APPENDIX C

EVALUATION METHODS

(a) METHODOLOGY FOR THE ECONOMIC ANALYSIS AND EVALUATION

(b) AN APPROACH TO THE EVALUATION OF THE CONTRIBUTIONS OF TECHNOLOGY TO HEALTH CARE

APPENDIX C(a)

METHODOLOGY FOR THE ECONOMIC ANALYSIS AND EVALUATION

1. *OBJECTIVE*

The goal is to make an objective economic evaluation of automated medical record systems (AMRS) for ambulatory care in order to obtain some feeling as to the worth or utility of the systems and how they compare to each other. Also, the total evaluation should provide some insight as to which types of systems will provide maximum payoffs in the future, as they are improved and/or expanded in their respective settings or implemented elsewhere.

2. *TRADITIONAL APPROACHES TO ECONOMIC ANALYSIS*

There are several types of analysis that can be made:

A. Cost Enumeration. For each site visited, a tabulation of direct and indirect costs associated with each system can be made in a common format.

B. Cost Comparisons. In addition to a cost enumeration, a comparison of the costs of alternative configurations can be made for each site (i.e., different equipment configurations to do the same work).[1,2]

C. Cost-Effectiveness Analysis. Cost-effectiveness analysis is primarily designed to compare the economic efficiency of alternative systems for utilizing resources which are directed at the same objective. It is designed to indicate whether or not the output of one or another system is likely to require fewer resources to attain the desired degree of accomplishment, or, alternatively, whether the same dedication of resources can provide greater output.[3] The output for each site can be identified, and these products compared among sites in order to determine which system is most efficient (i.e., which system does more for less). A constraint on this approach is that the sites must have a common set of objectives.

D. Cost-Benefit Analysis. Basically, cost-benefit analysis is an attempt to compare the costs incurred by undertaking an activity with the potential benefits to be derived. It requires a systematic and disciplined analysis of both the costs and the benefits beyond that which is likely to be undertaken for the direct requirements of fiscal control.[4] Simply stated, a cost-benefit analysis is a systematic identification, measurement, and placing a value on all costs and benefits over time associated with a project that is designed to achieve specific goals.

It would be desirable to conduct an economic analysis that covers more than a cost enumeration or a cost comparison in order to obtain some feeling for worth. Since system objectives will vary from site to site, a cost effectiveness analysis may have to be ruled out. It is recognized that the overall outcome objectives concerning health care may be similar, such as improved quality of care, but the manner in which the automated medical record system helps to meet these objectives will differ, that is, the operating objectives of the systems will differ. Therefore, the fourth type of economic analysis---cost-benefit analysis---appears to be the most viable approach to use.

3. *COST-BENEFIT ANALYSIS: THEORETICAL ISSUES TO BE CONSIDERED*

A. Definition

A cost-benefit analysis has been described as a practical way of assessing the desirability of projects, where it is important to take both a long view (in the sense of looking at repercussions in the further as well as the nearer future) and a wide view (in the sense of allowing for secondary effects of many kinds, affecting many persons, industries, and regions).[5] The cost-benefit analysis method was developed to provide a technique for the evaluation of programs in the public sector. Cost-benefit analysis may be considered to be analogous to an analysis of return on investment used in profit-making organizations. The purpose of cost-benefit analysis is to achieve an efficient allocation of available resources and to use the analysis as a rational tool in making investment decisions concerning the allocation of scarce resources. The aim of cost-benefit analysis is to maximize the present value of all benefits less that of all costs, subject to specified constraints.

B. Approaches to Measurement

Even though the concept of a cost-benefit analysis is very simple, its application can be very difficult, primarily due to problems associated with the determination of the proper value for the benefits of public goods, such as a super highway. There are no direct charges for the benefit of highway driving and the highways are available to everyone whether they want them or not. Additionally, the social benefits of some programs may not be considered suitable for measurement in monetary terms. This is particularly true in health programs for evaluating the quality of health care, sickness averted, or lives saved. Many programs have several benefits and exhibit very complex interrelationships with public and private activities, so that a systematic analysis of the program's costs and benefits becomes a very difficult if not impossible task. Thus, many government-supported projects have been evaluated on the basis of nonquantified descriptions of the project's activities and a comparison of operating costs for alternative system configurations.[1,2] It is recognized that cost-benefit analysis may not be the ultimate solution to the problems associated with an evaluation of a program, but it can offer valuable assistance in sorting out some of the associated variables and constraints.

1) *Measurement and Valuation of Costs*

A detailed enumeration of all costs associated with each project is required, and generally will be measurable in terms of market price.

In order to facilitate an analysis of marginal costs associated with different levels of operation, it will be necessary to differentiate between fixed and variable costs, a procedure also recommended by a number of medical economists.[6,7,8] *Fixed* costs are those costs invariant to the quantity of services and not related to optional services. They are those costs required to run the basic system regardless of volume and to meet the primary operating objectives. There may be two types of *variable* costs. One type relates to the volume of services or transactions. The other type of variable

cost relates to optional services that are not considered an essential component of a set of services needed to meet the basic system operating objectives. For example, the ability to inquire into the files for any boolean combination of variables may be very useful for related research activities, but not considered essential to the health care provider.

Costs then must be related to system services and system services related to outputs. This step is required to assure a complete enumeration of associated costs and to relate the costs of services to outputs and ultimately to benefits. The extent to which the system can be broken down into components should be specified in order to obtain the marginal value of optional services or service groups.

2) *Measurement and Valuation of Benefits*

The traditional and most commonly used approach is to attempt to enumerate and quantify all direct benefits associated with the program. Usually only benefits that are quantifiable in monetary terms are used in the analysis, such as cost savings (e.g., operating costs and costs of medical care) or averted income loss due to early return to work or prevention of early death.[9,10] Other more intangible benefits may be mentioned; however, no attempt usually is made to incorporate them formally into the analysis.[11]

An alternative to the detailed enumeration approach may be called the willingness-to-pay approach. With respect to health care, the willingness-to-pay approach attempts to measure the amount of money a person would be willing to pay to reduce the probability of illness, disability, or death to some specific level.[12,13] This approach may provide a better measurement of an individual's attitudes or preferences with respect to a disease and its alternative treatments. A limitation of this approach is that willingness to pay is extremely difficult to measure empirically. This problem becomes especially apparent when dealing with a prospective analysis of life and death decisions. An advantage of the willingness-to-pay approach, however, is that it does not require a detailed enumeration and measurement of benefits, and thus the problem of placing a value on intangible benefits is eliminated.

C. Cost-Benefit Measures

Most efforts to evaluate automated medical record systems have dealt with systems in the research and development stage, and have been concerned primarily with demonstrating the technical feasibility of certain subsystems. In the research and development stage of a system, where the primary objective is to demonstrate technical feasibility, this approach appears appropriate. However, when management considers the operational feasibility, the primary objective should shift toward demonstrating economic feasibility, and performance measures should reflect both costs and benefits.[14]

For an automated medical record system operating at a given performance level, C and B may be used to denote the costs and the benefits, respectively, provided that both benefits and costs can be expressed in the same units. Three measures which are readily derived from B and C are the cost benefit ratio, the net benefit (or profit), and the net benefit cost ratio. These three measures may be computed as follows:

Cost Benefit Ratio	$CBR = B \div C$
Net Benefit	$NB = B - C$
Net Benefit Cost Ratio	$NBCR = NB \div C$

In order for an automated medical record system to be judged economically feasible, one or both of the following two conditions should hold:

$$CBR \geqq 1$$

$$NBCR \geqq 0$$

For a situation where adequate resources are available for the selection of one of several alternative systems, the generally accepted measure of relative economic worth is the net benefit, i.e., the benefit minus the cost. However, since each of these three measures of the relationship between costs and benefits has its advantages and disadvantages,[15,16] for this comparative evaluation of automated medical record systems in ambulatory care settings an effort will be made to try to compute all three cost-benefit measures.

4. *DEVELOPMENT OF A COST-BENEFIT ANALYSIS FRAMEWORK FOR THIS ECONOMIC ANALYSIS*

The development of the specific framework for the cost-benefit analysis will take into consideration the potential users of the analysis and the nature of the kinds of questions that may be asked.

A. <u>Potential users of the cost-benefit analysis</u>:

1) Officials of the National Center for Health Services Research.
2) AMR sites included in the evaluation.
3) Other ambulatory care settings.
4) Information systems professionals.
5) Health planners (national/regional).

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B. <u>The cost-benefit analysis should help answer such questions as</u>:

1) Is the system independently viable (self-supporting) now or expected to be in the near future?
2) Is there a reasonable justification for a subsidy in order to attain broader social benefits?
3) Which AMR systems are showing the best return on their investment?

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C. What the economic analysis will try to do:

1) Relate provider objectives to system services and then to outputs.
2) Relate cost inputs to system services.
3) Relate benefits of outputs to system services.
4) Show cost-benefit relationships for system services and objectives at the current operating level and at projected future levels.
5) Develop a return on investment or break-even analysis.

5. *COST-BENEFIT ANALYSIS METHODOLOGY*

A. Introduction

A retrospective cost-benefit analysis will be directed primarily to the measurement and valuation of costs and benefits associated with the system (provider) objectives rather than the outcome (societal) objectives. The reason for this orientation is that it may be difficult to substantiate direct relationships between AMRS outputs and the social outcomes of improvements in the quality of health care. Or if a relationship is clearly identified, such as averted income loss due to early return to work, it is unlikely that data will be available to make an accurate measurement. Therefore, the data gathering emphasis will be directed toward the structure and process of health care rather than outcomes. However, if suitable data are available on societal health care outcomes, these data will be included.

B. Methodological Considerations

1) The data gatherers will encounter limited data availability due to

a) the briefness of the site visit (one day),
b) the fact that the evaluation is being approached retrospectively, and
c) the fact that records have not been kept specifically for this evaluation.

2) Different accounting procedures will prevail; the nature of the data available will vary from site to site.

3) The usual measurement problem for placing a value on benefits will be encountered (e.g., what is the value of information, or the value of improved medical care?).

4) Since the systems will be viewed from a retrospective point of view, some advantage in evaluating benefits may accrue. Enough time should have passed to allow some experience with the system. Also, cost data should be better. (NOTE: The usual use of cost-benefit or cost-effectiveness analysis is a *prospective* analysis of a proposed project or group of projects.)

5) The reality that must be accepted is that some of the data available for collection in this economic evaluation will be imprecise. Therefore, it is considered crucial to develop a sound conceptual framework for the economic analysis. The desirability of using imprecise data in a sound analytical model compared to using precise data in an inappropriate model has been expounded in the literature.[17,18]

C. Cost Measurement and Analysis

The cost analysis will be an enumeration of all costs associated with the Automated Medical Record System. Detailed data will be requested for all of the usual cost categories: Labor, Equipment, Supplies, Computer Services, Miscellaneous, and Overhead. It will be important to identify all costs for the system, including those incurred outside of the AMRS facility. The data collection format provides for a classification of costs according to fixed and variable, and for further classifications of costs according to system services and functions. A description of the cost categories follows.

Investment Cost (This category includes one-time expenditures required initially to establish the AMRS operation or to duplicate a system already in operation at another site.)

Labor (This category reflects total direct labor costs of AMRS personnel prior to the time the facility became routinely operational.)

Training (This category includes the cost of the various types of training associated with the first group of people to staff the AMRS operation.)

Furniture* (This category includes the cost of tables, desks, chairs, filing cabinets, and other furniture to be used in the AMRS operation.)

Office Equipment* (This category includes the costs associated with typewriters, calculators, adding machines, copy machines, and any other equipment that is to be used in the day-to-day operation of the AMRS office.)

Supplies (This category includes the costs incurred initially for printed forms, business and administrative supplies, bookkeeping material, administrative forms, and other office supplies.)

* If these items are being depreciated, they should be included instead in the category entitled, "Other System Equipment" under "Operations Cost."

Documentation (This category includes the cost of writing and initial printing of public relations brochures, procedural handbooks, and other documents pertaining to the operation of the AMRS facility.)

Facilities* (This category includes the cost of architects, engineering, land, and construction or renovation of major facilities associated with the AMRS operation along with real property installed equipment such as air conditioning, false floors, special electrical cabling, lighting, and telephone/telegraph wiring.)

Other (This category includes costs that cannot be specifically identified to line entries under the investment category, such as travel, utilities, and overhead incurred prior to the operational phase.)

Operations Cost (Under operations are listed the categories in which the day-to-day operating costs of the AMRS facility are stated. These categories represent costs that recur from reporting period to reporting period. The operations phase begins with the first day of actual operation of the AMRS facility.)

Labor (This category reflects total direct labor cost of operating an AMR system, including the salaries and wages of such personnel as facility manager, computer operators/programmers, technicians, data input specialists, medical record librarians, steno/clerks, and other personnel. Also to be specified in this category is the payroll burden, i.e., the employer's costs associated with employees' vacations, sick leave, retirement, unemployment insurance, health insurance, and other fringe benefits.)

Replacement Training (This category includes the costs associated with training of new employees and of staff retraining in the AMRS facility after it becomes operational. Included is the portion of the supervisor's time that is devoted to assisting new employees in learning their tasks.)

* If this item is being depreciated, it should be included instead in the category entitled, "Other System Equipment" under "Operations Cost."

System Operating Costs (This category includes total costs associated with equipment operation, maintenance, depreciation, and/or equipment rental.)

Computer Hardware Maintenance (This category includes personnel and materials costs or maintenance service associated with maintaining the AMRS computer equipment.)

Computer Hardware Depreciation (This category includes depreciation of fixed and major movable purchased AMRS computer equipment. Straight-line depreciation over a 5-year period is standard practice. If the computer is shared with other applications, show a pro rata share for the AMRS operation.)

Computer Hardware Rental (If the computer equipment is leased instead of purchased, this category should show the leasing cost. This cost typically includes equipment maintenance. If the computer is shared with other applications, show a pro rata share for the AMRS operation. Also included are computing services purchased from a time-sharing vendor.)

Computer Software (This category includes the cost of the software required to support the AMRS operation. If the software is leased, this category should show the leasing cost. If the software was developed locally, this category should show the depreciation of the software development amortized over an appropriate useful life expectancy, probably five years to correspond to the life expectancy of the computer hardware that it runs on.)

Other System Equipment (This category includes the depreciated cost of other equipment such as furniture, typewriters, calculators, adding machines, copy machines, computer terminals, remote printers, and any other equipment that is used in the day-to-day operation of the AMRS facility.)

System Communications (This category includes the cost of telephone, telegraph, WATS, and any other communication services used exclusively in the AMR system operation.)

Telephone (This category includes the cost of telephone services related to administrative functions of the AMRS.)

Supplies (This category includes the costs of stationery, postage, paper, file folders, forms, and other office supplies used in the day-to-day operation of the AMRS facility.)

Facility Rent (This category includes the rent paid for use of the facility in which the AMRS is housed.)

Consultants (This category includes fees and retainers of all professional consultants who support the AMRS operation.)

Travel (This category includes the cost of travel for all personnel and consultants associated with the AMRS operation when they are on official business for the facility.)

Indirect Costs (If an indirect cost rate has been negotiated or established, use this rate. Determine if the indirect cost rate is based on a percentage of direct costs or of personnel. If no rate has been established, obtain an estimate for Indirect Costs.)

D. Benefit Measurement and Analysis

With respect to the AMRS to be reviewed, it is expected that the intangible benefits relating to improvements in the delivery of health care will represent a major portion of system benefits. Considering the expensive nature of computing systems, the tangible benefits such as operating cost savings and savings in manpower time may not be greater than the system cost. Accordingly, it is necessary to develop some methodology for quantifying the intangible benefits so that all benefits may be evaluated in comparison to system costs.

Two approaches to the benefit analysis will be taken. The first approach will be an enumeration of specific benefits of the system along with a measurement of the value, to an extent that is feasible. The second approach is derived from the willingness-to-pay concept. The system's worth will be assessed through the measurement of user attitudes and preferences with respect to the AMRS that they are using. Both approaches will involve innovative methodology in the measurement and valuation of intangible benefits.

The direct enumeration approach will be incorporated into a cost-benefit analytical model. In order to achieve reasonable validity in the measurement of benefits, it will be necessary to interview persons who have a knowledge of the system objectives, costs, and performance. Thus, the cost-

benefit analysis will be limited in that it will represent an evaluation of the system based upon the judgment of key decision makers who may not be representative of the total user population. In order to capture a more representative evaluation of the AMRS, the second approach was developed as an attempt to measure the users' feelings as to the system's worth.

E. Direct Enumeration of Benefits

1) *The tangible and intangible benefits of the AMRS may be classified as follows:*

TANGIBLES

1. System Cost Savings (SCS)

2. Delivery of Health Care Savings (primary cost savings)

   a. Health Manpower Savings (HMS)
   b. Patient Care Cost Savings (PCS)

3. Facility Management and Operations: Secondary Operating Cost Savings (OCS)

   a. Fiscal Processes

      Lost Charges: Elimination of, reduction of
      Billing Procedures
      Claims Processing
      Inventory Losses

   b. Operations Management

      Manpower Utilization: Clerical tasks replaced by automation, improved work patterns, increased efficiency
      Space Allocation: Less required
      Productivity Increase
      Other Cost Savings

PROVIDER INTANGIBLE BENEFITS (PIB)

1. Quality of Health Care (Direct Delivery of Care) (IQC)

   a. Patient Management
   b. Patient Compliance
   c. Quality of Care Review Procedures

2. Access to Health Care (IAC)

   a. Appointment Scheduling
   b. Patient Follow-up
   c. Administrative Procedures
   d. Other

NOTE: Letters in parenthesis refer to the variables of the cost-benefit analytical model defined in Section 5.F.

3. **Facility Management and Operations (IFM) (Management Aspects of Health Care)**

   a. Fiscal Processes
   b. Financial Management: Planning, budgeting, and evaluation facilitated by

      Increased Information
      Access to Information
      New Analytical Tools

   c. Operations Management: Employee morale, working atmosphere

SOCIETAL INTANGIBLE BENEFITS (SIB)

Benefits may accrue to society as well as to the provider and the patient population.

1. Technological Advancement in AMRS **(TA)**
2. Quality of Care Review Methodology **(QRM)**
3. Research Activities **(RD)**
4. Training Programs **(TD)**
5. Regional/National Health Planning **(HP)**

OTHER BENEFITS (OB)

Other benefits which relate to specific provider objectives may be listed separately, or reclassified into one of the above groups.

2) *Methodology for Measuring and Determining Value of Benefits*

Measurement

Use actual data when available; otherwise, obtain subjective estimates. All benefit data should be obtained for the current operating level and for future operating levels, if substantial changes are expected.

Value of Tangible Benefits

System Cost Savings

The value of system cost savings is to be obtained from a comparison of costs prior to the implementation of the system to current operating costs. (Adjust for inflation if necessary.)

NOTE: Letters in parentheses refer to the variables of the cost-benefit analytical model defined in Section 5.F.

Health Manpower Time Savings:

Tasks associated with a patient visit (alternatives for determining value):

(a) Estimate the percent of time saved by type of personnel during a patient visit. Determine dollar value of savings using average salary data for type of personnel. Project annual savings using average number of patient visits per year.

(b) If savings in time results in more patients served, determine the annual increase in patient visits. Multiply by average revenue per patient visit.

Method (a) is preferred to Method (b) since it can be used regardless of the disposition of time saved. Essentially, the benefit will be considered the value of the additional amount of manpower made available for the process of health care. The disposition of the additional manpower may be up to the individual or it may be a management decision. For example, a physician may decide to use savings in chart review, in time for additional direct contact with patients, to see more patients, or for increased leisure time. Savings in clerical time may be subject to the assignment of additional duties by management. Under any circumstances, it is unlikely that health manpower savings will result in a reduction of labor costs.

Patient Care Cost Savings:

Savings due to fewer services required will be valued on the basis of average cost per service.

Reduced waiting time and fewer visits will be valued on the basis of time saved and average income data for the patient population. Other factors, such as savings in transportation costs, will not be included as it is unlikely that even rough estimates can be made.

Operating Cost Savings:

The value of these savings will depend upon the claims made and available data. If management personnel believe that such benefits are realized, they should be able to provide some estimate of the dollar value.

Two major factors must be considered when determining the extent to which these management benefits are to be included in a cost-benefit analysis:

(a) The extent to which an automated business system could provide the benefits independently of the AMRS, and

(b) The extent to which benefits may be counted elsewhere. For example, savings in provider time may result in increased productivity. This benefit should be included only once.

If management savings are reported, the data must be examined carefully to obtain measures for (a) and (b) above.

Value of Provider Intangible Benefits

The assignment of a value for provider intangible benefits is based upon the assumption that these intangible benefits justify some portion of the cost of automation. (The cost of automation is the total cost of the AMRS less any system cost savings. Theoretically, the portion of automation costs justified by intangible benefits could exceed 100 percent.) The following procedure was developed as a reasonable method for estimating the portion of automation costs that is justified by the provider intangible benefits that may be consistently applied to all sites visited. The conceptual framework for the assessment of the worth of the intangible benefits is based, in part, upon the procedures for the assessment of worth of complex alternatives as described in Miller's *Professional Decision Making*.[19] Due to the limiting constraints of the data-gathering process, it is not feasible to apply the rigorous methodology recommended in Miller's book.

The first part of assessing the provider intangible benefits is the determination of an overall worth rating that is compiled from individual worth ratings for the realization of individual benefits. An individual worth rating will be based upon the extent to which the benefit contributes to the achievement of provider objectives. The essential steps for the determination of the overall worth rating follow.

1. Proper identification and description of provider objectives. Using the objective framework as developed in the Objectives Protocol:

   a. Identify components applicable to each site under review, and

   b. Make any necessary additions or modifications for special characteristics of the site.

   Each objective must be independent of all others. The objective categories should be mutually exclusive of each other in order to achieve worth independence.[20]

2. Assignment of weights for each objective component.

   a. Each level of the objective hierarchical structure should equal one.

   b. Each decision maker (interviewee) provides an individual rating, and

   c. An average weight for each component is determined based upon individual scores.

3. Identification and classification of all intangibles according to major provider objective categories. Using the framework as developed in the Objectives Protocol and as described herein.

a. Identify components applicable to the site under review, and

b. Make any necessary additions or modifications for special characteristics of the site.

4. Identification of system features and outputs that contribute to the achievement of intangible benefits, and identification of possible surrogate measures of the intangible benefits. Using the framework developed in the Objectives Protocol and in the data collection section of the Economic Analysis Interview Guide.

   a. Identify measures suitable to the site under review, and

   b. Make any necessary additions, deletions, and adjustments.

5. Estimation of the level of benefit achievement with respect to expectations. Each decision maker (interviewee) is requested to provide a subjective estimate of the level of benefit achievement in relation to an expected level of provider objective achievement. The level of benefit achievement should be a score between 0 and 1; a negative score is permissible. The raters should be instructed to make the measure reflect the degree of benefit realization with respect to what could or should have been realized.

6. Calculation of the overall worth measure (PIW - Provider Intangible Worth).

   a. Determine the average worth rating for each benefit component of an objective group (i.e., Access to Care is a component of the Delivery of Health Care objective group). The average is based upon individual interviewee scores.

   b. Weight each individual worth rating by the respective objective component weight (derived in Step 2 above).

   c. Sum the individual weighted worth ratings for each objective group, and apply the objective group weight.

   d. Sum over all objective groups to obtain the overall worth measure.

The second part of assessing the provider intangible benefits is the assignment of a dollar value to the PIW (provider intangible worth measure). The assignment of a dollar value to the PIW is based upon the following assumptions.

1. The decision to automate the medical record most logically has been based upon two major factors:

   a. Potential Resource Savings: Manpower, operating expenses, and space. The resource savings may be considered the true cost savings.

   b. Benefits to be gained from automation that contribute to the delivery of health care, improved management, and society in general. These benefits have worth, but may not be readily measured in dollar terms.

2. The total benefit of an AMRS is derived from a measurement of resource savings and the worth of the benefits from automation. The resource savings are comparable to the tangible benefits and include the following:

   System Cost Savings
   Health Manpower Savings
   Patient Care Cost Savings
   Operating Cost Savings

   Only the system cost savings represent the primary tangible benefits. Health manpower savings and patient care cost savings are secondary because they may not represent a true cost reduction to the provider. For example reduced cost of patient care is realized by the patient rather than the provider. With respect ot health manpower, it is more reasonable to assume that the manpower savings will be consumed by the assumption of new or additional duties, rather than a decrease in payroll costs of the provider. Operating cost savings are considered to be secondary, in that they are an indirect in the assumption that similar savings could be realized with an improved business system that does not involve the medical record.

   The benefits to be gained from automation are comparable to the provider intangible benefits and include the following:

   Improved delivery of health care through:

   Better access to care,
   Better quality of direct patient care,
   New analytical tools and increased information for long-range health planning, and
   Quality of care review.

   Improvements to facility operations through better financial and operations management.

3. The decision to automate the medical record was based on the assumption that certain benefits were to be realized (the provider objectives) and that the realization of the benefits had some logical upper bound.

4. If all expected provider intangible benefits were realized at their logical upper bound, then the *minimum* value of the benefits would be the expected cost of automation. This assumption must hold or else the decision to install the AMRS would have been illogical. (The expected cost of automation is the total expected cost of the AMRS less expected system cost savings.)

In consideration of the foregoing assumptions, a conservative estimate of the dollar value of the total achievement of the provider intangible benefits would be equal to the expected cost of automation. Accordingly, a conservative estimate of the value of the benefits actually achieved would be the expected cost of automation multiplied by the provider intangible worth measure (AC' × PIW, where AC' is the cost of automation adjusted to compensate for any variance from the expected cost).

Value of Societal Intangible Benefits

A worth measure for the societal intangible benefits will be developed, using the site visit team as the scorers. Each team member will be asked to make a 0 to 1 assessment of the realized contributions to the societal objectives in comparison to what might have been accomplished. A Societal Worth Measure will be developed following the general procedure outlined above. If the facility under review has received some governmental support for the development of the AMRS, the amount of support will be used with the Societal Worth Measure to arrive at a rough estimate of the value of the societal intangible benefits.[21] If there have been no governmental funds involved with the AMRS, the societal worth measure will be developed with no associated dollar value.

F. An Analytical Model for Cost-Benefit Analysis

If the Automated Medical Record System (AMRS) is to replace or will eventually replace a Manual Medical Record System (MMRS), the cost-benefit analysis may be approached from a comparison of benefits to the cost of automating the medical record system, that is, benefits can be compared to the cost of the new system minus the cost of the old system. If the new system costs less than the old (which is unlikely in the cases under review), a net benefit is realized on the basis of system costs alone, and all other benefits attributable to automation are added to the net system benefit to attain the total benefit.

As indicated above, however, it is not expected that the new automated system will cost less than a manual system. Additionally, it will not always be the case that a manual system is to be totally replaced. In many cases it is expected that the automated medical record system will be an add-on to the existing record system. If the automated system is intended to augment an existing system, individual cost categories will have to be examined to determine whether there are any system cost savings.

is required in this analysis, which rather represents a methodological implementation of the willingness-to-pay approach to measuring benefits. The comparison among AMRS sites will be carried out in the following manner.

The response scale will be assigned weights from +2 to -2 as shown below:

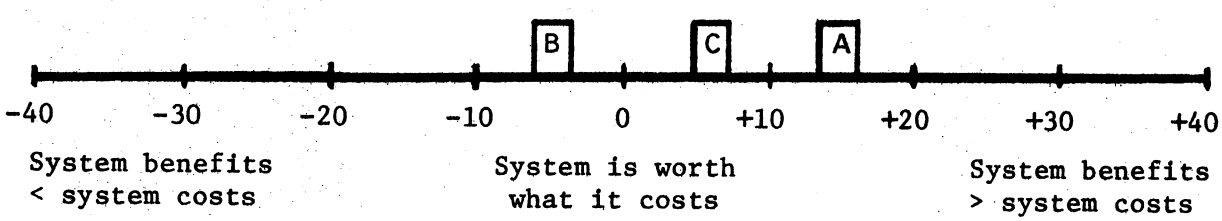
Strongly Agree	+2
Agree	+1
Neutral Opinion	0
Disagree	-1
Strongly Disagree	-2

If a subject selected "Strongly Agree" as his response to all 20 statements, his summated score on the Attitude Scale would be +40. Conversely, if he selected "Strongly Disagree" as his response to all 20 statements, his summated score would be -40. Thus, the range of possible scores for an individual on this Attitude Scale is -40 to +40. Note that the weights assigned to statements 3, 6, 10, 14, and 18 will be reversed since these statements reflect negative rather than positive attitudes toward the AMRS.

The key users at each AMRS site visited will be asked to respond to the Attitude Scale, which should take no more than 15 minutes of their time. They also will be cautioned verbally to respond to *all* 20 statements since the omission of a response compromises the analysis. If more than one person fills out the Attitude Scale at a particular institution, the arithmetic mean of summated scores for all persons responding will be used as the worth in which these users hold their AMR system. The following example will clarify the proposed method of analysis.

	Respondent 1	Respondent 2	Respondent 3	Mean
Site A	+17	+13	+15	+15
Site B	- 5			- 5
Site C	+ 4	+ 8		+ 6

A histogram can be constructed showing the relative position of each institution on a scale ranging from -40 to +40.



In the actual analysis that will be performed, it will be possible to discern if the benefits accruing from most AMR systems are considered to be greater than or less than system costs. Also, it will be possible to rank order all AMRS sites visited on the basis of this analysis. Thus, both skewness and kurtosis of the histogram distribution will be of interest. This analysis will provide ancillary findings to those resulting from the more usual valuation of benefits in monetary terms.

In view of the actual conditions of the information gathering process, sufficient data was not obtained to permit the assignment of a value to intangible benefits as described herein (Section E.2). In order to make the best use of the data that was available, the benefit valuation was revised as follows.

Revised procedure for development of cost-benefit measures.

1. The outcome and provider objectives for each site visit were given a relative weight as follows:

   1+ Minor objective
   2+ Secondary objective
   3+ Major objective

   This step was performed upon completion of all visits, buy a consensus judgement of the site visitors. The objective of this step was to provide an information base for step two.

2. For each site the benefit categories (tangible, provider intangible and societal intangible) were given weights based on the objectives. The relative weights for each site were set so that they would sum to one.

3. A benefit achievement score was developed for provider and societal intangible benefits and for tangible benefits that could not be quantifited. The score was developed as follows:

   a. A maximum benefit score was determined for each of the three groups by determining the number of applicable subcategories, based upon explicit and implied objectives and multiplying by three, the maximum individual benefit achievement score.

   b. The benefit achievement score was obtained by summing the individual score and dividing the maximum possible for the individual site.

4. To determine the cost-benefit status for each benefit group, benefit achievement score was multiplied by benefit objective weight arrived at in step two. This product can be considered the weighted achievement score. The total direct annual operating costs was then multiplied by the weighted benefit achievement score, to obtain an indication of the portion of operating costs justified by this benefit group.

5. The value obtained in step 4 is considered to be the cost-benefit status measure for intangible benefits (provider and societal). For tangible benefits, the value obtained step four, was multiplied by total operating costs and the result was added to any tangible costs that had been quantified in dollar terms. This sum divided by total operating costs is considered the cost benefit status measure for tangible benefits. The cost benefit status measure can be considered an indicator of the extent of benefit achievement in relation to stated objectives.

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APPENDIX C(b)

AN APPROACH TO THE EVALUATION OF THE CONTRIBUTIONS OF TECHNOLOGY TO HEALTH CARE

A structured approach to the evaluation of technological innovations for health services has been proposed by Charles D. Flagle (FLA72). The approach stresses the important element that evaluation must "measure how technology enables and augments a human performance rather than how it replaces it." Flagle combines the traditional operational measures of the engineering perspective, e.g. component and subsystem performance, with those of the traditional utilization measures of the health care evaluation perspective, e.g. process and outcomes analysis. The overall scheme is illustrated in Figure Cb1.

Further expansion of this array demonstrates the feasibility of adopting this scheme as the basis for evaluatin the contribution of an AAMRS to health care. The expanded array is illustrated in Tables Cb1 and Stet 1. Several definitions are pertinent to our understanding of this evaluation methodology. Operational (internal) measures refer to those

Figure Cb1.

	Operational Measures		Utilization Measures	
	Component Performance	Subsystem Performance	System Process	End Result for patient, staff, and society
Effect				
Cost				

of the technology's performance characteristics, either measured in the laboratory (component performance) or on-site (subsystem performance). The technical characteristics of component performance, such as availability, utilization, sensitivity, precision, stability and operability have a broader functional meaning when these measurements are made within the context of an organization's operating environment. Here, variations in the quality and quantity of the inputs to the technical device, as well as variations in the operating environment, be they derived from employee education standards, motivation or other dissimilarities from the laboratory site, all serve to distinguish achieved subsystem performance from component peroformance. Similarly, utilization (external) measures can be broken into two classes: system process measures and patient, staff and society end results. Since Flagle's initial description, a better formulation is available for the methods involved in making these two classes of measures (STA73). In fact, for utilization one may insert the familiar terms of process and outcomes measures from the care-quality evaluation literature. Thus, system process refers to the characterization of the care process in patient related terms, i.e., measures of the receipt of the care such as utilization, acceptance, understanding and compliance; in provider related terms, i.e., measures of the provision of care such as problem recognition diagnosis, management, and reassessment; or in the care delivery system's manager related terms, i.e., measures of the efficiency, productivity and utilization of the care delivery system's resources. The end results for the patient, staff and society refer to those universal outcomes measures such as those originally put forth by White (WHI67) (death, disease, disability, discomfort, and dissatisfaction) or those suggested recently by

Starfield (STA73) (longevity, activity, comfort, satisfaction, disease, potential and resilence).

One can look at Tables Cb1 and 2 and rightly ask: How relevant is such a broad-based and obviously technology-oriented evaluation scheme to the relatively simple technology of an AAMRS? We would argue that the scheme's value lies precisely in its theoretical comprehensiveness. It not only clarifies the relationships between operational and utilizational characteristics, but also allows one to distinguish with ease those parameters requiring analysis.

TABLE Cb1

OPERATIONAL OR INTERNAL SYSTEM MEASURES

Component Performance	Subsystem Performance
Effect	Effect
Availability	Availability
reliability	reliability
maintainability	maintainability
durability	durability
	timeliness
Performance	Performance
precision	precision
sensitivity	sensitivity
stability	stability
efficiency	efficiency
	completeness
Utilization	Utilization
capacity	capacity
cycle time	cycle time
reaction time	reaction
Operability	Operability
man-machine interface	man-machine interface
acceptance	acceptance achieved
fatigue	fatigue generated
training requirements	training actually required
machine-machine	machine-machine interface
networking potential	networking achieved
language compatibility	language compatibility
data-base compatibility	data-base compatibility
Cost	Cost
Labor cost	Life cycle cost
Operating costs	Cost per unit task performed
Capital costs	
Back-up costs	

TABLE Cb2

UTILIZATION OR EXTERNAL SYSTEM MEASURES

System Process	End Results for Patient, Staff and Society
Effect	**Effect**
Receipt of care (patient-related) Utilization Acceptance Understanding Compliance	Patient Therapeutic Death Disease Disability Discomfort Dissatisfaction Potential Resilence
Provision of care (Provider-related Problem recognition Diagnosis Management Reassessment	
Care Delivery System Management (Manager related) Efficiency Utilization Productivity Services provided Time delays for patients and staff	Provider Diagnostic Outcomes Quality of care Society Access to care Quality of care Cost of care
Cost	**Cost**
Cost/type of service Cost/encounter	Cost/episode of illness Opportunity costs derived from the results of POTENTIAL realized or RESILENCE maintained

CONTENTS OF APPENDIX C

Interview Guides for:

CONTENTS OF APPENDIX D

Site Visit Reports

Site Visit Reports

- continued -

		report
7.	Harvard Community Health Plan (HCHP) Kenmore Square Cambridge, Massachusetts	CDH
8.	Medical Data Systems Corporation (Automed) Olmsted Falls, Ohio	CDM
9.	Medical University of South Carolina (MUSC) Department of Family Practice Charleston, South Carolina	CDC
10.	Appalachia II District Health Department Greenville, South Carolina	CDG
11.	Duke University Medical Center Department of Community Health Services Durham, North Carolina	CDD
12.	Regenstrief Institute Indianapolis, Indiana	CDF
13.	Cardiovascular Clinic Oklahoma City, Oklahoma	CDO
14.	Casa de Amigos Houston, Texas	CDA
15.	Indian Health Service (IHS) Tucson, Arizona	CDT
16.	U. S. Naval Air Station Dispensary (NAS) Brunswick, Maine	CDB
17.	Bellevue Hospital Pediatric Outpatient Clinic New York, New York	CDN

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INTERVIEW GUIDE

FOR TECHNICAL AND OPERATIONAL EVALUATION

INTRODUCTION

The objective of this protocol is to determine the tasks performed by the Ambulatory Automated Record System under consideration, evaluate the processing required, and the hardware and software components used to achieve the processing.

An evaluation of the integration of the system into the organizational setting, and the means of information distribution completes the subjects covered in this protocol.

This is the area indicated as processing in the figure used to illustrate the model. This corresponds to items 4, 5B, 7 and 8 in the model.

SITE: _____

SOURCE: _____

INTERVIEWER: _____

4 TASKS REQUIRED

a. Data entry tasks

(1) Data entry is accomplished through

	percentage	volume
keypunch	____%	__/__
mark sense	____%	__/__
optical reading of hand printed characters	____%	__/__
optical reading of typed characters	____%	__/__
typewriter-keyboard text	____%	__/__
typewriter-keyboard responses	____%	__/__
CRT keyboard entry	____%	__/__
CRT selection entry with ____	____%	__/__
direct connection to instruments	____%	__/__
special techniques ____		

Missing data elements are

ignored and not distinguished/
explicitly skipped/
coded to a specific representation (____)/
not allowed.

(2) Verification of data entry

is not neccesary/
is not done/
done by output scanning/
done by special audit report scanning/
done by data entry limit checking/
done by data entry context checking/
done by duplicate entry/
done by an edit program/
done by analysis routines.

Most errors are found by

data entry personnel ____%/
health care delivery personnel ____%/
physicians ____%/
billing personnel ____%/
other clerical personnel ____%/
patients ____%.

(3) Error correction

is done on-line/
is done with a special batch program.

A correction

automatically changes all previously derived/fields/and/reports/
changes entry in file only.

An audit trail of all errors

is/is not maintained.

(4) Data entry hardware has given no/some/many problems in the area of

reliability/
uptime/ _____
cost/
man-machine interface. _____

Data entry software has given no/some/many problems in the area of

reliability/
uptime/ _____
cost/
man-machine interface. _____

b. Data storage

(1) File updating
Additional data entries are reflected in the files

immediately/
after a batch or background run/
after an overnight update run.

Changed data entried are reflected in the files

immediately/
after a batch or background run/
after an overnight update run.

The data invalidated are

kept available on-line for back up purposes/
can be retrieved from an audit run/
not kept.

(3) Tabulation of/provided services by/

diagnosis or problem/
patient category (age, sex,____)/
patient address or location/
provider/
services rendered/

is done

never/
occasionally/
regularly.

(4) Comparison of selected patient groups includes

descriptive statistics, eg.
tables/
histograms/
means and standard deviations,

inferential statistics, eg.
t-tests/
analysis of variance,

actuarial statistics eg.
survival rates/
morbidity rates/
mortality rates.

(5) Scheduling procedures for

patients/
clinic personnel/
transportation etc. services

are available and utilized.

(6) Financial management is aided by programs which do

budgeting/planning/
billing/
claims processing/
accounts receivable/
aged accounts receivable/
accounts payable/
ledger/
inventory control/
cost analysis.

d. Data analysis procedures, source and operation

The analysis routines were written by

a vendor/
research personnel/
clinical personnel/
professional programmers.

The routines are specified by

the vendor/
research personnel/
clinical personnel/
professional data-processing staff.

Their operation is verified by

the vendor/
research personnel/
clinical personnel/
professional data-processing staff

through

a formal check-out procedure/
pilot-operation/
routine operational use.

The routines are kept on a

general library file/
user specific library file/
by the individual user.

Their documentation is kept

on paper/on files
in a general library/
in user specific files/
by the individual user.

The principal programming language is

Assembler/
FORTRAN/
COBOL/
PL/1/
MUMPS/
Other_____.

e. Protection of Data

Access to the data is restricted
physically using locks/closed areas/
by identification and passwords known to
many/few users and to no/few/ the systems staff/
by identification card

for the entire data base/
specifically for selected files.

Violations of access are reported by the system.

Personnel which have access to the data in the computer are
all medical professionals/
clerical personnel/
administrative personnel.

The protection provided is
considered insufficient/
considered adequate/
considered thorough,
and fully utilized/
loosely utilized.
ignored or bypassed.

f. Training

New Medical Users of the system are given

a formal course/
instruction/demonstration/
documentation,

in order to learn how to use the system.

The training period is _____

and after an additional _____ they are fully proficient.

New clerical users of the system are given

a formal course/
instruction/demonstration/
documentation,

in order to operate the system.

The training period is _____

and after an additional _____ they are fully proficient.

g. Presentation of results

The means for producing output are

Hardcopy produced by
printers/terminals/
microfilm or fiche

Softcopy produced by
CRT displays/
Voice answer back.

5 B PROCESSING REQUIRED

a. The processing capability is provided through the following computer(s)

no.	manufacturer	model	size	cost	year installed
____	_____	_____	_____	___per___	_____
____	_____	_____	_____	___per___	_____
____	_____	_____	_____	___per___	_____
____	_____	_____	_____	___per___	_____

The computing services are provided through a

vendor:_____
associated organization: _____
in house.

The equipment is rented/leased/purchased.

Maintenance is by vendor/self
and costs _____ in addition.

Approximately _____% of the processing capability is used for the Ambulatory Medical Record Application.

Approximately ____ (% or actual) of the file capability is used for the Ambulatory Medical Record Application.

	no	type	model	cost
The files are stored on	____	_____	_____	_____
	____	_____	_____	_____
	____	_____	_____	_____
Other important equipment is	____	_____	_____	_____
	____	_____	_____	_____
	____	_____	_____	_____
Archival storage is	____	_____	_____	_____
	____	_____	_____	_____

Retrieval response time design criteria is _____.

Hardcopy terminals are

#	type	char/ line	u/l case	speed	mechanism	cost	relia- bility
____	_____	_____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____	_____	_____

Softcopy terminals are

#	type	Screen	char/ line	u/l case	speed	cost	relia- bility	legi- bility
____	_____	_____	_____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____	_____	_____	_____

b. The system uses

timesharing/
multiprogramming/
paging/
transaction processing/
foreground/background operation/
batch
for most of its processing.

Currently production occupies _____%
of the machine, and development _____%.

Of the production load

____% is data entry,
____% is file maintenance,
____% is data analysis, and
____% is report preparation.

c. The operating system was designed and written
for this application and/or institution/
for general medical purposes/
for general commercial purposes/

It is now being
further developed/maintained/understood/ignored
by the local staff, and
further developed/maintained/ignored
by the original supplier.

The file system is characterized by
sequential files/
tabular files/
indexed files/
direct access (random files)/
linked records/
hierarchical files.

The implementation of the AAMRS
requires _____ distinct files and
_____ distinct record types.

d. When there is a computer failure then

a backup computer is put into service/
the failed computer is restarted as fast as possible/
the problem is analyzed an systems personnel keep the computer until it is fixed.

A noticeable (to the user) failure happens about _____/____, and that number has been

improving/steady/getting worse.

When there is heavy usage of the Ambulatory Medical Record System then there will be

a noticeable slowdown/
an annoying slowdown/
terrible slowdown/
no effect.

When there is other heavy use of the computer system, then there will be

a noticeable slowdown/
an annoying slowdown.
terrible slowdown/
no effect.

e. The data processing staff consists of

	number local/remote
managers	(/)
medical specialists	(/)
systems analysts	(/)
programmers	(/)
operators	(/)
data entry clerks	(/)
messengers, etc.	(/)

The data processing staff reports to _____ of the institution.

The response to request for changes in system output is

immediate
1 week
1 month
3 months
6 months
1 year
not measurable

(as seen by the technical staff and its backlog).

f. The costs of the computer operation are

charged according to usage/
fixed and budgeted.

The investment in the system is about $_____ and
the operational cost is about $_____/_____.

g. The ambulatory record system is intended

only for this institution
for (future) distribution (to currently _____ sites)
one of many/few/_____sites

It is supported by a vendor (_____)
copied from _____.

It is to be used remotely on a

county wide/
regional/
state wide/
national

scale.

7 INTEGRATION OF FUNCTIONS (from the technical side)

a. The computer operation is

a service to the/
an integral part of the/
a project of the

ambulatory health care delivery service.

Administratively the computer service is directed by _____.

Technically the computer service is directed by _____.

The financial resources for its development have come from
_____ ($_____),
and the cost of its operation are paid by
_____ ($_____/_____).
The priority of new tasks for the system is determined by
_____.

b. The automated medical record system

replaces/
supplements/
supports/
ignores/
conflicts with

the manual medical records.

Its outputs are

kept separately from/
inserted into

the paper system.

Information from the paper system is taken into the automatic system in case of

inpatient stay/
previous ambulatory history (before registering in this AAMRS)/
laboratory/X ray _____ data (from outside of this AAMRS).

The automated system contents

is/not/accessed by the medical records librarian.

c. Other automated services, used by the ambulatory health care delivery services such as

patient history taking ____/
multiphasic testing ____/
billing _____/
payroll_____/
financial (accounts, ledger) _____/
scheduling _____/
other _____.

are now being done (N),

could be replaced with this system (R) or

and would be purchased from the outside (P).

d. In summary, this computer system is best viewed as

a pilot effort for evaluation/
a development effort/
a production service/
a research project.

8 INFORMATION DISTRIBUTION (from the technical side)

a. Reports received regularly by administrative management (and their importance scaled A to F, volume, frequency D, W, M, Q, Y)

aggregate cost (_____,_____,_____)/
aggregate services provided (_____,_____,_____)/
personnel statistics (_____,_____,_____)/
other
_____ (_____,_____,_____)/
_____ (_____,_____,_____).

On-line use by administrative management is for

_____ (_____,_____,_____)

b. Reports received regularly by clinical personnel (and their importance)

practice profile (_____,_____,_____)/
individual records (_____,_____,_____)/
data analyses (_____,_____,_____)/
total billings (_____,_____,_____)/
discounts (_____,_____,_____)/
_____ (_____,_____,_____)/
_____ (_____,_____,_____).

On-line requests by clinical personnel are for

individual records (_____,_____,_____)/
data analyses (_____,_____,_____)/
_____ (_____,_____,_____)/
_____ (_____,_____,_____).

c. Special requests are made to data processing staff for items such as

research studies (_____,_____,_____)/
_____ (_____,_____,_____)/
_____ (_____,_____,_____).

This happens about _____/_____.

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January 21, 1975
HRA Contract

PROTOCOL FOR

THE ECONOMIC ANALYSIS

INTERVIEW GUIDE

Site Visited_____

_____

Interviewer_____

Person Interviewed_____

_____

Date of Site Visit_____

PROTOCOL FOR

THE ECONOMIC ANALYSIS

INTERVIEW GUIDE

Site Visited _____

_____

Interviewer _____

Person Interviewed _____

_____

Date of Site Visit _____

11. ECONOMIC INFORMATION

a. IDENTIFICATION OF PROVIDER OBJECTIVES (Note: Refer to information obtained by use of the Objectives Protocol.)

1) How will the AMRS help the ambulatory care setting meet the outcome objectives of improved quality of care, improved access to care, and cost reduction or containment?

See page 2 of the Objectives Protocol. Identify or confirm identification of those objectives that apply to the site under review.

Obtain relative weights for each objective component.

a) Each level of the provider objective hierarchical structure should equal one.

b) Each decision maker (person interviewed) provides a personal assessment of the weight.

c) Determine an average weight for each component based upon individual scores.

2) Identify existing constraints that affect the accomplishment of provider objectives and that may affect the transferability of the AMRS to other locations or applications.

a) Organizational Constraints (size, nature of management)

_____

_____

b) Technological Constraints (hardware, software, system features, limitations)

_____

_____

c) Funding Constraints (dependent upon grant support)

_____

_____

d) Legal Constraints (privacy of information, PSRO legislation)

_____

_____

b. ORGANIZATIONAL ENVIRONMENT AND OPERATING DATA (to be completed only if not done with the Objectives Protocol)

1) Organizational Data (with respect to the parent organization and the user of the AMR system)

The organizational identification is accomplished in the Objectives Protocol. The financial data should be requested or obtained from an annual report if one is available.

	AMRS User*	Parent Organization
	_____	_____
a) General Data		
Annual operating budget	$_____	$_____
Manpower structure		
Size	_____	_____
Major categories of personnel	_____	_____
	_____	_____
	_____	_____
b) Source of Operating Funds		
Direct appropriation	_____%	_____%
Fee for service	_____%	_____%
Prepaid	_____%	_____%
Subsidy	_____%	_____%
Capitation	_____%	_____%
Other (specify) _____	_____%	_____%
_____		

c) Institution's Indirect Cost Rate _____

based on _____

Institution's Fringe Benefit Rate _____

2) Cost of Service Data (AMRS User)

a) Billing System Used _____

(i.e., relative value scale, unit value)

* AMRS User refers to the organization using the AMR system.

b) Typical Costs for Patient Visits

	Before AMRS	After AMRS
Brief visit	_____	_____
Extended visit	_____	_____
Comprehensive examination	_____	_____

c) Visit Data

Average number of visits per patient per year	_____	_____
Average number of lab tests per visit	_____	_____

d) Decision Makers for Visit Fee Structure

Parent organization _____

AMRS user _____

3) AMRS Finances

a) Source of AMRS Operating Funds

	$ Estimate per/_____ or % of Support
Direct funding from parent organization	_____/_____
User charges (describe):	_____/_____
_____	
_____	
_____	
Subsidies (describe, e.g., free computing time from the computer center):	_____/_____
_____	
_____	
Grant or contract support (describe):	_____/_____
_____	
_____	
Parent organization/overhead	_____/_____
Other (describe):	_____/_____
_____	
_____	
_____	

b) Budget Management of the AMRS

	AMRS Budget	Computer Use Charges
Degree of budget control/flexibility		
No control within system	_____	_____
Some control	_____	_____
Primary control	_____	_____
Complete control	_____	_____

Comments: _____

_____

_____

Identify the fiscal decision makers		
Hospital administrator	____%	____%
Clinic director	____%	____%
AMRS facility manager	____%	____%
Other (specify)_____	____%	____%

c) Independence of the AMRS

Self-supporting: Now / Eventually / Never

If eventually, estimate how soon _____

General Comments on AMRS Finances: _____

_____

_____

4) Nature of Medical Record System *Prior* to Automation (to provide a frame of reference for measuring benefits accruing from the AMRS)

Manner of Preparation	Handwritten / Typed
Locus of Storage	Centralized in parent organization / Separate storage
Identification Method Used	Unique patient ID number for continuing health care / Separate patient ID number for each visit
Medical Record Format	Well organized / Some standardization / Disorganized collection
Estimate of total operating costs of the medical record system *prior* to automation	_____

5) Expected Changes in AMRS Operations

Are any changes expected that will affect volume of activity? Describe changes and note expected date of change.

_____ Date _____

_____ Date _____

6) Timing of the AMRS Development

When did the original development begin? Date _____

How long did the development period last? _____

What would be the expected start-up time for another application of the AMRS? _____

When did/will the AMRS become operational? Date _____

Note other significant dates in the development and installation of the AMRS.

_____ Date _____

_____ Date _____

_____ Date _____

c. COST ANALYSIS

1) Development Costs (Obtain estimates if actual figures are not available.)

		Amount
Labor	_____	_____
	_____	_____
System Development	_____	_____
	_____	_____
Equipment	_____	_____
	_____	_____
Consultants	_____	_____
	_____	_____
Other	_____	_____
Fringe Benefits on Labor	_____	_____
Total Direct Costs - Development		_____
Indirect Costs Based on	_____	_____
TOTAL DEVELOPMENT COSTS		_____

Major Sources of Development Funds — Amount

_____ _____

_____ _____

_____ _____

Estimate of Ongoing Development Effort

Labor _____ _____

_____ _____

Computer Usage _____ _____

_____ _____

Other _____ _____

Fringe Benefits _____ _____

Total Direct Costs _____ _____

Indirect Costs Based on _____ _____

TOTAL ONGOING DEVELOPMENT COSTS _____

2) Investment Costs (One-time costs incurred for the adoption of the AMRS.)

Amount

Labor _____ _____

_____ _____

_____ _____

_____ _____

Fringe Benefits _____ _____

TOTAL LABOR _____

Training (describe): _____ _____

_____ _____

Equipment

Computer _____ _____

Terminals _____ _____

Other (i.e., office) _____ _____

_____ _____

Supplies _____ _____

Documentation (handbooks, procedures, etc.)

_____ _____

System Costs (software acquisition, other)

_____ _____

_____ _____

	Amount
Consultants _____	_____
Facilities (site preparation	
_____	_____
Other _____	_____
_____	_____
TOTAL INVESTMENT COSTS - DIRECT	_____
Indirect Costs _____	_____
TOTAL INVESTMENT COSTS	_____

Note major funding sources, if applicable.

_____ _____

_____ _____

3) Operating Costs

It is important to identify all costs associated with the AMR system, including costs incurred outside of the AMR facility, such as labor costs relating to the initial data gathering. For each category of operating costs an inquiry should be made as to whether all cost elements have been identified, particularly with respect to activities being performed outside of the AMR facility or to equipment located outside of the facility. Costs reported should be current annual costs.

	AMR Costs System	AMR Costs User	TOTAL* User Costs
Labor (List by major category; identify number of FTE's in each.)			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Subtotal Labor	_____	_____	_____
Fringe Benefits _____	_____	_____	_____
TOTAL LABOR	_____	_____	_____

* If the AMR system serves more users than the one under review, an allocation of total system costs will be made to the user under review based upon percentage of use, or other appropriate methods. Note basis for allocation:

_____

	AMR Costs System	AMR Costs User	TOTAL* User Costs
Computer Hardware (Details on the specific computer configuration to be obtained from the Technical Protocol)			
Computer Costs: Rent/Depreciation	_____	_____	_____
Service bureau	_____	_____	_____
Maintenance costs	_____	_____	_____
Terminals: Rent/Depreciation	_____	_____	_____
(#)_____			
Maintenance costs	_____	_____	_____
Computer Software (Describe):			
_____	_____	_____	_____
_____	_____	_____	_____
Other System Equipment/Services (e.g., telephone lines, WATS, etc. used exclusively for the AMRS)			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Supplies (List by major category)			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Facility Expenses (Costs associated with the AMRS but not recovered with indirect costs, e.g., extraordinary utilities or rent)			
_____	_____	_____	_____
_____	_____	_____	_____
Consultants _____	_____	_____	_____
Special Service Contracts			
_____	_____	_____	_____

* If the AMR system serves more users than the one under review, an allocation of total system costs will be made to the user under review based upon percentage of use, or other appropriate methods. Note basis for allocation:

_____

	AMR Costs System	AMR Costs User	TOTAL* User Costs
Other (Travel, employee replacement costs, training, administrative telephone)			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
TOTAL DIRECT COSTS	_____	_____	_____
Indirect Costs _____	_____	_____	_____
TOTAL COSTS	_____	_____	_____

Comments (Note anything special with respect to the operating budget.)

_____

_____

_____

_____

_____

4) Comparison of Actual Costs to Expected Costs

a) Current costs are less than / about the same as / more than estimated.

b) What is the approximate amount of the difference? _____

5) Expected Future System Costs

a) Future costs are expected to decrease / remain the same / increase.

b) Projections of future changes:

Percent change or amount _____

Expected date _____

Reason for change _____

* If the AMR system serves more users than the one under review, an allocation of total system costs will be made to the user under review based upon percentage of use, or other appropriate methods. Note basis for allocation:

_____

6) Allocation of Costs and Inputs to Services and Outputs

Consider the special relationships between system services and system outputs. Determine whether any costs are specifically related to a unique system service or output. For example, a terminal at an admissions desk would be used only for admission. Use data gathered on pages 9-10 of the Objectives Protocol.

System Input	System Service	System Output

For those costs that are applicable to more than one system service or output, determine a reasonable method for allocating the costs to the services. For example: size of data base, volume of input, volume of output.

System Input	Relevant Services and Outputs	Allocation Method

7) Data on AMRS Operating Levels

Obtain input/output volume, number of transactions, volume of reports, number of users, patient census, number of patient visits, etc. Use data gathered in Section 1.b. of the Objectives Protocol and in Section 8 of the Technical Protocol. Use whatever data the site has to offer. If data are not available for Items (3) and (4) below, obtain subjective estimates.

a) Current Level _____

_____

_____

b) System Capacity _____

_____

_____

c) Future Projections _____

_____

_____

d) Estimate of Current Level of Operations in Relation to Planned or Expected Level

_____

_____

_____

8) Average Annual Income/Salary for Health Manpower Personnel

For the economic evaluation standardized salaries will be used. All categories of personnel directly involved with the provision of health care should be included.

	Average Annual Income/Salary
Physicians	_____
Physician Assistants (including nurse practitioners)	_____
Nurses	_____
Aides	_____
Technicians	_____
Clerical Personnel	_____
Other (specify) _____	_____
_____	_____

d. BENEFIT ANALYSIS

1) Tangible Benefits

a) System Cost Savings

The listed categories have the same definitions as those in the cost analysis. Record the costs of the manual record system no longer being incurred, or note any increased costs.

	Amount
Development Costs (No savings expected)	_____
Investment Costs (No savings expected)	_____
Operating Costs	
Labor (Decreases due to the introduction of automation)	
Equipment substituted for labor /	
Increased productivity due to speed and accuracy /	
Other (specify)_____	_____
Equipment (No savings expected) _____	
_____	_____
Supplies (Paper costs and filing supplies no longer needed for paper/manual record)	
_____	_____
Consultants, Travel, and Communications (No savings expected)	_____
Facility Expense (May be increased or decreased depending upon the individual requirements of each system)	
_____	_____
_____	_____
Fringe Benefits_____	_____
TOTAL DIRECT COST SAVINGS	_____
Indirect Costs _____	_____
TOTAL SYSTEM COST SAVINGS	_____

b) Health Manpower Savings

	Health Services Providers			
	Physician	Physician Assistant	Nurse	Technician
Time Savings from:				
Data entry	_____	_____	_____	_____
Record review	_____	_____	_____	_____
Elimination of clerical tasks	_____	_____	_____	_____
Other (specify) _____	_____	_____	_____	_____
TOTAL	_____	_____	_____	_____
Use of Savings:				
More patients seen	_____	_____	_____	_____
More time per patient	_____	_____	_____	_____
More time for other duties	_____	_____	_____	_____

In the above table, estimate the number of minutes saved per appropriate unit (e.g., per week, per patient visit). Indicate unit of measurement: _____

For time savings, distribute total time saved among categories.

	Clerical Personnel
Time Savings from:	Amount of Time
Tasks performed faster due to AMRS	_____
Records located faster	_____
Elimination of error checks or corrections	_____
Other (specify) _____	_____
Disposition of Clerical Time Savings:	Amount of Dollars
Decrease in personnel _____	_____
Assignment of new duties	_____
Other (specify) _____	_____

Other Manpower Savings (Describe): _____

_____

_____

c) Patient Cost Savings

	Amount
Reduced cost of services performed:	
Reduced charge per service /	
Reduced deductible /	
Reduced subscription rates	_____
Fewer diagnostic tests and ancillary services	_____
Reduced waiting time for appointments	_____
Elimination of unnecessary visits due to the referral process	_____
Other (specify) _____	_____
_____	_____
_____	_____

d) Management Benefits (Secondary Cost Savings)

Reduction of lost charges

Billing procedures: Increased accuracy /

Increased speed, which leads to more timely collections, which leads to fewer bad debts and improved cash flow.

Claims procedures (third-party payments): Increased accuracy /

Increased speed.

Reduction in clerical tasks: Due to automation (e.g., elimination or reduction in accounting clerks) /

Due to improved work patterns.

More efficient use of resources: Space allocation /

Manpower scheduling.

Productivity increases (Increases in services with no increase in inputs brings in more revenue.)

Amount of Benefit (Show method of estimation):

_____	$ _____
_____	$ _____
_____	$ _____
_____	$ _____
_____	$ _____

2) Provider Intangible Benefits

a) Quality of Health Care (Direct Delivery of Care)

1. Relevant Health Care Processes — Identify System Features*

Patient Management:

Diagnostic tests _____

Treatment planning _____

Problem identification _____

Feedback to physician _____

Triage/Referrals _____

Other (specify)_____ _____

Patient Compliance:

Continuity of care _____

Response to treatment _____

Other (specify)_____ _____

Quality of Care Review:

_____ _____

_____ _____

2. Measures of Change

Increased information in the medical record
Number of errors in the record due to:
Transcription / filing errors / assignment errors
Availability of the record
Ease of finding data, readability
Comprehensibility of information in the record
Number of tests ordered: Variety / duplications / repeats
Number of accesses to the record or particular sections
Variety of persons accessing the record
Number of appointments made in response to reminders
Follow-up appointments scheduled, and kept
Length of treatment period, number of visits per treatment episode
Number of reports generated
Transfers of medical patient information among providers
Other (specify) _____

_____

3. Estimate of Benefit Achievement (with respect to quality) -1____+1

* Identify the relevant system features or outputs that contribute directly to the process, e.g., record content, legibility, accuracy, organization of the record, commonality of terminology, visit reminders, appointment schedules, and progress notes (refer to the Objectives Protocol).

b) Access to Health Care

1. Relevant Health Care Processes — Identify System Features*

Appointment scheduling _____

Patient follow-up _____

Administrative procedures _____

Other (specify) _____ _____

2. Measures of Change

Patient waiting time:
Length of registration process / wait from apointment time to service
Number of patient-initiated visits:
Drop-ins / appointments
Missed appointments:
No shows / rescheduled
Referrals to other providers
Frequency of appointments for periodic checkups or tests
Amount of administrative data collected at each visit
Availability of medical record at time of visit:
Time to locate the record / lost records / records lost temporarily

Other (specify) _____

3. Estimate of Benefit Achievement (with respect to access) -1____+1

c) Management Aspects of Health Care

1. Relevant Processes — Identify System Features*

Fiscal procedures _____

Financial management _____

Operations management (conditions) _____

Long-range facility planning _____

Long-range manpower planning _____

Utilization review _____

2. Measures of Change

Cash flow
New reports and methods of analysis
Employee morale

Other (specify) _____

3. Estimate of Benefit Achievement (with respect to management) -1____+1

* System features or outputs (e.g., visit reminders, automated registration, record retrieval, etc.).

** System features (e.g., accuracy, speed, analytical tools, availability of information, routine reports, special reports, etc.).

3) Societal Intangible Benefits

a) Technological Advancement in AMRS

Description _____

Relevant system features _____

Site visitor achievement score (between 0 and 1) _____

b) Quality of Care Review Methodology

Description _____

Relevant system features _____

Site visitor achievement score (between 0 and 1) _____

c) Research Activities (Access to Data and Information for Research)

Description _____

Relevant system features _____

Site visitor achievement score (between 0 and 1) _____

d) Training Activities (Use of Data and Information in the Development of Training Programs)

Description _____

Relevant system features _____

Site visitor achievement score (between 0 and 1) _____

e) Health Planning (Availability of Information for Regional and National Health Planning)

Description _____

Relevant system features _____

Site visitor achievement score (between 0 and 1) _____

4) Other Benefits

Describe additional benefits which relate to specific provider objectives and operating characteristics of the AMRS that are unique to the facility under review. Obtain a value or achievement measure as appropriate.

_____

_____

5) Expected Changes in Benefit Realization

Changes may be expected after

1) Users gain experience with the system,
2) The volume is expanded, and/or
3) Services are expanded.

Describe and obtain expected timing of change(s): _____

_____

_____

Dr. John V. Dervin
Dr. Jonathan E. Rodnick
Gio Wiederhold
M.I.S. - HRA Contract
University of California, San Francisco

IPCAMR-5

May 29, 1975

INTERVIEW GUIDE

CONTENT OF AUTOMATED MEDICAL RECORDS

INTRODUCTION

The purpose of this guide is the description of the content of the Automated Ambulatory Medical Record.

A format, which is based on the requirements of the problem oriented medical record is followed. Because of this structure data entries may be redundant, and the sequence of data items will not reflect the format of the stored records in the system.

Please circle appropriate items
cross out inappropriate items
group data in the most logically consistent manner

SITE: _____

SOURCE: _____

INTERVIEWER: _____

5 A

a. Quantitative Measures

The size of the patient identification record is fixed at/variable up to _____ characters.

The size of a visit record is fixed at/variable up to _____ characters.

At the initial visit up to _____ parameters may be collected, the average is _____. At follow-up visits up to _____ parameters may be collected, the average is _____. Approximately _____% of the information stored is medical in nature.

b Patient Identification

			Recorded by	Entered by
1	I.D. number	Social Security number or unit number with checkdigit or sequence number, or both family number		
2	name	full or abbreviated to ____characters, soundex		
3	address			
4	phone	home business		
5	sex			
6	date of birth or age			
7	marital status			
8	religion			
9	race			
10	education	level years		
11	occupation	free-text coded		
12	date when this information was collected/updated			

	Rec. by	Ent. by

c Financial and economic information

1 total bills — outstanding, aged, year-to-date

2 this visit — line itemized service amount
providers

3 billing — date, diagnosis, provider
detailed — line itemized,
retained — amount, discount, date paid

4 guarantor — relationship, amount

5 ability to pay — employment occupation ", phone", place, length
bank name, credit check

6 insurance carriers — name, type, code, date insured
insurance limits and conditions
automatic generation of third party bill complete
partial

d Data base
history of present illness/is not stored

Collected at
Health maintenance visit
Chronic disease visit
Normal acute visit
Emergency visit
Any visit

1 chief complaint coded
date of onset
severity
symptoms
coded/descriptive
detail: location, spread
onset type
quality
frequency
associated with . . .
preceded by . . ., time
relieved, made worse by . . .
other _____

2 active problems
date of onset
date of entry
problem name
problem code
severity
status (acute, chronic, preventive)

3 risk factors
smoking
alcohol
accidents

4 collector of information identified

" This data element repeated

e Data base
Past medical history/is not stored

1 Family history
family detail for
parents,
spouse,
children,
grand parents,
siblings,
number of children, size of household

relationship
year of birth
health status
chronic diseases
familial diseases
specific diseases
cause of death
age at death

2 Past diseases
coded as problem list
description
retention: all diseases
specific diseases only
chronic diseases
time ____

date of onset
diagnosis: coded
final date

3 Past hospitalizations
number
type of operation or illness
date
location
operative reports
discharge summaries for hospitals
full or abstracted

Coll. at	Rec. by	Ent. by

		Problem # indicated	Coll. at	Rec. by	Ent. by
4	Previous diagnostic tests (PPD, cholesterol, etc.) name code retention: time____ all ____most recent				
5	Immunizations name code retention: time____ effective period all ____most recent				
6	Allergies medicines negatives indicated name code environmental agents name code				
7	Current medications name code prescribed for ____ (problem) quantity frequency				
8	Past medications Rx quantity, frequency, patient compliance				
9	Diet type, detail, patient compliance				
10	Psychiatric general attitudinal detail				
11	Nutritional type of diet: descriptive, coded risks				
12	Collector identified "				

" This data element repeated

	Problem # given	Col. at	Rec. by	Ent. by
f Data base: Social history/is not stored				
place of birth, citizenship				
employment, income source, "				
size of household, "				
number of children, "				
level of education, type, highest or current grade, "				
primary language, ability to speak English,				
census tract, block,				
residence: length, adequacy, cost				
collector identified "				
g Data base: Review of systems/is not stored				
system name				
positive findings				
extent of detail summary-complete				
coded				
related to problems				
overall impression				
collector identified "				
h Data base: Physical examination/data are not stored				
retention of data last, all				
date				
height				
weight				
sex "				
race "				
risk factors "				
smoking				
alcohol				
accidents				
impression				
vital signs				
collector identified "				

" This data element repeated

Problem # given	Col. at	Rec. by	Ent. by

i Data base:
Objective findings of past medical history/are not stored

Retention of data: last, all, time ____,

1) routine laboratory orders, battery or specific, findings

2) special laboratory orders, findings

3) X-rays orders, anatomical site, report conclusion

4) EKGs, other cardiac tests orders, findings

5) EEGs, other neurological tests orders, findings

6) pulmonary function tests orders, findings

7) other medical tests: renal function, gastrointestinal, etc.

8) past memos orders, findings consultations comments to providers, suggestions to patient

9) source of order, etc. identified "

j Problem list/is not stored

active problems " (up to ____)
- date of onset (prior to visit)
- date of entry
- problem name, code
- diagnosis name, code if possible
- severity
- status

temporary problems

inactive problems "
- date of onset
- date of entry
- problem name, code
- diagnosis name, code
- merged with problem ____
- final date
- retention ____

" This data element repeated

(8)

Prob. # indictd	Rec. by	Ent. by

k Plans, diagnostic orders/are not stored

1 routine laboratory orders, battery or specific "

2 special laboratory orders "

3 X-rays order anatomical site"

4 EKGs, other cardiac test orders "

5 EEGs, other neurological test orders"

6 pulmonary function test orders "

7 other medical tests renal function " gastrointestinal, etc.

8 physician identified "

l Plans, therapeutic orders/are not stored

1 medications Rx " quantity, frequency

2 diet type, detailed "

3 patient education

4 physical therapy

5 occupational therapy

6 activity orders: descriptive, coded

7 nursing or home-care orders

8 physician identified "

" This data element repeated

	Prob.# indic.	Rec. by	Ent. by
m Follow up/data is not stored			
1 routine laboratory findings "			
2 special laboratory findings "			
3 X-rays report, conclusion "			
4 EKGs, other cardiac tests findings "			
5 EEGs, other neurological tests findings "			
6 pulmonary function tests findings "			
7 other medical tests: renal function, gastrointestinal, etc. findings "			
8 medications patient compliance general, by Rx "			
9 diet patient compliance "			
10 reassessment of problems delete, merge problems			
11 prognosis recovery time functional effectiveness long term care requirement			
12 disposition coded			
13 physician identified "			
n Progress notes/are not stored			
encounter forms coded, free form			
acute			
chronic for all, most, some diseases			
other _____			
physician identified "			

" This data element repeated

	Rec. by	Ent. by
o Patient services management/is not provided		
1 schedules for patient visits		
2 no-show rates, cancellation rates		
3 medication schedules for patient		
4 visit reminders for patient fixed interval dependent on diagnostic results		
5 staff schedules according to demand		
6 auxiliary service schedules		
7 chart review schedules		
8 patient compliance, promptness, etc.		
p Practice information/is not provided		
1 first contact with this practice or agency		
2 encounter sites type, code, mode of arrival		
3 referral self, MD, or other		
4 providers at encounter MD, nurse, PA, other		
5 encounter duration and frequency		
6 use of other facilities hospital, ER		
7 audit oriented data _____		

q Research oriented data

Many of the data categories listed above may be collected primarily for research purposes. It would be useful to indicate which elements are not used in any case-directed manner.

r Other comments

Diane Ramsey-Klee
HRA Contract
University of California

PEAA-2
Dec. 4, 1974

YOUR STRUCTURED APPRAISAL OF THE PERFORMANCE OF THE AMR SYSTEM

Contained in the following pages are 20 statements reflecting possible attitudes or opinions that users of an Automated Medical Record System (AMRS) might hold. You are being asked to carefully read each of these statements and then to place an "X" in the blank which most nearly reflects your opinion of your own AMRS, indicating the extent to which you agree or disagree with each statement. Please express an opinion on each statement even if you have never thought about this subject before in just this way.

The intent of this short exercise is to systematically explore what your subjective attitudes and opinions are concerning the impact on your institution of the AMR system. Your responses will remain anonymous and will be used only in the aggregate to provide a composite picture of the benefits that have accrued from the AMRS in your institution. *Thank you for your cooperation and valued assistance.*

Please return this questionnaire to any of the visiting group members or mail it later to:

Gio Wiederhold
Office of Medical Information Systems
A-16
University of California
San Francisco, Calif. 94143

SITE: _____

SOURCE: _____

INTERVIEWER: _____

PEAA-2

	Strongly Agree	Agree	Neutral Opinion	Disagree	Strongly Disagree
1. Medical record information is more accessible and available more quickly with the AMRS.	_____	_____	_____	_____	_____
2. As a result of the AMRS, I am able to do a better job.	_____	_____	_____	_____	_____
3. The performance of the AMRS falls short of what I expected.	_____	_____	_____	_____	_____
4. I could never go back to using the old manual medical record system now that I have been using the AMRS.	_____	_____	_____	_____	_____
5. The AMR system catches more human errors than the old manual system did.	_____	_____	_____	_____	_____
6. In my opinion the AMRS should never have been implemented at this institution.	_____	_____	_____	_____	_____
7. I never have to wait for necessary patient record information because the AMR system is down.	_____	_____	_____	_____	_____
8. In general, I like the AMRS better than the old system of medical record keeping, but there are some problems that need correction.	_____	_____	_____	_____	_____
9. If there were budget cuts at this institution, I would give up other services that I need before I would want to lose the AMRS.	_____	_____	_____	_____	_____

(Continued)

	Strongly Agree	Agree	Neutral Opinion	Disagree	Strongly Disagree
10. The AMR system has "goofed up" patient records more times than I care to remember.	_____	_____	_____	_____	_____
11. I truly feel that the quality of patient care has been improved as a result of the AMRS.	_____	_____	_____	_____	_____
12. From an administrative point of view, the AMRS provides timely data for making management decisions that were not available with the manual system.	_____	_____	_____	_____	_____
13. Patient scheduling and staffing patterns have been improved since the advent of the AMRS.	_____	_____	_____	_____	_____
14. The AMR system doesn't benefit me very much personally, but I can see how it can be a boon to other users.	_____	_____	_____	_____	_____
15. Patient satisfaction seems to be running higher since the AMRS was introduced.	_____	_____	_____	_____	_____
16. With the AMRS, I am able to get more done in a day.	_____	_____	_____	_____	_____
17. The medical records produced by the AMRS are more amenable to peer review and better meet PSRO requirements.	_____	_____	_____	_____	_____

(Continued)

PEAA-2

	Strongly Agree	Agree	Neutral Opinion	Disagree	Strongly Disagree
18. The confidentiality of the patient's record is more vulnerable in the AMRS than it was in the old manual system.	_____	_____	_____	_____	_____
19. I don't care what the AMRS costs to operate; we need it to handle our patient load efficiently.	_____	_____	_____	_____	_____
20. If the AMR system were to be taken out, I would be willing to pay a reasonable fee to get it back in service.	_____	_____	_____	_____	_____

The purpose of the following two questions is to provide classification information for the statistical analysis of responses to the questionnaire. Mark all categories that apply to you.

21. I am a system developer ☐
    user ☐

22. My function is management ☐
    medical ☐
    support staff ☐