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This study was conducted to determine the optimum method of scheduling surgery to make maximum use of the surgical facilities at Landstuhl Army Regional Medical Center. Current scheduling methods were assessed. Other Army medical facilities were surveyed to establish alternative methods of scheduling and compare use rates. A need for an improved method of surgery scheduling was established. The author recommended a central surgery scheduling office.

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TO DETERMINE THE METHOD OF SCHEDULING SURGERY TO OPTIMIZE UTILIZATION OF SURGICAL RESOURCES AT LANDSTUHL ARMY REGIONAL MEDICAL CENTER

By

Glade R. Hamilton

Captain, MSC

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INTRODUCTION

Considerable work has been devoted to developing less costly and more simplified hospital systems. With the increasing emphasis upon cost containment and the growing influences of competition, it is essential more than ever before in the history of hospital services, to utilize all resources efficiently. An area of major concern in utilization studies is the surgical suite for two interrelated reasons: "(1) surgical suites generally have high costs and historically low facility and/or personnel utilization rates; and (2) surgical patients provide a significant portion of the demand served by other hospital departments."[1]

Productivity is a major area of interest in today's health care institution. The prospective payment scheme directed by the government's Diagnostic Related Group (DRG) method of reimbursement is gaining acceptance and being adopted by many civilian third party insurers.[2] The incentive offered by prospective reimbursement is a margin of profit that corresponds dollar for dollar to the hospital's ability to reduce it's actual costs to a level below the national average of reimbursement for each given DRG. This has forced every administrator in the competitive world of health care to increase productivity, or at least maintain current levels of output while trying to curb expenditures and decrease people resources, thereby containing their costs.

Resource allocation and institutional funding are based upon workload statistics derived from outpatient and inpatient related medical care. This is particularly evident in the Army Medical Department (AMEDD). A recent

mandate by Congress to delete 123 personnel authorizations resulted from the inability of AMEDD workload figures to increase proportionally to personnel increases.[3] Hospital workload is directly related to surgical procedures. For instance, of the total inpatient admissions for non-federal short-stay hospitals during 1977, 42 percent were recipients of a surgical procedure before discharge.[4] An efficiently managed operating room reduces surgical staff waiting time between cases, minimizes workload fluctuations in surgical schedules and increases availability of non-scheduled time for outpatient related medical care. Thus more efficient methods allow more work to be accomplished with the same resources.

The demand for surgical procedures on an elective basis is generated from the consultation visit, which is normally on an outpatient basis. The significance of having an adequate supply of clinic/office visits to meet the outpatient demand is apparent. Operating room utilization cannot, therefore, be addressed without considering the availability of outpatient appointments.

The literature suggests that the civilian sector first focused its attention upon operating room (OR) utilization as early as 1963. This interest increased drastically during the decade of the 70's when cost containment issues encouraged the development of health systems to reduce costs.[5] Today, the economic forces that shadow the competitive health care environment provide incentives for the hospital to insure efficient use of OR resources and for the surgeon to optimize his time in treating patients outside the operating room.

Historically the utilization of military surgical resources has only been studied superficially. This may be attributed to several factors:

First, there are many variables which affect surgical resource utilization. These influencies include: organizational issues, patient issues, provider issues and community issues. The complexity of these variables discourages many individuals from studying the subject.

Second, the data necessary to determine local utilization rates is not readily available. The time required to gather and analyze such information is very time consuming.

Finally, studies to improve current operating procedures which may result in organizational change are not readily supported by some surgeons. They prefer to maintain the status quo in fear that change may impact upon their operating time.

There are several trends which suggest a growing concern to improve OR efficiency within military channels. There has recently been stronger emphasis from higher command channels for increased productivity. In addition, the increasing scrutiny from Congressional critics and Department of Defense analysts in recent years to determine the feasibility/practicality of civilian contracting of military health care, the broadening capability of Uniform Chart of Accounts (UCA) in measuring workload, and the interest in availability of medical care as it impacts upon quality care issues imply that in the very near future operating room utilization will be an area targeted with particular concern.

The recent attention to operating room utilization at Landstuhl Army Regional Medical Center (LARMC) evolved from several factors. The primary motivating factor was the dissatisfaction of the command group with the observed increase in surgery cancellations and the fluctuating workload in the surgery schedule. This perceived problem resulted in a limited

statistical review of OR use. It was determined from the study[6] that operating room utilization during prime time (0730-1500, Monday-Friday) was 59%. This is below utilization targets in the literature which suggest a rate of 75-85%.[7,8]

Second, there was no centralized operational control of OR scheduling. Beyond the assignment of operative days to particular surgical services the OR staff had very little input into the scheduling function. If the OR was vacant because the assigned service did not fully utilize its time, there was no mechanism to alert the other services that time was available. The OR personnel became cognizant of uncommitted time by reviewing the surgeons' list of scheduled patients at 0900 on the day before surgery, which was the surgeons' deadline to request OR time. At this point, the OR staff would assess the kinds of cases involved and would estimate the amount of OR time required. The cases would then be assigned rooms and placed in chronological sequence. The absence of timely exchange of information between the OR and the surgical services usually did not provide sufficient lead-time for other patients to be scheduled to fill the uncommitted time.

Third, the rate of cancellation in scheduled elective procedures was 14%.[9] During a six month period, 246 elective cases which were published on the OR schedule were cancelled. Reasons for cancellation included a high proportion of no shows, patient illness, test results negating surgery and emergency surgeries taking precedence over the elective cases. The inhibiting effect of cancellations upon productive use of surgical resources is evident. A mechanism to schedule patients in the outpatient clinic for the surgeon whose surgical case is cancelled also needs development. Alternatives such as a stand-by appointment list have never been pursued at LARMC.

Fourth, some of the surgical services are restricted in the number of patients who can be admitted at any one time for surgery due to the inability of the inpatient nursing care unit to support the admission. The surgical service is limited in optimizing their resources when their workload is dictated by the inpatient care unit rather than the availability of surgeons or OR time.

Fifth, the study[10] conducted at LARMC revealed that the average number of surgery hours per surgeon per week was 5.6 hours. The approximate number of physician hours set aside for surgery ranged from 7.5 to 20.5 hours weekly. This implies that there is a significant amount of time that could be better utilized by OR and surgical staff if the scheduling procedure were improved.

It has been said that those who fail to plan, plan to fail. A properly managed OR schedule produces a plan to assist in programming efficient utilization of surgical resources.

In order to overcome the myriad obstacles to efficient resource utilization, the operating room scheduling methodology should consider: (1) unity of control in initial scheduling of OR time, (2) OR and surgical staff fluctuations, (3) surgeon operating time for given surgical procedures, (4) interface with the outpatient scheduling system (5) adequate time to permit the scheduling of outpatients on surgery days when no surgery is planned, (6) time to allow other surgical services the opportunity to reserve uncommitted OR time (due to cancellations, no shows, and reserved time not scheduled) for their surgery patients and (7) bed availability.[11]

These concerns have aroused a need to critically analyze the management of operating room scheduling and develop a comprehensive system, incorporating the variables addressed above, in an attempt to optimize the utilization of surgical resources.

STATEMENT OF THE PROBLEM

To determine the method of scheduling surgery to optimize utilization of surgical resources at Landstuhl Army Regional Medical Center (LARMC).

OBJECTIVES

1. To determine the sequential steps in the OR scheduling procedure currently utilized at LARMC.
2. To determine how operating room use at LARMC for surgical procedures compares to other large health care facilities in the Army.
3. To identify current OR scheduling methodologies utilized in large health care facilities in the Army.
4. To conduct a literature search of civilian OR scheduling techniques.
5. To determine the major factors that influence scheduling elective inpatient surgery at LARMC (e.g., equipment availability, OR availability, nursing time, OR and surgical staffing, patient considerations, emergency surgery and cancellations).
6. To design an OR scheduling protocol which will improve utilization of surgical resources at LARMC.

CRITERIA

1. Utilization of the operating room on the average will be greater than 59 percent.
2. Cancellations of surgery within 24 hours of the scheduled date of surgery will be less than 14 percent. (NOTE: unique characteristics of LARMC may preclude any decrease in the cancellation rate.)
3. A procedure will be developed to schedule the surgeon(s) for outpatient clinic appointments when surgery cancellations caused by the patient or hospital occur, which do not permit the scheduling of another patient to fill the surgery time.
4. Staff required to perform scheduling function cannot exceed one manyear.
5. The new scheduling system will be more responsive to the dynamic forces that affect the use of surgical resources.

   a. Elective inpatient surgery will be scheduled to terminate not later than 1500 hours daily. Not more than 25 percent of the workdays will more than one OR suite continue elective surgery beyond 1500 hours due to unexpected delays and emergencies.

   b. Not more than ten (10) percent of the OR suites will be scheduled to terminate elective inpatient surgery prior to 1200 hours, given the fact that the room is opened for elective surgery at the beginning of the day.

ASSUMPTIONS

1. The demand for surgery will exceed available OR time.
2. Operating Room (OR) and anesthesia staffing will remain constant. Therefore, when the OR capability at LARMC increases to 8 rooms, the staffing levels will permit only 6 rooms to be utilized.
3. Surgical staff will remain relatively constant.
4. Time required to perform a surgical case at a hospital with a surgical residency program will on the average consume more time than a surgical procedure performed at a non-teaching hospital. The increased time may be attributed to the function of training the residents.

LIMITATIONS

1. Each surgeon has a finite capacity to perform surgical procedures.
2. The surgeons have obligations to the outpatient clinic. Professional Officer of the Day (POD) and "on-call" rosters, must also interface with operating room schedules.
3. The OR scheduling procedure will not consider the variable of bed availability.

DEFINITIONS

Add-On Surgery - Elective surgical cases that are added to the published OR schedule.

Anesthesia Staff - This refers to Anesthesiologists and Nurse Anesthetists.

Cancelled Elective - A surgical case published on the Operating Room Schedule which is marked "CX" on the Operating Room Schedule.

Central Appointment System - A centralized outpatient appointment scheduling service.

Command Element - This term refers to the Hospital Commander, Executive Officer, and Chief of Professional Services.

Community Issues - These are demands placed upon an individual (physician in this case) which are outside the realm of rendering patient care (i.e., instructing Advanced Trauma Life Support Classes, military training, etc.)

Elective Surgical Procedure - A surgical case published on the Operating Room Schedule and marked "elective" on the Operating Request and worksheet.

Landstuhl Army Regional Medical Center (LARMC) - A major army referral center located in Germany for all military/Department of Defense (DOD) civilian medical problems that can't be treated in local military treatment facilities within Europe, Middle East, Northern Africa and the Mediterranean.

Nursing Time - This time represents the total cumulative time commencing when the patient (patient #1) enters the OR, continues through the surgical procedure and ends when the staff has the OR ready to receive the next patient (patient #2).

Nursing Care Unit - A location within the hospital which provides inpatient medical care for particular types of medical conditions. This was historically referred to as a patient ward.

Operating Room Utilization - The number of hours an operating room is in service in behalf of specific patients during the day divided by the scheduled number of hours available the same day.[12]

OR Staffing - This refers to operating room nurses and operating room technicians.

Surgical Resources - Refers to the surgeon, anesthesiologist, nurse anesthetist, OR nurse and OR technician.

Surgical Services - These services include: General Surgery, OB-GYN, Orthopedics, Urology, Podiatry, Oral Surgery, Plastic Surgery, Otorhinolaryngology, Thoracic Surgery, Neurosurgery and Ophthalmology.

Turnaround Time - Time between surgical cases required by the nursing staff to prepare the operating room for the next case.

Uniform Chart of Accounts (UCA) - A standardized methodology for Department of Defense hospitals to report performance and expense classifications by work centers and cost assignment.

Unity of Control - A term which implies that there is only one central control...one person responsible to perform the OR scheduling function.

RESEARCH METHODOLOGY

The research procedure will conform to the following steps:

Step 1 - Conduct survey of selected Army medical treatment facilities to obtain information regarding their surgery scheduling practices.

The Survey results will be considered in the modification of LARMC OR scheduling procedures. The survey will be sent initially to the Chief, Department of Surgery at 2nd General Hospital and 97th General Hospital to validate the content of the questionnaire. The questionnaire will then be modified for clarity and meaningful data.

Step 2 - Research literature for OR scheduling methodologies utilized in the civilian hospitals.

Step 3 - Calculate average operating time per surgical procedure at LARMC. This figure will be representative of the shortest time average to conduct a surgical case.

Step 4 - Estimate the average operating time per surgical procedure at an Army Medical Center which has surgical residency programs, this figure will be representative of the longest time average to conduct a surgical case.

Step 5 - The two figures from steps 3 & 4 will be used to determine the range of operating room utilization of the surveyed Army hospitals. The shortest average time per surgical case (representing hospitals without surgical training programs) will provide the lowest possible OR utilization rate and the longest average time per surgical case (representing hospitals with surgical training programs) will provide the highest possible utilization rates among large Army hospitals. The calculated range for each hospital will be compared to LARMC OR utilization. The scheduling practices of the hospitals with OR utilization rates greater than LARMC will be reviewed. This will help to determine the existence of scheduling trends which will be considered in modifying the OR scheduling methodology at LARMC.

Step 6 - Identify the major factors which affect scheduling elective inpatient surgical procedures. This will be accomplished by: (1) an ongoing review of OR documents; (2) two weeks of unstructured observation of personnel in the OR environment; (3) informal interviewing of personnel in the OR during the two weeks of unstructured observation; and (4) formal interviewing of selected key individuals following the first week of unstructured observation.

Step 7 - Monitor the OR schedule to determine the reasons by percentage for surgery cancellations.

Step 8 - Determine minimal time required for patients to make necessary preparations before entering the hospital for an elective surgical procedure. The convenience group (patients admitted for inpatient elective surgery) will be surveyed until 341 patients[13] have received the questionnaire. The sample population is based upon historical records of approximately 3000 inpatient elective surgical cases annually.[14] Patient groups are: (1) Single adult working outside the home; (2) Adult family member (married) working outside the home; (3) Adult family member not working outside the home; (4) Family member school age (6-18 years); and (5) Family member preschool age under 6 years. The parents will be surveyed in the latter two (2) groups. A Chi-Square Analysis of Variance will be computed to determine if there is any significant relationship between patient groups and their ability to respond to openings in the surgery schedule. Ho: no relationship between groups and their ability to respond to openings in the inpatient elective surgery schedule at $\alpha = .05$.

Step 9 - Determine minimal time required for patients to appear for an outpatient appointment that becomes available unexpectedly. The convenience group (patients requesting clinic appointments through CAS) will be surveyed until 390[15] patients have been administered the questionnaire. The sample population is based upon historical records of approximately 200,000 outpatient clinic visits (hospital clinics only) annually.[16] Patient groups are: (1) Single adult working outside the home; (2) Adult family member (married) working outside the home; (3) Adult family member not working outside the home; (4) Family member school age (6-18 years); and (5) Family member preschool age under 6 years. A Chi-Square Analysis of Variance will be computed to determine if there is any significant relationship between patient groups and their ability to respond to openings in the outpatient appointment schedule. Ho: no relationship between groups and their ability to respond to openings in the outpatient appointment schedule at $\alpha = .05$.

Step 10- Utilizing the information gathered from subsequent steps a scheduling protocol will be developed.

DISCUSSION

Present Operating Room Design

The operating room suites at LARMC are located on the first floor of a two story building. This building is centrally situated among a cantonment designed hospital complex. (Figure 1 illustrates the location of the OR in perspective to the other hospital buildings). There are six operating rooms, four (4) on one side of the building separated from the other two (2) rooms by a sterile corridor (see Figure 2). The rooms are of various sizes. Storage space is less than adequate and the limited size of the majority of the operating rooms hinder efficency. The sterile corridor leading to the operating rooms is often crowded with carts carrying surgical instruments and housekeeping equipment, which impedes patient transfer and room turnaround efforts. The traffic flow within the OR is less than optimal. Patients entering the operating room service from the nursing care units utilize the same corridor as patients enroute to the recovery room following surgery. The excellent performance of the OR staff, however, has helped to minimize many of the problems that are attributed to the poor facility design. Many of these obstacles will be removed when the OR is relocated to the new addition (see Figure 3 for floor design of future OR location).

The OR Scheduling System

The days of the week for operating time in the OR have been dedicated for each surgical service by a block time basis (Appendix A displays the weekly operating room schedule for the six (6) ORs by surgical service).

LANDSTUHL ARMY REGIONAL MEDICAL CENTER

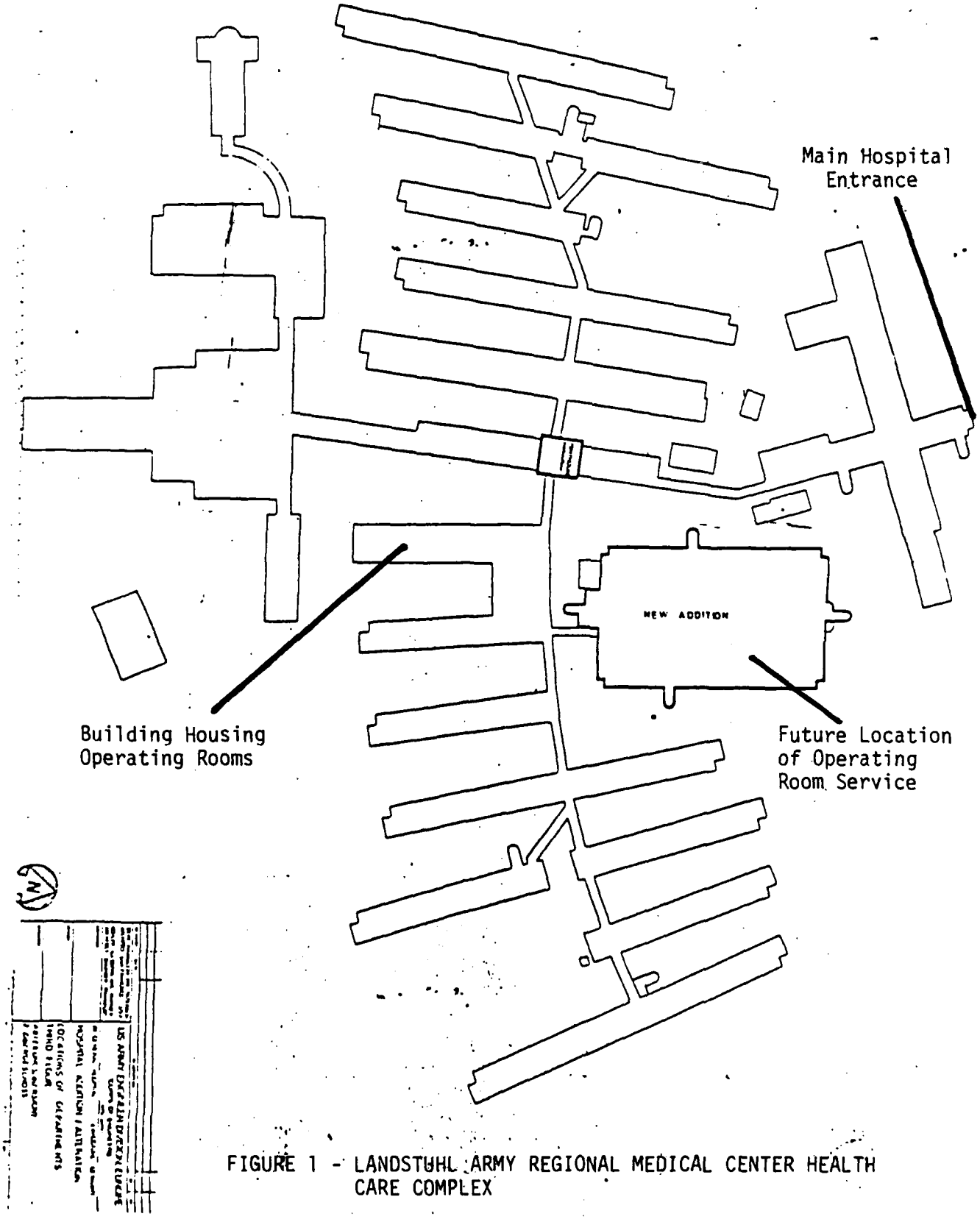

FIGURE 1 - LANDSTUHL ARMY REGIONAL MEDICAL CENTER HEALTH CARE COMPLEX

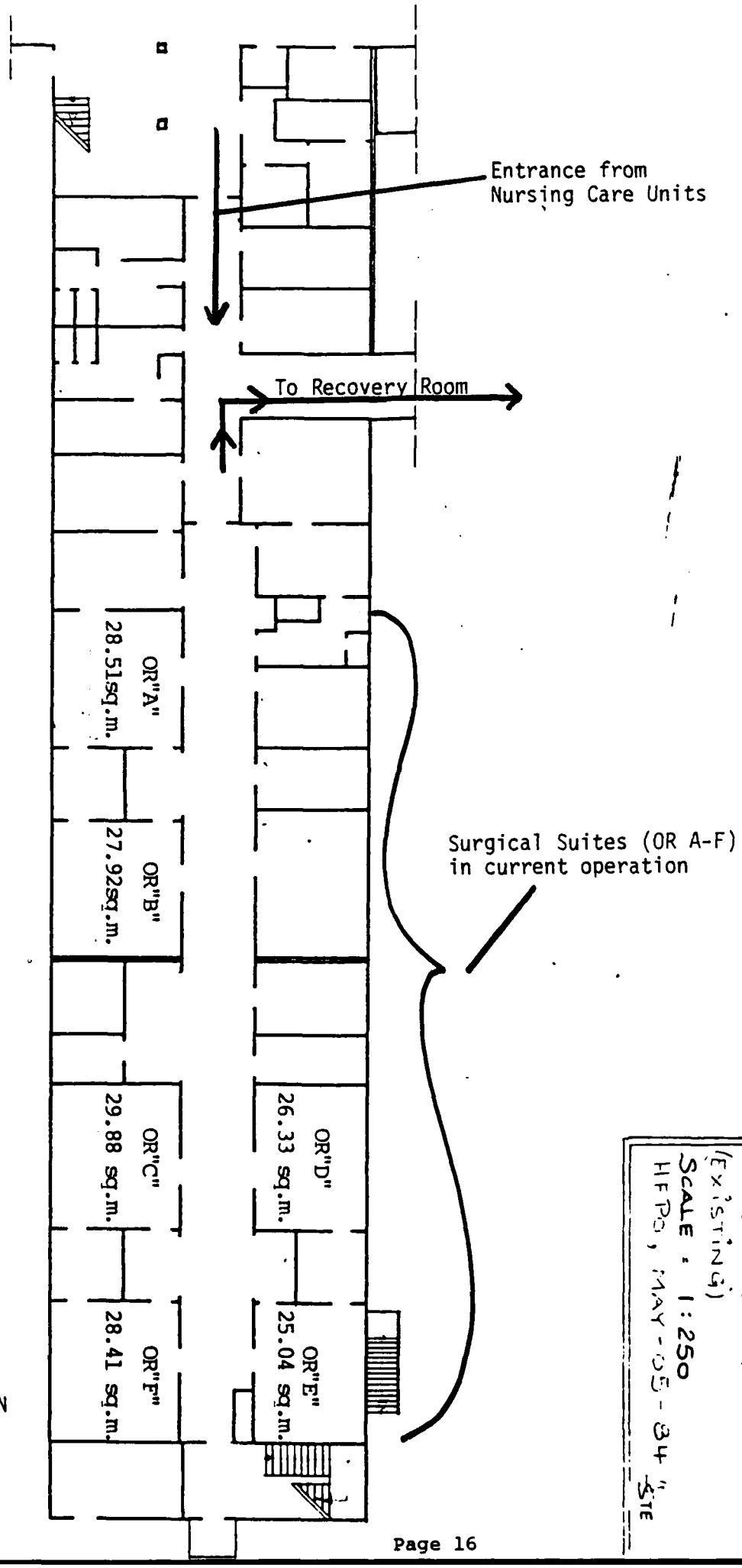

FIGURE 2 - FLOOR DESIGN OF CURRENT OPERATING ROOM SERVICE

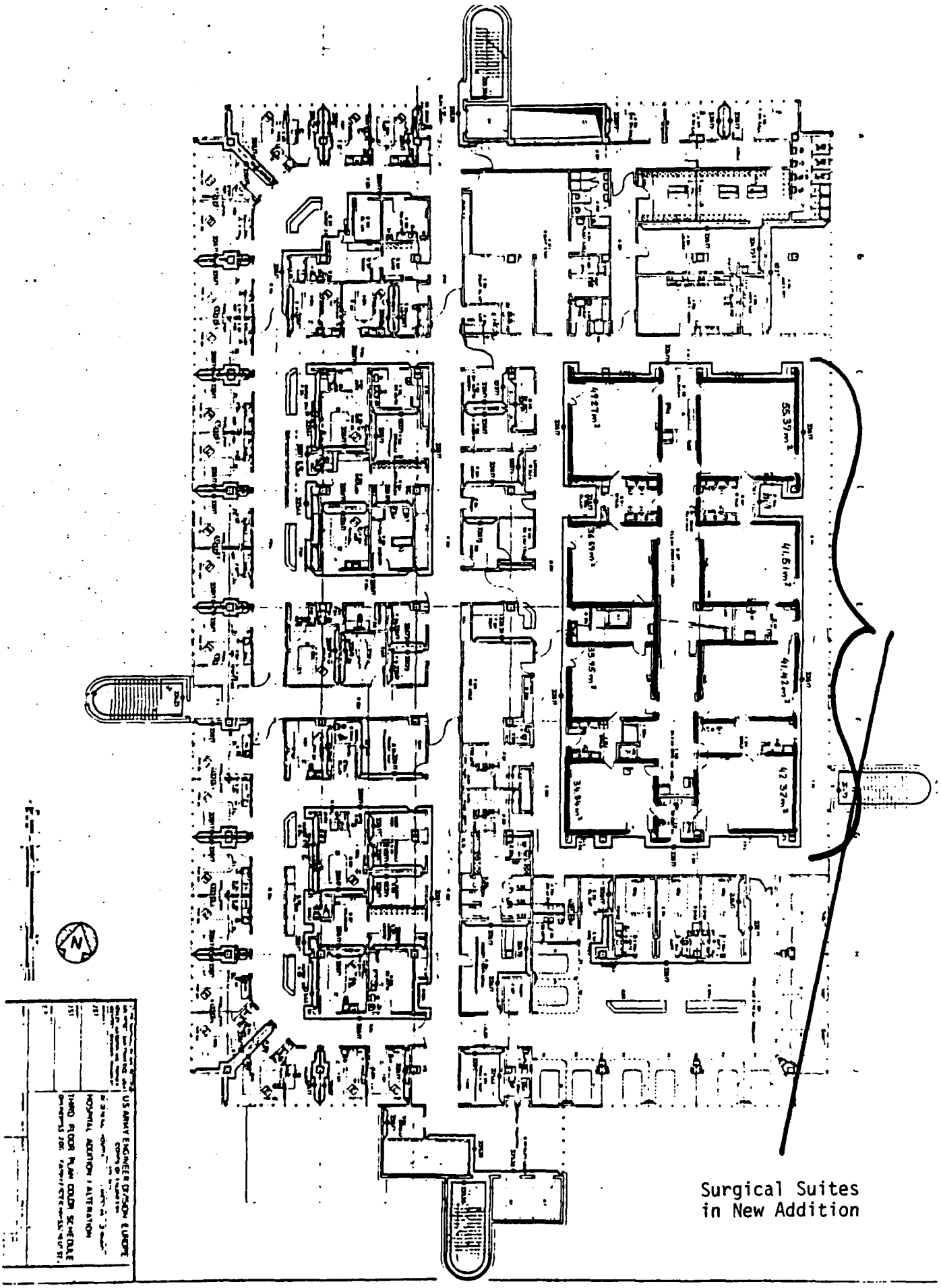

FIGURE 3 - FLOOR DESIGN OF FUTURE LOCATION OF OPERATING ROOM SERVICE

Within the larger surgical specialties, operating time is further allocated to physicians on given days to insure fairness and create a sense of order to the scheduling function. The date of surgery is directly negotiated with the patient by the physician or clinical staff. Surgery is scheduled on the surgeon's designated surgery day. If the dedicated surgery day is filled then the patient is given an appointment for surgery on the next available dedicated day. The surgeon does not have the time to verify whether or not other surgical specialties have their operating time fully scheduled. Without a central clearing house to monitor OR availability for all surgical services on a given day, an avenue is provided to avoid optimum utilization of OR time. Each surgical service maintains their own surgery book and is responsible to schedule their own cases during the alloted time. Physicians estimate the procedure time and determine the number of cases that can be accomplished during the normal OR hours of operation (7:30 a.m. to 3:00 p.m., Monday through Friday). The OR is not aware of all the scheduled cases until 0900 hours on the day prior to the scheduled surgery. This nullifies any prior planning efforts by the OR/anesthesia supervisors.

Although it is not required, some of the surgical services provide the OR with a list of projected surgeries scheduled for the following week. This practice is appreciated by the OR and anesthesia supervisors in an effort to facilitate planning their staffing patterns for the coming week. However, not all services provide this advanced schedule and those services that do often modify the schedule prior to the day of surgery without coordinating the changes with the OR staff. This results in surprise additions or deletions on the day prior to surgery when the OR schedule is formalized and published.

Patients are admitted to the hospital the day prior to surgery for preoperative work-up. In many instances, it is at this time that surgery cancellations are discovered. There is not a formal process established to insure that the patient is going to keep the surgery appointment. Some clinics have the patient confirm the surgery date one week prior by a phone call, while other clinics wait for the patient to be admitted the day before surgery. Needless to say, contact with the patient within a week prior to surgery provides a better projection to determine the patient's availability for surgery.

A Survey of Large Army Hospitals' OR Utilization

Hospital staff had mixed attitudes regarding the efficient use of the OR at LARMC. Some users of the OR felt that, despite the turnover of personnel created by military transfers, the OR could improve surgery availability during normal hours of operation. Other staff members were advocating a centralized scheduling area patterned after civilian hospitals, where they had practiced, to avoid the communication pitfalls of a decentralized system. Another group feared any change in the status quo and were quite content with the current system.

Since little research had been performed in the area of OR scheduling within the military, it was decided to survey several large Army hospitals that resembled workload and types of operative procedures at LARMC and determine whether or not LARMC was within the norm of OR utilization.

A questionnaire was developed. After several modifications it was validated at two Army hospitals in Europe. The resultant product is provided in Appendix B. The nine military hospitals selected to participate

in the survey are listed in Appendix C. An introductory letter explaining the study to the surveyed hospital is provided in Appendix D. All nine questionnaires were returned. Appendix E summarizes by frequency the individual responses to the survey.

Comparisons of LARMC with Other Large Army Medical Facilities

A profile of OR utilization rates from surveyed Army hospitals is provided in Table 1. The range of utilization rates for each hospital have been derived from mathematical manipulations by multiplying each hospital's monthly elective inpatient procedures by the average operation time per surgical case at LARMC (representing lowest utilization rates) and

TABLE 1

OR UTILIZATION RATES (estimated) - calculations are provided in Appendix F

Hospital	Range of OR Utilization Rates	
Darnall	75.2%	125.9%
Eisenhower	74.6%	125.0%
Fitzsimons	59.9%	100.3%
Frankfurt	93.9%	157.4%
Landstuhl	52.2%	87.5%
Letterman	55.9%	93.7%
Madigan	70.0%	117.2%
Tripler	82.6%	138.4%
William Beaumont	42.0%	70.5%
Womack	51.7%	82.7%

William Beaumont Army Medical Center (WBAMC) (representing the highest utilization rates) to estimate the range of OR time used for surgery. These figures were then divided by OR hours available for elective surgery to estimate utilization rates. A detailed outline of calculations are provided in Appendix F.

The average time per operation at LARMC (1.85 hrs derived by dividing total hours of elective surgery (2431 hours) by total elective cases (1298)).[17] is used to represent hospitals without surgical residency programs and the WBAMC average (3.10 hrs derived from surgery time provided in WBAMC study)[18] represents teaching hospitals. See Appendix G for calculations. These average times support the assumption made earlier in the paper that teaching hospitals normally have more lengthly surgical cases. This is probably attributed to the training of the residents. The low utilization rate of LARMC in comparison to the other hospitals suggest a need to study utilization rates of the OR at LARMC.

There are two arguments that could foster low OR utilization rates. These are: 1) a lack of surgical cases to fill-up the available OR time and 2) inefficient methods in scheduling the use of the operating theatres. The first argument can be refuted by the fact that lists exist of patients who are awaiting surgery in some surgical specialties. Therefore, scheduling procedures need to be evaluated to determine if the OR utilization rates could be improved.

The survey results from the seven (7) hospitals (Darnell, Eisenhower, Fitzsimons, Frankfurt, Letterman, Madigan, and Tripler) with estimated utilization rates greater than Landstuhl were evaluated to verify any scheduling trends (see Appendix H for survey results). The summarized

results are listed in Table 2. It is particularly evident that a scheduling methodology should consider surgical specialty workload when determining the distribution of time blocks for reserved surgery days. The unscheduled reserved surgery time should be made available to other surgical specialties more than 48 hours from the date of surgery. Surgery scheduling should remain on a block basis by surgical specialty. A developing trend appears

TABLE 2

Scheduling Trends of Surveyed Hospitals with Estimated OR Utilization Rate Greater Than LARMC

1. Average cancellation = 46.5; standard deviation = 19

2. Average add-on rate = 62.8; standard deviation = 36.5

3. Initial incision time - ..... 1 Hospital - 0715 hours
   ..... 3 Hospitals - 0730 hours
   ..... 1 Hospital - 0745 hours
   ..... 2 Hospitals - 0800 hours

4. Have published anesthesia cut-off time.....4 Hospitals

5. OR Scheduling on block basis by specialty.....7 Hospitals

6. Distribution of time blocks determined by workload and/or committee consensus.....5 Hospitals

7. Unscheduled time blocks are made available to other surgeons more than 48 hours before date of surgery.....4 Hospitals

8. Centralized scheduling.....2 Hospitals
   Note: These two were among the top 5 in estimated utilization rate

9. OR schedule projecting surgery in advance..... no Hospitals

10. Computer use under consideration to assist in OR scheduling functions .....4 Hospitals

11. Substitute outpatient appointments when surgery cancels..2 Hospitals

to be the use of computerization in OR scheduling functions. It is interesting to note that two hospitals have a centralized scheduling office and two hospitals substitute outpatient appointments when unexpected surgery cancellations occur.

The needed improvement in scheduling functions is particularly evident in examining the distribution of OR terminating times (refer to Appendix I for a detailed breakdown). A dichotomy exists when 21% of the rooms terminate prior to 1200 (Noon) hours and 31% of the rooms terminate after 1500 hours. The disparity suggests an uneven OR workload which may be attributed to the poor communication among services fostered by the decentralized scheduling system. An improved scheduling protocol should diminish the tendency for an uneven workload.

Cancellations and Add-on Surgeries

Two factors that directly influence uneven workloads are cancellations and add-ons. After the surgery schedule has been published the scheduled cases that aren't performed or cases that are added to the schedule are grouped as cancellations and add-ons respectively. In order to determine an acceptable level of cancellations and add-ons the individual responses of the surveyed hospitals were studied. A summary of their surgery cancellation and add-on rates are listed in Appendix J. High rates in either area can detract from the efficiency of surgical resources. Cancellations for whatever reason waste valuable time in OR and surgical preparations. Short notice cancellations normally do not provide enough time for surgical assets to be programmed for other patient care duties. Add-ons demoralize the OR staff. A constant state of flux destroys planning initiatives for staffing and equipment preparation. Darnall Army Community

Hospital and William Beaumont Army Medical Center seem to have a good mechanism in keeping cancellations to a minimum. Additionally, Darnall hospital has provided a challenge for other medical facilities in achieving a 5% add-on rate. This implies that only 5% of their elective surgery was added on after the schedule was published.

The LARMC cancellation rate is the second highest in comparison with the other Army hospitals surveyed. The add-on rate for LARMC was third highest among the hospitals. Appendix K provides a breakdown of the reasons secondary to LARMC's surgery cancellations. Over fifty percent of the cancellations were caused either by patient illness or "no-shows". Several of the no-shows could have been avoided. At least four (4) of the no-shows were attributed by the lack of communication between the clinic and the operating room. In these four cases either the patient cancelled with the clinic or the physician cancelled the operation with the patient several days prior to the date of surgery. However, these cancellations were never coordinated with the operating room. Three cancellations were a result of poor communication by the clinic in not coordinating the surgery date with the patients. Another two cancellations reflected faults with insufficient blood volume in the laboratory which could have been remedied through a better communication system.

If the overall cancellation rate and add-on rates are somewhat equal in value one could suppose that the add-ons from a surgical specialty replace their cases that were cancelled. However, upon examining the cancellation and add-on rates by specialty, something very interesting is revealed. As depicted in Appendix L the add-on rate does not necessarily parallel the respective specialty's cancellation rate. Some specialties are more

accustomed to adding elective cases to the surgical schedule than other specialties. It would also suggest that specialties in Appendix L whose rate of difference (column C) is a negative value would have time available to perform other elective surgeries or to see outpatient clinic appointments. The feasibility of scheduling another surgery or outpatient clinic appointments in the event of a cancellation in the elective surgery schedule will be discussed in the next two sections.

Patient Response Time for Elective Surgery

When trying to fill vacancies in the elective surgery schedule created by unexpected patient related cancellations the response time of a patient awaiting elective surgery to fill the vacancy must be considered. Normally the patient requires some advance notice prior to admission. How much advanced notice is a very vital factor to know. The hospital's initial awareness of a cancellation should occur within the timeframe needed by patients' awaiting surgery to arrange their personal affairs prior to hospital admission.

A survey was conducted to determine the minimum amount of time required for patients' to respond to an unexpected opening in the elective surgery schedule. A nonrandom sample of patients admitted to the hospital for elective surgery between 1 March and 22 May responded to the survey (see Appendix M for the questionnaire). The results of the survey are provided in Appendix N.

It can be summarized from the Chi-Square Analysis of the survey results that no signficant relationship exists between response time to be admitted to the hospital for an elective surgery and patient status with exception of

the single person. Distance from the hospital has no significant influence upon the ability to respond to unexpected openings in the surgery schedule. Single persons rely upon public transportation as many of them do not own an automobile, which explains why distance might be a hindering factor. Logically, patients living outside Germany would not be considered to fill unexpected openings due to the overwhelming distance factor and other variables affecting the mode and availability of their transportation.

The minimum amount of time to arrange personal affairs and be admitted to the hospital required by a majority (66 percent) of the patients surveyed was two to three days. Surprisingly, a total of 30 percent of the patients surveyed could respond within 24 hours. Therefore, the surgery time reserved by surgical specialty which is not scheduled should be made available to other surgeons three days prior to the day of surgery, in order to optimize the availability of patients to fill unexpected schedule openings.

Patient Response Time for Outpatient Clinic Appointments

If the surgeon has reserved a block of time for surgery, those hours are then not normally scheduled for other duties. If a cancellation unexpectedly occurs which cannot be filled by another patient, the surgeon may have some time available to devote in seeing outpatients. Again a dependent factor is the patients' availability in responding to "short notification" of an appointment opening. To determine how quick patients seeking clinic appointments could respond to unexpected openings in the clinic schedule a nonrandom survey was conducted by the Central Appointments

staff. Approximately 400 patients seeking outpatient appointments were asked the questions listed on the survey form (see Appendix O).

The survey results indicated that over sixty percent of the patients seeking an outpatient appointment would be able to see the physician if they were given four to eight hours (same day response) advance notice prior to the appointment. The Chi-Square Analysis showed that there is a significant relationship between response time and patient status. Therefore, patient status should be considered when offering outpatient appointments which become available spontaneously. Table 3 demonstrates that the patient status groups of Single Working, Married Working Outside Home and Under 6 year, have a higher percentage of responding to same day appointments than do the other two categories of patients. A detailed summary of the survey results are provided in Appendix P.

TABLE 3

Percentage of Sample by Status Able to Respond to Same Day Appointment Opening

	Response to Same Day Appointment Opening		
Single Working	$\frac{58}{93}$	=	62%
Married - Working Outside Home	$\frac{81}{129}$	=	62%
Married - Working Inside Home	$\frac{53}{95}$	=	55%
6 - 18 year old	$\frac{27}{51}$	=	53%
Under 6 year old	$\frac{20}{32}$	=	62%

The results of the survey indicate the feasibility in maintaining a limited patient waiting list in the event of unexpected appointment openings in the various surgical sub-specialty clinics secondary to surgery cancellations. There are many "horror stories" heard concerning waiting lists. Therefore, the list should be limited in size with those patients on the list receiving first priority in obtaining new appointment openings. This would insure that the names on the waiting list are rotating regularly.

Identified Problems With The Current Scheduling System

1. The decentralized scheduling system hinders any attempt in coordinating the availability of unscheduled OR time with surgical specialties who would welcome the opportunity to schedule elective surgery at times other than their dedicated surgery days.

2. The current system doesn't provide a mechanism to analyze the demand for surgery time by surgical specialty with surgery time availability.

3. A system does not exist to identify no-shows and other forms of surgery cancellations prior to 24 hours before surgery when the patient is admitted to the hospital for preoperative work-up.

4. The decentralized scheduling methodology places too much emphasis upon communication systems when schedules, whether physician, patient or hospital directed, are changed. The poor communication system and distance factors between clinics negate any attempt to coordinate changes with appropriate offices.

5. Over-committed OR time for elective surgery necessitates overtime from the OR staff which is a demoralizing factor. This coupled with a nonexistent cut-off time for initiating anesthesia on elective cases has

resulted in 31 percent of the OR suites terminating after the desired time of 3:00 p.m. (refer to Appendix I for clarification).

6. The excessive number of add-on (elective) surgical cases suggest an abuse of the scheduling system. Either surgeons need more than their alloted time, or they aren't using their alloted time profitably. The latter explanation may be the cause since 21 percent of the OR suites are terminated prior to 1200 hours (refer to Appendix I for clarification).

Controlling the Scheduling Function

The results of a study to improve hospital efficiency strongly encouraged that a single office perform the operating room scheduling function.[19] Cancellations, changes in staffing, schedule modifications and scheduling policies are all monitored centrally. Duplication, waste of surgical resource time, and poor communication among surgical services, which are all fostered by the decentralized scheduling methodology can be replaced by a well planned centralized scheduling system. The new system must be pliable to meet the unexpected surgery demands of a major referral center, and yet be structured to permit efficiency and internal planning initiatives. The ultimate aim is to minimize staff frustrations with the scheduling system while enhancing the utilization of surgical resources.

There are several issues to consider in planning a centralized scheduling system. First, the system must be assessible without compromising the integrity of the system. This suggests that the scheduling function should be managed by one individual, preferably a nurse who is familiar with operating room functions. A telephone dedicated solely for scheduling purposes should be installed in the OR area. Within Germany a

civilian telephone would also be required to insure assessability. Information vital to the scheduling system should include: room number, scheduled time for the surgery to begin, time estimated to perform the surgery, name of the surgical procedure(s), special equipment, surgeon's name, assistant surgeon's name, patient's name, patient's age, any extenuating circumstances, date surgery is to be performed, date the surgery was scheduled with the OR and initials of OR person scheduling the case.

In civilian hospitals the time estimated to perform the surgery is normally a "swag" by the scheduler who becomes aware of physician operating time through experience.[20] Within the military channels, experience of the scheduler in becoming aware of physician operating times is hindered by the frequent transfer of OR personnel and military physicians. Therefore, it would be ideal to capture operating time by surgical procedure on a computer for each surgeon. This information coupled with anesthesia time and room turnaround time would indicate the nursing time or the length of time that the OR suite would be occupied for the given surgical procedure. This would facilitate scheduling. Of course, allowances for unexpected delays would have to be programmed into the scheduling function.

Second, an orderly scheduling methodology would permit the use of a published anesthesia cut-off time for elective surgeries. This would help to minimize overtime in the OR for elective procedures and put a semblance of order to the scheduling function.

Third, a preadmission protocol should be developed to maintain patient committment during the interim until admission to the hospital. The protocol should include a phone call one week prior to surgery which the patient originates in order to confirm the surgery date. When feasible

(depending upon distance) the patient would be directed to appear at the hospital between the third and fifth working day prior to the surgery for preadmission testing. Patient's living beyond a one hour drive from LARMC would be required to obtain the laboratory work-up at their servicing medical facility within 3 to 5 days prior to the date of surgery. Test results outside the normal range would require phone consultation with the OR scheduler/Anesthesiologist to determine if the surgery needed to be rescheduled. Both of the actions mentioned above would establish a committment from the patient to undergo the surgery. Non-action on behalf of the patient would permit clinic follow-up to verify the patient's intentions and when necessary, allow a patient on the waiting list to be programmed for surgery.

Fourth, there needs to be an interface between the Central Appointments Section and the OR scheduling office. Cancellations occurring after the schedule is published (within 24 hours of surgery) would necessitate a review to determine whether or not outpatient appointments should be scheduled for the surgeon. If the surgeon had some difficult surgery cases scheduled in addition to the case which was cancelled, then obviously no outpatient appointments would be scheduled.

Fifth, the tentative weekly schedule would be distributed one week in advance to appropriate hospital personnel. This affords individual surgeons and OR/anesthesia staff an overall look at the upcoming surgery schedule for planning purposes.

Sixth, a timeframe must be established when unscheduled pre-reserved blocks of time become available to other surgical specialties on the first come first served basis. Since responsiveness to emergencies of the

sub-surgical specialties which represent the referral center for all of Europe (e.g. Thoracic Surgery and Neurosurgery) is a key element, a recommended cut-off time for referral specialties would be 48 hours prior to the day of surgery and 72 hours for other surgical specialties.

Seventh, a computer system for gathering OR data would be beneficial. Perhaps the computer program could even include the OR scheduling function explained previously. In addition to collecting information required on DA Form 4108 (see Appendix Q), it would be desirable to monitor surgical specialty use of designated surgery periods, cancellation rates and reasons for cancellations (refer to Appendix R for an outline of reasons for surgery cancellations developed by Madigan Army Medical Center), and average procedure time by physician name, which would be automatically updated for each new surgery input made on the computer.

Eighth, all personnel actions affecting surgery scheduling would be routed through the OR scheduling office to maintain continuity.

CONCLUSION AND RECOMMENDATIONS

There is a need to improve the scheduling methodology for inpatient elective surgery at LARMC. It is evident in studying other similar Army medical treatment facilities that LARMC could improve the utilization of surgical resources. In considering the needs of the providers of medical care, the demands from the patients and the issues of accountability being regulated through command channels, despite facility/technological limitations commensurate to being in a foreign land, there is no excuse to idly witness a scheduling system that muddles through in meeting most of the demands placed upon it. Opportunity does exist to minimize cancellations, to improve communications among surgical services regarding availability of surgery time, and to incorporate guidelines and workload review for scheduling analysis studies; thereby, enhancing the efficient use of surgical resources.

The results of the study and research have been the genesis of the following recommendations:

1. The OR scheduling function will be centralized to enhance operational efficiency.[21,22] A position will be developed for a person with OR nursing skills and background to be primarily responsible to schedule the surgeries. A civilian phone, as well as a military phone line, will be dedicated solely for the scheduling function. The OR scheduling office will be staffed from 0800 hours to 1700 hours, Monday through Friday.

2. A computer will be used to gather and store OR statistics. Computer assisted OR scheduling practices should be pursued to include average operation time per physician by surgical procedure to facilitate projections

in length of procedure.[23] This information will be valuable in scheduling cases with minimal waste of surgical resource time during the duty day. The assessibility of OR statistics will permit regular monitoring of surgical scheduling practices, periodic analysis in allocation of dedicated surgery days, and routine retrieval of necessary information for quality assurance purposes. In addition to these benefits, there will be several hours of administrative time saved in the preparation of required reports.[24] These facts strongly support the use of a computer in the OR scheduling function.

3. The unscheduled dedicated surgery times would be made available to other surgical specialties on the first come first served basis within 72 hours from the date of surgery except for the referral center surgical specialties which would relinquish control of their unscheduled dedicated surgery time 48 hours prior to surgery. This complies with the minimum time required by patients to respond to schedule openings (see Appendix N). "If the cut-off time is too near the date of surgery, the unfilled block of time may remain idle."[25]

4. The elective surgery schedule will not be booked beyond four weeks. This will minimize adjustments in the schedule secondary to the transient nature of the military. If elective surgery cannot be scheduled within four weeks on a specialty clinic's dedicated surgery day then a waiting list will be maintained by the clinic. The waiting list will consist of a completed DA Form 4107 (see Appendix S). The patient's telephone number will be included on the form. Patients' requiring surgery who live outside the immediate area (over 4 hours by car) will be tentatively scheduled on a dedicated surgery day three or four workdays following their consultation visit. If it is determined during the consultation visit that surgery is

not required then a patient will be programmed from the surgery waiting list to fill the vacancy.

5. A Preadmission Testing (PAT) program that requires laboratory results to be reviewed well in advance to surgery significantly reduces the number of patients whose surgery is cancelled just prior to surgery because of abnormal results.[26] A PAT program will be formalized to cater to the needs of the hospital while considering the needs of the patient, in attempt to reduce the number of cancellations resulting from patient illness. The preadmission protocol will require phone contact with the patient one week prior to the date of surgery. Within three to five days before the surgery the patient will come to the hospital (if distance permits) for preoperative tests. Otherwise, the necessary laboratory tests will be obtained 3 days prior to surgery at their servicing medical facility. (Note: If the patient doesn't demonstrate a committment to surgery by appearing for the PAT then another patient on a waiting list will be notified to fill the vacancy. This allows 2-3 days notification required by the majority of surgical patients to be admitted to the hospital (refer to Appendix N)). The patient will be admitted to the hospital not earlier than the day prior to scheduled surgery. When a cancellation occurs, the programming of another patient from the physician's waiting list will be attempted.

6. In the event that a cancellation occurs and there is either not sufficient time to call a patient from the surgery waiting list or there is not a waiting list for the respective physician, then the Central Appointments Section will be notified to schedule outpatients during the time that the surgeon would otherwise be in the operating room. Central Appointments will keep a waiting list of not more than 10 to 20 patients who

are in need of an outpatient appointment. This list will be rotated regularly by giving those on the list first priority in any new appointment openings. The new appointments will exhaust the waiting list while other phoning customers, who are unable to obtain an appointment will being placed on the waiting list.

In order to coincide with the survey results outlined in Appendix R, it will be the intent to notify patients on the waiting list at least 8 hours in advance of programmed appointment openings. However, this will not preclude attempts to notify a patient within 2-4 hours of an unexpected appointment opening.

Scrutinity removes attitudes of mediocrity and instills motivation to evaluate existing practices in identifying areas for improvement; thereby replacing poor operational mechanics with effective administrative practices.

The recommended system is a heuristic approach to improve upon the current methods of scheduling surgery at LARMC. Every hospital staff member associated with the operating room will undoubtedly have concerns with the system. Change is difficult for any person to accept without some element of skepticism. A unified cooperative effort will provide a fair opportunity to test these recommendations. An ongoing review will purge the system of ineffective procedures and staff involvement in developing more meaningful protocols will enhance the viability of the proposed system. If the criteria are not met after a six month trial period, then the scheduling function will return to previous protocol.

FOOTNOTES

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[17] A Study of the Appointment System in 2nd General Hospital, (Figure 7), p. 21.

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[21] Hejna, William F. and Cheryl M. Gutmann, "The Management of Surgical Facilities in Hospital," Healthcare Management Review (Winter 1983), pp. 52-53.

[22] Peterson, et.al., p.65.

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[24] Martinez, P. 31.

[25] Magerlein, p. 423.

[26] Peterson, et.al., p. 59.

APPENDIX A

OR BLOCK SCHEDULE BY SURGICAL SPECIALTY

O. R. SCHEDULE STARTING OCTOBER 3, 1983

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
NEURO	NEURO	THORACIC	THORACIC	NEURO
GEN	GEN	EYE (LOCAL)	GEN	GEN
ORTHO	ORTHO	ORTHO	ORTHO	G.U.
EYE	ENT	ENT	ENT	ENT
GYN	G.U.	GYN	GYN	ORAL
PLASTIC	ORAL	PLASTIC	GYN	PLASTIC
		G.U. CLINIC		

DONALD X. PERRY M.D.
MAJ. MC
CHIEF ANES/OR

APPENDIX B

HOSPITAL OR SCHEDULING SURVEY DOCUMENT

QUESTIONNAIRE

Purpose: To determine Operating Room scheduling procedures

1. Elective surgery time is made available to surgeons on a
   _____ First come first served basis (please skip to question #6)
   _____ Block basis by individual surgeon's name (please answer all questions)
   _____ Block basis by surgical specialty (please answer all questions)
   _____ Other, please specify (please answer questions that apply)
   _____

2. How is distribution of time blocks among specialties/surgeons determined?
   _____ Committee consensus _____ Workload statistics _____ Other _____

3. How are unscheduled pre-reserved blocks of time utilized?
   _____ Not utilized (please skip to question #6)
   _____ Made available to other surgeons
   _____ Other, please specify _____

4. If unscheduled pre-reserved blocks of time are made available to other surgeons/ specialties how is this accomplished?
   _____

5. When is it determined that unscheduled pre-reserved blocks of time are available to other surgeons/specialties?
   _____ 24 hours _____ 48 hours _____ more than 48 hours

6. How is elective surgery scheduled at your institution?
   _____ Each surgical clinic maintains their own surgery schedule.
   _____ A central office maintains the surgery schedule for all specialties.
   _____ Other, please specify _____

7. Is there a centralized scheduling mechanism that provides a summary of all scheduled elective surgeries up to five (5) workdays in advance?
   _____ yes _____ no

8. Please explain the centralized scheduling process.
   _____
   _____

9. Is a computer used to schedule surgeries?
   _____ yes _____no, but under consideration _____ no, not being conside

10. What software package is being utilized/under consideration?
    _____

11. List scheduling methods followed to minimize patient cancellations (e.g. no-shows) of elective surgery.
    _____
    _____

12. List scheduling methods followed to minimize physician cancellations (e.g. positive lab results) of elective surgery.
    _____
    _____

13. When surgeons experience unexpected surgery cancellations is there a mechanism to substitute outpatient clinic appointments for the unscheduled time?
    _____ yes _____ no

14. Please describe the scheduling process that accomplishes that function.
    _____
    _____

15. Please provide any additional information that is deemed essential.

DEMOGRAPHY DATA

1. Name of Hospital _____

2. Size of Hospital: _____ under 200 beds
   _____ 201-300 beds
   _____ 301-400 beds
   _____ 401-500 beds
   _____ over 500 beds

3. Monthly average inpatient elective procedures performed in OR. _____

4. Are ambulatory (outpatient) surgeries performed? ____ yes ____ no

5. ANSWER THIS QUESTION ONLY IF YOU INDICATED YES IN #4 ABOVE. Has ambulatory surgery been utilized to help alleviate the backlog in inpatient operations?
   _____ yes _____ no

6. Average monthly cancellations of published elective surgeries. _____

7. Average monthly "add-ons" to published surgery schedule. _____

8. The surgeon is scheduled to make the incision on the first surgery of the day at _____ hours.

9. What is the cut-off time to start anesthesia on elective procedures?
   _____ No cut-off time.
   _____ Published cut-off time is _____ hours.
   _____ Other, please specify _____

10. Please complete the following table. Refer to the example for clarification.

# of suites open for elective surgery	# of hours/week the OR is normally open for elective surgery	total hours/week for elective surgery
Example: Hospital #1 6 suites in OR 4 suites	40 hours (inclusive of room/ anesthesia prep & clean-up)	160 hours
2 suites	25 hours " "	50 hours

APPENDIX C

LIST OF ARMY HOSPITALS SURVEYED

Surveyed Army Hospitals

Letterman Army Medical Center (San Francisco, CA)

Madigan Army Medical Center (Ft. Lewis, WA)

Tripler Army Medical Center (Honolulu, HI)

William Beaumont Army Medical Center (El Paso, TX)

Eisenhower Army Medical Center (Ft. Gordon, GA)

Fitzsimons Army Medical Center (Denver, CO)

Frankfurt Army Regional Medical Center (Frankfurt, Germany)

Darnall Army Community Hospital (Ft. Hood, TX)

Womack Army Community Hospital (Ft. Bragg, NC)

APPENDIX D

INTRODUCTORY LETTER

DEPARTMENT OF THE ARMY
LANDSTUHL ARMY REGIONAL MEDICAL CENTER
APO NEW YORK 09180

AEMLA-DCA 5 March 1984

SUBJECT: Survey of Operating Room Scheduling Systems

Colonel Louis J. Hansen
Deputy Commander for Administration
Darnall Army Community Hospital
Ft. Hood, TX 76544

1. This survey has been developed to research the surgical scheduling procedures from various medical treatment facilities. It is designed to solicit the best ideas from each scheduling system so they might be integrated to produce an efficient system for Landstuhl Army Regional Medical Center, and perhaps a model for developing other OR scheduling systems for other hospitals.

2. This project has been undertaken by the Administrative Resident from the U.S. Army/Baylor University Graduate Program in Health Care Administration. Your assistance in providing this information would be greatly appreciated.

3. Request that the survey be mailed no later than 25 Mar 84.

1 Incl
as

JAMES G. HELGESON
COL, MSC
Deputy Commander for Administration

APPENDIX E

SUMMARY OF HOSPITAL OR SCHEDULING SURVEY

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

NAME NAME OF HOSPITAL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
WOMACK	0.	1	10.0	10.0	10.0
DARNELL	1.	1	10.0	10.0	20.0
D D EISENHOWER	2.	1	10.0	10.0	30.0
FITZSIMONS	3.	1	10.0	10.0	40.0
FRANKFURT	4.	1	10.0	10.0	50.0
LANDSTUHL	5.	1	10.0	10.0	60.0
LETTERMAN	6.	1	10.0	10.0	70.0
MEDIGAN	7.	1	10.0	10.0	80.0
TRIPLER	8.	1	10.0	10.0	90.0
WILLIAM BEAUMONT	9.	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

SIZE SIZE OF HOSPITAL

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
201-300 BEDS	2.	2	20.0	20.0	20.0
301-400 BEDS	3.	3	30.0	30.0	50.0
401-500 BEDS	4.	3	30.0	30.0	80.0
OVER BEDS	5.	2	20.0	20.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

INPTSURG MONTHLY AVERAGE INPATIENT SURGERIES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
280 ELECTIVE SURG	1.	1	10.0	10.0	10.0
300 ELECTIVE SURG	2.	1	10.0	10.0	20.0
325 ELECTIVE SURG	3.	2	20.0	20.0	40.0
380 ELECTIVE SURG	4.	1	10.0	10.0	50.0
400 ELECTIVE SURG	5.	2	20.0	20.0	70.0
450 ELECTIVE SURG	6.	1	10.0	10.0	80.0
500 ELECTIVE SURG	7.	2	20.0	20.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

OUTPTSUR ARE OUTPATIENT SURGERIES PERFORMED?

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	1.	5	50.0	50.0	50.0
NO	2.	5	50.0	50.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

BACKLOG OUTPT SURG ALLEVIATE INPT SURG BACKLOG?

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	1.	4	40.0	40.0	40.0
NO	2.	1	10.0	10.0	50.0
NA	3.	5	50.0	50.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

CANCEL AVERAGE MONTHLY CANCELS TO PUB SCHEDULE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
10 SURG	1.	1	10.0	10.0	10.0
11 SURG	2.	1	10.0	10.0	20.0
42 SURG	3.	1	10.0	10.0	30.0
45 SURG	4.	1	10.0	10.0	40.0
50 SURG	5.	1	10.0	10.0	50.0
54 SURG	6.	1	10.0	10.0	60.0
60 SURG	7.	2	20.0	20.0	80.0
96 SURG	8.	1	10.0	10.0	90.0
UNKNOWN	9.	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

ADDONS AVERAGE MONTHLY ADD-ONS TO PUB SCHEDULE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
15 SURG	1.	1	10.0	10.0	10.0
45 SURG	2.	1	10.0	10.0	20.0
50 SURG	3.	1	10.0	10.0	30.0
63 SURG	4.	1	10.0	10.0	40.0
65 SURG	5.	1	10.0	10.0	50.0
70 SURG	6.	1	10.0	10.0	60.0
116 SURG	7.	1	10.0	10.0	70.0
128 SURG	8.	1	10.0	10.0	80.0
UNKNOWN	9.	2	20.0	20.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

INCTIME TIME OF INCISION FOR 1ST CASE OF DAY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
0715	1.	1	10.0	10.0	10.0
0730	2.	6	60.0	60.0	70.0
0745	3.	1	10.0	10.0	80.0
0800	4.	2	20.0	20.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

CUTOFF CUTOFF TIME FOR ANESTHESIA STARTS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NONE	1.	4	40.0	40.0	40.0
1330	2.	1	10.0	10.0	50.0
1400	3.	3	30.0	30.0	80.0
1430	4.	1	10.0	10.0	90.0
1500	5.	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

FTOPRMS # OF RO MS OPEN 40 HOURS PER WEEK

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	4.	2	20.0	25.0	25.0
	5.	1	10.0	12.5	37.5
	6.	3	30.0	37.5	75.0
	7.	1	10.0	12.5	87.5
	8.	1	10.0	12.5	100.0
	0.	2	20.0	MISSING	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 8 MISSING CASES 2

SPSS BATCH SYSTEM
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

FTHRS TOTAL SURG HRS-RMS 40 HRS PER WEEK

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	160.	2	20.0	25.0	25.0
	200.	1	10.0	12.5	37.5
	240.	3	30.0	37.5	75.0
	280.	1	10.0	12.5	87.5
	320.	1	10.0	12.5	100.0
	0.	2	20.0	MISSING	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 8 MISSING CASES 2

PTOPRMS # ROOMS OPEN LESS THAN 40 HRS PER WK

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	1.	4	40.0	66.7	66.7
	2.	2	20.0	33.3	100.0
	0.	4	40.0	MISSING	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 6 MISSING CASES 4

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY'HOSPITAL SURVEY

PTHRS TOTAL SURG HRS-RMS LESS THAN 40 HRS P WK

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	8.	1	10.0	20.0	20.0
	16.	1	10.0	20.0	40.0
	32.	1	10.0	20.0	60.0
	40.	1	10.0	20.0	80.0
	48.	1	10.0	20.0	100.0
	0.	5	50.0	MISSING	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 5 MISSING CASES 5

OVER40RM # RMS OPEN MORE THAN 40 HRS PER WEEK

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
2 ROOMS	2.	1	10.0	33.3	33.3
	6.	1	10.0	33.3	66.7
	7.	1	10.0	33.3	100.0
	0.	7	70.0	MISSING	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 3 MISSING CASES 7

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

OVER40HR TOTAL SURG HRS MORE THAN 40HRS PER WEEK

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	130.	1	10.0	33.3	33.3
	298.	1	10.0	33.3	66.7
	324.	1	10.0	33.3	100.0
	0.	7	70.0	MISSING	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 3 MISSING CASES 7

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

TOTORRMS TOTAL OR ROOMS USED FOR ELECT IP SURGERY

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
8 RMS	4.	1	10.0	10.0	10.0
9 RMS	5.	1	10.0	10.0	20.0
	7.	5	50.0	50.0	70.0
	8.	1	10.0	10.0	80.0
	9.	1	10.0	10.0	90.0
	11.	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

TOTORHRS TOTAL OR HOURS MONTH FOR ELECT INP SURG

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	640.	1	10.0	10.0	10.0
	800.	1	10.0	10.0	20.0
	992.	3	30.0	30.0	50.0
	1120.	1	10.0	10.0	60.0
	1190.	1	10.0	10.0	70.0
	1424.	1	10.0	10.0	80.0
	1544.	1	10.0	10.0	90.0
	1760.	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

Q1 HOW IS ELECTIVE SURGERY MADE AVAILABLE?

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
BLOCK BY SPECIALTY	3.	10	100.0	100.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

Q2 HOW IS DISTRIBUTION OF TIME DECIDED?

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
COMMITTEE CONSENSUS	1.	3	30.0	30.0	30.0
WORKLOAD	2.	2	20.0	20.0	50.0
SURG DEPT CHAIRMAN	3.	1	10.0	10.0	60.0
COMMITTEE & WORKLOAD	4.	3	30.0	30.0	90.0
TRADITION	5.	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

Q3 ARE UNSCHEDULED,PRERESERVED BLOCKS USED?

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NOT UTILIZED	1.	1	10.0	10.0	10.0
GIVEN TO OTHER DRS	2.	9	90.0	90.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

Q5 UNSCH,PRERES BLOCKS OPEN FOR OTHER SURG

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
24 HOURS	1.	5	50.0	55.6	55.6
MORE THEN 48 HOURS	3.	4	40.0	44.4	100.0
NOT OPENED UP	4.	1	10.0	MISSING	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 9 MISSING CASES 1

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

Q6 HOW IS ELECTIVE SURG SCHEDULED?

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
SPECIALTY CLINIC	1.	8	80.0	80.0	80.0
CENTRAL OFFICE	2.	1	10.0	10.0	90.0
OTHER	3.	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

Q7 CENTRAL SCHEDULING WITH 5 WKDAY SUMMARY?

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	1.	1	10.0	10.0	10.0
NO	2.	9	90.0	90.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

Q9 IS A COMPUTER USED TO SCHEDULE SURGERY?

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NO BEING CONSIDERED	2.	6	60.0	60.0	60.0
NO NOT CONSIDERED	3.	4	40.0	40.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

Q10 WHAT SOFTWARE PACKAGE IS USED-PLANNED?

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
NA	1.	9	90.0	90.0	90.0
LOCAL SOFTWARE	2.	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM 05/25/84 PAGE
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

Q13 WAY TO APPOINT OUTPTS WHEN SURG CANCELS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
YES	1.	2	20.0	20.0	20.0
NO	2.	8	80.0	80.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

SPSS BATCH SYSTEM
FREQUENCIES FOR ALL VARIABLES
FILE ARHOSSUR (CREATION DATE = 05/25/84) ARMY HOSPITAL SURVEY

UTILRATE PERCENT UTILIZATION

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	42.	1	10.0	10.0	10.0
	49.	1	10.0	10.0	20.0
	52.	1	10.0	10.0	30.0
	56.	1	10.0	10.0	40.0
	60.	1	10.0	10.0	50.0
	70.	1	10.0	10.0	60.0
	74.	1	10.0	10.0	70.0
	75.	1	10.0	10.0	80.0
	83.	1	10.0	10.0	90.0
	94.	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

VALID CASES 10 MISSING CASES 0

APPENDIX F

ESTIMATED OR UTILIZATION RATES

ESTIMATED OR UTILIZATION RATES

Lower End of Utilization Rate Scale

Hospital Name	Monthly Elective Cases	LARMC Average Time per Case	OR Hours Utilized	OR Hours Available for Elective Surgery	Estimated OR Utilization Rate
Darnall	325	1.85hr	601.25hr	800hr	75.2%
Eisenhower	400	1.85hr	740.0 hr	992hr	74.6%
Fitzsimons	500	1.85hr	925.0 hr	1544hr	59.9%
Frankfurt	325	1.85hr	601.25hr	640hr	93.9%
*Landstuhl	280	1.85hr	518.0 hr	992hr	52.2%**
Letterman	300	1.85hr	555.0 hr	992hr	55.9%
Madigan	450	1.85hr	832.5 hr	1190hr	70.0%
Tripler	500	1.85hr	925.0 hr	1120hr	82.6%
William Beaumont	400	1.85hr	740.0 hr	1760hr	42.0%
Womack	380	1.85hr	703.0 hr	1424hr	49.4%

*Health Care Facility Providing Base Time for Average Procedure time.

** The 52.2% is less than the 59% referred to in the introduction. The 52.2% does not include emergency surgery during normal duty hours.

Upper End of Utilization Rate Scale

Hospital Name	Monthly Elective Cases	WBAMC Average Time per Case	OR Hours Utilized	OR Hours Available for Elective Surgery	Estimated OR Utilization Rate
Darnall	325	3.10hr	1007.50hr	800hr	125.9%
Eisenhower	400	3.10hr	1240.0 hr	992hr	125.0%
Fitzsimons	500	3.10hr	1550.0 hr	1544hr	100.4%
Frankfurt	325	3.10hr	1007.50hr	640hr	157.4%
Landstuhl	280	3.10hr	868.0 hr	992hr	87.5%
Letterman	300	3.10hr	930.0 hr	992hr	93.7%
Madigan	450	3.10hr	1395.0 hr	1190hr	117.2%
Tripler	500	3.10hr	1550.0 hr	1120hr	138.4%
*William Beaumont	400	3.10hr	1240.0 hr	1760hr	70.5%
Womack	380	3.10hr	1178.0 hr	1424hr	82.7%

* Health Care Facility Providing Base Time for Average Procedure Time.

Note 1: The following factors could influence the estimated utilization rates: 1) Monthly elective cases could include emergency procedures thus falsely inflating utilization rates (LARMC figure is elective cases only); 2) Hours available for elective surgery may not be representative of the total time in which elective procedures are performed. For instance, overtime required to complete elective surgery is not considered. Excessive overtime used for elective surgery would decrease the average time required per surgical case, thus falsely inflating the efficiency indicator. A more accurate estimate should include hours of overtime. In addition, available hours for elective inpatient surgery from an operating suite located in another part of the hospital may not be represented in the total hours of available time. If their workload is included in the monthly total then the estimated OR utilization would be indicating a higher rate of utilization than was actually occurring.

Note 2: In comparing the lower end with the upper end of the utilization rate scale, one can roughly determine the efficiency of operating room use.

APPENDIX G

CALCULATIONS TO DETERMINE AVERAGE TIME PER OPERATION AT WILLIAM BEAUMONT ARMY MEDICAL CENTER

SURGICAL SERVICE

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. =.5 HRS)

GENERAL SURGERY

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room in Use	A(B&C)
Mastectomy	16	3.16 hr	.20 hr	3.26	52.16
Excision Ancillary Mass	12	2.27 hr	.20 hr	2.47	29.64
Tracheostomy	4	2.67 hr	.20 hr	2.87	11.48
Exploratory Laporatomy					
a. Lysis of adhesions	4	2.04 hr	.20 hr	2.24	8.96
b. Ileum	4	2.0 hr	.20 hr	2.20	8.80
c. with duodectomy	12	4.68 hr	.20 hr	4.88	58.56
Herniorrhaphy					
a. Ventral	12	2.33 hr	.20 hr	2.53	30.36
b. Inguinal	19	2.37 hr	.20 hr	2.57	48.83
c. Bilateral	4	3.42 hr	.20 hr	3.62	14.48
Appendectomy	19	1.85 hr	.20 hr	2.05	38.95
Cholecystectomy	19	2.16 hr	.20 hr	2.36	44.84
Hemorrhoidectomy	12	2.19 hr	.20 hr	2.39	28.68
Colostomy/Colon Resection	12	5.73 hr	.20 hr	5.93	71.16
Peritoneal Dialysis Catheter	4	2.16 hr	.20 hr	2.36	9.44
Epigastric Hernia	4	2.08 hr	.20 hr	2.28	9.12
AP Resection	8	5.58 hr	.20 hr	5.78	46.24
Spincterotomy	4	2.25 hr	.20 hr	2.45	9.80
Thyroidectomy	16	3.03 hr	.20 hr	3.23	51.68
Colectomy	8	7.29 hr	.20 hr	7.49	59.92
Hemicolectomy	4	1.58 hr	.20 hr	1.78	7.12
TOTAL	197				640.22

ORTHOPAEDICS

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total time Room in Use	A(B&C)
Total Hip	22	5.76 hr	.25 hr	6.01 hr	132.22 hr
Arthrotomy/Arthroscopy	30	3.27 hr	.25 hr	3.52 hr	105.60 hr
ORIF					
a. Radius	30	2.95 hr	.25 hr	3.20 hr	96.00 hr
b. Metatarsal	15	4.17 hr	.25 hr	4.42 hr	66.30 hr
c. Ankle	7	3.67 hr	.25 hr	3.92 hr	27.44 hr
Total Knee	7	3.58 hr	.25 hr	3.83 hr	26.81 hr
Hardware Removal	30	2.54 hr	.25 hr	2.79 hr	83.70 hr
Below the Knee Amputation	15	3.62 hr	.25 hr	3.87 hr	58.05 hr
TOTAL	156				596.12 hr

ORTHOPAEDICS (HAND)

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room In Use	A(B&C)
Hunter Rod Insertion	5	3.69 hr	.30 hr	3.99 hr	19.95 hr
Styliodectomy	3	2.58 hr	.30 hr	2.88 hr	8.64 hr
Exploration/Debridement	11	1.38 hr	.30 hr	1.68 hr	18.48 hr
Trigger Finger Release	11	1.81 hr	.30 hr	2.11 hr	23.21 hr
Excision Ganglion	13	1.70 hr	.30 hr	2.00 hr	26.00 hr
Carpal Tunnel Release	8	1.62 hr	.30 hr	1.92 hr	15.36 hr
TOTAL	51				111.64 hr

OPHTHALMOLOGY

Surgical Procedures	A	B $\bar{X}$	C Turn Around Time	B&C Total Time Room in Use	A(B&C)
Cataracts	10	2.88 hr	.45 hr	3.33 hr	33.30 hr
Strabismus					
a. Exotropia	8	1.80 hr	.45 hr	2.25 hr	18.00 hr
b. Esotropia	7	2.00 hr	.45 hr	2.45 hr	17.15 hr
TOTAL	25				68.45 hr

UROLOGY

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room in Use	A(B&C)
Nephrectomy	6	5.44 hr	.33 hr	5.77 hr	34.62 hr
Pyeloplasty	4	4.50 hr	.33 hr	4.83 hr	19.32 hr
Uretherolithotomy	25	3.13 hr	.33 hr	3.46 hr	86.50 hr
Suprapubic Prostatectomy	6	2.98 hr	.33 hr	3.31 hr	19.86 hr
Orchiopexy Inquinal	12	1.96 hr.	.33 hr	2.29 hr	27.48 hr
Hydrosadias	4	5.25 hr	.33 hr	5.58 hr	22.32 hr
Hydrocelectomy	4	2.88 hr	.33 hr	3.21 hr	12.84 hr
Vasovasostomy	4	2.33 hr	.33 hr	2.66 hr	10.64 hr
Orchiectomy	6	1.50 hr	.33 hr	1.83 hr	10.98 hr
Scrotal Exploration	4	2.67 hr	.33 hr	3.00 hr	12.00 hr
Cystoscopy	6	1.80hr	.33 hr	2.13 hr	12.78 hr
TOTAL	81				269.34 hr

OB-GYN

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room in Use	A(B&C)
Total Abdominal Hysterectomy	30	3.10 hr	.29 hr	3.39 hr	101.70 hr
Total Vaginal Hyster.	30	1.86 hr	.29 hr	2.15 hr	64.50 hr
Bilateral Salingoophorectomy	30	2.60 hr.	.29 hr	2.89 hr	86.70 hr
Exploratory Laparotomy	30	3.28 hr	.29 hr	3.57 hr	107.10 hr
Laproscopic Tubal Ligation	30	1.55 hr	.29 hr	1.84 hr	55.20 hr
Ceserean Section	30	1.58 hr	.29 hr	1.87 hr	56.10 hr
Dilation and Curettage	30	1.10 hr	.29 hr	1.39 hr	41.70 hr
TOTAL	210				513.00

OTOLARYNGOLOGY

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room in Use	A(B&C)
Tonsilloadeniodectomy	13	1.22 hr	.18 hr	1.40 hr	18.20 hr
Typanomastoidectomy	8	1.42 hr	.18 hr	1.60 hr	12.80 hr
Direct Laryngoscopy	3	1.45 hr	.18 hr	1.63 hr	4.89 hr
Septoplasty	6	.80 hr	.18 hr	.98 hr	5.88 hr
Myringotomy with PE tubes	13	1.12 hr	.18 hr	1.30 hr	16.90 hr
TOTAL	43				58.67 hr

THORACIC SURGERY

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room In Use	A(B&C)
Rib Reconstruction	4	2.20 hr	.22 hr	2.42 hr	9.68 hr
Cervical Mediastinal Endoscopy	2	2.33 hr.	.22 hr	2.55 hr	5.10 hr
Thoracotomy	4	2.98 hr	.22 hr	3.20 hr	12.80 hr
Permanent Pacemaker	2	2.74 hr.	.22 hr	2.97 hr	5.94 hr
Pneumonectomy	2	8.00 hr	.22 hr	8.22 hr	16.44 hr
Venacava Filter	2	2.75 hr	.22 hr	2.97 hr	5.94 hr
Pericardial Window	2	1.25 hr	.22 hr	1.47 hr	2.94 hr
TOTAL	18				58.84 hr

ORAL SURGERY

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room in Use	A(B&C)
Temporal Mandibular Joint	4	3.51 hr	.39 hr	3.90 hr	15.60 hr
Vestibuloplasty with Skin Graft	2	2.75 hr	.39 hr	3.14 hr	6.28 hr
Osteotomies					
a. Mandible	4	3.71 hr	.39 hr	4.10 hr	16.40 hr
b. Maxilla	3	5.44 hr	.39 hr	5.83 hr	17.49 hr
c. Segmentals	2	3.25 hr	.39 hr	3.64 hr	7.28 hr
d. Genioplasty	3	3.13 hr	.39 hr	3.52 hr	10.56 hr
Extraction of Teeth	4	1.83 hr	.39 hr	2.22 hr	8.88 hr
Ridge Augmentation					
a. Mandibular	3	1.50 hr	.39 hr	1.89 hr	5.67 hr
b. Maxilla	3	2.54 hr	.39 hr	2.93 hr	8.79 hr
TOTAL	28				96.95 hr

NEUROSURGERY

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room in Use	A(B&C)
Laminectomy	12	4.96 hr	0	4.96 hr	59.52 hr
Exploration of Brain	3	6.58 hr	0	6.58 hr	19.74 hr
Subdural Hematoma/ Temporal Lobectomy	3	5.75 hr	0	5.75 hr	17.25 hr
Occipitial Craniotomy	6	8.29 hr	0	8.29 hr	49.74 hr
Lumbar Discectomy	3	3.28 hr	0	3.28 hr	9.84 hr
TOTAL	27				156.09 hr

Turn around time not included as there is normally no elective surgery following a neurosurgical case.

PLASTIC SURGERY

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room in Use	A(B&C)
Augmentation Mammoplasty	16	2.58 hr	.33 hr	2.91 hr	46.56 hr
Reduction Mammoplasty	8	3.42 hr	.33 hr	3.75 hr	30.00 hr
Abdominoplasty	16	3.04 hr	.33 hr	3.37 hr	53.92 hr
Otoplasty	4	2.42 hr	.33 hr	2.75 hr	11.00 hr
Palataplasty	4	3.42 hr	.33 hr	3.75 hr	15.00 hr
Blepharoplasty	4	2.08 hr	.33 hr	2.41 hr	9.64 hr
TOTAL	52				166.12 hr

PERIPHERAL VASCULAR SURGERY

Surgical Procedures	A n	B $\bar{X}$	C Turn Around Time	B&C Total Time Room In Use	A(B&C)
Cartoid Endarterectomy	14	3.56 hr	.22 hr	3.78 hr	52.92 hr
Abdominal Anuerysm	5	3.92 hr	.22 hr	4.14 hr	20.70 hr
Femoro-popliteal By-pass	2	2.40 hr	.22 hr	2.62 hr	5.24 hr
AV-Fistual Shunt	5	3.78 hr	.22 hr	4.00 hr	20.00 hr
TOTAL	26				98.86 hr

SUMMARY

Surgical Service	Procedures	Time
General Surgery	197	640.22 hr
Orthopaedics	156	596.12 hr
Orthopaedics (Hand)	51	111.64 hr
Ophthalmology	25	68.45 hr
Urology	81	269.34 hr
Ob/Gyn	210	513.00 hr
Otolaryngology	43	58.67 hr
Oral Surgery	28	96.95 hr
Thoracic Surgery	18	58.84 hr
Neurosurgery	27	157.09 hr
Plastic Surgery	52	166.12 hr
Peripheal Vascular	26	98.86 hr
TOTAL	914	2834.43 hr

$$\text{Average Operating Time} = \frac{2834.43}{914} = 3.10 \text{ hr/procedure}$$

APPENDIX H

SURVEY RESULTS OF HOSPITALS WITH ESTIMATED OR UTILIZATION RATES GREATER THAN LANDSTUHL OR UTILIZATION RATE

	DARN	EISEN	FITZ	FKF	LETTER	MADIGAN	TRIPLER
Cancellations	10	60	50	unknown	54	60	45
Add-Ons	15	70	50	unknown	63	116	unknown
Incision Time	0730	0715	0745	0730	0800	0800	0730
Anesthesia Cut-Off Time	yes	yes	no, but have time to complete cases	no, but have time to complete cases	yes	yes	no
Block Basic by Specialty	yes	yes	yes	yes	yes	yes	yes
Determine Dist. of Time Blocks	Committee/ Work-load	Committee Consensus	Tradition	Work-load	CC+Work-load	Work-load	C, Dept. Surgery
Unscheduled Made Available	yes	yes	yes	yes	yes	yes	yes
Time When Unscheduled Blocks Made Available	Over 48 hr	Over 48 hr	24 hr	Over 48 hr	24 hr	Over 48 hr	24 hr
Centralized Scheduling	no	yes	no	yes	no	no	no
Centralized Summary Projecting Surgery 5 days in Advance	no	no	no	no	no	no	no
Computer Under Consideration	yes	yes	no	no	no	yes	yes
Substitute Outpatient Appointments When Surgery Cancels	no	no	no	yes	no	no	yes

Darn = Darnell
Eisen = Eisenhower
Fitz = Fitzsimons
FKF = Frankfurt
Letter = Letterman

APPENDIX I

DISTRIBUTION OF TERMINATING TIMES FOR ELECTIVE SURGERY IN LARMC OR SUITES

DISTRIBUTION OF TERMINATION TIMES FOR ELECTIVE SURGERY IN LARMC OR SUITES
(33 Workdays Randomly Selected Between 4 January and 25 April 1984)

Time Interval Termination Occurred	Frequency	
0730 - 0959	6	$\frac{39}{185} \approx 21\%$ Terminate Prior to 1200 (noon)
1000 - 1059	9	
1100 - 1159	24	
1200 - 1259	14	
1300 - 1359	31	
1400 - 1459	42	
1500 - 1559	36	$\frac{59}{185} \approx 31\%$ Terminate After 3 p.m.
1600 - 1659	14	
1700 - 1759	3	
after 1800	6	
TOTAL ROOM TIMES	185	

APPENDIX J

SURGERY CANCELLATION/ADD-ON RATES FOR MILITARY HOSPITALS

CANCELLATION/ADD-ON RATES FOR MILITARY HOSPITALS

Army Hospital	Average Monthly Cancellations	Average Monthly Add-Ons
Darnell	10/335 = 3%	15/325 = 5%
Eisenhower	60/460 =13%	70/400 =18%
Fitzsimons	50/550 = 9%	50/500 =10%
Frankfurt	not available	not available
Landstuhl	42/322 =13%	65/280 =23%
Letterman	54/354 =15%	63/300 =21%
Madigan	60/510 =12%	116/450 =26%
Tripler	45/545 = 8%	not available
William Beaumont	11/411 = 3%	45/400 =11%
Womack	96/476 =20%	128/380 =34%
AVERAGE	11%	19%

APPENDIX K

REASONS FOR SURGERY CANCELLATION AT LARMC

REASONS FOR SURGERY CANCELLATION AT LARMC

CANCELLATION CODES	FREQUENCY
-Surgeon Caused	
Overscheduled	4 .... 5.0%
Inadequate/incomplete workup	5 .... 6.3%
Lack of Surgery Staff (TDY's, Sickness - not communicated to OR)	7 .... 8.8%
-OR Caused	
Lack of available OR time	0 ....
OR staffing problems	1 .... 1.3%
Anesthesia staffing problems	0 ....
Equipment problems	0 ....
-Hospital Caused	
Poor communication	8 ....10.0%
Lack of bedspace	0 ....
Patient fed	0 ....
Laboratory fault	2 .... 2.5%
-Patient Caused	
Refusal	1 .... 1.3%
No Show	19 ....23.8%
Patient Illness	24 ....30.0%
-Other	
Preempted by Emergency	2 .... 2.5%
Intraoperative complication	2 .... 2.5%
Cured, condition cleared	2 .... 2.5%
Turned into ER procedure	1 .... 1.3%
DX discovered in Pulmonary	2 .... 2.5%
TOTAL	80

Note: Information was gathered over a 7 week period (12 March - 27 April 1984)

APPENDIX L

LARMC ADD-ON/CANCELLATION RATES BY SURGICAL SPECIALTY

SPECIALTY	A ADD-ON RATES	B CANCELLATION RATE	C DIFFERENCE
General Surgery	10 ÷ 95 = 11%	20 ÷ 105 = 19%	-7%
Orthopedics	16 ÷ 73 = 22%	5 ÷ 62 = 8%	+14%
OB/Gyn	38 ÷ 122 = 31%	10 ÷ 94 = 11%	+20%
Plastic Surgery	0 ÷ 41 = 0%	4 ÷ 45 = 9%	-9%
Neurosurgery	3 ÷ 32 = 9%	4 ÷ 33 = 12%	-3%
Urology	7 ÷ 69 = 10%	18 ÷ 80 = 23%	-13%
Oral Surgery	0 ÷ 23 = 0%	3 ÷ 26 = 12%	-12%
Podiatry	0 ÷ 18 = 0%	2 ÷ 20 = 10%	-10%
Otorhinologology	2 ÷ 99 = 2%	9 ÷ 106 = 9%	-7%
Ophtalomology	1 ÷ 21 = 5%	3 ÷ 23 = 13%	-8%
Thoracic Surgery	2 ÷ 23 = 9%	2 ÷ 23 = 7%	+2%

A = Elective Add-Ons (Total # of scheduled cases + elective Add-Ons)

B = Cancelled Elective Cases (Total # of scheduled elective surgical cases + cancelled elective cases)

C = Column A - Column B

Notes for Column C -
-A negative number implies any of the following:
1) Another specialty scheduled cases in the cancelled time
2) The specialty scheduled too many cases and some had to be delayed (cancelled) to another day
-A positive number implies any of the following:
1) The specialty has many patients waiting from surgery
2) The specialty has short order surgery

Survey was conducted from 12 March - 27 April 1984.

APPENDIX M

QUESTIONNAIRE - ELECTIVE SURGERY RESPONSE TIME

PATIENT QUESTIONNAIRE

When developing more efficient methods in quality care patient input is a valuable resource to consider. Although you are not required to fill out this survey your opinions would greatly assist our hospital in establishing more efficient capabilities in quality care issues.

STATUS OF PATIENT BEING ADMITTED TO THE HOSPITAL FOR ELECTIVE (NON-EMERGENCY SURGERY:

_____ Active duty (single)
_____ Active duty (married) or adult family member working outside the home
_____ Adult family member not working outside the home
_____ Family member school age (6-18 years)
_____ Family member preschool age (under 6 years)

PLEASE CHECK THE BOX THAT APPLIES:

1. The minimum amount of time required to arrange personal affairs between date of notification that elective (non-emergency) surgery is required and admission to the hospital for surgery is:

_____ One (1) day or less
_____ At least 2 days
_____ At least 3 days
_____ At least one week
_____ Over one week but under two weeks
_____ Over two weeks

2. Location of overseas residence from the hospital:

_____ Walking distance
_____ Within 15 minutes by car
_____ Within 30 minutes by car
_____ Between 30 and 60 minutes by car
_____ Over one hour by car

3. List things that do not allow you to come to the hospital quicker. (e.g., transportation, arrange babysitter, employer, etc.)

_____

_____

_____

PLEASE RETURN QUESTIONNAIRE TO ADMISSIONS OFFICE PERSONNEL

APPENDIX N

RESULTS OF ELECTIVE SURGERY RESPONSE TIME SURVEY

SURGERY RESPONSE SURVEY

Status - Single Working (Active Duty)

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1 day or less	O = 13 E = 10.8	O = 12 E = 14.2	O = 25
2-3 days	O = 14 E = 11.3	O = 12 E = 14.7	O = 26
over 3 days	O = 2 E = 6.9	O = 14 E = 9.1	O = 16
	O = 29	O = 38	N = 67

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance $(\alpha) = .05$

O = Observed Value

Expected Value (E) = $\frac{\text{(Column Total)(Row Total)}}{\text{Grand Total}}$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

$X^2_{.05;2} = 5.991$

$$X^2 = \left(\sum \frac{O^2}{E}\right) - n = 8.05$$

Reject Ho since calculated X^2 (8.05) is more than critical value X^2 (5.991).

Refer to page 101 for conclusion of Chi-Square Analysis of the Inpatient Survey.

SURGERY RESPONSE SURVEY

Status - Married Working Outside the Home

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1 day or less	O = 19 E = 16.2	O = 15 E = 17.8	O = 34
2-3 days	O = 24 E = 23.3	O = 25 E = 25.7	O = 49
over 3 days	O = 16 E = 19.5	O = 25 E = 21.5	O = 41
	O = 59	O = 65	N =124

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance (α) = .05

O = Observed Value

Expected Value (E) = $\frac{\text{(Column Total)(Row Total)}}{\text{Grand Total}}$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

$X^2_{.05;2} = 5.991$

$$X^2 = \left(\sum \frac{O^2}{E}\right) - n = 2.37$$

Accept Ho since calculated X^2 (2.37) is less than critical value X^2 (5.991).

Refer to page 101 for conclusion of Chi-Square Analysis of the Inpatient Survey.

SURGERY RESPONSE SURVEY

Status - Married Not Working Outside Home

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1 day or less	O = 13 E = 12.7	O = 9 E = 9.3	O = 22
2-3 days	O = 15 E = 19.1	O = 18 E = 13.9	O = 33
over 3 days	O = 24 E = 20.2	O = 11 E = 14.8	O = 35
	O = 52	O = 38	N = 90

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance $(\alpha) = .05$

O = Observed Value

Expected Value (E) = $\frac{\text{(Column Total)(Row Total)}}{\text{Grand Total}}$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

$X^2_{.05;2} = 5.991$

$$X^2 = \left(\sum \frac{O^2}{E}\right) - n = 3.80$$

Accept Ho since calculated X^2 (3.80) is less than critical value X^2 (5.991).

Refer to page 101 for conclusion of Chi-Square Analysis of the Inpatient Survey.

SURGERY RESPONSE SURVEY

Status - 6 - 18 year old

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1 day or less	O = 4	O = 3	O = 7
2-3 days	O = 2	O = 6	O = 8
over 3 days	O = 4	O = 9	O = 13
	O= 10	O = 18	N = 28

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance (α) = .05

O = Observed Value

Expected Value (E) = $\frac{\text{(Column Total)(Row Total)}}{\text{Grand Total}}$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

X^2 test not valid since more than 20% of the cells have a value less than 5.

Refer to page 101 for conclusion of Chi-Square Analysis of the Inpatient Survey.

SURGERY RESPONSE SURVEY

Status - Preschool (under 6 years)

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1 day or less	O = 7	O = 8	O = 15
2-3 days	O = 5	O = 4	O = 9
over 3 days	O = 3	O = 10	O = 13
	O = 15	O = 22	N = 37

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance $(\alpha) = .05$

O = Observed Value

$$\text{Expected Value (E)} = \frac{(\text{Column Total})(\text{Row Total})}{\text{Grand Total}}$$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

X^2 test not valid since more than 20% of the cells have a value less than 5.

Conclusion: In each of the two of the three previous Chi-Square Analysis the null hypothesis (Ho) is accepted. This suggests that there is not sufficient evidence to conclude that the factors affecting response time and residency location from the hospital are not independent. In other words, one can be 95% confident that location of residence is independent (doesn't influence) response time to be admitted for elective inpatient surgery. Patients living outside a 4 hour radius from LARMC would not be considered in this program. The single adult member (Ho is rejected) suggests that distance of residence from the hospital may be a factor that influences response time.

It is also of interest to note that in each category of patient status the majority of the patients surveyed would be able to respond to an unexpected opening in the surgery schedule within 2-3 days from date of notification. The ability of patients to respond within 24 hours is higher than one would anticipate.

SURGURY RESPONSE SURVEY

Minimum Response Time to be Admitted

Patient Status	1 day or less	2-3 days	1 week	over 1 week	
Single Working	O = 25 E = 19.9	O = 26 E = 24.2	O = 10 E = 15.3	O = 6 E = 7.6	O = 67
Married working outside of home	O = 34 E = 36.9	O = 49 E = 44.8	O = 29 E = 28.3	O = 12 E = 14.0	O =124
Married working inside home	O = 22 E = 26.8	O = 33 E = 32.5	O = 24 E = 20.5	O = 11 E = 10.1	O = 90
6-18 year old	O = 7 E = 8.3	O = 8 E = 10.1	O = 8 E = 6.4	O = 5 E = 3.2	O = 28
under 6 years old	O = 15 E = 11.0	O = 9 E = 13.4	O = 8 E = 8.4	O = 5 E = 4.2	O = 37
	O =103	O =125	O = 79	O = 39	N =346

Ho: Response time to be admitted for an elective surgical procedure and patient status are independent.

$$X^2 = \left(\sum \frac{O^2}{E}\right) - n = 11.31 \qquad X^2_{.05,12} = 21.026$$

DF = 3 x 4 = 12

Accept Ho, which suggests that there is not sufficient evidence to conclude that response time to be admitted for an elective surgical procedure and patient status are not independent.

Conclusion: Approximately 66% of the patients surveyed could respond and be admitted to the hospital in 2-3 days or less.

Limitations of the Analysis: The Chi-Square Analysis assumes that the sample population has a normal distribution. The sample was not gathered in a random manner and thus the distribution may be skewed. Therefore, the results of the analysis may exhibit bias.

APPENDIX O

QUESTIONNAIRE - OUTPATIENT CLINIC RESPONSE TIME

PATIENT QUESTIONNAIRE

When developing more efficient methods in quality care patient input is a valuable resource to consider. Although you are not required to respond to this survey your opinions would greatly assist our hospital in establishing more efficient capabilities in quality care issues.

The category that best describes the status of individual whose name would go on the outpatient appointment schedule.

_____ Active duty (single)
_____ Active duty (married) or adult family member working outside the home
_____ Adult family member not working outside the home
_____ Family member school age (6-18 years)
_____ Family member preschool age (under 6 years)

PLEASE CHECK THE BOX THAT APPLIES:

1. Please indicate the minimum amount of time required to arrange personal affairs in order to respond to an outpatient clinic appointment that becomes available unexpectedly. Time is measured from time of patient notification until time of the appointment.

_____ 1-4 hours
_____ 4-8 hours (appointment is same day as patient notification)
_____ one day (appointment is day following patient notification)
_____ two days (appointment is two days following patient notification)
_____ more than two days

2. Location of overseas residence from the hospital:

_____ walking distance (Landstuhl or Atzel area)
_____ within 15 minutes by car
_____ within 30 minutes by car
_____ between 30 and 60 minutes by car
_____ over one hour by car

3. List things that do not allow you to come to the hospital quicker (e.g., transportation, arrange babysitter, etc.)

_____

_____

_____

PLEASE RETURN COMPLETED QUESTIONNAIRES TO CPT HAMILTON

APPENDIX P

RESULTS OF OUTPATIENT CLINIC RESPONSE TIME SURVEY

OUTPATIENT CLINIC RESPONSE SURVEY

Status - Single Working (Active Duty)

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1-4 hr. (same day)	O = 29 E = 19.3	O = 10 E = 19.7	O = 39
4-8 hr. (same day)	O = 11 E = 9.4	O = 8 E = 9.6	O = 19
more than 8 hrs. next day	O = 6 E = 17.3	O = 29 E = 17.7	O = 35
	O = 46	O = 47	N = 93

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance $(\alpha) = .05$

O = Observed Value

Expected Value (E) = $\frac{\text{(Column Total)(Row Total)}}{\text{Grand Total}}$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

$X^2_{05;2} = 5.991$

$$X^2 = \left(\sum \frac{O^2}{E}\right) - n = 22.7$$

Reject Ho since calculated X^2 (22.7) is more than critical value X^2 (5.991).

Refer to page 110 for conclusion of Chi-Square Analysis of the Inpatient Survey.

OUTPATIENT CLINIC RESPONSE SURVEY

Status - Married Working Outside Home

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1-4 hr. (same day)	O = 30 E = 21.6	O = 15 E = 23.4	O = 45
4-8 hr. (same day)	O = 13 E = 17.3	O = 23 E = 18.7	O = 36
more than 8 hrs. next day	O = 19 E = 23.1	O = 29 E = 24.9	O = 48
	O = 62	O = 67	N =129

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance $(\alpha) = .05$

O = Observed Value

Expected Value (E) = $\frac{\text{(Column Total)(Row Total)}}{\text{Grand Total}}$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

$X^2_{05;2} = 5.991$

$$X^2 = \left(\sum \frac{O^2}{E}\right) - n = 9.7$$

Reject Ho since calculated X^2 (9.7) is more than critical value X^2 (5.991).

Refer to page 110 for conclusion of Chi-Square Analysis of the Inpatient Survey.

OUTPATIENT CLINIC RESPONSE SURVEY

Status - Married Not Working Outside Home

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1-4 hr. (same day)	O = 14 E = 8.2	O = 16 E = 21.8	O = 30
4-8 hr. (same day)	O = 6 E = 6.3	O = 17 E = 16.7	O = 23
more than 8 hrs. next day	O = 6 E = 11.5	O = 36 E = 30.6	O = 42
	O = 26	O = 69	N = 95

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance $(\alpha) = .05$

O = Observed Value

Expected Value (E) = $\frac{\text{(Column Total)(Row Total)}}{\text{Grand Total}}$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

$X^2_{05;2} = 5.991$

$$X^2 = \left(\sum \frac{O^2}{E}\right) - n = 9.28$$

Reject Ho since calculated X^2 (9.28) is more than critical value X^2 (5.991).

Refer to page 110 for conclusion of Chi-Square Analysis of the Inpatient Survey.

OUTPATIENT CLINIC RESPONSE SURVEY

Status - 6 - 18 yr old Family Member

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1-4 hr.(same day)	O = 8 E = 4.8	O = 5 E = 4.8	O = 13
4-8 hr.(same day)	O = 8 E = 5.2	O = 6 E = 8.8	O = 14
more than 8 hrs. next day	O = 3 E = 8.9	O = 21 E = 15.1	O = 24
	O = 19	O = 32	N = 51

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance $(\alpha) = .05$

O = Observed Value

Expected Value (E) = $\frac{\text{(Column Total)(Row Total)}}{\text{Grand Total}}$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

$X^2_{05;2} = 5.991$

$$X^2 = \left(\sum \frac{O^2}{E}\right) - n = 12.0$$

Reject Ho since calculated X^2 (12.0) is more than critical value X^2 (5.991).

Refer to page 110 for conclusion of Chi-Square Analysis of the Inpatient Survey.

OUTPATIENT CLINIC RESPONSE SURVEY

Status - Under 6 yr old Family Member

Residence Location from Hospital

Response Time	Within 30 min. by car	Over 30 min. by car	
1-4 hr.(same day)	O = 7	O = 9	O = 16
4-8 hr.(same day)	O = 0	O = 4	O = 4
more than 8 hrs. next day	O = 1 E = 8.9	O = 11 E = 15.1	O = 12
	O = 8	O = 24	N = 32

X^2 Test is not valid since more than 20% of the cells have a value less than 5.

Ho: The factors influencing response time are independent of the residence location from the hospital

Level of Significance $(\alpha) = .05$

O = Observed Value

$$\text{Expected Value (E)} = \frac{\text{(Column Total)(Row Total)}}{\text{Grand Total}}$$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 2

$X^2_{05;2} = 5.991$

$$X^2 = \left(\sum \frac{O^2}{E}\right) - n = 12.0$$

Conclusions: In each of the four previous Chi-Square Analysis the null hypothesis (Ho) is rejected. This suggests that there is not sufficient evidence to conclude that the factors affecting response time and residence location from the hospital are independent. In other words, one can be 95% confident that location of residence is not independent (does influence) response time for an outpatient clinic appointment. This appears logical as the ability to respond within hours after notification of an outpatient clinic appointment opening depends to some extent upon proximity to the hospital.

Limitations of the Analysis: The Chi-Square Analysis assumes that the sample population has a normal distribution. The sample was not gathered in a random manner and thus the distribution may be skewed. Therefore, the results of the analysis may exhibit some bias.

OUTPATIENT CLINIC RESPONSE SURVEY

Minimum Response Time for Appointment

Patient Status	1-4 hr. same day	4-8 hr. same day	one day next day	more than one day	
Single Working	O = 39 E = 33.2	O = 19 E = 22.3	O = 20 E = 28.4	O = 15 E = 9.1	O = 93
Married - Working Outside Home Family Member	O = 45 E = 46.1	O = 36 E = 31.0	O = 34 E = 39.3	O = 14 E = 12.6	O = 129
Married - Working Inside Home Family Member	O = 30 E = 34.0	O = 23 O = 22.8	O = 38 E = 29.0	O = 4 E = 9.3	O = 95
6-18 yr old	O = 13 E = 18.2	O = 14 E = 12.2	O = 20 E = 15.6	O = 4 E = 5.0	O = 51
Under 6 yr.	O = 16 E = 11.4	O = 4 E = 7.7	O = 10 E = 9.8	O = 2 E = 3.1	O = 32
	O = 143	O = 96	O = 122	O = 39	N = 400

Ho: Patient status and response time are independent

Level of Significance $(\alpha) = .05$

$$x^2 = \left(\sum \frac{O_i^2}{E_i}\right) - n = 24.88$$

Degrees of Freedom (df) = (Rows - 1)(Columns - 1) = 12

$x^2_{.05;12} = 21.026$

Conclusions: Reject Ho, which suggests that there is not sufficient evidence to indicate that the ability to respond to an outpatient appointment opening is independent from patient status. Therefore, response time may be influenced significantly by patient status. The survey also indicates that 36% of the patients surveyed could respond within 4 hours to an appointment opening. Approximately 60% of those surveyed could respond to an appointment opening if they had less than 8 hours to respond.

Limitations of the Analysis: The Chi-Square Analysis assumes that the sample population has a normal distribution. The sample was not gathered in a random manner and thus the distribution may be skewed. Therefore, the results of the analysis may exhibit some bias.

APPENDIX Q

REGISTER OF OPERATIONS DA FORM 4108

REGISTER OF OPERATIONS

For use of this form, see AR 40-68, the proponent agency is Office of The Surgeon

HOSPITAL

FILE NUMBER

SEQ NO	DATE	NAME (Last, First, MI)	REGISTER NO	NURSING UNIT	REQUESTING SERVICE	OPERATION PERFORMED [ ] MAJOR [ ] MINOR	TIME (Anes begun) (Surgery begun) (Anes & Surgery ended)	SURGEONS	PREOPERATIVE DIAGNOSIS
OR NO	CASE NO	AGE / STATUS	SSN (with Family Member Prefix)						POSTOPERATIVE DIAGNOSIS
EMERGENCY / COMBAT	NURSING TIME	NURSING TEAM [ ] EPISODE(S)	ANESTHETIST(S)		ANESTHESIA AGENTS	SPONGE COUNT	DRAINS	SPECIMEN TO LABORATORY	COMPLICATIONS [ ] SEPTIC
SEQ NO	DATE	NAME (Last, First, MI)	REGISTER NO	NURSING UNIT	REQUESTING SERVICE	OPERATION PERFORMED [ ] MAJOR [ ] MINOR	TIME (Anes begun) (Surgery begun) (Anes & Surgery ended)	SURGEONS	PREOPERATIVE DIAGNOSIS
OR NO	CASE NO	AGE / STATUS	SSN (with Family Member Prefix)						POSTOPERATIVE DIAGNOSIS
EMERGENCY / COMBAT	NURSING TIME	NURSING TEAM [ ] EPISODE(S)	ANESTHETIST(S)		ANESTHESIA AGENTS	SPONGE COUNT	DRAINS	SPECIMEN TO LABORATORY	COMPLICATIONS [ ] SEPTIC
SEQ NO	DATE	NAME (Last, First, MI)	REGISTER NO	NURSING UNIT	REQUESTING SERVICE	OPERATION PERFORMED [ ] MAJOR [ ] MINOR	TIME (Anes begun) (Surgery begun) (Anes & Surgery ended)	SURGEONS	PREOPERATIVE DIAGNOSIS
OR NO	CASE NO	AGE / STATUS	SSN (with Family Member Prefix)						POSTOPERATIVE DIAGNOSIS
EMERGENCY / COMBAT	NURSING TIME	NURSING TEAM [ ] EPISODE(S)	ANESTHETIST(S)		ANESTHESIA AGENTS	SPONGE COUNT	DRAINS	SPECIMEN TO LABORATORY	COMPLICATIONS [ ] SEPTIC
SEQ NO	DATE	NAME (Last, First, MI)	REGISTER NO	NURSING UNIT	REQUESTING SERVICE	OPERATION PERFORMED [ ] MAJOR [ ] MINOR	TIME (Anes begun) (Surgery begun) (Anes & Surgery ended)	SURGEONS	PREOPERATIVE DIAGNOSIS
OR NO	CASE NO	AGE / STATUS	SSN (with Family Member Prefix)						POSTOPERATIVE DIAGNOSIS
EMERGENCY / COMBAT	NURSING TIME	NURSING TEAM [ ] EPISODE(S)	ANESTHETIST(S)		ANESTHESIA AGENTS	SPONGE COUNT	DRAINS	SPECIMEN TO LABORATORY	COMPLICATIONS [ ] SEPTIC
SEQ NO	DATE	NAME (Last, First, MI)	REGISTER NO	NURSING UNIT	REQUESTING SERVICE	OPERATION PERFORMED [ ] MAJOR [ ] MINOR	TIME (Anes begun) (Surgery begun) (Anes & Surgery ended)	SURGEONS	PREOPERATIVE DIAGNOSIS
OR NO	CASE NO	AGE / STATUS	SSN (with Family Member Prefix)						POSTOPERATIVE DIAGNOSIS
EMERGENCY / COMBAT	NURSING TIME	NURSING TEAM [ ] EPISODE(S)	ANESTHETIST(S)		ANESTHESIA AGENTS	SPONGE COUNT	DRAINS	SPECIMEN TO LABORATORY	COMPLICATIONS [ ] SEPTIC

DA FORM 4108

*OR – OPERATING ROOM

APPENDIX R

REASONS FOR SURGERY CANCELLATIONS - DEVELOPED BY MADIGAN ARMY MEDICAL CENTER

CANCELLATION CODE FORMAT

DEVELOPED BY MADIGAN ARMY MEDICAL CENTER

CANCELLATION CODES

A Surgeon Caused

- A-1 Overscheduled cases
- A-2 Inadequate/incomplete workup
- A-3 Lack of surgical staff
- A-4 Incorrect Op permit

B OR Caused

- B-1 Lack of available OR time
- B-2 OR Staffing problems
- B-3 Anesthesia staffing problems
- B-4 Equipment problems

C Hospital Caused

- C-1 Lack of bedspace
- C-2 Patient fed

D Patient Caused

- D-1 Refusal
- D-2 No show
- D-3 Pt Ill

D Other

- E-1 Preempted by emergency
- E-2 Scheduled procedure aborted due to intraoperative complication
- E-3 Condition cleared, cured, etc. (no need for surgery)

APPENDIX S

OPERATION REQUEST AND WORKSHEET DA FORM 4107

OPERATION REQUEST AND WORKSHEET

For use of this form, see AR 40-407, the proponent agency is the Office of The Surgeon General

SECTION A - REQUEST FOR SURGERY

1. PATIENT'S NAME *(Last, First, MI) (Print)*	2. STATUS	3. AGE	4. RELIGION	5. REGISTER NO	6. SSN *(with Family Member Prefix)*

7. PREOPERATIVE DIAGNOSIS	8. NURSING UNIT *(from - to)*

9. OPERATION PROPOSED

10. REQUESTING SERVICE	11. DATE OF SURGERY	12. TIME OR CASE NO	13. *(Check one)* ☐ EMERGENCY ☐ ELECTIVE	14. BLOOD REQUIRED *(Unit)* cc	15. SEPTIC

16. SURGEON	17. ASSISTANT(S)	18. POSITION OF PNT	19. PREP REQUIRED

20. NURSING STAFF	21. ANESTHETIST(S)	22. ANESTHESIA

23. SPECIAL INSTRUCTIONS AND REMARKS

24. REQUESTING OFFICER *(Printed Name and Signature)*

SECTION B - OPERATION WORKSHEET

25. OPERATING ROOM NO	26. TIME OR CASE NO	27. *(Check one)* ☐ EMERGENCY ☐ ELECTIVE	28. SEPTIC	29. FLUIDS *(other than blood)*	30. BLOOD ADMINISTERED

31. SURGEON	32. ASSISTANT(S)	33. ANESTHETIST(S)	34. ANESTHESIA TIME *(Began and Ended)*

35. INDUCTION ANESTHETIC	AGENT	TECHNIQUE	38. AIRWAY	40. SPECIAL PROCEDURES *(Anesthesia)*
36. PRIMARY ANESTHETIC	AGENT	TECHNIQUE	39. RELAXANTS INTUBATION / OTHER	
37. SECONDARY ANESTHETIC	AGENT	TECHNIQUE		

41. NURSING TIME *(Began and Ended)*	42. SCRUB NURSE(S)	43. CIRCULATING NURSE(S)

44. OPERATION DATE	45. OPERATION TIME *(Began and Ended)*	46. DRAINS	47. SPONGE COUNT	48. LABORATORY SPECIMEN

49. OPERATIVE DIAGNOSIS

50. OPERATION(S) PERFORMED	☐ EPISODES OF SURGERY ☐ MAJOR ☐ MINOR

51. COMPLICATIONS *(Continue on reverse, if more space is required)*

52. DICTATOR'S NAME, SERVICE & PHONE EXT	RECORDED IN REGISTER *(Initials)*

DA FORM 1 JUN 73 4107

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