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PROVIDERS CHOICES IN WEB-MEDICAL RECORDS: AN ANALYSIS OF
TRADE-OFFS MADE BY PHYSICIANS IN SAN BERNARDINO COUNTY

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Business Administration

by
Jay Eriah Shankar

June 2002

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ABSTRACT

Electronic Medical Records are increasingly being considered by health providers as a way of improving documentation and availability for better quality of patient care. Security and privacy are important issues for which workable solutions are predicted in the next 2 years. A study of San Bernardino County's physician preferences in web-based medical records was done to know perceived needs of that county's physicians for web-medical records and complementary technology. A cross-sectional Web-based survey targeted to the county's physicians with access to the Internet was employed. Through a convenience sample of those responding we studied their overall choices on 14 combinations of factors (services—including pricing, and products) presented them. JMP statistical software was used for a conjoint analysis, and respondents salient demographic variables were used to also do a cluster analysis. Of the 48 responding, 6 groups were identified by their trade-offs and demographics. The two largest were groups 1 (34%) and 2 (25%). Average utility scores (u.s.) from the conjoint analysis were largest for a desire for uploading records (u.s. = 3.4) and wireless access (u.s. = 3.16). Overall, almost one-half (48%) of the doctors responding

liked dictating their information to be transcribed. Most physicians studied demonstrated clear preferences by groupings of doctors that were independent from each other. About one-half preferred dictation transcription while the others liked templates and PDA generated medical records. We concluded that offering physicians appropriate Web-based transcription service should be well received and improve their medical record management and patient care.

ACKNOWLEDGMENTS

There are three people whom I must acknowledge for the success of this project. The first is my mentor and research advisor Nabil Razzouk, Ph.D. I am eternally grateful to him for his patience and wisdom as he guided me throughout my MBA program and definitely this thesis. James Wilson, MS (Computer Science-UCLA), MS (Mathematics-MIT), is second person that proved to be indispensable to the success of this effort. His skill in setting up and analyzing the web-based survey was amazing. M. Anthony Frankson, MBBS, MPH, the third person facilitating my success in this project, was frequently available to offer his guidance and ability to make the statistical results comprehensible and practically applicable.

DEDICATION

I dedicate this thesis to my wife Suguna, my daughter Rashmi, and my son Varun. They were very understanding and supportive of me as I plodded through this adventure to its completion.

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CHAPTER ONE

BACKGROUND

Introduction

Medical practice has over time become a multi-specialty discipline for any one individual in need of health care. While medical care with its already daunting demands is still mostly episodic the emphasis is increasingly shifting to lifetime patient care and prevention. In such an environment it is very important that patient care information be promptly documented and again made easily available to that person's provider(s). As the challenges of patient's disease prevention and management of chronic illnesses have been added to this scenario physicians are endeavoring to meet these challenges by attempting to "access 'best practices' and a vast array of information at the point of medical care delivery" (Frisse, 1998, p. 26). Health status documentation is therefore increasingly needed for continuously improving the quality of care as providers responsibly evaluate and manage today's patients. In addition, the modern trend toward managed health care (in the interest of cost containment) with its emphasis on shorter duration of stay in hospital for ill patients has

further compounded the urgency for having quickly available and adequately documented medical records. Such documentation is also vital for satisfying today's regulatory agencies and payors. This has led physicians to be heavily burdened with paper work required of them to document patient care details.

Presently, the reality is still that most physicians typically document medical information manually in records or dictate relevant information that then is formally transcribed by a transcription service into the official medical records. It may take anywhere from 2 days to weeks for a typical transcription service and others compiling the hard copies of complete (legible, spelling mistake free, and presentably ordered) information to have such records available to the physician involved in a particular patient's care. Because of this we became interested in this project as a part of the lead investigator's graduation requirements for the Masters in Business Administration (MBA) degree course conducted by California State University San Bernardino (CSUSB) and with the cooperation of the San Bernardino County Medical Society (SBCMS). We found that a significant number of the members of the SBCMS were interested in arriving at

feasible answers that facilitate a modern strategic management based solution to this challenging situation.

Several physicians are now turning to hopefully helpful tools of modern technology for assistance that could offer them improved documentation in medical records in convenient ways that enhance both legibility and real time accessibility. One such technological aid that a growing number of physicians are proactively taking the lead in to address this matter is the modern computer. Not only is the modern computer progressively becoming an essential part of today's physicians practice, but more and more physicians are also becoming accustomed to using this device to expedite their health care related projects with word processing, electronic mailings and internet/web-based searches among other features. With the incorporation of recently developed systems that are more secure and that, therefore, complement efforts at confidentiality in transmitting and handling patient information, the time may now be right for physicians to use the internet to greatly improve the ease with which they can get their data promptly transcribed, plus access their patients data from even a wireless PDA or cell phone, and thereby obtain information that could improve patient care.

Along with such technology doctors may also be able to use telephony to call in to have selected patient records sent to a nearby facsimile (fax) machine, make toll-free calls for dictations and gaining of access to patient records, upload existing records into a designated system, and even do sophisticated searches on individual records or a set of patients data. Such services could be possible at various monthly fees and transcription could also be billed at one of several amounts per line of text completed. Some of these devices and services in combination may be less or better suited to these professionals patient management needs and preferences. However, although a growing number of doctors in San Bernardino County are becoming quite familiar with each of these options individually very few may have ever considered them in various combinations based on practical and distinct attributes of the factors involved.

Health care marketing researchers have long known that studies involving the obtaining of targeted people's overall responses to multiattribute alternatives can be usefully assessed and validated using conjoint analysis (Rosco, DeVita, McKenna, & Walker, 1985). Conjoint measurement and analysis could throw light on the utility of each of the attribute levels of products and services

like those just mentioned above. No one has as of yet applied this technique to acquire health care marketing information on that county's health care providers perceptions of optimum combinations of such above mentioned products and services that would enhance care through improved patient record documentation (including transcription) and access.

Problem Statement

Presently there exists a lack of information on combinations of such factors that would be perceived by physicians in San Bernardino County as time saving, otherwise enabling efficiency, and decreasing hassle should a web-based transcription and medical records system be made available to such providers who are willing to use available computer technology for this purpose.

Purpose

With the intent of using a suitable measurement approach that allows data on trade-offs with products and services to be analyzed and so increase the availability of such information for San Bernardino County, the MBA student submitting this paper identified two helpful associates skilled in such procedures as research associates in this project. Throughout this thesis this

team is referred to as we. He led this team with the purpose of arriving at preliminary credible answers about which combination of dictation transcription services, record searching capabilities, and related pricing structures would be preferred by most physicians in this county. To arrive at such answers we also incorporated a cluster analysis that allowed us to reliably group responding physicians and then examine the utility of the products and services offered to them.

Scope

This project has been directed at all physicians working in San Bernardino County who have access to the Internet. Our assumption is that this includes more than 50 percent of the practicing physicians. The majority of these physicians are members of the San Bernardino County Medical Society. Although all such providers are potentially included, those responding may not be a sufficiently random selection since participating is voluntary. Results from this study should, therefore, be regarded as preliminary and should be generalized with care; this being evidence based on a convenience sample. We carried out this study during the summer of year 2001 and because changes in the technology associated with the

factors whose preferences we evaluated are occurring rapidly this also constrains the study's external validity in upcoming years.

Limitations also included the time period delimiting a more extensive study of the phenomenon of interest, and minimal funding. Despite these constraints we hope that those interested in the approach and findings presented and discussed below will be able to use them for bettering strategic management decisions that result in improved health information management and patient care. To this end, we next present our review of the relevant literature, the methodology we employed, results from the conjoint and cluster analyses we did, a discussion that explicates the findings, and our conclusions.

CHAPTER TWO

REVIEW OF THE LITERATURE

Electronic Medical Record Issues

Physicians have long known that availability of current, reliable medical information has always been central to the practice of medicine. Sir William Osler, a well-respected physician of over 100 years ago, would have been pleasantly surprised with the extent to which medical documentation is required in today's world. He was a strong supporter of the accessing and using of current medical information. To him, one who couldn't do so "flounders along in an aimless fashion, never able to gain any accurate conception of disease, practicing a sort of popgun pharmacy, hitting now the malady and again the patient, he himself not knowing which" (Frisse, 1998, p. 26).

Medical informatics is the name given to the ever-increasing practice of professionally making medical information available. Commenting on the present status of medical informatics among internal medicine specialists Frisse states the following. It is a verity for other medical practitioners as well.

The telephone, the textbook, and the paper-based medical record remain the dominant forms of

medical communication, but they are often inadequate to meet the information needs of physicians. The rapid evolution of computer and communication technology holds the potential to be invaluable support to the management of patients in the modern medical care setting. Widespread availability of relatively inexpensive computers and network-based communication technologies promises secure, ubiquitous access to all types of information relative to patient care, health care administration, and professional education. ... Currently", however, "these technologies and information resources are at different stages of maturity and are not well integrated, and the practice of ... medicine finds itself in a period of great transition from an era characterized solely by paper, voice, and telephony to a new era in which these methods of communication are enhanced or supplemented by digital communications. Information technology has the potential to change every aspect of medical communication, from traditional "curbside" medical consult to the provision of continuing medical education. In some areas of medical practice systems are already in place in many clinical settings. (Frisse, 1998, p. 26)

The time now seems be right for physicians to better use such modern technology in this arena to greatly improve the ease with which they can access their patients data and improve patient care. Already one recent study done by Hospitals and Health Networks, and Deloitte and Touche revealed that "many U.S. hospitals are using the Internet to communicate with employees, patients, suppliers, and insurers" (Solovy & Serb, 1999, p. 43). Findings from that study indicated that "the most wired hospitals were using the Internet and the Web to provide

health information for chronically ill patients and "using computer-based patient records, physicians will be able to communicate with one another as well as with pharmacists" (Solovy & Serb, 1999, p. 44). The investigators with that study foresaw that such a "network will allow patients to access their own health information and communication with providers from home" (Solovy & Serb, 1999, p. 45). Indeed, several of these possibilities are already being realized in even Internet-based digital medical libraries and computer-based medical records, to name two such areas.

Probably because most physicians are presently unaware of such developments some researchers are still, however, reporting that the majority of today's "physicians would not consider using a computer during an office visit and would not take the time to transcribe their notes on a keyboard after the visit" (Mittman & Cain, 2001, p. 47). These authors remind us that the reality is still that medical "providers are at the beginning of a slow transition toward electronic medical records [EMRs]" (Mittman & Cain, 2001, p. 53). Computers, they observe, are still mostly used "in medical offices and hospitals are for administrative rather than clinical functions" (Mittman & Cain, 2001, p. 55). These authors have noted that it has typically been in departmental

"islands of information," that clinical functions of computers have been mostly used (Mittman & Cain, 2001). Usually this has been in the pharmacy, lab, and radiology departments as systems that are usually "homegrown and proprietary" (Mittman & Cain, 2001, p. 57).

These researchers estimate further "that fewer than 5% of physicians are now using a comprehensive electronic patient record" (Mittman & Cain, 2001, p. 61). Some institutions have led the way by developing "their own Web-based front-ends for their electronic medical records" (Mittman & Cain, 2001, p. 70). Examples of such institutions are Wishard Memorial Hospital and Clarian Health Partners (Indianapolis), University of California (San Diego), Columbia Presbyterian Medical Center (New York), University of Washington (Seattle), Care Group (Boston), the Mayo Clinics, and Centre Hospitalier (Rennes, France, & McDonald, 1998).

"Most of these systems get information from legacy information systems, localized database server systems that reside onsite, and present it on a browser front-end. They do not integrate data from across legacy systems, but simply present it in a consistent format" (Mittman & Cain, 2001, p. 72).

However, it has been thought by some that technology like the Internet possessing the "ability to distribute a message across the world in only a few seconds leads to powerful and sometimes disruptive changes in society" (Frisse, 1998, p. 27). Few would deny that despite the fact that "physicians are well trained not to discuss the affairs of their patients when in elevators or other public places, new communication technologies allow these same individuals to discuss confidential matters over discussion forums, e-mail, or newsgroups" (Frisse, 1998, p. 27). Also, too frequently "authors of sensitive documents write impulsively without giving thought to the damage that may result if a message to a colleague is intentionally or unintentionally distributed to a wider audience" (Frisse, 1998, p. 27). Unfortunately, it is still true that although technology is quickly evolving in most modern computer systems security is still a problem since as of yet "one cannot guarantee that any personal message will be delivered in a secure form only to the intended recipient." Many e-mail users have discovered, Frisse states that "one cannot generally 'retract' a message that has already been sent, and the potential damage of an electronically disseminated regrettable utterance is far more substantive than if the same

utterance was made in the hallway or an office" (1998, p. 28). His advice is that "all messages sent over the Internet must be assumed to be permanent, and the long-term implications of a recorded message must be considered. Messages that may seem appropriate within the context of an acute problem may appear very different when read at a later date in a different context. Although the legal status of e-mail in the medical setting remains a matter of debate, potential legal implications must be considered along with other ethical issues" (Frisse, 1998, p. 28).

Until recently, this discouraging reality was where such arguments left the physician. It is encouraging to note that systems are now available in some settings to ensure security and privacy of records, etc. on the Internet. Technologists with the Internet2 initiative (see www.internet2.edu/ and www.ucaid.edu/) are pioneering such systems among select schools and universities and within two years this service should be available to non-academician physicians.

Web-based front-ends to electronic medical records are forecasted to "attract a lot of attention and development effort in the next 5 years" (Mittman & Cain,

2001, p. 72). These authors make the following sobering predictions.

1. Just as hospitals and clinics were not able to push vendors of clinical information systems to create open architectures in the 1980s and 1990s, they will have difficulty in getting the vendors to build interfaces to the Web. Vendors will resist installing a technology that makes it easy to substitute competitors' systems.
2. Standards work, which always proceeds slowly, will have to be done to get vendors to agree on how applications should link to the Web. Health Level Seven (HL7), a standard for health care information, will likely incorporate XML (eXtensible Markup Language) to create the same general look as conventional (HTML) Web documents, but better able to represent structured records.
3. The effort to build tools that agglomerate and represent information from disparate systems' electronic medical records will not result in systems that integrate information well enough to provide effective, real-time decision support for physicians. Integration at the display and interface level will not be sufficient.
4. Although there will be a lot of activity in electronic medical records for the next 5 years, it will not provide solutions that are sufficiently compelling to drive widespread adoption, and fragmentation will continue. (Mittman & Cain, 2001, p. 52)

None would dispute that good medical records are critical in risk management, as increasingly physicians also need documented information to effectively defend themselves. However, the "record of the medical care of the patient has traditionally been separate from the

record of its financial consequences" (Frisse, 1998, p. 27). With the current and projected advances in computer technology availability of information in medical records should increase the quality of care for patients. Frisse points out that today's "embodiment of the medical record in digital form—the computer-based patient record (CPR)—holds both great promise and great peril for" doctors (1998, p. 27). "The promise", he states, "lies in the ability to record and have available all information relevant to the care of patients, to have automated assistance in monitoring treatment and appropriate drug dosage, to integrate active clinical problems with recent relevant medical literature, to link community health care information with appropriate public health agencies, and to provide adequate lifelong medical care for patients and populations" (Frisse, 1998, p. 28). He cautions, however, that "the perils associated with CPR are equally significant. As information systems become more ubiquitous, they will be vulnerable to abuse and privacy violations if not created and managed correctly" (Frisse, 1998, p. 28). For him, used well "CPR is both the embodiment of the highest standards of medical practice and the means by which the profession can learn more about

improving these processes and enhancing the quality of patient care" (Frisse, 1998, p. 28).

Conjoint Analysis Issues

Rice (2001) explains that conjoint analysis is a versatile marketing research technique that can provide valuable information for new product development and forecasting, market segmentation and pricing decisions. It is suitable when respondents are asked to make a global evaluation of the alternatives given to them in situations that prompt trade-off decision-making. The ranking or ratings of the respondents chosen responses are then analyzed to yield answers that optimize strategic planning. To this end this multivariate technique decomposes "a set of overall responses to multiattribute alternatives so that their features can be inferred" (Rosko, DeVita, McKenna, & Lawrence, 1985, p. 27).

Conjoint analysis can be used to answer a wide number of questions including the following:

- Which new products will be successful?
- Which features or attributes of a product or service drive the purchase decision?
- Do specific market segments exist for a product?

- What advertising appeals will be most successful with these segments?
- Will changes in product design increase consumer preference and sales?
- What is the optimal price to charge consumers for a product or service?
- Can price be increased without a significant loss in sales?

Lancaster's theory of consumer behavior has the assumption that in order to assess the utility of a service or good a person evaluates the properties or characteristics of that service or good and not simply the service or good itself. One approach that would be in keeping with using this philosophy would be to employing an additive main-effects compensatory model to retrospectively predict HMO enrollment choice. This approach has been used by researchers "to determine the most appropriate market mix for an operational HMO which is entering a new market, ...external validation of the results, ...and a demonstration of how conjoint analysis can be used to simulate market responses to changes in the provider's marketing mix" (Rosko, DeVita, McKenna, & Lawrence, 1985, p. 29). Other examples are evident in the marketing research arena and from as early as 1982 where

researchers demonstrated its utility for health care marketing (Akaah & Becherer, 1983; Malhotra, & Jain, 1982; Rosko & McKenna, 1983). A later brief review of these early assessments reported that although they failed to "integrate the market mix" they showed "that conjoint analysis can be used to measure consumer preferences for attributes of health care services at either the individual or segment level of aggregation" (Rosko, DeVita, McKenna, & Lawrence, 1985, p. 33).

CHAPTER THREE

METHODOLOGY

Study Design

A cross-sectional Web-based survey was developed and made available to physicians in San Bernardino County, California in year 2001. A cover letter was also sent as a fax and by e-mail to the potential respondents explaining the project and soliciting their participation. In the appendix is a sample of the Fax.

Data Collection Techniques

Once at the web site the respondent could fill out the survey. The data was collected over the Internet with the first respondent filling out the survey on 30-Aug-2001 and the last respondent filling out the survey on 18-Sep-2001. The respondents were notified of the survey by both e-mail and fax. In order to conduct a conjoint analysis, information must be collected from a sample of the users of the service. This data was conveniently collected over the Internet.

Collecting Conjoint Data

Data collection involved showing respondents a series of written description of the product or service. The respondents were then asked to assign scores to each of

the products or services. One popular approach to collecting conjoint data would be to provide the respondents with a series of service description and ask them to score each service. For example:

How likely is it that you would replace your current patent records system with one that costs 20c per line and \$750 per Month, did not support Wireless Web, did not allow fax retrieval, provided toll-free phone access, did not allow you to upload your existing records but allowed you to perform advanced searches?

Very Likely *Likely* *Don't Know* *Unlikely* *Very Unlikely*

The advantage of this approach is its sheer simplicity. Each service description is self-contained and easy to understand. However, this approach has a number of significant drawbacks. First, the order in which the service descriptions are presented will influence the score that it receives. That is, a service description may sound quite appealing to a respondent *until* he or she sees the next service description and then the previous one does not seem so good after all. In addition many service descriptions may end up with the same score, when in fact the respondent prefers some more than others.

The other popular approach to conjoint data collection is to present the respondent with a series of service descriptions and ask them to sort them in order of preferences. This is typically done with a deck of cards. In concept this also seems quite simple, but in practice respondents become confused when asked to sort too many cards. The average individual seems to be able to handle up to 20 different items. This technique also has the disadvantage that it forces the respondent to select a single preferred item where two or more items may be equally appealing.

For this research the latter approach was used because the researchers felt that the disadvantages of the second approach would be less bothersome to the respondents than the disadvantages of the first approach. Once the respondents sorted all the services they were assigned a score. The least appealing service was given the score of 1 and each subsequent service was given a higher score.

Readers might be worried at this point about the total number of services that need to be rated by a single respondent. Fortunately, we are able to use statistical manipulations to cut down on the number of services compared. In a typical conjoint study, respondents only

need to rate between 10-20 products or services. For this survey we chose 14 different services because our preliminary study suggested that 20 different services would be more than the average doctor would be willing to sort.

Choices Among Alternatives

Conjoint analysis presents choice alternatives between products/services defined by sets of attributes. It was important in this project that the attributes should play an important part in the provider's (consumer's) choice for better health care practice documentation, etc. Also, it was also important that attributes chosen should be actionable in the sense that doctors can do specific things with the factors presented rather than simply expressing their attitudes toward the object. Bearing these two points in mind, in this study we looked at the following service attributes.

- Wireless Web Access Doctors can view patient records from a wireless PDA or cell phone.
- Fax Retrieval Doctors can call in and have selected patient records sent to a fax machine.

- Toll-free Service Calls for dictations and gaining access to patient records are toll-free.
- Upload Records Doctors can upload their existing data into the system.
- Advanced Searches Doctors can do sophisticated searches on an individual's records or on a collection of patients' data. This will allow the doctors to look for trends in their treatment of patients. (For example, a doctor can get a list of all patients within a specified age range who had been prescribed a particular drug).

We also examined the following pricing models:

- Monthly fee \$0, \$250, \$500, \$750
- Per line of text 0¢, 10¢, 15¢, 20¢

If all combinations were presented there would be a staggering 512 possible service offerings. A technique called design of experiments (DoE) was used to reduce the choices presented in the survey down to 14.

Design of Experiments

Using Design of Experiments (DoE) in this project, we reduced the number of potential service offerings from the 512 possible service-offerings that could be put together with the service options we selected. DoE techniques enable researchers to learn about behaviors by running a series of experiments, where a maximum amount of information will be learned, in a minimum number of runs. Trade-offs as to amount of information gained for number of runs, are known before running the experiments.

Experimental Designs are used to identify or screen important factors, and to develop empirical models. Statistical DoE provides a rigorous and universal framework to design and analyze comparative experiments. The major ideas were conceived and developed in the 1920's by the great British statistician and geneticist, Sir Ronald Fisher. He did so chiefly to meet the needs of agricultural experimentation that he faced as a statistician at the British Agricultural Experimentation Station in Rothamstead, England.

Fisher discovered that the way to achieve efficiency when studying more than one experimental factor is to simultaneously vary them all in carefully prescribed (but quite simple) patterns. This is in direct opposition to

the scientific culture of varying only One Factor At a Time (OFAT) while holding all other factors constant. With DoE the gains in efficiency can be quite large, permitting experiments that are half, a quarter, or even less as large as OFAT experiments with the SAME experimental effort. In fact, such multifactor experiments actually provide more information than their OFAT counterparts. In multifactor designed experiments, information on interactions is also obtained; OFAT experiments provide no interaction information, since when only one factor is changed, no interactions can occur!

While in this project service offerings are not experiments per se, there is a simple analogy that allows the DoE tools to be used in crafting service offerings. If we consider the options to be factors, the service offering to be experiments and the score to be the results of the experiment then we can use the DoE tools to determine the service offering given the set of options we defined. There are a number of software tools that can be used for DoE. For this research I used the DoE platform in JMP, a statistical package produced by SAS Institute Inc.

We entered the following options:

- Monthly fee \$0, \$250, \$500, \$750
- Per line of text 0¢, 10¢, 15¢, 20¢

- Wireless Web Access Yes, No
- Fax Retrieval Yes, No
- Toll-free Service Yes, No
- Upload Records Yes, No
- Advanced Searches Yes, No

JMP determined that minimum number of service offering that could be use in the survey was 12. We selected 14 to gain more accuracy. For 14 service offerings JMP suggested the following:

Table 1.

Service Offerings Produced by Statistical Software Package

Service Offering	Per Line	Monthly Fee	Wireless Web	Fax Retrieval	Toll-Free	Upload Records	Advanced Searches
1	20c	\$750	No	No	Yes	No	Yes
2	20c	\$500	No	Yes	Yes	No	No
3	10c	\$750	Yes	No	No	No	No
4	15c	\$750	No	Yes	No	Yes	Yes
5	0c	\$0	Yes	Yes	Yes	No	Yes
6	15c	\$0	No	No	Yes	Yes	No
7	20c	\$0	Yes	Yes	No	Yes	No
8	10c	\$250	No	Yes	No	No	Yes
9	20c	\$250	Yes	No	Yes	Yes	Yes
10	10c	\$500	Yes	Yes	Yes	Yes	Yes
11	15c	\$500	Yes	No	No	No	Yes
12	15c	\$250	Yes	Yes	Yes	No	No
13	0c	\$750	Yes	Yes	Yes	Yes	No
14	0c	\$500	No	No	No	Yes	No

It is important to notice the symmetry of the service offerings. The software attempts to generate service options with a balance of each value for each option. If 16-service offering had been requested the software would have been even better able to balance the options.

Table 2.

Options, Values, and Count of Services Offered

Option	Value	Count
Monthly fee	\$0	3
	\$250	3
	\$500	4
	\$750	4
Per line of text	0¢	3
	10¢	3
	15¢	4
	20¢	4
Wireless Web Access	Yes	8
	No	6
Fax Retrieval	Yes	8
	No	6
Toll-free Service	Yes	8
	No	6
Upload Records	Yes	7
	No	7
Advanced Searches	Yes	7
	No	7

The survey was in three parts. The first part of the survey was the conjoint questions. The user was shown the description of the service options and 14-service offerings in pairs and asked to pick which of the two they preferred. Their choice determined which was the next pair

of service offerings they would pick from. Each service offering was compared to two to four other service offerings. The survey software used what is called a "binary sort" algorithm to determine which pair of service offerings to present. This insured that the respondent made only the minimum number of comparisons necessary. The next set of questions determined which of the services the respondent would consider using. The software used a "binary search" algorithm so that respondent only had to answer questions about four or five of the service offerings. The last section contained demographic questions.

Among the demographic questions were as set of questions that asked the user how likely they were to use each of the service options. The first doctor provided the following responses.

Table 3.

First Respondent's Attitude toward Options Offered

Option	Likelihood of use
Wireless Web Access	Very Likely
Fax Retrieval	Likely
Toll-free Service	Likely
Upload Records	Likely
Advanced Searches	Likely

While the doctor's response showed his preference for wireless web over the other options it failed to show the relative unimportance of toll-free service compared to advanced searches.

Assumptions

To minimize the time required for doctors to fill out the survey, the software makes the assumption that there is transitivity of comparisons. That is, if a doctor prefers service A to service B and he or she also prefers service B to service C. Then the software assumes that the doctor will prefer service A to service C. Further the software also assumes that if the doctor prefers service A to service B and he or she would not use service A then the software assumes that the doctor would not use service B.

CHAPTER FOUR

RESULTS

In this section the overall and group specific findings are simply presented and will be detailed in the discussion section. Mostly graphs, tables and charts are presented here.

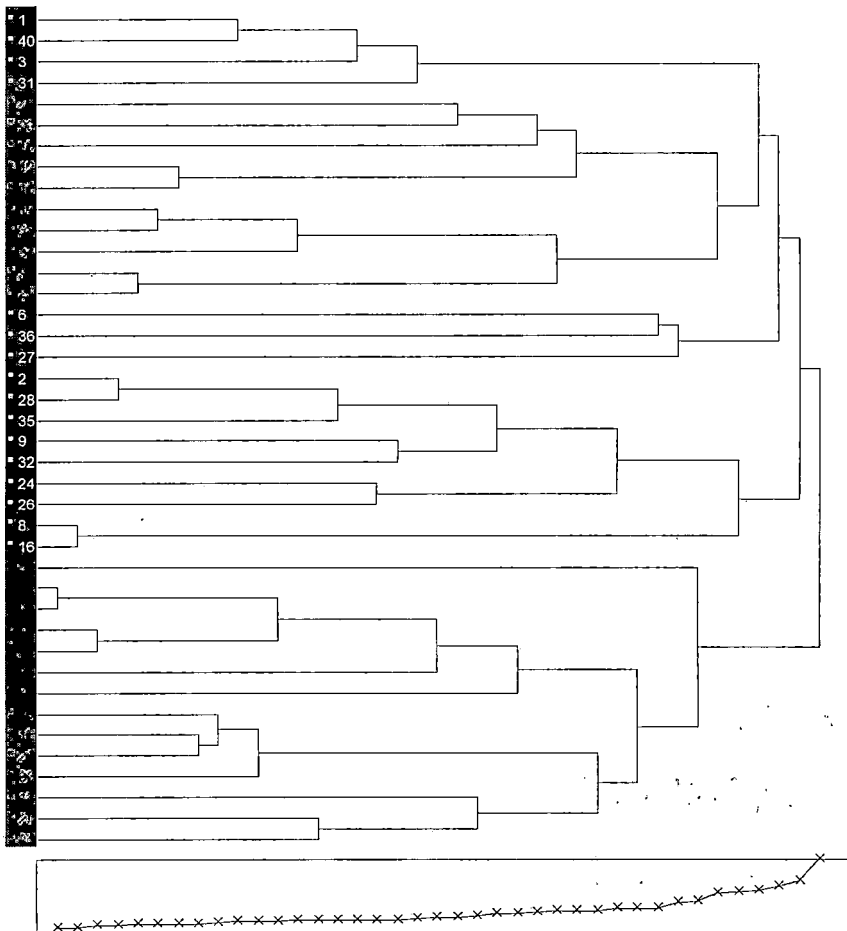


Figure 1.

Dendrogram Delineating the Six Physician Groups by Preference

The Dendrogram above graphically depicts the groupings of the responses to the survey based on the utilities. The responses fall into two major groups, the large green group at the bottom of the graph and a group that consists of five distinct sub-groups with sufficiently unique characteristics that we will deal with them separately.

The Groups

Let us take a closer look at the distinctive attributes of each group.

Group 1

This group accounts for about 34% of the survey respondents and is therefore the largest single group. They are the most price sensitive of all the groups. As a group they are less interested than their peers in dictating patient records over the telephone and have a greater interest than their peers in using paper templates. Of all the groups this group is the most willing to experiment with using PDA's to generate patient records. This is probably because they are more likely to have a color PDA than their peers and less likely to have a laptop.

Group 2

This group accounts for about 25% of the survey respondents. They have a strong preference for a service that allows them to do advanced searches on their data. They are not particularly interested in uploading their existing data into a new system. They are relatively price insensitive. They would prefer to dictate on the telephone instead of the PC. They are more likely to have a PDA with color and wireless connection than their peers.

Group 3

This group accounts for about 18% of the survey respondents. This group would prefer a flat fee of \$500 a month with no per line charges and toll-free phone access. They have little interest in doing advanced searches on their data. They have a relatively lower interest in dictation on the PC and a relatively higher interest in using templates on a PC. They are more likely to have a laptop and do not have a PDA or high-speed Internet access.

Group 4

This group accounts for about 10% of the survey respondents. They are mostly 41 to 45 years of age and have a very strong preference for the wireless web option, an above average preference for the advanced search option

and are largely price insensitive. They have a stronger preference for dictating patient records over the phone and are less likely than other groups to want to experiment with dictations on a PC. They are more likely than the average doctor to have high-speed Internet access and a laptop. These doctors spent on average more time filling out the survey than did their peers.

Group 5

This group accounts for about 8% of the survey respondents. They have a slightly lower than average interest in doing advanced searches on their data. They do not mind paying for their patient records service. They have no interest in using templates to generate their patient records. They are older than their peers 45 - 65 years of age. As a group they are the most interested in the results of this survey.

Group 6

This group accounts for about 5% of the survey respondents. These doctors seemed to have been heavily influenced by the order in which the services were presented. They took the least amount of time to fill out the survey. They were the least satisfied with their current systems. They had the strongest preference for dictation on the PC. They are also the least likely to

want to use paper template or a PDA to generate patient records.

Overall Results

The following graph shows the distribution of respondents by groups.

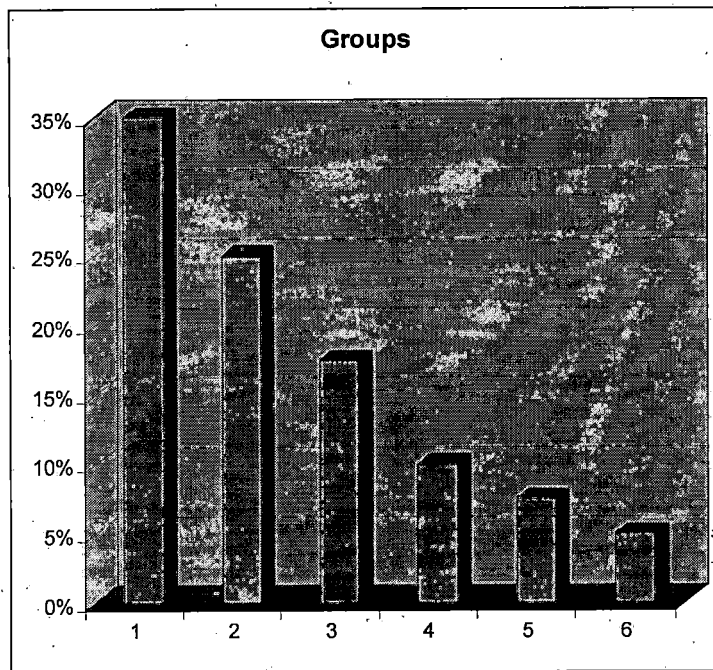


Figure 2.

Percentage Bar Graph of Respondents by Preference Groups

The following table and chart show the average utilities associated with each group.

Table 3.

Utilities by Preference Groups

Group	Advanced Searches	Upload Records	Toll-free Service	Fax Retrieval	Wireless Web Access	Monthly Charge: \$750	Monthly Charge: \$500	Monthly Charge: \$250	Price per Line: 20c	Price per Line: 15c	Price per Line: 10c	Responses	
1	1.29	3.43	2.33	2.61	3.16	-3.81	-2.21	-0.63	1.92	2.63	2.85	14	35%
2	5.01	1.59	1.39	3.25	1.58	0.21	0.79	0.78	-0.80	0.50	0.52	10	25%
3	0.63	3.26	3.70	2.66	2.28	0.34	2.23	1.97	-2.73	-0.69	-0.75	7	18%
4	2.14	1.47	0.50	1.49	7.24	-0.93	0.07	0.41	0.13	0.76	0.42	4	10%
5	-1.79	-0.91	2.22	2.68	1.24	3.95	4.12	2.30	2.30	3.43	1.91	3	8%
6	-0.73	4.27	-0.31	0.77	3.77	3.11	6.48	8.57	-3.35	-0.05	-3.58	2	5%

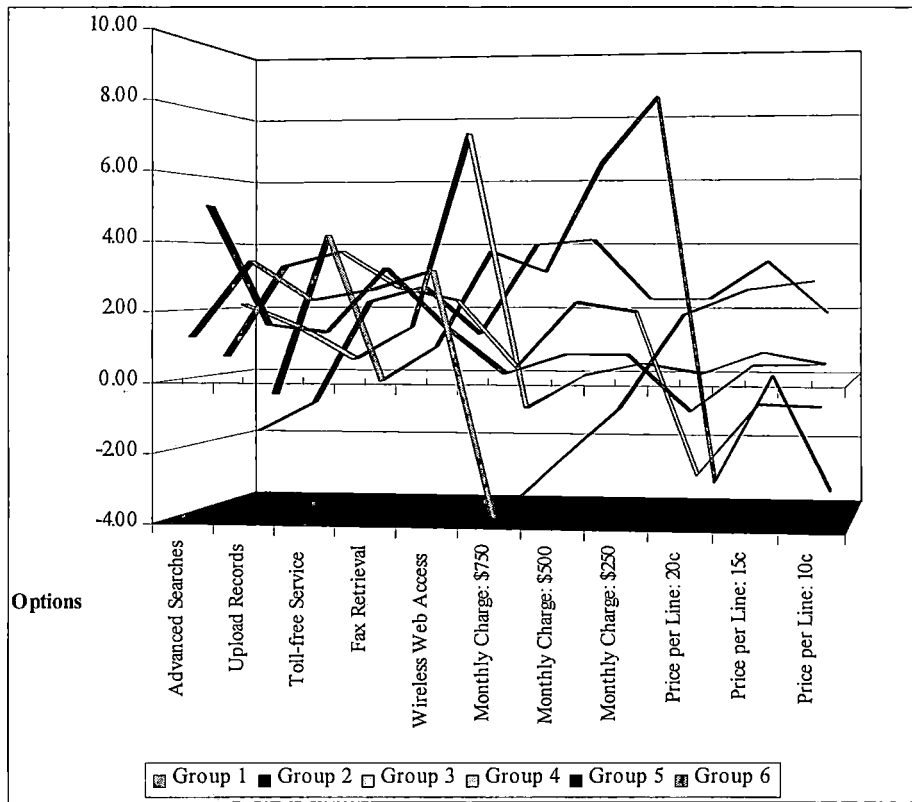


Figure 3.

Graph of Utilities by Preference Groups

CHAPTER FIVE

DISCUSSION

The Concept

Conjoint analysis worked well as a suitable decompositional multivariate technique with which to analyze this project's data. The basics of conjoint analysis are easy to understand. Let's look at a simple example. Suppose a doctor wanted to buy a medical records management system and he or she had a choice of spending \$500 per month or \$250 for use of the system. If this were the only consideration then the choice is clear: the lower priced system is preferable. What if the only consideration in choosing the system was the ability to do advanced searches? If the ability to do advanced searches were the only consideration then he or she would probably prefer the system that provides advanced searches. Finally, suppose the choice was based on whether or not they could upload their existing data into the new system then the choice would probably be the system that allowed them to upload their existing data.

In a real purchase situation, however, consumers do not make choices based on a single attribute like cost. Consumers examine a range of features or attributes and

then make judgments or trade-offs to determine their final purchase choice. Conjoint analysis examines these trade-offs to determine the combination of attributes that will be most satisfying to the consumer. In other words, by using conjoint analysis a company can determine the optimal features for their product or service. In addition, conjoint analysis will identify the best advertising message by identifying the features that are most important in product choice. In sum, the value of conjoint analysis is that it predicts what products or services people will choose and assesses the weight people give to various factors that underlie their decisions. As such, it is one of the most powerful, versatile and strategically important research techniques available.

Conjoint analysis was used to determine the relative importance of each attribute, attribute level, and combinations of attributes in this project. If the most preferable product is not feasible for some reason (perhaps the vendor simply cannot provide all the services for free) then the conjoint analysis will identify the next most preferred alternative. Because we had other information on doctors background demographics, we were able to identify market segments for which distinct services may be appealing. We could expect that, for

example, the young technologically savvy doctors and older more established doctors may have very different preferences, which could be met by distinct service offerings. This turned out to be true in this project.

This shows the value of conjoint analysis. Conjoint analysis allowed the researchers to examine the trade-offs that people make in purchasing a product. This allowed us to design products/services that will be most appealing to a specific market. In addition, because conjoint analysis identifies important attributes, we could use it to create advertising messages that will be most persuasive.

In evaluating products and services, consumers will always make trade-offs. A doctor may like the features of a particular service, but reject purchase due to the cost. In this case, cost has a high utility value. Utility can be defined as a number, which represents the value that consumers place on an attribute. In other words, it represents the relative "worth" of the attribute. A low utility indicates less value; a high utility indicates more value.

The following table presents the utilities for the first doctor that completed the survey:

Table 4.

Attributes and Associated Utility Scores of One Respondent

Attribute	Utility
Advanced Searches	1.41
No Advanced Searches	0.00
Upload Records	1.30
No Upload Records	0.00
Toll-free Service	0.16
No Toll-free Service	0.00
Fax Retrieval	0.96
No Fax Retrieval	0.00
Wireless Web Access	6.96
No Wireless Web Access	0.00
Monthly Charge: \$750	-0.77
Monthly Charge: \$500	2.48
Monthly Charge: \$250	2.74
Monthly Charge: Free	0.00
Price per Line: 20c	-0.79
Price per Line: 15c	1.50
Price per Line: 10c	0.82
Price per Line: Free	0.00

Based on these utilities, we made the following conclusions:

- This doctor places a greater value on a system with advanced searches (the utility is 1.41) than on a system without advanced searches (utility is 0.00).

- This doctor does not differ much in the value that he places on Toll-free Service. That is, the utilities are quite close (0.16 vs. 0.00).
- This doctor places a much higher value on a system with wireless web access (utility is 6.96) than on one without (utility is 0.00).
- This doctor's preference for monthly charge are as follows:
 - \$250 1st choice (utility 2.74)
 - \$500 2nd choice (utility 2.48)
 - \$0 3rd choice (utility 0.00)
 - \$750 last choice (utility -0.77)

The preceding example depicts an individual doctor's utilities. Average utilities were also calculated for all doctors or for specific subgroups of doctors.

These utilities also indicated to us the extent to which each of these attributes drives the decision to choose a particular service. The importance of an attribute was calculated by examining the range of utilities (that is, the difference between the lowest and highest utilities) across all levels of the attribute. That range represents the maximum impact that the attribute can contribute to a service.

Using the utilities presented earlier, JMP statistical software calculated the relative importance of each of the attributes. The range for each attribute is given below:

Table 5.

Attributes and Ranges for Utility Scores of One Respondent

Attribute	Range	
Advanced Searches	1.41	1.41 - 0.00
Upload Records	1.30	1.30 - 0.00
Toll-free Service	0.16	0.16 - 0.00
Fax Retrieval	0.96	0.96 - 0.00
Wireless Web Access	6.96	6.96 - 0.00
Monthly Charge	3.51	2.74 +0.77
Price per Line	2.29	1.50 + 0.79

These ranges indicate the relative importance of each attribute. Wireless Web Access stands out as the most important factor for this doctor in the service purchase decision-making process. This is because it has the highest range of utility values. This is followed in importance by the monthly service charge of the service. Based on the range and value of the utilities, it was evident to us that toll-free service is relatively unimportant to this doctor. Therefore, advertising which emphasizes toll-free service would be ineffective. This doctor will make his or her purchase choice based mainly

on wireless web access and then on the monthly charge of the service.

Marketers can use the information from utility values to design products and/or services, which come closest to satisfying important consumer segments. In this project conjoint analysis was used to identify the relative contributions of each feature to the choice process. This technique could also be used to identify market opportunities by exploring the potential of product feature combinations that are not currently available.

For conjoint studies one of the underlying assumptions is that each of the factors contribute in a predictable way to the score assigned to the service offering by the respondent.

There are a number of ways that the effect of each factor can be expressed. One approach is to compute the average score for each service option. For example, the first doctor indicated the following preferences:

How Utilities were Computed

Sorting the services by their scores produces the following (with the most preferred services to the left):

Table 6.

Choice Ranking of Services with Score = 1 Being the Most Preferred, and 14 Being the Least Preferred.

Service	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14
Score	1	2	7	4	10	3	9	6	11	14	12	13	8	5

Service	P10	P12	P11	P9	P5	P7	P13	P3	P8	P14	P4	P6	P2	P1
Score	14	13	12	11	10	9	8	7	6	5	4	3	2	1

The following table lists the options presented, the services that contained them, the scores the first doctor gave each service, and the average score for the option:

Table 7.

First Doctor's Scores and Ranking of Service Options

Option	Value	Service	Score	Average
Monthly fee	\$0	P5, P6, P7	10, 3, 9	7.33
	\$250	P8, P9, P12	6, 11, 13	10.00
	\$500	P2, P10, P11, P14	2, 14, 12, 5	8.25
	\$750	P1, P3, P4, P13	1, 7, 4, 8	5.00
Per line of text	0¢	P5, P13, P14	10, 8, 5	7.67
	10¢	P3, P8, P10	7, 6, 14	9.00
	15¢	P4, P6, P11, P12	4, 3, 12, 13	8.00
	20¢	P1, P2, P7, P9	1, 2, 9, 11	5.75

Option	Value	Service	Score	Average
Wireless Web Access	Yes	P3, P5, P7, P9, P10, P11, P12, P13	7, 10, 9, 11, 14, 12, 13, 8	10.50
	No	P1, P2, P4, P6, P8, P14	1, 2, 4, 3, 6, 5	3.50
Fax Retrieval	Yes	P2, P4, P5, P7, P8, P10, P12, P13	2, 4, 10, 9, 6, 14, 13, 8	8.25
	No	P1, P3, P6, P9, P11, P14	1, 7, 3, 11, 12, 5	6.50
Toll-free Service	Yes	P1, P2, P5, P6, P9, P10, P12, P13	1, 2, 10, 3, 11, 14, 13, 8	7.75
	No	P3, P4, P7, P8, P11, P14	7, 4, 9, 6, 12, 5	7.17
Upload Records	Yes	P4, P6, P7, P9, P10, P13, P14	4, 3, 9, 11, 14, 8, 5	7.71
	No	P1, P2, P3, P5, P8, P11, P12	1, 2, 7, 10, 6, 12, 13	7.29
Advanced Searches	Yes	P1, P4, P5, P8, P9, P10, P11	1, 4, 10, 6, 11, 14, 12	8.29
	No	P2, P3, P6, P7, P12, P13, P14	2, 7, 3, 9, 13, 8, 5	6.71

This technique makes it clear where this doctor's priorities are. The eight service offerings with wireless web access were this doctors top eight choices! That is,

no service regardless of features or price that did not have wireless web access was considered better than a service that had wireless web.

Another approach to modeled this relationship mathematically is as follows:

$$Y_1 = C_1 \cdot X_1 + C_2 \cdot X_2 \dots C_n \cdot X_n$$

$$Y_2 = C_1 \cdot X_1 + C_2 \cdot X_2 \dots C_n \cdot X_n$$

$$Y_n = C_1 \cdot X_1 + C_2 \cdot X_2 \dots C_n \cdot X_n$$

Where:

y_i is the score assigned to the i^{th} service offering

x_i is: 0 if the i^{th} factor is absent from the service offering and

1 if the i^{th} factor is present in the service offering

c_i is the utility for the i^{th} factor

There are a number of mathematical tools that can be used to solve for the utilities given that both the x and y values are known for each survey respondent. For this research we used the "least squares" method to estimate the values of the utilities. This resulted in the following utility values for the first doctors that filled out the survey:

Table 8.

Utilities for the Various Values for Each Option

Option	Value	Utility
Monthly fee	\$0	0
	\$250	2.74
	\$500	2.48
	\$750	-0.77
Per line of text	0¢	0
	10¢	0.82
	15¢	1.50
	20¢	-0.79
Wireless Web Access	Yes	6.96
	No	0
Fax Retrieval	Yes	0.96
	No	0
Toll-free Service	Yes	0.16
	No	0
Upload Records	Yes	1.30
	No	0
Advanced Searches	Yes	1.41
	No	0

This technique for quantifying the respondent's preferences for proposed options also places the Wireless Web as the most significant service option for this respondent. It also provides a clearer picture of the relative importance of the monthly service fee. While this doctor had a preference for a monthly service fee in the range of \$250 - \$500 some of the services in this range got some of the lowest scores, indicating that monthly service fee alone would not make the service acceptable.

It is important for the reader to understand that while these techniques provide a wealth of information

about the respondent's preferences, the calculations are not free from errors and only form an approximation for the mental model used by the respondent.

Choice Simulations

In addition to providing information on the importance of product features, conjoint analysis provides the opportunity to conduct computer choice simulations. Choice simulations reveal consumer preference for specific products defined by the researcher. In this case, simulations will identify successful and unsuccessful service offerings before they are introduced to the market!

The conjoint simulation will indicate the percentage of consumers that prefer each of the service offerings. The simulation might show that doctors are willing to do without certain features if they can pay less for the service. Simulations allow the researcher to estimate preference, sales and market share for new services before they come to market. Simulations can be done interactively on a microcomputer to quickly and easily look at all possible options. Also, conjoint will let the researcher look at interactions among attributes.

Market Segmentation

A useful mechanism for understanding the results of the conjoint analysis is to group similar responses together. For this research we used the Cluster Analysis Tool in JMP a statistical package produced by SAS Institute Inc.

The Groups

Let us again take a closer look at the distinctive attributes of each group.

Group 1

This group accounts for about 35% of the survey respondents and is therefore the largest single group. They are the most price sensitive of all the groups. As a group they are less interested than their peers in dictating patient records over the telephone and have a greater interest than their peers in using paper templates. Of all the groups this group is the most willing to experiment with using PDA's to generate patient records. This is probably because they are more likely to have a color PDA than their peers and less likely to have a laptop.

Group 2

This group accounts for about 25% of the survey respondents. They have a strong preference for a service that allows them to do advanced searches on their data. They are not particularly interested in uploading their existing data into a new system. They are relatively price insensitive. They would prefer to dictate on the telephone instead of the PC. They are more likely to have a PDA with color and wireless connection than their peers.

Group 3

This group accounts for about 18% of the survey respondents. This group would prefer a flat fee of \$500 a month with no per line charges and toll-free phone access. They have little interest in doing advanced searches on their data. They have a relatively lower interest in dictation on the PC and a relatively higher interest in using templates on a PC. They are more likely to have a laptop and do not have a PDA or high-speed Internet access.

Group 4

This group accounts for about 10% of the survey respondents. They are mostly 41 to 45 years of age and have a very strong preference for the wireless web option, an above average preference for the advanced search option

and are largely price insensitive. They have a stronger preference for dictating patient records over the phone and are less likely than other groups to want to experiment with dictations on a PC. They are more likely than the average doctor to have high-speed Internet access and a laptop. These doctors spent on average more time filling out the survey than did their peers.

Group 5

This group accounts for about 8% of the survey respondents. They have a slightly lower than average interest in doing advanced searches on their data. They do not mind paying for their patient records service. They have no interest in using templates to generate their patient records. They are older than their peers 45 - 65 years of age. As a group they are the most interested in the results of this survey.

Group 6

This group accounts for about 5% of the survey respondents. These doctors seemed to have been heavily influenced by the order in which the services were presented. They took the least amount of time to fill out the survey. They were the least satisfied with their current systems. They had the strongest preference for dictation on the PC. They are also the least likely to

want to use paper template or a PDA to generate patient records.

Conclusion

In this study the researchers have provided initial important information on San Bernardino County based practicing physicians preferences regarding factors that would save them time, increase efficiency, and decrease hassle should a Web-based transcription and medical records system be introduced to them. Design of Experiment (DoE) and conjoint analysis was done on data collected via an Internet based survey from a sample (n = 48) of these doctors. Just over 100 doctors could potentially respond. The conjoint analysis, supplemented with cluster analysis, revealed that 6 major groups of these doctors existed based on preference groupings from 14 overall factor combinations given them.

Just over one-third (35%) were interested in utilizing Web-based services proposed to do advanced searches. These were characteristically younger physicians. Price was not a deterrent to 40 percent of the 48 doctors responding regardless of whether there would be monthly fees of \$0, \$250, \$500, or \$750 or whether transcription charges per line was 0¢, 10¢, 15¢, 20¢. Such

"price insensitive" doctors were in groups 2, 4, and probably 6. Group 6 typified the older physicians and they preferred dictation but were least interested in using a template or a PDA. Overall, almost one-half (48%) of the doctors responding liked dictating their information to be transcribed. They were particularly in groups 2, 5, and 6. Just over one-half (53%) preferred using templates or a PDA. They were members of groups 1, and 3. Most of the physicians studied, therefore, demonstrated clear preferences by groupings of doctors that were independent from each other. About one-half preferred dictation transcription while the others liked templates and PDA generated medical records.

Based on the results of this study, we propose to offer a Web-based medical record service that would have as its core services a basic dictation transcription service and a template based medical record using a laptop/hand-held computer or a PDA. Additionally, we could offer advanced searches, uploading and retrieval of records by telephone/fax, PDA, etc. at extra cost for those physicians interested in such features. Because findings from this study are based on a relatively small sample size it is also important that further studies of this nature be soon conducted to strengthen the validity

of results obtained here. Doing so would more properly inform the relevant strategic management decision-making process and likely benefit patients for whom these physicians care.

APPENDIX A
COVER LETTER

Jay E. Shankar, M.D., F.A.C.P.
12675 Hesperia Road
Victorville, CA 92392

Diplomate American Board of Internal Medicine Ph# (760) 241-3306
Diplomate American Board of Nephrology Fax (760) 241-5037

SUBJECT: WEB-MEDRECORDS SURVEY (Reminder)
Now thru September 11, 2001

Dear Doctor.

Studies have shown a need for improved documentation, enhancements in gathering and retrieval of medical records to improve quality of care, decrease the risk of litigation and provide documentation for reimbursement. This survey is conducted by me as part of MBA course through California State University of San Bernardino. This research will attempt to determine which of the proposed features will be of greatest value to Physicians. Please go to the following Website, <http://www.web-medrecords.com/> then fill out the survey by clicking on "Survey" in the upper left hand corner. Thanking you for taking the time to fill out the survey. I know your time is valuable; the survey will only take 5 to minutes. If you would like to know the results please provide your e-mail address. If you have any problems doing the survey, please contact me at jamboor01@aol.com or James Wilson at jswilson@alum.mit.edu

One lucky physician will receive a brand new PDA. To have a chance at being that lucky person, please fill in your email address in the survey.

Sincerely yours

Jay Shankar

APPENDIX B

WEB-SITE


http://www.web-medrecords.com/ - Microsoft Internet Explorer provided by StarBand

File Edit View Favorites Tools Help Address http://www.web-medrecords.com/ Go

Home

Survey

Web-MedRecords



Studies have shown a need for improved documentation. Enhancements in the gathering, storage and retrieval of patient records improve the quality of care, decrease the risk of litigation, and provide the documentation needed for reimbursement.

Web-MedRecords will embody a sophisticated collection of advanced technologies. This survey attempts to determine which of the proposed web based medical record features will be of greatest value to physicians.

This research is being conducted by Jay E. Shankar M.D. as part of the requirement for the MBA program at California State University, San Bernardino. Your prompt response and participation is highly appreciated.

Please fill out the survey to help us determine what features you would find most valuable. If you desire a copy of the findings of the survey please let me know.

Internet

Survey - Microsoft Internet Explorer provided by StarBand

Address: http://www.web-medrecords.com/survey_b.htm

Survey

Part 1 of 3

The first part of the survey is the most difficult. It involves comparing 14 potential services. Each of the services will contain a mix of the following attributes and their associated value. Please carefully examine each of the two services and select the one that will best meet your needs. The number of comparisons for a given service will vary, starting with one or two for the first few ending with three or four for the last few.

Attributes	Value	Description
Price per Line	0c, 10c, 15c, 20c	Cost of each line of text dictated.
Monthly Charge	\$0, \$250, \$500, \$750	Monthly service Charge.
Wireless Web Access	Yes/No	Doctors can view patient records from a wireless PDA.
Fax Retrieval	Yes/No	Doctors can call in and have selected patient records sent to a fax machine.
Toll-free Service	Yes/No	Calls for dictations and gaining access to patient records are toll-free.
Upload Records	Yes/No	Doctors can upload their existing data into the system.
Advanced Searches	Yes/No	Doctors can do sophisticated searches on an individual's records or on a collection of patients' data. This will allow the doctors to look for trends in their treatment of patients. (For example a doctor can get a list of all patients within a specified age range who had been prescribed a particular drug).

Which of the two services better meets your needs?

<= Press here to start over.

Service A	Service B
Service 2 of 14	Service 1 of 14
20c per line	20c per line
\$500 per Month	\$750 per Month
No Wireless Web	No Wireless Web
Fax Retrieval	No Fax Retrieval
Toll-Free	Toll-Free
No Upload Records	No Upload Records
No Advanced Searches	Advanced Searches

Survey - Microsoft Internet Explorer provided by StarBand

Address: http://www.web-medrecords.com/survey_b.htm

Survey

Part 2 of 3

Please indicate which of the following services you would use by pressing on the appropriate button.

Attributes	Value	Description
Price per Line	0c, 10c, 15c, 20c	Cost of each line of text dictated.
Monthly Charge	\$0, \$250, \$500, \$750	Monthly service Charge.
Wireless Web Access	Yes/No	Doctors can view patient records from a wireless PDA.
Fax Retrieval	Yes/No	Doctors can call in and have selected patient records sent to a fax machine.
Toll-free Service	Yes/No	Calls for dictations and gaining access to patient records are toll-free.
Upload Records	Yes/No	Doctors can upload their existing data into the system.
Advanced Searches	Yes/No	Doctors can do sophisticated searches on an individual's records or on a collection of patients' data. This will allow the doctors to look for trends in their treatment of patients. (For example a doctor can get a list of all patients within a specified age range who had been prescribed a particular drug).

Service

Service 8 of 14
 10c per line
 \$250 per Month
 No Wireless Web
 Fax Retrieval
 No Toll Free
 No Upload Records
 Advanced Searches

Would you use this service? Yes No

<=> Press here to start over.

Done Internet

Survey - Microsoft Internet Explorer provided by StarBand

Address: http://www.web-medrecords.com/survey_b.htm

Part 3 of 3

What other options in a web based medical record service would be valuable to you?

Approximately what is your average cost for dictations each month?

Approximately what is your current cost per line of dictation?

How satisfied are you with your current dictation service?

Very Dissatisfied Dissatisfied N/A Satisfied Very Satisfied

If a web based medical record service were made available in your area how likely would you be to use each of the following services?

	Very Likely	Likely	N/A	Unlikely	Very Unlikely
Wireless Web Access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fax Retrieval	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Toll-free Service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Upload Records	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Advanced Searches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please tell us about yourself

What is your gender?
 Male Female

How old are you?
 25 and under 26-30 31-35
 36-40 41-45 46-50
 51-55 56-60 over 60

What are your preferred ways of generating patient records?
 Dictation - Telephone
 Dictation - PC
 Template - Paper
 Template - PC
 Template - PDA
 Other

Do you own any of the following?
 Cellular phone Digital Camera
 Pager Laptop
 Personal Computer Personal Digital Assistant

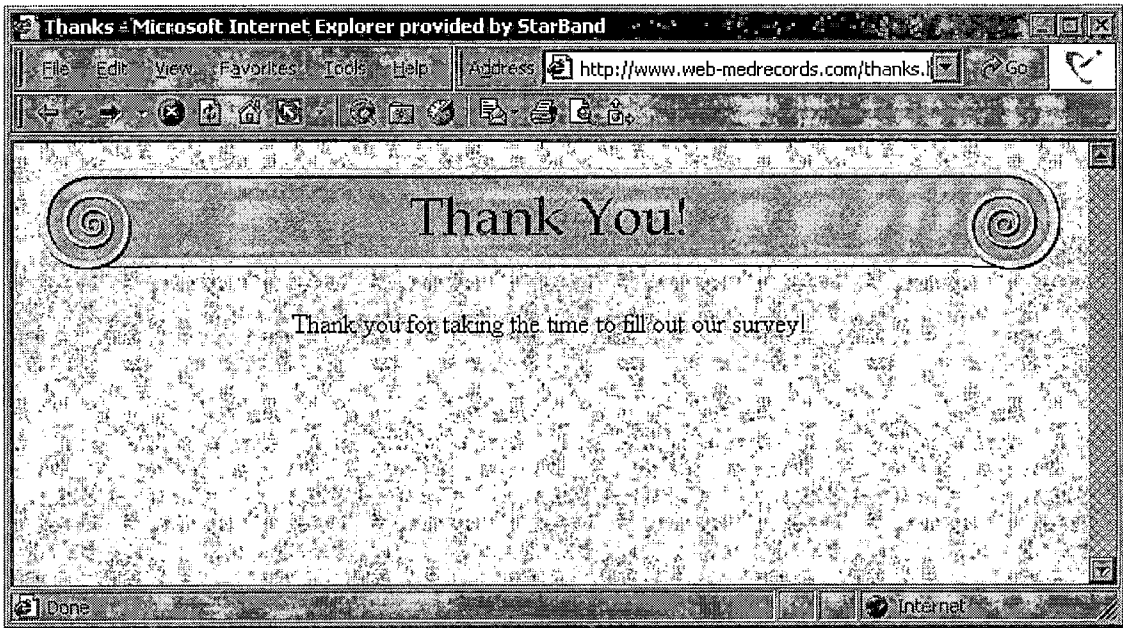
What options do you have on your PDA?
 Color Wireless Expandable memory

What type of internet connection do you have?
 Cable/DSL/Satellite Ethernet
 Modem Wireless

What is your specialty?
 Allergy Genetics Obstetrics and Gynecology Physical / Rehabilitation Surgery - General
 Anesthesiology Geriatric Medicine Occupational Medicine Podiatry Surgery - Neurological
 Audiology Hematology Oncology Preventative Medicine Surgery - Oral-Maxillofacial
 Cardiology Immunology Ophthalmology Psychiatry Surgery - Orthopedic/Sports
 Dentistry Internal Medicine Orthopedics Psychology Surgery - Plastic
 Dermatology Kidney Transplant Otolaryngology Pulmonary Medicine Surgery - Thoracic
 Electrophysiology Liver Transplant Pathology Radiation Oncology Surgery - Trauma
 Emergency Medicine Nephrology Pediatric Cardiology Radiology Surgery - Vascular
 Endocrinology Neurology Pediatric Gastroenterology Gastroenterology Urgent Care
 Family Practice Neurosurgery Pediatric Oncology Surgery - Colon/Rectal Urology
 Gastroenterology Nuclear Medicine Pediatrics Surgery - Dermatological Other (Enter specialty below)

Would you like to provide more input on what this service should provide?
 Would you be willing to try this service when it becomes available?
 Would you like a copy of the findings of the survey?

Your email address:



REFERENCES

- Akaah, I., & Becherer, R. (1983). Integrating a consumer orientation into the planning of HMO programs: An application of conjoint segmentation. Journal of Health Care Marketing, 3, 9-18.
- Eder, L. B., Arinze, B., Darter, M. E., & Wise, D. E. (2000). An analysis of intranet infusion levels. Information Resources Management Journal, 13(2), 14-22.
- Frisse, M. E. (1998). Medical Informatics. In J. H. Stein (Ed.), *Internal Medicine* (pp. 26-28). St. Louis, MO: Mosby Pub.
- Malhotra, N., & Jain, A. (1982). A conjoint analysis approach to health care marketing and planning. Journal of Health Care Marketing, 2, 35-44.
- Mittman, R., & Cain, M. (2001). The Future of the Internet in Health Care. In R. E. Rice & J. E. Katz (eds.), A five-year forecast: In the internet and health communication-experiences and expectations, (pp. 47-73). Thousand Oaks, CA: Sage Publications, Inc.
- Rice, M. (2001). A description of Conjoint Analysis; Schulich School of Business, York University. Retrieved 08/01/2001 from <http://mot.vuse.vanderbilt.edu/marketing/conjoint.htm>
- Rosco, M. D., DeVita, M., McKenna, W. F., & Walker, L. R. (1985). Strategic marketing applications of conjoint analysis: An HMO perspective. Journal of Health Care Marketing, 5(4), 27-38.
- Rosko, M., & McKenna, W. (1983). Modeling consumer choices of health plans: A comparison of two techniques. Social Science and Medicine, 17, 421-429.
- Solovy, A., & Serb, C. (2001). Health care's 100 most wired. Hospitals & Health Networks, 73(2), 43-51
- Sondak, N. (2001). Into the future: Emerging technologies in the world of computing. Physicians and Computers, 18(8), 28-35.

The Columbia Encyclopedia, (6th Ed). 2001: see Fisher, Sir
Ronald Aylmer at web site
<http://www.bartleby.com/65/fi/FisherRA.html>