IPA Approval and Referral System Redesign

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Preface

Background and Purpose

This paper is the culmination of a semester-long project. The project encompassed finding an existing system with at least two user groups that was experiencing problems due to a lack of parity between user requirements and system design. Throughout the semester, the project proceeded through system analysis, trade-off studies, and solution proposals. The assignment required a system that was experiencing a moderate number of difficulties, so that redesign was an appropriate response.

Document Organization

This document is organized into six major sections, followed by a list of references, and two appendices which includes a user-interface style guide constructed for use with this system, and materials from two oral presentations.

Section 1.0 – Introduction. This section includes an introduction to the business that houses the system under study, as well as the goals of the business and the specific company's strategy to achieve those goals. The relevance and role of the system under study to the broader goals of the company are discussed briefly.

Section 2.0 – System Description. This section includes a discussion of the purpose of the system, as well as system objectives and required functions.

Section 3.0 – Initial State of The System. This section includes a flow-through analysis of the system as it existed at the beginning of this study. Problems are identified, as well as their symptoms and causes.

Section 4.0 – Emphasis of Redesign. This section prioritizes system problems and provides focus for the redesign effort.

Section 5.0 – System Decomposition and Redesign. This section is divided into four segments, one for each major function of the system. Each section decomposes a single function of the system, and includes a function analysis, a task analysis, proposal of alternative solutions, a trade-off study, recommendations, and implementation.

Section 6.0 – Recommended Changes. This section summarizes the recommendations from section 5.0, followed by an implementation scheme for all recommended changes, and a flow-through analysis of the redesigned system. An assessment of the redesign effort and its anticipated consequences, including a discussion of shaping PCP behavior, and concerns about reliance on automation is also included in this section.

References provides detailed information on the authorship and publications of sources cited.

Appendix A – User-Interface Style Guide. This guide includes relevant guidelines pertaining to the application under development. These were selected from various sources and assembled specifically for use with this system.

Appendix B – Presentation Materials. Materials used during in-class presentations can be found here.

Abstract

The approval and referral system within an Independent Physician Association (IPA) is systematically decomposed and redesigned in this document. The initial design of the system lacked parity with user requirements and system goals. For each function of the system, an analysis is provided along with alternative solutions, trade-off studies, and finally, recommendations and implementation schemes. Recommended changes include reallocation of human tasks to hardware and software, the combining of some functions, and the introduction of a new fax-receiving system and a new entry interface with automated tasks. The redesign is assessed, along with its anticipated consequences and a discussion regarding the shaping of physician behavior and concerns about reliance on automation.

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Abbreviations

IPA	Independent Physician Association
HW	Hardware (machinery, computer components)
IT	Information Technology
PCP	Primary Care Physician
SW	Software (computer programs)

1.0 Description of Business

The system selected for this project is an internal system within an Independent Physician Association (IPA). The IPA acts as an agent for Health Insurance companies as well as physicians, negotiating contracts between the parties, processing their paperwork, and authorizing and coordinating medical care for the end users: the patients.

1.1 Business Goals and Strategy

Business objectives and the company's strategy for achieving these are closely tied to the system under study. Behavior that is desired from the system is driven by economic objectives, as is often the case. Therefore, a brief discussion is provided here.

IPA profits can be generated in three ways:

Volume. The IPA receives funds per patient per month from Health Insurance companies. Therefore, the more member-physicians associated with the IPA, the more patients, and hence, the more funds.

Low administrative costs. Since income is relatively fixed, administrative costs are particularly important.

Health care management. The philosophy employed by the IPA asserts that proper management of patient care can result in higher profits. The IPA sites numerous studies and successful administration of the philosophy in other countries which have shown that preventative care as well as properly advised referrals and treatment reduce health care costs. This simply amounts to replacing needless visits and treatments with effective, coordinated care.

The IPA targeted in this study employs all three strategies; however, volume and care management are particularly emphasized. Administrative costs are important as well, but only insofar as they do not interfere with the other two strategies.

The resultant behavioral needs of the IPA to achieve its objectives are: 1) to acquire and keep as many member-physicians as possible, 2) to acquire and keep as many patients as possible, 3) to properly manage healthcare (as previously described), and 4) to keep administrative costs low.

1.2 Role of the System

The approval and referral system serves as a main interface between the IPA and its member-physicians and patients. As such, it must act in accordance with the general objectives of the IPA. Hence, the system must be easy for physicians to use, responsive to physicians and patients, allow proper care coordination, be accurate and quick, and, if possible, keep administrative costs low without sacrificing functionality.

This system is crucial to the overall health of the company. Its failure translates into poor care management, physician frustration, patient frustration, increased administrative costs, loss of physician members and their patients, and eventual loss of economic viability.

2.0 System Description

2.1 Purpose of System

The approval and referral system is a request processing system initiated by the physician on behalf of the patient. The requests are sent to the IPA, where they are approved or denied. The physician and patient are then notified of the outcome.

2.2 System Objectives

As was previously stated (see 1.2), the system serves as a main interface between the IPA and its member-physicians and patients. As such, the system goals must be in line with the overall goals of the IPA. Thus, the system must be easy for physicians to use, facilitate proper care management (refer to 1.1), be responsive to physicians and patients, be accurate and quick, and keep administrative costs as low as possible without sacrificing functionality.

These goals are defined operationally as follows:

1. Ease of use by member-physicians, as measured by a low number of complaints regarding the complexity of the system, as well as complimentary feedback (solicited and unsolicited).
2. Facilitate proper care management, as measured by the speed with which requests are processed, a low number of erroneous decisions, a low number of unproductive physician visits, treatments, and procedures, and a high number of productive physician visits, treatments, and procedures.
3. Responsive to physicians and patients, as measured by a low number of complaints regarding the system, a low number of calls

regarding the status of requests, and complimentary feedback (solicited and unsolicited).

4. Accuracy, as measured by a low number of erroneous dispositions, and a low lost-request rate.
5. Speed, as measured by the mean request processing time, as well as a measure of the range variability of processing times, a low number of complaints regarding the processing time of the system, a low number of calls regarding the status of requests, and complimentary feedback (solicited and unsolicited).
6. Keep administrative costs as low as possible without sacrificing functionality, as measured by the per-request average cost of processing, as well as a measure of the range and variability of per-request cost.

2.3 System Functions

The system accommodates three types of requests: 1) to confirm insurance eligibility for new patients, 2) to confirm insurance coverage for special procedures and treatments, and 3) to refer patients to specialists when the requested treatment cannot be administered by their primary care physician (PCP). The functions for each are similar.

All requests must be initiated by the physician's office, sent to the IPA, evaluated and approved or denied by the IPA, and the physician and patient must be notified of the outcome. From this, we can define the following required system functions:

1. Initiation of a request. This requires the physician's office to submit a request, either by phone, mail, fax, or e-mail to the IPA. Required information includes the nature of the request, the physician's name and member number, the patient's name and file number, the diagnosis, and the requested treatment. Optionally, the physician may request a specific facility or specialist.
2. Receipt of the request. The IPA must receive the request.
3. Insurance eligibility / active coverage of the patient must be verified before the request is processed. Entering a request legally binds the IPA even if the patient is not covered, so this step is very important.
4. Request must enter IPA system and be tracked. The request must somehow enter the IPA main computer system, and employees must be able to find the request both during processing and after disposition. Additionally, denied requests must be retained indefinitely by law.
5. The request must be evaluated, then approved or denied. This step must facilitate proper care management. Some requests require little expertise to evaluate. Common procedures, such as the removal of an ingrown toenail, may be approved with little medical expertise. Whereas, open-heart surgery or the treatment of a brain tumor, requires careful examination and evaluation to insure the patient receives proper care. Thus the level of expertise

of the request evaluator varies by the type of request and diagnosis.

6. The physician and patient must be notified of the outcome of the request. Notification serves not only to complete the request, but can serve a customer service function as well. If done in an efficient and courteous manner, it serves in accordance with the objective of system responsiveness to both the physician and the patient.

3.0 Initial State of System

The approval and referral system is linear and therefore lends itself well to flow-through analysis. The first part of this section will follow a typical request through the system. The second part of the section will discuss system problems, along with their symptoms and causes.

3.1 Flow-through Analysis

The initial design of the approval and referral system requires a typical request to traverse six or seven steps. Three types of requests are processed by this system: 1) new patient insurance eligibility, 2) referral to a specialist, 3) approval for a special procedure. Each will be represented in the following narrative.

Step 1: Requests are submitted to the IPA by the physician's office. The physician or office staff prepare the requests. All requests are initiated by the patient's PCP or affiliated physicians on their behalf. A single form for use with all three types of requests is supplied by the IPA. These forms are typically completed by hand by either the physician or a member of his or her staff. However, many physicians submit hand-written requests on letterhead instead. These requests are sent to the IPA by mail, fax, or the physician's office may call the IPA and submit the request verbally over the phone. The majority of requests are faxed. Regardless of the mode of submission, paperwork is generated and kept on file by the PCP to document the request.

Step 2: Requests are received by the IPA. Requests which have been faxed are received by a computer program. This program only enables fax data

to be received. It does not allow it to be viewed. So, the data is sent to software that enables the faxes to be viewed and printed. The faxed requests and mailed requests are gathered by the Receiving Department. Phone requests are also processed by this department.

Step 3: Requests are entered into the main system and prioritized. The Receiving Department enters all requests into the main system. Requests received by phone are entered during the call. Two to four data entry clerks enter the faxed and mailed requests. If a request lacks sufficient information for entry, the clerk may call or fax the physician's office to request the missing information. The physician's office may supply the information or resubmit the request with complete information. During entry, the clerks assign each request to one of two queues. If the physician labeled the request as urgent, the request is assigned to the urgent queue. All other requests are placed into a normal request queue.

Step 4: Requests are matched to patient files, and insurance eligibility is confirmed. Two to four employees in the Matching Department receive the requests via the queues coordinated by the Receiving Department. The urgent queue is processed first. This department matches each request with the corresponding patient file. If the request cannot be matched to an existing patient, the physician's office will be contacted. This may result in either correcting inaccurate information on the request or canceling the request. Requests for insurance eligibility are concluded at this stage. All other requests are placed in new queues for the next department to review.

Step 5: Requests are evaluated by nurses, and approved, denied, or sent for further review by a physician. Each request is viewed by a registered nurse. During this review, the nurse may request additional medical information from the physician. The nurse then approves or denies the request based upon insurance coverage limitations, company standards, and medical expertise. If the request involves a referral to a specialist, the nurse will assign a member-physician who specializes in the specific ailment.

The nurses may process ailments of a certain nature. A list of these is given to all evaluators. Any request that deals with an ailment not on this list must be sent to Medical Review. Additionally, any request that the evaluator finds questionable, or of a particularly serious nature, is also sent to Medical Review for processing by a staff physician.

Requests that are approved receive an authorization number. The addition of this number generates an approval letter that is sent by the computer to the PCP via fax or mail. Requests that are denied are closed without an authorization number, generating a denial letter.

Step 6: Certain requests are evaluated by a staff physician, then approved or denied. Requests involving certain ailments and procedures, as well as requests that were found to be questionable by nurse evaluators, are evaluated by staff physicians. During this review, the evaluating physician may request additional information from the requesting physician, PCP, and other physicians and specialists before reaching a decision.

Once a decision is reached, the request is closed and a computer-generated approval or denial letter is sent to the PCP in the same manner that was outlined in step 5.

Step 7: Disposition of the request is communicated to the PCP and the patient. The computer-generated approval or denial letter processes overnight. If the physician fax number is present in the program, then the approval or denial letter is faxed to the PCP. If not, the letter is printed for mailing. An employee will fold and stuff the letter into an envelope and mail it within two days to the PCP. The PCP in turn must communicate the outcome to the patient.

3.2 Symptoms

Symptoms are the visible signs that indicate problems in the system. The symptoms exhibited by the approval and referral system include complaints from member-physicians and patients regarding the length of time required to process requests and the high rate of lost requests. Additionally, the IPA experiences high call volume regarding the status of submitted requests, and a higher than desired physician and patient attrition rate that can be directly attributed to frustration associated with the approval and referral system.

Another symptom that speaks to system problems greatly and directly affects company's administrative costs. The number of employees who work exclusively on this system, as well as the many employees who supply support, and the overtime hours commonly worked indicate problems as well.

These symptoms highlight the two major problems of the system: requests take too long to process, and the percentage of lost requests is too

high. These create a third problem: the high cost of processing requests. Though this can also be seen as a symptom, the impact upon the company is great enough to consider it a third problem. Each of these will be explored in depth, and their causes explored and hypothesized.

3.3 Problems and Their Hypothesized Causes

To reduce or eliminate symptoms, we must uncover that which causes the problem and creates the visible symptom. This section will take each problem separately and explore the hypothesized causes of each. From this, we will be able to assemble a direction and focus for the redesign effort.

3.3.1 Requests Take Too Long to Process

Once received by the IPA, requests can take from one to eight working days before the decision reaches the PCP. Urgent requests are normally processed within one to three working days, with the decision often verbally relayed to the PCP by phone. Non-urgent requests are handled only after urgent requests have been processed at each stage. So, a non-urgent request could take up to two days before it has been entered into the main system and matched to a patient file – longer if there is insufficient information or an error on the request. By the time the non-urgent request reaches a nurse evaluator, the request could be three days old.

Once a decision is reached, the computer-generated letter is printed overnight. If fax information exists, the letter is faxed to the PCP automatically. However, if the letter must be mailed, it must wait for an employee to prepare it for mailing within the next two days. Factoring in delivery time of the U.S. mail,

the letter will reach the PCP within two to four days. This could be eight working days from the date the request was submitted.

Since the PCP is responsible for notifying the patient of the disposition of a request, it is likely that the patient may wait an additional day or two before being contacted. This can result in patient and PCP calls to the IPA requesting the status of the request.

Processing time is clearly a function of the number of steps required, the number of employees who must scrutinize the merits of each request using different criteria, and components requiring fixed time periods, such as computer programs that must process information overnight, and the U.S. mail service.

3.3.2 The Percentage of Lost Requests is Too High

The IPA estimates a 12% lost request rate. However, this really represents the number of requests that must be resubmitted by the PCP. Whether they are truly lost, or simply not locatable in the system is not quantifiable. For example, if a PCP calls to check on the status of a request they have submitted, the IPA customer service representative may not be able to locate the request because the system lacks a searchable database. If the request was received within the last two days and was not marked urgent, it may not have been entered into the main system yet. If the request has been entered, finding it is still not easy. It could be in one of many queues: the Matching queue, the Evaluation queue, or the Medical Review queue. Each must be separately searched. A request is easily found once it is closed (whether approved or denied). Once closed, requests are attached to the patient's file and thereby viewable.

Unfortunately, there is also another possible explanation. If the request was submitted by fax, it may have been lost by the fax-receiving program. This software was initially a packaged program that over many years has been customized to do things it was not designed to do. The result is an unstable program.

For example, the program has been known to lose some faxes, seemingly at random. One morning, the fax-receiving program transferred 100 faxes to the viewing program, while withholding another 50 that were later manually and painstakingly transferred to the viewing program. On another day, employees noted an unusually small number of faxes had been received. However, on this day, there were no additional faxes held in the receiving program. As subsequent days and weeks passed, calls regarding missing requests that should have been received that day numbered over 70.

There is no way to quantify the number of faxes this program may lose in a typical failure, or the frequency of such failures. It is also difficult to locate the source of such failures. Since there is no fail-safe built into the receiving process, there is no way to verify the functioning of the components. For example, a problem may exist in the actual receiving of faxes, or a problem may exist in the conversion of faxes from the fax-receiving program to the fax-viewing program, or a problem may exist solely in the fax-viewing program. Perhaps a mixture of some or all of these is responsible, or perhaps there is another cause not yet identified. Without a verification process built into the system, diagnostic detection is haphazard at best.

While it is impossible to ascertain the rate of requests that are actually lost, rather than temporarily out of view in a system queue, or pending on a desk somewhere, it is also impossible to attribute the cause of those that are lost to a particular software program, or stage in the process. Because of this, the IPA has adopted the policy of asking the PCP to resubmit requests that aren't readily locatable. The problem is so frequent that a separate fax line serves soley to receive re-submitted requests. This assists the employee to insure that the resubmitted request is indeed received and processed.

If a duplicate request is received, it will be discovered either in the matching process or in the evaluation process when the first request is closed. Once the first request closes, it is attached to the patient's file and therefore viewable. It is therefore assumed that any duplicate will be discarded.

3.3.3 High Labor Cost

Navigating through this system creates more work for employees and physicians alike. Asking PCPs to resubmit 12% of requests simply runs counter to the goals of the company and the system. The full effect of this cannot be easily quantified, but it is the subject of many member-physician complaints and undoubtedly contributes to member-physician attrition rates.

Internally, ten employees of the IPA work exclusively on this system. Other employees provide support to the system as well, such as IT, Data Management, and various management personnel. An average of 5,000 requests are processed each month. This translates into a processing rate of about 3.1 requests per hour. At a mean salary of $15.00 per hour, the average

labor cost to process a request is $5.00, bringing the total estimated labor cost of this system to about $25,000 per month.

Additionally, employee overtime in many departments is often needed to compensate for the system. The IT Department commonly spends time monitoring and maintaining the receiving system and, at times, transferring otherwise corrupt data from one program to another. Many of the IT duties require that they work while the system is down, requiring work on weekends and late into the night. The Receiving Department commonly works overtime, often working one Saturday a month to assure timely request entry. Similarly, the Evaluation Department commonly works extra hours to process backlogs of pending requests.

The exact cost of overtime to the company exceeds wages since some employees are salaried rather than hourly. Salaried employees are given time off during normal work hours to compensate for late night and weekend work. This has an impact upon the normal functioning of other departments within the IPA. This impact is an important consideration that deserves more study. However, such a study is beyond the scope of the present investigation.

3.3.4 Non-member Requests

Non-member requests are requests either received from non-member physicians, member-physicians not authorized to submit requests (non-PCPs), or requests regarding non-member patients. These requests pose a special problem since the assignment of a tracking number to these requests in the IPA's system signifies legal and financial culpability. Once a tracking number is assigned, the request must be carefully handled if denied, or worse, if

accidentally authorized, the IPA can be held financially liable for the approved procedure and care, including any mishaps that may occur.

This problem has no readily visible symptom, nor did the IPA offer it as a concern. Strong adaptation to the initial system masked this problem. However, during the course of this investigation, the problem began to surface. Though non-member requests are a rarity, one accidental approval can produce severe financial consequences, and denials of “accepted” requests which have been assigned a tracking number, may create difficult legal issues.

The initial system has mitigated this problem by not assigning tracking numbers. The only number that is assigned is an approval number. However, this does not eliminate the possibility that a non-member claim will be approved. Since all requests are entered into the system, then checked by the Matching Department, the possibility is nearly 100% that a non-member request will be entered. Additionally, once the request reaches the Evaluation Department, it is assumed that the request is valid. If the Matching Department makes a mistake, and if the evaluator doesn’t review any information that would reveal the mistake, the error would not be caught. The initial system assumes that severe diagnoses or costly or atypical procedures or care would be reviewed to an extent that any such errors would be caught. However, if even a routine procedure is approved, it opens the IPA to legal and financial liability for the patient in question.

4.0 Emphasis of Redesign

The redesign effort will seek to mitigate identified system problems, which include reducing processing time, reducing the number of requests that must be resubmitted, and reducing the administrative costs of the system.

4.1 Goal Statements

System redesign will be successful if:

1. Processing time for requests is reduced, as measured by:
    a. A reduction in the mean number of days required to process requests, and low range and variability of processing times.
    b. A reduction in the number of complaints from both member-physicians and patients regarding processing time.
2. The rate of “missing” or lost requests is reduced, as measured by:
    a. A reduction in the rate of requests that must be resubmitted by the PCP.
3. Requests are easily located in all stages of the system, as measured by:
    a. A reduction in the average search time to locate a request.
    b. A reduction in the rate of requests that must be resubmitted by the PCP.
4. Labor costs associated with the system are reduced, as measured by:
    a. An increase in the average processing rate of number of requests per number of employees directly involved in the system process, as well as a low range and variability.

5. Exclude processing of non-member requests, as measured by:
    a. The absence of non-member requests entered into the system.
    b. The rejection of all non-member requests prior to entry into the system.

4.2 Redesign Priorities

Redesign efforts will emphasize streamlining the internal system within the IPA. The first priority will be to create a searchable database so that employees can easily find and view each request regardless of its current stage of processing. This should help reduce time spent searching for requests as well as reduce the number of “missing” or lost requests PCPs must resubmit.

The second priority will be to implement new fax-receiving software that permits tracking of received fax requests, and allows detection of software problems and fail-safes when such problems occur. This should further reduce the amount of time spent on “missing” requests as well as reduce the actual number of lost requests.

Redesign will seek to exclude entry of non-member requests into the main system. The system should prohibit such entries to eliminate any legal or financial liability the IPA may incur for non-members.

The next priority will encompass techniques to reduce the number of steps and departments a request must traverse, and reduce the number of employees who must familiarize themselves with each request, then assess it using different criteria than the last employee. This may lead to consolidating functions from several steps into one, or to automating some steps altogether.

Redesign efforts will seek to avoid changing the member-physician process unless the change would be a vast improvement for them, or is otherwise unavoidable in the redesign process. The only change that this redesign effort seeks for member-physicians and patients is a faster, more responsive, and accurate approval and referral system.

The IPA requested that the scope of this investigation include the application of new technologies, particularly the initiation of a web-interface for request submission. For this reason, web-interface and e-mail will be included in this study, and its merits assessed.

4.3 Access & Approach

The IPA under study was highly motivated to improve this approval and referral system. As such, they allowed the author access to people in top management positions, company information, and allowed on-site observations of the system. It was understood that this project would first fulfill assigned requirements. However, the IPA expressed interest in reviewing the final report in exchange for providing access.

This study employed two different approaches. While observing the initial state of the system, the author was an unobtrusive observer. It is unlikely that the act of observing the system exerted any real effect upon the system. Observations were comprised of both physical observations of employees at various stages of the system, and data collection from reports and management personnel.

A different approach was used when interacting with management personnel in discussions regarding alternative solutions. These discussions

required active participation and brainstorming, as well as the sharing of expertise. These meetings were interactive and resembled teamwork more than observations.

5.0 System Decomposition and Redesign

This section is divided into four segments, one for each function of the system. Each section decomposes a single function, and includes a function analysis, a task analysis, proposal of alternative solutions, a trade-off study, recommendations for redesign, and an implementation scheme.

5.1 Receiving Requests from Physicians

The function of "receiving" is defined as the series of tasks that take place between the inception of the request (at the PCP's office) and the receipt of the request by employee at the IPA who can enter the request into the system. Since this redesign effort does not seek to change the functions of the member-physicians, the IPA can expect to receive most requests by fax, and can expect most requests to be submitted using the IPA's form, some to be submitted on the PCP's letterhead, and expect all to be hand-written. (For the initial state of this function, see section 3.1, step 2.) However, the process of submission by e-mail and web-interface will also be included as a guide toward future technology.

5.1.1 Function Analysis

Requirements. For the IPA to receive requests from physicians, the following requirements must be met:

1. The physician must submit a request in a manner that can be received by the IPA.
    a. The PCP must write or type the request.
    b. The PCP must send the request.
2. The IPA must receive the request. This means that the appropriate receiving devices must be in place to receive requests.

a. For mailed requests: Mail must be routed correctly, received by the IPA, opened, and routed correctly to an employee with the ability to enter the request into the system.
b. For faxed requests: Fax-receiving device(s) must be in place, functional, and the faxes routed correctly to an employee with the ability to enter the request into the system.
c. For phone requests: The phone must be answered so requests can be received orally, and the call routed to an employee with the ability to enter the request into the system.
d. For e-mailed and web-interface requests: Computers must be connected to the Internet and have software that enables e-mail. E-mail must be viewed and routed to an employee with the ability to enter the request into the system.

Function allocation. The following table illustrates how functions would be allocated among software (SW), hardware (HW), and human operators at either the PCP's office or the IPA, based upon alternative submission/receiving methods. As the table shows, writing the request will always involve a human operator at the PCP's office. The request may be handwritten, or the operator may type the request, involving SW and HW. The human operator at the PCP's office will always be involved in sending the request, whether by pushing a key to send it by e-mail, through a web-interface, faxing from a computer program, manual fax machine, calling the IPA by phone, or stuffing the request in an envelope and mailing it. Some of these methods involve HW (phone, fax

machine, computer), and some involve HW and SW (e-mail, computerized fax programs, web-interface).

Function	SW	HW	Human PCP	Human IPA
Write the request				
Hand-written			✓	
Typed	✓	✓	✓	
Send the request				
Phone		✓	✓	
Mail			✓	
Fax	✓	✓	✓	
E-mail or web-interface	✓	✓	✓	
Receive the request				
Phone		✓		✓
Mail				✓
Fax	✓	✓		
E-mail	✓	✓		
Web-interface	✓	✓		
Route to appropriate employee				
Received by phone	✓	✓		✓
Received by mail				✓
Received by fax machine				✓
Received by fax computer program	✓	✓		
Received by e-mail or web-interface	✓	✓		

Table 5.1.1 Allocation of functions among software (SW), hardware (HW), and human operators at the PCP or IPA, based upon alternative submission/receiving methods.

Receipt of the request may or may not involve a human operator at the IPA. If the request is submitted by phone or mailed, then a human operator at the IPA will naturally receive the request. If the request is faxed, e-mailed, or sent via a web-interface, it will be received by HW and SW. Finally, routing the request to an IPA human operator who can enter the request into the system will involve a human if the request was received by mail; a human, HW and SW if the request is received by phone (phone system) or a fax machine. If the request is received via a fax computer system, e-mail or a web-interface, HW and SW will route the request automatically.

5.1.2 Task Analysis

The following table shows an analysis of the tasks involved for each mode of receiving a request at the IPA. Each row includes the basic tasks involved in receiving the request and routing it to an employee who can enter the request into the system.

Receiving Mode	**Interface Components**	**Indicator (I) Decision (D) Response (R) Feedback (F)**
Phone	HW: Phone SW: Phone system Human	(I) Phone call (D) Caller selects dept. from voice menu (R) System routes call to appropriate employee (F) Caller reaches appropriate employee
Mail	Human	(I) Mail received in mail room (D) Human identifies request (R) Human delivers to appropriate dept. (F) None. Receipt and routing not tracked
Fax machine	HW: Fax machine Human	(I) Fax received on dedicated request fax machine (D) Human identifies request (R) Human delivers to appropriate dept. (F) None. Routing not tracked
Fax computer program	HW: Fax server SW: Routing Human	(I) Fax received on dedicated request fax line (D) None (all faxes received on this line are handled the same) (R) SW automatically sends to viewing program, human must view/pick up faxes (F) Receipt of request can be tracked
E-mail	HW: E-mail server SW: Routing	(I) Request received through e-mail (D) None (all e-mails handled the same) (R) SW automatically routes to e-mail (F) Receipt of request can be tracked
Web-interface	HW: Web server SW: Routing	(I) Request received through web-interface form (D) Rules allow program to route requests directly to certain departments (R) Requests sent to various departments (e-mail) (F) Receipt and routing of requests can be tracked

Table 5.1.2 The tasks involved for each mode of receiving a request at the IPA.

5.1.3 Problems

As discussed in section 3.2.2, the greatest problem found with receiving requests is the fax-receiving program itself. Not only is the HW/SW problematic, but there is no fail-safe built into the system to alert users of a problem. Since the majority of requests are currently received via fax, and this redesign effort seeks not to alter the behavior of the PCP's – at least not until a benefit in doing so can be found, a solution to this HW/SW problem, as well as fail-safes, must be established.

5.1.4 Alternative Solutions

There are several modes by which requests can be submitted to the IPA. Modes already in existence include phone, mail and a fax-receiving software (see section 3.1, step 2). This investigation has added e-mail, web-interface, and manual fax machines (already in existence at the IPA). These alternatives for receiving requests have been discussed and compared in the preceding sections (5.1.1 and 5.1.2).

It is recommended that several modes of receiving be maintained, particularly those already in use. It may be advisable to offer more alternatives if such alternatives are made more feasible by other changes in the system, or if study reveals a strong advantage with use of a new mode. Regardless of the number of receiving modes in operation, it is advised that the IPA use this study to shape the behavior of the PCP's toward the submission method(s) most desired by the IPA. A discussion of how to do this can be found in section 6.5.1.

The remainder of this section will seek alternative solutions for the fax-receiving problem. Clearly, a new program is needed. Since most of the more

than 5,000 requests received per month are faxed, a method that can receive multiple faxes at once and route them would be optimal.

At the inception of this project, only received faxes were included in the scope of the study. However, it was learned that this system also encompasses outgoing faxes. Commonly, when a request is illegible, incomplete, or if an evaluator needs more information, faxes may be sent from the IPA to the PCP. In response, the PCP may fax the requested materials back to the IPA, but to a different fax number than the original request. Additionally, evaluators may send disposition of urgent requests or other correspondence via fax. Thus, four fax lines are included in this system: 1) request receiving line, 2) re-fax to Receiving Department, 3) Evaluation Department, and 4) Medical Review. Faxes are routed by the computer software to the appropriate printer as a function of the fax line they transmit through.

Further, the fax-receiving program in use only receives faxes. If an employee needs to send a fax, they must walk to a community fax machine and send it manually. Thus, it was determined that outgoing faxing must be considered in the search for solution to the incoming fax problem.

Observations of several system employees were conducted. Employees who sat an average distance from a community fax machine were timed while sending outgoing faxes. Timing began when an employee began to move away from their desks toward a fax machine, and concluded when they returned to their desks after sending the fax. The mean time was 4.6 minutes (standard deviation = .87 minutes). The average number of outgoing faxes involved with the approval and referral system per month is 2,000. So, the time required to

send faxes per month in this system is approximately 153.3 hours (equivalent to 19.2 eight-hour days per month). Further, the average cost of employees who work in this system and send faxes is $13.00 per hour. This brings the estimated labor cost of sending faxes to nearly $2,000 per month.

Other costs associated with manual faxing include toner, paper, repair costs, etc., and were not studied in-depth. Only the cost of toner for the four machines used in this system was easily obtained ($525 per month). The cost of manually faxing was a useful factor in assessing alternative solutions.

The first solution considered was manual faxing. However, the sheer volume of incoming faxes made this option prohibitive. So, the search for a solution centered on software and hardware that could employ fail-safes and supply a reliable searchable database of all received faxes.

In collaboration with the IT Manager, several software programs were reviewed. These programs included IBM Lotus Notes, Panagon Filenet, GFI FaxMaker, Vogler, and others. A trade-off study was conducted using the three most promising alternatives and manual faxing as a baseline.

5.1.5 Trade-off Study

The three most promising software solutions were included in the trade-off study, along with manual faxing as a comparison. Each option was rated using the following criteria: reliability, ability to employ fail-safes, databasing, routing, compatibility with legacy software, ease of use, processing speed, and monthly operating cost. Each of these variables was weighted by importance with input from management at the IPA. Additionally, scores were assigned collectively by

the IT manager and the Human Factors researcher using a 10-point rating scale (10 being best).

Criteria	Weight	Manual Faxing		IBM Lotus Notes		Panagon Filenet		GFI FaxMaker	
			Score		Score		Score		Score
Reliability	+30	5	150	10	300	7	210	9	270
Fail-Safes	+30	5	150	7	210	5	150	8	240
Databasing	+30	2	60	6	180	10	300	7	210
Compatibility	+30	10	300	0	0	2	60	10	300
Routing	+20	0	0	4	80	10	200	8	160
Ease of Use	+20	7	140	5	100	5	100	9	180
Speed	+20	2	40	10	200	5	100	10	200
Mo. Cost	+10	4	40	9	90	2	20	9	90
Total			**880**		**1160**		**1140**		**1650**

Table 5.1.5 Trade-off analysis for fax-receiving methods.

Reliability, fail-safes, databasing, and compatibility with existing legacy software programs were rated equally as the most important criteria. Routing, ease of use and speed were equally rated as the next most important criteria, with the monthly operating costs receiving the least weight (cost analysis is presented in the table below). The trade-off analysis reveals the GFI FaxMaker as the best solution using the given criteria.

Software	Cost to Implement	Monthly Operating Cost
Manual Faxing	$ 0	$2,000 labor $ 525+ materials
IBM Lotus Notes	$ 38,000	$ 450 labor
Panagon FileNet	$ 27,000	$4,200 fees $ 450 labor
GFI FaxMaker	$ 20,000	$ 450 labor

Table 5.1.5a Cost Analysis of the four fax-receiving options used in the trade-off study.

Perhaps the most appealing aspect of this choice is that it will work with all existing legacy software. Therefore, no employee re-training will be needed. Aside from this, it was highly rated on all criteria used. Since the GFI software

won in the trade study, an additional step was taken to assess the cost of implementation. The following analysis projects a monthly savings in operating costs of $7,075. At this rate, the system will pay for itself in less than three months, and in the first year will save the company a projected $64,880. A future expansion to the IPA's 20 remaining fax machines would yield even greater savings.

Current Faxing Costs **4 fax machines** Fees: $5,000 Fax Labor: 2,000 Toner: 525 Monthly: $7,525	**GFI / Exchange** **4 fax lines** Initial Cost: $20,020 Fees: 0 Fax Labor: 450 Toner: 0 Monthly: $450
Future Expansion **20 additional fax machines** Monthly: $10,000	**Future Expansion (20 lines)** Initial Cost: $2,350 Monthly: $2,250

Table 5.1.5b Comparison of current operating fax costs with FaxMaker operating costs.

5.1.6 Recommendations

It is recommended that the IPA upgrade their existing Exchange 5.5 server to Exchange 2000 and install GFI FaxMaker. It is also recommended that a redundant fax server be initiated to work in tandem with the existing fax server. In this way, if one of the servers experiences a problem, the other will continue to route faxes. This will add to the reliability of the hardware and thus, provide a fail-safe for the receiving system.

The GFI FaxMaker software offers a searchable database of all incoming and outgoing messages. Though the faxes are not in viewing form, they are stored by fax header as well as the phone numbers received from and sent to, in addition to routing information. Thus, any fax received or sent through FaxMaker can be quickly and easily tracked.

FaxMaker routes faxes seamlessly into Outlook e-mail, and can be sorted by the fax line it was received through. Each department can share a fax e-mail inbox and in this way, each employee within the department can view faxes at their desk, accessing them through e-mail, ascertain which are pending, and process them without the need to leave their desks. Figure 5.1.6 illustrates how faxes will appear in e-mail.

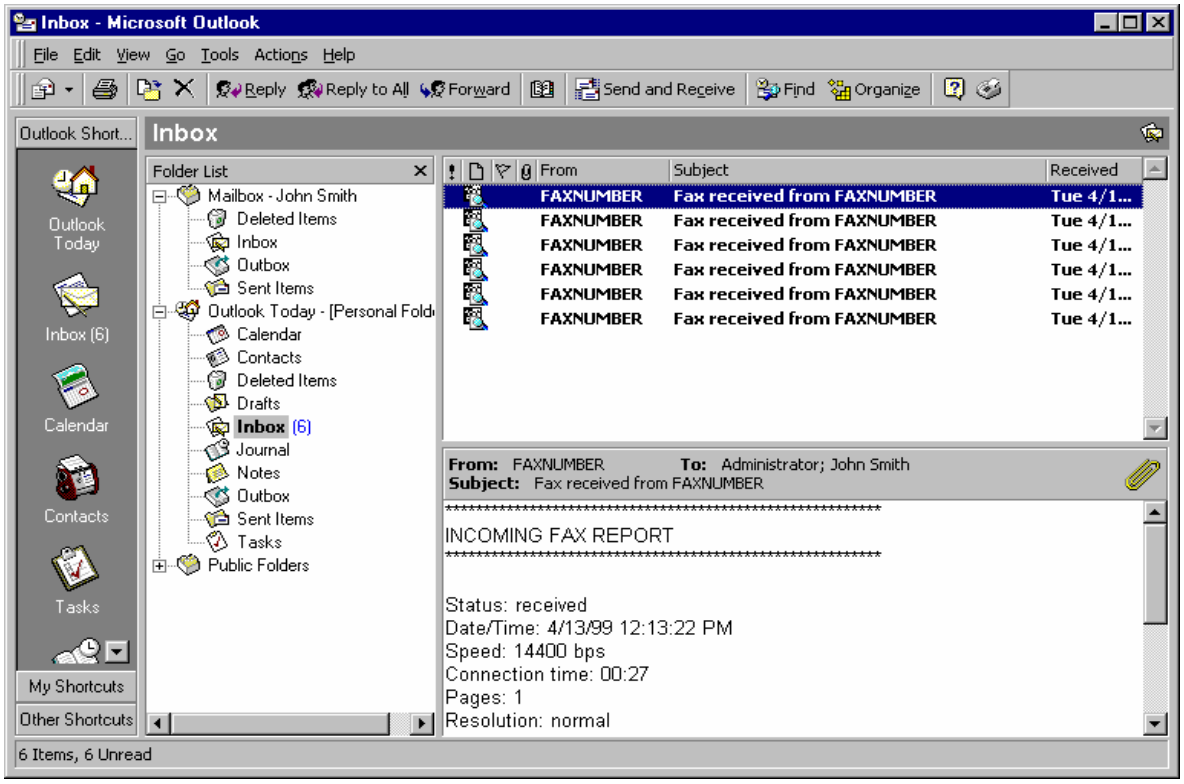

Figure 5.1.6 Using GFI FaxMaker, faxes will appear in Outlook as e-mail.

Since FaxMaker also facilitates outgoing faxes, users can send faxes from e-mail, Microsoft Word, and many other existing desktop applications, eliminating the need to walk to a fax machine. These faxes can be sent in the background while the user is working in another program on their computer, thus saving about four minutes with each outgoing fax.

5.1.7 Implementation

The current Exchange 5.5 server must be upgraded to Exchange 2000 prior to installing the GFI FaxMaker software. The upgrade will take approximately 24 hours. During this time, the e-mail system will be down. Allowing for this, it is recommended that the upgrade be performed over a weekend. A second redundant server will also be needed, but the e-mail system will be unaffected by the second server set-up, as the first will be handling the system.

The GFI FaxMaker installation will take approximately two hours, with an additional four hours for configuration. The e-mail system will not be affected by this, so this procedure can be done during normal working hours. Once the installation and configuration are complete, the phone lines will be plugged in and the system turned on.

Employee training will not be extensive. To create a smooth transition to the new system, supervisors and leads should receive training on the system before implementation. Once the new system is live, employees should attend a short training session and each should be given paperwork with basic step-by-step information about using the new system. Thereafter, the previously trained supervisors and leads will be available to assist employees in learning the new system.

5.2 Entering Requests into the Main System, Matching Requests

The function of “entering requests” is defined as the collection of tasks that occur after the request is received and until the request is entered into the main system. “Matching requests” is defined as the act of verifying that both the requesting physician and the patient are members of the IPA. In the initial design of this system, these are treated as two separate steps (see section 3.1, steps 3 and 4).

There are a few important areas of consideration with these functions. As required by law, once a tracking number is assigned to a request, it has become valid in the sense that the IPA is now responsible to the patient to provide a response. So, any request involving an uninsured patient should not be assigned a tracking number. Similarly, if the request is submitted by a doctor who is not a member-physician of the IPA, or is not permitted to submit such requests, and the request is assigned a tracking number, the IPA is now responsible to both the patient and the physician to respond in compliance with the law. If the request is authorized, the IPA has assumed financial responsibility for the procedure or care authorized. The number of requests with these sorts of issues is not great, however, a single erroneously approved request could cost the IPA a great deal.

Consequently, requests from non-member physicians, unauthorized physicians, and requests regarding non-member or uninsured patients should be refused upon receipt, before any time is spent on entry. Additionally, once the request is entered, it has a higher chance of accidentally being assigned a tracking number, or worse, being authorized.

The initial design of the system does not provide for any screening. All requests are entered into the system and placed in a queue for the Matching Department, where requests are matched to physician and patient files. This redesign effort with combine these two functions in effort to avert these problems.

Another consideration for the redesign is the lack of a searchable database for entered requests. The initial system design does not provide such a database until the request has been closed. So to find a pending request, a human operator must search each queue in the system. A successful redesign will provide a direct and easy method to find requests in process.

5.2.1 Function Analysis

Requirements. The required functions in matching and entering are as follows:

1) The requesting physician must be verified as a member-physician who is authorized to submit such requests.
2) The patient must be verified as a member with active coverage.
3) The request must be entered into the main computer system for processing throughout the system. (The system must exclude entry of non-member requests.)
4) The request will be easily found in a searchable database.

Function allocation. The initial design of the system allocates all the decision functions to the human operator. The computer serves only as an input and information holding

device. The following table allocates functions based upon recommendations from Sanders & McCormick (1993). The human operator enters the request into

the system. During entry, the SW assists the human operator by using the database to match the physician and the patient. If the SW cannot locate a match with either, the human operator should not be allowed to continue entry. Requests that are not matched or have left required fields blank, will not be accepted into the system. Finally, the SW will ask the human to chose a queue: urgent or normal.

Function	**SW**	**HW**	**Human IPA**
Enter into system	✓	✓	✓
Match to physician and patient	✓	✓	
Queue as urgent or normal request	✓	✓	

Table 5.2.1 Allocation of functions for entry and matching among software (SW), hardware (HW), and human operators at the IPA.

5.2.2 Task Analysis

The following table shows a detailed analysis of the tasks involved in matching requests to patient and physician files and entering them into the main system. This model uses function allocation based upon recommendations from Sanders & McCormick (1993), thereby portraying the optimal design. Both positive and negative responses are shown.

Task	Interface Components	Indicator (I) Decision (D) Response (R) Feedback (F)
Matching Physician	Human HW SW	(I) Human enters request into HW/SW system (D) SW searches database for physician (R) SW finds physician, inserts information (F) Human confirms physician is correct
Matching Patient	Human HW SW	(I) Human enters request into HW/SW system (D) SW searches database for patient (R) SW finds patient, inserts information (F) Human confirms patient is correct
Submitting	Human HW SW	(I) Human completes request entry and activates submission into the system (D) SW verifies form is complete (R) SW informs human form is complete, shows completed form, asks for confirmation (R) Human confirms submission (F) SW informs human form has submitted
Can't Match Physician	Human HW SW	(I) Human enters request into HW/SW system (D) SW searches database for physician (R) SW can't find physician, advises human (R) Human must correct entry or reject request (F) SW won't allow entry to continue until physician matched
Can't Match Patient	Human HW SW	(I) Human enters request into HW/SW system (D) SW searches database for patient (R) SW can't find patient, advises human (R) Human must correct entry or reject request (F) SW won't allow entry to continue until patient matched
Can't Submit	Human HW SW	(I) Human completes request entry and activates submission into the system (D) SW rejects form as incomplete (R) SW informs human form is incomplete, shows which fields are needed (R) Human completes form, resubmits (F) SW either rejects or advises prompts human to review and submit

Table 5.2.2 The tasks involved in entering and matching requests in an optimal design.

5.2.3 Problems

Problems found with entry and matching functions were discussed in the beginning of this section (5.2). The two primary problems to mitigate are: 1) excluding the entry of non-member patient and physician requests, 2) providing a searchable database of entered requests.

5.2.4 Alternative Solutions

To exclude entry of non-member patient and physician requests, only a few alterative solutions have been identified. The first alternative is to implement a manual screening process prior to entry. This would be comprised of a human operator investigating the membership of each physician and patient prior to entering the request into the system. However, this would only prevent entry, not exclude it. This idea provides no checks or fail-safes. Since the number of non-member requests is low, the temptation to skip the screening step would be high. Since there are no fail-safes built into the system to catch such mistakes (evaluators will expect screening to be complete prior to reaching them), this alternative will not exclude the problem.

Manual screening also fails to provide a platform which would help create a searchable database. This alternative is clearly a first-cut solution, but will not mitigate the problems sufficiently. It will be considered only for comparison purposes going forward.

Another possible solution is to automate some tasks. Since the requests must be entered into a computer system, the system should be programmed to screen certain information automatically. During entry, the SW could interact with the database to match physician and patient information, providing the

human operator with prompts and feedback. Thus, the entry and matching processes are consolidated into one. Rather than simply holding information, the SW would work interactively with the human operator to complete the tasks.

Additionally, this interface could attach requests to the physician files and the patient files so that requests could be called up for review in either place. This would create a database of requests. Whether a physician or patient called the IPA to check on the status of a request, the request would be easily found. Further, it would be found in two places, so that if, for example, the patient's name was Bill Smith and there were numerous patients will that name, the IPA employee could find the patient's file by accessing the physician's file. Optimally, the request should be located by either physician name or number, or patient name or number.

The IPA was particularly interested in offering direct entry to member-physicians via a web-interface. Consequently, this option will also be evaluated. This alternative is being conceptualized as an interface that both employees of the IPA and authorized member-physicians would use for entry via a secure website. These physicians would be allowed to enter requests into the system using a smart interface that would verify patient coverage and accept or reject submission as shown in table 5.2.2. Exclusion of non-member requests would be absolutely required with a web-interface design, as would tracking systems.

5.2.5 Trade-off Study

Three alternative solutions were included in this study: manual screening prior to entry, an interactive entry interface, and an interactive entry web-interface. Criteria for a solution was assembled and weights were assigned to

each by the author with input from IT and Entry management. Scoring was based upon a 10-point scale (10 being the best rating). Each alternative was scored by the author.

Criteria	Weight	Manual Screening		Interactive Interface		Web-Interface	
			Score		Score		Score
Non-member exclusion	+30	0	0	10	300	10	300
Databasing	+30	0	0	10	300	10	300
Fail-safes	+30	0	0	10	300	10	300
Ease of use	+30	5	150	9	270	9	270
Training needs	+30	9	270	8	240	8	240
Speed of process	+20	3	60	8	160	8	160
Implementation Cost	+10	10	100	7	70	5	50
Total			**580**		**1640**		**1620**

Table 5.2.5 Trade-off analysis for request entry and matching system.

The interactive interface won the trade study, with the web-interface a close second. This was expected since the manual screening was included simply for comparison purposes. The two interfaces are conceptually identical. Only implementation costs differ between the two, primarily due to security administration across the Internet.

5.2.6 Recommendations

It is recommended that the IPA implement an interactive interface that will exclude entry of non-member requests and attach requests to both the physician and patient files. The content of the interface should follow the same layout as the existing request forms. This will reduce training time and aid employee entry. The interface could be created in such a way that would be amenable to a web-interface in the future. However, usability of a web-interface by physicians at this time is not clear.

A survey to assess the number of member-physicians whose offices are computerized, as well as those with Internet access, was sent to 500 member-

physicians. Only 54 responses were received. Of these, 70% indicated the use of computerized billing, and 40% indicated they had Internet access. From this low response rate, it is untenable to extrapolate these percentages as representative of the general population of member-physicians. Therefore, this study can only recommend further study.

Before implementing a change that physicians are expected to use, it is advised that the process at physician offices be observed and an assessment made as to whether the change would offer enough advantage to them to implement a change. Testing the interface with a random sample of physician offices would also be prudent so that problems can be detected prior to assessing a true implementation scheme.

This study can also offer the concrete recommendation that the interface be created and run on internal systems, while the problems are assessed and solutions implemented. If the IPA is determined to go live on the Internet, then it is recommended that the interface be created and run on an internal intranet where problems can be assessed in private. Internet security experts should be consulted prior to Internet testing with a selected group of PCPs.

Boxed interface products can be purchased; however, either they are not customizable, or they are costly. Table 5.2.6 shows a comparison of the most

Interface	**Cost**	**Pros**	**Cons**
OAO Web	Free	Pre-built	Can't customize
Scipa	$30,000	Pre-built	Need to customize
Asterion	$47,000 first yr	Pre-built	Can't customize
Building Own	$ 8,000 (200 hrs)	Control over design	Future support costs, upgrades

Table 5.2.6 Interface cost comparisons.

promising Internet-ready interface programs. Because this interface is not very elaborate and because the IPA has programmers capable of creating the interface, it is recommended that the IPA created the interface internally.

5.2.7 Implementation

The IPA programmers should begin by building a simple prototype of the interface with the same layout as the request form in use. The User-interface Style Guide, which can be found in Appendix A, was assembled for use in this project, and should be reviewed by the programmers in building the prototype. Once a functioning prototype has been built, testing should occur with a group of users who will ultimately use the interface. Feedback should be collected and the interface should be evaluated and improved. This process will repeat a number of times until the interface can function as specified and has accommodated user needs to the extent that its intended functionality has not been compromised.

Employee training will not be extensive. An interface that follows the format of the request form, is self-explanatory, and excludes errors, will not require much training. Similarly, training employees to locate requests in the system will not be extensive either.

5.3 Request Disposition

Requests are decided by one of two departments, Evaluation or Medical Review, depending upon the severity of the diagnosis and the scope of the treatment. In the initial system design, all requests travel through the Evaluation Department, where they are either decided upon or sent to Medical Review.

The Evaluation Department is comprised of nurses who receive requests via a queue. They review the requests and reach a decision to either approve or deny each. The evaluators have a list of diagnoses and treatments that they can decide, and a list of those that they must send to Medical Review for a physician to evaluate.

Each evaluator may contact the PCP, other physicians involved in the request, etc., in reaching their decision. Once they have reached a decision, they either deny the request or approve the request. Notes are placed on the request stating what was done and why the decision was reached, and the request is closed. If the request is approved, an authorization number is assigned, which alerts the computer to generate an approval letter. If the request is denied, no number is assigned, which alerts the computer to generate a denial letter.

If the request is sent to Medical Review, then a physician will review the request, and may consult other physicians, request files, etc. in reaching a decision. Once a decision is reached, notes are placed on the request stating what was done and why the decision was reached, and the request is closed. The closing process is identical to that of the Evaluation Department. However, the physician may contact treating physicians and hospital facilities to schedule

treatment immediately and discuss proper treatment with those involved in delivering the care.

5.3.1 Function Analysis

Requirements. The functions required to close a request are as follows:

1) The request must reach the Evaluation Department or Medical Review.
2) Each request must be evaluated against insurance and medical criteria.
3) Notes must be placed on each request.
4) Each request must be either approved or denied and closed.

Function allocation. The initial design of the system allocates all decision functions to the human operator, who manipulates the HW/SW to hold information or execute certain commands (hold these notes, send request to this queue, close this request, send this type of letter). Since the requests reach the Evaluation Department via a queue assigned by a department that no longer exists in this redesign, functions need to be reallocated.

Since requests are entered into the new interface where patient and physician membership is verified, and the requests are attached to the physician and patient files, the interface can also introduce functional rules automating some decisions. For example, the list of diagnoses and treatments which must be reviewed by a physician can be programmed into the interface, routing those requests directly to the Medical Review queue. All other requests can default to the Evaluation queue. Similarly, the urgency of the request can be indicated on the request interface entry and routed to an urgent queue.

Other functions can be automated as well. However, a full discussion of these is beyond the scope of this investigation. The current concern is with the allocation of the basic functions of request disposition system. The allocation scheme of the redesign is shown on the following table.

Using this scheme, requests will be routed to Medical Review or Evaluation by a logic script programmed into the new interface. Additionally, some requests will be forwarded from Evaluation to Medical Review by evaluators. Nurses and physicians will evaluate requests and decide to approve or deny them. Then, notes will be entered into the system and the request will be closed.

Function	**SW**	**HW**	**Human IPA**
Evaluation Dept. receives request	✓	✓	
Medical Review receives request	✓	✓	✓
Evaluate request			✓
Decision to approve or deny request			✓
Enter notes	✓	✓	✓
Close request	✓	✓	✓

Table 5.3.1 Allocation of evaluation functions among software (SW), hardware (HW), and human operators at the IPA.

5.3.2 Task Analysis

The following table shows a detailed analysis of the two basic tasks involved in request disposition. The first task is getting the request to the appropriate evaluator (Evaluation Department or Medical Review). The second task is the evaluation process itself which culminates in the approval or denial of the request. The evaluation process can vary considerably with each request. Those variations are not addressed in this project since a proper evaluation of this function would require considerable time and medical expertise.

Task	Interface Components	Indicator (I) Decision (D) Response (R) Feedback (F)
Sending requests to evaluators	HW SW	(I) Request has been entered into system (D) SW logic compares diagnosis and treatment codes on request with programmed list for Medical Review (R) SW sends certain requests to Medical Review, all others default to Evaluation Dept. (F) Request is received in correct department
Request Disposition	Human HW SW	(I) Request appears in queue (D) Human compares request with insurance limits and medical knowledge (R) Human enters notes, approves or denies request, closes request (F) Request is closed in system

Table 5.3.2 The tasks involved in request disposition.

5.3.3 Problems

The actual evaluation process which produces request disposition is not itself a subject of this study. However, the routing of requests to the proper evaluator is within the scope. The primary concern of redesign in this area is to reduce the number of steps or time required to complete the task while not intruding directly upon the evaluators efforts.

5.3.4 Alternative Solutions

As discussed in sections 5.3.1 and 5.3.2, only one solution with various uses is suggested. The entry interface discussed in section 5.2 could be programmed with logic that enables it to route requests directly to the appropriate evaluator. More specifically, the list of diagnosis codes and treatment codes currently used to manually route requests to Medical Review could be programmed into the interface and routed directly upon entry. This would reduce

the time and number of people who review a request that must be reviewed by a physician, potentially saving that request one or two days of transit time before reaching Medical Review. Additionally, it would eliminate the need for a nurse evaluator to view the request and determine manually that it must be forwarded to Medical Review – allowing the nurse to spend time on other requests.

The interface program would send all other requests to the Evaluation Department as a default. Some of these requests may still require Medical Review, so the nurse evaluators should have the ability to post them to the Medical Review queue.

Other tasks could be programmed into the interface logic. For example, simple logic scripts could route urgent requests into urgent queues, and some routine requests such as referrals to gynecologists for yearly exams could follow a quick script that verifies the patient hasn't used their quota of these visits for the current year, and then approve the request automatically. Automatic approvals should require a stringent set of requirements. If any of these fail, the request should default to Evaluation.

5.3.5 Trade-off Study

With this function, the most beneficial use of a trade-off study would involve the various tasks that could be automated, and the consequences of errors. If the IPA generates a list of tasks under consideration, each could be studied and alternative modes of accomplishing the tasks could be weighed, along with consequences of errors for each mode.

5.3.6 Recommendations

It is recommended that the IPA integrate routing rules in their new entry interface design. The benefit of instant routing upon entry is obvious and substantial. Requests will be received by evaluators two to three days faster, and many requests requiring medical review will reach a physician evaluator three to four days sooner. This could reduce the total processing time of normal requests to the current time it takes to process urgent requests. Naturally, the rate of processing also relies strongly on the number of requests to evaluators as well. However, by re-allocating some tasks to HW and SW, the task load of human operators will decrease, allowing them to process a higher volume of requests. The automation of other tasks should be evaluated for their actual benefit and potential problems before implementation.

5.3.7 Implementation

Implementation of automated tasks should be contained within stages of building, testing, and evaluating the new entry interface discussed in 5.2 (see section 5.2.7). The User-interface Style Guide (Appendix A) should be consulted by programmers during the building of the interface.

5.4 Notifying Physicians and Patients of Disposition

Notifying physicians and patients of the disposition of the request is the final function of the system. In the initial design of the system, a letter is automatically generated by the computer once the request is closed. The letter request is processed overnight and the system either faxes the outcome directly to the PCP or, if the system cannot locate a fax number, a letter is printed for mailing. The PCP is then required to notify the patient of the outcome.

At one time, patients were also mailed a letter. However, the IPA halted this practice in response to several member-PCPs requests. Many PCPs prefer to handle all referrals and specialist appointments themselves. Since the PCP must keep records, and thus must be notified, a decision was made by the IPA to stop notifying patients directly and allow the PCP to handle patient notification.

5.4.1 Function Analysis

Requirements. The functions required to notify the PCP and the patient are as follows:

1) Notify PCP of request disposition.
    a) IPA generates notification.
    b) IPA delivers notification to PCP.
2) Notify patient of request disposition.
    a) IPA or PCP generates notification.
    b) IPA or PCP delivers notification to patient.

Function allocation. The following table shows function allocation among SW, HW, and human operators at the IPA and PCP for various alternative notification methods.

Function	SW	HW	Human IPA	Human PCP
IPA generates notification (either 1 copy for the PCP, or 2 copies for the PCP and patient)	✓	✓	✓	
Notify PCP of request disposition				
IPA mail to PCP			✓	
IPA fax to PCP	✓	✓		
Notify patient of request disposition				
IPA mail to patient			✓	
PCP mail to patient				✓
PCP phones patient				✓

Table 5.4.1 Allocation of disposition notification functions among software (SW), hardware (HW), and human operators at the IPA and PCP, based upon alternative methods.

5.4.2 Task Analysis

Table 5.4.2 (on the following page) shows a detailed analysis of the tasks involved in request disposition notification, based upon the different methods available. The IPA must first generate notification to send to the PCP. After this, notification can be sent to the PCP via fax or mail. Patient notification can be administered a number of ways. Either the IPA can notify the patient by mail, or the PCP can notify the patient by mail or phone.

5.4.3 Problems

Among of the visible symptoms of the system (see section 3.2) are patient calls regarding the status of their request, and patient complaints regarding the time spent processing requests. While it has not been measured, it is possible that some of these calls and complaints are created by the further delay caused when the PCP notifies the patient, or perhaps when a PCP forgets to notify the patient. In the interest of the best possible analysis, alternative notification schemes will be evaluated briefly.

Task	Interface Components	Indicator (I) Decision (D) Response (R) Feedback (F)
IPA generates notification	HW SW	(I) Request has been closed in system (D) If denied, SW generates denial letter; if approved, SW generates approval letter (D) If SW finds PCP fax number, fax letter generated; otherwise letter is printed for mailing (R) SW either faxes notification to PCP or prints it (F) Fax sent to PCP or letter printed
Fax: Notify PCP of requests disposition	HW SW	(I) SW finds fax number for PCP (D) Create fax letter (R) SW faxes to PCP (F) Fax queue empty, fax log shows sent
Mail: Notify PCP of request disposition	Human (IPA)	(I) Printed letter (D) Human recognizes it must be mailed (R) Human stuffs it in an envelope and mails it (F) Letter is gone
IPA notifies patient of request disposition by mail	Human (IPA)	(I) Printed letter (D) Human recognizes it must be mailed (R) Human stuffs it in an envelope and mails it (F) Letter is gone
PCP notifies patient of request disposition by mail	Human (PCP)	(I) Notification received from IPA (D) Human recognizes it must be mailed (R) Human stuffs it in an envelope and mails it (F) Letter is gone
PCP notifies patient of request disposition by phone	Human (PCP)	(I) Notification received from IPA (D) Human recognizes patient must be notified (R) Human calls the patient (F) Notes added to notification, and notice filed

Table 5.4.2 The tasks involved in various methods of request disposition notification.

5.4.4 Alternative Solutions

The PCP notification function is working adequately. For time considerations, the fax function should be used as much as possible, thus reducing the number of mailed notifications. This, however, is not a change from the current system.

The only alternative available to the IPA regarding patient notification is for the IPA to generate a second notification for patients and send them through the mail. Since some requests are denied simply to cancel duplicates or erroneous requests, the evaluator would need to consider whether a letter should be generated upon closing each request – adding to the mental load of their task which is already heavily laden with memory requirements (what Norman, 1988 refers to as information in the head). The evaluator would need an override function to keep a letter from being generated in such cases. A prompt from the interface program may alleviate some of the metal load if positioned properly on the interface. However, the ability of the software to accomplish any of these functions has not been assessed.

Additionally, if the evaluator forgot to override notification generation, two possible consequences would occur: 1) the evaluator would try to find the letter before it was mailed the following day, or 2) the patient would receive a denial letter that may cause them distress or confusion, causing the patient to call the IPA or the PCP, perhaps only to find it was an internal correction. Much time and frustration could be wasted in such a case, creating a bad impression of the IPA with the member-patient and member-physician alike.

5.4.5 Trade-off Study

Patient notification by the IPA and PCP are compared in the following trade-off study. Criteria for a solution was assembled and weights were assigned to each by the author with input from IPA management personnel. Scoring was based upon a 10-point scale (10 being the best rating). Each alternative was scored by the author.

Criteria	Weight	IPA Patient Notification		PCP Patient Notification	
			Score		Score
Accuracy	+30	6	180	8	240
Speed of notification	+20	6	120	7	140
Reliability of method	+10	10	100	7	70
IPA labor	+20	5	100	10	200
Total			**500**		**650**

Table 5.4.5 Trade-off analysis for patient notification of request disposition.

5.4.6 Recommendations

It is recommended that no changes be made to the request disposition notification function. The problems associated with sending false notifications outweigh any benefit that may be garnered. Additionally, since some member-physicians have requested that the IPA not notify patients directly of request disposition, it is important to include an assessment of the relative importance of member-physicians and member-patients to the IPA.

According to management at the IPA, the cost of losing a member-physician typically outweighs the cost of losing numerous member-patients. Similarly, the cost of procuring new member-physicians is much higher than the cost of procuring new member-patients. This follows since member-physicians tend bring many patients with them into the IPA. Further, the loss of one member-physician tends to be followed by the loss of many of his or her patients.

Because of the importance of member-physicians to the IPA, their requests are honored to as great an extent as is feasible for the IPA and for proper care management of patients. Therefore, if the problems of false notification can be mitigated, before the IPA considers direct notification of patients, member-physicians should be surveyed and otherwise included in the process.

6.0 Recommended Changes

This section is presented for quick review. First, table 6.1 illustrates a summary of all the recommendations posed by this study. Recommendation sections are referenced for easy review. Table 6.2 follows with an implementation scheme for all recommended changes. Implementation sections are referenced here as well. Finally, table 6.3 shows a function allocation for all the steps in the redesigned system. This allows easy review of all changes. Section 6.4 gives a assessment of the redesigned system. And finally, section 6.5 offers a brief discussion of some anticipated consequences.

6.1 Summary of Recommendations

Section	Recommended Action	Benefit
5.1.6	Upgrade fax server to Exchange 2000	• Can install GFI FaxMaker
5.1.6	Install redundant Exchange 2000 fax server	• Greatly reduces the possibility of fax down-time
5.1.6	Install GFI FaxMaker SW	• Reduces time spent receiving and sending faxes • Database of incoming and outgoing faxes, including routing information • Routes faxes to Outlook e-mail • Allows faxing from SW applications
5.2.6	Create interactive entry interface	• Exclude non-member request entry • Attach requests to physician and patient files
5.3.6	Introduce routing rules in the interface	• Evaluators receive requests sooner • Requests requiring Medical Review do not have to be screened by Evaluation Department
5.4.6	Request disposition notification should remain as is	• Worse potential problems will be avoided

Table 6.1 Summary of recommendations.

6.2 Implementation Scheme

Section	Action	Time Line	Comments
5.1.7	Fax server upgrade to Exchange 2000	1 weekend	24 hours of fax down time
5.1.7	Install redundant Exchange 2000 fax server	24 hours	No down time
5.1.7	Install GFI FaxMaker SW	Approx. 6 hours	No down time
5.1.7	Train supervisors and leads	Approx. 1 hour	
5.1.7	Fine-tuning per supervisor feedback	Undetermined	
5.1.7	Introduction to users / Training session for all users	Approx. 1 hour	
5.1.7	Allow users at least 3 weeks before introducing new entry interface	3 weeks +	
5.2.7	Creating interface prototype design	Can overlap pervious stages	No down time
5.2.7 5.3.7	Interface prototype testing/evaluation and redesign	Undetermined	
5.2.7 5.3.7	Train supervisors and leads	Approx. 1 hour	
5.2.7 5.3.7	Fine-tuning per supervisor feedback	Undetermined	
5.2.7 5.3.7	Introduction to users / Training session for all users	Approx. 2 hours	
5.2.7 5.3.7	Allow redesign while working toward web installation	Undetermined	Consult Internet security experts
5.2.7 5.3.7	Test web-interface with PCP test group	Undetermined	

Table 6.2 Implementation scheme.

6.3 Flow-through Analysis of Redesigned System

The following table shows the function allocation of the redesigned system. This format was chosen because it nicely displays the functions allocated to human users. As is shown, the human operators in steps 2 and 3 are involved in receiving requests, entering requests into the main system and prioritizing requests. These functions can be allocated to a single human operator. In step 4, some human operators (nurse evaluators) may send

Steps of new system	**HW**	**SW**	**Human IPA**	**Human PCP**
Step 1: Requests are submitted to the IPA by the physician's office				
Fax	✓	✓		✓
Phone	✓	✓		✓
Mail				✓
E-mail	✓	✓		✓
Web-interface	✓	✓		✓
Step 2: Requests are received by the IPA				
Fax or e-mail	✓	✓	✓	
Phone			✓	
Web-interface	✓	✓		
Step 3: Requests are entered into the main system, matched to patient and physician files, and prioritized and placed in queues				
Entry (excluding web-interface requests which are already entered)	✓	✓	✓	
Matched to patient and physician files	✓	✓		
Prioritized			✓	
Queuing	✓	✓		
Step 4: Evaluators receives requests				
Nurse evaluators receive requests	✓	✓		
Physician evaluators receive requests	✓	✓	✓	
Step 5: Disposition of request	✓	✓	✓	
Step 6: Notification of request disposition to PCP	✓	✓		
Step 7: Notification of request disposition to patient				✓

Table 6.3 Function allocation of steps in the redesigned system.

requests manually to Medical Review. However, in the new design, the number of these has been reduced, allowing the nurse evaluators to concentrate on applying their expertise in reviewing and deciding each request. Little has changed for the physician evaluators.

What this demonstrates is that all tasks unnecessary for a human operator to perform have been reallocated to SW and HW – as much as was feasible for the system to fulfill its goals.

The system has not changed for the member-PCP, save for the possibility of adding web-interface request entry in the future. However, even with this addition, the PCP can chose to continue to submit requests by whatever mode they are accustomed.

6.4 Assessment of Redesign

The redesign effort can be assessed by revisiting the goal statements (section 4.1). The first goal was to reduce processing time of requests. This goal has been addressed by automating the matching function and queuing for Medical Review (see sections 5.2.6 and 5.3.6). The success of this solution can be measured by a reduction in the mean number of days required to process requests, as well as low range and variability of processing times, and a reduction in complaints about processing time from members.

The second goal was to reduce the rate of “missing” or lost requests. This goal has been addressed by recommending new fax software that is reliable and provides a searchable database of all incoming and outgoing faxes, along with their routing information (see section 5.1.6). In addition, creation of an entry interface is recommended which attaches request to both patient files and PCP files immediately upon entry, where they remain during processing and after disposition (see section 5.2.6). The success of this approach can be measured by a reduction in the rate of requests that PCPs are asked to resubmit.

The third goal is closely linked with the second goal. It requires that requests be easily located in all stages of processing. This goal addresses the need for a searchable database of all requests in the system. What this adds to the second goal is a reduction in time spent locating a request. This has been addressed in sections 5.1.6 with a database for faxes, and 5.2.6 with the attachment of requests to physician and patient files upon entry into the system.

The fourth goal was to reduce IPA labor costs associated with this system, as measured by an increase in the average processing rate of number of requests per number of employees directly involved in the process. This means that more requests should be processed by the same number of employees, or conversely, that the same number should be processed by fewer employees. Either tack will improve productivity and thus lower labor costs.

The approach taken to this problem involved reallocating human user tasks to SW/HW to the extent that proper care management would not be jeopardized. This includes new fax SW that effectively reduces time spent receiving and sending faxes (see section 5.1.4), the creation of an interactive entry interface that automates matching and queuing to Medical Review, thus alleviating the need for nurse evaluators to spend time with requests clearly requiring a physician evaluator (see sections 5.2.6 and 5.3.6), and concentrating on those requests that require their attention.

The fifth goal seeks to exclude the processing of non-member requests. This problem has been addressed in the interactive entry interface (section 5.2.6). This interface should exclude entry unless both the physician and patient can be matched to existing active files. The success of this solution could be

measured by the absence of non-member requests entered into the system, and the rejection or exclusion by the system of all non-member requests prior to entry.

Finally, the redesigned system should be measured using the criteria listed in section 2.2 to assess how well the redesigned system meets all system objectives.

6.5 Anticipated Consequences

This section provides a brief discussion of two areas: shaping PCP submission behavior and the reliance on automation. The IPA is advised to assess the behavioral changes that they wish to shape and those that may occur as a consequence of certain system changes. The IPA is also advised to consider the interrelation of many departments and requirements that may change with automated functions. Again, consequences must be carefully assessed and tolerance levels formulated for certain types of errors.

6.5.1 Shaping PCP Submission Behavior

It is important that the IPA consider which submission method they would prefer their member-PCPs to use and shape behavior accordingly. The initial system reports that most requests are received via fax. This may seem surprising with the high lost-request rate. However, the lack of a searchable database masks the problem area by spreading resubmission needs across all receiving methods.

Faxed requests are likely to be the most popular type of submission in the redesigned system as well. This is anticipated because the PCPs are accustomed to this method and aren't likely to change unless there is a

compelling benefit in doing so. However, if certain approvals were automated and a disposition could be obtained immediately, there may be a growing incentive to submit requests by phone. This would only be the case if PCP offices saw a benefit in certain immediate referrals, as they would quickly learn the types of requests that were given immediate approval. If phone submission sped the process by a day or two, this may be a sufficient benefit to the PCP offices. In this case, the IPA would be advised to sufficiently staff the Receiving Department to handle the volume.

If the web-interface is implemented, allowing PCP offices to enter requests directly into the system, the IPA is advised to pay attention to the incentives and drawbacks of using the system and how these will determine its use. If the interface is perceived as easier than faxing, it will be used more. Please note that the perception of ease of use may have nothing to do with the actual ease of use, and any change from the present system already has a negative perception for many users. These must be overcome if the IPA wants to shape PCP behavior toward using the web-interface.

One way to shape behavior would be to offer certain real-time approvals over the Internet. However, if these were also offered by phone, perhaps the PCP would find it easier to phone rather than type the request themselves. However, if the phones were not sufficiently manned, a recording could direct member-physicians to the web-interface for “faster service.” This may be sufficient incentive to shape behavior toward use of the web-interface. Other incentives may include monetary rewards, etc.

This discussion is presented to demonstrate how the IPA can shape behavior of its member-physicians to match its goals. However, the consequences and costs (both qualitative and quantitative) of each should be carefully considered before implementation. For example, there is no need to create and implement a costly option if there is no incentive for it to be used, and if after careful consideration, a lower cost alternative provides better functionality anyway.

6.5.2 Reliance on Automation

The redesigned system relies on the entry interface to exclude non-member requests from being entered into the system. For exclusion to be successful, the IPA must provide quick entry of member status changes into the system. Once a physician or patient leaves the IPA, they must be excluded from entry immediately. The IPA reports that this is already in practice.

Similarly, new members must be added to the system quickly to avoid rejection of valid requests. The IPA reports new member entry time does not exceed two business days from receipt of notification from the insurance company. Nevertheless, the IPA will need a policy for handling requests received prior to the establishment of a file for new patients and physicians. For example, requests for non-members can be held in entry for two business days, and entry attempted again, prior to rejecting the request. Or if holding such requests is problematic, they could be rejected and the PCP asked to resubmit the request at a later date. In any event, the IPA must consider consequences of their reliance on automation.

Similarly, consequences of real-time automated decisions must take into account the information needed to make the decision and whether that information can be available to the system in real-time. If not, the consequences of errors must be weighed along with the advantages and a level of tolerance for errors must be agreed upon. This level is not only helpful in reaching policy decisions, but in monitoring the functioning of the system. An error level which rises above tolerance is a clear indication that the system is not functioning properly either by design or by a system component failure. Either way, action must be taken to mitigate the problem.

In practice, this is how it may appear: A request is submitted by a PCP via the web-interface. Logical rules designed into the interface allow approval of certain requests. First, the rules establish whether the patient exists. Then the rules establish whether the diagnosis and treatment codes qualify for immediate approval. The rules establish whether the patient has coverage for the requested treatment, and if so, whether the patient has depleted his or her coverage limits. If all these pass the test, the request is approved Online.

But, what if one of the criterion do not pass the test? If membership of the patient cannot be established, then the request is rejected. However, if the patient membership is established, but another criterion is not met, then the request will be submitted – rather than approved Online.

If one of the rules is faulty, or if information entry is lagging, requests could be submitted when they should be rejected, or worse, requests could be approved when they shouldn't be. Reliance on automation requires strict monitoring, good alerts to catch errors quick, and fail-safes to minimize the

impact of errors when they do occur, as well as a tolerance for a certain volume and type of error.

References

Human Factors and Ergonomics Society. (1995). Human factors perspectives on human-computer interaction: selections from proceedings of Human Factors and Ergonomics Society annual meetings, 1983-1994. Human Factors and Ergonomics Society.

SIGCHI. (1995). Human factors in computing systems: proceedings, annual conference series, 1995. Association for Computing Machinery.

Norman, D. A. (1988). Memory is knowledge in the head, Design of everyday things. New York: Doubleday.

Sanders, M. S,, & McCormick, E. J. (1993). Allocation of functions, Human factors in engineering and design (7^{th} ed.). New York: McGraw-Hill.

Sheppard, S. (1996). User-Interface guidelines. Maryland: NASA/Goddard Space Flight Center.

Appendix
User-interface Style Guide

Methodology

This style guide was assembled specifically for use with the interface design proposed by this study. Both the entry interface and a web-interface were considered. Relevant guidelines were acquired from the NASA/Goddard Space Flight Center User-Interface Guidelines (1996), and various journal articles published in the Human Factors Perspectives on Human-Computer Interaction, selected proceedings of the 1983-1994 annual meetings, and the 1995 Association for Computing Machinery conference proceedings (SIGCHI). These guidelines and information were narrowed into a subset of pertinent guidelines.

How to Use This Document

This document was created to be used by programmers in creating a user interface. The best way to apply this information is to review it early in the planning stages of the interface, and then consult it throughout the prototyping, test and evaluation processes. The document is organized into sections which are ordered from basic screen layout criteria, through interactive forms criteria, and feedback criteria.

Screen Layout

- Reserve areas for commands, status messages, and input fields
- The following should be consistent:
  - Title location
  - Menu far location
  - Message location
  - Color meanings (if used)
  - Data entry prompts
  - Labeling terminology
  - Visual coding (if used)

Font Considerations

- Avoid serifs
- Use Arial or similar font
- Use a minimum size of 14 pt. font

Information Presentation

- Text should be brief and clear.
- Command statements should be positive. Always avoid negative command statements.
- Use active voice.
- Use terminology familiar to the user (use abbreviations, icons, acronyms only where understood).
- Include a descriptive title in a consistent location on each screen and window. This title should be short, reflecting purpose or content.

- Present information in a directly usable form.
- The user should not have to cross-reference other resources or perform mental transformations of data.
- Offer text-only version (some physicians may have older computers and browsers).

Visual Guidelines

- No more than 6 distinct colors or 3 shades of gray should be used
- Use colors to group similar items or functions or draw the user's attention
- Common coding includes:
    - Red = warning
    - Amber = alert/caution
    - Green = access, acceptance
    - Blue = message (neutral meaning)
- Don't use flashing or blinking

Limit the Number of Steps

- Limit the number of interactions frequent users must perform.
- Minimize the number of screens required to complete a transaction.
- Provide shortcuts for experienced users. This allows experienced users to by-pass instructions or a series of steps that a novice user may need to use.

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Interactive Layout Criteria

- Use distinctive, consistent prompts and messages
- Use positive wording
- Use minimal punctuation
- Use concise phrasing
- Prompts should be explicit
- Don't use "I' or "you"
- Design with the novice user in mind, and allow experts to work the system
- Use consistent cautions and warnings throughout system
- Inform user when information is rejected
- Inform user why information is rejected
- Design the focus on the task, not on what the user must do with the program
- Allow error recovery (undo function, clear function, cancel request function)
- Provide acknowledgement of every control entry
- Exclude the user from completing a dangerous operation

List Presentation

- Numerical lists:
  - Align decimal points when listing numbers with decimals.
  - Flush numbers right when no decimals are present.
- Alphabetical lists:
  - Alphabetical lists should be flushed left.
  - Labels should be flushed left or centered.

Provide Help

- Allow users to access help from any screen (searchable help function?)
- Offer FAQs
- Tell user where to e-mail suggestions, comments, andquestions
- Include instructions on how to fill out request form
  - A description of the process the user can expect from the system
  - Where to call, e-mail, or fax with questions
  - Where the information goes once submitted
  - How long it will take to get a response
  - What form the response will take
  - How to cancel an erroneous or duplicate submission
- Provide an easy way to return to the task after accessing help functions

Entry Forms

- Make forms compatible. Screen design and layout should be compatible with those used for input (should take the same form as the printed request forms)
- Should use the same labeling and ordering
- Data should be entered in units familiar to the user
- User should not have to enter data more than once
- Feedback should be supplied advising user that information has been received
- Aid user in entering data
- Maintain data relationships across forms
- Distinguish clearly between required and optional fields
- Display default values (if there are any, and if doing so won't result in unacceptable errors)
- Make the most likely selection in a menu list the default option, or allow immediate access to critical or frequently used options
- If selection must be made from a list of more than 8 options or if sequential selection is required, consider using hierarchic menu structure.

Drop-Down Menus

- Use when space is limited
- Use when users need to see menu options
- Use to minimize scrolling by presenting all options at once
- Limit the number of windows. If many are needed, consider tiling rather than overlapping

Supply Feedback

- Provide orientation aids and instructions to help users maintain a sense of where they are in the system, what they can do, and how they can get out
- Supply feedback when user selects an item or icon (highlight or change color)
- Supply feedback when a submission is made
- Validate information before accepting it
- Notify user that the request is being processed (while the request is being processed)
- Provide a log-off
  - Inform the user that any pending items will be lost
  - Allow log-off even if items are pending

Warn user any time data may be lost

- Allow recovery from "clear"
- Allow recovery from "back" button
- Allow recovery from "log-off"
- Suggestion: Upon log-off, give user the message

  "*You have submitted (4) requests;*
  you have (1) request pending.
  Pending requests will be lost when you log-off.
  Are you sure you want to log-off?"

- ***User guidance and feedback should provide***:
  - Consistency of operational procedures
  - Efficient use of system capabilities
  - Limited memory load on user
  - Reduced learning time
  - Flexibility in supporting different classes of users
  - Error prevention
  - Reflect the user's (not the designer's) understanding of the system. This requires review and usability testing by potential end users who have not been involved in system development.