



**Decision Model for Ranking the
National Cardiovascular Data
Registry's Contracted Vendors**



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National Cardiovascular Data Registry

Overview

With a mission to foster optimal cardiovascular care and disease prevention, the American College of Cardiology (ACC) has been a leader in the cardiovascular community since its charter in 1949. With a membership of over 24,000 cardiovascular physicians and scientists from around the world, ACC has been committed to improving cardiovascular care through training and education programs, establishing practice guidelines, and promoting medical research. The recently established National Cardiovascular Data Registry (NCDR or Registry) continues ACC's tradition in providing opportunities to improve cardiovascular care.

The NCDR's mission is to create the preeminent comparative database for assessing and improving the quality and outcomes of cardiovascular care. Its goals are:

- To provide timely, meaningful data for improving the quality and outcomes of cardiovascular care
- To standardize cardiovascular data reporting requirements for physicians and institutions
- To achieve recognition and appropriate use of Registry data elements, specifications, and analytical output among multiple audiences
- To facilitate systematic data collection and analysis of each participating physician, practice, and institution's experience and outcomes in relation to appropriate benchmarks
- To serve as a national repository for longitudinal data related to cardiovascular episodes of care

While the NCDR intends on becoming the comprehensive comparative database on all aspects of cardiovascular care, the Registry, as it stands now, is only designed to capture information on cardiac cath and percutaneous transluminal coronary angioplasty (PTCA) procedures performed in cardiac cath labs. Work on the cardiac cath module began in 1993 and was completed in 1997 with creation of Version 1.1 of the ACC-

NCDR's core data elements. The 141 core data elements in the cardiac cath module provide the foundation of the Registry and are designed to facilitate the collection of consistent data through the use of standard data elements, definitions, specifications, and collection procedures.

Previous Data Registry Attempt

Prior to the development of the cardiac cath core data elements, the only previous attempt to capture cardiac cath data was an unsuccessful joint venture between the ACC and Summit Medical Systems. In that incarnation, cardiac cath labs that used Summit Medical Systems submitted data to the ACC on their cardiac cath procedures. ACC then analyzed and reported the data in an annual report. This venture ultimately proved to be unsuccessful because only the approximately 400 cardiac cath labs using Summit Medical Systems were eligible to participate in the program and there were questions as to the quality of data being submitted to and reported by the program.

Because of the shortcomings of the previous program, the NCDR has employed a multiple vendor strategy, consisting of thirteen vendors including Summit Medical Systems. The NCDR hopes that by partnering with multiple vendors it will be able to attract a majority of the approximately 2,000 cardiac cath labs in the United States through the development of cardiac cath data collection systems that are compliant with Version 1.1 of the core data elements and through joint marketing efforts. The complete list of vendors contracted through January 4, 1999 is included in Appendix A.

Problem Scenario

The NCDR has experienced considerable variability in their associations with their contracted vendors. In the past year, two vendors, LifeRate Systems and Summit

Medical Systems, have left the cardiac cath software market, while two other vendors, Cedaron and ComputerWerk, have not developed software for the cardiac cath module or participated in any vendor related activities sponsored by the NCDR. Because institutions must use an ACC-certified vendor to participate in the Registry, many of the current vendors do not have a significant market share to attract institutions to the Registry. As a result of vendor shortcomings, the NCDR's multiple vendor strategy has not been as successful as anticipated.

As the contracts for all thirteen vendors expire on January 4, 1999, the NCDR needs to decide which vendors it should renew its contract. The first step in this process requires that the NCDR be able to rank its nine active vendors. A systematic ranking based on objective criteria may help decide which vendors best support the goals of the Registry. It is important for the NCDR to continue working with vendors that are attractive to both potential participants and work closely with the NCDR.

Analytical Hierarchy Process

Approach

Since Summit Medical Systems' decision to exit the medical software business and LifeRate's declaration of bankruptcy, the market support for commercial data collection software has become less clear, and appears somewhat riskier than was earlier perceived. As a result, senior leadership at the ACC charged NCDR staff with re-evaluating the relationships between vendors and the NCDR to help ultimately drive vendor contracting decisions. An initial evaluation revealed that comparisons among vendors were either too subjective or there was not enough quantitative data to make a clear decision. As a result, staff recommended that market forces should drive vendor selection and that all interested vendors would be contracted.

While the initial work of NCDR staff did provide a strategy for contracting with vendors, this situation could be better addressed by applying the Analytical Hierarchy Process (AHP) and Expert Choice. AHP provides a systematic approach to decision making by applying a "hierarchical structure showing the relationships of the goal, objectives (criteria), subobjectives, and alternatives."¹

In order to apply AHP in a decision support situation, the following process should be followed:

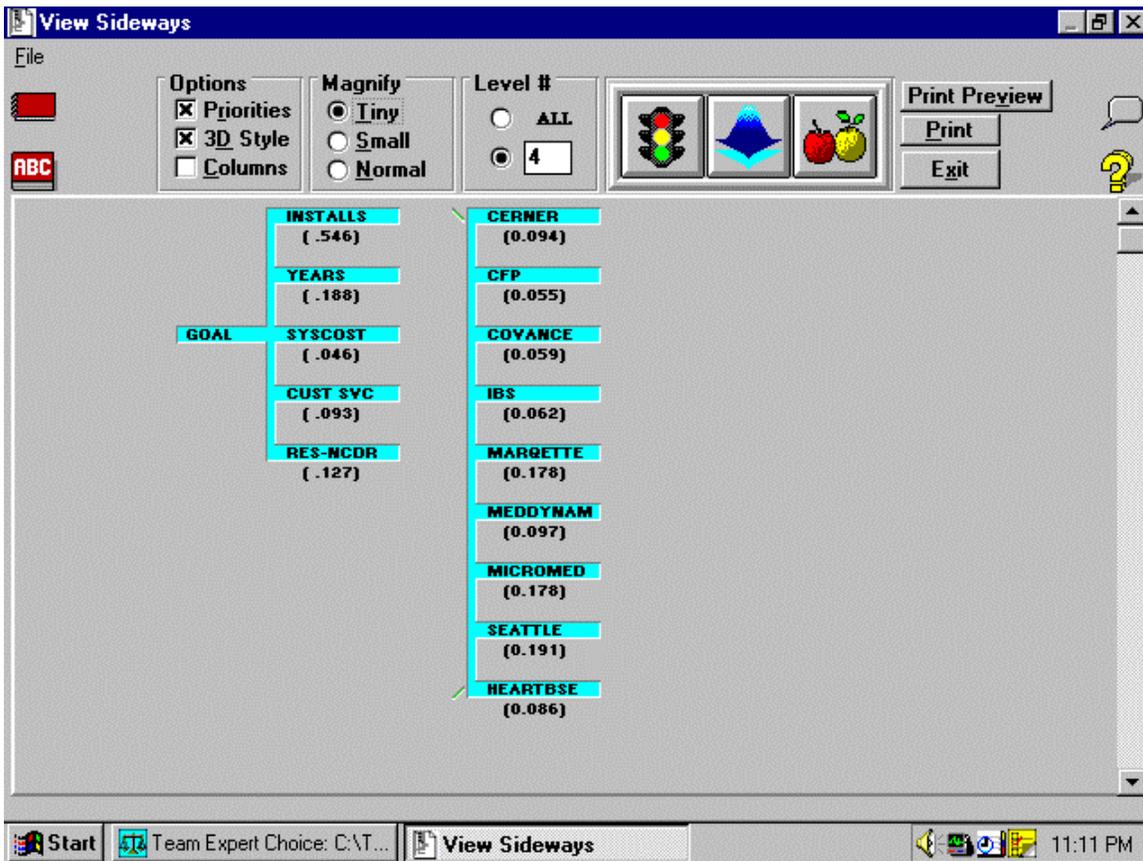
- Decompose the problem – develop a hierarchy
 - ⇒ Formulate a goal
 - ⇒ Develop objectives
 - ⇒ Consider all feasible alternatives
- Establish Priorities
 - ⇒ Through pairwise comparisons evaluate and prioritize all objectives and subobjectives

¹ Forman, E.H. (1996). Decision by Objectives. McLean, VA: author.

- ⇒ Evaluate the preference of each alternative with respect to the lowest levels of subobjectives
- Conduct sensitivity analysis
 - ⇒ Review and evaluate output of model
 - ⇒ Analyze what changes in the model may effect the outcome of the model

The hierarchical structure of the NCDR vendor situation is presented in Figure 1.

Figure 1 - NCDR Vendor Hierarchical Structure



Alternatives

It was decided that the AHP model would be used to evaluate the nine active remaining vendors to determine the ranking of vendors with respect to NCDR objectives.

A detailed description of each alternative specified in this decision model is presented below:

Cerner Corporation

Cerner Corporation is a leading provider of clinical and management information and knowledge systems for the healthcare industry worldwide. More than 1,000 clients representing over 1,600 individual sites use Cerner systems everyday, including Emory Healthcare in Atlanta, Georgia; Integris in Oklahoma City, Oklahoma; and Penn State Geisinger Health System in Harrisburg, Pennsylvania. Cerner's Health Network Architecture is the world's most comprehensive application architecture. It is a bridge to the new millennium built on a solid foundation of vision and experience that spans nearly two decades and four continents. In 1997, Cerner entered into the cardiovascular arena and developed CVNet. CVNet is one component of a fully-integrated, user-friendly cardiovascular information management system with multi-dimensional, multi-relational reporting capabilities.

Computerized Fiscal Planning (CFP)

CFP, Inc. has been providing software solutions for a variety of business and clinical applications since 1978. At present, approximately 250 businesses are using CFP software. In 1984, CFP teamed with the Cardiology Division of The Ohio State University Hospitals to design the original, modifiable MedInfo database system. Since then, MedInfo CS has become even more adaptable, has received ACC-certification and has been installed at a dozen healthcare facilities throughout the country. Users have complete control over the contents of their databases, designing the questions, possible responses and screen appearance, and modifying them as needed, without expensive outside help. The cost for this uniquely adaptable product is \$275,000. A special ACC-only offering is available for Ohio hospitals - call CFP for details.

Covance

Covance Health Economics and Outcomes Services Inc. is a leading developer of software applications for measuring and evaluating practice patterns, product utilization, and patient outcomes of care. Our Quality Assessment and Improvement Systems (QAIS) division (pronounced "case") specializes in helping health care providers, managed care organizations, and product manufacturers collect, analyze, and report performance data in clinically, statistically, and meaningful ways. QAIS Manager™ ACC-NCDR™ Edition -- designed exclusively for cardiac cath labs -- tracks, analyzes, and reports clinical outcomes on the American College of Cardiology's National Cardiovascular Data Registry™ (ACC-NCDR™) core data elements. This stand-alone, Windows-based software application is priced to be the most cost-effective way to

participate in the ACC-NCDR™. To purchase QAIS Manager™ ACC-NCDR™ Edition, please call the QAIS Manager™ marketing department toll free at 888.508.8086.

IBS

Intelligent Business Solutions, Inc. (IBS) has been developing Cardiovascular Information Systems for over 10 years. Eleven sites make up our existing Heart Center client base including well-known institutions like Wake Forest University Baptist Hospital and The University of Virginia's Medical Center. Our flagship product "CAOS - Heart Center" covers the electronic patient charting, documentation and informatic needs of an entire Heart Center. In the spring of 1998 our Cath Lab module was certified by the ACC as ACC-certified software. The pricing for CAOS begins at \$25,000.

Marquette Medical Systems

Founded in 1965, Marquette Medical Systems is the world's largest supplier of ECG databases. Over the past twenty years, we have built Cardiovascular databases, including the MUSE CV, utilized by four hundred of the five hundred major hospitals in the world, and we are the global leader with over 1,800 installs worldwide. In addition to our MUSE ACC Module, certified by the (ACC) American College of Cardiology to submit to the (NCDR) National Cardiovascular Data Registry, many Marquette Medical Systems MUSE CV Systems are used to populate existing hospital database repository and other systems used for data analysis and review. Marquette has been managing thousands of customer databases through the process of database conversion, modification, and upgrading for over twenty years and has considerable experience with database integrity and confidentiality issues. Our ACC module is more than just ACC certified software. It automatically populates ACC prescribed fields from hemodynamic systems and HIS, making Registry participation virtually effortless and highly cost effective. The Marquette Medical Systems MUSE CV System is FDA 510K approved and ISO 9000 compliant, which insures stringent design documentation guidelines and controlled testing.

Medical Dynamics

Medical Dynamics, SC markets software and imaging products to Cardiac Cath Labs. Prominent clients include Wake Heart Center, University Hospital, and Duke University Hospital. Medical Dynamics, SC was founded in 1990 and has been marketing the current product line since then. The Orion-ACC product can be both a standalone system (\$4,800) or part of the Orion family of Cath Lab data management system (price depends on options selected). Medical Dynamics, SC has some form of product in over 200 Cath Labs.

Micro Medical Systems

Micro Medical Systems is a national supplier of Oracle based multi-site multi-modality cardiology integrated information management systems. Over the last six years, MMS has installed systems in more than 50 sites across the United States. Many of the CardioNet implementations focus first on Cath lab automation before adding EP, Echo, EKG, Surgery, Rehab, Holter, Nuclear, Stress, Vascular, or other CardioNet modules. Although fully integrated multi-site, multi-module implementations of CardioNet can cost hundreds of thousands of dollars, ACC certified ACCAccess, introduced at ACC in

March of 1998, is free for demonstration and costs only \$500.00 per year unsupported or \$2500.00 per year fully supported including a reports package. ACCAccess can stand alone as a fully functional database solution with data import options from existing databases or Cath lab systems, or integrate with CardioNet and other MMS point of care data collection solutions.

Seattle Systems

Seattle Systems offers two ways to participate in the ACC-NCDR(tm). The Apollo(TM) suite of clinical information management software functions as an integrating bridge between the central HIS and clinical subsystems across the continuum of cardiovascular care. Offering a full range of features, Apollo gathers and merges imaging, hemodynamic, and patient demographic data to produce statistical analyses of clinical and cost outcomes, and clinically rich longitudinal electronic medical records. Used in four out of ten of the nation's top 40 cardiology centers, (as identified by U.S. News & World Report), Apollo is ideal for heart centers requiring software with comprehensive data management capabilities as well as registry participation views. A limited-function registry participation software application is also currently in development. This program will allow smaller sites to use Seattle Systems technology to participate in the ACC-NCDR without the investment required by the Apollo parent product.

SIR Americas - Heartbase

Heartbase provides integrated, longitudinal, clinical and financial outcome-based cardiac disease state management systems. We offer a compelling solution to the burgeoning demand for timely, comprehensive and sophisticated information requested by healthcare providers, payers, patients, registries, and medical suppliers. Heartbase has evolved from over 15 years of collaboration between clinicians, nurses, physicians, and biostatisticians, who are involved in extensive research at the San Francisco Heart Institute and the Indiana Heart Institute. Benefits afforded to the users of Heartbase include: improved patient care, significant payback opportunities, registry reporting (ACC, STS-certification pending, DCNHS, and NCN), distinguished and validated competitive advantages, hospital accreditation, and litigation support. Heartbase is in over 25 institutions ranging in size from 300 to over 20,000 procedures per year. Pricing is available on request.

Decision Model

In formulating the decision model, goals and objectives were developed. Figure 2 depicts the Vendor Decision Model.

Goal

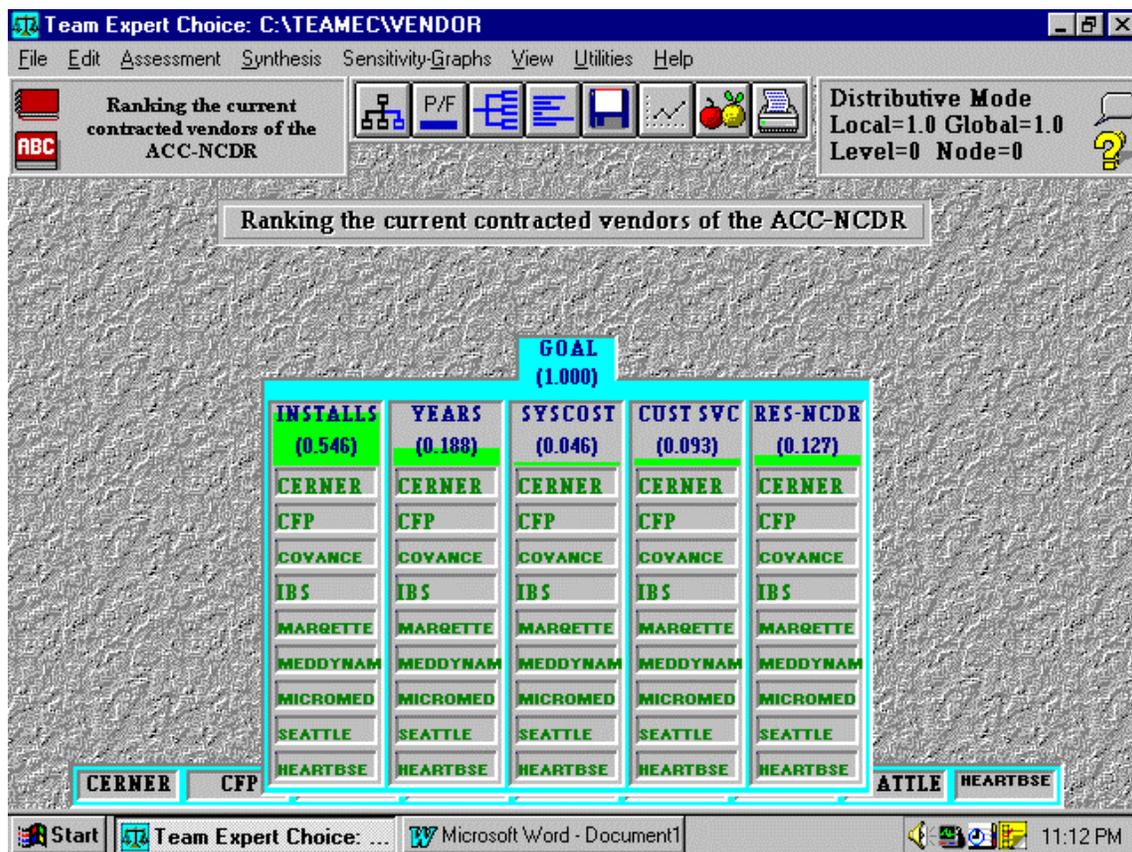
The goal of the decision model is to rank the contracted vendors of the NCDR.

Objectives

The objectives of the model that most closely support the goal are as follows:

- Installs – Number of cardiac cath installations
- Years – Number of years in the software development business
- Cost – Cost of the NCDR System
- Cust Svc – Customer Service/responsiveness
- Res-NCDR – Responsiveness to NCDR requests

Figure 2 - Vendor Decision Model



Results

Weight by Objectives

As a result of the development of the AHP model and the results of the pairwise comparison of each objective, weights were developed for each of the objectives. The weight of each objective reflects the impact/importance of a particular objective to the overall goal.

The following table presents the associated weight for each objective:

Table 1 – Weight by Objective in Vendor AHP Model

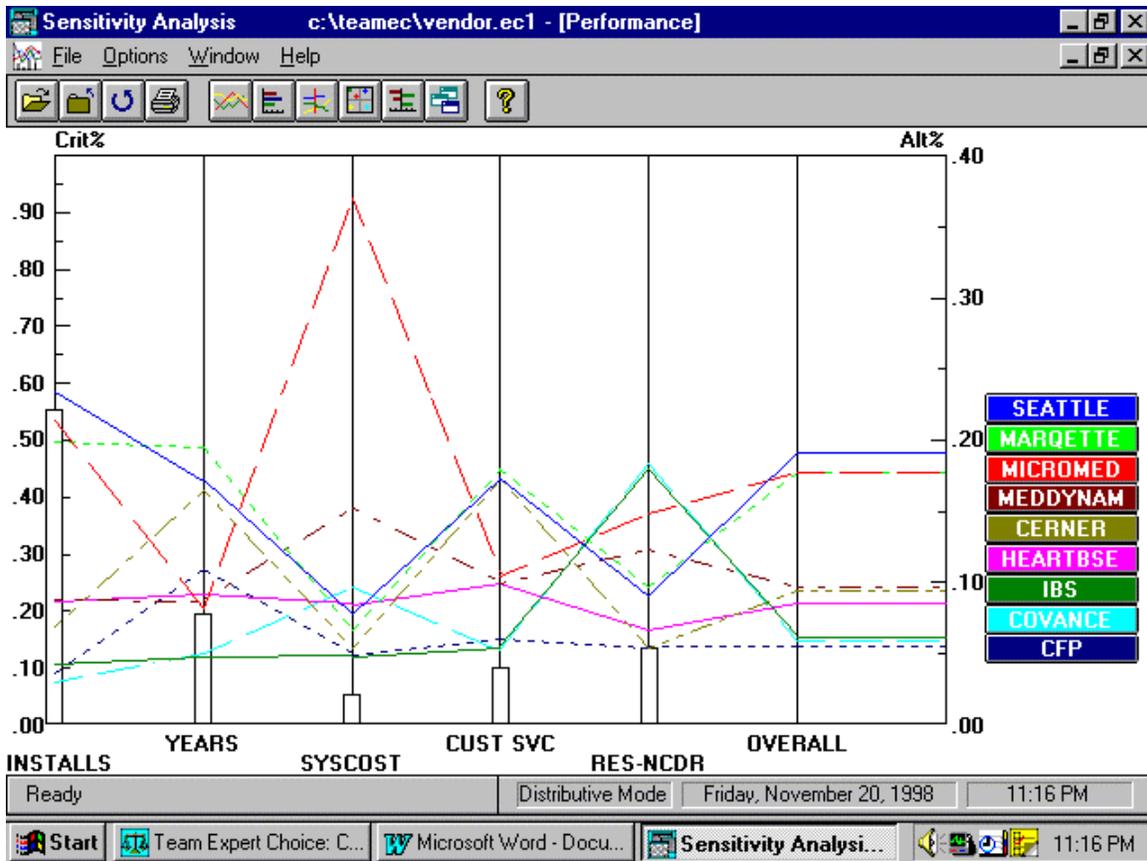
Objective	Weight
Installs	0.546
Years	0.188
Cost	0.046
Cust Svc	0.093
Res-NCDR	0.127

Not surprisingly, installs were by far the most important objective in the model, followed by the years in business, responsiveness to the NCDR, customer service and cost of the system. Intuitively, NCDR staff knew the number of installs was the most important criteria because the success of the Registry depend highly on enrolling institutions that collect cardiac cath data using a certified vendor. Surprisingly, responsiveness to the NCDR by participating in co-marketing efforts and policies was considered to be very important. The weights developed by Expert Choice were able to quantify the impact of the objectives that were previously unknown to staff when developing the initial vendor strategy.

Ranking of NCDR Contracted Vendors

From the results of the AHP model (see Figure 3), it is clear that the NCDR currently has three tiers among its vendors. The top tier consists of Seattle Systems, Marquette Medical Systems and Micro Medical Systems. The middle tier is composed of Medical Dynamics, Cerner, and SIR Americas-Heartbase. IBS, Covance, and CFP make up the bottom tier.

Figure 3 – Vendor Sensitivity Analysis



It is apparent that the top tier of vendors are those that have or are projected to have substantial share in the cardiac cath lab market. The impact of installations clearly derives the outcome of the analysis. The outcome of the analysis might be considerably different if the model weighted other objectives more strongly and reducing the impact of

the installation objective. For example, if system cost was the primary objective in evaluating and ranking vendors, Micro Medical Systems would be the runaway leader among the current vendors. By conducting additional sensitivity and “what-if” analyses, the model can help refine and shape the current vendor strategy.

Conclusion

The NCDR is committed to a partnership with software vendors to develop cardiac cath software that participating institutions must use in order to join the Registry. However with the dynamic changes in the vendor market, the NCDR must be careful in selecting vendors that are committed to the being market and are capable of supporting the Registry. The NCDR needs to maintain a decision support algorithm that allows the evaluation of contracted and prospective vendors in this highly complex decision. As the results of this model show, there are various strata of vendors currently under contract with Registry. NCDR leadership need to critically evaluate these results and determine which vendors should be maintained with the Registry.

Appendix A

Contracted Vendors through January 4, 1999

Cedaron

Cerner

ComputerWerk

Computerized Fiscal Planning (CFP)

Covance

Intelligent Business Solutions (IBS)

LifeRate

Marquette Medical Systems

Medical Dynamics

Micro Medical Systems

Seattle Systems

SIR Americas-Heartbase

Summit Medical Systems