the aftercare program estimated the percentage of time that a given treatment procedure focused on modifying specific psychosocial processes (table 31). All four procedures were described as affecting at least two different psychosocial processes; all four procedures contributed via multiple processes to treatment outcomes. Even if one of the processes (say, support access) were not affected by relapse prevention, other processes would be. Staff felt comfortable using percentages (rather than correlations or other measures) to estimate the strength of relationships between procedures and processes.

Table 31. Procedure x process matrix for the program

Procedures	Processes					
	Self-efficacy expectations	Skill acquisition			Bonding	
		Relapse prevention	Support access	Service access	With addicts and ex-offenders	With counselors
Group counseling	33%				33%	33%
Relapse prevention	20%	20%	20%		20%	20%
Individual counseling	50%					50%
Case management				75%	12.5%	12.5%

Adding Costs to Procedure-Process Relationships

The percentages were then used to distribute the total cost of each procedure among the processes (table 32). The total cost of changing each of the five processes can be calculated by totaling costs in the respective column.

Table 32. Procedure x process matrix with cost estimates

Procedures	Processes					
	Self-efficacy expectations	Skill acquisition			Bonding	
		Relapse prevention	Support access	Service access	With addicts and ex-offenders	With counselors
Group counseling	\$238				\$238	\$238
Relapse prevention	\$436	\$436	\$436		\$436	\$436
Individual counseling	\$441					\$441
Case management				\$1218	\$203	\$203
Totals	\$1115	\$436	\$436	\$1218	\$877	\$1318

Outcomes

Process-Outcome Relationships

The psychosocial processes listed in the preceding tables were supposed to increase the likelihood that a patient would achieve four primary outcomes, defined by program staff as—

- Being drug free, that is, abstaining from drugs for a month, according to urine tests, self-reports, and peer reports (i.e., from other former users).
- Having stable employment, that is, having a legal full-time job for the past month.
- Being crime free, that is, avoiding all criminal behavior for the past month, according to self and peers as well as reports from family and probation officers.
- Being compliant with probation and parole according to the probation officer (who met weekly with the aftercare worker).

The question was, were these outcomes actually related to changes in the previously mentioned processes? More concretely, what were the connections between the processes and outcomes, according to staff and according to research?

Percentage Contributions of Processes to Outcomes

Staff also were asked to estimate how much each psychosocial process determined each of the four types of program outcomes. It was fairly easy to obtain these estimates after several hours of discussion. Again, the staff wished to use percentages. The results are detailed in table 33, with percentages of each process assigned to different outcomes and summing to 100 percent for each process (each row). For example, staff estimated that 40 percent of the change produced by treatment procedures in self-efficacy expectancies contributed to the outcome of being drug free. Staff viewed relapse prevention skills as entirely (100 percent) focused on drug abstinence. Staff also reported that equal proportions of improved skills for accessing support affected the outcomes of drug abstinence, stable employment, absence of criminal behavior, and compliance with probation and parole.

Adding Costs to Process-Outcome Relationships

The total cost of changing a process was distributed among the outcomes according to the percentages given earlier by staff to describe relationships between processes and outcomes (table 33). The total cost of achieving each outcome was calculated by adding up the cost figures in each column. These costs sum to \$5,400, the total cost of the program for the month. This does not reflect the total cost of achieving these outcomes. The total cost per outcome achieved per patient must include the cost of participating in the therapeutic community for 6 to 9 months, plus 3 months of the aftercare program. Unfortunately, data

Table 33. Adding costs to process-outcome relationships

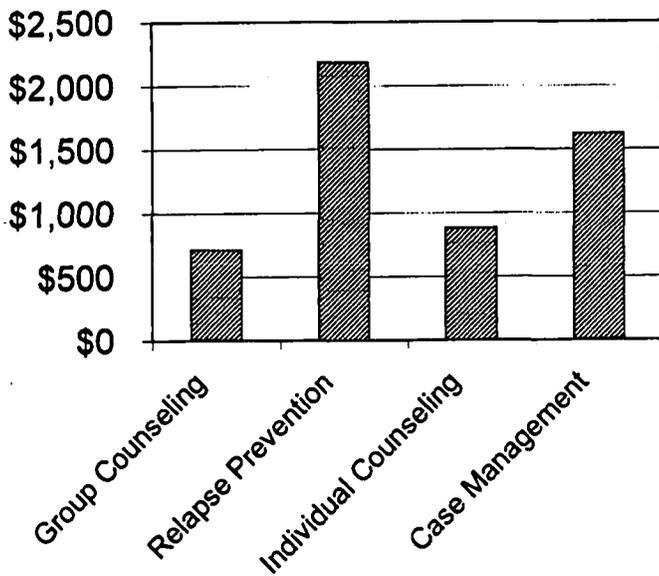
Processes		Outcomes			
		Drug-free (complete drug abstinence)	Stable employment	Crime-free (avoidance of all criminal behavior)	Compliance with probation and parole
Self-efficacy expectancies (\$1115)		\$446 (40%)	\$223 (20%)	\$446 (40%)	
Skill acquisition	Relapse prevention (\$436)	\$436 (100%)			
	Support access (\$436)	\$109 (25%)	\$109 (25%)	\$109 (25%)	\$109 (25%)
	Service access (\$1218)		\$974 (80%)		\$244 (20%)
Bonding	With addicts and ex-offenders (\$877)	\$281 (32%)	\$34 (4%)	\$281 (32%)	\$281 (32%)
	With counselors (\$1318)	\$132 (10%)	\$527 (40%)	\$132 (10%)	\$527 (40%)
TOTAL outcome cost		\$1404	\$1867	\$968	\$1161

were not available for the therapeutic community program. Although it is tempting to assign a cost to these outcomes of three times the monthly cost, and to then divide the cost by the proportion of patients attaining the outcome to arrive at a cost/outcome ratio, this would seriously underestimate the cost of attaining these outcomes. That ratio completely omits the costs of the therapeutic community.

Qualitative/Quantitative Path Analysis

By constructing bar graphs of the amounts of resources focused on each procedure, process, and outcome, it is easy to see where the costs are and what outcomes they provide. For example, it is evident in graph 8 that the most costly procedures are relapse prevention and case management. Also, some processes absorb far more resources than do others. As shown in graph 9, self-efficacy enhancement, skill acquisition for service access, and both types of bonding are particularly large investments of potentially therapeutic resources.

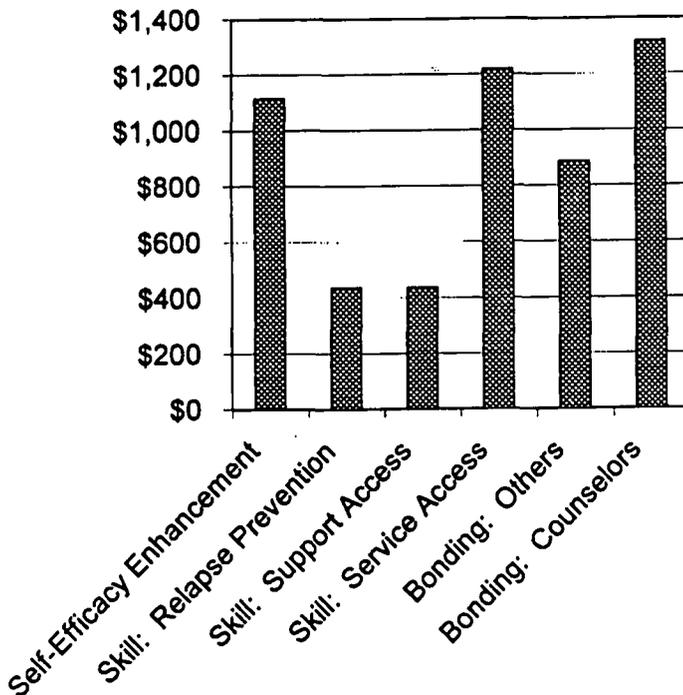
Graph 8. Costs of implementing procedures



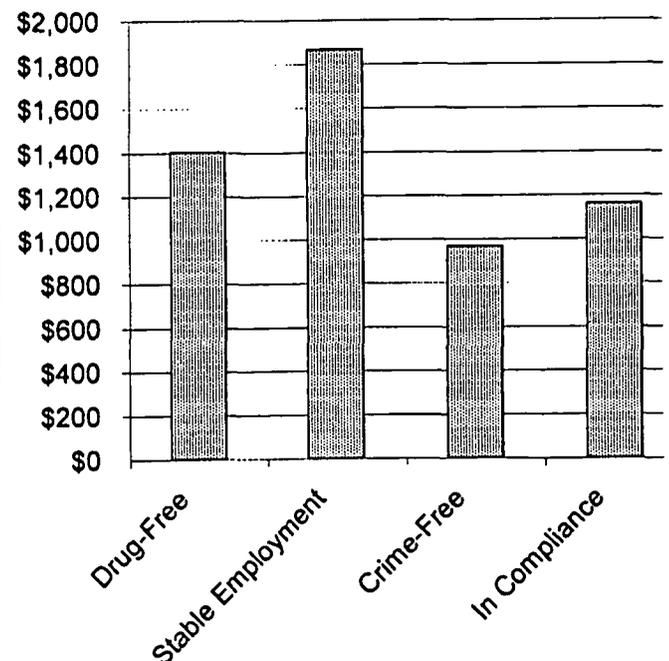
However, the outcomes associated with these procedures and processes differ in both the cost of resources devoted to them and the degree to which patients achieved what was desired. The outcome toward which the least amount of resources was directed, being crime free (graph 10), was the most likely to be achieved (by 100 percent of patients). The outcome toward which the most resources were directed (stable employment) was the least likely to be achieved (by a relatively low 65 percent of patients). These costs may reflect the program manager's expectation that stable employment would be the most difficult to achieve and thus deserved more resources. Nevertheless, the cost findings for each class of variables in the CPPOA model are of potential value in program management.

Most of the relapse prevention efforts resulted in a 90-percent abstinence rate. The CPPOA model also shows that several other procedures contributed to this outcome. However, the case management procedure produced a less impressive outcome. By connecting procedures to processes to

Graph 9. Costs of changing processes



Graph 10. Costs of achieving outcomes



outcomes, it becomes clear that much of the case management effort is related to the employment outcome. Yet, stable employment (steady work sufficient to support the patient and his or her dependents) is the outcome attained by the lowest percentage of patients. Perhaps this outcome would have been worse without case management, but it does call into question the value of this procedure for program outcomes. It also is interesting to note how much bonding to counselors was estimated to contribute to outcomes.

Integrating Qualitative and Quantitative Models for Formative CPPOA

The CPPOA model and its associated costs and outcomes (and cost-outcome ratios) are based on estimated and informally observed findings generated over the short term, rather than entirely objective measures collected using instruments of proven reliability and validity over several months or years.

The result is more of a qualitative and subjective, rather than a quantitative and objective, understanding of treatment. The qualitative CPPOA diagram and its associated estimates of costs and outcomes can be used as a sort of baseline against which to compare more quantitative data during data collection. Regular updates of the model can contrast and replace estimations with observations, showing staff how closely their understanding of the program matches the understanding provided by more objective measures.

With information on cost-procedure, procedure-process, and process-outcome relationships like that shown in the preceding example, the CPPOA model can then be used to make decisions about program changes or developments. In this example, it seems reasonable to keep intact the procedures and processes related to the abstinence outcome. In fact, the model affirms staff efforts in assisting patients in maintaining abstinence. Some staff, for example, questioned the efficacy of urine testing. Here it appears that urine testing is an important part of the procedures that produce the desired processes and outcomes.

Examining the cost-procedure-process-outcome model, staff can see that the case management efforts aimed at improved employment status may not be producing the desired outcomes. Seeing that a different approach, one aimed at skills acquisition and self-efficacy, was more productive in maintaining abstinence, staff may decide to decrease some of the time devoted to case management to allow for a more focused skills-building and problem-solving employment group.

This brief description shows how the CPPOA model can be used to make decisions about program changes. Many other program descrip-

tions are embedded in the sample above. From these descriptions and connections between costs and outcomes, a variety of more informed program decisions can be made.

Many program managers will recognize ways to reduce the cost of treatment as soon as figures show up in a resource x procedure matrix. The decisions inspired by a resource x procedure matrix are, however, only as good as the data on which they are based. Although estimates such as those made above are enticingly quick and (relatively) easy to generate, their validity is suspect. With so much in the balance, there may be some temptation to bias estimates in favor of one's favorite procedures. It also can be very tempting to underestimate the cost of one's own role in providing treatment. Sometimes one does not realize the presence or strength of this bias.

Although even cost data collected with carefully constructed questionnaires administered by persons not directly involved in treatment can be biased, entirely estimated cost data may be more biased. If cost estimates are used, as in the example developed here, the validity of these estimates needs to be supported—perhaps by collecting some cost data in the more careful, expensive way and comparing the estimated to the observed costs.

CPPOA Research Design

If you have been trained in research design, you may be wondering about the role of research design in CPPOA. The answer is that both experimental and correlational designs can provide useful information for CPPOA.

Experimental CPPOA

Most experimental designs carefully manipulate the procedure part of the CPPOA model, usually presenting different procedures to different patients. Sometimes the procedure to which some patients are assigned is to simply wait, whereas others receive treatment immediately. A random lottery is used to decide which patients should wait and which should receive treatment right away. Outcome measures may be administered to the waiting-list control group, so that researchers can tell how much of the improvement in patients who received actual treatment procedures might be due to (a) the effects of repeatedly administering the same outcome measures and to (b) factors other than treatment procedures.

In variations of this experimental design, patients may be assigned randomly to treatment procedures that begin after different delays. Sometimes entirely different procedures are compared for effectiveness; sometimes different mixtures of procedures are compared.

Correlational Designs and CPPOA

In some treatment settings, it makes sense to assign patients to short-term waiting lists; sometimes there is more demand for services than there are services available. In some programs, too, the procedures have not yet been proven to be effective and need to be tested before being used with many patients. In most programs, however, all patients must receive treatment immediately. Patients sometimes can be assigned randomly to different groups of treatment procedures, such as usual treatment versus new experimental treatment.

Often, patients receive mixtures of treatment procedures that have been carefully tailored to their individual needs, problems, and financial and employment situations. In these circumstances, CPPOA becomes a correlational rather than an experimental analysis. Correlational analyses can accurately describe cost-effectiveness and cost-benefit relationships and can provide the basis for systematic improvement. Sophisticated statistical techniques, as well as tables and graphs, can be used to explore the strength of relationships between costs, procedures, processes, and outcomes.

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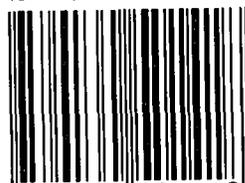
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