A STUDY TO IDENTIFY

THE CAUSES OF DECREASING SURGICAL SUITE PRODUCTIVITY AND RECOMMEND METHODS WHICH MAY RESTORE SURGICAL OUTPUT TO PREVIOUS LEVELS AT THE UNITED STATES AIR FORCE ACADEMY HOSPITAL

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Surgical productivty at the United States Air Force Academy Hospital steadily decreased over three years. There was no apparent reason for the decline, and evaluation of every activity surrounding the Surgery Department found no overall causative factor. However, during this study it became apparent that the problem could be attributed to command interest. When the Hospital Commander encouraged the surgeons to work harder productivity levels returned to previous levels.

This study also found support for other studies in which the Longest Case First method of scheduling surgical cases into operating rooms results in better throughput than other methods. The information in this study points to the possibility that operating room turnovers are faster as the day wears on. This indicates that when shorter cases go last, as in the Longest Cases First method, there is more opportunity for a larger number of faster turnovers; resulting in greater throughput than achieved using other scheduling methods.

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ORIENTATION.

Background description.

The United States Air Force Academy Hospital (USAFAH) is a 60 bed acute care facility with a wartime expansion mission of 205 operational and 195 minimal care (400 total) beds. Due to its unique peacetime mission as the health provider for an extraordinarily active and controlled populace of Air Force Academy Cadets, it boasts an unusually large array of specialties for a small hospital. This range of services includes General Surgery, OB/GYN, Orthopedics, Neurology, ENT, Urology, Dermatology, Podiatry and Opthamology and Sports Medicine.

On a monthly basis during fiscal year 1987 USAFAH admitted an average of 368 patients; of which 195 were surgical services patients (1988 is not representative for reasons discussed later). In addition to the inpatient case load, the outpatient clinics currently see an average of 23,600 patients per month. These patients are drawn from a population of 4454 cadets, 66,586 active duty personnel and their dependents from three military bases, plus an estimated 44,738 eligible patients in the retired sector, for a combined patient population of 115,778. Of course, the 44,530 Air Force related patient population provides the vast majority (86+%) of the workload.

Patients requiring specialty care not available at the USAFAH are generally referred to Fitzsimmons Army Medical Center in Aurora CO, 60 miles away. Some non-active duty patients are also referred to civilian facilities in the area.

Surgical services available at USAFAH cover the same broad spectrum of procedures generally found in community hospitals. These include procedures ranging from dilation and curettage to total joint arthroplasty. As indicated above, in fiscal year 1987 there were 2344 procedures performed in the three operating rooms. During fiscal year 1988 the Surgical Suite was closed for renovation from 15 May through 15 September, hence the workload from that time period is not representative of a normal year's productivity. There are also two delivery rooms capable of cesarean sections and a Proctoscopy room.

Since 1985 the USAFH has experienced a steady decrease in both number of operative cases performed and total minutes of anesthesia. This decrease is represented in the chart below. There is no readily apparent causative factor associated with the decrease, so the Hospital Administrator has requested this study to determine the reasons behind the decrease and offer solutions which will maximize surgical suite utilization and reduce the patient backlog.

Year	Operations	% Decrease	Minutes	% Decrease
1985	2801	-	N/A	-
1986	2612	6.75	216600	-
1987	2344	10.25	197908	8.6
1988	1745*	25.50	138249*	30.1

* Surgery Suite renovated May - September 1988

Figure 1.1. Decrease in operations and anesthesia minutes 1985 - 1988.

Statement of the problem.

The purpose of this research is to evaluate surgical suite productivity and identify management initiatives which will optimize Operating Room utilization and production at the USAFAH.

Objectives.

1. Conduct a literature review to assess the current thinking on Operating Room (OR) staffing requirements, case mix, and scheduling methodology.

2. Review and compare historical data to verify the impression of declining surgical suite productivity and attempt to assign a causation to any discovered productivity decrease (i.e. new personnel, procedures, techniques)

3. Compare the staffing at the USAFAH to that in similar Air Force hospitals and current industry standards at civilian hospitals.

4. Assess current surgical clinic and surgical suite scheduling practices for factors which impede patient throughput.

5. Determine if variances in performance data are statistically significant.

6. Discover the OR utilization scheduling methodology which will achieve optimal throughput of surgical cases, given staffing and other constraints.

7. Examine ward capacity to determine the impact of available surgery beds upon the number and kinds of OR procedures performed.

8. Identify modifications to ward configuration which will support optimal OR scheduling.

9. Examine any existing backlog of surgery cases to develop a scheduling methodology which will reduce the waiting list at a constant rate while accommodating all new cases.

10. Make recommendations which have the potential to improve Surgical Suite productivity.

Criteria.

1. Recommendations will be prioritized within two categories: those costing above, and then below, $10,000 per fiscal year. The thrust of this research is to identify improvements which can be achieved without a significant impact upon limited facility resources, therefore emphasis will be placed upon those initiatives which are beneath the $10,000 level.

2. A level of significance of .05 will be used with all statistical tests applied to utilization data.

3. The recommendations resulting from the study can not adversely impact the productivity of other USAFAH workcenters.

Assumptions.

This research is subject to the following assumptions:

1. The USAFAH's Surgery section will be 100% operational (see definition section) during the course of the study.

2. Data collection for a four month period will provide a statistically appropriate workload base from which to determine and evaluate existing utilization and scheduling practices.

3. Historical utilization documentation was compiled and tabulated in the same way as the current documentation and both are accurate reflections of surgical suite utilization.

4. Staffing in the Surgery section, surgery-related clinics and wards will remain at a constant level. Appropriate staffing levels will be determined by USAF staffing goals for these specialties, as disclosed by the Air Force Manpower and Personnel Center; or, alternatively, the average actual staffing in these areas during the data collection period.

5. Resource allocations have been adequate and have not impacted upon Surgical Suite productivity.

Definitions.

1. OR utilization refers to management of the assigned resources. This includes staffing, operating hours, and specified task performance.

2. OR production refers to the scheduling process and adherence to that process.

3. OR utilization hours are the number of hours during which scheduled surgical procedures are being performed. Downtime between procedures is not counted in this computation; however, OR cleanup and preparation (turnover) time will be counted as in-use time, subject to the HQ USAF/SG imposed 20 minute standard allocated to these activities.

4. Surgical suite operational status consists of two elements; operating room availability and staffing levels. The surgery section will be considered to be 100% operational if all ORs are available five seven hour days per week 95% of the time, and surgical staffing levels remain above 85% (Note: The Air Force has recently decreed that 85% staffing is the level at which they become concerned and take action to fill shortages.) of the funded authorizations.

5. Productivity is determined by the number of surgical procedures performed during normal workdays, excluding holidays, for each month included in the study.

Limitations.

1. The backlog of surgical cases will consist only of unscheduled cases as of December 1988, which have been added to each department's waiting list for scheduling by 1 November 1988.

2. New specialties which are introduced into the surgery mix during the 1 October 1988 - 31 January 1989 data collection period will be evaluated to the extent allowed by the close of the collection period and included in scheduling recommendations.

LITERATURE REVIEW.

Introduction to the topic.

There have been numerous studies addressing surgical suite utilization over the past 25 years. These studies have shown surgical suites to have high costs and low utilization rates (Magerlein 418). In fact, Michael Nathanson, among others, claims the national OR utilization rate is in the 40% range (44). It is no surprise then, that surgical suite productivity articles are on an upsurge, increasing from one or two per year to three or four during the 1980s. Perhaps the impetus for this emphasis is the recognition that inefficient surgery suites consume significant hospital resources; up to one-tenth of the hospital's total costs (Bridenbaugh 11), or; it may be the result of increasing managerial professionalism combined with the advent of easier computer access and knowledge.

A rather interesting similarity between the problems confronting USAFAH and those facing civil sector hospitals prior to the advent of DRGs arises as one peruses the literature. Stewart provides an excellent description of the scenario in citing a facility he was associated with in 1971 experiencing high occupancy rates and low surgical productivity (132). It seems that USAFAH is facing the same dilemma; as surgical productivity is boosted the inpatient units become strained and unable to provide the desired level of care indefinitely.

An excellent literary starting point for any study concerning surgical suite productivity is Przanyski's scholarly 1986 literature review on operating room scheduling (67 - 79). Citing over 50 references, he methodically groups his sources together, highlights the meritorious efforts, and points out the weaknesses of the various groupings. The present study leans heavily upon his methodology and evaluations. In fact, the effort here is to identify his few omissions and contrast findings during this study to his opinions.

Przanaski identifies five areas of effort in the study of surgical productivity: utilization, cost containment, planning and organization, scheduling specific resources (i.e. personnel) and scheduling of operations into operating rooms (67). His five areas seem to lack just one consideration, identified by Magerlein and Martin, which is to consider the entire patient experience from admission through discharge (425). They discovered only one study which attempted to combine nursing unit occupancy and surgical suite utilization. This discovery points to the fact that too many studies are conducted by people who cannot see beyond the small portion of the complex operative patient experience for which they are responsible. To give Przanaski credit in this area however, he does say that "the complete problem and not a theoretical subset must be attacked" (76). Along with their comment that little work of a comprehensive nature has been attempted (419), Magerlein and Martin charge much of the existing literature with failure to consider the constraints involved in day to day surgical facility operations (426).

To differentiate further from Przanaski's research, and perhaps provide some fresh perspective, this literature review discusses topics which are more important to the surgery suite in the military setting. This group of topics includes computerization, staffing, scheduling methods, surgical facility sizing, utilization, ward capacity and waiting lists. Where the post-DRG civilian facility is rightly concerned with cost control and becoming a profit center, the military facility is concerned with maximizing a finite resource.

That is to say the civilian facility may expand, and or change mission emphasis but the military facility cannot expand or change to create markets; it must do the best it can with the available resources.

The first topic, computerization, is important to surgical productivity in that it can allow the manager to more rapidly enter daily work data and then produce utilization reports with much less time and effort than traditional manual systems of collecting historical data. Evaluation of staffing mechanisms is a key consideration, in relation to other military and civilian facilities, in the discovery of alternative methodologies. A review of scheduling methods is vital to ensuring the local procedure will provide the optimal throughput. Surgical facility sizing is important to the study because no procedural improvements can overcome an inadequate facility. Operating room (OR) utilization studies are vital to understanding what is possible; there is no sense in trying to improve the utilization of the surgical suite without something against which to compare and measure success. Ward capacity is the constraint on the far end of the OR utilization issue; if the ward cannot accommodate an increased surgical case load it must grow or some alternative solution must be discovered. Finally, the dynamics of waiting lists must be considered in order to reduce the queue of patients created by inefficient operations.

Computerization of surgical suite administrative activities.

According to Hejna and Gutmann there are four general areas in the surgery suite which may benefit from computerization: facility utilization, personnel activity, surgical service utilization and trends (265). These are all retrospective types of information from which proactive computer uses such as surgical scheduling are noticeably absent. Przanaski laments the paltry amount of work done to further these systems; of the many studies purporting to offer automated scheduling systems he found only two which had actually been implemented (74). However, he also recognizes the value of the historical information contained in an computerized surgical log providing retrospective reports on the four areas identified by Hejna and Gutmann (68).

When an organization decides it needs more surgery suite management information the obvious answer is to automate the surgery log, which contains a wealth of performance information. In one of the earlier works recommending an automated log, Cresto and Devor found the major advantages to be fewer errors and greater report flexibility (60). Later, in the early 1980s, Priest, Pelati and Marcello cited the savings in time to compare monthly utilization reports as the major advantage in their automated log system. They said report creation in the previous manual system took up to eight hours and the information was often unavailable until the middle of the following month. With the new system, report creation required half the time and resulted in more extensive reporting on a "todate" basis (82). The same year Morrison reported a similar system in which report tabulation was reduced to 25% of the previous time and preparation of monthly utilization statistical reports took 20 minutes compared to 30 hours previously, the article did not identify the tasks that consumed this exorbitant amount of time (20). Both articles cite similar uses for the reports; staffing, utilization of facilities, anesthesia trends and tracking surgeon's times for various procedures. Bringing the automation trend up to date, Oliver provides a table of advantages which includes such interactive features as credentialing verification, inventory assessment prior to procedures, inventory usage accounting with automatic reordering, and automatic transfer of information to the patient's bill (584).

In scheduling cases the surgeon's time estimates are a key factor in the accuracy of the days' schedule. Pirnke found that these estimates are untrustworthy; 94.6% of the cases in her study were inaccurately estimated, with more (64%) being underestimated than overestimated (1085). Michael Nathanson believes that the early computerization process of scheduling using overall time averages has also led to surgeons' mistrust of scheduling systems, resulting in attempts to avoid the system through demands for earlier operation times or indifference to their personal punctuality. The poor utilization which then springs from this is a self-perpetuating cycle (44).

With the advent of an accurate, surgeon specific, computerized track record the scheduler's work has become much easier and reliable in that the surgeon's estimates may be compared to the actual record and changed if necessary (Austin and Laufman, 47). This recording of historical information has enabled today's networked interactive scheduling systems to be developed. However, there are still limitations in some systems requiring human intervention to circumvent the computer's requirement to operate using intractable rules (Spohn and Sponseller, 19). Given the sophistication of even today's smallest microcomputers there must be off the shelf software packages capable of true interactive processing, unfortunately no description of such systems could be found in the literature. Considering that the <u>1988 Computers in Healthcare Directory</u> lists 99 vendors of surgery related software, there is a tremendous need for comparative research in the area (86).

Any study considering computerization of the surgery suite should identify the data elements found in the literature which are required to retrieve management information. Figure 1.2 shows the various bits of information resulting from this search. While there are many more references which discuss surgical suite productivity the articles cited in Figure 1.2 relate specifically to computerization and are the best among those reviewed. It seems the more complete lists are those which provide their collection instrument as part of the article (Morrison, 18; Priest, 80), although bias toward these articles was avoided by looking to the reports the authors described and intuitively crediting them with using the data elements one would need to produce the report. Oliver also provides a useful chart which displays the data element, the element's acceptable value range and then the action to take if the value falls outside the acceptable range (581).

ELEMENT	AUSTIN	HEJNA	KELLEY	MARTIN	MORRISON	NATHANSON	OLIVER	PRIEST
#CASES/NURSE	X		X	X	X		X	X
#CASES/SURG		X		X	X		X	X
ANES TIME			X	X	X	X	X	X
ANES TYPE	X			X	X	X		X
CASE MIX	X			X	X	X		X
CASE TIME/SURG	X	X	X	X	X	X	X	X
CLOSURES		X	X	X	X	X		X
COMPLICATIONS					X			
COST DATA	X						X	X
COUNTS								X
DELAYS/CANX					X		X	X
DIAGNOSES				X				X
DRAINS & TUBES								X
EQUIP NEEDS	X							
EQUIP PROBS							X	
ESTIM TIMES					X			
INCISION		X	X	X	X	X		X
INFECT CNTRL				X				
MEDICATIONS	X							X
OR UTILIZATION		X		X	X			X
PATIENT INFO				X				
PERSONNEL	X			X	X	X	X	X
ROUTINE/EMERG				X	X			X
SERVICE UTIL		X		X	X		X	X
SPECIMENS								X
SUPPLIES	X			X				
TOT # CASES		X		X	X			X
TOT SURG HRS	X	X		X	X		X	X
TRANSFUSION							X	X
TURNOVER TIME		X	X		X			
WOUND CLASSIF							X	

Figure 1.2. Data elements discussed in selected references.

In addition to their proven value in providing retrospective reports, and the potential for interactive scheduling, today's computers and software are valuable simulation tools for evaluating new concepts without actually going through the effort to implement each idea. The discussion on this developing technology is located in the section covering the various surgery scheduling methods.

Staffing issues.

To the casual observer surgery suite staffing issues would seem to center upon how many FTEs are required to do the job efficiently. According to Przanaski, however, the focus is also upon keeping the nursing force satisfied and productive. He says the literature generally reports that any systematic approach, and in particular those which allow the staff some input to schedules, results in greater staff satisfaction (72). In addition, this study has discovered a third surgical staffing issue; clarifying the perioperative role.

Przanaski says the various studies on scheduling nursing staff have each perceived benefits "primarily because of the interest taken on the part of management in personnel scheduling and ... tangible improvements" (72). This sounds like the Hawthorne studies revisited; no matter what you do to the workers, if they see you're interested in them they will produce at a greater rate. He adds that no one study proved to be the best - further evidence of the Hawthorne effect (72).

Looking at productivity through satisfaction in a slightly different way, Pitzer attributes the need for more control over the work environment to generational values. He finds that young nurses of today are "more liberally educated, articulate and impatient"; they have no use for the autocratic curmudgeons often found in nursing management positions (19). He prescribes participative management as the key to getting the best from young nurses (20).

An additional body of work covers modification to the shifts worked by OR personnel. McQuarrie found that eight hour shifts were not compatible with the work pattern in about one-third of the ORs. He recommends a 10 hour shift; perhaps working four day weeks (1070). Curtis and Scott echo this concept but think adding two shifts, one early and the other late, can result in a more predictable schedule, less overtime and more operations performed; of course they're writing about a large hospital with 24 hour operations (48-49). Hejna and Gutmann agree that extended hours covering early and late periods can lead to greater efficiencies but caution that extended hours are not preferred by surgeons or their patients (257).

There are still those who wish to develop a more mechanical method by which to arrive at staffing. These efforts rely on discovering a measure of the acuity of the caseload. For example, an unknown staff writer in Same-Day Surgery described the attempt of a consulting firm to quantify the required nursing effort at a 250 bed outpatient surgery department. After a meticulous time and motion study the firm categorized patients and applied a weighted average factor to the number of patients in each category; through simple mathematics they could then establish the correct staffing level. This study did discover an interesting fact: Anesthesia had no impact upon the hours of care required by a patient (perhaps the length of stay, but not total care hours) (Unk, 122-125).

In addition to trying to decide what staffing levels they require and how to achieve staff satisfaction, surgical suite managers are trying to delineate their functions. Mailhot and Binger provide an interesting comparison of an OR Director's 1973 daily schedule to those which appear on the day's schedule in 1983. The 1983 schedule is two hours longer, has twice as many entries, and more importantly, shows a shift from direct OR involvement to more strategic, hospital-wide issues (1984, 12). Five years later they've moved from examining schedules to publishing detailed, four page, "Director Of Operating Region" position descriptions. Nowhere do they mention activities such as rounds and morning report, which were routine in 1973; instead these Directors generate new surgical business, design fee structures and devote energy to capitol budget formation (Mailhot and Binger, 1988, 8-11).

Surgery scheduling methods.

Scheduling is perhaps the most critical element in efficient OR operations, in fact Goldman, Knappenburger and Moore found scheduling policies had a statistically significant impact upon utilization rates, overtime and delays (51). Unfortunately, Przasnyski found the literature on surgical scheduling to be scarce, and perhaps it is, compared to some other issues (74). The present review, however, found it not so scarce as limited in variety. Only four variations could be located in the literature; scheduling on a first come, first serve basis; assigning individual services or surgeons blocks of time to use; scheduling the longest case first and, conversely, shortest case first; or tinkering with the room assignments such as in the "two room method". There have been a number of computer scheduling systems developed, however most are basically booking systems which assign OR time based upon information in the data base (Przanaski 74).

Perhaps the reason for the lack of variation in scheduling methods is the complexity of the issue. While its an easy task to fill in an empty slot on a book, or to structure an OR day based upon previous experience to determine probable case duration, the matter of OR time has been subject to surgeons' egocentric demands to accommodate their desires regardless of the resulting inefficiencies. The OR has been a primary area in which senior surgeons have demanded precedence and, in some cases, almost excluded the younger ones from the schedule. Given that our hospitals have historically operated in a political environment, it is no wonder that scheduling systems have been devised with the primary emphasis on keeping the physicians using the ORs happy.

Apparently the oldest scheduling system in use today is the "first come, first serve" (FCFS) method. Goldman, et al, writing in 1969, found FCFS to be the most prevalent method then used by hospitals (40). Indeed, Magerlein and Martin report that in 1971 over 80% of the hospitals in the Chicago area used FCFS (420). More recently it has fallen into disfavor as cost efficiency has become a greater influence. Susan Nathanson complains that FCFS represents a lack of control with resulting inefficiencies in staffing and supplies, and undue inconvenience and anxiety to the patient (66). She concludes that it favors the physician over the patient (69). Hackey, Casey and Narasimhan agree; their hospital changed from FCFS because it resulted in the seemingly conflicting problems of idle time during the day and overtime for the staff members (1174).

However, FCFS is not found to be all bad, Goldman, et al, found it to have intermediate utilization results between block scheduling and shortest case first (51). Grumbles, Sutton and Sanders even reported that their hospital switched to FCFS as late as 1977 and found it to be an improvement over the previous system in which the schedule was developed in accordance with the preferences of the surgical suite supervisor and the days' surgeons. They reported it to be more equitable in the eyes of the surgeons, resulted in patients knowing their surgery date well in advance and proved a much easier scheduling system for the staff to operate (95-96).

Block scheduling has replaced FCFS as the preferred method of surgical scheduling, somewhat because of its greater OR utilization potential, but also for other reasons. In this method a prearranged block of OR time is reserved exclusively for a service, or even a surgeon. If the block is not completely filled by some point in time prior to the surgery date, usually a day or two, the unused time is released for use by others. Usually, this available time is allocated on a FCFS basis (Magerlein and Martin, 422). Of course, a primary consideration in this process is the duration and timing of blocks awarded to various services. Hejna and Gutmann recommend reallocating them on an annual basis (253), while Martin, et al, encourage reassignment quarterly based on the service's utilization over the previous 12 months (19).

The foremost advantage of block scheduling, as mentioned previously, is greater utilization. Magerlein and Martin cite several studies which attribute this to more effective use of afternoon times. Many surgeons are willing to give up morning case starts if they can be assured definite afternoon time. The major advantage of morning surgery is the assurance of fairly fixed start times, and the block method extends this benefit to other times of the day (422).

Other block scheduling benefits include reduction of competition among services for premium times, fewer cancellations (Magerlein and Martin 422), more stable staffing and more even equipment utilization (Drier, et al 673-4); greater ability for surgeons to plan their day (Hejna and Gutmann 252); more easily scheduled patient teaching and an excellent marketing tool with which to attract surgeons (Voss 1010). Susan Nathanson also points out that it results in greater patient satisfaction in that they are more assured of surgery dates and times, and they suffer fewer cancellations and delays; all of which allows them to have better control over their own schedules (69).

There are some problems with block scheduling however; for instance operating room case scheduling cutoffs which allow too little time for rescheduling unused block time result in poor utilization. While most of the facilities discussed in the literature combat this problem with cutoffs of a day or two, Drier, et al, report that their hospital releases ambulatory surgery time seven days before the surgery date (673). Such an early cutoff may negate many the scheduling benefits cited by others. In addition, the block method requires much closer coordination between the scheduler and the surgeon's office to insure time reserved for a particular surgeon is reallocated when the surgeon is not available (Hejna and Gutmann 253). Magerlein and Martin, writing in 1978, worried that block scheduling could result in excessive lengths of stay, caused by surgeons who keep filler patients around rather than giving up time; and that some patients in need of urgent surgery may be delayed until the surgeon is scheduled to operate (423). Given today's focus upon DRG and quality assurance these issues should no longer be of concern.

There are two other scheduling methods cited in the literature which represent opposite poles of thought, however; they are so closely related in concept it seems more appropriate to combine them into one method entitled "scheduling by case duration". These methods are scheduling the shortest case first and scheduling the longest case first. Goldman, et al, discussed and compared both methods to FCFS. They said that shortest first can sometimes spread the recovery room workload uniformly throughout the day and longest case first helps to avoid overtime (41-2). In their comparison longest first resulted in the highest utilization and lowest overtime among the three methods; shortest case first resulted in the lowest scores (51).

The shortest case first method is little evident in more current literature. Voss, writing in 1986 claimed it to be the dominant scheduling method, however most other writers merely acknowledge the method exists (1010).

McQuarrie did research the longest case first method by comparing it to optimization techniques first devised for computer scheduling. He found using this algorithm seldom resulted in OR utilization more than 33% under the optimum (1069). Considering that the optimum utilization would approach 100%, the inverse of his findings (a 67% utilization level) is much better than the typical utilization described earlier as in the 40% range. Przanaski found fault with McQuarrie's technique, however; he felt such a simplistic method failed to recognize the myriad constraints imposed upon daily surgical schedules (75). However, McQuarrie did recognize the presence of the constraints and recommended efforts be taken to reduce them (1070). He also identified the problem of certain specialties always being relegated to the later surgery times by virtue of their typically shorter cases. He advises scheduling some short cases to fill precise eight hour blocks but reserving at least one third of them to distribute to the ORs at the end of the schedule (1071).

A few fairly recent articles cite the use of scheduling method combinations, usually as subordinate procedures within a block scheduling framework. Hackey, et al, switched from FCFS to block scheduling by service but retained FCFS as the policy to schedule within each service's block (1179). Voss, apparently trying to satisfy those who prefer FCFS while gaining some of the control and utilization advantages of block scheduling, recommends a combination of both. She claims one could achieve maximum efficiency by implementing the best features of both methods; the only disadvantage she foresaw was striking the correct balance between the two systems (1010).

There are a few writers who recommend additional methodologies which are little noted in other works. In 1970 Kildea recommended a two room method to reduce overtime. He found that scheduling one surgeon back to back into two ORs, resulting in less surgical suite staff overtime by reducing physician lag time between cases, was the key to throughput. He claims the method reduced overtime in his surgery suite by 99% (99-100). The obvious question arising from studying this article is physician fatigue brought on by going immediately from case to case (Przasnyski 75). Perhaps fatigue would be an issue if cases were long, however Kildea does not mention it as an issue nor do Falasco and Easthaugh in their 1986 article on the same subject. In fact, Falasco and Easthaugh claim the medical staff indicated a desire to continue with the program (30). Considering that they increased utilization by an average of 37%, this method may be worth investigation by the surgery suite with a larger load of shorter cases.

It would appear from examining the literature that block scheduling and modified longest case first have generally achieved the best satisfaction and utilization records. Given their success and the fact that there must be some method by which to distribute cases within a block scheduling mechanism, perhaps the optimal method is block scheduling using a modified longest case first algorithm within the blocks.

Surgical schedule simulation.

Implementing a system on a trial basis and then comparing the result is often considered to be out of the question for most hospitals; they lack the time, research expertise, and flexibility to conduct such experiments. As McQuarrie points out, a hospital with 10 ORs performing an average of 20 cases per day would face 20 factorial (20!) possible sequences of operations (1066). However, given that most hospitals have invested significant capitol in automation and the human resources to go along with it, the science of simulation may provide the typical hospital this experimental capability. One would think that a few knowledgeable scientists with adequate computer support could devise the one optimal solution for the entire industry, however each hospital is a unique case. There have been several attempts to simulate surgical scheduling in the literature, however the large number of constraints (political, operational and behavioral) seem to have impeded wide success (Przanaski 76).

In 1969 Goldman, Knappenberger and Moore used a simulation program developed by Moore to evaluate three scheduling policies; FCFS, Longest Cases First and Shortest Cases First. The simulator provided accounting of patient flow in five minute increments based upon each scheduling policy algorithm (42). The authors then had to perform the statistical tests upon the output to learn that scheduling policies did have a significant impact upon utilization (51).

Another successful surgical suite scheduling simulation study was conducted in 1973 by Kuzdrall, Kwak and Schmitz attempting a replication of an eariier simulation study by Schmitz and Kwak in 1971. The first study involved a ten day simulation of a surgical suite case load using recovery room beds as a constraint, with no queuing allowed as a policy decision. Their basic transaction was a patient moving through the system and being stored in the OR, with a maximum of five patients allowed in storage at any given time. Queuing at the recovery room indicated a need for additional recovery beds. As they added recovery beds to the simulation they found the study did replicate the previous work in that 12 recovery beds could accommodate the output of the five ORs (438). A primary concern in both studies was that simulated surgery times should closely resemble observed times. As described in the 1971 article, this hypothesis was supported to a .01 level of significance (1174). Of interest is that they later applied this simulator to scheduling methodologies and found longest case first yielded the highest OR utilization rates but resulted in uneven recovery room utilization

(Magerlein and Martin 428). Such a finding supports the concept of modifying the longest case first algorithm to include some shorter cases, as discussed by McQuarrie.

Goldman and Knappenberger performed an early (1968) simulation experiment to determine the optimum number of operating rooms using a breakeven analysis. They found that the variables stabilized within 180 days so chose to simulate that length of time. They then selected five intermediate levels of daily OR time demand and ran the simulation program against each demand level. The resulting patient waiting times, overtime, and OR utilization figures were plugged into a breakeven formula to determine the appropriate number of ORs to open (114). Hopkins, et al, fault this study. They say Goldman and Knappenberger do not consider lost demand, that their variables are too difficult to predict, and the model is hospital specific (50).

Another simulation study involving surgical suite sizing was conducted by Zilm, Calderaro and DelGrande. Because the facility in question had no operating room historical data they were forced to develop a data collection sheet and collect their own data for statistical analysis. The study provides charts which display two interesting aspects of their simulation process; one depicting the major components of the data analysis as well as the simulation steps, and another showing a 35 item collection instrument they had devise in order to collect information on each procedure performed during a one month period (80).

Hopkins, et al, hoping to improve upon previous attempts at optimizing operating rooms, constructed a simulation model in which the demand function stated that the number of cases is a function of the number of ORs. They constrained the result by selecting an arbitrary figure at which demand would peak (a 25% increase over current volume) and computed the solution as a profit maximization problem. This is a 1982 article so their basic assumption that "given the opportunity surgeons will choose to perform more operations there" may have held some credence at the time, however; it is quite impractical today (53).

The problem with simulation is much the same as with software designed for the surgical suite; the knowledge and available software must be out there, but there is little or no empirical data in the topical literature with which to find or compare them. It is doubtful that the typical hospital can reasonably conduct such a comparative study, nor could the business oriented student; however such an endeavor would be worthwhile for the student with a computer science orientation or a national medical organization with research capabilities. There is a significant need to evaluate simulation packages and report on them in the medical literature.

Surgery suite utilization considerations.

Evaluating operating room utilization is the key to increasing productivity in the surgery suite. This measure indicates how well the area is being managed, plus the data elements involved can often pinpoint the source(s) of low utilization figures.

As Przanaski points out; the studies on utilization usually consist of the researcher's definition of utilization and quantitative manipulation of logbook or data sheet information (67). These studies often involve careful coding and copious data entry (Przanaski 68). Of course, one must also review the literature for those items which impede efficient utilization.

Typical barriers to throughput include the usual staffing and facility limitations, however there are other obstructions confronting surgery managers. Williams handily slots these barriers into three areas; procedural factors, scheduling constraints and delay factors (93). Procedural factors are those actions which comprise turnover time (Gorden 18). Scheduling factors include overbooking, poor time estimates (Michael Nathanson 46), or scheduling inappropriate procedures (i.e. dirty cases first) (Laufman 53). Finally, delay factors are those occurrences which prevent the next case from starting on time, including congestion due to confused traffic patterns (Hopkins 49, Laufman 55), late patients and staff (Williams 96), and staff unfamiliar with procedures (Voss 1011); plus emergency cases, which are always a possibility (Goldman, et al 42). There are also structural problems, such as the lack of a preanesthesia area in which to prepare patients (Kelley, et al 567) and factors outside the surgery suite, such as ward capacity and occupancy, which must be monitored by managers.

Most of the literature recognizes that surgical suite utilization has been dismally low; McQuarrie reports ranges of 38% to 82% (1066) and Phillips found the national average to be about 46% (44). Although there are some success stories; Binger and Mailhot claim their facility achieved a 91% rate in 1987 (7); many experts believe that the constraints involved prohibit 100% utilization, and agree that 70% or 80% is about the best one can hope for (Gorden 16, M. Nathanson 46, Bridenbaugh 16).

A key factor in the determination of a utilization rate is the formula used. While there is some variance in the formulae found throughout the literature, it most commonly consists of in use hours divided by available hours. The following formulae were found during this project:

1. Bridenbaugh (14): $$\frac{\text{time OR occupied (surgery time + 30 min)}}{\text{time OR staffed and available}}$$
   Note: The 30 minutes does not include turnover time, which is not calculated.

2. Stewart (134): $$\frac{\text{total surgery time}}{\text{available hours}}$$

3. Gorden (16): $$\frac{\text{daily workload X (average time per case + changeover time)}}{\text{number of ORs X number of available hours per OR}}$$

4. McQuarrie (1066): $$\frac{\text{total OR hours used}}{\text{OR hours available}}$$

5. Phillips (44): $\dfrac{\text{estimated time required for all cases + 15 min}}{\text{actual time taken}}$

6. Swanberg (17): $\dfrac{\text{total active time}}{\text{total OR time available Monday - Friday}}$

Notes: Active time = case time + set-up (turnover) time.
Available time = 7:15 - 3:15 week days (except Thursday which is 7:45 - 3:15)

The formula proposed by Gorden is aimed at discovering average times. Considering that accurate records are available there's no reason to use averages. Phillips is trying to present a method of predicting utilization, however; she doesn't indicate that fact; reading the article leads one to believe her method is "the" utilization formula. More importantly, her method determines the accuracy of surgeon's time estimates rather than utilization. Bridenbaugh seems to think available time should include only the time in which the OR is staffed, such a measure could allow manipulation of the figures. Available time should be determined in advance as a policy matter, as Swanburg and Fahey indicate.

Stewart uses total surgery as his dividend, a procedure which will result in an artificially low utilization rate because it fails to include anesthesia and turnover times. McQuarrie's dividend, "OR time used", has the same problem as Swanburg's and Fahey's, who are correct in computing available time. However, their computation of active time allows excessive turnover times to be considered "good" utilization time. A maximum turnover time should be determined and added to the actual case time of each procedure. The benefit of this action is that it allows the crew to gain some time if they turn the room over faster while those turnovers which are too long reflect lower utilization and provide a clue for management that all is not well.

Inpatient unit contraints.

A barrier to optimizing surgery suite throughput is the capacity of the inpatient unit, or ward. There must be a balance between the two; too much surgery capability for the ward to handle can lead to a barrier to utilization, plus an overworked and dissatisfied nursing staff. Conversely, too many beds may result in unused space; although such space can be used for other reasons. Indeed, the current state of healthcare finds many hospitals frantically searching for ways to turn unused bed capacity into revenue generating alternatives.

Stewart recommends that hospitals determine the number of surgical cases their bed capacity will accommodate. The resulting information can then be used to modify admission policies to optimize the existing facilities. He claims his facility increased the number of cases by 20% merely by changing policies. This increase is accompanied by a 66% utilization rate so perhaps his actions resulted in larger numbers of short cases. He recommends the required average number (AVNO) of cases be determined based upon the average length of stay (AVLOS) and average census (AVCEN) (134). Of course, the AVCEN should be adjusted to the desired level. The formula he derives is:

$$\frac{1}{\text{AVLOS}} \times \text{AVLOS} = \text{AVNO}$$

The problem with this method is that it does not consider the inpatient nursing workload created by the surgery case load. Such acuity measures can be used to structure the admission policy and identify effective staffing patterns (Same Day Surgery 122). However, in 1978 Magerlein and Martin found little research in the area of integrated surgical admissions systems which consider the multiple constraints affecting both areas. They found only one study addressing the topic and faulted it for failing to consider the daily case mix (426). In this light, the need for more comparative research on the many commercial surgical suite software packages available today is all the more evident.

Alternative Methods of Treatment.

One difficulty faced by federal sector hospitals is the tremendous demand for services. While such demand and the resultant queues, or waiting lists, are not the norm in the United States, they are a way of life in other countries. As Bloom and Fendrick point out: "queues...are essentially the case in all countries where money is not the means for gaining access to medical services" (131). It may be that we in the U.S. federal hospital system may be able to learn something from the research completed in other parts of the world. However, a quick review of recent literature shows they have the same questions we do: are there process bottlenecks, can patients be safely discharged any earlier, are our priorities correct, and, are there alternative modes of treatment which could allow us to see more people? The problem there is worse; they have done little about it and view our efforts with suspicion (Jennette 797).

Diagnoses Related Groups (DRGs) in the U.S. were designed to bring costs under control. In some areas they have worked well but, they have also encouraged the healthcare industry to create ways to improve patient throughput; to become more efficient. Patients are now being discharged much earlier, some to home and others to step-down treatment units. Many patients are visiting the doctor's office less frequently, instead they are seeing extenders who may not even be located in a healthcare facility; they come to patient's home. Many hospitals have arranged certain beds in such a manner as to "swing" from use by one type of patient to another depending upon the need at the time. Finally, many patients who visit the OR do so as an outpatient and never spend a night in the hospital, some of the ORs are not even located in a hospital, instead, they are in freestanding ambulatory surgery units.

There has been a tremendous move toward ambulatory surgery in the U.S. during the last decade. Susan Nathanson reports that 80% of our hospitals provide ambulatory surgery, and that 35% of the operations performed in 1985 were on an ambulatory basis; in some areas of the country the number is 50% (63). The military hospital sector has not enjoyed this growth in efficient care because the Department of Defense (DOD) reimbursement continued to be based upon beds filled when the rest of the industry was forced to switch to DRGs. Now, as DOD works to catch up and convert to a DRG-style reimbursement mechanism, many military healthcare managers look around and wonder how to convert their existing plants to best take advantage of the new system.

An unidentified staff writer for <u>OR Manager</u> says outpatient surgery is still finding its way. This journal interviewed 15 OR managers and found that there is no one good model for the design of outpatient surgery. In fact they found that small to medium sized facilities were doing outpatient procedures in the inpatient surgery suite but had separate pre-and-postop areas (7). This finding should allow the military manager to take heart; you don't need a major construction program to implement ambulatory surgery. In fact, the decision seems to be more of a meshing of policy and philosophy. If you want to move ahead into ambulatory surgery you will find the personnel and facility resources to support it; if you choose to put it off you'll look around at your crowded facility and busy people and swear it can't be done.

Literature Review Summation.

In reviewing the fairly large amount of literature associated with surgery suite productivity it becomes clear that while there are many ideas, there is little of a definitive nature. No one really agrees on much; block scheduling is the current favored method, utilization levels between 70 and 80% are all that can be expected and computerized logs are great for management reports. Przanaski attributes the lack of clear progress to the lack of monetary commitment for demonstrating the practicality of some of the ideas. He feels the only improvement will be incremental, based upon the small amount of proven research which comes to light from year to year (76).

METHODOLOGY

1. Review a wide spectrum of literature on OR management, OR scheduling and queuing methods to discover the current state of OR productivity.

2. Review local historical OR utilization documentation to compare past and present productivity and link any changes to possible causative factors.

3. Assessment of factors which impact Surgical Suite scheduling.

a. Surgical specialty clinic practices.

(1.) Examine clinic scheduling criteria to assess utilization of surgeon's time. The assessment procedure includes comparing the mean differences of these scheduling practices (length of appointment, spacing of appointments and number of appointments per surgeon) across clinics in three similarly sized Air Force hospitals. An analysis of variance will be performed to determine statistical significance of these descriptive statistics.

(2.) Examine scheduling criteria to determine if additional flexibility can be put into the system to enable surgeons to take advantage of unexpected surgery suite time gained through cancellations, unused time, or other reasons. (For example, can certain appointments be made on a tentative basis and confirmed only at some specified time prior to the appointment time?)

b. Surgical suite scheduling and utilization practices.

(1.) Spend two weeks' orientation time in the Surgery section. Review regulations, operating instructions, procedures, and conduct interviews with key personnel.

(2.) Develop a scheduling process flow diagram.

(3.) Collect data for a four consecutive month period using existing source documents. The following data elements will be collected:

(a.) Patient's Family Member Prefix and register number for inpatients and SSAN for outpatients.

(b.) Surgeon's identification.

(c.) Surgery team (nurse, technician and anesthecist) identification.

(d.) Type of surgery by code: ICD-CM-9, DRG, and urgency (scheduled or emergency).

(e.) Date surgery scheduling was requested.

(f.) Date surgery was scheduled to be performed.

(g.) Time estimated by surgeon.

(h.) Surgery process data. (Date, patient arrive time, Patient pre-and-post operation preparation time, anesthesia start and stop times, surgery start (incision) and stop time (closure complete), patient arrival in Recovery time.

(i.) Operating room utilization data. (First case start time and turnover time between each case, by operating room.)

(j.) Delay reason when applicable.

(4.) Calculate descriptive statistical data: mean OR utilization rate by day of week.

(5.) Conduct analysis of variance upon mean differences of specific performance data for individual tasks which comprise a surgery case plus those which are appropriate for examining individual OR utilization.

(a.) Surgery time by procedure and surgeon.

(b.) Anesthesia time by procedure.

(c.) Surgery time by procedure and surgery team member.

(d.) First daily surgical case setup time by surgery team member.

(e.) Operating room turnover time by nurse and technician assigned.

(h.) Delays by reason.

(6.) Compare the scheduling technique used to other methods to determine if a greater number of cases (optimal throughput) could have been scheduled under the alternate procedure.

(a.) The optimal number and mix of surgical procedures will be as determined by linear programming techniques, however; the number of procedures must equal or exceed those achieved using current scheduling practices.

(b.) Apply the scheduling techniques discovered in the above paragraph to the backlog of surgery cases and offer the result to the surgical services.

c. Assess surgical ward staffing, equipment and facility capacity.

(1.) Examine assigned staffing versus authorizations, and determine the cause of any variance (manpower shortage or internal staffing decision). Compare the authorized and assigned staffing to three similarly sized Air Force hospitals, and three civilian hospitals. Investigate staffing variances to determine reason for differences.

(2.) Collect surgical bed utilization data over a continuous four month period.

(a.) Patient identification.

(b.) Patient length of stay.

(c.) Ward occupancy by day of week.

(3.) Calculate descriptive statistical data. This will only involve calculating mean patient length of stay by surgeon.

(4.) Conduct analysis of variance upon patient LOS by surgeon and surgery type).

2. Exploration of alterative practices discovered in the literature search. This can be any method which has proven successful in similar situations to the USAFA Hospital. For example, two concepts which come to mind are swing beds on the ward and more ambulatory surgery.

3. Examine ward capacity to determine bed availability constraints upon the number of surgeries performed.

a. Obtain from Nursing Services the allocation of beds to the various services. Determine through utilization reports if certain allocations are underutilized.

b Discuss historical bed shortages with surgeons to find any real or perceived bed limitations upon their services.

4. Identify modifications to ward configuration which may increase surgical procedure scheduling.

a. Compare under utilization information gained in 3.a. above to surgeons comments on bed limitations. b. If surgeons prove to have valid surgical case expansion capability discuss the issue with Nursing Services personnel to determine if present staffing could accommodate the change in patient mix. Identify any staffing constraints which could adversely impact achieving greater surgical throughput.

c. identify ward modifications which will support a greater workload if management feels the change can be supported by the existing staffing.

5. Examine surgical case backlogs and develop methodology which will reduce the backlog at a constant rate.

a. Collect backlog lists from surgical specialties at the beginning of December.

b. Conduct research to discern an appropriate scheduling methodology and conduct experimentation on the backlogs to search for a better model than that which is currently in use.

6. Recommend, through my preceptor, ways in which the USAFAH may be able to perform more surgical procedures.

II. DISCUSSION

This study is designed to assess the reasons behind the decreasing surgical productivity at USAFA Hospital, and discover methods whereby that decrease may be reversed. One of the first questions that comes to mind is the extent of the situation; just how poor is productivity? In assessing performance a yardstick is required for comparison; in this case three Air Force hospitals of comparable size were selected. Fortunately, all three facilities were responsive in the request for assistance and the results are shown below in Figure 2.1.

OPERATIONS PERFORMED: FIRST FOUR MONTHS FY 89

	OCT	NOV	DEC	JAN	TOTAL
LANGLEY	203	139	159	177	678
MACDILL	202	196	182	222	802
OFFUTT	205	208	147	206	766
USAFA	227	204	205	252	888

Figure 2.1. Comparison of operations performed in USAF hospitals.

To gain some idea as to the surgical case workload the military facilities are facing, and thus the impact upon the surgical services and inpatient units, each was asked to supply information on operations performed. It appears that the USAFA Hospital performs significantly more operations than these comparable facilities. Much of this difference is due to the heavy Orthopedic caseload at the USAFA, however, not all of the variance can be attributed in that way. The USAFA Hospital is at least as productive as these similar facilities.

DATA BASE COLLECTION.

In order to analyze individual performance and departmental procedures an extensive data base was constructed. The data base consists of 22 primary data elements from all 734 day shift surgical cases during the period October 1988 through January 1989. These data elements were selected based upon their ability to resolve several hypotheses concerning surgical productivity, plus enough information to allow the researcher to return to the surgical log in order to verify individual case information. The data elements are shown below and a copy of the data base, less personal information, is located in the Appendix.

Data Base Information Elements

Patient register number	Patient last name
Surgical service involved	Surgeon
Anesthecist	Circulating nurse
Scrub Technician	Begin anesthesia time
Stop anesthesia time	Begin surgery time
End surgery time	Total anesthesia duration
Total surgery duration	Turnover duration
ICD-9 code	Number of additional procedures
First case of the day status	Month
Day	Delays
Operating room number	Patient length of stay

The hypotheses this information was collected to answer were formulated from the following questions:

a. Are individual surgeons less efficient than others?

b. Do individual anesthecists contribute to longer surgical cases?

c. Are individuals on the operating team (surgeon, anesthecist, circulating nurse, and scrub technician) associated with longer turnover times?

d. Are individual surgeons chronically late in arriving to start first cases in the morning?

e. Are there avoidable delays being caused by specific persons?

EXAMINATION OF DATA BASE CORRELATIONS.

In order to answer these questions a statistical analysis of the data base was completed using the Microstat software package. The first run consisted of a correlation matrix weighing each factor against all others. After that, Analysis of Variance (ANOVA) runs were made against selected portions of the data base. As certain factors of interest appeared they were examined further to reach a conclusion concerning the hypothesis being tested. A discourse on each hypothesis, and the resulting evaluation follows the matrix display, Figure 2.2, below.

CORRELATION MATRIX; ALL FACTORS

NUMBER OF CASES: 734 NUMBER OF VARIABLES: 14

CORRELATION OF ALL VARIABLES

	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESTART	ANESTIME	SURGSTRT
SURGCODE	1.00000							
ANESCODE	-.13694	1.00000						
CNURCODE	.04780	-.05515	1.00000					
STECCODE	.12254	-.05150	-.02997	1.00000				
TURNOVER	**.02480**	**-.07940**	**-.01543**	**.04903**[1]	1.00000			
ANESTART	.00930	-.06581	.03581	-.11748	**-.37476**[4]	1.00000		
ANESTIME	**.08592**[2]	**.16757**[3]	-.03170	.07818	-.02444	-.18135	1.00000	
SURGSTRT	.02181	-.05060	.04252	-.11569	**-.37664**[4]	.99380	-.13096	1.00000
SURGSTOP	.05822	.00887	.00976	-.07318	**-.35926**[4]	.86322	.30517	.88120
SURGTIME	**.07853**[2]	.11916	-.06410	.07680	-.00331	-.16862	.89922	-.14329
ICD-9	-.30983	.12065	-.00924	-.09290	-.02497	.03515	.11002	.04678
ADLPROCD	-.03144	.16454	-.05438	.04880	.03046	-.00296	.49316	.01273
MONTH	.14388	-.16084	-.14425	-.02290	-.02177	.01814	.00838	.02097
FIRSTCSE	.05918	**.10817**[5]	-.00514	**.11766**[5]	**.25333**[4]	-.70946	**.27594**[6]	-.69605

	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	FIRSTCSE
SURGSTOP	1.00000					
SURGTIME	**.34159**[7]	1.00000				
ICD-9	.07796	.07021	1.00000			
ADLPROCD	.23571	**.46816**[6]	.22019	1.00000		
MONTH	.01887	-.00219	-.00647	.07472	1.00000	
FIRSTCSE	-.53917	**.25507**[6]	.03145	**.12206**[5]	.00045	1.00000

CRITICAL VALUE (1-TAIL, .05) = + Or - .06078
CRITICAL VALUE (2-tail, .05) = +/- **.07238**
N = 734

Figure 2.2. Correlation matrix using all variables.

Please note the observations listed below concerning this matrix. Each significant correlation adjudged by the researcher to contain value is highlighted and assigned a superscript number. Further discussions centering upon individual correlations will be addressed by the assigned number, and figure number where applicable. Also note that the critical value of .07238 is highlighted, this value represents the .05% confidence level upon which all statistical observations in this study are based.

1. The matrix indicates that the assigned anesthecist (ANESCODE) may contribute to variations in turnover times, but there is not adequate significance to support the contention that the presence of other surgical team members impact turnover times.

2. The .07853 and .08592 correlation between SURGCODE (surgeon) and the variables of SURGTIME (surgery time duration) and ANESTIME (anesthesia time duration) indicate that case duration is related to the individual surgeon performing the procedure.

3. The significant finding in anesthesia time (ANESTIME) correlated to anesthecist (ANESCODE) indicates specific anesthecists impact upon case duration.

4. There is a significant negative correlation in case beginning (SURGSTRT and ANESSTRT) and surgery ending (SURGSTOP) times to turnover time (TURNOVER), and a positive correlation between turnover time to first cases of the day. This indicates that there may be a relation between late cases and shorter turnover times, while earlier cases are associated with longer turnover times.

5. The positive correlation between first cases with anesthecists and scrub technicians (STECCODE) indicates certain personnel participate in cases based upon the time of day. While an interesting bit of information, it bears no real significance to productivity and will not be examined further.

6. The positive correlation between first cases and case duration indicates that longer cases start earlier than other cases.

7. Conversely from the above observation, the strong positive correlation between surgery duration and surgery ending indicates longer cases end later in the day.

8. Apparently, and perhaps obviously, the number of additional procedures (ADLPROCD) correlates to longer surgery durations. This factor is important if there appear to be significant variances in case length between surgeons performing the same primary operation.

Investigation into the impact of anesthesia personnel upon turnover times.

Beginning with the first observation above it is appropriate to further pursue the impact of anesthesia personnel upon turnover times. At the outset of this study there did not appear to be an association between this department and the mechanics of the turnover, since housekeeping and surgery section personnel generally perform these actions. Upon reflection, it does make some sense that the Anesthesia Department contributes since they, too, must perform actions to clean up from the previous case and prepare for the next.

The first step consisted of examining the turnover times of all cases based upon the anesthecist. Since many cases were not immediately followed by another, many turnovers were coded as zero; these had to be removed from the population of cases, resulting in a reduced set of 449 cases. To further confuse the issue many cases featured the surgeon as the primary anesthecist. These cases demanded separate consideration to determine if this practice may be contributing to the significant correlation of anesthecist to turnover time.

In order to examine the data selected descriptive statistic totals were extracted and compared. These totals are as depicted in Figure 2.3. Note that anesthecists 1 through 14 are surgeons, and the others are all Anesthesia Department personnel. The important indicator in this figure is the mean turnover time in column three. The overall mean is .2834 hour; compare that to the Air Force imposed standard for turnovers of 20 minutes, or .3333 of an hour. While this performance is certainly within the standard it may be instructive to look at subsets of this data. Also, the three outliers within the Anesthesia Department personnel, anesthecists 22, 26 and 27, are not regular operating room anesthesia personnel; their slowness is likely due to unfamiliarity with standard procedures.

Anesthecist	# Cases	Mean	0^2	Min.	Max.
1	3	.3033	.0462	.2500	.3300
7	5	.2580	.0733	.1600	.3300
8	13	.4085	.5581	.1600	2.2500
10	8	.3775	.2252	.1600	.8400
14	15	.3480	.1723	.0900	.7500
21	75	.3291	.1396	.0900	1.0000
22	19	.4726	.4616	.0900	1.8400
23	54	.2487	.1036	.0900	.5000
24	118	.2511	.1528	.0200	1.1600
25	70	.2169	.1597	.0700	1.2000
26	9	.3678	.0618	.3300	.5000
27	10	.3390	.1067	.2000	.5900
28	15	.2587	.0898	.1600	.5000
TOTAL	449	.2834	.1972	.0200	2.2500

Figure 2.3. Descriptive statistics; Anesthecist to turnover time.

The data subset reviewed during this portion of the study consisted of surgeon anesthecists compared to anesthecists from the Anesthesia Department. As one can see from the information in Figure 2.4, performing an ANOVA upon the null hypothesis "Turnover time is not a function of anesthecist origin", results in accepting this null hypothesis; there is not sufficient variance in the means to support the contention that cases wherein surgeons perform their own anesthesia duties are characterized by longer turnover times.

Of course, surgeons acting as their own anesthecists do not perform the turnover tasks. Rather, studying the means above shows that the practice is somewhat inefficient in terms of operating room utilization; perhaps because there is somewhat of a delay waiting for someone else to arrive to fulfill Anesthesia's turnover responsibilities. However, in terms of overall efficiency, not requiring an individual from Anesthesia to be physically present in the room may well be the greater efficiency.

ANALYSIS OF VARIANCE

NUMBER OF CASES: 13 NUMBER OF VARIABLES: 6

ONE-WAY ANOVA

ANOVA: MEANTIME BETWEEN SURGEON ANESTHECISTS AND ANES. DEPT.

GROUP	MEAN	N
1. SURGEONS	.339	5
2. ANESTHESIA	.310	8
GRAND MEAN	.321	13

VARIABLE 3: MEANTIME

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F RATIO	PROB.	
BETWEEN	2.5120E-03	1	2.5120E-03	.434	.5238	(Accept H_0)
WITHIN	.064	11	5.7944E-03			
TOTAL	.066	12				

Figure 2.4. ANOVA comparing turnover times by anesthecist origin.

It is also interesting to note in Figure 2.4 that the means between the groups indicate that cases wherein surgeons performed anesthesia duties resulted in turnover times above the Air Force 20 minute standard. To test this possibility a "Z" test was run to determine the probability that cases in which the surgeon performs anesthesia duties will experience turnover times greater than 20 minutes, or .33 of one hour. The figure below, Figure 2.5, shows that indeed, these cases can expect a turnover exceeding the Air Force standard of 20 minutes, or less, 67% of the time. This result may be the most significant management indicator concerning turnover times. Perhaps greater emphasis should be placed on getting the Anesthesia Department's turnover tasks accomplished more rapidly when surgeons perform as anesthecists.

PROBABILITY THAT TURNOVER WILL EXCEED 20 MINUTES
WHEN SURGEONS PERFORM ANESTHECIST DUTIES

$P(Z > .33)$

$$Z = \frac{X - \bar{X}}{\sigma} = \frac{.33 - .2081}{.2835} = .42998$$

$Z = .6664$

$Z = 67\%$

Figure 2.5. Probability that surgeon anesthecists will have long turnovers.

Investigation into the affect of individual surgeons upon case duration.

The correlation between surgeon and case duration indicates some association in these variables. This factor is somewhat harder to examine on a facility wide basis since several of the surgical specialties at the USAF Academy Hospital are one-deep positions; providing no one against whom to compare surgical efficiency. Additionally, the vagaries of surgery and the emphasis upon quality assurance make it unproductive to compare individuals and attempt to make surgically inefficient appearing surgeons operate more quickly (Interview, COL (Dr) Antonio Mediavilla, 5 Oct 1988).

While it may be an unworthy pursuit, any study of surgical productivity must at least examine individual surgeon performance and provide management the information to use as it sees fit. Hence, this study did examine surgeon performance within selected procedure categories, limited to those specialties with more than one surgeon. These results are shown in Figure 2.6, wherein the null hypothesis states: "Surgical case duration is not a function of individual surgeon".

ANALYSIS OF VARIANCE

ONE WAY ANOVA

GEN SURGEONS	TO SURGTIME IDC 5122	PROB.:	.1379	
GEN SURGEONS	TO SURGTIME ICD 5301	PROB.:	.0139	(Reject H_o)
GEN SURGEONS	TO SURGTIME ICD 5302	PROB.:	.1147	
ORTH SURGEONS	TO SURGTIME ICD 8060	PROB.:	.2413	
ORTH SURGEONS	TO SURGTIME ICD 8145	PROB.:	.1893	
ORTH SURGEONS	TO SURGTIME ICD 8377	PROB.:	.0614	
GYN SURGEONS	TO SURGTIME ICD 6629	PROB.:	.3999	
GYN SURGEONS	TO SURGTIME ICD 6909	PROB.:	.5148	
GYN SURGEONS	TO SURGTIME ICD 7410	PROB.:	.3400	

Figure 2.6. ANOVAs on selected surgical procedures examining case duration.

As can be determined from examining the results of these nine ANOVAs, there is little to support anything but the null hypothesis. There is one significant finding in the General Surgeon's ICD-9 5301, however existence of one such finding cannot be used to support a management action to increase the speed of certain surgeons since there is a 37% chance of rejecting the null hypothesis at least one of nine times (LTC Arthur Badgett, comment received 30 May 1989). In light of this result there is no reason to explore the correlation between case duration and additional procedures, which was briefly discussed as correlation eight at the beginning of this section.

Investigation into the affect of individual anesthecists upon case duration.

In order to look further in the significant correlation between anesthecist and anesthesia time; an indication that individual anesthecists impact upon case duration; the same approach was used as in examining the impact of individual surgeons. ANOVAs were run on ten frequent procedures with a large number of anesthecists participating. The probability results of of these ANOVAs are displayed below, in Figure 2.7.

ANALYSIS OF VARIANCE

ONE-WAY ANOVA

ANESTHESIA TIME IN CASES 53 - 62	PROB.: .7396
ANESTHESIA TIME IN CASES 140 - 155	PROB.: .4824
ANESTHESIA TIME IN CASES 166 - 180	PROB.: .4539
ANESTHESIA TIME IN CASES 182 - 198	PROB.: .3306
ANESTHESIA TIME IN CASES 214 - 233	PROB.: .6558
ANESTHESIA TIME IN CASES 261 - 282	PROB.: .4100
ANESTHESIA TIME IN CASES 315 - 336	PROB.: .6321
ANESTHESIA TIME IN CASES 352 - 379	PROB.: .5220
ANESTHESIA TIME IN CASES 380 - 421	PROB.: .7080
ANESTHESIA TIME IN CASES 570 - 588	PROB.: .5765

ACCEPT H_0 IN ALL CASES

Figure 2.7. ANOVAs on anesthecist performance in selected cases.

As can be seen from examining Figure 2.7, none of the selected 200 cases indicates a significant difference in the means of anesthesia time. Given that this sample represents over 25% of the entire population of cases, the null hypothesis stating: "Mean differences in anesthesia time are not a function of the anesthecist on the case" can be accepted.

Examination of the relationship between turnover times and time of day.

The interesting correlation between these items indicates that perhaps surgery personnel work a bit faster as the day wears on. Perhaps they become concerned about avoiding working overtime and speed up in the one area possible without obvious quality assurance risks; the turnover. In order to look deeper into this phenomenon it seems most appropriate to compare turnover duration at various times of day.

Four time periods were selected for this examination, those occurring prior to 1000 hours, those between 1000 and 1200, between 1201 and 1400, and then those after 1400. The results are shown in Figure 2.8; a comparison of means is in the top half and the ANOVA on the time periods in the bottom.

ANALYSIS OF VARIANCE

NUMBER OF CASES: 442 NUMBER OF VARIABLES: 14
(CASE NUMBER EXCLUDES THOSE WHICH WERE NOT FOLLOWED BY ANOTHER OPERATION)

ONE-WAY ANOVA

ANOVA DIFFERENCE IN TURNOVER TIMES AT SELECTED TIMES OF DAY

GROUP	MEAN	MINUTES	N
1. CASES BEFORE 1000	.242	14.52	166
2. CASES 1000 - 1200	.289	17.34	173
3. CASES 1200 - 1400	.273	16.38	84
4. CASES AFTER 1400	.268	16.08	19
GRAND MEAN	.267	16.02	442

VARIABLE 5: TURNOVER

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F RATIO	PROB.
BETWEEN	.184	3	.061	3.742	.0112 (Reject H_o)
WITHIN	7.194	438	.016		
TOTAL	7.379	441			

Figure 2.8. ANOVA on turnover durations at selected times of day.

As can be determined from the ANOVA, the hypothesis stating: "The time of day in which a turnover occurs has no affect upon the turnover's duration" can be rejected at the .05% confidence level. While this highly significant statistical result is noteworthy, it may have limited value to the manager seeking to improve surgical suite productivity. Considering that a very busy day in the USAF Academy Hospital's Surgery Suite may see 15 cases, and the maximum per case turnover time savings available is the difference between 14.52 and 17.34 minutes; a total savings of 45 minutes of daily surgical suite use is possible. Considering that this savings is further diluted between three ORs, the savings may not be worth the effort to speed turnovers.

Investigation into longer cases starting earlier in the day.

This correlation has no real productivity implication, other than possibly matching the Longest Cases First model discussed in the literature review (Goldman, et al 412; McQuarrie 1069). It is important to the present study for the purposes of later discussing the possibility of achieving an optimal scheduling methodology. In order to study this item, which is not occurring by design, an ANOVA was completed upon case durations by hour of the day, this analysis is presented in Figure 2.9.

ANALYSIS OF VARIANCE

NUMBER OF CASES: 734 NUMBER OF VARIABLES: 14

ONE-WAY ANOVA DURATION OF CASES BY HOUR OF DAY

GROUP	MEAN	N
1. BEFORE 0800	1.920	215
2. 0800 - 0859	1.250	87
3. 0900 - 0959	1.166	101
4. 1000 - 1059	1.393	106
5. 1100 - 1159	1.233	80
6. 1200 - 1259	1.499	77
7. 1300 - 1359	1.290	42
8. 1400 - 1459	1.226	18
9. 1500 - 1559	.803	8
GRAND MEAN	1.476	734

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F RATIO	PROB.
BETWEEN	68.090	8	8.511	7.906	3.121E-10 (Reject H_o)

Figure 2.9. Analysis of case durations by time of day in which started.

The result of the ANOVA clearly supports the contention that there is a difference in case durations by time of day. The scheduling methodology would account for some of this since the block scheduling method, shown in Figure 2.10 below, is used and schedulers do tend to start longer cases first. Figure 2.10 also shows the mean case duration times for each specialty during the data collection period. However, there is no real answer to correlation six wherein first cases seem to be longer. The probable explanation is as indicated earlier; the longer cases occur earlier with enough frequency to cause the correlation.

USAFA HOSPITAL BLOCK SCHEDULING PLAN

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
ROOM 1	UROLOGY	GENERAL	GENERAL	GENERAL	PODIATRY
ROOM 2	GYN	ORAL (WK 1/3) UROLOGY (2/4)	GYN	OPTHA	GYN
ROOM 3	ORTHO	ENT	ORTHO	ORTHO	ORTHO

MEAN CASE DURATION TIMES BY SPECIALTY OCT 88 - JAN 89

	OCT	NOV	DEC	JAN	MEAN	σ^2
ENT	1.03	1.42	.69	1.23	1.09	.27
GENERAL	1.49	1.45	1.56	1.15	1.41	.16
GYN	.79	.91	1.15	.95	.95	.13
OPTHAMOLOGY	1.55	1.88	1.67	1.88	1.74	.14
ORAL	2.21	3.41	4.33	3.03	3.24	.76
ORTHO	2.29	2.46	2.10	2.24	2.27	.13
PODIATRY	1.18	1.29	1.28	1.29	1.26	.05
UROLOGY	.85	1.02	.93	.97	.94	.06

Figure 2.10. Block scheduling scheme and mean case length.

EXAMINATION OF OTHER FACTORS NOT PRESENT IN THE CORRELATION MATRIX.

Surgical Scheduling Process.

Since the block scheduling scheme was just discussed this is an ideal point to examine the scheduling process itself. The flow diagram in the figure below, Figure 2.11, shows this process. As can be seen, the physician picks the surgery date using the knowledge of the blocks assigned to his or her specialty. While discussing the date with the patient the physician completes the USAFA Form 0-830, which identifies the patient, the procedure and the surgery date. The form then goes to the Surgical Suite supervisor for inclusion onto the schedule and assignment of a specific case order.

Case order is assigned by the patient's condition and status. Very young, elderly and ill patients are generally assigned the first slots, after that the patient category comes into play in the following order: cadets, active duty, active duty dependents, and then retirees and their dependents. This is the standard patient precedence found at all military installations, except the USAFA's unique cadet training mission is recognized through their assignment to the highest precedence.

USAFA HOSPITAL SURGERY SCHEDULING PROCESS

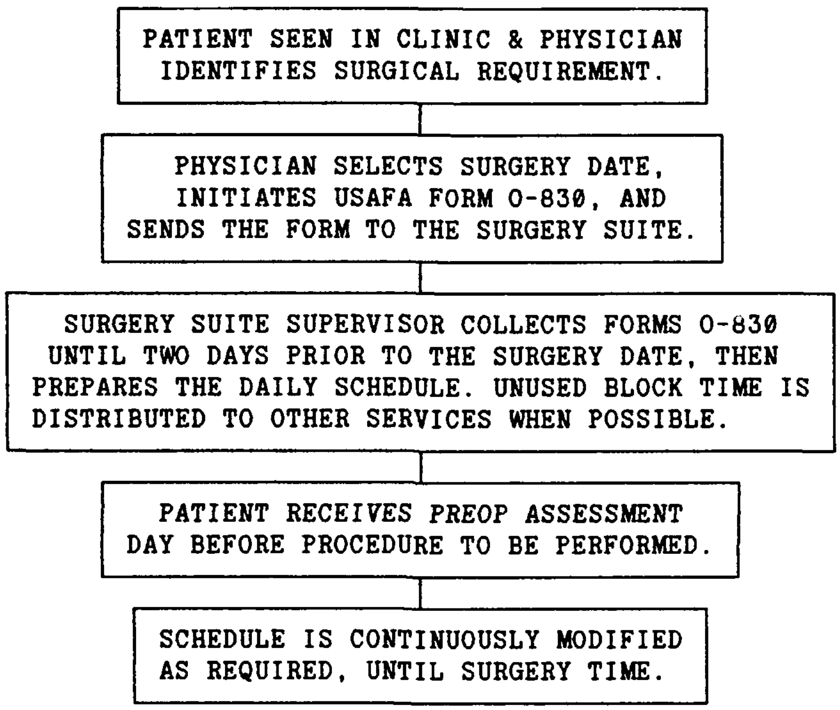

Figure 2.11. Surgical scheduling at USAFA Hospital.

Turnover times compared by nurse and technician personnel.

While there was not a significant correlation in this area, the literature cites slow room turnover as such a factor in low productivity studies that the issue warrants closer examination. Each nurse was compared to the others by turnover times in the cases they were present for by ANOVA. Then technicians were compared individually by their frequency as well as in toto. As can be seen in Figure 2.12, there is no statistical significance in the means of turnover times associated with these personnel.

ANALYSIS OF VARIANCE

ONE-WAY ANOVA ON NURSE AND TECHNICIAN TURNOVER TIMES

ANOVA EACH NURSE TO T/O
GRAND MEAN: .173 N: 734 PROB.: .8827

ANOVA TECHNICIANS PRESENT IN > 5% OF CASES TO T/O
GRAND MEAN: .160 N: 432 PROB.: .4838

ANOVA TECHNICIANS PRESENT IN < 5% OF CASES TO T/O
GRAND MEAN: .197 N: 271 PROB.: .5921

ANOVA TECHNICIANS COMPARING FREQUENT TO INFREQUENT PERFORMERS
GRAND MEAN: .192 N: 358 PROB.: .3476

ANOVA ALL TECHNICIANS TO TURNOVER
GRAND MEAN: .175 N: 703 PROB.: .1057

Figure 2.12. ANOVA comparing nurses and technicians to turnover times.

First daily case start times by personnel.

This variable is important in the sense that the literature cites personnel who are chronic late arrivers causing early morning delays. In order to investigate this possibility a correlation analysis was run looking at the personnel involved in first cases starting more than five minutes after the scheduled beginning time of 0730. Figure 2.13 shows the correlation.

CORRELATION: LATE START 1ST CASES TO PERSONNEL

	ANESTART	SURGCODE	ANESCODE	CNURCODE	STECCODE
ANESTART	1.00000				
SURGCODE	.07534	1.00000			
ANESCODE	**-.33204**	-.05829	1.00000		
CNURCODE	.07277	.03127	-.20773	1.00000	
STECCODE	.09797	.30717	.01706	.15104	1.00000

CRITICAL VALUE (1-TAIL, .05) = + Or - .23548
CRITICAL VALUE (2-tail, .05) = +/- **.27841**
N = 50

Figure 2.13. Correlation matrix looking at personnel and late starts.

The correlation shows a significance between anesthecist and late anesthesia start times, indicating the possibility that certain of these

ANALYSIS OF VARIANCE

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GRAND MEAN: .173 N: 734 PROB.: .8827

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GRAND MEAN: .197 N: 271 PROB.: .5921

ANOVA TECHNICIANS COMPARING FREQUENT TO INFREQUENT PERFORMERS
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	ANESTART	SURGCODE	ANESCODE	CNURCODE	STECCODE
ANESTART	1.00000				
SURGCODE	.07534	1.00000			
ANESCODE	-.33204	-.05829	1.00000		
CNURCODE	.07277	.03127	-.20773	1.00000	
STECCODE	.09797	.30717	.01706	.15104	1.00000

CRITICAL VALUE (1-TAIL, .05) = + Or - .23548
CRITICAL VALUE (2-tail, .05) = +/- .27841
N = 50

Figure 2.13. Correlation matrix looking at personnel and late starts.

The correlation shows a significance between anesthecist and late anesthesia start times, indicating the possibility that certain of these personnel are the source of some late starts. In order to examine this further, an ANOVA was run comparing late starts to individual anesthecists. Also, because they are often cited in the literature as a source of late starting early cases, surgeons were examined in the same way. These comparisons, coupled with frequency distribution graphics, are presented in Figures 2.14 and 2.15.

------------- ANALYSIS OF VARIANCE ----------------

ONE-WAY ANOVA ANESTHESCISTS TO LATE START 1ST CASES

GROUP	MEAN	N
1. ON TIME STARTS	23.023	171
2 LATE STARTS	21.568	44
GRAND MEAN	22.726	215

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F RATIO	PROB.
BETWEEN	74.107	1	74.107	4.926	.0275 (REJECT H°)

--------------- FREQUENCY DISTRIBUTIONS ----------------

```
=====ANESTHECISTS===========FREQUENCY ...........................
        21                   9 ¦=============================
        22                   5 ¦================
        23                   7 ¦======================
        24                   7 ¦======================
        25                   8 ¦=========================
        26                   0 ¦
        27                   0 ¦
        28                   2 ¦======
```

Figure 2.14. Comparison of anesthecists to late starting first cases.

This significant finding indicates that certain anesthecists are probably associated with late starting cases. While this statistical result is highly interesting the manager must go one one step further and assign actual numbers to the statistics; hence the frequency distribution is presented. Among the full time anesthecist personnel, numbers 21, 23, 24, and 25, there is a range of but two cases; hardly cause for action.

ANALYSIS OF VARIANCE

ONE-WAY ANOVA SURGEONS TO LATE START 1ST CASES

GROUP	MEAN	N
1. ON TIME 1ST CASES	6.614	171
2. LATE 1ST CASES	9.091	44
GRAND MEAN	7.121	215

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F RATIO	PROP
BETWEEN	214.693	1	214.693	12.399	5.254E-04

SURGEONS	FREQUENCY	
1	1	¦====
2	3	¦============
3	2	¦========
4	3	¦============
5	1	¦====
6	4	¦================
7	4	¦================
8	2	¦========
9	0	¦
10	4	¦================
11	1	¦====
12	5	¦====================
13	6	¦========================
14	7	¦============================
15	1	¦====

Figure 2.15. Comparison of surgeons to late first case starts.

Here, again, as with the anesthecists; there is a strong statistical significance associating certain physicians with late first case starting times. During the data collection period each of these surgeons had the opportunity to have a first case approximately 15 times. If a very liberal policy were established wherein no action were taken until a surgeon established a track record of being late 20% of the time, or more than three times during this period, perhaps some corrective action would be appropriate, since six surgeons exceeded this marker. Given that these late starting physicians average 5 late starts each, to 1.6 for the other physicians, further examination is advisable; especially considering the relatively small number of first starting cases. In order to accomplish this closer examination all delays in this time frame were examined.

Examination of surgical delays.

Delays are a good indication of the extent to which management has control of the surgical schedule. Of course, there will always be unavoidable delays; such as those caused by emergencies, equipment failure, or some patient caused delays. However, tracking delays and taking action to decrease them is a vital management action every surgical services management must pursue.

Fortunately, in recent months the USAFA Hospital Surgery Department has increased emphasis on monitoring and correcting delays. This action is very timely too, during the data collection period of this study there were delays associated with nearly 18% of the 734 cases involved in the study. A breakdown of these delays is found in Figure 2.16. It is significant that nearly 30% of these are physician caused, and only one of these delays appears to be due to the previous case requiring more physician time than expected.

It is also instructive to look at the time of day in which these delays occur, and who appears to be associated with delays. Over 50% of the delays occur in the first half hour of the day, and only 10% after noon. To find if certain personnel were associated with the delays a correlation matrix was completed. As shown in Figure 2.17, there appears to be some correlation between surgeon and delays. However, when isolating those delays considered to be physician caused the association disappears, as indicated by the ANOVA in Figure 2.18. Turning the approach of this ANOVA around and examining delays by each surgeon also showed no significance, at approximately the same level of probability as the ANOVA shown.

NUMBER OF CASES: 129   NUMBER OF VARIABLES: 7
VARIABLE: 7. DELAYS

FREQUENCY COUNT OF DELAYS

DELAY CODE	FREQUENCY	PERCENT	....CUMULATIVE... FREQUENCY	PERCENT
1. PHYS. NOT AVAIL.	35	27.13	35	27.13
2. PHYS. LEFT OR	1	.78	36	27.91
4. PHYS. IN CONVERSATION	1	.78	37	28.68
5. PREV. CASE IN PROGRESS	1	.78	38	29.46
11. ANES. PERS. NOT AVAIL.	7	5.43	45	34.88
13. ANES. EQUIP NOT READY	6	4.65	51	39.53
16. PT. SENSITIVITY TO MED.	7	5.43	58	44.96
17. DIFFICULTY W/ NEEDLE LOCATION	7	5.43	65	50.39
18. LATE IV START	6	4.65	71	55.04
21 TURNOVER > 20 MIN.	2	1.55	73	56.59
23. TECHNICIAN NOT AVAILABLE	1	.78	74	57.36
24. PT. XPORTED TO OR LATE	2	1.55	76	58.91
25. PT. INCORRECTLY PREPED B4 XPORT	3	2.33	79	61.24
26. EQUIP NOT AVAIL.	6	4.65	85	65.89
27. PT. PREP TIME - EXPECTED	3	2.33	88	68.22
34. AWAITING RADIOGRAPHIC PROCESSING	2	1.55	90	69.77
41. OUTPATIENT LATE ARRIVAL	6	4.65	96	74.42
42. PT. RELUCTANT TO PROCEED	2	1.55	98	75.97
43. PT. CONVENIENCE	1	.78	99	76.74
52. UNKNOWN DELAY REASON	25	19.38	124	96.12
53. PREV. CASE IN ROOM RAN LATE	1	.78	125	96.90
54. EMERGENCY CAUSED DELAY	4	3.10	129	100.00
TOTAL	129	100.00		

Figure 2.16. Frequency of delays.

CORRELATION OF ALL DELAY VARIABLES

	SURGCODE	ANESCODE	CNURCODE	STECCODE	ANESSTRT	SURGSTRT	DELAYS
SURGCODE	1.00000						
ANESCODE	-.14700	1.00000					
CNURCODE	-.06281	-.18480	1.00000				
STECCODE	.29919	-.15049	-.03257	1.00000			
ANESSTRT	.00448	-.16679	.11702	-.13148	1.00000		
SURGSTRT	.00418	-.15706	.10741	-.11132	.99613	1.00000	
DELAYS	-.18070	-.13202	-.01911	-.09513	.26921	.26896	1.00000

CRITICAL VALUE (1-TAIL, .05) = + Or - .14553
CRITICAL VALUE (2-tail, .05) = +/- .17289

N = 129

Figure 2.17. Correlation of all personnel and delays.

Figure 2.17. Correlation of all personnel and delays.

ONE-WAY ANOVA SURGEON TO SURGEON CHARGED DELAYS

DELAY	MEAN	N
1	8.676	35
2	3.000	1
3	14.000	1
4	10.000	1
GRAND MEAN	8.579	38

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F RATIO	PROB.
BETWEEN	83.822	4	20.955	1.135	.3572
WITHIN	609.441	33	18.468		
TOTAL	693.263	37			

Figure 2.18. ANOVA surgeons to surgeon attributed delays.

As indicated earlier, the study collection period coincided with a peak in delays. Strong management action has reduced them to 14 in February 1989 and 21 in March. Heartening also is a reduction in delays to which there is no assigned cause. However, the resolution must take on a long term perspective, with continual monitoring and correction as required. The above analysis indicates that it would be difficult to link a few people to the delays; it is a facility-wide problem. Therefore the actions management is taking must be sweeping in nature and not focused upon one group. Although, admittedly, correcting physician caused delays can only be accomplished on an individual basis.

Examination of aggregate operating room utilization.

This is the key question surrounding the present study: why has there been a steady decline in utilization of the USAFA Hospital Surgery Suite? A good starting point is to examine utilization statistics through the data collection period and attempt to discovery when the problem originated, and then investigate possible causes. Figure 2.19 depicts monthly utilization in anesthesia hours beginning in fiscal year (FY) 1986.

USAFA HOSPITAL SURGERY SUITE UTILIZATION

FY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	CUM TOTS	MON AVG
1986	292	256	272	354	335	254	330	315	315	258	312	317	3610	301
1987	357	268	285	293	284	268	360	235	265	202	242	227	3286	274
1988	220	187	232	201	212	257	224	151	74	93	188	296	2335	195
1989	349	381	329	398										

Figure 2.19. Surgery suite utilization in anesthesia hours FY 1986 - 1989.

It appears as though something occurred in November 1986 to cause a precipitous decline in surgery hours, and then another incident in late summer 1987 to acerbate the problem. Upon questioning the Surgery Suite supervisor about the events which may have occurred at that time she disclosed that the downturn coincides with her own arrival (Interview, LTC Brenda Kier, 12 Jan. 1989). Other than that, she had little information to offer. Logically, her arrival should not immediately impact utilization hours unless she fully controlled the schedule; which she does not.

The question proved difficult to answer until two events occurred; the current Hospital Commander reemphasized increased productivity among the surgeons and it was learned that the previous Surgical Suite supervisor had retired and still resided in the area.

The initial downturn roughly coincides with the arrival of the previous hospital commander. While there are no records available, it appears he put less emphasis on surgery throughput, allowing some decline in productivity.

Corporate memory, even on a fairly short term basis, is rare in the military setting; we move around too frequently. It was a stroke of good luck that lead to the former supervisor. She relayed that not only did her position change hands during the second productivity downturn, but up to six surgeons departed at the same time (Interview, Maj (ret.) MaryAnn Hahn, 2 Mar. 1989). Considering that there was little overlap in the tenures of the departing surgeons and their replacements it is probable that the new surgeons never achieved the level of productivity of those formerly holding the positions. They were very 'comfortable' at a rate approaching 75% of the former level and no one motivated them to do better.

The present austere budget environment and a new hospital commander attuned to high productivity and its impact upon Air Force resource allocation have reversed the low emphasis on surgical throughput at the USAFA Hospital. As is evident from the surgical hours beginning in October 1988, when the Surgery Suite reopened after renovation, surgery productivity has attained and maintained previous high levels. The basic impetus behind this resurgence is the current commander's emphasis, and the surgeons responding to his interest. When this occurred it also seriously reduced the requirement for this study.

Exmaination of daily operating room utilization.

Considering that the previous figure depicts anesthesia hours for each month a little mathematical calculation shows that one could expect that each operating room is used for about three hours of surgery per day. Adding perhaps one hour for turnover time in each room shows the surgical suite is fully utilized for four of the anticipated eight hour day; the suite is in use about 50% of the time. A 'by-day' approach was used in order to examine this situation. Figure 2.20, below, shows the utilization of each room by day of the week in anesthesia hours, along with the mean case duration times by specialty, which was originally displayed in Figure 2.10. This figure shows actual usage to be somewhat beyond five hours per day when turnover times are factored in.

WEEKLY UTILIZATION BY OPERATING ROOM

	OPERATING MONDAY	ROOM TUESDAY	ONE WEDNESDAY	THURSDAY	FRIDAY
OCT	4.63	3.30	4.65	6.38	4.70
NOV	4.32	4.95	5.09	5.20	1.29
DEC	3.08	4.59	4.15	4.36	7.39
JAN	3.23	5.10	2.95	4.68	5.46
MEAN	**3.82**	**4.49**	**4.21**	**5.16**	**4.71**
				ROOM ONE DAILY STD. DEV.: .51	
	OPERATING MONDAY	ROOM TUESDAY	TWO WEDNESDAY	THURSDAY	FRIDAY
OCT	4.68	3.07	4.61	4.52	3.76
NOV	3.99	5.28	4.20	5.67	4.54
DEC	4.58	4.94	3.83	5.42	4.67
JAN	4.72	3.23	4.07	5.33	3.99
MEAN	**4.49**	**4.13**	**4.18**	**5.24**	**4.24**
				ROOM TWO DAILY STD. DEV.: .46	
	OPERATING MONDAY	ROOM TUESDAY	THREE WEDNESDAY	THURSDAY	FRIDAY
OCT	2.96	1.45	4.88	4.84	4.05
NOV	7.11	4.43	3.98	5.17	6.17
DEC	3.67	1.58	2.12	4.69	3.76
JAN	5.78	4.59	6.11	7.27	5.63
MEAN	**4.88**	**3.01**	**4.27**	**5.49**	**4.90**
				ROOM THREE DAILY STD. DEV.: .94	
GRAND MEAN	**4.40**	**3.88**	**4.22**	**5.30**	**4.62**
STD. DEV.	**.54**	**.77**	**.05**	**.17**	**.34**

MEAN CASE DURATION TIMES BY SPECIALTY OCT 88 - JAN 89

	OCT	NOV	DEC	JAN	MEAN	σ^2
ENT	1.03	1.42	.69	1.23	**1.09**	**.27**
GENERAL	1.49	1.45	1.56	1.15	**1.41**	**.16**
GYN	.79	.91	1.15	.95	**.95**	**.13**
OPTHAMOLOGY	1.55	1.88	1.67	1.88	**1.74**	**.14**
ORAL	2.21	3.41	4.33	3.03	**3.24**	**.76**
ORTHO	2.29	2.46	2.10	2.24	**2.27**	**.13**
PODIATRY	1.18	1.29	1.28	1.29	**1.26**	**.05**
UROLOGY	.85	1.02	.93	.97	**.94**	**.06**

Figure 2.20. Comparing day of week operating room utilization to case length.

There is some small variation in room and by day utilization, however it remains fairly constant throughout the entire period. Given the wide varience in case duration between specialties, the Surgery Suite supervisor has attained a remarkable degree of balance between the room assignments of the specialties. Also, this figure does show that there is unused capacity in the Surgery Suite facility. It is important to mention here, however, that Air

Force staffing methods preclude a rapid increase in procedures to make use of this capacity. Since the current staffing is based upon previous output, and additional staffing can not be in place immediately, the best hope is incremental increases over a course of several years. That is, unless some program is implemented which provides additional funding to hire additional staff.

However, at this time staffing for the USAFA Hospital Surgery Suite is not considered a significant issue. There are two unfunded nurse anesthescist requirements, but it is otherwise staffed according to the positions earned. In fact, staffing compares favorably to similar Air Force hospitals, as shown in Figure 2.21.

SURGICAL SUITE STAFFING COMPARISON

	ANESTHESIA					SURGERY					
	PHYSICIANS		NURSE ANES		TOTAL	NURSES		TECHNICIANS		TOTAL	
	AUTH	ASGN	AUTH	ASGN	ASGN	AUTH	ASGN	AUTH	ASGN	AUTH	ASGN
LANGLEY	2	2	4	3	5	5	5	16	16	21	
MACDILL	2	2	5	3	5	6	5	16	15	20	
OFFUTT	2	1	4	3	4	5	5	16	15	20	
USAFA	2	2	5	3	5	5	5	15	16	21	

Figure 2.21. Comparison of Surgery Suite Staffing.

ASSESSMENT OF INPATIENT UNIT CAPACITY.

Ward capacity involves staffing and census considerations along with the actual size and configuration of the inpatient unit. In order to adjudge the adequacy of USAFA Hospital inpatient unit staffing at six similar facilities was compared; three of these facilities were the Air Force medical treatment facilities (MTFs) shown in the previous figure, and the other three were civilian hospitals. A total of eight hospitals were informally contacted and asked to cooperate in the study; however two civilian facilities elected to decline to provide information when their insurance underwriters advised against releasing the information.

Examination of staffing levels.

The first area examined was staffing. This proved a somewhat difficult comparison effort since military requirements are determined through the periodic application of manpower standards to past workload while civilians generally project workload and apply staffing to meet these projections.

The Air Force initial staffing methodology involves requesting workload and staffing input from a large number of Air Force facilities. The staffing claims are then plotted on the best-fitting regression line with manhours as a function of the workload. The resulting staffing levels are applied Air Force wide, with skill level requirements negotiated at the Major Command level (Interview, SSGT Michale McWilliams, 13 Mar. 1989).

Civilian facilities individually decide upon a staffing level and then determine skill levels based upon the patient census. Often the ratio of RNs to lesser qualified employees is inversely related to the patient number. The best explanation of this system came from the associate administrator of a rural Kansas hospital. His management group initially agreed upon a staffing level of 6.6 manhours per patient day. They then developed a staffing manual which determines the professional/nonprofessional ratio at any given patient census. For example, at up to 15 patients the ratio is 64% RNs while above 27 patients it reduces to 58%. The Accounting Department then projects workload for the coming week(s) based upon past years' experience and current trends. This projection is then applied to the inpatient unit staffing. If the core staff can accommodate the expected workload no action is taken; however, if the core staff falls short of the requirement arrangements are made with the float pool to provide additional staffing (Interview, Kathy Strand, 23 May 1989).

This last area, the float pool, is a primary difference between military facilities and their civilian counterparts. Military hospitals are allocated staffing based upon the workload three years ago, and there's virtually no funding provision at this time for adjusting staffing levels based upon current workload; such as the float pool concept allows. Therefore military hospitals often require staff to work longer hours or underman selected units to meet demands in higher priority areas.

It may help to present a matrix against which to compare all seven hospitals. Figure 2.22 represents the reported staffing as of mid-May 1989. To make a comparison possible the reported staffing levels are reduced to a staff to bed ratio.

INPATIENT UNIT STAFFING COMPARISONS

HOSPITAL	BEDS	RN STAFF (AUTH)	RN RATIO STAFF:BED	OTHER STAFF (AUTH)	OTHER RATIO STAFF:BED	OVERALL STAFF:BED
CIV 1	35	20	.57:1	3	.09:1	.66:1
CIV 2	40	11	.28:1	15	.38:1	.65:1
CIV 3	30	20	.67:1	3	.10:1	.77:1
LANGLEY	28	5(5)	.18:1	17(16)	.61:1	.78:1
MACDILL	32	9(9)	.28:1	14(10)	.43:1	.71:1
OFFUTT	18	10(14)	.56:1	16(15)	.89:1	1.44:1
USAFA	55	13(13)	.24:1	15(20)	.27:1	.51:1

Figure 2.22. Staff to bed ratio in selected hospitals.

The USAFA Hospital inpatient units involved in this study are both located on the fourth floor of the hospital. Unit 4C is designated for Orthopedic patients and Unit 4D for all other surgical patients. Unit 4C has a capacity of 26 patients and 4D can accommodate 29; hence the 55 reported beds. This represents a much more significant Orthopedics workload at the USAFA due to the highly active cadet population. The matrix shows that staffing at the USAFA Hospital is somewhat lower that at the other facilities. This holds true even when the current staffing shortage at USAFA Hospital is brought up to authorized levels.

These differences appear to be due mostly to Headquarters USAF, or perhaps major command, choice. The military facilities were selected because they have much the same ability to achieve preferential treatment as the USAFA. Offutt and Langley AFBs are the homes of major commands and MacDill hosts a vital unified command. However, the two facilities on the Major Command (MAJCOM) host bases enjoy much higher staffing authorizations than MacDill or the USAFA. It is often said that MAJCOMs tend to divert manpower away from outlying units to their own home bases; perhaps this is a graphic example of such activity.

Examination of inpatient unit census.

Given that the USAFA Hospital is performing so many more operations than comparable military facilities (see Figure 2.1), there must be some effort to assess the real impact upon the surgical inpatient units. Figure 2.23 provides some insight as to the unit census by day of the week. While there is some slack time over the weekends, occupancy remains above 50% most of the time. In fact, the weekend figures belie the actual workload since Sunday is a very busy day for admitting Monday surgery patients.

When examining these figures the a question concerning length of stay arises. Specifically; is there room for improvement in the length of time certain surgeons hold on to patients? While it is beyond the parameters of this study, and the ability of the researcher, to identify such problems, it is an issue in the assessment of ward capacity. To this end an analysis of variance was conducted on the lengths of stay of patients undergoing three frequent procedures in each of three surgical specialties with more than one surgeon. The resulting nine studies comprise nearly 25% of the entire population of cases. This effort is displayed in Figure 2.24.

SURGICAL FLOOR CENSUS
Unit 4C Capacity 26

	OCTOBER	NOVEMBER	DECEMBER	JANUARY	MEAN	STD. DEV.	%FILLED
SUNDAY	15	14	11	14	13.4	1.28	51
MONDAY	17	16	12	15	15.1	1.71	58
TUESDAY	17	15	12	17	15.1	2.20	58
WEDNESDAY	19	16	11	17	15.5	3.14	60
THURSDAY	21	17	12	19	17.2	3.35	66
FRIDAY	16	13	9	16	13.5	2.68	52
SATURDAY	15	11	7	15	12.0	3.27	46

Unit 4D Capacity 29

	OCTOBER	NOVEMBER	DECEMBER	JANUARY	MEAN	STD. DEV.	%FILLED
SUNDAY	10	12	14	10	11.6	1.47	40
MONDAY	15	15	16	13	15.0	.94	52
TUESDAY	22	19	17	18	18.8	1.97	65
WEDNESDAY	19	18	15	20	18.1	1.77	62
THURSDAY	17	16	16	19	17.0	1.45	59
FRIDAY	12	12	12	13	15.3	.61	53
SATURDAY	9	7	10	10	9.1	1.23	31

Figure 2.23. Surgical floor census by day of week.

There are two areas of concern in Figure 2.14; both annotated "reject H_o". The means of these significant results were retained in order help in the discussion of them. In ICD 6850 there is an apparent real difference in opinion between the GYN surgeons as to how long to retain these patients. While the variance is little more than a day from the mean, such a finding would be reason for investigation in a setting where lengths of stay are closely monitored. The second significant result, in ICD 8086, is somewhat different. The large disparity between the means reflects the unique military problem of patients residing in dormitories with no one to monitor and assist them while recovering from surgery. The great outlier mean of 9.5 days simply reflects a surgeon who primarily operates on cadets. The 6.667 day mean is a surgeon who had two patients from the USAF Academy Preparatory School.

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------------------------------------------------------------------------------
--------------------- ANALYSIS OF VARIANCE ---------------------
NUMBER OF CASES: 178   NUMBER OF VARIABLES: 4

           ONE-WAY ANOVA UPON LOS BY SURGEON

        GEN  SURG LOS ON ICD 5122   GRAND MEAN 6.600 PROB.: .7765
        GEN  SURG LOS ON ICD 5300        "     3.500 PROB.: .2143
        GEN  SURG LOS ON ICD 5301        "     3.571 PROB.: .8897
        GYN  SURG LOS ON ICD 6840        "     5.160 PROB.: .5367
        GYN  SURG LOS ON ICD 6850        "     4.359 PROB.: .0289 (REJECT H°)
                   GROUP         MEAN    N
                     1          4.333   12
                     2          3.722   18
                     3          5.667    9
        GYN  SURG LOS ON ICD 6909   GRAND MEAN 1.900 PROB.: .5111
        ORTH SURG LOS ON ICD 8060        "     4.059 PROB.: .6789
        ORTH SURG LOS ON ICD 8086        "     5.273 PROB.: .0266 (REJECT H°)
                   GROUP         MEAN    N
                     1          3.400    5
                     2          9.500    2
                     3          6.667    3
                     4          2.000    1
        ORTH SURG LOS ON ICD 8145   GRAND MEAN 7.09 PROB.: .7315
------------------------------------------------------------------------------
```

Figure 2.24. ANOVA upon selected lengths of stay.

One would wonder if the low staffing, combined with a high workload, at the USAFA hospital is causing quality or morale problems. In fact, at the end of the data collection period there was some difficulty. Nursing staff was tired and making too many errors; however in the ensuing months the charge nurses throughout the facility worked out a method much like a pool in a civilian facility. Not every clinic or inpatient unit is busy at the same time so the busy units request, and receive, temporary help from whomever is not busy. Even the acting Chief Nurse helps admit patients to the ward when the need arises. This "all for one" attitude is a significant factor in keeping this facility going (Interview, Maj Dian Atkins, 24 May 1989).

EXAMINATION OF CLINIC PRACTICES.

On the other side of the surgical productivity issue from the inpatient unit capacity, is the efficiency of the individual clinics. This issue was examined from two perspectives; clinic appointment scheduling practices and reduction of the lists of patients waiting to get into surgery.

Examination of waiting lists.

At the beginning of the data collection period for this study waiting lists were a significant issue because the recent renovation of the surgery suite resulted in a backlog of patients awaiting surgery. In early December there were 150 patients on these lists, however most clinics indicated confidence that the lists would be quickly reduced to nothing. This belief came true for all clinics except ENT; which, by May 1989, had increased from 45 patients to 65. The single surgeon in this clinic has expressed a desire for more surgery time in order to accommodate his caseload (Interview, Col (Dr) Manubhai Patel, 24 Mar. 1989).

In examining his schedule it appears he is assigned Operating Room Three every Wednesday, apparently for the entire day. His use of this time during the data collection period is shown below, in Figure 2.25.

ENT USAGE OF AVAILABLE OR TIME

MONTH FY 89	SURGERY DAYS	NUMBER CASES	TOT ANES TIME	AVG DAILY ANES TIME
OCT	4	11	11:21	2:50
NOV	5	12	17:05	3:25
DEC	3	10	6:55	2:20
JAN	4	15	18:35	4:37

Figure 2.25. ENT OR utilization.

The trend in ENT cases is upward, except for the holiday month of December. Looking back to the OR utilization by week figure (Fig. 2.20), displayed earlier, there is more use of OR three than shown here. The average

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Wednesday utilization was 4.27 hours, compared to an overall weekly average use of 4.51 hours for that room.

More important to the reduction of the ENT waiting list is technician management of the list. The May 1989 waiting list is exactly the same as the list provided in December; except it has grown longer. The other clinics found that many patients sought and received their surgical care elsewhere while the surgical suite renovation was going on. The ENT technician needs to make an effort to identify the patients who should be removed from this list, many of whom have been on it for a year.

Surgical Clinic scheduling practices.

To assist in assessing Surgical Clinic scheduling practices input was requested from the three Air Force MTFs, cited earlier, at Langley AFB, Offutt AFB, and MacDill AFB. This was the least successful aspect of the comparative attempt in that the clinic schedules at these bases, as at most locations, are governed by a convoluted series of rules which generally insure adequate time for a particular kind of appointment, but are virtually impossible to put clearly into the written word. For example, MacDill responded with the most complete information by submitting seven different schedule templates. Offutt AFB, on the other hand, provided a short paragraph stating the Clinic runs eight hours per day with appointments every 15 minutes. Langley AFB made it the easiest by submitting a template for each day of the week, supposedly each repeats itself weekly without interruption, as exists in the MacDill example. Using this information requires the reader to remember that it is suspect; too much so to attempt to find any statistical significance in the variances, however, the aggregate raw data is presented below in Figure 2.26.

MONTHLY SURGICAL CLINIC APPOINTMENT AVAILABILITY PER SURGEON

	NUMBER OF APPOINTMENTS	TOTAL TIME IN MINUTES
LANGLEY	244	5140
MACDILL	174	4250
OFFUTT	512	7680
USAFA	172	4260

Figure 2.26. Comparative surgical clinic appointment availability.

It appears that clinic scheduling at the USAFA Hospital compares favorably with that found at MacDill AFB, which supplied the most complete data. The Langley data was seemingly complete but there was no time allocated for surgery. It is reported as received but the reader must remember that it is a bit higher than must actually occur. The Offutt data did not allow any surgery time either, but it was not as complete as Langley's, so one day was arbitrarily assigned to that purpose. Even with that, the data from that location seem to be far from accurate and should be discounted; all surgeons require additional time for certain types of appointments, for administrative time, and for ward rounds.

EXAMINATION OF ALTERNATIVE PRACTICES.

This section concerns alternative practices open to the USAFA Hospital, which could enhance surgical productivity. Only one action discovered in this effort merits closer examination, and that is ambulatory surgery. This may be the time for military hospitals to "get smart" in this area because, in the coming years, resources will be earned through other than patient bed day mechanisms. These new methods will most assuredly reward those hospitals with the foresight to establish ambulatory surgical capability. With the USAFA Hospital facing a lengthy inpatient unit closure, it may well be wise to begin ambulatory surgery on a small scale, using some of the staff normally occupied on the units undergoing renovation.

As discussed in the literature review, many smaller facilities are performing ambulatory surgery in the main surgical suite, so a separate surgery section is not required. Patients undergoing ambulatory procedures do need a separate preparation and recovery area, however, and this may be the key to the success of a local attempt to implement the service. While there is insufficient room in the surgery suite to house a combination preparation/recovery ambulatory surgery area, there may be space on other units.

To exmaine this possibility the census of all inpatient units was compiled for the most recent months; March, April and May 1989 (Only 1 - 21 May was available at the time of this writing). This data is presented in Figure 2.27. It appears that almost any unit could house a four patient room given over to Ambulatory Surgery.

INPATIENT CENSUS BY UNIT MARCH - MAY 1989

	Average Census					Highest Census				
	NU 1	**SCU**	**NU 3**	**NU 4C**	**NU 4D**	**NU 1**	**SCU**	**NU 3**	**NU 4C**	**NU 4D**
March	3.3	3.9	12.7	16.8	15.1	6	6	21	21	23
April	4.4	2.2	13.6	16.9	13.5	12	6	21	21	22
May	8.0	3.7	13.0	13.3	13.3	14	6	20	18	21
Capacity	13	8	28	26	29	13	8	28	26	29

Figure 2.27. Average and highest inpatient unit census, March - May 1989.

In addition to the existing room capacity it appears that most surgeons feel they could perform many procedures on an outpatient basis. Figure 2.28 displays the results of a question posed to all surgeons during an informal survey. The question asked: "How much of your present caseload could be done on an outpatient basis if we implemented a proper ambulatory surgery program?" Names were omitted as part of a promise which accompanied the request for information.

To conclude this section, USAFA Hospital seems to possess both the space and ability to implement ambulatory surgery. The present may well be a good time to begin such an effort.

SERVICE	SURGEON	SURGEON	SURGEON
ENT	80%		
GYN	75%	40%	30 - 40%
GEN	40%	50%	0[1]
OPTHA	75%		
ORTHO	50%	HAND[2]	?[3]

NOTES:

1. This surgeon gave no percentage and appears to disagree with the wisdom of ambulatory surgery, especially in a military setting.
2. This Orthopedic surgeon failed to cite an amount but felt most hand surgery could be accomplished in an ambulatory mode. He also felt it would not increase productivity.
3. This surgeon's response failed to cite a number but he felt it could be performed "given proper motivation in OR".

Figure 2.28. Surgeon responses to ambulatory surgery query.

ATTEMPT TO OFFER MORE EFFICIENT SCHEDULING OF SURGICAL CASES.

The final aspect of this research effort centers upon searching for a surgical scheduling method whereby optimal throughput may be obtained. As cited in the literature review, little success has been realized in this area; largely due to the maze of constraints surrounding such an effort. There are some hints available, however.

If the longest cases first rule has been indicated in previous studies to provide more efficiency, and this may be attributed to faster turnovers later in the day, as a possibility springing from the present study, perhaps the present block scheduling assignments and precedence rules could be modified to achieve faster throughput. Exploring this concept further provides the average case length figure and the block scheduling scheme, both shown previously in Figure 2.10, provided here again for easier comparison.

USAFA HOSPITAL BLOCK SCHEDULING PLAN

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
ROOM 1	UROLOGY	GENERAL	GENERAL	GENERAL	PODIATRY
ROOM 2	GYN	ORAL (WK 1/3) UROLOGY (2/4)	GYN	OPTHA	GYN
ROOM 3	ORTHO	ENT	ORTHO	ORTHO	ORTHO

AVERAGE CASE DURATION

SERVICE	HOURS	SERVICE	HOURS
UROLOGY	.94	GENERAL	1.41
GYN	.95	OPTHA	1.80
ENT	1.12	ORTHO	2.29
PODIATRY	1.25	ORAL	3.11

Figure 2.29. Comparison of block scheduling scheme to case duration.

Little is gained in this exercise, if there were cases where two specialties shared a day the one with longer cases should perhaps go first. Also, given the present rules for assignment of daily case order, the scheduler may well want to consider anticipated case duration along with patient problem potential and precedence. In fact, precedence should probably come after case duration in scheduling importance.

Finally, early in this research effort an attempt was made to discern an optimal scheduling technique through linear programing. Unfortunately, the problem does not lend itself to such methods since block scheduling is used at the USAFA Hospital. This method provides greater patient service stability throughout the facility at the expense of optimal surgical suite throughput. Rather than having the ability to schedule all patients in the most expedient fashion throughout the day the scheduler must determine the order in which three or four patients go into a predesignated operating room. Further limitations are added when surgeons in a specialty share a room on a day or only one surgeon is scheduled in a room and also has clinic scheduled for that day. The result is that scheduling at this facility often becomes a matter of filling the only available time. In light of these considerations the attempt to offer an optimal throughput methodology was abandoned.

III. CONCLUSIONS AND RECOMMENDATIONS

RESTATEMENT OF THE RESEARCH QUESTION.

The purpose of the research project was to evaluate USAFA Hospital surgical activities to discern the reason for the steady decline in productivity and recommend management actions which may optimize output in this area.

PRIMARY CONCLUSION.

Generally, when productivity falls in an Air Force hospital the required biometric reports gain the commander's attention and corrective action is taken. Often, however, commanders are embroiled in other issues and without a major commander reviewing the facility's activities, nonpressing, "down the road" issues, such as productivity, can be overlooked. This is apparently the case at the U.S. Air Force Academy Hospital; there is no major command to which reports must flow, they go directly to Headquarters USAF where they are tabulated and applied at budget time. Of course then; the USAFA has enjoyed relative immunity from personnel and budget cuts, given its special mission. So, there was no reason to worry as long as the Academy Superintendent was happy with the Hospital's support of the Cadet Wing. Unfortunately, USAF put the Academy Hospital on notice late in 1988: no more full exemption from funding cuts. This Hospital is fortunate that notice came no earlier; his own interest in high performance had already motivated the new Commander toward pushing the surgeons to perform more cases.

PRIMARY RECOMMANDATION

Based upon recent surgical productivity at the USAFA Hospital the requirement for this project is significantly reduced. However, the conditions leading to the low levels of surgical productivity can recur with surprising rapidity. Virtually every year one of the two conditions cited previously as the probable root causes of this decrease; a new commander caught up in other issues and a large turnover of surgeons; happens again. In fact, constant reemphasis is required to keep the numbers from falling off. Examining the latest production reports shows that while the trend in surgery case numbers is up, anesthesia hours are falling. Figure 3.1 tells the story. May anesthesia hours were not available at the time of this writing.

USAFA HOSPITAL SURGICAL PRODUCTIVITY FEB - MAY 1989

	Avg Daily Cases	% Change	Avg Daily Anesthesia Hours	% Change
Feb	9.9	- 11	17.5	- 10
Mar	10.3	+ 10	16.5	- 6
Apr	12.2	+ 8	15.5	- 6
May	11.1	- 9	N/A	-

Figure 3.1. Trend in monthly surgical activity.

SECONDARY CONCLUSIONS AND RECOMMENDATIONS.

While command emphasis is the probable explanation for the decrease in surgical productivity, and the main recommendation to avoid such an occurrence in the future, there are other actions which may lead to enhanced surgical suite operations. This section offers recommendations a number of areas found during the course of this project.

Delays have made a serious impact upon surgery productivity in the past. As discussed previously, nearly 18% of the cases during the data collection period were affected by delays. While the Surgery Site Supervisor has successfully tackled this problem continued emphasis is required to keep their numbers low. This should be a command interest item provided periodically by Nursing Services.

Surgery Suite and Anesthesia Department personnel should increase emphasis on turnover speed when physicians perform anesthesia duties. While not a significant factor in overall productivity, turnover times in these cases are usually over the Air Force imposed 20 minute standard.

Inpatient unit staffing seems to be lower than at comparable civilian and military facilities. Nursing Services, in conjunction with Resources Management, should address this shortfall and bring Unit staffing more closely aligned with the other, similarly sized, facilities.

The ENT Clinic Surgical Waiting List is unreasonably long. The ENT technician should verify that Clinic's surgical waiting list. It appears that there are a large number of people who have been on the list for up to a year, and perhaps longer. Other clinics with similar lists have found that many patients no longer have the need for the procedure in question. While this list is being pared down, the ENT Specialist should more fully utilize the available OR time to take care of those patients who still need surgery.

In recent months surgery suite utilization has decreased from around 95% in January 1989 to around the 80% mark. This is a positive finding if held at the present level, since industry averages are 50% at best. All hospital surgical departments must strive to keep the impressive accomplishments since reopening the Surgical Suite in September 1988 from falling away to mediocre, or worse, output. This finding reflects directly back to the primary finding concerning command interest; however it bears repeating in this short paragraph concerning utilization.

The final recommendation is to implement a limited ambulatory surgery activity. The two main questions concerning such an attempt center upon available space and surgeon cooperation. As discussed in the previous section, both the space and surgeon willingness are available. Implementing this activity now should give the staff the experience required to make the effort successful and make ambulatory surgery commonplace in this facility before it becomes an imperative, and resources are lost because the capability doesn't exist.

APPENDIX

DATA BASE

[illegible]	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	ORROOM	LOS
14?905	GEN	5	21	46	64	0.16	7.25	8.16	0.91	7.53	8.00	0.47	7410	0	10	25	1	0	4	4
[illegible]	URO	4	23	44	61		10.5	10.78	0.28	10.63	10.70	0.07	6011	0	10	3	0	0	4	
141191	ORTH	2	22	41	65	1.5	7.59	12.16	4.57	8.00	12.90	4.90	8377	1	10	3	1	11	3	18
141192	GYN	1	24	42	64	0.25	9.11	9.83	0.72	9.38	9.72	0.34	6639	0	10	3	0	0	2	1
[illegible]	ORTH	2	21	47	72		12.33	13.75	1.42	12.80	13.59	0.79	7781	0	10	3	0	0	1	3
141194	URO	4	23	44	75		7.5	9.09	1.59	8.50	8.92	0.42	6310	0	10	3	1	0	1	
141195	URO	4	23	44	61	0.16	9.33	10.33	1.00	9.59	10.25	0.66	6020	0	10	3	0	0	4	
141196	ORTH	2	22	41	69		13.67	15.09	1.42	13.92	14.92	1.00	8060	1	10	3	0	0	3	9
141197	GEN	5	22	41	72	0.42	7.5	11.67	4.17	8.25	11.33	3.08	4575	1	10	6	1	0	1	11
141198	GYN	1	24	42	64	0.25	10.09	12.67	2.58	10.40	12.46	2.06	6850	2	10	3	0	0	2	3
141199	GYN	1	24	41	64		12.92	13.67	0.75	13.21	13.50	0.29	5421	0	10	3	0	0	2	1
[illegible]	GYN	6	24	42	71	0.2	7.75	8.92	1.17	8.40	8.79	0.39	6840	0	10	3	1	1	2	5
141205	URO	4	24	41	62	0.33	7.38	8.05	0.67	7.75	8.33	0.58	6020	0	10	4	1	0	4	
141206	GYN	6	22	46	69	1.84	7.5	8.16	0.66	7.84	8.00	0.16	5421	0	10	4	1	0	2	1
[illegible]	GEN?	7	21	47	64	0.25	7.5	9.59	2.09	8.08	9.50	1.42	5122	1	10	4	1	0	1	6
[illegible]	URO	4	24	41	61		8.84	9.84	1.00	9.26	9.72	0.46	6020	0	10	4	0	0	4	
141213	ORTH	3	24	47	69	0.33	7.42	9.84	2.42	8.00	9.67	1.67	8345	2	10	5	1	0	3	5
141214	ORTH	3	24	42	74		10.16	12.42	2.26	10.59	12.33	1.74	8060	2	10	5	0	0	3	5
141215	GYN	6	22	46	66	0.22	8.67	9.05	0.38	9.00	9.33	0.33	5421	0	10	5	0	0	1	1
141216	GYN	1	23	42	77	0.5	7.5	8.75	1.25	7.84	8.55	0.71	7410	0	10	5	1	0	2	4
141217	GEN	5	23	42	71		9.25	10.75	1.50	9.50	10.55	1.05	4050	0	10	5	0	18	2	3
141219	GYN	6	22	46	72	0.16	7.42	8.33	0.91	7.75	8.25	0.50	6551	0	10	5	1	0	1	4
141229	GYN	6	22	46	72		9.72	10.33	0.61	10.00	10.25	0.25	5421	0	10	5	0	0	1	1
141231	GEN	5	22	44	66		12.09	14.59	2.50	12.50	14.42	1.92	620	0	10	6	0	52	1	3
141232	ORTH	2	21	42	69	0.33	7.42	10.25	2.83	7.48	10.25	2.77	8149	0	10	6	1	0	3	5
141233	GYN	6	23	44	64	0.33	7.5	8.09	0.59	7.78	7.92	0.14	5421	0	10	6	1	0	2	1
141234	ORTH	2	21	47	69	0.42	10.35	11.84	1.49	10.84	11.67	0.83	8086	1	10	6	0	0	3	3
141239	GEN	8	24	44	64		8.42	9.84	1.42	9.00	9.67	0.67	5310	0	10	6	0	0	2	2
[illegible]	URO	4	23	44	62		9.92	10.67	0.75	10.05	10.59	0.54	5600	[illegible]	10	6	0	0	4	
141242	ORTH	2	21	42	74		12.15	13.75	1.60	12.62	13.59	0.97	8081	0	10	6	0	52	3	3
141246	GYN	6	24	42	76	0.09	11.67	12.00	0.33	11.78	11.84	0.06	6909	0	10	7	0	0	2	1
141247	GYN	1	24	42	64	0.2	7.5	8.59	1.09	7.82	8.42	0.60	6540	1	10	7	1	0	2	3
141248	GYN	6	24	42	76	0.22	8.78	9.67	0.89	9.07	9.53	0.46	6850	0	10	7	0	0	2	3
141249	GYN	1	24	42	78	0.16	9.89	11.05	1.16	10.21	11.33	1.12	6850	1	10	7	0	0	2	3
[illegible]	GYN	1	24	42	76		12.09	12.75	0.66	12.59	12.64	0.05	6629	0	10	7	0	0	2	1
141251	ORTH	2	22	46	69		7.5	12.05	4.55	8.09	12.25	4.16	8377	1	10	7	0	0	3	15
141252	POD?	9	21	41	72	0.09	7.5	9.42	1.92	8.00	9.00	1.00	7759	0	10	7	1	0	1	
141253	POD	0	23	41	72	0.16	9.5	10.67	1.17	9.96	10.59	0.63	7759	0	10	7	0	0	1	
141276	URO	4	24	41	61	0.33	7.59	8.42	0.83	7.89	8.30	0.41	6400	0	10	11	1	6	2	
141277	ENT	10	21	46	74		8.25	9.42	1.17	8.50	9.25	0.75	2820	0	10	11	0	0	3	
141278	ENT	10	21	46	74	0.25	7.75	8.00	0.25	7.80	7.95	0.15	2001	0	10	11	1	1	3	1
141279	ENT	10	21	46	74	0.16	9.75	10.75	1.00	10.09	10.75	0.66	2188	0	10	11	0	0	3	3
141280	URO	4	24	41	61		10.21	11.42	1.21	10.50	11.25	0.75	6020	0	10	11	0	28	4	
141281	URO	4	24	41	61	0.09	8.75	9.33	0.58	9.10	9.16	0.06	5860	1	10	11	0	0	4	
141282	GEN	8	24	44	66	0.16	12.38	13.92	1.54	12.80	13.75	0.95	5302	0	10	11	0	0	1	4
141283	GEN	8	24	44	70		14.09	15.25	1.16	14.38	15.19	0.81	5302	0	10	11	0	3	1	3
141284	GYN	6	22	45	78	0.33	7.75	8.59	0.84	8.00	8.42	0.42	5405	1	10	13	1	11	1	12
141286	GEN	5	21	41	76		12.75	17.33	4.58	13.25	17.00	3.75	5122	3	10	11	0	0	2	2
[illegible]	GEN	8	22	44	70	0.09	7.92	9.25	1.33	8.25	9.00	0.75	4700	0	10	11	0	0	1	10

STAFFNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	OPROOM	LOS
141294	ORTH	3	24	46	64	0.42	7.59	8.92	1.33	8.12	8.77	0.65	8060	1	10	12	1	41	3	6
141295	ORTH	3	24	41	74		11.09	13.75	2.66	11.52	13.62	2.10	8046	3	10	12	0	0	3	6
141296	ORTH	3	24	46	64	0.25	9.33	10.84	1.51	9.68	10.66	0.98	8221	1	10	12	0	0	3	2
141297	GYN	6	25	44	73		12	12.50	0.50	12.20	12.33	0.13	5421	0	10	12	0	0	2	1
141298	GYN	6	25	44	70		11.12	11.75	0.63	11.42	11.59	0.17	5421	0	10	12	0	0	2	
141299	GYN	1	25	44	70	0.2	9.84	10.92	1.08	10.25	10.75	0.50	6720	2	10	12	0	0	2	1
141300	GYN	1	25	44	70	0.09	8.33	9.75	1.42	8.66	9.59	0.93	7050	0	10	12	0	0	2	5
141301	GYN	1	25	44	73	0.16	7.59	8.16	0.57	7.84	8.00	0.16	6629	0	10	12	1	52	2	1
141310	ORTH	3	21	46	66		13.75	14.75	1.00	14.00	14.75	0.75	7902	0	10	12	0	0	1	2
141311	ORTH	12	25	41	74	0.25	10.33	12.66	2.33	10.60	12.66	2.06	8046	4	10	13	0	52	3	3
141312	ORTH	12	25	41	64	1.2	7.42	9.13	1.71	8.07	8.97	0.90	8196	3	10	13	1	0	3	6
141313	ORTH	2	22	46	64		13.25	17.75	4.50	13.75	17.59	3.84	8145	2	10	13	0	21	1	16
141314	ORTH	12	25	47	74		12.92	14.66	1.74	13.50	14.50	1.00	8060	1	10	13	0	0	3	6
141315	ORAL	11	21	44	70	0.42	7.5	10.42	2.92	8.09	10.25	2.16	7665	2	10	13	1	0	2	
141318	GEN	5	22	46	73	0.16	8.92	9.92	1.00	9.25	9.75	0.50	5301	0	10	13	0	0	1	6
141320	ORAL	11	21	44	70		10.84	13.66	2.82	11.12	13.50	2.38	7662	1	10	13	0	26	2	
141321	GEN	8	21	44	65		14	14.66	0.66	14.33	14.59	0.26	4959	1	10	13	0	0	2	3
141324	ORTH	13	24	44	64	0.16	7.5	8.33	0.83	7.78	8.21	0.43	8201	0	10	14	1	0	3	1
141325	ORTH	13	24	44	74	0.25	8.5	12.09	3.59	9.03	11.92	2.89	8388	1	10	14	0	0	3	4
141326	ORTH	13	24	41	74		12.33	14.09	1.76	12.84	13.87	1.03	8060	2	10	14	0	0	3	3
141327	POD	9	21	46	73	0.25	7.09	8.25	1.16	7.50	8.16	0.66	407	0	10	14	1	0	1	3
141328	GEN	5	22	41	63		9.92	11.16	1.24	10.33	11.09	0.76	5302	0	10	14	0	0	2	2
141329	ORTH	12	22	41	63	0.33	7.66	9.59	1.93	7.92	9.50	1.58	7902	2	10	14	1	52	2	4
141337	GYN	6	25	47	73	0.33	8.5	8.92	0.42	8.66	8.78	0.12	6952	0	10	14	0	0	1	1
141344	GEN	5	25	44	76		13.66	15.42	1.76	14.02	15.25	1.23	5321	0	10	14	0	0	1	3
141353	ORAL	11	26	46	69		10.92	12.16	1.24	11.13	11.78	0.65	7675	1	10	18	0	0	2	
141363	URO	4	24	41	62	0.33	8.25	9.16	0.91	8.59	9.09	0.50	6020	1	10	17	0	0	4	
141364	ORTH	2	23	42	75		7.5	12.25	4.75	7.92	12.16	4.24	8145	1	10	17	1	0	3	12
141365	ORTH	2	25	42	69		11.84	14.66	2.82	12.53	14.53	2.00	8182	0	10	17	0	0	1	5
141366	ORTH	2	25	47	66		13.33	14.59	1.26	13.74	14.42	0.68	8241	0	10	19	0	0	2	5
141367	GYN	6	26	44	65		9.84	10.75	0.91	10.20	10.63	0.43	6850	1	10	17	0	0	2	4
141368	URO	4	24	41	61	0.25	7.59	8.00	0.41	7.78	7.87	0.09	5860	1	10	17	1	52	4	
141369	GYN	6	26	44	66	0.33	7.42	8.25	0.83	7.74	8.09	0.35	7410	0	10	17	1	0	2	5
141370	GYN	6	26	44	66	0.33	8.59	9.05	0.46	8.84	9.35	0.51	6840	0	10	17	0	0	2	4
141375	ORAL	11	26	46	69	0.33	7.5	10.59	3.09	8.00	10.50	2.50	7666	1	10	18	1	0	2	
141377	GEN	8	24	47	79		8.62	9.75	1.13	8.92	9.61	0.69	5302	0	10	18	0	0	1	3
141378	ORTH	14	23	41	70	0.16	7.75	9.09	1.34	7.92	9.05	1.13	2184	1	10	18	1	4	3	3
141379	ENT	10	23	41	70	0.2	9.25	10.25	1.00	9.45	9.92	0.47	2820	0	10	18	0	0	3	
141380	ENT	10	23	41	70		10.45	11.84	1.39	10.66	11.66	1.00	2138	0	10	18	0	0	3	
141381	GEN	8	24	47	79	0.2	7.42	8.42	1.00	7.83	8.28	0.45	5302	1	10	18	1	0	1	
141382	GEN	8	24	47	79	0.09	12.42	13.09	0.67	12.66	13.00	0.34	4946	1	10	18	0	0	1	3
141383	GYN	1	24	44	66	0.16	11	12.15	1.15	11.16	12.09	0.93	5359	2	10	18	0	11	1	11
141389	GEN	5	26	42	79		13	13.92	0.92	13.25	13.84	0.59	5301	0	10	19	0	0	1	3
141390	GYN	1	25	47	66	0.25	12.5	13.09	0.59	12.75	12.92	0.17	6629	0	10	19	0	0	2	1
141391	ORTH	3	23	46	75		11.66	14.66	3.00	12.16	14.50	2.34	8182	2	10	19	0	0	3	10
141392	GYN	1	25	47	69	0.33	9.09	10.25	1.16	9.33	10.16	0.83	5450	2	10	19	0	0	2	5
141397	GEN	8	25	47	66		10.59	11.53	0.94	10.95	11.09	0.14	6850	0	10	19	0	0	2	4
141393	GYN	1	25	47	65	0.27	10.59	11.53	0.94	10.90	11.36	0.46	8512	0	10	19	0	0	2	
141394	ORTH	3	23	46	75	0.16	7.59	11.33	3.74	8.30	11.16	2.86	7781	3	10	19	1	43	3	7
141395	GYN	1	24	41	66	0.16	11.8	12.33	0.53	12.07	12.20	0.13	5421	0	10	19	0	0	2	1
141396	GEN	7	26	42	76	0.5	8.5	10.00	1.50	8.88	9.92	1.04	5122	1	10	19	0	34	1	4

FIRSTNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	OPROOM	LOS
141397	GEN	7	26	42	76	0.42	7.42	8.09	0.67	7.69	8.03	0.34	8630	0	10	19	1	0	1	1
141398	GEN	7	26	42	79	0.16	10.5	12.84	2.34	11.00	12.75	1.75	3859	0	10	19	0	16	1	5
141409	GYN	1	25	47	66	0.22	7.42	8.87	1.45	7.97	8.69	0.72	7410	1	10	19	1	0	2	3
141410	ORTH	14	25	42	76	0.25	9.84	11.05	1.21	10.00	11.33	1.33	1359	1	10	20	0	0	1	2
141411	GEN	8	25	44	76	0.2	11.75	12.97	1.22	12.09	12.80	0.71	5301	0	10	20	0	0	1	2
141412	GEN	5	24	42	78		12.25	13.25	1.00	12.50	13.00	0.50	5300	0	10	20	0	0	2	3
141413	ORTH	12	24	41	69		7.42	12.09	4.67	7.99	11.51	3.52	8145	1	10	20	1	0	3	12
141426	GYN	6	24	44	79	0.3	9.09	10.42	1.33	9.38	10.22	0.84	7050	1	10	21	0	0	2	5
141428	GYN	1	24	41	69	0.09	7.5	8.42	0.92	7.75	8.25	0.50	6909	1	10	21	1	0	2	1
141429	GYN	1	24	41	79		10.72	11.33	0.61	11.03	11.24	0.21	6629	0	10	21	0	0	2	1
141430	ORTH	13	24	41	79		12	12.66	0.66	12.30	12.59	0.29	8084	0	10	21	0	0	2	1
141431	ORTH	13	22	44	64	0.66	10.3	12.00	1.70	10.99	11.92	1.03	8145	1	10	21	0	0	1	2
141432	ORTH	13	22	46	75		7.66	10.09	2.43	8.16	10.00	1.84	8149	2	10	21	1	1	3	2
141433	ORTH	13	22	44	64		12.75	15.42	2.67	13.27	15.33	2.06	8060	2	10	21	0	0	1	2
141443	GYN	6	24	42	64		14.16	15.16	1.00	14.44	15.00	0.56	6662	1	10	20	0	0	1	5
141448	GYN	6	24	41	69	0.16	8.5	8.92	0.42	8.69	8.80	0.11	6952	0	10	21	0	0	2	1
141469	ORTH	2	21	46	78		13.42	14.84	1.42	13.84	14.30	0.46	7781	0	10	24	0	0	2	5
141470	ORTH	2	21	47	64	0.25	8.75	13.16	4.41	9.25	13.00	3.75	8182	1	10	24	0	0	2	5
141471	GYN	5	25	42	70	0.09	12.5	13.67	1.17	13.12	13.30	0.18	6850	0	10	24	0	0	1	5
141472	GYN	6	25	42	72		13.75	14.04	0.29	14.00	14.14	0.14	6639	0	10	24	0	0	1	1
141473	URO	4	25	42	72	0.09	9.09	9.84	0.75	9.33	9.40	0.07	6310	0	10	24	0	0	1	
141474	GYN	1	25	44	65	0.16	11.42	12.16	0.74	11.84	12.02	0.18	5421	0	10	24	0	0	1	1
141475	URO	4	25	42	61	0.09	7.42	8.25	0.83	7.67	8.05	0.38	6400	0	10	24	1	0	1	
141476	GYN	6	25	44	72	0	12.33	12.84	0.51	12.50	12.70	0.20	6909	1	10	24	0	0	1	2
141477	URO	4	25	42	70	0.09	8.33	9.00	0.67	8.59	8.83	0.24	6400	0	10	24	0	0	1	
141478	URO	4	25	42	70	0.09	9.92	11.05	1.13	10.25	11.20	0.95	6382	1	10	24	0	0	1	
141481	ORTH	12	21	47	64	0.33	7.75	8.42	0.67	7.92	8.15	0.23	7902	0	10	24	1	0	2	2
141485	GEN	5	21	42	74		14.5	17.25	2.75	15.09	17.05	1.96	5122	2	10	24	0	0	1	5
141489	URO	4	23	44	62		10.33	11.84	1.51	10.59	11.66	1.07	9969	0	10	25	0	0	4	
141490	URO	4	23	44	72		1.67	10.09	1.42	9.00	10.00	1.00	6495	0	10	25	0	0	1	
141491	URO	4	23	44	72	0.25	7.67	8.42	0.75	8.00	8.22	0.22	6400	0	10	25	1	52	1	
141492	GEN	5	23	44	72		7.5	15.42	7.92	7.75	15.25	7.50	6840	2	10	26	1	0	1	11
141493	GEN	7	25	42	64	0	8.33	11.00	2.67	8.92	10.84	1.92	5122	1	10	25	0	0	2	4
141494	ENT	10	25	42	64	0.25	12.5	13.75	1.25	12.84	13.50	0.66	2820	0	10	25	0	0	2	
141495	ENT	10	24	46	74	0.42	9.66	12.05	2.39	10.00	12.33	2.33	2260	1	10	28	0	0	3	4
141496	ENT	10	25	42	67		14	15.05	1.05	14.33	15.33	1.00	2131	0	10	25	0	0	2	
141497	OEAL	11	23	44	72		12.09	13.05	0.96	12.25	13.33	1.08	2743	0	10	25	0	0	1	
141505	ORTH	3	21	42	66	0.5	9.75	10.67	0.92	9.92	10.50	0.58	7906	1	10	28	0	0	2	8
141514	GYN	6	24	47	74		11.25	12.25	1.00	11.55	12.09	0.54	6669	0	10	26	0	[illegible]	3	4
141515	GEN	5	21	44	66		15.25	16.09	0.84	15.66	16.00	0.34	8512	1	10	26	0	0	2	2
141516	ORTH	3	21	42	64	0.33	7.75	9.42	1.67	8.16	9.33	1.17	8060	3	10	26	1	2	2	2
141517	ORTH	3	21	42	65		11.16	12.33	1.17	11.59	12.25	0.66	8086	1	10	26	0	52	2	9
141519	GYN	1	24	47	74	0.25	8.84	9.16	0.32	8.95	9.07	0.12	6906	0	10	26	0	0	3	1
141520	GYN	1	24	47	78	0.16	7.55	8.16	0.61	7.82	8.05	0.23	5421	0	10	26	1	1	3	1
141521	GYN	1	24	47	74	0.42	9.42	9.75	0.33	9.47	9.66	0.19	6906	1	10	26	0	0	3	1
141522	GYN	1	24	47	78	0.16	8.33	8.66	0.33	8.45	8.59	0.14	6909	0	10	26	0	0	3	1
141523	GYN	6	21	46	66		12.75	13.09	0.34	12.95	13.00	0.05	6952	0	10	25	0	0	3	1
141527	ORTH	2	25	42	66	0.25	7.33	8.84	1.51	7.92	8.75	0.83	8021	0	10	27	1	0	2	3
141534	ORTH	13	24	47	78	0.25	7.5	9.42	1.92	7.83	9.25	1.42	8284	0	10	27	1	0	3	1
141535	ORTH	12	25	42	66		13.75	15.66	1.91	14.14	15.50	1.36	8143	4	10	27	0	0	2	7
141536	GEN	5	21	46	70		13.75	15.59	1.84	14.14	15.50	1.36	620	0	10	27	0	0	1	3

[illegible]REGNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	OPROOM	LOS
141537	GEN	5	21	44	70	0.25	10.66	13.52	2.86	11.20	13.42	2.22	8543	1	10	27	0	0	1	20
141538	GEN	7	21	44	72	0.33	7.59	8.59	1.00	7.97	8.50	0.53	5300	0	10	27	1	52	1	1
141545	ORTH	2	25	42	64	0.25	9.09	11.59	2.50	9.52	11.42	1.90	8388	1	10	27	0	0	2	4
141546	ORTH	12	25	46	64		11.84	13.42	1.58	12.25	13.25	1.00	8060	2	10	27	0	0	2	6
141547	ORTH	3	24	42	72	1.16	10	11.33	1.33	10.16	11.25	1.09	8622	3	10	28	0	0	1	3
141549	ENT	10	24	47	74		12.92	14.00	1.08	13.16	13.66	0.50	3142	1	10	27	0	52	3	
141555	OPTH	13	21	47	64		8.25	12.05	3.80	9.22	12.42	3.20	8181	0	10	28	1	0	2	7
141556	POD	9	25	46	78		7.42	8.05	0.63	7.50	8.50	1.00	407	0	10	28	1	0	3	11
141558	GYN	6	24	42	72	0.02	7.33	8.25	0.92	7.62	8.09	0.47	6850	0	10	28	1	0	1	4
141559	GYN	6	24	42	70	0.05	8.27	8.84	0.57	8.49	8.70	0.21	6629	0	10	28	0	0	1	1
141560	GYN	1	24	42	72	0.12	8.88	9.16	0.28	8.99	9.09	0.10	6906	0	10	28	0	0	1	1
141561	ORTH	13	25	42	70		12.5	15.84	3.34	13.16	15.66	2.50	8183	1	10	28	0	0	1	4
141563	GYN	1	24	41	70	0.16	9.28	9.84	0.56	9.50	9.70	0.20	6629	0	10	28	0	0	1	1
141578	GYN	6	24	42	78	0.09	7.5	8.59	1.09	7.80	8.42	0.62	6551	1	10	31	1	0	1	5
141579	GYN	1	24	42	74		10.5	10.75	0.25	10.57	12.66	2.09	6909	0	10	31	0	0	1	1
141580	GYN	1	24	42	74	0.33	9.5	10.16	0.66	9.75	12.00	2.25	6720	0	10	31	0	0	1	2
141581	GYN	1	24	42	74	0.09	8.66	9.42	0.76	8.92	9.25	0.33	5421	0	10	31	0	0	1	1
141582	ORTH	2	26	41	64	0.25	7.59	8.75	1.16	7.95	8.55	0.60	7760	1	10	31	1	42	2	4
141593	GEN	5	23	47	75		7.5	8.59	1.09	7.80	8.42	0.62	5301	0	10	31	1	0	3	3
141584	ORTH	2	26	41	64		9	12.25	3.25	9.52	11.66	2.14	8182	0	10	31	0	0	2	6
141601	GEN	8	26	44	64		12.66	13.05	0.39	12.89	13.33	0.44	4700	0	10	31	0	0	2	4
141604	GEN	5	24	42	73		12.59	13.66	1.07	12.89	13.47	0.58	5300	0	10	31	0	0	1	1
0F2198	POD	9	9	47	73		9.25	10.25	1.00	9.50	10.16	0.66	8331	0	10	14	0	0	1	
0F2911	GEN	7	22	44	73	0.13	11.25	12.25	1.00	11.50	12.25	0.75	3440	0	10	11	0	0	1	
0F3222	GEN	5	22	47	66		10.5	11.16	0.66	10.75	11.09	0.34	4021	0	10	12	0	0	1	
0F3594	GEN	5	22	47	78		11.75	12.42	0.67	11.92	12.33	0.41	8512	0	10	13	0	0	1	
0F3920	GEN	7	21	47	71		9.84	10.48	0.64	10.16	10.42	0.26	8630	0	10	4	0	0	1	
0F4222	URO	4	24	41	62	0.35	9.42	9.84	0.42	9.62	9.72	0.10	6011	0	10	11	0	0	4	
0F4225	GEN	8	8	44	78	2.25	7.5	8.09	0.59	7.69	8.09	0.40	8621	0	10	20	1	0	2	
0F5225	ENT	10	10	47	74		11.84	12.25	0.41	11.92	12.25	0.33	2171	0	10	11	0	0	3	
0F5494	URO	4	24	41	62		9.5	9.75	0.25	9.59	9.65	0.06	6011	0	10	17	0	0	4	
0F5547	GEN	8	22	44	73	0.33	10	10.92	0.92	10.16	10.84	0.68	8511	0	10	11	0	0	1	
0F7765	GEN	[illegible]	22	44	70	0.16	9.33	9.84	0.51	9.50	9.75	0.25	3440	0	10	11	0	0	1	
0F7793	GEN	8	24	47	75	0.5	9.84	10.05	0.21	10.00	10.42	0.42	4051	0	10	18	0	0	1	
0F7917	GEN	7	22	47	78	0.66	7.92	8.59	0.67	8.16	8.50	0.34	7817	0	10	12	1	1	1	
0F7935	GEN	7	22	47	78	0.25	9.25	10.25	1.00	9.50	10.18	0.66	8339	0	10	12	0	34	1	
0F9011	GEN	5	24	46	79	0.09	11.05	11.66	0.61	11.26	11.59	0.33	8512	0	10	13	0	0	1	
0F8953	GEN	5	23	44	78	0.42	10.33	10.92	0.59	10.50	10.84	0.34	8512	1	10	20	0	41	2	
0F9124	ENT	10	10	46	74	0.33	11.16	11.50	0.34	11.42	11.50	0.08	2171	0	10	11	0	0	3	
0F9752	OPTH	14	25	42	79	0.09	7.66	9.75	2.09	7.92	9.59	1.67	1359	1	10	20	1	41	1	

[illegible]	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURG TIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DF[illegible]S	OPROOM	LOS
141303	GYN	6	23	41	70		13.83	14.83	1.00	14.05	14.58	0.53	7410	4	11	3	0	0	3	28
141588	ENT	10	26	41	66	0.41	8.08	9.08	1.00	8.33	8.92	0.58	2820	0	11	1	0	52	3	
141589	ENT	10	10	41	66		9.50	12.00	2.50	9.75	11.83	2.08	2187	0	11	1	0	0	3	3
141590	GEN	8	21	46	74	0.33	8.33	10.33	2.00	8.67	10.17	1.50	4051	0	11	1	0	0	1	4
141591	GEN	8	21	44	73	0.16	10.67	11.83	1.17	10.17	11.75	1.58	5301	0	11	1	0	0	1	3
141592	GEN	8	21	46	64		12.00	12.75	0.75	12.33	12.67	0.33	4911	2	11	1	0	0	1	3
141597	ORAL	11	24	45	64		11.12	13.92	2.80	11.67	13.67	2.00	7662	1	11	1	0	0	2	4
141598	ORAL	11	24	42	45	0.28	7.33	10.83	3.50	8.00	10.67	2.67	7662	1	11	1	1	0	2	2
141600	ENT	10	26	41	68	0.25	7.50	7.83	0.33	7.67	7.75	0.08	2001	0	11	1	1	0	3	1
141612	ORTH	3	23	45	66		7.50	9.92	[illegible].42	7.95	9.80	1.85	8076	1	11	2	1	0	3	2
141613	GYN	6	26	44	47	0.16	8.75	9.92	1.17	9.12	9.83	0.72	6850	1	11	2	0	0	2	4
141614	GEN	7	24	41	74		10.50	11.83	1.33	10.83	11.67	0.83	5302	0	11	2	0	0	1	4
141615	GEN	7	24	41	73	0.13	7.33	8.58	1.25	7.62	8.42	0.80	5302	0	11	2	1	0	1	3
141616	GEN	7	24	41	74	0.16	8.72	10.33	1.62	9.12	10.17	1.05	5301	0	11	2	0	0	1	3
141617	GYN	6	26	44	71	0.16	7.42	8.58	1.17	7.83	8.50	0.67	6840	0	11	2	1	0	2	5
141618	GEN	7	24	46	64	0.25	7.67	10.17	2.50	8.08	10.00	1.92	4579	0	11	3	1	52	2	8
141619	GYN	1	26	44	71		11.25	12.00	0.75	11.58	11.95	0.37	7073	0	11	2	0	0	2	2
141620	GYN	1	26	44	71	0.25	10.17	11.08	0.92	10.45	10.95	0.50	6629	1	11	2	0	0	2	2
141632	ORTH	2	24	46	66	0.16	10.42	12.17	1.75	10.67	11.92	1.25	8086	3	11	3	0	0	2	4
141633	ORTH	14	21	42	83	0.33	7.67	11.17	3.50	8.38	10.97	2.58	1452	1	11	3	1	18	1	2
141635	ORTH	12	24	46	66	0.32	12.33	14.00	1.67	12.93	13.88	0.95	8041	0	11	3	0	0	2	3
141535	ORTH	12	24	46	66		14.32	15.42	1.10	14.70	15.25	0.55	7766	1	11	3	0	0	2	6
141539	GYN	6	26	41	72		13.42	14.67	1.25	13.70	14.40	0.70	6850	2	11	2	0	0	1	3
141545	GYN	6	23	41	74	0.33	7.50	8.50	1.00	7.75	8.42	0.67	7410	1	11	4	1	0	2	4
141546	GYN	6	23	41	73	0.12	9.92	10.67	0.75	10.17	10.58	0.42	6629	0	11	4	0	0	2	1
141547	GYN	1	24	41	74		11.25	12.00	0.75	11.55	11.83	0.28	6629	0	11	4	0	0	2	1
141548	ORTH	2	21	45	66	0.41	7.67	9.08	1.42	8.00	9.00	1.00	8060	2	11	4	1	13	3	2
141649	GYN	5	6	41	74	0.09	10.78	11.17	0.38	10.93	11.03	0.10	6909	0	11	4	0	0	2	1
141650	GYN	6	23	41	73	0.25	8.83	9.67	0.83	9.08	9.47	0.38	7051	0	11	4	0	0	2	6
141651	ORTH	2	21	42	64		12.42	15.92	3.50	13.00	15.67	2.67	8182	1	11	4	0	0	3	7
141653	ORTH	2	21	42	66	0.33	9.50	12.08	2.58	9.92	12.00	2.08	8182	0	11	4	0	52	3	4
141671	URO	4	21	45	62		13.00	14.17	1.17	13.58	14.08	0.50	6020	0	11	7	0	52	4	6
141672	GYN	1	26	44	74	0.25	7.42	8.25	0.83	7.73	8.17	0.43	7051	0	11	7	1	0	2	4
141673	URO	4	23	42	62	0.16	8.67	9.75	1.08	8.75	9.67	0.92	6020	0	11	8	0	26	4	6
141674	URO	4	21	45	76	0.50	10.42	12.50	2.08	10.95	12.33	1.38	5950	0	11	7	0	1	1	6
141675	URO	4	26	44	66	0.33	9.33	10.33	1.00	9.62	10.20	0.58	6250	0	11	7	0	0	2	2
141676	ORTH	12	23	44	78		10.67	12.50	1.83	11.25	12.42	1.17	7964	0	11	7	0	0	2	3
141677	ORTH	2	25	46	69	0.10	10.83	11.90	1.07	11.30	11.73	0.43	8229	0	11	7	0	0	3	2
141678	ORTH	2	25	42	79	0.09	7.67	10.75	3.08	8.17	10.58	2.42	8182	0	11	7	1	11	3	4
141679	GYN	1	26	44	66	0.33	8.50	9.00	0.50	8.73	8.85	0.12	6629	0	11	7	0	0	2	1
141680	ORTH	2	25	46	69		12.00	14.25	2.25	12.33	14.08	1.75	7767	1	11	7	0	0	3	8
141686	ENT	10	25	41	67		7.58	12.00	4.42	8.00	11.83	3.83	1952	0	11	8	1	1	3	2
141687	GEN	7	26	45	74	0.33	8.92	10.08	1.17	9.20	10.00	0.80	5302	0	11	8	0	0	1	2
141688	URO	4	23	42	66		7.58	8.25	0.67	7.93	8.08	0.15	6310	0	11	8	1	18	2	3
141689	URO	4	23	42	62	0.33	11.00	11.92	0.92	11.25	11.83	0.58	6020	0	11	8	0	0	4	5
141690	URO	4	23	42	62	0.25	9.92	10.75	0.83	10.17	10.67	0.50	6020	0	11	8	0	0	4	5
141692	GEN	7	25	45	79	0.25	7.42	8.67	1.25	7.80	8.58	0.78	5302	0	11	8	1	0	1	3
141693	GEN	7	26	45	79		10.42	11.42	1.00	10.68	11.38	0.70	5302	0	11	8	0	0	1	3
141701	ORTH	2	24	46	79		7.50	14.67	7.17	8.12	14.50	6.38	8377	4	11	14	1	0	3	22

PTREGNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURG TIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	OFROOM	LOS
141708	GYN	1	21	44	76	0.33	8.92	9.42	0.50	9.00	9.28	0.28	6629	0	11	9	0	0	2	1
141709	GYN	1	1	44	76	0.33	8.33	8.58	0.25	8.42	8.57	0.15	6909	0	11	9	0	0	2	1
141710	OTPR	3	25	45	64	0.23	7.42	10.83	3.42	8.00	10.67	2.67	8145	3	11	9	1	0	3	14
141711	ORTH	12	25	45	64		7.42	10.83	3.42	8.00	10.67	2.67	7902	0	11	9	0	0	3	2
141712	GEN	8	26	46	79	0.33	7.33	9.00	1.67	7.73	8.83	1.10	3440	0	11	9	1	0	1	3
141713	GEN	8	26	42	74	0.09	10.17	11.25	1.08	10.38	11.08	0.70	4946	0	11	9	0	0	1	5
141714	GYN	1	21	44	75	0.6	7.50	8.17	0.67	7.67	8.00	0.33	6680	2	11	9	1	0	2	1
141715	GEN	8	8	42	74	0.33	9.33	9.50	0.17	9.50	9.75	0.25	5351	1	11	9	0	0	1	2
141724	GYN	1	1	44	76	0.25	9.67	9.92	0.25	9.75	9.83	0.08	6909	0	11	9	0	0	2	2
141728	ORTH	12	25	41	64	0.16	11.67	13.75	2.08	12.03	13.58	1.55	7936	2	11	10	0	0	3	7
141729	OPTH	14	14	45	83		12.00	13.42	1.42	12.42	13.33	0.92	1359	1	11	10	0	0	2	
141730	GEN	8	23	45	75		12.17	12.92	0.75	12.47	12.92	0.45	5302	1	11	10	0	0	1	3
141731	GEN	7	23	45	79	0.33	10.58	11.83	1.25	11.00	11.75	0.75	5302	0	11	10	0	0	1	7
141733	OPTH	14	14	42	64	0.42	12.17	14.42	2.25	12.50	14.33	1.83	1264	1	11	14	0	1	1	11
141733	OPTH	14	14	45	70	0.33	7.67	9.67	2.00	8.22	9.58	1.37	1264	0	11	10	1	0	2	11
141736	ORTH	2	26	41	64	0.16	7.50	11.50	4.00	7.95	11.33	3.38	8182	0	11	10	1	0	3	7
141737	ORTH	12	26	41	66		13.92	14.75	0.83	14.17	14.75	0.58	8086	1	11	10	0	0	3	9
141747	GEN	8	24	45	71	0.42	7.40	11.50	4.10	7.82	11.33	3.52	5122	4	11	15	1	0	1	15
141757	GYN	1	1	45	0		15.67	16.08	0.42	15.83	16.00	0.17	6952	0	11	10	0	0	1	1
141776	GEN	8	26	44	71	0.16	7.42	9.17	1.75	7.68	9.03	1.35	5122	1	11	16	1	0	1	8
141780	URO	4	26	42	64		7.50	8.08	0.58	7.75	8.00	0.25	6400	0	11	14	1	0	1	8
141781	GYN	1	21	41	79		7.50	9.00	1.50	7.83	8.92	1.08	6840	2	11	14	1	0	2	
141782	GYN	1	21	41	79		11.33	11.92	0.58	11.42	11.83	0.42	6909	1	11	14	0	0	2	2
141783	URO	4	26	42	61		11.50	12.42	0.92	11.75	12.33	0.58	6020	0	11	14	0	0	4	
141784	URO	4	26	42	61	0.33	9.75	11.17	1.42	10.00	11.08	1.08	6020	0	11	14	0	0	4	
141785	URO	4	26	42	62	0.16	8.67	9.58	0.92	8.88	9.50	0.62	6020	0	11	14	0	0	4	
141786	GYN	1	21	41	48	0.25	9.25	11.08	1.83	9.55	10.92	1.37	6850	2	11	14	0	0	2	4
141787	URO	4	26	42	61	0.16	8.25	8.50	0.25	8.38	8.42	0.03	5732	0	11	14	0	0	4	
141789	GEN	8	24	44	48		11.92	14.75	2.83	12.38	14.58	2.20	4576	1	11	15	0	23	1	10
141793	GYN	1	24	42	60		13.92	15.42	1.50	12.20	15.25	3.05	6662	4	11	16	0	0	2	5
141797	GEN	7	25	[illegible]	64		13.75	14.83	1.08	14.05	14.75	0.70	6330	1	11	16	0	0	1	3
141798	GEN	8	26	44	71	0.16	12.50	13.58	1.08	12.68	13.50	0.82	5300	1	11	16	0	0	1	5
141799	ENT	10	10	42	68	0.84	10.42	11.50	1.08	10.58	11.33	0.75	2188	0	11	15	0	0	3	
141800	ENT	10	10	42	68		10.42	11.50	1.08	10.58	11.33	0.75	2188	0	11	15	0	54	3	
141801	ORAL	11	21	41	81	0.59	7.58	12.08	4.50	8.00	11.92	3.92	7662	0	11	15	1	52	2	
141802	ORAL	11	21	41	80		12.67	15.75	3.08	13.08	15.50	2.42	7662	0	11	15	0	28	2	4
141805	ENT	10	25	42	68	0.25	8.08	8.33	0.25	8.17	8.33	0.17	2001	0	11	15	0	0	3	
141810	ORTH	1	26	46	0		14.83	15.67	0.83	15.03	15.55	0.52	7902	0	11	14	0	0	1	3
141815	GYN	6	24	42	78	0.16	9.00	9.58	0.58	9.22	9.38	0.17	5421	0	11	16	0	0	2	1
141817	ORTH	3	21	45	48	0.50	10.50	12.00	1.50	11.22	11.92	0.70	8086	3	11	16	0	0	3	8
141818	ORTH	3	21	45	66	0.33	7.50	10.17	2.67	8.08	10.00	1.92	8046	3	11	16	1	0	3	14
141819	GYN	1	24	42	78	0.16	12.25	13.75	1.50	12.38	13.58	1.20	6850	1	11	16	0	0	2	3
141820	GEN	8	26	44	64	0.25	10.00	11.50	1.50	10.38	11.25	0.87	5122	1	11	16	0	0	1	6
141821	GYN	1	24	42	78	0.27	9.75	11.00	1.25	10.03	10.80	0.77	6840	1	11	16	0	0	2	3
141822	GYN	6	24	42	69	0.16	7.50	8.83	1.33	7.80	8.70	0.90	6840	1	11	16	1	0	2	6
141825	GYN	6	26	46	76		9.83	10.67	0.83	10.02	10.50	0.48	7410	1	11	15	0	0	2	3
141827	GYN	6	25	46	64		13.25	13.92	0.67	13.47	13.83	0.37	5421	0	11	17	0	0	1	2
141829	ORTH	3	21	45	66		12.50	13.75	1.25	13.00	13.58	0.58	8026	0	11	16	0	21	3	7
141834	GYN	1	24	42	78	0.25	11.27	12.00	0.73	11.52	11.83	0.32	6952	1	11	16	0	0	2	1
141841	GEN	7	25	46	64	0.16	7.33	9.00	1.67	7.67	8.87	1.20	5122	1	11	17	1	0	1	5
141842	GEN	7	25	46	64	0.16	10.08	11.50	1.42	10.33	11.33	1.00	5302	0	11	17	0	0	1	6

FILEGNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURG TIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	OPROOM	LOS
141843	GEN	8	25	46	71	0.16	11.67	13.08	1.42	12.12	12.92	0.80	5302	0	11	17	0	0	1	5
141844	ORTH	14	26	42	83	0.25	7.58	9.67	2.08	8.00	9.83	1.83	1530	0	11	17	1	1	2	
141845	ORTH	14	26	42	83		11.92	13.00	1.08	12.25	12.83	0.58	1513	0	11	17	0	0	2	
141846	ORTH	2	21	41	66	0.50	7.50	11.25	3.75	8.08	11.33	3.25	8182	0	11	17	1	52	3	7
141847	ORTH	12	21	44	75	0.42	11.75	14.42	2.67	12.25	14.50	2.25	8060	3	11	17	0	52	3	13
141849	ORTH	12	21	44	69		14.83	16.00	1.17	15.17	15.83	0.67	7768	1	11	17	0	0	3	2
141850	ORTH	13	26	45	75	0.33	7.50	11.42	3.92	8.48	11.25	2.77	8181	0	11	18	1	0	3	7
141859	GYN	5	24	45	76	0.16	9.75	12.42	2.67	10.07	10.23	0.17	6909	1	11	18	0	0	2	1
141850	ORTH	13	13	45	75		11.75	12.67	0.92	12.00	12.50	0.50	8221	0	11	18	0	0	3	1
141852	POD	9	21	44	71	0.42	7.50	8.75	1.25	7.87	8.58	0.72	7759	0	11	18	1	0	1	
14186[illegible]	GYN	5	24	46	69	0.33	10.58	11.17	0.58	10.87	11.33	0.47	6629	0	11	18	0	0	2	1
141854	GYN	1	24	46	69	0.33	7.53	8.17	0.63	7.87	8.03	0.17	6629	0	11	18	1	52	2	1
141865	GYN	6	24	46	69	0.36	8.50	9.38	0.88	8.80	9.58	0.78	6850	0	11	18	0	0	2	3
141855	GYN	1	24	46	79		11.50	12.08	0.58	11.77	12.25	0.48	6720	1	11	18	0	0	2	2
141867	POD	9	21	44	71		9.17	10.50	1.33	9.42	10.42	1.00	7759	0	11	18	0	0	1	
141866	GYN	1	24	45	72	0.15	7.50	8.58	1.08	7.78	8.37	0.58	6850	0	11	21	1	0	2	3
141897	ORTH	2	21	42	79		12.75	15.83	3.08	13.58	15.67	2.08	8182	1	11	21	0	52	3	7
141898	ORTH	2	21	42	79	0.42	7.50	12.33	4.83	7.92	12.17	4.25	8145	3	11	21	1	0	3	13
141839	GEN	7	25	45	79	0.00	8.00	12.75	4.75	8.50	12.25	3.75	5122	4	11	23	1	25	1	20
141890	ORTH	3	24	45	66		12.58	14.08	1.50	12.95	13.97	1.02	8253	1	11	21	0	0	2	3
141891	GYN	6	24	45	66	0.36	8.73	9.83	1.10	9.10	9.67	0.57	6840	0	11	21	0	0	2	4
141893	GYN	1	24	45	66	0.25	11.75	12.33	0.58	12.00	12.23	0.23	6909	1	11	21	0	0	2	1
141893	GYN	1	24	45	66	0.33	10.20	11.42	1.22	10.47	11.30	0.83	6850	0	11	21	0	0	2	3
141894	GEN	7	24	44	70	0.22	8.67	11.67	3.00	9.05	11.50	2.45	4576	1	11	22	0	0	1	9
141895	ORAL	11	23	44	81	0.41	7.58	13.00	5.42	8.05	12.83	4.78	7670	1	11	21	1	18	1	
141901	GEN	8	24	44	78	0.33	7.42	8.33	0.92	7.78	8.20	0.42	5359	0	11	22	1	0	1	2
141902	ORTH	13	23	42	66		11.58	13.83	2.25	11.95	13.75	1.80	460	0	11	22	0	0	2	2
141903	ORTH	13	25	45	76		13.37	15.83	2.47	14.02	15.75	1.73	8046	2	11	22	0	0	3	4
141904	ENT	10	25	45	67	0.33	7.75	8.00	0.25	7.83	7.90	0.07	2001	0	11	22	1	1	3	
141905	GYN	1	23	44	73		13.42	14.58	1.17	13.70	14.50	0.80	6662	2	11	21	0	0	1	4
141906	ORAL	11	23	42	80		7.58	9.92	2.33	8.00	9.75	1.75	7662	1	11	22	1	18	2	
141907	ORTH	13	13	44	66	0.25	7.17	8.42	1.25	7.45	8.42	0.97	7862	0	11	23	1	0	2	2
141909	ORTH	13	25	45	73		9.58	11.67	2.08	10.17	11.50	1.33	8086	1	11	22	0	0	3	2
141917	GYN	1	21	44	72		10.08	10.67	0.58	10.33	10.58	0.25	5421	0	11	23	0	0	2	1
141918	GYN	1	21	44	72	0.25	9.42	9.83	0.42	9.50	9.75	0.25	7031	0	11	23	0	0	2	1
141919	GEN	8	23	45	70		12.67	14.33	1.67	13.05	14.20	1.15	5122	2	11	23	0	0	1	8
141923	GYN	1	1	44	66	0.33	8.67	9.08	0.42	8.75	9.00	0.25	8901	1	11	23	0	0	2	1
141947	URO	4	24	45	78		11.42	13.00	1.58	11.75	12.87	1.12	6382	0	11	28	0	0	1	
141948	URO	4	24	45	78	0.16	10.00	11.25	1.25	10.43	11.08	0.65	6310	0	11	28	0	0	1	
141949	URO	4	24	45	62	0.28	7.50	7.92	0.42	7.67	7.75	0.08	5732	0	11	28	1	0	4	
141950	ORTH	2	25	42	73	0.25	7.38	11.92	4.53	7.83	11.75	3.92	8145	2	11	28	1	0	3	15
141951	GYN	15	23	44	74		9.00	10.17	1.17	9.33	10.07	0.73	6840	1	11	28	0	0	2	6
141952	GYN	15	23	44	74	0.28	7.50	8.72	1.22	7.95	8.63	0.68	6840	1	11	28	1	0	2	5
141953	ORTH	2	25	42	69		12.17	14.58	2.42	12.33	14.42	2.08	7901	0	11	28	0	0	3	8
141954	ORAL	11	23	42	80		10.67	13.67	3.00	10.92	13.50	2.58	2319	1	11	29	0	13	2	
141957	URO	4	24	42	71		13.58	14.42	0.83	13.87	14.17	0.30	8604	2	11	29	0	0	1	
141958	GEN	8	24	44	70	0.59	11.72	13.00	1.28	12.83	13.83	1.00	5301	0	11	29	0	0	1	4
141959	ENT	10	21	45	68	0.33	10.25	11.67	1.42	10.50	11.42	0.92	2820	0	11	29	0	5	3	
141960	ENT	10	25	41	68		13.50	14.75	1.25	13.67	14.75	1.08	2188	0	11	30	0	52	2	
141961	ENT	10	21	45	68		12.00	14.50	2.50	12.42	14.42	2.00	2131	1	11	29	0	0	3	
141962	ORAL	11	23	42	81	0.42	7.58	10.25	2.67	8.25	10.08	1.83	2630	0	11	29	1	13	2	

PTREGNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURG TIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	OPROOM	LOS
141953	GEN	8	24	44	71	0.16	7.42	9.58	2.17	7.78	9.47	1.68	5122	1	11	29	1	0	1	4
141968	ORTH	3	21	45	69	1.00	7.50	9.25	1.75	8.08	9.17	1.08	8060	4	11	29	1	0	3	5
141970	URO	4	24	45	21		8.20	9.67	1.47	8.50	9.50	1.00	8703	1	11	28	0	52	4	
141975	GEN	7	21	42	70	0.16	9.25	11.42	2.17	9.58	11.33	1.75	5301	0	11	30	0	0	1	3
141976	GEN	7	21	42	71		13.17	13.75	0.58	13.50	13.67	0.17	6821	0	11	30	0	0	1	24
141977	GYN	15	25	41	74	0.00	7.83	9.75	1.92	8.17	9.58	1.42	6840	2	11	30	1	0	2	5
141978	GYN	6	25	41	74	0.25	10.17	11.08	0.92	10.55	10.92	0.37	8783	2	11	30	0	0	2	2
141979	GYN	6	25	41	74	0.66	12.33	12.83	0.50	12.50	12.67	0.17	7031	0	11	30	0	0	2	1
141981	ORTH	3	24	44	73		7.92	11.08	3.17	8.50	10.92	2.42	8377	4	11	30	1	0	3	7
141992	GYN	6	25	41	64	0.16	11.33	12.17	0.83	11.67	12.05	0.38	7052	1	11	30	0	0	2	3
141994	GYN	6	25	41	64	0.09	9.75	10.08	0.33	9.88	9.98	0.10	6951	0	11	30	0	0	2	1
141995	ORTH	3	24	44	73		12.67	14.75	2.08	13.25	14.58	1.33	7766	2	11	30	0	0	3	7
141991	GEN	5	23	41	64		13.92	14.67	0.75	14.25	14.55	0.30	4901	0	11	29	0	0	2	3
141823	GEN	8	8	46	71	0.25	11.75	12.25	0.50	11.95	12.17	0.22	8621	0	11	16	0	0	1	3
0F0449	GEN	8	8	46	74	0.27	7.50	8.08	0.58	7.70	8.10	0.40	8349	0	11	1	1	0	1	
0F0947	GEN	8	8	45	75	0.33	8.58	9.25	0.67	8.78	9.17	0.38	5430	0	11	10	0	0	1	
0F1402	ORTH	14	14	45	83	0.33	10.00	11.67	1.67	10.58	11.58	1.00	1359	1	11	10	0	0	2	
0F2042	ORTH	14	26	42	83	0.25	9.92	11.67	1.75	10.17	11.50	1.33	809	0	11	17	0	0	2	
0F2536	GEN	7	7	44	70	0.22	10.83	11.50	0.67	11.17	11.42	0.25	8630	0	11	29	0	0	1	
0F2801	ORTH	14	14	42	83		13.33	14.83	1.50	13.75	14.67	0.92	3821	0	11	3	0	0	1	
0F4203	GEN	7	7	45	79	0.16	7.58	8.42	0.83	7.83	8.33	0.50	8512	0	11	10	1	41	1	
0F5004	ENT	10	10	45	67	0.25	8.33	9.33	1.00	8.53	9.33	0.80	1829	0	11	22	0	0	3	
0F5503	GEN	8	8	42	79		11.33	12.42	1.08	11.50	12.33	0.83	8603	0	11	9	0	0	1	
0F6263	GEN	7	24	44	72		11.88	12.92	1.03	12.03	12.75	0.72	7769	0	11	22	0	0	1	
0F9337	GEN	7	7	42	71	0.33	8.00	8.92	0.92	8.13	8.83	0.70	8512	0	11	30	1	0	1	
0F8435	ORTH	14	14	42	83	0.33	11.50	13.00	1.50	11.92	12.92	1.00	842	0	11	3	0	0	1	
0F8701	ORTH	14	14	45	83	0.66	7.67	9.75	2.08	8.17	9.67	1.50	1359	1	11	7	1	17	1	

[illegible]	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURG TIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	OPROOM	LOS
141983	ORTH	13	25	44	64		7.42	13.33	5.92	8.42	13.17	4.75	8159	0	12	2	1	0	3	13
142004	ORTH	2	23	41	64		11.08	14.17	3.08	11.75	14.05	2.30	8182	2	12	1	0	0	3	8
142005	ORTH	12	23	41	73	0.00	7.50	11.83	4.33	8.12	11.75	3.63	8145	3	12	1	1	0	3	13
142006	GYN	2	21	42	70		12.17	14.00	1.83	12.58	13.92	1.33	8081	2	12	2	0	11	1	3
142009	GEN	8	25	44	70	0.09	7.42	8.67	1.25	7.83	8.50	0.67	5300	0	12	1	1	0	1	3
142019	GYN	6	24	41	74	0.25	7.42	8.58	1.17	7.67	8.42	0.75	6840	1	12	2	1	0	2	5
142020	GYN	6	24	41	71	0.16	8.83	9.75	0.92	9.12	9.62	0.50	6850	0	12	2	0	0	2	5
142021	GYN	6	24	41	71	0.92	9.92	10.58	0.67	10.25	10.38	0.13	5421	0	12	2	0	0	2	2
142022	GYN	1	24	41	71		11.50	12.17	0.67	11.75	11.98	0.23	5421	1	12	2	0	0	2	2
142023	POD	9	22	42	70	0.33	7.42	9.33	1.92	8.00	9.17	1.17	7769	0	12	2	1	0	1	
142028	GYN	1	22	42	74	0.66	9.67	11.50	1.83	9.92	11.33	1.42	6850	2	12	2	0	0	1	
142029	GYN	1	21	41	72		15.07	16.02	0.95	15.08	16.33	1.25	7079	3	12	2	0	0	1	6
142044	ORTH	13	13	42	74	0.66	8.75	9.75	1.00	9.05	9.67	0.62	8284	1	12	5	0	0	3	1
142045	GYN	1	25	41	70	0.33	11.75	12.50	0.75	12.03	12.17	0.13	6629	0	12	5	0	0	2	2
142046	ORTH	13	25	42	74	0.25	7.50	8.50	1.00	7.87	8.33	0.47	8221	0	12	5	1	0	3	2
142047	GYN	15	25	45	72		12.83	13.25	0.42	13.00	13.08	0.08	6739	0	12	5	0	0	2	1
142048	GYN	15	24	45	72	0.22	9.17	10.25	1.08	9.48	10.05	0.57	6850	1	12	5	0	0	2	9
142049	GYN	1	24	45	72	0.25	10.47	11.50	1.03	10.75	11.33	0.58	6850	0	12	5	0	0	2	3
142050	GYN	1	24	45	72	0.25	7.42	8.58	1.17	7.78	8.80	1.02	6840	2	12	5	1	0	2	4
142051	URO	4	28	44	61		8.17	8.75	0.58	8.42	8.58	0.17	5600	1	12	5	0	0	4	
142052	URO	4	28	44	66		9.17	10.17	1.00	9.42	10.00	0.58	6310	1	12	5	0	18	1	
142053	URO	4	28	44	66		11.17	12.08	0.92	11.50	11.92	0.42	6310	0	12	5	0	0	1	
142054	GEN	8	25	41	50	0.16	7.42	10.92	3.50	7.83	10.75	2.92	4574	1	12	6	1	0	1	12
142060	GYN	15	28	45	79		14.17	15.25	1.08	14.50	15.08	0.58	7410	0	12	5	0	0	1	3
142062	ORAL	11	28	45	80		7.67	14.92	7.25	8.08	14.75	6.67	7662	1	12	6	1	25	2	
142064	ENT	10	23	42	67	0.25	8.17	8.50	0.33	8.35	8.38	0.03	2001	0	12	6	0	0	3	
142067	GEN	5	25	44	66		11.08	12.33	1.25	11.38	12.17	0.78	5301	0	12	6	0	0	1	3
142068	ENT	10	23	42	67	0.09	7.67	8.08	0.42	7.77	7.95	0.18	2001	0	12	6	1	1	3	
142069	ENT	10	23	42	67	0.25	9.83	10.25	0.42	9.97	10.08	0.12	2171	0	12	6	0	0	3	
142070	ENT	10	23	42	67	0.25	8.75	9.58	0.83	9.08	9.42	0.33	2820	0	12	6	0	0	3	
142073	ORTH	3	25	42	74		10.42	11.17	0.75	10.63	11.33	0.70	8627	1	12	5	0	0	3	1
142080	GYN	15	28	44	72	0.33	7.58	8.92	1.33	7.92	8.83	0.92	7050	1	12	7	1	1	2	7
142081	ORTH	13	23	42	70	0.16	7.67	8.50	0.83	8.02	8.42	0.40	8221	1	12	7	1	1	3	1
142082	ORTH	13	13	42	70	0.50	8.67	9.50	0.83	8.75	9.42	0.67	8201	1	12	7	0	0	3	1
142083	GYN	1	23	42	74	0.42	10.00	10.58	0.58	10.20	10.45	0.25	6629	0	12	7	0	0	3	2
142084	GYN	6	28	44	78		10.83	12.92	2.08	11.23	12.75	1.52	6551	1	12	7	0	0	2	5
142085	GYN	6	28	44	64	0.25	9.25	10.58	1.33	9.62	10.50	0.88	6840	2	12	7	0	0	2	5
142086	GYN	1	23	42	70		11.00	12.25	1.25	11.28	12.08	0.80	6850	0	12	7	0	0	3	4
142087	GEN	8	25	41	79	0.13	7.50	8.43	0.93	7.78	8.27	0.48	5300	0	12	7	1	0	1	1
142088	GEN	5	25	41	66	0.09	9.92	11.00	1.08	10.25	10.83	0.58	5301	0	12	7	0	0	1	2
142089	GEN	8	25	41	79	0.16	8.57	9.75	1.18	8.90	9.58	0.68	5302	1	12	7	0	0	1	2
142098	ORTH	1	23	42	70		11.00	12.25	1.25	11.28	12.08	0.80	8086	1	12	8	0	0	1	2
142099	ORTH	12	28	45	50		13.67	15.08	1.42	14.08	14.92	0.83	8046	2	12	8	0	0	1	7
142100	ORTH	12	28	45	66	0.25	12.17	13.42	1.25	12.58	13.25	0.67	443	1	12	8	0	0	1	2
142101	ORTH	12	28	45	79	0.33	7.50	10.08	2.58	7.88	10.00	2.12	8086	3	12	8	1	0	1	8
142104	GEN	5	23	41	74		13.17	14.33	1.17	13.50	14.25	0.75	5301	0	12	8	0	0	3	2
142105	GEN	8	23	44	74	0.16	8.50	11.08	2.58	8.80	10.92	2.12	5361	1	12	8	0	0	3	12
142114	GEN	8	21	44	74	0.25	7.33	8.25	0.92	7.58	8.08	0.50	4700	0	12	8	1	0	3	4
142118	GYN	6	6	45	69	0.28	10.50	10.83	0.33	10.63	10.72	0.08	6909	0	12	9	0	0	1	1

FTREGNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURG TIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	OFROOM	LOS
142119	GYN	6	25	44	66	0.16	11.12	12.17	1.05	11.35	12.00	0.65	6850	0	12	9	0	0	1	3
142120	GYN	15	25	45	70	0.25	12.33	13.92	1.58	12.62	13.75	1.13	6850	2	12	9	0	0	1	7
142121	GYN	1	25	45	79	0.16	7.50	9.42	1.92	7.80	9.25	1.45	524	3	12	9	1	0	1	4
142122	GYN	15	25	45	69	0.16	9.58	10.33	0.75	9.92	10.25	0.33	6629	0	12	9	0	0	1	1
142123	ORTH	3	28	42	50	0.16	7.42	10.83	3.42	8.02	10.75	2.73	8377	5	12	9	1	0	2	8
142124	ORTH	3	28	42	72		11.00	13.92	2.92	11.58	13.83	2.25	8377	3	12	9	0	0	2	8
142127	GEN	5	23	44	0	0.16	12.17	13.00	0.83	12.42	12.83	0.42	4700	0	12	8	0	0	3	3
142134	GYN	15	15	45	70		10.08	14.50	4.42	14.25	14.33	0.08	6952	0	12	9	0	0	1	1
142137	URO	4	24	44	62		9.25	10.33	1.08	9.63	10.17	0.53	5749	0	12	13	0	17	4	
142138	GYN	15	24	41	64	0.16	8.72	10.00	1.28	9.02	9.83	0.82	6840	1	12	14	0	16	2	10
142150	ORTH	2	21	45	72		10.50	12.25	1.75	11.00	12.17	1.17	8060	2	12	12	0	54	1	5
142151	ORTH	2	21	45	72		10.05	12.25	2.20	11.00	12.17	1.17	8060	2	12	12	0	0	2	3
142152	ORTH	2	21	45	74	0.25	9.08	10.25	1.17	9.42	10.17	0.75	8086	1	12	12	0	0	2	3
142153	URO	4	24	42	61	0.33	9.83	11.00	1.17	10.25	10.92	0.67	6020	0	12	12	0	0	4	
142154	URO	4	24	42	62		7.58	8.92	1.33	7.92	8.75	0.83	6310	0	12	12	1	1	3	
142155	ORTH	2	21	45	72	0.25	7.58	8.83	1.25	8.00	8.75	0.75	8081	1	12	12	1	27	2	2
142156	GYN	1	28	41	73	0.16	7.50	9.08	1.58	7.82	8.92	1.10	6840	0	12	12	1	0	1	3
142157	GYN	6	28	41	79		11.08	11.67	0.58	11.33	11.50	0.17	6629	0	12	12	0	0	1	1
142158	URO	4	24	42	61		11.33	12.42	1.08	11.67	12.25	0.58	6020	0	12	12	0	0	4	
142159	GYN	6	28	41	73	0.16	9.25	9.83	0.58	9.52	9.75	0.23	6629	0	12	12	0	0	1	1
142160	GYN	6	28	41	73	0.25	10.00	10.83	0.83	10.33	10.67	0.33	6850	0	12	12	0	0	1	4
142161	URO	4	23	45	0	0.42	10.58	11.83	1.25	11.00	11.75	0.75	6020	1	12	18	0	0	3	
142163	GEN	5	28	42	73		12.92	17.92	5.00	13.50	17.58	4.08	4360	2	12	14	0	0	1	12
142168	ENT	10	28	42	68	0.16	8.00	8.50	0.50	8.25	8.33	0.08	7671	0	12	13	0	0	2	
142169	ENT	10	10	42	0	0.16	8.67	10.17	1.50	8.92	10.12	1.20	2188	0	12	13	0	0	2	
142171	GEN	8	23	45	76		13.45	14.75	1.30	13.78	14.58	0.80	5300	1	12	13	0	0	1	4
142172	GEN	8	23	45	73	0.20	10.75	13.25	2.50	11.17	13.08	1.92	5361	0	12	13	0	0	1	9
142173	GEN	5	21	45	72	0.42	7.50	9.25	1.75	7.92	9.12	1.20	630	0	12	13	1	0	1	3
142174	URO	4	24	44	62	0.16	7.67	8.08	0.42	7.83	7.90	0.07	5860	1	12	13	1	16	4	
142176	ENT	10	28	42	68	0.25	7.50	7.75	0.25	7.67	7.70	0.03	2001	0	12	13	1	0	2	
142187	GYN	6	24	41	70	0.38	7.42	8.33	0.92	7.73	8.17	0.43	7410	0	12	14	1	0	2	3
142188	GYN	6	24	41	69	0.22	11.92	13.83	1.92	12.63	13.67	1.03	6850	2	12	14	0	16	2	5
142189	GYN	6	24	41	69	0.50	10.17	11.42	1.25	10.45	11.25	0.80	6850	3	12	14	0	0	2	4
142190	GYN	1	24	41	64		14.05	14.70	0.65	14.33	14.53	0.20	5421	0	12	14	0	0	2	1
142192	GEN	5	28	44	73	0.50	10.33	11.17	0.83	10.65	11.08	0.43	5301	0	12	14	0	0	1	3
142193	GEN	7	28	44	73	0.33	7.50	9.00	1.50	8.92	9.58	0.67	5122	1	12	14	1	0	1	6
142194	ORTH	12	21	45	78	0.33	8.75	10.42	1.67	9.20	10.33	1.13	460	1	12	14	0	0	3	4
142195	ORTH	13	21	45	66		7.87	8.42	0.55	7.67	8.33	0.67	9826	0	12	14	1	16	3	1
142195	ORTH	12	21	45	66		10.75	12.00	1.25	11.22	11.92	0.70	443	0	12	14	0	0	3	6
142204	ORTH	12	28	42	91	0.25	7.67	10.75	3.08	8.07	10.58	2.52	8377	5	12	15	1	1	2	8
142205	GEN	5	23	41	73	0.33	7.63	10.00	2.37	8.08	9.83	1.75	640	0	12	15	1	13	1	5
142206	GEN	5	23	41	79		10.33	12.83	2.50	10.73	12.67	1.93	620	1	12	15	0	0	1	5
142209	ORTH	12	28	42	66		11.00	15.58	4.58	11.33	15.50	4.17	8377	6	12	15	0	0	2	16
142214	GYN	1	21	44	78	0.16	14.33	14.92	0.58	14.50	14.83	0.33	6909	1	12	16	0	0	1	2
142216	POD	9	21	44	78	0.33	7.50	8.42	0.92	7.78	8.33	0.55	8339	0	12	16	1	0	1	
142217	GYN	1	21	44	78		15.08	15.67	0.58	15.30	15.50	0.20	6629	0	12	16	0	0	1	2
142218	GEN	5	25	42	92		8.58	11.17	2.58	8.95	11.00	2.05	4571	2	12	22	0	0	2	
142218	GYN	1	24	41	51	0.25	12.03	13.25	1.22	12.48	13.08	0.60	6850	1	12	16	0	0	2	
142220	GYN	15	24	41	69		13.42	14.32	0.90	13.75	14.15	0.40	6850	0	12	16	0	0	2	4
142221	ORTH	3	23	45	66	0.33	7.47	10.25	2.78	8.13	10.08	1.95	8181	3	12	16	1	0	3	5
142222	GEN	8	21	44	65		10.25	12.75	2.50	10.62	12.50	1.88	8543	0	12	16	0	1	1	6

[illegible]	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURG TIME	ICD-9	ADLPROCD	MONTH	DAY	FIRSTCASE	DELAYS	OFROOM	LOS
142223	POD	9	21	44	78	0.50	8.75	9.75	1.00	9.08	9.67	0.58	7759	0	12	16	0	0	1	
142224	GYN	6	23	44	66		10.17	11.22	1.05	10.47	11.08	0.62	7410	1	12	28	0	0	1	17
142229	GYN	6	24	41	79	0.22	7.42	8.25	0.83	7.67	8.08	0.42	6529	0	12	16	1	0	2	4
142234	GYN	15	28	45	0	0.25	14.75	15.00	0.25	14.83	14.87	0.03	6952	0	12	16	0	0	3	1
142236	GYN	15	15	45	0		15.25	15.50	0.25	15.42	15.48	0.07	6952	0	12	16	0	0	3	1
142247	URO	4	24	45	0	0.22	8.67	9.87	1.20	9.08	9.70	0.62	5700	2	12	19	0	0	4	
142248	URO	4	24	45	0	0.16	10.08	11.50	1.42	10.67	11.33	0.67	6020	0	12	19	0	0	4	
142249	GYN	1	21	42	64	0.25	7.58	8.92	1.33	7.92	8.83	0.92	6840	1	12	19	1	1	2	5
142250	GYN	1	21	42	70	0.42	9.17	10.25	1.08	9.42	10.12	0.70	6850	0	12	19	0	0	2	4
142251	GYN	15	21	42	70	0.25	10.67	11.83	1.17	11.08	11.73	0.65	6850	1	12	19	0	18	2	5
142252	GYN	1	21	45	64		12.08	13.17	1.08	12.28	13.05	0.77	7073	1	12	19	0	0	2	3
142253	URO	4	24	45	76		7.58	8.50	0.92	7.98	8.33	0.35	6400	0	12	19	1	1	1	
142254	ORTH	2	25	41	88	0.25	7.42	8.33	0.92	7.72	8.17	0.45	7760	0	12	19	1	0	3	4
142255	ORTH	2	25	41	88	0.25	8.58	9.83	1.25	8.83	9.70	0.87	8086	2	12	19	0	0	3	4
142256	ORTH	2	25	41	75	0.16	10.08	12.75	2.67	10.50	12.58	2.08	8182	0	12	19	0	0	3	6
142257	ORTH	2	25	41	88		12.92	15.00	2.08	13.45	14.92	1.47	7767	2	12	19	0	0	3	5
142261	GEN	8	8	41	64	0.33	9.42	9.92	0.50	9.58	9.83	0.25	8621	0	12	20	0	0	2	1
142263	GEN	8	21	41	76		10.25	13.00	2.75	10.58	12.83	2.25	8543	1	12	20	0	0	2	7
142264	GEN	7	25	45	75		8.80	10.17	1.37	9.12	10.08	0.97	5349	0	12	20	0	0	1	2
142265	GEN	7	25	45	73	0.22	7.40	8.58	1.18	7.80	8.50	0.70	5349	0	12	20	1	0	1	2
142266	GEN	5	23	42	70		8.92	9.67	0.75	9.18	9.50	0.32	630	0	12	20	0	17	3	2
142269	ORAL	11	21	41	81	0.42	7.58	9.00	1.42	8.00	8.88	0.88	7665	0	12	20	1	0	2	
142271	ENT	10	23	42	67	0.42	7.50	8.50	1.00	7.67	8.33	0.67	2820	0	12	20	1	0	3	
142279	GEN	8	23	45	75	0.16	7.50	9.00	1.50	8.08	8.88	0.80	5300	1	12	21	1	0	1	3
142290	GYN	1	1	42	74		11.08	12.25	1.17	12.05	12.17	0.12	6909	0	12	21	0	0	2	1
142292	ORTH	13	21	42	70		7.33	8.83	1.50	8.08	8.75	0.67	8313	1	12	21	1	1	3	1
142293	GYN	1	24	41	74	0.18	7.55	8.58	1.03	7.90	8.42	0.52	7410	0	12	21	1	52	2	4
142295	GYN	1	24	41	64	0.69	8.77	10.08	1.32	9.22	9.92	0.70	6840	2	12	21	0	0	2	4
142299	ORTH	12	24	41	70		7.42	9.00	1.58	8.00	8.88	0.88	8060	2	12	22	1	0	3	2
142292	GEN	9	24	45	0		10.50	11.67	1.17	10.90	11.58	0.68	5300	0	12	22	0	0	1	2
142293	GYN	1	24	41	64	0.09	10.78	11.83	1.05	11.12	11.67	0.55	7410	1	12	21	0	0	2	3
142298	GEN	9	25	45	92	0.25	7.50	9.08	1.58	7.83	9.00	1.17	4700	0	12	22	1	0	1	7
142302	GYN	6	25	45	66		13.55	14.58	1.03	13.87	14.48	0.62	6662	0	12	22	0	0	1	2
142313	GYN	1	1	41	74		11.08	11.42	0.33	11.22	11.30	0.08	6952	0	12	24	0	0	1	1
142329	GEN	7	24	45	66	0.33	7.42	9.83	2.42	8.07	9.67	1.60	4022	0	12	28	1	0	1	5
142339	ORTH	2	24	44	70		7.62	11.92	4.30	8.17	11.75	3.58	8377	2	12	29	1	26	1	15
142345	GYN	6	25	42	70		9.00	10.25	1.25	9.30	10.08	0.78	6840	1	12	30	0	0	2	6
142346	GYN	6	25	42	70	0.16	7.42	8.83	1.42	7.75	8.67	0.92	6850	2	12	30	1	0	2	4
0F0768	OFTH	14	14	42	64	0.25	11.45	12.75	1.30	11.75	12.67	0.92	1359	1	12	8	0	0	2	
0F1229	OFTH	14	14	45	76	0.42	8.33	10.25	1.92	8.75	10.25	1.50	809	0	12	15	1	1	3	
0F1929	ENT	10	10	42	68		10.33	11.00	0.67	10.58	10.95	0.37	1840	0	12	13	0	0	2	
0F2042	OFTH	14	14	45	83		10.67	12.42	1.75	10.83	12.42	1.58	870	0	12	15	0	0	3	
0F2159	OFTH	14	14	45	64		12.25	13.08	0.83	12.75	13.00	0.25	1390	0	12	16	0	41	3	
0F2158	OFTH	14	14	45	83	0.25	7.58	10.42	2.83	8.17	10.33	2.17	1359	1	12	1	1	0	2	
0F2270	URO	4	28	44	0		10.83	11.10	0.27	10.87	10.90	0.03	6496	0	12	5	0	26	4	
0F2803	GEN	7	7	44	73		11.67	12.08	0.42	11.78	12.08	0.30	8630	0	12	14	0	1	1	
0F3137	ENT	10	23	42	67		10.50	11.50	1.00	10.80	11.42	0.62	8339	0	12	6	0	0	3	
0F3507	GEN	5	5	44	70	0.33	11.25	11.83	0.58	11.47	11.75	0.28	3859	0	12	8	0	0	3	
0F4354	OFTH	14	14	42	64	0.28	7.50	9.67	2.17	8.12	9.58	1.47	1359	1	12	8	1	0	2	
0F5303	GEN	8	8	45	72	0.16	9.67	10.58	0.92	9.83	10.50	0.67	3893	0	12	13	0	17	1	
0F5119	OFTH	14	14	45	83	0.25	10.67	12.25	1.58	11.17	12.17	1.00	1359	1	12	1	0	0	2	

PTREGNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURG TIME	ICD-9	ADLFROCD	MONTH	DAY	FIRSTCASE	DELAYS	OPROOM	LOS
0F6177	GEN	7	7	46	78		12.00	12.75	0.75	12.17	12.62	0.45	3893	0	12	29	0	0	2	
0F6204	GEN	8	8	44	70		9.67	10.75	1.08	9.92	10.50	0.58	4011	0	12	1	0	0	1	
0F6493	OFTH	14	14	45	83		12.67	14.08	1.42	13.08	14.00	0.92	1359	1	12	1	0	41	2	
0F6963	GEN	7	7	44	79	0.33	9.33	10.00	0.67	9.58	10.00	0.42	8630	0	12	14	0	0	1	
0F7144	GEN	8	8	42	64		13.00	13.92	0.92	13.13	13.83	0.70	8630	0	12	8	0	0	2	
0F7193	URO	4	28	44	61	0.25	7.58	7.92	0.33	7.75	7.80	0.05	6011	0	12	5	1	18	4	
0F7985	OFTH	14	14	42	72	0.28	9.95	11.17	1.22	10.25	11.08	0 83	1359	1	12	8	0	0	2	
142219	GYN	1	24	41	0	0.25	8.47	11.78	3.32	9.00	11.62	2.62	6679	0	12	16	0	0	2	

REFERNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	DATE	FIRSTCASE	DELAYS	OPROOM	LOS
142291	ORTH	2	25	44	0		10.75	11.25	0.50	10.92	11.17	0.25	9326	0	13	4	0	0	1	36
142315	URO	4	24	44	61	0.33	8.08	8.92	0.83	8.33	8.75	0.42	5749	3	13	10	0	0	4	
142360	URO	4	25	44	72		8.50	9.08	0.58	8.67	8.92	0.25	6310	0	13	3	0	0	3	
142361	ORAL	11	23	45	80		10.42	11.67	1.25	10.75	11.58	0.83	7662	0	13	3	0	0	2	
142362	URO	4	25	44	64	0.25	7.42	8.25	0.83	7.83	8.17	0.33	6400	0	13	3	1	0	3	
142363	URO	4	25	44	61		12.25	13.92	1.67	13.08	13.75	0.67	6020	0	13	4	0	1	4	
142364	ORAL	11	23	45	80	0.33	7.50	10.08	2.58	7.95	9.98	2.03	7662	1	13	3	1	0	2	
142371	GEN	7	23	45	66		13.25	14.75	1.50	13.50	14.58	1.08	4700	0	13	3	0	0	1	
142373	GYN	1	21	41	72	0.25	9.83	10.92	1.08	10.05	10.75	0.70	6840	1	13	4	0	0	2	4
142374	GYN	5	21	41	72	0.25	13.50	14.17	0.67	13.68	14.03	0.35	6850	0	13	4	0	0	2	4
142375	GYN	5	21	45	70		14.42	15.00	0.58	14.67	14.83	0.17	6629	0	13	4	0	0	2	1
142376	ORTH	13	24	46	66	0.22	12.22	14.00	1.78	12.88	13.92	1.03	8026	0	13	4	0	0	3	
142377	ORTH	13	24	42	64	0.13	8.00	12.08	4.08	8.48	11.92	3.43	8419	2	13	4	1	0	3	5
142378	GYN	15	21	45	70	0.42	11.75	13.08	1.33	12.17	12.80	0.63	6850	1	13	4	0	0	2	6
142379	GYN	1	21	41	70	0.33	8.00	9.50	1.50	8.33	9.33	1.00	6840	1	13	4	1	0	2	5
142381	ORTH	13	24	42	70		14.22	17.08	2.87	14.78	16.92	2.13	8366	2	13	4	0	0	3	
142383	GYN	15	15	41	69	0.25	11.17	11.50	0.33	11.25	11.42	0.17	6952	0	13	4	0	0	2	1
142389	ORTH	12	22	45	64		13.08	15.33	2.25	13.67	15.17	1.50	7766	3	13	5	0	52	3	6
142390	ORTH	12	22	45	64	0.50	7.67	12.58	4.92	8.17	12.42	4.25	7766	6	13	5	1	11	3	8
142392	ORTH	14	23	42	76	0.25	7.67	9.42	1.75	8.28	9.25	0.97	1151	0	13	5	1	24	2	
142393	ORTH	14	14	42	66		11.42	13.42	2.00	11.50	13.33	1.83	1359	2	13	5	0	0	2	
142395	GEN	7	7	44	70		11.83	12.50	0.67	12.00	12.42	0.42	3893	0	13	10	0	0	1	9
142399	GEN	8	8	46	73	0.16	7.75	8.58	0.83	7.92	8.50	0.58	4320	0	13	4	1	42	1	7
142401	POD	9	9	45	73	0.50	8.83	9.67	0.83	9.00	9.58	0.58	8339	0	13	6	0	0	1	
142405	POD	9	9	45	73	0.16	7.50	8.67	1.17	7.67	8.50	0.83	7760	0	13	6	1	0	1	
142407	GYN	15	24	42	66	0.16	10.50	11.83	1.33	10.90	11.67	0.77	6850	2	13	6	0	0	2	7
142408	GYN	6	24	42	66	0.33	9.67	10.17	0.50	9.83	10.00	0.17	6909	1	13	6	0	0	2	1
142409	GYN	6	24	42	66		12.00	12.58	0.58	12.25	12.45	0.20	5421	0	13	6	0	0	2	1
142410	GYN	6	24	42	66	0.16	8.17	9.50	1.33	8.67	9.33	0.67	6850	1	13	6	0	17	2	5
142414	ORTH	12	12	44	73		13.00	13.33	0.33	13.13	13.25	0.12	9788	0	13	6	0	0	1	1
142415	ORTH	12	22	45	70	0.25	10.17	12.75	2.58	10.67	12.58	1.92	443	0	13	6	0	0	1	4
142417	ORTH	3	21	41	79		10.25	12.25	2.00	10.73	12.25	1.52	8087	3	13	6	0	52	3	4
142419	ORTH	3	21	41	64	0.50	7.58	9.75	2.17	8.22	9.50	1.29	8182	2	13	6	1	11	3	8
142424	ORTH	12	24	45	84		15.42	17.17	1.75	15.58	17.00	1.42	7902	0	13	5	0	0	1	4
142426	GYN	5	23	42	64		13.83	14.47	0.63	14.15	14.38	0.23	7359	3	13	19	0	0	2	15
142427	GYN	6	24	42	66	0.16	8.17	9.50	1.33	8.67	9.33	0.67	6909	0	13	6	1	0	2	1
142451	ORTH	2	23	42	74	0.28	7.53	8.30	0.77	7.75	8.22	0.47	8026	0	13	9	1	24	3	2
142452	ORTH	2	23	45	49	0.33	8.58	10.92	2.33	9.00	10.83	1.83	8182	0	13	9	0	0	3	7
142453	ORTH	2	23	45	74	0.25	11.25	12.50	1.25	11.75	12.33	0.58	8081	0	13	9	0	0	3	1
142454	ORTH	2	23	45	49		12.75	14.33	1.58	13.25	14.22	0.97	7781	1	13	9	0	0	3	4
142455	GYN	5	21	44	73	0.28	10.33	10.75	0.42	10.45	10.67	0.22	6909	0	13	9	0	0	2	1
142456	GYN	6	21	44	71		11.03	11.50	0.47	11.20	11.42	0.22	6620	1	13	9	0	0	2	1
142457	URO	4	24	42	66	0.22	7.50	8.58	1.08	7.95	8.42	0.47	6310	0	13	9	1	0	1	
142458	URO	4	24	42	61		8.80	10.00	1.20	9.08	9.83	0.75	6310	0	13	9	0	0	1	
142459	URO	4	24	42	62	0.16	10.17	10.75	0.58	10.33	10.58	0.25	9625	1	13	9	0	0	4	
142460	URO	4	24	42	62	0.42	10.92	11.58	0.67	11.17	11.42	0.25	5732	0	13	9	0	0	4	
142461	URO	4	24	45	61		12.00	12.92	0.92	12.30	12.75	0.45	6020	0	13	9	0	17	4	
142462	GYN	15	21	41	73	0.25	7.58	8.83	1.25	7.92	8.70	0.78	6850	1	13	9	1	54	2	4
142463	GYN	15	21	41	71	0.25	9.08	10.08	1.00	9.37	10.00	0.63	6850	1	13	9	0	0	2	4

PIRGNUM	SERVIC-	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	DATE	FIRSTCASE	DELAYS	OFROOM	LOS
142455	ORTH	12	25	45	72		12.12	14.08	1.97	12.68	13.92	1.23	8145	1	13	10	0	1	3	3
142457	GEN	8	21	41	66	0.33	7.50	9.00	1.50	7.87	8.92	1.05	5122	2	13	10	1	0	1	4
142458	GEN	8	21	41	66	0.42	9.33	10.08	0.75	9.62	10.00	0.38	8511	0	13	10	0	0	1	2
142469	URO	4	24	46	73		11.75	13.42	1.67	12.25	13.25	1.00	6382	0	13	10	0	0	2	
142470	URO	4	24	44	61		9.75	11.42	1.67	10.03	11.30	1.27	6020	0	13	10	0	0	4	
142471	URO	4	24	44	73		7.58	7.92	0.33	7.75	7.78	0.03	5810	0	13	10	1	1	2	
142475	ENT	10	10	45	85		10.17	11.58	1.42	10.58	11.42	0.83	2188	1	13	10	0	27	3	
142476	GEN	9	21	41	66	0.42	10.50	11.42	0.92	10.78	11.33	0.55	5329	0	13	10	0	17	1	3
142477	ENT	10	25	45	85	0.25	7.75	8.08	0.33	7.87	8.00	0.13	2001	0	13	10	1	1	3	
142479	ENT	10	25	45	85	0.13	8.33	8.87	0.53	8.42	8.70	0.28	2001	0	13	10	0	0	3	
142492	ORTH	2	23	41	72		12.00	14.58	2.58	12.58	14.42	1.83	8026	2	13	11	0	0	3	7
142494	ORTH	13	23	41	74	0.33	7.50	10.33	2.83	7.92	10.25	2.33	8060	1	13	11	1	0	3	2
142495	ORTH	13	13	41	74	0.12	10.67	11.88	1.22	11.10	11.83	0.73	8221	0	13	11	0	0	3	2
142497	GEN	5	25	46	71		12.17	13.17	1.00	12.58	13.08	0.50	8621	0	13	11	0	0	2	7
142498	GYN	1	25	42	71		9.17	10.58	1.42	9.48	10.42	0.93	6840	1	13	11	0	0	2	5
142499	GYN	1	25	42	73	0.12	7.37	9.05	1.68	7.70	8.88	1.18	7080	1	13	11	1	0	2	5
142500	GYN	1	25	42	71	0.59	10.72	11.58	0.87	10.95	11.42	0.47	6850	0	13	11	0	0	2	3
142501	GEN	7	7	45	64		11.17	12.33	1.17	11.37	12.25	0.88	5302	0	13	11	0	53	1	17
142504	GEN	8	21	45	66	0.33	7.50	9.50	2.00	8.00	9.67	1.67	8543	0	13	11	1	0	1	3
142516	GEN	5	24	44	64	0.16	7.92	9.50	1.58	8.25	9.33	1.08	3859	0	13	12	0	0	1	4
142517	GEN	5	24	44	66	0.25	9.67	10.67	1.00	10.23	10.50	0.27	8621	0	13	12	0	0	1	5
142519	ORTH	14	23	45	83	0.25	7.50	9.58	2.08	8.08	9.38	1.30	1530	0	13	12	1	0	2	
142520	ORTH	12	21	42	72	0.42	7.58	9.08	1.50	8.33	9.00	0.67	8026	0	13	12	0	0	3	2
142521	ORTH	2	21	42	74		9.50	12.17	2.67	10.00	12.08	2.08	8636	2	13	12	1	54	3	6
142533	POD	9	9	41	66	0.42	9.33	10.00	0.67	9.60	9.92	0.32	8139	0	13	13	0	0	1	
142534	POD	9	24	41	64	0.25	7.33	9.08	1.75	7.80	8.92	1.12	8139	1	13	13	1	0	1	
142535	ORTH	3	23	45	74	0.30	11.50	13.33	1.83	11.75	13.25	1.50	8060	3	13	13	0	0	3	2
142536	ORTH	2	24	41	64		10.42	14.50	4.08	10.92	14.38	3.47	7939	2	13	13	0	52	1	6
142538	GYN	1	25	44	71		10.50	12.33	1.83	10.77	12.17	1.40	6850	3	13	13	0	0	2	5
142539	GYN	6	21	44	71	0.16	9.00	10.33	1.33	9.38	10.17	0.78	6850	2	13	13	0	0	2	5
142540	GYN	6	25	44	71	0.12	7.75	8.88	1.13	8.00	8.72	0.72	6840	1	13	13	1	1	2	4
142542	ORTH	3	23	45	74	0.16	7.50	9.08	1.58	8.07	8.97	0.90	7934	2	13	13	1	0	3	4
142544	ORTH	3	23	45	72	0.33	9.25	11.17	1.92	9.55	11.03	1.48	8046	3	13	13	0	0	3	15
142554	ORTH	3	3	46	78		15.58	16.25	0.67	15.83	16.25	0.42	8623	1	13	13	0	0	1	4
142570	ORAL	11	25	45	80		10.83	13.42	2.58	11.25	13.25	2.00	7662	1	13	17	0	0	2	
142571	ORAL	11	25	45	80	0.28	7.50	10.55	3.05	8.17	10.38	2.22	7662	1	13	17	1	0	1	
142572	ORTH	2	24	44	79	0.09	12.58	14.58	2.00	12.92	14.42	1.50	7937	4	13	19	0	0	3	8
142573	ENT	10	24	42	85	0.33	11.00	13.92	2.92	11.37	13.75	2.38	2150	2	13	17	0	27	3	
142574	GEN	7	21	41	72	0.25	10.50	11.67	1.17	10.92	11.58	0.67	4930	2	13	17	0	0	1	7
142575	ENT	10	24	42	67	0.16	7.58	9.08	1.50	7.83	8.92	1.08	4029	0	13	17	1	1	3	
142575	ENT	10	24	42	85	0.42	9.25	10.58	1.33	9.50	10.42	0.92	2198	0	13	17	0	0	3	
142577	GEN	7	21	41	72	0.66	7.58	8.83	1.25	7.88	8.78	0.90	5301	1	13	17	1	12	1	3
142578	ENT	10	10	42	85	0.27	14.25	15.33	1.08	14.50	15.25	0.75	2131	0	13	17	0	0	3	
142592	ORTH	13	21	41	79		12.25	13.92	1.67	12.75	13.83	1.08	8360	0	13	18	0	0	3	3
142583	ORTH	13	21	41	75	0.16	7.75	12.08	4.33	8.08	11.92	3.83	8145	2	13	18	1	0	3	7
142584	ORTH	2	23	45	74		12.00	13.17	1.17	12.33	13.00	0.67	8088	0	13	18	0	0	1	2
142586	GYN	6	24	44	87	0.25	10.08	11.33	1.25	10.55	11.17	0.62	6850	2	13	18	0	0	2	5
142587	GYN	15	24	44	72	0.25	8.58	9.83	1.25	8.92	9.67	0.75	6840	1	13	18	0	0	2	5
142588	GYN	6	24	44	64		11.58	12.25	0.67	11.88	12.08	0.20	6629	0	13	18	0	0	2	2
142589	GEN	5	23	45	66	0.16	8.67	9.42	0.75	9.00	9.30	0.30	4946	0	13	18	0	0	1	3
142590	GEN	5	23	45	66	0.16	7.48	8.50	1.02	7.87	8.42	0.55	8621	0	13	18	1	0	1	6

PTREGNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	DATE	FIRSTCASE	DELAYS	OPROOM	LOS
142591	ORTH	13	24	41	79	0.25	7.57	9.42	1.85	8.05	9.30	1.25	8372	2	13	23	1	1	2	8
142593	GYN	15	24	44	87	0.25	7.50	8.33	0.83	7.78	8.17	0.38	7410	0	13	18	1	0	2	5
142596	GYN	15	21	46	78		11.92	12.25	0.33	12.05	12.15	0.10	6902	0	13	17	0	0	1	1
142598	GYN	15	25	41	72		15.00	15.97	0.97	15.30	15.80	0.50	6902	2	13	17	0	0	1	1
142600	ORTH	3	21	41	0		14.25	14.75	0.50	14.33	14.67	0.33	7902	0	13	17	0	0	1	1
142617	ORTH	12	27	45	0		13.00	15.67	2.67	13.60	15.50	1.90	8147	2	13	19	0	0	1	8
142618	ORTH	2	24	44	79		14.67	17.25	2.58	15.20	17.00	1.80	7781	1	13	19	0	0	3	6
142619	UR	4	27	41	72	0.59	11.67	12.42	0.75	12.00	12.20	0.20	6250	0	13	19	0	0	1	
142620	GEN	5	27	45	66	0.26	7.50	8.53	1.03	7.88	8.33	0.45	5301	0	13	19	1	0	1	5
142621	GEN	5	27	45	66	0.33	10.58	11.33	0.75	10.83	11.25	0.42	8511	0	13	19	0	0	1	2
142622	ORTH	14	14	42	74	0.00	7.58	9.50	1.92	7.67	9.42	1.75	1359	1	13	19	1	0	2	
142625	ORTH	2	24	44	79	0.42	7.25	12.17	4.92	7.67	12.00	4.33	8145	5	13	19	1	0	3	9
142627	ORTH	12	24	41	79		12.00	14.17	2.17	12.37	14.00	1.63	7936	2	13	23	0	0	2	22
142630	GYN	15	21	44	76		9.25	9.92	0.67	9.50	9.75	0.25	5450	2	13	25	0	0	2	
142640	POD	9	25	45	74	0.09	7.25	9.67	2.42	7.92	9.50	1.58	7759	0	13	20	1	0	1	
142641	GYN	1	23	41	64	0.13	7.50	9.17	1.67	7.83	9.00	1.17	6840	0	13	20	1	0	2	4
142642	GYN	1	23	41	64	0.25	9.30	10.00	0.70	9.50	9.85	0.35	6720	0	13	20	0	0	2	2
142643	GYN	6	23	41	64	0.12	11.50	12.13	0.63	11.78	12.00	0.22	5421	0	13	20	0	0	2	1
142644	GYN	6	23	41	64	0.09	10.25	11.42	1.17	10.50	11.25	0.75	6850	0	13	20	0	0	2	5
142645	POD	9	25	45	66	0.25	9.75	10.67	0.92	10.08	10.50	0.42	407	0	13	20	0	0	1	
142646	ORTH	3	21	42	75	0.16	7.50	9.67	2.17	7.95	9.50	1.55	8080	2	13	20	1	0	3	2
142647	ORTH	12	25	45	49	0.28	10.92	12.42	1.50	11.50	12.25	0.75	7766	1	13	20	0	0	1	6
142648	ORTH	12	12	46	74		12.70	14.25	1.55	12.75	14.08	1.33	7934	0	13	20	0	0	1	6
142649	ORTH	3	21	42	88	0.25	9.83	12.00	2.17	10.35	11.83	1.48	8182	2	13	20	0	0	3	5
142651	GYN	6	23	41	72		12.25	13.00	0.75	12.58	12.83	0.25	6909	1	13	20	0	0	2	1
142652	ORTH	3	21	42	75		12.25	14.67	2.42	12.75	14.50	1.75	8040	3	13	20	0	0	3	7
142677	GYN	6	25	42	66	0.25	8.90	9.83	0.93	9.45	9.75	0.30	7051	0	13	23	0	0	1	5
142678	ORTH	2	23	44	70		7.50	11.67	4.17	7.88	11.55	3.67	8377	4	13	23	1	0	3	9
142680	GYN	6	25	42	76		11.17	11.73	0.57	11.38	11.62	0.23	6629	0	13	23	0	0	1	1
142681	GYN	6	25	42	66	0.16	10.08	11.00	0.92	10.37	10.92	0.55	5950	0	13	23	0	0	1	5
142682	ORT	12	24	41	84	0.25	9.67	11.75	2.08	10.17	11.58	1.42	7936	0	13	23	0	0	2	18
142683	GYN	1	25	42	76	0.07	7.33	8.83	1.50	7.67	8.67	1.00	6840	0	13	23	1	0	1	4
142690	GEN	8	27	45	73		13.50	14.67	1.17	13.83	14.42	0.58	5300	1	13	24	0	0	2	2
142691	GEN	8	27	44	73	0.33	12.25	13.17	0.92	12.50	13.00	0.50	5302	1	13	24	0	0	2	3
142692	GEN	7	24	45	79		12.08	12.75	0.67	12.50	12.65	0.15	8621	0	13	24	0	0	1	10
142693	URO	4	23	42	61		12.50	13.42	0.92	12.83	13.25	0.42	6020	0	13	24	0	0	4	
142694	URO	4	23	41	73	0.09	7.50	9.08	1.58	8.08	8.92	0.83	6020	0	13	24	0	0	4	
142695	URO	4	21	42	61	0.16	11.50	12.33	0.83	11.72	12.25	0.53	5749	1	13	24	0	0	4	
142696	URO	4	23	42	61	0.33	7.75	9.08	1.33	7.83	9.00	1.17	5850	0	13	24	1	1	4	
142697	ENT	10	10	41	68		10.67	12.25	1.58	11.00	12.17	1.17	2188	1	13	24	0	0	3	
142698	ENT	10	10	41	69	0.33	8.83	10.33	1.50	9.03	10.25	1.22	2188	0	13	24	0	0	3	
142699	ENT	10	25	41	85	0.22	7.55	8.62	1.07	7.80	8.42	0.62	2820	0	13	24	1	1	3	
142711	GYN	15	25	41	70		12.92	13.25	0.33	13.33	14.17	0.83	7410	0	13	24	0	0	3	4
142712	GEN	5	27	45	74	0.33	7.42	11.75	4.33	7.92	11.50	3.58	5411	3	13	24	1	0	1	
142717	ORT	13	23	42	74	0.22	7.50	9.58	2.08	7.83	9.42	1.58	8046	4	13	25	1	0	3	6
142718	GEN	8	23	42	75		10.58	11.58	1.00	10.78	11.50	0.72	5301	1	13	25	0	0	3	3
142719	GEN	7	24	41	73	0.09	7.50	9.08	1.58	8.08	8.92	0.83	5302	0	13	25	1	0	1	2
142720	GYN	15	21	44	76	0.33	8.25	8.92	0.67	8.50	8.75	0.25	5421	0	13	25	0	0	2	1
142722	GYN	15	21	44	76	0.25	7.50	8.00	0.50	7.70	7.92	0.22	6909	0	13	25	1	0	2	1
142735	ORTH	2	27	45	73	0.42	7.50	13.58	6.08	8.08	13.50	5.42	7808	5	13	26	1	0	3	6
142735	GEN	5	24	41	79	0.25	12.17	13.42	1.25	12.50	13.28	0.78	5430	1	13	26	0	0	1	6

PTREGNUM	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	DATE	FIRSTCASE	DELAYS	OPROOM	LOS
142737	GEN	5	24	41	75	0.22	7.33	11.08	3.75	7.75	10.92	3.17	5122	3	13	26	1	0	1	8
142738	GEN	8	24	41	71		13.67	14.88	1.22	14.00	14.82	0.82	5349	1	13	26	0	0	1	3
142739	ORTH	12	27	45	70		14.00	16.17	2.17	14.75	16.08	1.33	8145	3	13	26	0	25	3	5
142741	ORTH	2	25	44	66	0.09	9.08	10.67	1.58	9.48	10.50	1.02	7753	0	13	27	0	1	2	6
142750	ORTH	3	24	45	73	0.15	10.08	12.25	2.17	10.67	12.08	1.42	8060	2	13	27	0	0	3	4
142751	ORTH	3	24	45	73	0.16	7.33	9.92	2.58	7.92	9.75	1.83	8182	0	13	27	1	0	3	18
142752	ORTH	12	25	44	71	0.42	7.67	8.67	1.00	8.15	8.57	0.42	8026	0	13	27	1	1	2	5
142753	ORTH	3	24	41	70		12.42	13.92	1.50	12.78	13.75	0.97	8060	2	13	27	0	0	3	5
142755	GYN	1	1	41	74		11.00	11.33	0.33	11.00	11.25	0.25	6909	0	13	27	0	0	1	1
142756	GYN	1	23	41	75	0.16	7.97	9.50	1.53	8.33	9.33	1.00	6840	1	13	27	0	0	1	14
142757	GYN	1	23	41	75	0.09	9.67	10.92	1.25	9.92	10.75	0.83	6850	0	13	27	0	0	1	4
142758	GYN	6	6	44	71		10.75	11.17	0.42	10.88	11.02	0.13	6909	0	13	27	0	0	2	
142757	GYN	1	21	41	74	0.30	7.42	7.67	0.25	7.50	7.58	0.08	6952	0	13	27	1	0	1	1
142780	URO	4	21	45	61	0.33	7.58	8.75	1.17	8.00	8.67	0.67	6310	0	13	30	1	1	1	
142781	GYN	15	27	44	70	0.20	10.93	11.97	1.03	11.43	11.82	0.38	6850	0	13	30	0	0	2	5
142782	GYN	6	27	44	70	0.30	9.08	10.63	1.55	9.55	10.30	0.75	6840	2	13	30	0	0	2	5
142783	URO	4	21	45	62		10.92	12.08	1.17	11.25	12.00	0.75	6020	0	13	30	0	0	4	
142784	URO	4	21	45	0	0.33	9.92	10.58	0.67	10.22	10.45	0.23	5784	0	13	30	0	0	4	
142785	GYN	6	27	44	73		7.50	8.75	1.25	8.05	8.58	0.53	7410	0	13	30	1	0	2	4
142786	ORTH	12	21	42	66		13.67	16.00	2.33	14.13	15.92	1.78	8086	1	13	30	0	0	1	3
142787	ORTH	2	25	42	79		10.97	14.67	3.70	11.57	14.50	2.93	8182	0	13	30	0	0	3	
142788	ORTH	2	25	42	49	0.13	7.30	10.83	3.53	7.72	10.67	2.95	8145	2	13	30	1	0	3	4
142795	ORAL	11	23	42	80		7.50	13.17	5.67	8.08	13.00	4.92	7662	2	13	31	1	0	2	
142795	GEN	7	27	41	73	0.36	7.50	9.05	1.55	7.95	8.95	1.00	5122	1	13	31	1	0	1	7
142797	GEN	8	27	41	70	0.25	9.42	12.17	2.75	9.83	12.00	2.17	5361	0	13	31	0	13	1	9
142798	ENT	10	21	45	86	0.53	11.75	12.92	1.17	12.08	12.75	0.67	2820	0	13	31	0	0	3	
142799	ENT	10	21	45	86	0.33	10.25	11.42	1.17	10.47	11.33	0.87	2820	0	13	31	0	0	3	
142801	ENT	10	10	45	86	0.25	8.00	10.00	2.00	8.33	9.92	1.58	2188	1	13	31	0	0	3	
142807	GEN	8	27	44	73		12.17	13.25	1.08	12.50	13.00	0.50	4700	0	13	30	0	0	2	4
142809	GEN	8	27	44	73		13.92	15.00	1.08	14.55	14.92	0.37	4946	0	13	31	0	0	1	6
142810	ENT	10	21	45	68	0.15	7.58	7.83	0.25	7.67	7.75	0.08	2001	0	13	31	1	0	3	
142835	ORTH	3	21	44	84		13.45	14.25	0.80	13.50	14.17	0.67	7912	1	13	31	0	0	3	3
OP0272	GEN	8	8	46	73	0.33	7.92	8.42	0.50	8.08	8.42	0.33	8512	0	13	4	1	0	1	
OP0402	ENT	10	10	45	85	0.59	9.00	9.58	0.58	9.28	9.58	0.30	1829	0	13	10	0	0	3	
OP0519	GEN	8	8	41	64		10.92	11.33	0.42	11.08	11.33	0.25	8640	0	13	12	0	0	1	
OP1057	OPTH	14	14	42	93	0.15	7.58	9.58	2.00	8.17	9.50	1.33	1359	1	13	26	1	1	2	
OP1229	OPTH	14	14	45	71		9.83	11.62	1.78	10.08	11.38	1.30	809	0	13	12	0	0	2	
OP1361	OPTH	14	14	46	83		11.58	13.58	2.00	12.08	13.50	1.42	1359	1	13	26	0	0	2	
OP1924	GEN	5	5	41	75	0.25	11.30	11.92	0.62	11.45	11.83	0.38	8512	0	13	26	0	0	1	
OP1949	GEN	8	8	42	73	0.33	7.50	8.17	0.67	7.75	8.08	0.33	3893	0	13	3	1	0	1	
OP2665	GEN	8	8	41	70	0.16	13.33	13.75	0.42	13.47	13.72	0.25	8630	0	13	31	0	0	1	
OP2626	URO	4	24	44	61	0.16	9.25	9.58	0.33	9.38	9.47	0.08	6012	0	13	10	0	0	4	
OP3372	OPTH	14	14	42	64		9.50	11.58	2.08	9.67	11.50	1.83	1359	0	13	19	0	0	2	
OP4358	GEN	7	7	41	73	0.25	9.17	10.00	0.83	9.43	9.83	0.40	1821	0	13	25	0	0	1	
OP4534	URO	4	4	45	61	0.33	9.08	9.58	0.50	9.25	9.45	0.20	6011	0	13	30	0	0	4	
OP5393	GEN	8	8	45	66		10.55	11.08	0.53	10.72	11.00	0.28	3893	0	13	18	0	0	1	
OP5419	OPTH	14	14	42	66	0.09	9.67	11.33	1.67	9.75	11.17	1.42	1359	1	13	5	0	0	2	
OP5505	GEN	7	7	41	73		10.25	11.17	0.92	10.42	11.00	0.58	8512	0	13	25	0	0	1	
OP5237	OPTH	14	14	42	83	0.75	9.75	11.42	1.67	9.92	11.33	1.42	1359	1	13	26	0	0	2	
OP5209	GEN	8	8	42	73	0.16	8.50	9.25	0.75	8.67	9.17	0.50	8512	0	13	3	0	0	1	
OP7236	GEN	5	5	45	66	0.25	8.92	9.50	0.68	9.00	9.38	0.38	8512	0	13	19	0	0	1	

[illegible]	SERVICE	SURGCODE	ANESCODE	CNURCODE	STECCODE	TURNOVER	ANESSTART	ANESSTOP	ANESTIME	SURGSTART	SURGSTOP	SURGTIME	ICD-9	ADLPROCD	MONTH	DATE	FIRSTCASE	DELAYS	OFROOM	LOS
[illegible]	OPTH	14	14	42	74	0.42	11.67	13.42	1.75	11.78	13.33	1.55	1359	1	13	19	0	0	2	
[illegible]	GEN	5	5	46	70	0.25	8.75	9.25	0.50	8.92	9.20	0.28	8512	0	13	5	0	0	1	
[illegible]	GEN	8	8	46	73		11.25	12.00	0.75	11.42	11.92	0.50	8591	0	13	5	0	0	1	
[illegible]	GEN	8	8	46	73	0.25	12.42	13.08	0.67	12.83	13.03	0.40	5359	1	13	31	0	0	1	

BIBLIOGRAPHY

Books

Hejna, William, and Cheryl Gutmann. Management of Surgical Facilities. Rockville: Aspen, 1984.

Articles and Periodicals

Austin, Hubert, Harold Laufman, and Lawrence Zelner. "Strategic Automation For Surgery." Computers In Healthcare. Sep. 1987:44+.

Bloom, Bernard S., and A. Mark Fendrick. "Waiting for Care Queuing and Resource Allocation." Medical Care Feb 1987: 131-9.

Bridenbaugh, Donald L. "Operating-room Utilization and the Care of the Surgical Patient." American College of Surgeons Nov. 1979: 11-4.

Computers In Healthcare. "Product Source Directory." 1988 Market Directory 1988: 78-112.

Cresto, John, and Daniel Devor. "Computerize The Log." Hospitals, J.A.H.A. 1 July 1973: 58+.

Curtis, Robert, and Eleanor Scott. "Alternative Scheduling for OR Personnel Results in More Surgeries, Less Overtime." Hospitals 16 Nov. 1982: 48, 50.

Drier, Christine, Ruth Van Winkle, and Bernard Wetchler. "Ambulatory Surgery: Block Scheduling Contributes to Ambulatory Surgery Center Success. AORN Journal Mar. 1984: 673-4.

Falasco, Pamela R., and Nancy A. Eastaugh. "Effective Utilization Of Operating Room Services." Health Matrix 6.3 Fall (1986): 29-31.

Goldman, J., and H. A. Knappenberger. "How to Determine the Optimum Number of Operating Rooms." Modern Hospitals Sep. 1968: 114+.

Goldman, J., H. A. Knappenberger, and E. W. Moore. "An Evaluation Of Operating Room Scheduling Policies." Hospital Management Apr. 1969: 40+.

Gorden, Woods. "Cost Containment in the O. R.." Dimensions In Health Service Mar. 1980: 10.

Grumbles, Hunter, Ronald Sutton, and Willis Sanders. "Simple, Equitable System Blends Flexibility With Firm Scheduling." Hospitals, J.A.H.A. 1 Oct. 1977: 95+.

Hackey, Barbara, Kimberly Casey, and Seetharama Narasimhan. "Maximizing Resources: Efficient Scheduling of the OR." AORN Journal June 1984: 1174-80.

Hopkins, David, et al. "A Model For Optimizing the Number of Operating Rooms In a Hospital Surgical Suite." Health Care Management Review Spring 1982: 49-64.

Jennett, Bryan. "Waiting Lists: A Surgeon's Response." The Lancet 4 Apr. 1987: 796-7.

Kelley, Michael, Ann Eastham, and Gypsie Bowling. "Efficient OR Scheduling: A Study To Decrease Cancellations." AORN Journal Mar. 1985: 555-7.

Kildea, John. "OR Scheduling Methods." Hospitals, J.A.H.A. 16 Nov. 1970: 99-101.

Kuzdrall, Paul, Homer Schmitz, and N. K. Kwak. "The Monte Carlo Simulation of Operating-Room and Recovery-Room Usage." Operations Research Mar.-Apr. 1974: 434-40.

Laufman, Harold. "Operating Room Environment - The Surgeon's Obligation." Hospital Topics May-June 1979: 53-6.

Magerlein, James, and James Martin. "Surgical Demand Scheduling: A Review." Health Services Research Winter 1978: 418-33.

Mailhot, Claire, and Jane Binger. "The Operating Room a Complex Challenge for the Nursing Administrator." The Journal of American Nursing Apr. 1984: 11-16.

---. "The Operating Room Director: Functions and Responsibilities." JONA 18.9 (1988): 6-14.

Martin. James, Roger Smith, Myra Radoyevich, and Robert Fichman. "Surgically-Related Applications Of Computerized Operating Room Data." Surgery, Gynecology & Obstetrics Jan. 1985: 17-9.

McQuarrie, Donald. "Limits to Efficient Operating Room Scheduling." Archives of Surgery Aug. 1981: 1065-71.

"Measure Work Load, Staff Ratio to Identify Effective Staffing Pattern." Same-Day Surgery Sep. 1988: 122-5.

Morrison, Gabrielle. "Word Processing In OR Management." Dimensions In Health Service Mar. 1980: 18+.

Nathanson, Michael. "Computer-aided Scheduling an Put Scalpel to Costs of Operating Room." Modern Healthcare 1 May 1984: 44-6.

Nathanson, Susan. "Managing Resources Effectively in a Hospital-Based Ambulatory Surgery Program." Journal of Ambulatory Care Management Feb. 1988: 63-71.

"No One Good Model Found For Hospital OP Surgery." OR Manager 3.3 (1987): 7.

Oliver, Joanne. "Computers in the OR." AORN Journal 49.2 (1989): 590-2.

Phillips, Kanella. "Operating Room Utilization." Hospital Tcpics Mar.-Apr. 1975: 42-5.

Pitzer, Michael. "Increasing Productivity in the Operating Room with Participative Management." Perioperative Nursing Quarterly June 1987: 19-21.

Priest, Stephen, Barbara Pelati, and David Marcello. "Computerized OR Log System Has Many Uses." Hospitals 1 June 1980: 79-82.

Prinke, Linda. "OR Scheduling." AORN Journal Apr. 1989: 1083-6.

Przasnyski, Zbigniew. "Operating Room Scheduling." AORN Journal July 1986: 67-79.

Schmitz, Homer, and N. K. Kwak. "Monte Carlo Simulation of Operating-Room and Recovery-Room Usage." Operations Research Nov.-Dec. 1972: 1171-80.

Spohn, Denise, and Mary Jo Sponseller. "Computers and OR Nursing: Have You the Time?." Today's OR Nurse 10.5 (1988): 19-23.

Stewart, Jimmy. "Surgical Specialties Affect Scheduling." Hospitals, J.A.H.A. 1 Sep. 1971.

Swanberg, Gloria, and Barbara Fahey. "More Operating Rooms or Better Use of Resources?" Nursing Management May 1983: 16-19.

Voss, Sheri. "Ambulatory Surgery Scheduling: Assuring a Smooth Patient Flow." AORN Journal May 1986: 1009-12.

Williams, Wilson. "Improved Utilization of the Surgical Suite." Hospitals, J.A.H.A. 1 Mar. 1971: 93-6.

Zilm, Frank, Luci Calderaro, and Madlyn Del Grande. "Computer Simulation Model Provides Design Framework." Hospitals, J.A.H.A. 16 Aug. 1976: 79-85.

Interviews

Atkins, Dian. Personnal Interview. 24 May 1989.

Hahn, MaryAnn. Telephone interview. 2 Mar. 1989.

Kier, Brenda. Personnal interview. 12 Jan. 1989.

McWilliams, Michale. Personnal interview. 13 Mar. 1989.

Mediavilla, Antonio. Personnal interview. 5 Oct. 1988.

Patel, Manubhai. Personnal interview. 24 Mar. 1989.

Strand, Kathy. Telephone interview. 23 May 1989.