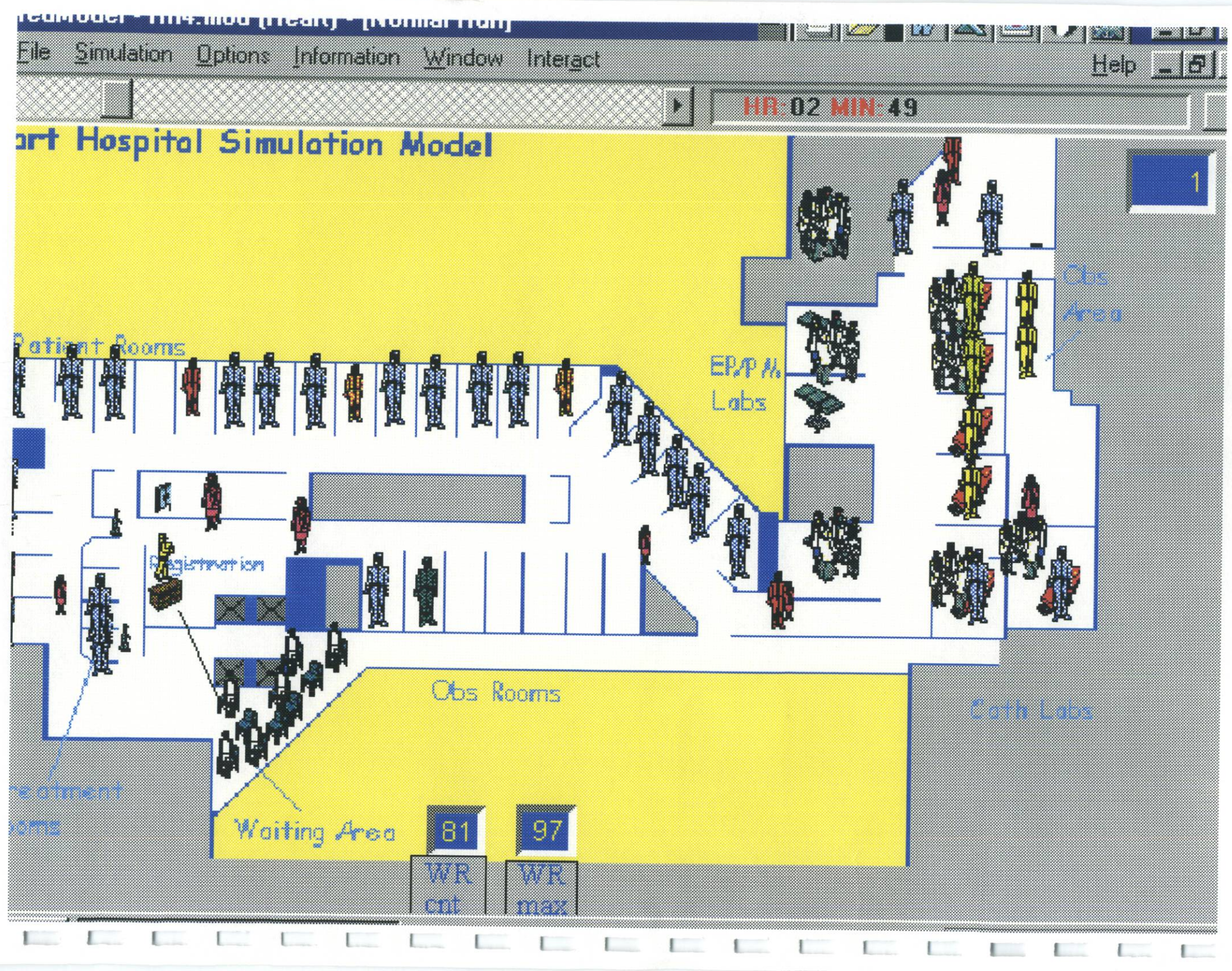
Baylor Heart Hospital

Senior Design
Spring 1998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ort Hospital Simulation Model
1
Patient Rooms
EP/P M
Labs
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Obs Rooms
Cath Labs
Waiting Area
81
97
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max

Management Summary

Baylor University Medical Center, a five-hospital complex located just north of downtown Dallas, is one of the leading tertiary care teaching and referral centers in Texas and the Southwest. The complex currently has 1,455 licensed beds with 681 people on the medical staff. Our project focused on the planned heart hospital, which is to be built across Worth Street from the main hospital tower. This eight-story facility would be financed and run jointly by Baylor and three major cardiac physician groups. The third floor of the hospital would house the cathology and electrophysiology labs that provide diagnostic tests and host several non-emergency procedures.

A team consisting of Baylor employees and the Healthcare Environmental Design architectural firm has been working on the floor plan and design of this facility. Because the project involves multimillion dollar expenditures from both the physicians and the hospital and performs tasks vital to the welfare of cardiology patients, the two sponsors want to insure the facility can handle the expected patient flow in the new heart hospital. As a result, our team has been asked to collect data, run a simulation for the new facility, and analyze the results. To accomplish this task, we used data taken from logs, hospital databases, nurse and doctor estimates, and personal observations to construct a MedModel (software designed to simulate medical facilities) model which simulated the heart hospital environment. According to the simulation, the third floor of the heart hospital will be able to support the expected patient flow with no glitches if some minor changes are made. If the new facility is approved by Baylor and the physicians, it could begin construction as early as September 1998.

Background

The purpose of our project was to work with a team of Baylor employees to create a working model of the proposed heart hospital using a simulation program called MedModel. We used the architectural blueprints created by Healthcare Environmental Design as the basis for the model. Our group wanted to create a model which was easy to understand, filled with meaningful statistics, and easily alterable to test the impact changes in staffing or scheduling might produce. In addition, the simulation is intended to assist the hospital in determining the exact number of rooms on the floor and the necessity of building more labs. The information will be used by Baylor management to help determine the floor plan of the hospital to be built later this year.

To create the model, our team compiled and analyzed data collected from hospital databases, logs, nurses and doctors, and previous design projects. We also gathered data while observing the current heart treatment facility over a two-week period. We used the statistical output of the model to locate and reduce future problems with the new hospital. The statistical data and final simulation will be used by the physician groups and Baylor to help achieve the optimal staffing and scheduling mix for their new facility.

Data Collection

Data Sources

We used the following sources to obtain our data for the simulation:

1. **Apollo Database:** This hospital-wide database is run and maintained by John Dixon. It is the computerized log of many cardiology procedures performed at the current heart treatment facility. The database contains the procedure done, time taken for the procedure, and subsequent destination of the patient. This information was used to determine the distribution of cath lab procedure times, patient types, and helped fill any holes in the patient flow charts.
2. **Nurse's Logs:** These logs provided raw data not included in the Apollo database. Specific data obtained from these logs include time spent in the 3 East Observation room, 3 South Observation room, and cath holding. We took the hard data from the nurse logs and entered them into our own database.
3. **Nancy Vish:** Nurse Vish, the senior managing cardiology nurse, provided patient types for all different classes of patients. She also suggested initial procedure times and patient flow quantities for several different types of patients and provided confirmation for all patient procedure times and distributions.
4. **Student Observation:** Our team spent two weeks taking procedure times for those tasks not included in the logs or the Apollo database. These include IV times, EKG times, nurse interviews, and a few other tasks completed in the treatment room before the main procedure.
5. **Dr. Ed Bond:** Dr. Bond, a cardiologist at Baylor, provided firm estimates for electrophysiology, IDC, and pacemaker procedures which did not have enough data points to accurately described with an continuous distribution.
6. **Data From 2 Roberts South Project:** We used family member arrival numbers and distributions determined by a previous design team

Patient Types

Elective Cath Patient: These are outpatients who need to undergo cath procedures. This initially consists of a simple assessment by the doctors; some patients stop at this diagnostic step, whereas others need further invasive treatment (such as an angioplasty, for example). The elective cath patients will make up the largest part of the patient flow.

Pacemaker Patient: These are patients who need to have their pacemakers remotely adjusted. The pacemaker patients also make up a large number of patients in the heart hospital. They are treated in the EP labs.

Electrophysiology Patient: These are patients who have their hearts electrically stimulated in the EP labs. These patients are also outpatients; however, their time in the hospital is usually greater than average due to the longer procedure time and the level of sedation (which requires a longer post-procedure stay).

ICD Patient: These are patients who had an EP done the day before and the doctors decided they need an ICD. The procedure is similar to a pacemaker implantation—a electronic device is attached to the heart and provides periodic shocks to the organ.

Ablation Patient: These are patients who had an EP done the previous and their physician decided they needed an ablation. An ablation is a procedure in which decaying heart cells are removed.

Biopsy Patient: These patients need a biopsy done on their heart. This procedure occurs in the cath lab; the doctors insert a tiny device into the body and "grab" a tiny piece of the heart. It is primarily a procedure practiced on transplant cases.

Cardioversion Patient: These patients do not use the cath or EP labs; Rather, they are kept in the inpatient or observation room and have their hearts periodically "shocked" with electric paddles.

Right Heart Patient: These patients need cath labs only on the right side of their heart. They are treated just like normal cath patients; they do, however, have shorter hospital stays.

Transfer/ED Patient: These patients are transferred from the Baylor University Medical Center facility. They bypass the admission and pre-operation treatment room. Most are admitted for cath labs, but some are there for EP labs.

Staffing

The staff which will run the new heart hospital consists of doctors, nurses, and technicians from both Baylor and the physicians' groups who will help finance the new facility. The simulation attempts to record the activities performed on the patient by each of the employees.

Registration Clerk: The receptionist is a non-nurse who takes the proper documentation from the patients as they arrive for their surgery. He/she will direct the patient to the waiting room until a treatment room vacates.

Treatment Room Technician: The technician assists the patient in the treatment room. He/she will perform the duties which do not require a nurse, such as undressing the patient, taking the patient's pulse, and testing the patient's blood.

Treatment Room Nurse: This nurse will bring the patient from the waiting room to the treatment room. He/she will run an IV, take the patient history, and perform other tasks needed before the patient can undergo treatment.

Heart Nurse: These nurses escort the patient from the treatment room to the observation and/or inpatient rooms. Then, they will take the patients from these rooms to the cath or EP labs. After the procedure, the nurses will observe any patients who are recuperating in the inpatient or observation rooms on a periodic basis.

Cath Observation Nurse: These nurses take patients from the cath labs to the cath holding facility or the 3 East facility (or BUMC if the patient has had severe problems in the lab). These nurses will also observe the patients in cath holding.

3-East Nurse: These nurses observe the patients in the 3-East facility.

Cath Teams: These are the teams which perform the cath labs on the patients.

EP Teams: These teams perform the EP procedures.

Each of the team members in the new hospital has duties not confined to those enumerated here; these "extra" tasks include paperwork, data entry, and any emergency duties which might arise if a patient has unexpected problems. These duties do not directly effect the patients, and therefore are omitted from this model.

Statistical Analysis

MedModel uses both constant numbers and variable distributions to simulate certain events such as patient arrivals, procedure times, and even the number of family members arriving with each patient. To calculate these distributions, our design team used ExpertFit, a software package designed to fit data to certain distributions. To accomplish this task, we entered the raw data into a spreadsheet and then ran a statistical analysis. Two results emerged from this process; first, several possible distributions were returned by the computer, and second, a number which indicated the reliability of these distributions was given. If the reliability score was sufficient, that distribution was used. If no suitable distribution was returned, our group manually entered the data into a user defined distribution. All of the distributions and tables are included in an appendix later in the report.

Arrivals: The arrivals basically follow two different types of distributions. The first, applied to the high volume patients (such as cath patients), is a logarithmic distribution. The mean for the distribution of the cath patients was 22.5 patients per day, the minimum was 10 patients and the maximum was 35 patients. The other arrivals did not have enough data to warrant statistical distributions. For this reason, our group used the estimates given by Nancy Vish; however, due to the small number of patients, the simulation should not be adversely effected. In all, 19 non-cath patients can be expected every day. See the appendix for exact numbers for all patient types.

Family Member Distribution: The family member distribution was taken from a previous design project. We used this data to create an empirical table. Most patients (65%) are accompanied by one or two family members.

Registration Process: This data was taken from direct student observation and used to create an empirical table. Most patients (49%) take five minutes to register; all are registered within two or three minutes of that mark.

Treatment Room: This procedure consists of an IV, blood lab, EKG, database entry, and patient education. The distribution for each subprocedure is normal. See the attached chart for specific means and standard deviations. Overall, the mean for the treatment room time was 44.5 minutes and the standard deviation was 12.5 minutes.

Cath Labs: The lab time was taken from the Apollo database and confirmed by Nancy Vish. The data could not be suitably fit to any distribution; therefore, an empirical tables were used. The mean time for the lab was 49.2 minutes with a minimum time of 19.3 minutes and a maximum time of 90 minutes.

EP Labs: The lab time for EP labs, like that of the cath labs, was taken from the Apollo database and could not be fit to any distribution, so an empirical table was used. The mean for the procedure was 144.6 minutes with a minimum of 10 hours and a maximum of 45 minutes.

Biopsy Procedure: The biopsy data was taken from the Apollo database. It fit a normal distribution with a mean of 25 minutes and a standard deviation of 5 minutes.

Ablation Procedures: Data on ablations was taken from medical logs. No curve could be fitted to the procedure, so an empirical table was used. The mean time for the procedure was 6 minutes, with a minimum time of 5 minutes and a maximum time of 10 minutes.

Cardioversion Procedures: Data was insufficient for the cardioversion procedure; however, due to the extremely small volume of cardioversion patients (one or less per day), the 6 hour estimate given by Nancy Vish should not effect the outcome of the model.

ICD Procedures: An empirical table was used to describe the distribution for this procedure. The mean for the ICD's was 145 minutes, the minimum time was 90 minutes, and the maximum was 240 minutes.

Right Heart Procedures: This procedure was fit to a normal curve; the mean was 30 minutes and the standard deviation was 5 minutes.

Pacemaker Procedures: No distribution was a suitable fit, so an empirical table was used. The mean for the procedure was 131 minutes, the minimum was 90 minutes, and the maximum was 240 minutes.

Again, for more detailed information on the statistical distribution used, see the appendix in back. This appendix provides best-fit curves for each type of data, empirical tables from which the distributions were derived, and the exact number of observations used to map the data.

MedModel

MedModel is the computer software package used to simulate medical facilities. The program has an extensive graphical interface, complete with dozens of computer graphics. In this model, we entered the design given to us by Healthcare Environmental Design firm and built locations and paths on top of the blueprints. We created the model to an accurate scale—the software is detailed enough to include the time an employee takes to walk from one room to the next.

In the model, the ten patient types follow paths from one location to the next. The specific path taken by each patient depends on his/her patient type. The resources (Baylor employees) also move along these paths from location to location either with a patient or to meet one. The software then collects statistics on locations, patients, and resources after the model is run. For further reference, see the patient flow charts included in a later appendix.

Model Components

Each model consists of several elements:

Entities: Entities are the elements which pass through the model and have actions performed on them—in other words, in general, they are the patients in the model. Our model also consider family members to be entities. For a more detailed description of the ten entities (patient types) see the preceding section on patient types.

Locations: Locations are places in the model where an action is done to an entity, even if the action is only waiting. Each location in the model will be discussed in the subsequent section.

Path Networks: These are the paths the entities and resources take around the model. Entities and resources travel around separate paths. Interfaces connect nodes on the path to the locations in the model.

Resources: The resources are the members of the Baylor heart hospital team. They include the techs, nurses, and doctors that treat patients.

Processing: Processing is the logic followed by the entities in the model; in general, the processing is broken up into two parts—the movement of the entities along the paths, and the actions taken upon them at their destination.

Arrivals: Arrivals dictate when and how frequently the entities arrive.

Attributes: Attributes are characteristics assigned to each of the entities. In our model, these include number of family members, whether or not certain patients require an overnight stay, and several other characteristics relevant to some patient types.

Locations

Entrance: This location is the point at which the majority of patients will enter the model (with the exception of those patients like the ICD or Ablation patients already in the model). It represents the door or elevator from which the patients will emerge.

Registration Line: This is where the patients coming from the entrance will wait until a registration clerk is available.

Registration Desk: The patients will fill out the preliminary documentation here and then be directed to the waiting room until a treatment room opens.

Waiting Room: The patients will wait here until a treatment room opens.

Treatment Room: The patients will be sent here. A nurse and a technician will run an IV, take patient histories, perform EKG tests, and prepare the patient for his or her procedure.

Observation Rooms: The patients will wait in these rooms until the appropriate lab is ready for them. In case these rooms are full, the patients will occupy an inpatient room. Post-procedure patients will also come here if they do not need the intensive observation provided at the cath holding or 3 East recovery rooms.

Inpatient Rooms: In case the observation rooms are full, the patients will wait here for their procedure. These rooms will also be used to house any patients who need overnight stays. Post-procedure patients will also recuperate here.

Cath Labs: These labs will be used for several procedures, foremost among them, the actual cath lab procedure.

EP Labs: Several procedures, including electrophysiology labs and pacemaker labs, will be performed here.

Cath Holding: Cath patients who do not need extensive observation will be kept here after their labs before moving to inpatient/observation rooms.

3 East: EP patients and cath patients who need closer observation will be kept here before they can be moved to an inpatient/observation room.

Departure: Patients and family members exit the model here.

BUMC: Not officially part of the model, BUMC is the main hospital to which emergency cases will be sent. Transfer patients will also arrive from BUMC.

Patient Flow

These are the different paths that the patients take through the model. Many of the paths are variable; in these cases, we have tried to give the exact percentages for the proportion of patients that travel along each alternate route. Flow charts are also included in a later appendix. Due to the numerous patient types, this section will only give a brief description of their flow. For a more detailed description please consult the additional material. Also, this simulation was concerned only with the third floor of the new hospital—traffic outside this limited subject area was not explicitly noted in the simulation. In the case that a patient does leave the third floor facility (and goes to BUMC, for example), the model (and the flow chart) will just show the entity departing.

Elective Cath Patient

This patient will enter the model at the official entrance and then move to the registration line to wait to register. From there, the patient will wait in the waiting room until a treatment room is open. From the treatment room, the patient will move into either an observation room or an inpatient room (the observation room will have priority) until the cath lab is ready. After the cath procedure, the patient will go one of three places. If the cath team decided not to use an interventional procedure (as happens in 56% of the cases), the patient will move to the cath observation room. If the patient does require intervention (29% of cases), he/she will be moved to the 3 East recovery room. If the patient was a transfer from BUMC (14%), they will be discharged and transported back to the main hospital. For those patients that remain in the heart hospital, they will be moved to an observation or inpatient room and discharged after a rest period.

EP Patient

These patients will arrive and register, just as the cath patients do. They follow the same path to the observation/inpatient rooms; however, from there, the EP

patients travel to the EP lab. After the lab procedure, about half of the patients are well enough to be moved to an observation/inpatient room. However, due to the need for heavy sedation during the procedure, the other half of patients are moved to the 3 East recovery room. After four to six hours of observation, both types of patient are usually released.

Pacemaker Patient

The pacemaker patients follow the same path through registration, treatment, and to the observation/inpatient room as do the EP and cath lab patients. Like the EP patients, they are moved to the EP lab. However, their procedure is usually much shorter and less invasive than the EP patients', so they usually do not require recovery in 3 East. These patients are held in an inpatient/observation room until 11:00 AM the next day.

ICD Patients

These patients are ones that have already undergone an EP procedure, but the doctors feel their is a need to insert the ICD device. Therefore, since they are already in the system, these patients bypass the normal entrance process completely. For the purpose of this model, they are assumed to have entered the system directly into an inpatient/observation room. From there, the patients will move to the EP labs for their procedure. Due to the highly invasive nature of this procedure, all ICD patients spend time in the 3 East recovery room. From there, they will move to an inpatient/observation room until 3:00 PM the next day when they are discharged.

Ablation Patients

Similar to ICD patients, ablation patients are former AP patients who need further treatment. These patients enter the system (for the purpose of this model) in the inpatient/observation rooms. From there, the patient will move to the EP lab, where he/she will undergo the ablation. Again like the ICD procedure, ablations are highly invasive, and the ablation patients require observation in the 3 East

recovery room. From there, they will be moved back to an observation/inpatient room until they are discharged at 3:00 PM the next day.

Biopsy Patients

Biopsy patients arrive and register in the same fashion as do cath patients or EP patients. From the waiting room area, however, they bypass the observation/inpatient rooms and move directly to the cath lab. For most (90%) of the biopsy patients, the procedure is relatively minor and they are discharged immediately after the biopsy. However, for the 10% of patients who undergo a groin biopsy, a short stay in the cath observation recovery room is needed.

Right Heart Patients

These patients arrive, register, and move to an observation/inpatient room just like the cath patients do. From there, they move to the cath lab and have the right heart procedure done. A slight majority of the patients who undergo the procedure (60%) are ready to be discharged after the lab; however, a significant number (40%) need to be transferred to BUMC for further treatment.

Transfer Patients

Some patients are transferred from BUMC to the heart hospital; these patients enter through the normal entrance, but they bypass the registration line and waiting room and move straight to an observation/inpatient room. Ninety percent of the patients are at the heart hospital for a cath lab, and these patients enter the cath lab path at the inpatient/observation node. The remaining 10% enter the EP lab path at the same point. When discharged, these patients are treated like any other within the model, although in reality, they will move back to BUMC.

Cardioversion Patients

These patients arrive and register and wait like cath or EP patients. From there, they move to an inpatient/observation room, where the cardioversion treatment is performed on the patient. After a four hour treatment, the patient is discharged.

Model Analysis

After completion, we tested the model by running it several dozen times to insure no problems existed. Initially, we tested it with the staffing and lab numbers given to us by the doctor groups and Baylor. These initial figures included two registration clerks, two treatment nurses, two treatment technicians, eight heart nurses, six cath lab teams, three EP lab teams, two 3 East nurses, and four cath holding nurses. The day at the heart hospital will officially run from 7:00 AM to 11:00 PM—seventeen hours. However, with these initial resources, the operating time of the hospital was more than twenty-eight hours, well over the seventeen hour target. Therefore, we altered several different resource levels.

The first main problem we discovered was with the treatment nurses. With the initial level of two nurses, the treatment rooms were simply being underutilized—in fact, two of the cath labs were unused because not enough patients were running through the model. Our group found that by increasing this number to three nurses, the treatment room could be fully utilized. This reduced the total time to 21:02, about four hours over the target time.

The next "bottleneck" we tackled was the 3 East nurses. We noticed that several patients were forced to remain in the cath and EP labs well after their procedures were finished. The nurses in 3 East seemed hopelessly overloaded, so we increased their number until time improvement stopped. We found that five is the optimal number for the 3 East nurses. By increasing the number to five, the simulation time was cut to 17:30.

Finally, we tried to shave off the extra time by increasing the number of heart nurses. We found that nine of these nurses is the optimal number. With this many nurses, we whittled the total time down to 17:01—well within a reasonable margin of error for the desired operating time.

Because several of the patient types required nearly all of the seventeen hours for their procedure and recovery time, we did not try to further lower the simulation running time. Instead, we ran several scenarios to determine if any "fat" existed in the system. We tried lowering the number of technicians, registration clerks, cath holding nurses, and many of the other non-critical variables. Not surprisingly, we found that several resources can actually be reduced with no negative impact on the overall time. For example, the new hospital has 23 inpatient rooms. Or simulation indicates that this number could be lowered to 22 rooms with no adverse impact. Otherwise, we found the optimal number of each resource to be:

Registration Clerks: 2

Treatment Nurses: 3

Treatment Technicians: 2

Heart Nurses: 9

3 East Nurses: 5

Cath Holding Nurses: 4

Cath Teams: 6

EP Teams: 6

Treatment Rooms: 4

Inpatient Rooms: 22

EP Labs: 3

Perhaps most surprisingly, we found that the hospital could actually lower the number of cath labs to five with only a minor negative time cost (5 labs used about 15 more minutes than 6). However, other considerations must be balanced before eliminating a lab. If one of the five remaining cath labs was to go down, only having four labs would provide a serious bottleneck in the patient flow. So, although eliminating one of the cath labs might be economically attractive on paper, we would not recommend the risk, especially when people's lives might be at risk.

Conclusions and Recommendations

Baylor and the doctors' groups are planning on spending a lot of money on their new heart facility; before they do so, they need to be certain the facility they are building is adequate to handle the expected patient flow. Our model indicates that with only a few minor changes, such as using more treatment and heart nurses, their new hospital will be able to handle the number of patients expected to come through the building.

The model, with its ten patient types and mutiple laboratory facilities, was a complex one; our design team, however, attempted to create a completely unbiased simulation. After analyzing the model, we would make the following recommendations:

1.) Increase the staff levels so they at least meet the numbers given under "Model Analysis."
2.) Determine whether or not the space which houses the inpatient room that our model indicates is superfluous can be used for a more necessary facility.
3.) Include six cath labs in the new facility—even if the sixth lab is a bit unnecessary, it provides "insurance" in case one of the other labs malfunctions.

For more detailed information (scenario results, empirical data, floor plans, etc.) please refer to the accompanying appendices.

MedModel Processing

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Formatted Listing of Model:
C:\MedMod3\models\Hh4.mod

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Time Units: Minutes
Distance Units: Feet

Locations

Name	Cap	Units	Stats	Rules	Cost
Entrance	inf	1	Time Series	Oldest, ,	
Desk	2	1	Time Series	Oldest, ,	
Waiting_Room	inf	1	Time Series	Oldest, ,	
Treatment_Room	4	1	Time Series	Oldest, ,	
Inpatient_Room	23	1	Time Series	Oldest, ,	
Observation_Room	7	1	Time Series	Oldest, ,	
Three_East	9	1	Time Series	Oldest, ,	
EP_1	1	1	Time Series	Oldest, ,	
EP_2	1	1	Time Series	Oldest, ,	
EP_3	1	1	Time Series	Oldest, ,	
Cath1	1	1	Time Series	Oldest, ,	
Cath2	1	1	Time Series	Oldest, ,	
Cath3	1	1	Time Series	Oldest, ,	
Cath4	1	1	Time Series	Oldest, ,	
Cath5	1	1	Time Series	Oldest, ,	
Cath6	1	1	Time Series	Oldest, ,	
Cath_Holding	6	1	Time Series	Oldest, ,	
Regline	INFINITE	1	Time Series	Oldest, ,	
Departure	inf	1	Time Series	Oldest, ,	
Staff_room	inf	1	Time Series	Oldest, ,	
desk_workers	2	1	Time Series	Oldest, ,	
BUMC	inf	1	Time Series	Oldest, ,	

Entities

Name	Speed (fpm)	Stats	Cost
Cath	114	Time Series	
Fam_member	114	Time Series	
EP	114	Time Series	
ICD	114	Time Series	
Biopsy	114	Time Series	
Cardiovers	114	Time Series	
Right_Heart	114	Time Series	
Transfer_ed	114	Time Series	
PM	114	Time Series	
Ablation	114	Time Series	

Path Networks

Name	Type	T/S	From	To	BI	Dist/Time	Speed Factc
PT_NET	Passing	Speed & Distance	N1	N2	Bi	16.50	1
			N2	N3	Bi	16.99	1

		N3	N4	Bi	30.45	1
		N4	N5	Bi	10.00	1
		N5	N6	Bi	15.74	1
		N6	N7	Bi	12.00	1
		N6	N8	Bi	15.60	1
		N8	N9	Bi	13.36	1
		N9	N10	Bi	13.20	1
		N10	N11	Bi	12.40	1
		N11	N12	Bi	12.80	1
		N12	N13	Bi	12.40	1
		N13	N14	Bi	12.00	1
		N14	N15	Bi	15.73	1
		N15	N16	Bi	11.12	1
		N16	N17	Bi	3.39	1
		N17	N18	Bi	49.38	1
		N18	N19	Bi	13.20	1
		N19	N20	Bi	16.04	1
		N20	N21	Bi	9.23	1
		N21	N22	Bi	18.41	1
		N18	N23	Bi	10.00	1
		N23	N24	Bi	7.21	1
		N24	N25	Bi	6.41	1
		N24	N26	Bi	10.49	1
		N15	N27	Bi	6.01	1
		N27	N28	Bi	8.40	1
		N28	N29	Bi	13.20	1
		N29	N30	Bi	11.20	1
		N5	N30	Bi	49.71	1
		N31	N1	Bi	4.81	1
		N21	N32	Bi	40.41	1
STAFF_NET	Passing Speed & Distance	N1	N2	Bi	14.40	1
		N2	N3	Bi	8.80	1
		N2	N4	Bi	5.21	1
		N5	N6	Bi	5.21	1
		N6	N7	Bi	5.65	1
		N4	N8	Bi	28.84	1
		N8	N5	Bi	7.69	1
		N8	N9	Bi	9.80	1
		N9	N10	Bi	6.80	1
		N10	N11	Bi	6.81	1
		N9	N12	Bi	15.22	1
		N12	N13	Bi	8.09	1
		N13	N14	Bi	6.80	1
		N14	N15	Bi	5.61	1
		N15	N16	Bi	12.40	1
		N16	N3	Bi	8.48	1
		N3	N17	Bi	10.80	1
		N17	N18	Bi	12.80	1
		N18	N19	Bi	12.40	1
		N19	N20	Bi	5.21	1
		N20	N21	Bi	11.12	1
		N21	N22	Bi	13.93	1
		N22	N23	Bi	49.06	1
		N4	N24	Bi	16.00	1
		N24	N25	Bi	13.60	1
		N25	N26	Bi	12.40	1
		N26	N27	Bi	12.00	1
		N27	N22	Bi	7.20	1
		N23	N28	Bi	14.84	1
		N28	N29	Bi	10.40	1
		N29	N30	Bi	10.67	1
		N30	N31	Bi	19.69	1
		N23	N32	Bi	15.33	1
		N32	N33	Bi	6.81	1
		N33	N34	Bi	7.58	1
		N33	N35	Bi	6.80	1
		N4	N36	Bi	21.96	1

N7	N37	Bi	20.37	1
N30	N38	Bi	20.36	1
N30	N39	Bi	6.70	1
N29	N40	Bi	10.46	1
N28	N41	Bi	11.06	1
N23	N42	Bi	11.76	1
N32	N43	Bi	5.44	1
N35	N44	Bi	5.33	1
N23	N45	Bi	8.23	1
N28	N46	Bi	11.11	1
N29	N47	Bi	9.74	1
N30	N48	Bi	36.46	1

Interfaces

Net	Node	Location
PT_NET	N4	Treatment_Room
	N7	Inpatient_Room
	N18	EP_3
	N19	Cath4
	N20	EP_1
	N20	EP_2
	N20	Cath2
	N21	Cath1
	N19	Cath3
	N23	Cath5
	N25	Cath6
	N26	Cath_Holding
	N22	Three_East
	N3	Desk
	N1	Regline
	N1	Entrance
	N1	Departure
	N2	Waiting_Room
	N32	BUMC
	N27	Observation_Room
STAFF_NET	N7	Treatment_Room
	N11	Inpatient_Room
	N34	Cath_Holding
	N31	Three_East
	N1	Staff_room
	N27	Observation_Room
	N37	Waiting_Room
	N36	Desk
	N39	Cath1
	N40	Cath2
	N41	Cath3
	N42	Cath4
	N43	Cath5
	N45	EP_3
	N46	EP_2
	N47	EP_1
	N44	Cath6
	N48	BUMC

Resources

Name	Units	Stats	Res Search	Ent Search	Path	Motion	Cost

```
   pre_nurse   4     By Unit  Closest Oldest STAFF_NET  Empty: 114 fpm
                                             Home: N1    Full: 114 fpm
                                             (Return)

   pre_tech    2     By Unit  Closest Oldest STAFF_NET  Empty: 114 fpm
                                             Home: N1    Full: 114 fpm
                                             (Return)

   reg         2     By Unit  Closest Oldest STAFF_NET  Empty: 114 fpm
                                             Home: N36   Full: 114 fpm
                                             (Return)

   heartnurse  8     By Unit  Closest Oldest STAFF_NET  Empty: 114 fpm
                                             Home: N1    Full: 114 fpm
                                             (Return)

   enurse      6     By Unit  Closest Oldest STAFF_NET  Empty: 114 fpm
                                             Home: N31   Full: 114 fpm
                                             (Return)

   obsnurse    2     By Unit  Closest Oldest STAFF_NET  Empty: 114 fpm
                                             Home: N34   Full: 114 fpm
                                             (Return)

   cathteam    6     By Unit  Closest Oldest STAFF_NET  Empty: 114 fpm
                                             Home: N38   Full: 114 fpm
                                             (Return)

   epteam      3     By Unit  Closest Oldest STAFF_NET  Empty: 114 fpm
                                             Home: N38   Full: 114 fpm
                                             (Return)

*****************************************************************************
*                                Processing                                 *
*****************************************************************************

                                        Process                        Routing

Entity      Location          Operation              Blk Output      Destination      Ru
----------- ----------------- ---------------------  --- ----------- ---------------- --
Cath        Entrance          CATH_LOS = Clock()

                              FAM_MEM = NO_FAM_MEMBERS()
                              CREATE FAM_MEM AS Fam_member

                              CATHPT=1
                              Cath_Dest = Cath_Dest_table()
                                                     1   Cath        Regline          FI
Cath        Regline                                  1   Cath        Desk             FI
Cath        Desk              USE reg FOR N(5,1)
                                                     1   Cath        Waiting_Room     FI
Cath        Waiting_Room      INC Waitroom_count, 1
                              If Waitroom_count > Waitroom_max then
                              Waitroom_max = Waitroom_count
                                                     1   Cath        Treatment_Room   FI

Cath        Treatment_Room    USE pre_tech FOR  N(5,1)
                              USE pre_tech FOR N(5,1)
                              USE pre_nurse FOR N(7,1)

                                                     1   Cath        Inpatient_Room   FI
```

```
                                                        Cath        Observation_Room F
Cath        Inpatient_Room   Macro_room              1   Cath        Cath1            F

                                                        Cath        Cath2            F
                                                        Cath        Cath3            F
                                                        Cath        Cath4            F
                                                        Cath        Cath5            F
                                                        Cath        Cath6            F
                                                    2   Cath        Departure        F

Cath        Observation_Room Macro_room              1   Cath        Cath1            F

                                                        Cath        Cath2            F
                                                        Cath        Cath3            F
                                                        Cath        Cath4            F
                                                        Cath        Cath5            F
                                                        Cath        Cath6            F
                                                    2   Cath        Departure        F

Cath        Cath1            Macro_cath

                                                    1   Cath        Cath_Holding     F

                                                    2   Cath        Three_East       FI
                                                    3   Cath        BUMC             FI

Cath        Cath2            Macro_cath             1   Cath        Cath_Holding     FI

                                                    2   Cath        Three_East       FI
                                                    3   Cath        BUMC             FI
Cath        Cath3            Macro_cath             1   Cath        Cath_Holding     FI

                                                    2   Cath        Three_East       FI
                                                    3   Cath        BUMC             FI
Cath        Cath4            Macro_cath
                                                    1   Cath        Cath_Holding     FI
                                                    2   Cath        Three_East       FI
                                                    3   Cath        BUMC             FI
Cath        Cath5            Macro_cath             1   Cath        Cath_Holding     FI
                                                    2   Cath        Three_East       FI
                                                    3   Cath        BUMC             FI
Cath        Cath6            Macro_cath             1   Cath        Cath_Holding     FI
                                                    2   Cath        Three_East       FI
                                                    3   Cath        BUMC             FI
Cath        Three_East       USE enurse FOR -488+W(7.06,969)
                                                    1   Cath        Inpatient_Room   FI

                                                        Cath        Observation_Room FI

Cath        Cath_Holding     USE obsnurse FOR CATH_OBS_TABLE()

                                                    1   Cath        Inpatient_Room   FI

                                                        Cath        Observation_Room FI

Cath        Departure        JOIN FAM_MEM Fam_member
                             log "Cath Average LOS", CATH_LOS

                             FREE ALL
                                                    1   Cath        EXIT             FI

Fam_member  Entrance
                                                    1   Fam_member  Waiting_Room     FI

Fam_member  Waiting_Room
```

```
                                INC Waitroom_count, 1
                                If Waitroom_count > Waitroom_max then
                                Waitroom_max = Waitroom_count

                                                    1   Fam_member  Departure       JC


Fam_member  Departure
                                FREE ALL
                                                    1   Fam_member  EXIT            FI


Cath        BUMC                INC BUMC_count
                                GRAPHIC 2           1   Cath        Departure       FI

EP          Entrance            EP_LOS = Clock ()
                                EP_ATT=EP_ROUTE_TABLE()
                                PRO_DONE=0
                                FAM_MEM = NO_FAM_MEMBERS()
                                CREATE FAM_MEM AS Fam_member
                                                    1   EP          Regline         FI

EP          Regline                                 1   EP          Desk            FI

EP          Desk                USE reg FOR N(5,1)
                                                    1   EP          Waiting_Room    FI

EP          Waiting_Room        INC Waitroom_count, 1
                                If Waitroom_count > Waitroom_max then
                                Waitroom_max = Waitroom_count
                                                    1   EP          Treatment_Room  FI


EP          Treatment_Room      USE pre_tech FOR  N(5,1)
                                USE pre_tech FOR N(5,1)
                                USE pre_nurse FOR N(7,1)
                                                    1   EP          Inpatient_Room  FI

                                                        EP          Observation_Room FI

EP          Inpatient_Room      Macro_room          1   EP          EP_1            FI

                                                        EP          EP_2            FI
                                                        EP          EP_3            FI
                                                    2   EP          Departure       FI

EP          Observation_Room    Macro_room          1   EP          EP_1            FI
                                                        EP          EP_2            FI
                                                        EP          EP_3            FI
                                                    2   EP          Departure       FI

EP          EP_1                Macro_ep            1   EP          Three_East      FI

                                                    2   EP          Inpatient_Room  FI

                                                        EP          Observation_Room FI

EP          EP_2                Macro_ep            1   EP          Three_East      FI

                                                    2   EP          Inpatient_Room  FI

                                                        EP          Observation_Room FI

EP          Departure           JOIN FAM_MEM Fam_member
                                log "EP Average LOS", EP_LOS
                                FREE ALL            1   EP          EXIT            FI
```

```
EP          EP_3              Macro_ep                  1   EP          Three_East          F

                                                        2   EP          Inpatient_Room      F
                                                            EP          Observation_Room    F
EP          Three_East        USE enurse FOR N(54,27)
                                                        1   EP          Inpatient_Room      F

                                                                        Observation_Room    F

ICD         Inpatient_Room    ICD_LOS = Clock ()
                              ICD_ATT=1

                              WAIT 120
                              Macro_room                1   ICD         EP_1                FI

                                                            ICD         EP_2                FI

                                                            ICD         EP_3                FI
                                                        2   ICD         Departure           FI

ICD         Observation_Room  Macro_room                1   ICD         EP_1                FI
                                                            ICD         EP_2                FI
                                                            ICD         EP_3                FI
                                                        2   ICD         Departure           FI

ICD         Departure         JOIN FAM_MEM Fam_member
                              log "ICD Average LOS", ICD_LOS
                              FREE ALL                  1   ICD         EXIT                FI

ICD         EP_1              Macro_ep                  1   ICD         Three_East          FI

ICD         EP_2              Macro_ep                  1   ICD         Three_East          FI

ICD         EP_3              Macro_ep                  1   ICD         Three_East          FI
ICD         Three_East        USE enurse FOR N(54,27)
                                                        1   ICD         Inpatient_Room      FI

                                                            ICD         Observation_Room    FI

Biopsy      Entrance          BIOP_LOS = Clock ()
                              BIOP=BIOP_GROIN()
                              FAM_MEM = NO_FAM_MEMBERS()
                              CREATE FAM_MEM AS Fam_member
                                                        1   Biopsy      Regline             FI

Biopsy      Regline                                     1   Biopsy      Desk                FI

Biopsy      Desk              USE reg FOR  N(5,1)
                                                        1   Biopsy      Waiting_Room        FI

Biopsy      Waiting_Room      INC Waitroom_count, 1
                              If Waitroom_count > Waitroom_max then
                              Waitroom_max = Waitroom_count
                                                        1   Biopsy      Cath1               FI

                                                            Biopsy      Cath2               FI

                                                            Biopsy      Cath3               FI

                                                            Biopsy      Cath4               FI

                                                            Biopsy      Cath5               FI

                                                            Biopsy      Cath6               FI

Biopsy      Cath1             Macro_cath                1   Biopsy      Cath_Holding        FI
```

```
                                                    2   Biopsy      Departure        FI

Biopsy      Cath2           Macro_cath              1   Biopsy      Cath_Holding     FI

                                                    2   Biopsy      Departure        FI

Biopsy      Cath3           Macro_cath              1   Biopsy      Cath_Holding     FI

                                                    2   Biopsy      Departure        FI

Biopsy      Cath4           Macro_cath              1   Biopsy      Cath_Holding     FI
                                                    2   Biopsy      Departure        FI

Biopsy      Cath5           Macro_cath              1   Biopsy      Cath_Holding     FI

                                                    2   Biopsy      Departure        FI

Biopsy      Cath6           Macro_cath              1   Biopsy      Cath_Holding     FI

                                                    2   Biopsy      Departure        FI

Biopsy      Cath_Holding    USE obsnurse FOR N(45, 15)
                                                    1   Biopsy      Departure        FI

Biopsy      Departure       JOIN FAM_MEM Fam_member
                            log "Biopsy Average LOS", BIOP_LOS
                            FREE ALL                1   Biopsy      EXIT             FI

Cardiovers  Entrance        CARD_LOS = Clock ()

                            FAM_MEM = NO_FAM_MEMBERS()
                            CREATE FAM_MEM AS Fam_member
                                                    1   Cardiovers  Regline          FI

Cardiovers  Regline                                 1   Cardiovers  Desk             FI

Cardiovers  Desk            USE reg FOR N(5,1)
                                                    1   Cardiovers  Inpatient_Room   FI

                                                        Cardiovers  Observation_Room FI

Cardiovers  Inpatient_Room  USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                                                    1   Cardiovers  Departure        FI

Cardiovers  Observation_Room USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                            WAIT 30
                            USE heartnurse FOR 5
                            WAIT 30
```

```
                                USE heartnurse FOR 5
                                WAIT 30
                                USE heartnurse FOR 5
                                WAIT 30
                                USE heartnurse FOR 5
                                WAIT 30                 1   Cardiovers  Departure        FI

Cardiovers  Departure           JOIN FAM_MEM Fam_member
                                log "Cardioversion Average LOS", CARD_LOS
                                FREE ALL                1   Cardiovers  EXIT             FI

Right_Heart Entrance            RIGHT_LOS = Clock ()
                                RIGHT=RH_dest_table()
                                FAM_MEM = NO_FAM_MEMBERS()
                                CREATE FAM_MEM AS Fam_member
                                                        1   Right_Heart Regline          FI

Right_Heart Regline                                     1   Right_Heart Desk             FI

Right_Heart Desk                USE reg FOR  N(5,1)
                                                        1   Right_Heart Waiting_Room     FI

Right_Heart Waiting_Room        INC Waitroom_count, 1
                                If Waitroom_count > Waitroom_max then
                                Waitroom_max = Waitroom_count
                                                        1   Right_Heart Inpatient_Room   FI

                                                            Right_Heart Observation_Room FI

Right_Heart Inpatient_Room      Macro_room              1   Right_Heart Cath1            FI
                                                            Right_Heart Cath2            FI
                                                            Right_Heart Cath3            FI
                                                            Right_Heart Cath4            FI
                                                            Right_Heart Cath5            FI
                                                            Right_Heart Cath6            FI
Right_Heart Cath1               Macro_cath              1   Right_Heart Departure        FI

                                                        2   Right_Heart BUMC             FI

Right_Heart Cath2               Macro_cath              1   Right_Heart Departure        FI

                                                        2   Right_Heart BUMC             FI

Right_Heart Cath3               Macro_cath              1   Right_Heart Departure        FI

                                                        2   Right_Heart BUMC             FI
Right_Heart Cath4               Macro_cath              1   Right_Heart Departure        FI

                                                        2   Right_Heart BUMC             FI
Right_Heart Cath5               Macro_cath              1   Right_Heart Departure        FI

                                                        2   Right_Heart BUMC             FI
Right_Heart Cath6               Macro_cath              1   Right_Heart Departure        FI

                                                        2   Right_Heart BUMC             FI
Right_Heart BUMC                INC BUMC_count, 1
                                GRAPHIC 2               1   Right_Heart Departure        FI

Right_Heart Departure           JOIN FAM_MEM Fam_member
                                log "Right Heart Average LOS", RIGHT_LOS
                                FREE ALL                1   Right_Heart EXIT             FI

Right_Heart Observation_Room    Macro_room              1   Right_Heart Cath1            FI

                                                            Right_Heart Cath2            FI
```

```
                                                    Right_Heart Cath3          FI
                                                    Right_Heart Cath4          FI
                                                    Right_Heart Cath5          FI
                                                    Right_Heart Cath6          FI
                                                2   Right_Heart Departure      FI

Transfer_ed Entrance          TRANS_LOS = Clock ()
                              TRANS=TRANS_ROUTE()

                                                1   Transfer_ed Inpatient_Room FI

Transfer_ed Inpatient_Room
                              Macro_room        1   Transfer_ed Cath1          FI
                                                    Transfer_ed Cath2          FI
                                                    Transfer_ed Cath3          FI
                                                    Transfer_ed Cath4          FI
                                                    Transfer_ed Cath5          FI
                                                    Transfer_ed Cath6          FI
                                                2   Transfer_ed EP_1           FI
                                                    Transfer_ed EP_2           FI
                                                    Transfer_ed EP_3           FI
                                                3   Transfer_ed Departure      FI

Transfer_ed Cath1             Macro_cath        1   Transfer_ed Cath_Holding   FI
                                                2   Transfer_ed Three_East     FI

Transfer_ed Cath2             Macro_cath        1   Transfer_ed Cath_Holding   FI
                                                2   Transfer_ed Three_East     FI

Transfer_ed Cath3             Macro_cath        1   Transfer_ed Cath_Holding   FI
                                                2   Transfer_ed Three_East     FI

Transfer_ed Cath4             Macro_cath        1   Transfer_ed Cath_Holding   FI
                                                2   Transfer_ed Three_East     FI

Transfer_ed Cath5             Macro_cath        1   Transfer_ed Cath_Holding   FI
                                                2   Transfer_ed Three_East     FI

Transfer_ed Cath6             Macro_cath        1   Transfer_ed Cath_Holding   FI
                                                2   Transfer_ed Three_East     FI

Transfer_ed EP_1              Macro_ep          1   Transfer_ed Three_East     FI

Transfer_ed EP_2              Macro_ep          1   Transfer_ed Three_East     FI
Transfer_ed EP_3              Macro_ep          1   Transfer_ed Three_East     FI
Transfer_ed Cath_Holding      USE obsnurse FOR 120

                                                1   Transfer_ed Inpatient_Room FI

Transfer_ed Three_East        USE enurse FOR 120
                                                1   Transfer_ed Inpatient_Room FI
Transfer_ed Departure         JOIN FAM_MEM Fam_member
                              log "Transfer Average LOS", TRANS_LOS
                              FREE ALL          1   Transfer_ed EXIT           FI
```

```
PM          Entrance          PM_LOS = Clock()
                              PM_ATT=1


                              FAM_MEM = NO_FAM_MEMBERS()
                              CREATE FAM_MEM AS Fam_member
                                                  1   PM          Regline          FI

PM          Regline                                 1   PM          Desk             FI

PM          Desk              USE reg FOR  N(5,1)
                                                    1   PM          Waiting_Room     FI

PM          Waiting_Room      INC Waitroom_count, 1
                              If Waitroom_count > Waitroom_max then
                              Waitroom_max = Waitroom_count
                                                    1   PM          Treatment_Room   FI

PM          Treatment_Room    USE pre_tech FOR  N(5,1)
                              USE pre_tech FOR N(5,1)
                              USE pre_nurse FOR N(7,1)
                                                    1   PM          Inpatient_Room   FI

                                                        PM          Observation_Room FI

PM          Inpatient_Room    Macro_room            1   PM          EP_1             FI

                                                        PM          EP_2             FI
                                                        PM          EP_3             FI
                                                    2   PM          Departure        FI

PM          Observation_Room  Macro_room            1   PM          EP_1             FI
                                                        PM          EP_2             FI
                                                        PM          EP_3             FI
                                                    2   PM          Departure        FI

PM          EP_1              Macro_ep              1   PM          Inpatient_Room   FI

                                                        PM          Observation_Room FI
PM          EP_2              Macro_ep              1   PM          Inpatient_Room   FI
                                                        PM          Observation_Room FI
PM          EP_3              Macro_ep              1   PM          Inpatient_Room   FI
                                                        PM          Observation_Room FI
PM          Departure         JOIN FAM_MEM Fam_member
                              log "PM Average LOS", PM_LOS

                              FREE ALL              1   PM          EXIT             FI

Ablation    Entrance          Ab_LOS = Clock()
                              Ab_ATT=1


                              FAM_MEM = NO_FAM_MEMBERS()
                              CREATE FAM_MEM AS Fam_member
                                                  1   Ablation    Inpatient_Room   FI

Ablation    Inpatient_Room    Macro_room
                                                    1   Ablation    EP_1             FI

                                                        Ablation    EP_2             FI
                                                        Ablation    EP_3             FI
                                                    2   Ablation    Departure        FI
```

```
Ablation    EP_1              Macro_ep                1   Ablation    Three_East       F
Ablation    EP_2              Macro_ep                1   Ablation    Three_East       F
Ablation    EP_3              Macro_ep                1   Ablation    Three_East       F
Ablation    Three_East        USE enurse FOR N(54, 27)
                                                      1   Ablation    Inpatient_Room   F
Ablation    Departure         JOIN FAM_MEM Fam_member
                              log "AB Average LOS", Ab_LOS
                              FREE ALL                1   Ablation    EXIT             F
```

****

* Arrivals *

****

Entity	Location	Qty each	First Time	Occurrences	Frequency	Logic
Cath	Entrance	P(22.5,2)	5+N(0,2)	1	0	
EP	Entrance	3	1	1	10	
ICD	Inpatient_Room	1	0	1	0	
Biopsy	Entrance	1		6	15	
Cardiovers	Entrance	1		1	60	
Right_Heart	Entrance	1		4	60	
Transfer_ed	Entrance	2		1		
Ablation	Entrance	1		1		
PM	Entrance	2		1		

****

* Attributes *

****

ID	Type	Classification
FAM_MEM	Integer	Entity
CATH_LOS	Real	Entity
#		
#0 for no, 1 for yes		
PRO_DONE	Integer	Entity
EP_LOS	Real	Entity
RIGHT_LOS	Real	Entity
CARD_LOS	Real	Entity
BIOP_LOS	Real	Entity
ICD_LOS	Real	Entity
TRANS_LOS	Real	Entity
BIOP	Integer	Entity
CATHPT	Integer	Entity
RIGHT	Integer	Entity
TRANS	Integer	Entity
TRANSENT	Integer	Entity
Cath_Dest	Integer	Entity
CATH_3E_STAY	Real	Entity
CATH_OBS_STAY	Real	Entity
EP_ATT	Integer	Entity
CATH_IN_ROOM	Real	Entity
ICD_ATT	Integer	Entity
TRANS_CATH_TEST	Real	Entity
TRANS_EP	Integer	Entity
PM_LOS	Real	Entity
PM_ATT	Integer	Entity
Ab_LOS	Real	Entity

```
  Ab_ATT             Integer      Entity
  cath_op_time_temp  Real         Entity
  cath_op_time       Real         Entity


*****************************************************************************
*                              Variables (global)                           *
*****************************************************************************

  ID              Type         Initial value Stats
  --------------- ------------ ------------- -----------
  Waitroom_max    Integer      0             Time Series
  Waitroom_count  Integer      0             Time Series
  BUMC_count      Integer      0             Time Series


*****************************************************************************
*                                    Macros                                 *
*****************************************************************************

  ID              Text
  --------------- ------------
  Macro_room      IF PRO_DONE = 0 AND TRANS=2 THEN
                  {USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
                   ROUTE 1 }
                  IF PRO_DONE=0 AND TRANS=1 THEN
                  {USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
                  ROUTE 2}

                  If Pro_Done=1 and Trans=1 then
                    {USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
                      Route 3}
                  If Pro_Done=1 and Trans=2 then
                    { CATH_IN_ROOM=720
                      IF CLOCK()+CATH_IN_ROOM>1020 THEN
                      CATH_IN_ROOM=1020-CLOCK()
                      WAIT CATH_IN_ROOM
                      Route 3}

                  IF CATHPT>0 AND PRO_DONE=0 THEN
                  {
                  USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
                   ROUTE 1
                  }


                  IF EP_ATT>0 AND PRO_DONE=0 THEN
                  {
                  USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
                  ROUTE 1
                  }
                  IF ICD_ATT>0 AND PRO_DONE=0 THEN
                  {
                  USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
                  ROUTE 1
                  }
                  IF Cath_Dest=1 AND PRO_DONE=1 THEN
                  {USE heartnurse FOR 5
                  WAIT 120
                  USE heartnurse FOR 5
                  WAIT 120
                  USE heartnurse FOR 5
                  WAIT 120
                  free heartnurse
                  ROUTE 2
                  }
                  IF Cath_Dest=2 AND PRO_DONE=1THEN
```

```
{
CATH_IN_ROOM=720
IF CLOCK()+CATH_IN_ROOM>1020 THEN
CATH_IN_ROOM=1020-CLOCK()
WAIT CATH_IN_ROOM
ROUTE 2
}



IF  EP_ATT>0 AND PRO_DONE=1 AND CLOCK()+375<1020 THEN
{
USE heartnurse FOR 5
WAIT 120
USE heartnurse FOR 5
WAIT 120
USE heartnurse FOR 5
WAIT 120
free heartnurse
ROUTE 2
}
IF  EP_ATT>0 AND PRO_DONE=1 AND CLOCK()+375>=1020 THEN
{
WAIT 1020-CLOCK()
ROUTE 2
}

IF ICD_ATT>0 AND PRO_DONE=1 THEN
{
WAIT 1020-CLOCK()
ROUTE 2
}
IF RIGHT>0 AND PRO_DONE=0 THEN
{
USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
ROUTE 1
}
IF TRANS>0 AND PRO_DONE=0 THEN
{
USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
ROUTE 1
}

IF PM_ATT>0 AND PRO_DONE=0 THEN
{
USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
ROUTE 1
}
IF PM_ATT>0 AND PRO_DONE=1THEN
{WAIT 1020-CLOCK()
ROUTE 2}



IF Ab_ATT>0 AND PRO_DONE=0 THEN
{
USE heartnurse FOR N(7.5, 2.5)+N(12, 4)+N(7.5,2.5)
ROUTE 1
}
IF (Ab_ATT>0 AND PRO_DONE=1) THEN
{WAIT 1020-CLOCK()
ROUTE 2}


Macro_Cath
IF BIOP >0 THEN
{
```

```
                    USE cathteam FOR 1.82+P5(5.75,119)
                    PRO_DONE=1
                    ROUTE BIOP
                    }

                    IF RIGHT>0 THEN
                    {
                    USE cathteam FOR N(30, 5)

                    PRO_DONE=1
                    ROUTE RIGHT
                    }
                    IF CATHPT>0 THEN
                    {

                    cath_op_time_temp=B(70.2,90,19.2,90)
                    If ((Clock()+cath_op_time_temp)>1020) then
                       {
                         if Clock()>1020 then
                           {  cath_op_time=0}
                        else
                           {cath_op_time=1020-cath_op_time_temp}
                        }
                    Else
                       {cath_op_time=cath_op_time_temp}
                    USE cathteam FOR cath_op_time
                    PRO_DONE=1
                     ROUTE Cath_Dest
                    }
                    IF TRANS>0 THEN
                    {
                    USE cathteam FOR   B(70.2,90,19.2,90)
                    PRO_DONE=1
                    ROUTE 1

                    }
Macro_ep            IF EP_ATT>0 THEN
                    {
                    cath_op_time_temp=EP_LAB_TIME()
                    If ((cath_op_time_temp+Clock())>1020) then
                       {
                          If Clock()>1020 then
                             {  cath_op_time=0}
                         else
                             {  cath_op_time=1020-Clock()}
                     }
                    Else
                       {  cath_op_time=cath_op_time_temp}
                    USE epteam FOR cath_op_time

                    PRO_DONE=1
                    ROUTE EP_ATT
                    }
                    IF ICD_ATT>0 THEN
                    {
                    USE epteam FOR ICD_LAB_TIME()
                    PRO_DONE=1
                    ROUTE 1
                    }
                    IF TRANS>0 THEN
                    {
                    USE epteam FOR EP_LAB_TIME()
                    PRO_DONE=1
                    ROUTE 1
                    }
                    IF PM_ATT>0 THEN
```

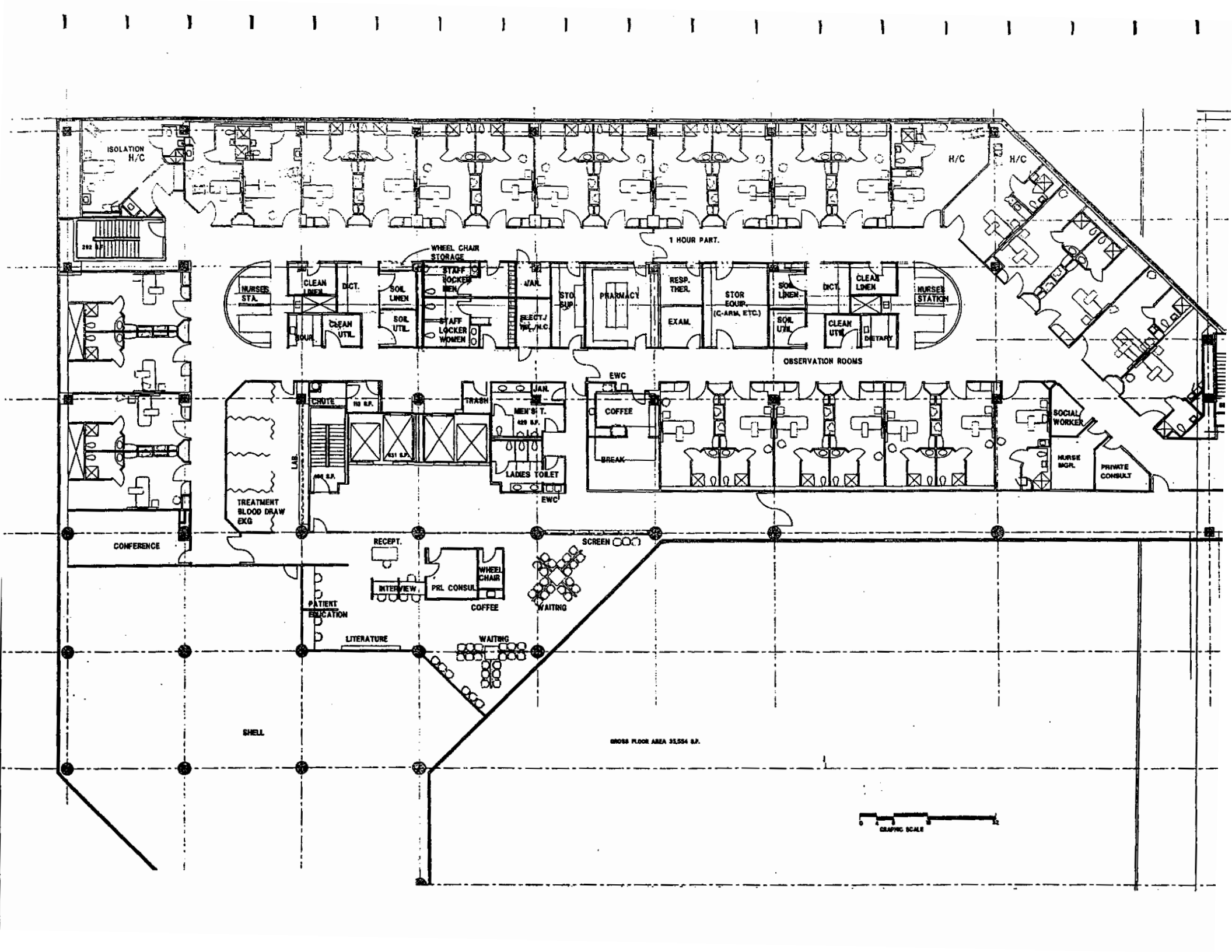
```
                {
                USE epteam FOR PM_LAB_STAY()

                PRO_DONE=1

                ROUTE 1}

                IF Ab_ATT>0 THEN
                {
                USE epteam FOR N(360,120)

                PRO_DONE=1

                ROUTE 1}
```

```
*******************************************************************************
*                                Arrival Cycles                               *
*******************************************************************************

  ID          Qty / %      Cumulative   Time (Hours) Value
  ----------  -----------  -----------  -----------  -----------
  cathcyc     Percent      No
```

```
*******************************************************************************
*                              User Distributions                             *
*******************************************************************************

  ID               Type         Cumulative   Percentage   Value
  ---------------  -----------  -----------  -----------  -----------
  NO_FAM_MEMBERS   Discrete     No           5.56         0
                                             36.36        1
                                             29.29        2
                                             11.11        3
                                             11.11        4
                                             3.03         5
                                             1.52         6
                                             1.01         7
                                             0.51         9
                                             0.50         12
  BIOP_GROIN       Discrete     No           10           1
                                             90           2
  TRANS_ROUTE      Discrete     No           10           1
                                             90           2
  Cath_Dest_table  Discrete     No           14.54        3
                                             29.34        2
                                             56.12        1
  RH_dest_table    Discrete     No           40           2
                                             60           1
  CATH_OBS_TABLE   Continuous   No           0            30
                                             8.7          33
                                             12.5         36
                                             12.5         39
                                             35           42
                                             31.3         45
  EP_ROUTE_TABLE   Discrete     No           50           1
                                             50           2
  EP_LAB_TIME      Continuous   No           0            45
                                             15.9         82.2
                                             26.5         118.8
                                             27.3         156
                                             10.7         193.2
                                             7.55         229.8
                                             4.37         267
```

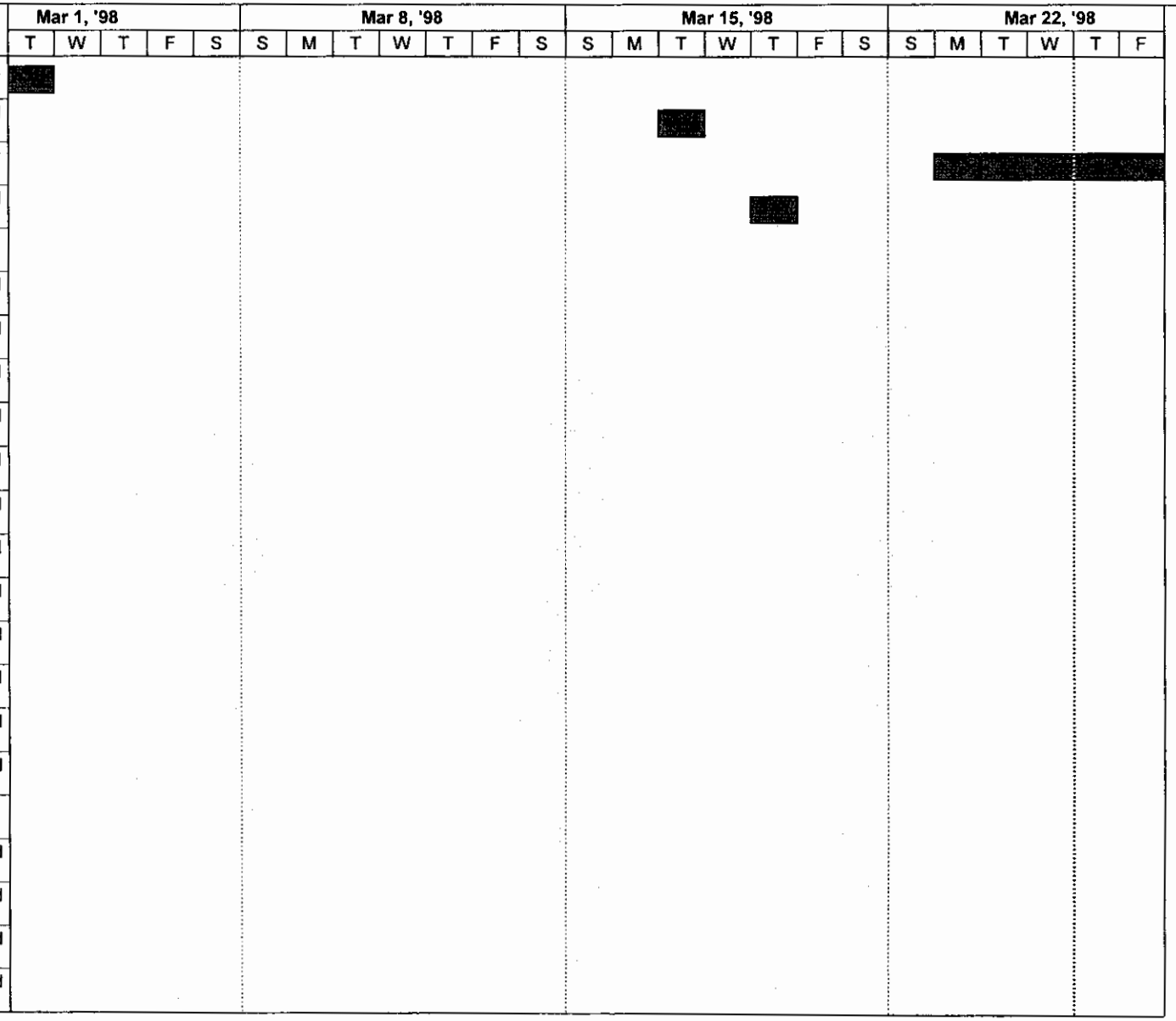
			3.81	304.2
			1.48	340.8
			.776	378
			.494	415.2
			.28	451.8
			.35	489
			.14	526.2
			.21	562.8
			.14	600
ICD_LAB_TIME	Continuous	No	0	90
			26.4	111.6
			22.03	132.6
			20.1	154.2
			5.03	175.8
			12.6	197.4
			8.18	218.4
			5.66	240
PM_LAB_STAY	Continuous	No	0	90
			25.3	106.8
			30.6	123.6
			14.04	139.8
			13.2	156.6
			4.449	173.4
			5.62	190.2
			2.25	206.4
			2.57	223.2
			1.971	240

Heart Hospital Floorplan


ISOLATION H/C
H/C
H/C
1 HOUR PART.
WHEEL CHAIR STORAGE
NURSES STA.
CLEAN LINEN
DICT.
SOIL LINEN
STAFF LOCKER MEN
JAN.
STO SUP.
PHARMACY
RESP. THER.
STOR EQUIP. (C-ARM, ETC.)
SOIL LINEN
DICT.
CLEAN LINEN
NURSES STATION
SOUR.
CLEAN UTIL.
SOIL UTIL.
STAFF LOCKER WOMEN
ELECT./TEL./N.C.
EXAM.
SOIL UTIL.
CLEAN UTIL.
DIETARY
OBSERVATION ROOMS
EWC
CHUTE
110 S.F.
TRASH
JAN.
MEN'S T.
429 S.F.
COFFEE
SOCIAL WORKER
LAB.
431 S.F.
LADIES TOILET
BREAK
NURSE MGR.
PRIVATE CONSULT
EWC
TREATMENT BLOOD DRAW EKG
CONFERENCE
RECEPT.
SCREEN
WHEEL CHAIR
INTERVIEW
PRL CONSUL
COFFEE
WAITING
PATIENT EDUCATION
LITERATURE
WAITING
SHELL
GROSS FLOOR AREA 33,554 S.F.
GRAPHIC SCALE

Time Line Used

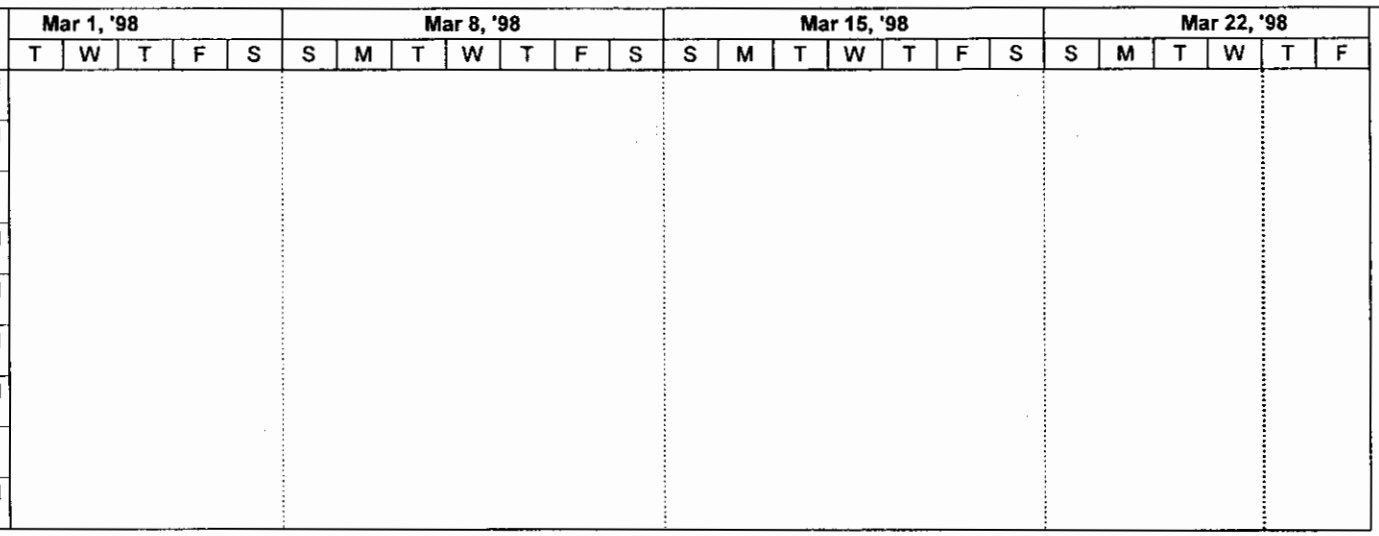
ID	Task Name	Duration
1	Project Overview	1d
2	Determine Scope	1d
3	Flow Chart Process	5d
4	Software Orientation	1d
5		
6	Collect Arrival Data	5d
7	Family Member Data	5d
8	Time to Register Data	1d
9	Clothes Change Data	1d
10	Place IV Time	1d
11	Lab and EKG Times	1d
12	Admitting Database Time	1d
13	Nurse Assessment, Consent,	1d
14	Procedure Times	1d
15	Disposition Data	1d
16	3E Recovery Time	2d
17	HHOBS Recovery Process	2d
18		
19	Modeling Layout	1d
20	Locations	1d
21	Path Network	1d
22	Resources	1d



Project: HeartPlan.MPP
Date: Thu 3/26/98

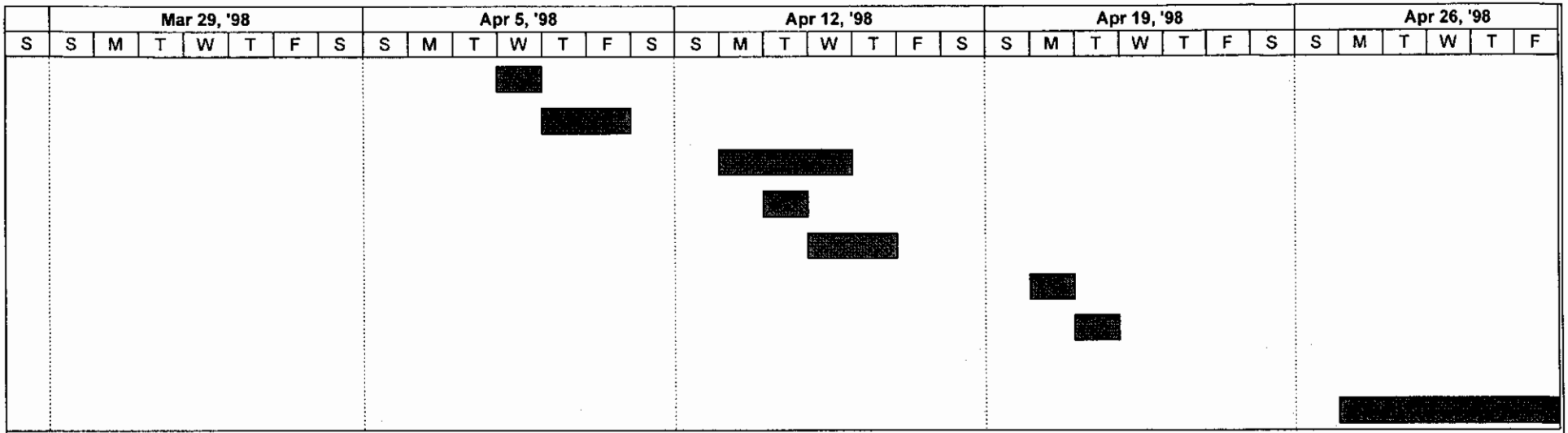
Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

ID	Task Name	Duration
23	Entities	1d
24	Skeleton Logic	2d
25	Detailed Logic	3d
26	Insert Distributions	1d
27	Debug	2d
28	Validate	1d
29	Scenarios	1d
30		
31	Final Presentation	5d



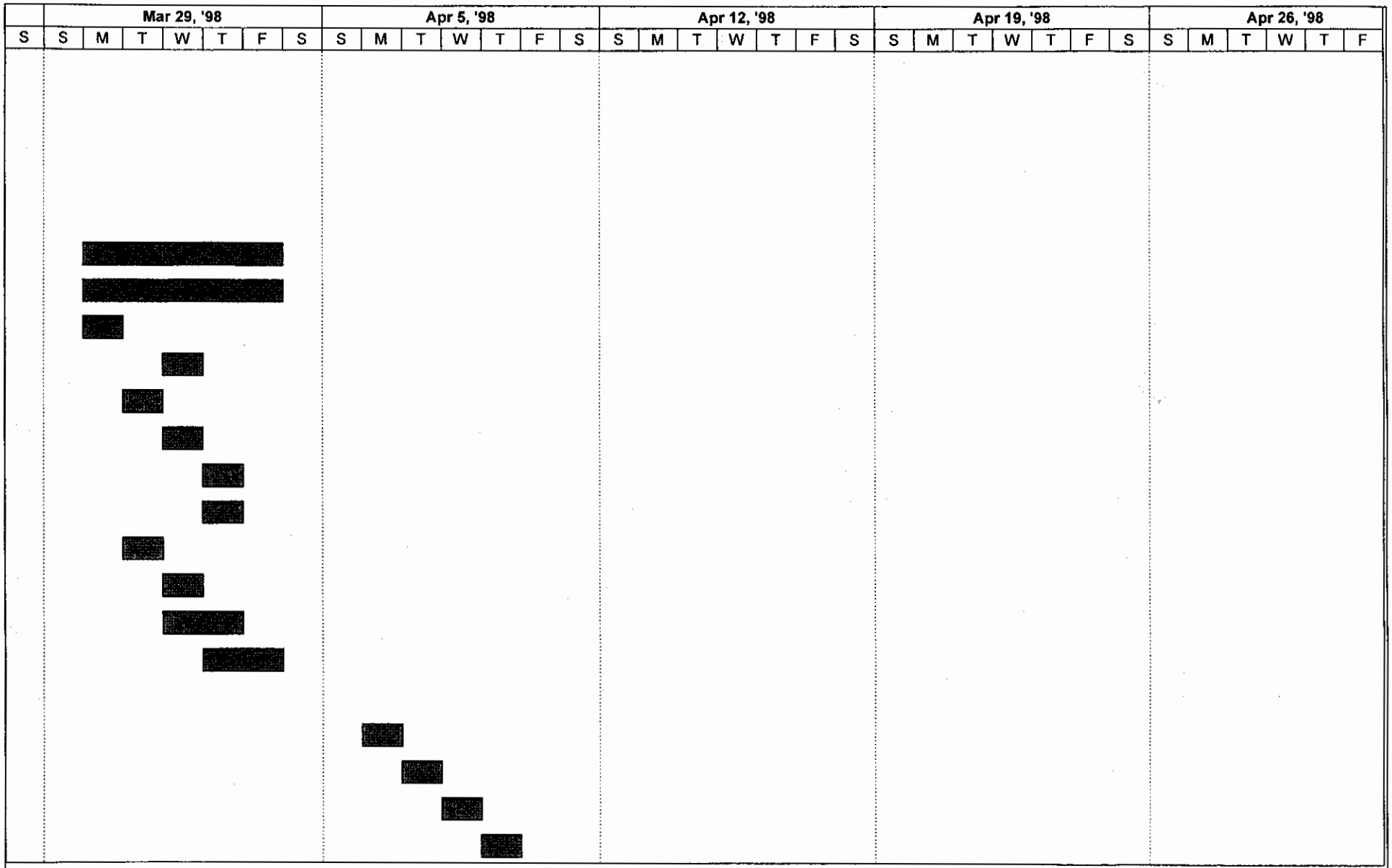
Project: HeartPlan.MPP
Date: Thu 3/26/98

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress



Project: HeartPlan.MPP
Date: Thu 3/26/98

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress



Project: HeartPlan.MPP
Date: Thu 3/26/98

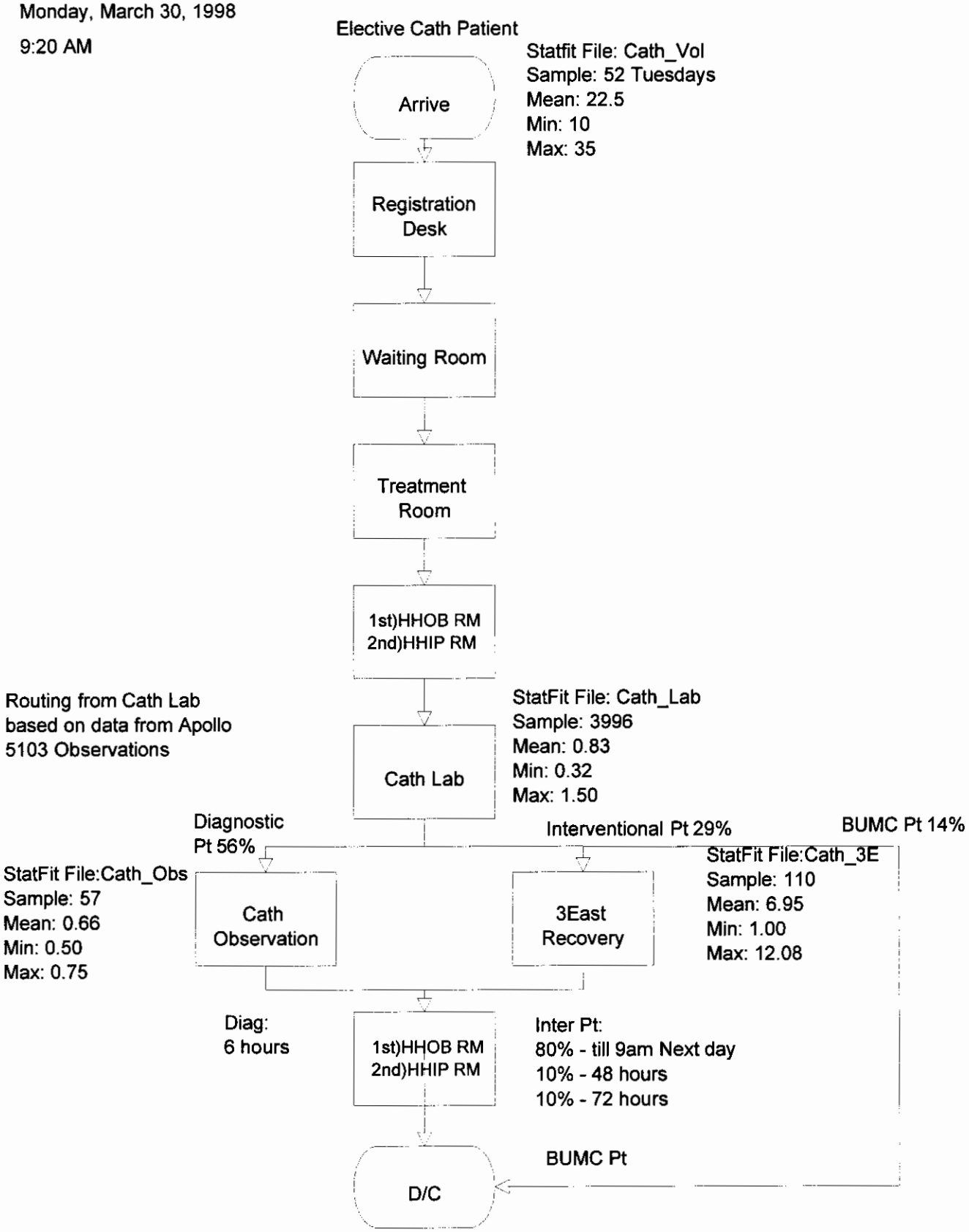
Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

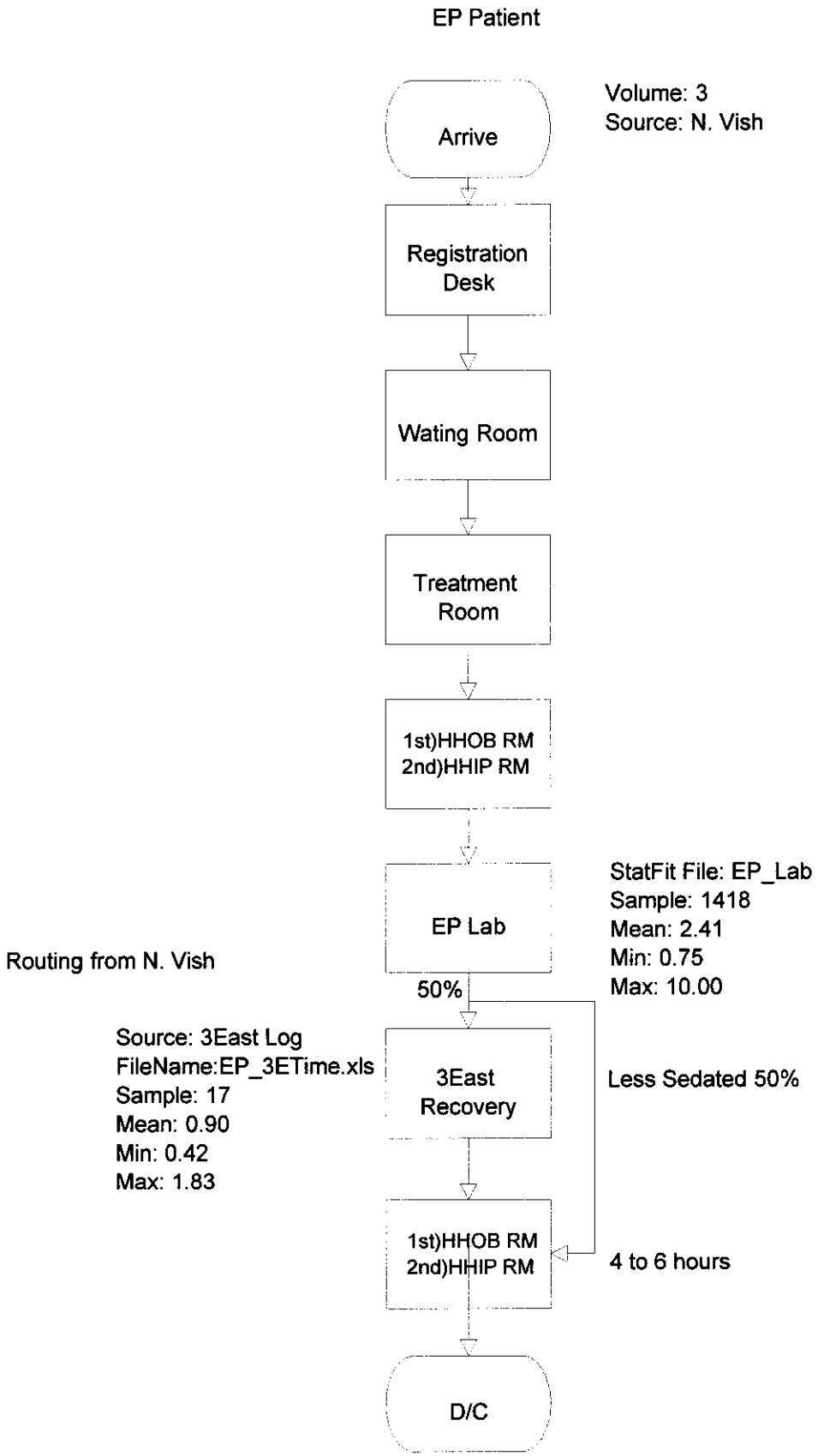
Patient Flow Charts

C:\ATEMP\HH.AF3

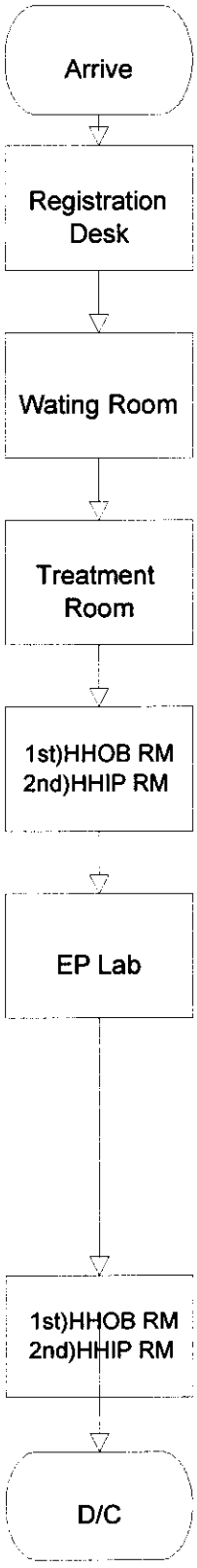
Monday, March 30, 1998

9:20 AM




EP Patient
Arrive
Volume: 3
Source: N. Vish
Registration Desk
Wating Room
Treatment Room
1st)HHOB RM
2nd)HHIP RM
EP Lab
StatFit File: EP_Lab
Sample: 1418
Mean: 2.41
Min: 0.75
Max: 10.00
Routing from N. Vish
50%
Source: 3East Log
FileName:EP_3ETime.xls
Sample: 17
Mean: 0.90
Min: 0.42
Max: 1.83
3East Recovery
Less Sedated 50%
1st)HHOB RM
2nd)HHIP RM
4 to 6 hours
D/C

PM Patient

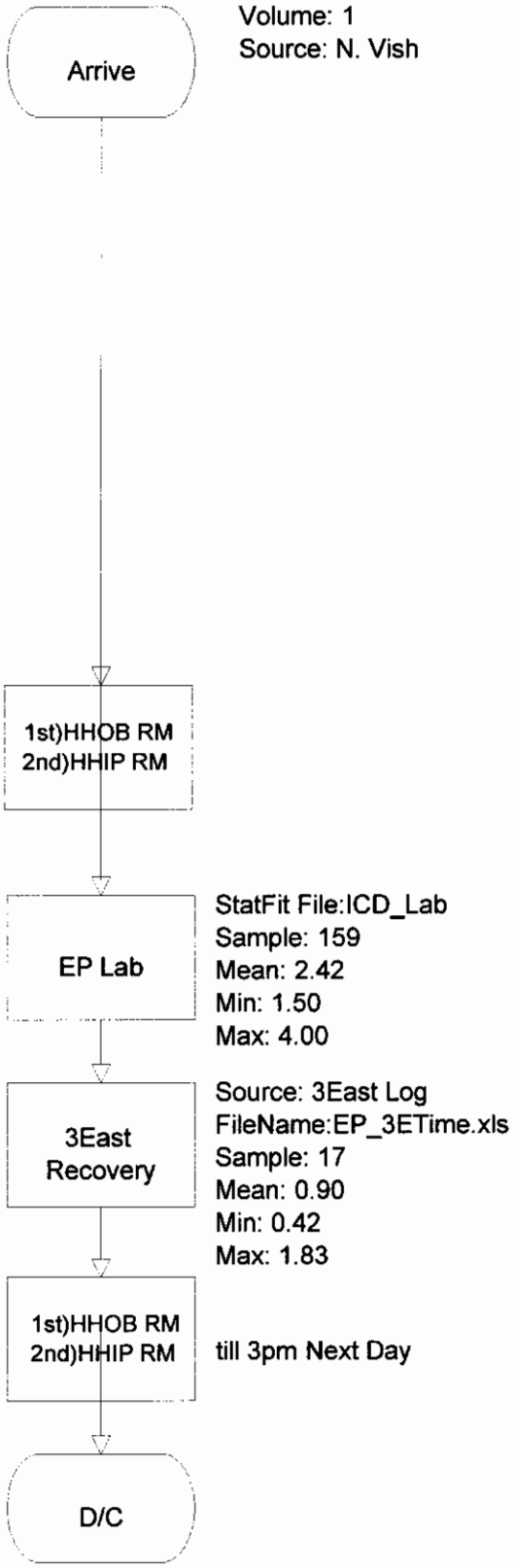


Volume: 2
Source: N. Vish

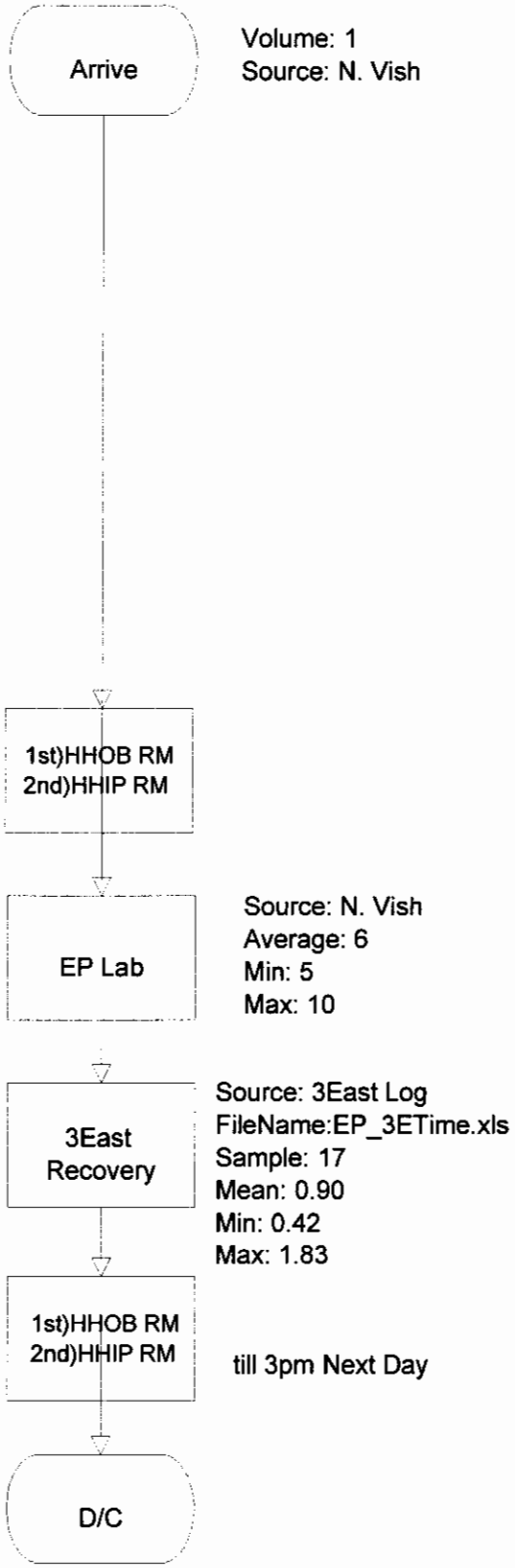
StatFit File: PM_Lab
Sample: 356
Mean: 2.17
Min: 1.40
Max: 400

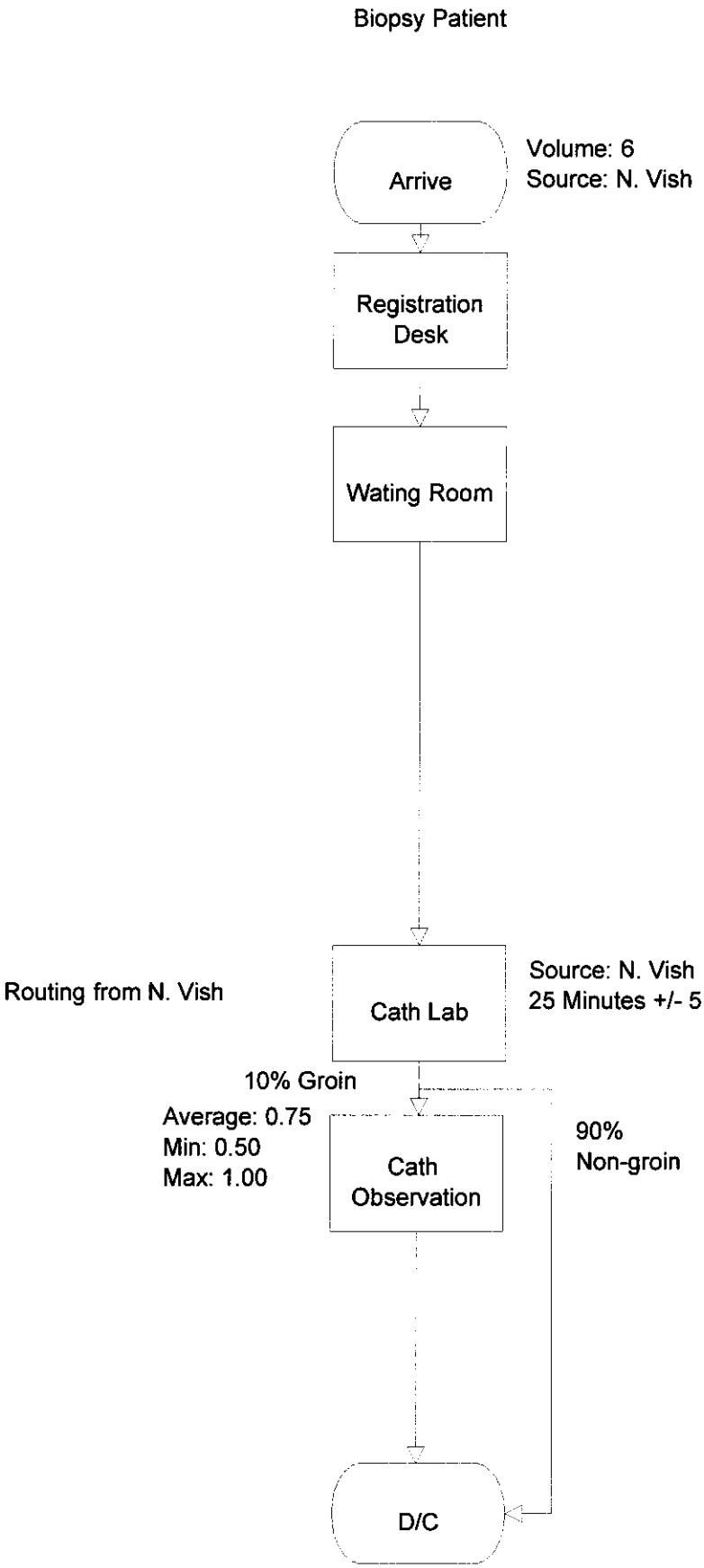
till 11am Next Day

ICD Patient

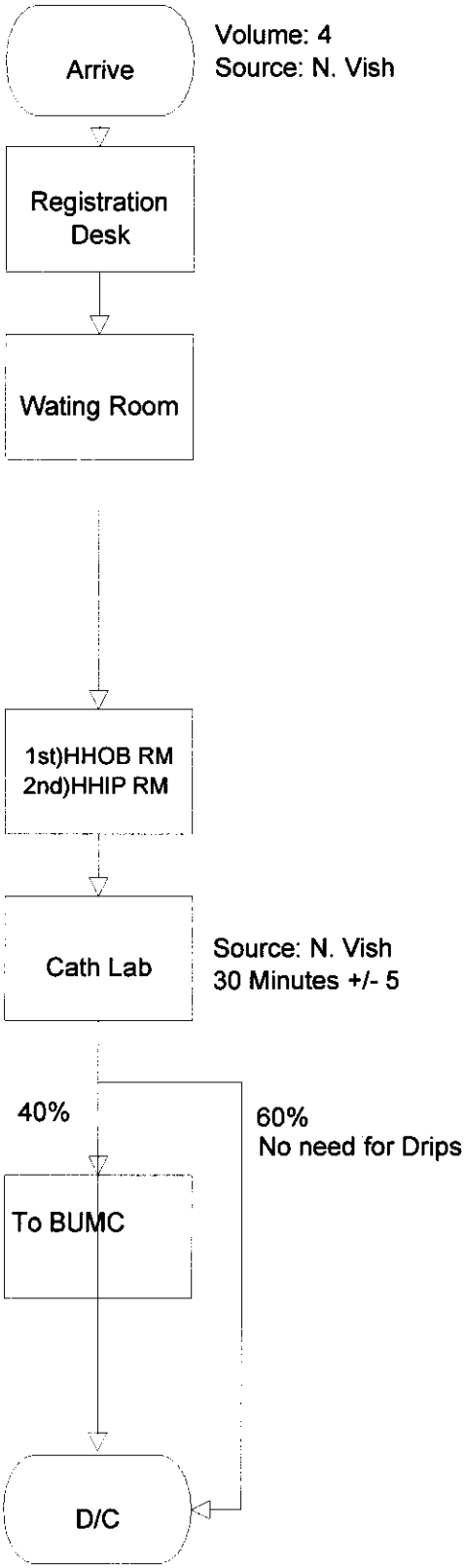

Arrive
Volume: 1
Source: N. Vish
1st)HHOB RM
2nd)HHIP RM
EP Lab
StatFit File:ICD_Lab
Sample: 159
Mean: 2.42
Min: 1.50
Max: 4.00
3East
Recovery
Source: 3East Log
FileName:EP_3ETime.xls
Sample: 17
Mean: 0.90
Min: 0.42
Max: 1.83
1st)HHOB RM
2nd)HHIP RM
till 3pm Next Day
D/C

Ablation Patient




Biopsy Patient
Arrive
Volume: 6
Source: N. Vish
Registration Desk
Wating Room
Routing from N. Vish
Cath Lab
Source: N. Vish
25 Minutes +/- 5
10% Groin
Average: 0.75
Min: 0.50
Max: 1.00
Cath Observation
90%
Non-groin
D/C

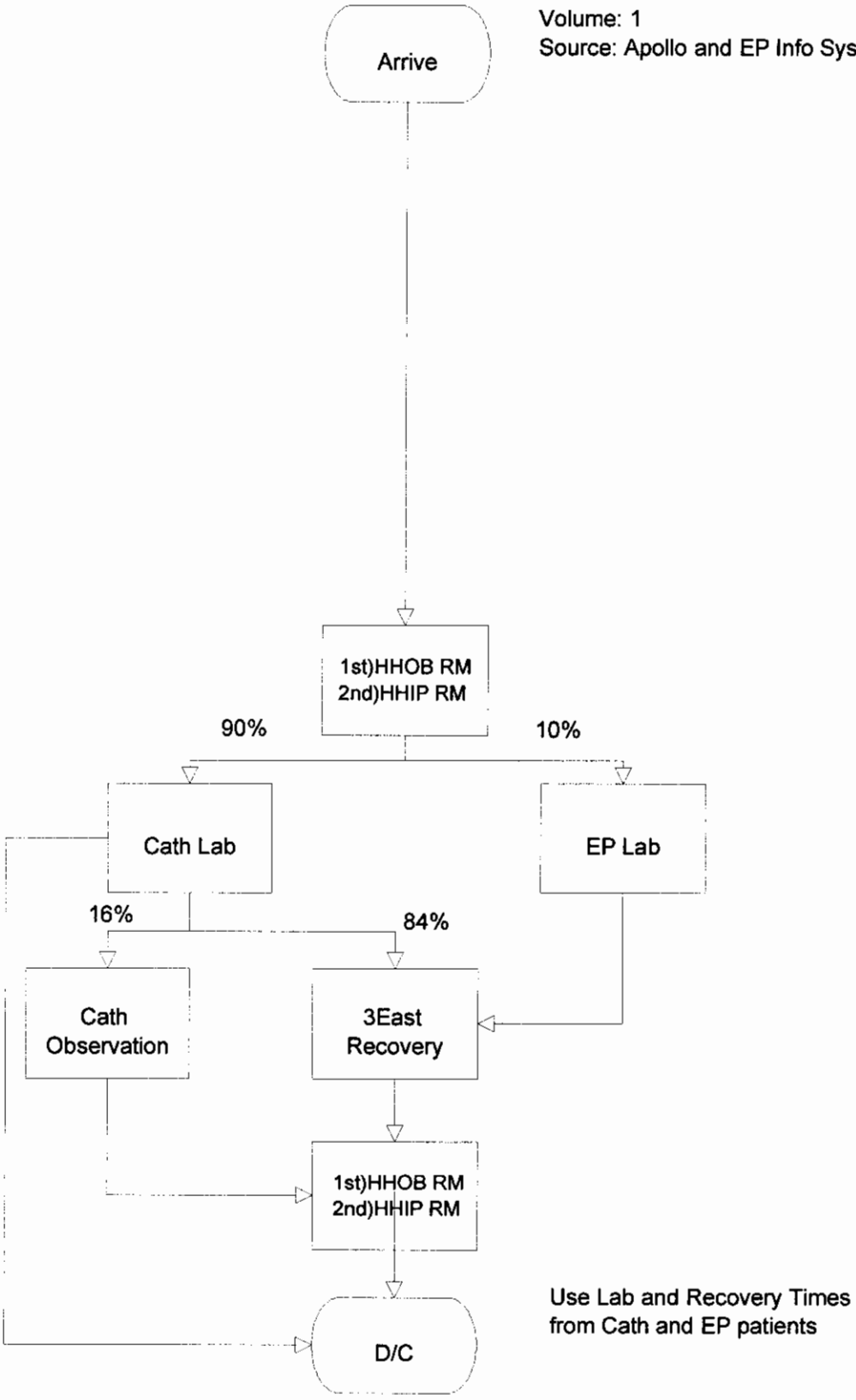
Right Heart



Routing from N. Vish

Transfer/ED Pt

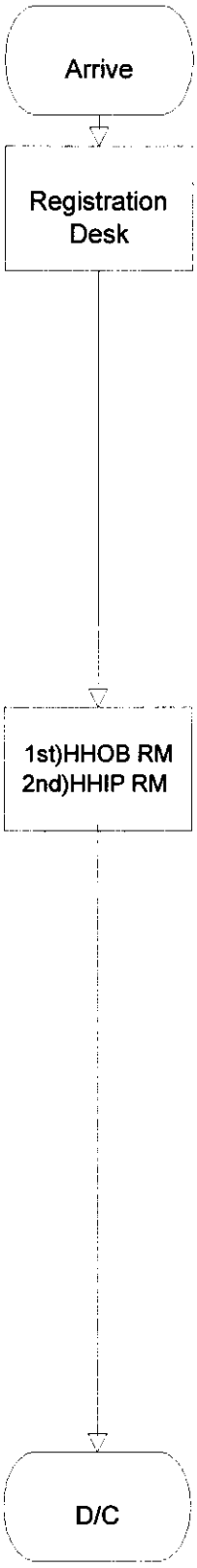
Volume: 1
Source: Apollo and EP Info System



Use Lab and Recovery Times
from Cath and EP patients

Cardioversion

Cardioversion

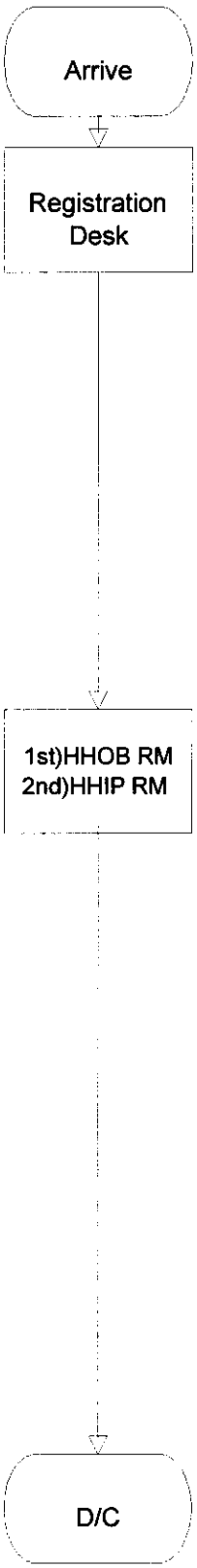


Volume: 1
Source: N.Vish

4 hours

PM Patient

INPATIENTS



Volume: Use 15 for now
Source: N.Vish
Represents Medically Managed Patients currently placed on Telemetry Units.

4 hours

Examples of Data Analyzed

Year	1997						1998									
Pacemaker	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	YTD	FY 98 Mean	FY 97 Mean	% Change
Inpatient																
Pacer Evaluation, Clinic	47	35	25	40	38	37	43	47					312	39.0	36.2	8%
Pacer Evaluation, Telephone	0	0	0	0	0	0	0	0					0	0.0	0	#DIV/0!
Pacemaker Reprogramming	40	28	39	45	41	41	36	47					317	39.6	46.8	-15%
PP/Electrode Implant (Lab(	33	26	30	27	28	35	32	38					249	31.1	0	#DIV/0!
PP/Electrode Implant (OR)	2	0	2	2	2	1	0	1					10	1.3	0	#DIV/0!
Pacemaker Revision	1	3	6	4	3	1	3	1					22	2.8	3.8	-28%
(Cath Lab Ea Addl 30 min (PP)	61	45	43	66	62	64	71	60					472	59.0	68	-13%
Cath Lab add'l/30 min (ICD)	19	30	36	52	41	19	51	55					303	37.9	0	#DIV/0!
Threshold Analysis	41	35	36	39	39	36	39	46					311	38.9	0	#DIV/0!
Pacemaker Generator	34	27	30	28	29	36	33	39					256	32.0	32.2	-1%
Pacemaker Electode	63	46	55	50	56	57	58	69					454	56.8	59.3	-4%
EP Study, Tachycardia	43	44	58	59	38	43	53	48					386	48.3	40.6	19%
ICD Implant (Lab)	8	18	17	17	12	8	17	11					108	13.5	0	#DIV/0!
ICD Implant (OR)	2	1	3	1	1	0	0	1					9	1.1	0	#DIV/0!
ICD Revision (Lab)	4	0	1	3	2	4	3	4					21	2.6	0	#DIV/0!
ICD Revision (OR)	0	0	1	0	0	0	0	0					1	0.1	0	#DIV/0!
ICD Generator	14	19	22	21	15	12	19	16					138	17.3	0	#DIV/0!
ICD Electrodes	13	26	25	24	17	13	22	21					161	20.1	0	#DIV/0!
ICD Evaluation	4	3	7	8	9	7	12	8					58	7.3	0	#DIV/0!
ICD Reprogrammings	6	20	29	26	22	17	18	20					158	19.8	0	#DIV/0!
Lead Extractions (OR)	3	2	1	4	4	2	2	4					22	2.8	0	#DIV/0!
EP Study, Drug Follow-up	28	44	51	48	41	29	45	36					322	40.3	31.2	29%
Total	466	452	517	564	500	462	557	572					4090	511.3	398.8	28%
# In Patients Procedures	83	143		323									549	183.0		
Outpatient																
Pacer Evaluation, Clinic	32	21	26	27	24	26	25	15					196	24.5	37.2	-34%
Pacer Evaluation, Tele	95	86	82	82	73	78	78	62					636	79.8	98.8	-19%
Pacemaker - Reprogramming	4	2	0	3	2	3	6	3					23	2.9	4	-28%
Pacemaker Revision	7	2	5	3	2	1	6	5					31	3.9	4.8	-19%
Cath Lab Ea Addl 30 min (PP)	0	1	0	0	1	0	0	1					3	0.4	1.9	-80%
Pacemaker Generator	7	2	5	3	2	1	6	4					30	3.8	3.8	-1%
Pacemaker Electrode	0	0	0	0	0	0	0	0					0	0.0	0.4	-100%
Threshold Analysis	5		5	4	1	3	5	3					26	3.7	0	#DIV/0!
ICD Evaluation	1	3	1	0	0	0	0	1					6	0.8	0	#DIV/0!
ICD Reprogramming	0	1	0	0	0	1	0	0					2	0.3	0	#DIV/0!
ICD Revision	0	6	0	0	0	0	0	0					6	0.8	0	#DIV/0!
Cath Lab add'l 30 min (ICD)	0	6	0	0	0	0	0	0					6	0.8	0	#DIV/0!
ICD Generator	0	2	0	0	0	0	0	0					2	0.3	0	#DIV/0!
ICD Electrode	0	6	0	0	0	0	0	0					6	0.8	0	#DIV/0!
Transtelephonic ECG	0	0	0	4	1	0	1	0					6	0.8	3.4	-78%
Total	151	140	124	126	106	113	127	94					981	122.6	156.3	-22%
Total	**617**	**592**	**641**	**690**	**606**	**575**	**684**	**666**					**5071**	**633.9**	**555.1**	**14%**
#Outpatient Procedures	7	119											126	63.0		

Year	1997						1998									
Invasive	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**YTD**	**FY 98 Mean**	**FY 97 Mean**	**% Change**
Inpatient																
Cath - side	16	20	41	32	21	23	27	32					212	27	20	33%
Cath - 2 sides	79	50	49	74	56	56	59	68					491	61	63	-3%
Cornary Angiogram	350	330	349	366	314	329	364	395					2797	350	313	12%
Temporary Pacemaker Insert	2	2	2	2	3	6	1	2					20	3	2	25%
PTCA (Only)	41	44	53	31	34	43	34	39					319	40	0	#DIV/0!
PTCA w/Stent	106	92	88	122	120	84	116	121					849	106		
DCA	9	6	5	8	4	9	9	3					53	7	0	#DIV/0!
Heart Biopsy w/Fluoro	44	42	49	56	52	58	64	61					426	53	32	66%
PTA	8	6	9	8	14	5	9	9					68	9	4	113%
Valvuloplasty					1	0	1	0					2	1	0	#DIV/0!
Intra-Aortic Balloon							12	8					20	10		#DIV/0!
PTMR							6	5					11	6		#DIV/0!
Renal Angiogram							10	6					16	8		#DIV/0!
Total Procedures	**655**	**592**	**645**	**699**	**619**	**613**	**712**	**749**					**5284**	661	576	15%
Total Number of Patients Seen					400	443	472	525								
PTCAs (Total)	156	142	146	161	158	136	159	163					1221	153	142	7%

DATE 12/98 DAY: MONDAY **3 EAST RECORD** PAGE 1 TOTAL ADMITS _____

CHARGE 7A-3P/3P-7P T. McVey CHARGE 3P-7P/7P-11P _____ CHARGE 7P-11P/11P-7A _____

CCA 7A-3P _____ CCA 3P-11P S Mathis CCA 11P-7A _____

BED #	TIME ADM./ DISC.	TRANS: FROM/TO	TOT.HRS CHARGED	USE PATIENT LABEL WRITE INTERVENTIONALIST:IF DIFF. THAN ADMITTING DR.	VES/PROC. PTCA,ROTO STENT,ETC	PULLED BY? CLAMP TIME ON / OFF	7A-3P/3P-7P RN: 3P-7P/ 7P-11P RN: 7P-11P/ 11P-7A RN:	AUDIT RESULTS: (ANY PROBLEMS-BLEEDS OR COMPLICATIONS?)
1 3 3 3	900 / 1700	Cath lab / J308	7-8 hrs. SDM	253412-003 I/A 58 FW PETREA.ROBBIE DEANNA DR STOLER.ROBERT C. 15701725 05/31/39	PTCA STENT Prox. RCA		C. Wimmer	
2 3 2 5	1025 2230	Cath lab / 529	12-13 hrs SDM	113879-009 O/Q 57 MW SIGN,ROBERT PAUL DR DEMAIO,SAMUEL J,MD 15694482 01/07/41	PTCA STENT x3 VG CIRC.		C. Salanice	
3 3 3 2	1030 1600	Cath lab 306	5-6 hrs SDM	538265-001 I/A 48 MW LOUDERMILK.JOHN MD DR DONSKY.MICHAEL S 15697436 06/04/49	PTCA STENT MID RCA		C. Wimmer	
4 3 2 7	1030 2030	Cath lab / R1006	10-11 hrs SDM	212245-003 O/Q 64 MB BROWN,CHARLES DR JOHNSTON,STEPHEN B 15695067 05/19/33	PTCA Diagonal PT/STENT LAD		C. Salanice	
5 3 2 4	1230 2230	Cath lab	10 hrs. SDM	534078-002 O/Q 54 FW SUTTON.ANN B DR STOLER.ROBERT C. 15705171 02/14/44	PTCA LAD		C. Salanice	
6 3 3 0	1300 1830	Cath lab / 527	5 hrs. SDM	538412-001 I/A 49 MW ROBERTS.RICHARD DR VALLABHAN.RAVI 15701634 03/19/48	PTCA STENT		R. Jenkins	

DR. HEARTS / DEATHS / EMERGENCY RETURNS TO CATH LAB

BED	TIME FRAME	PT. NAME	DR.HEART/DEATH/REOCCL.TO LAB & BACK	DISPOSITION

DATE 3/13/98 DAY: TUESDAY **3 EAST RECORD** PAGE 1 TOTAL ADMITS _____

CHARGE 7A-3P/3P-7P _____ CHARGE 3P-7P/7P-11P _____ CHARGE 7P-11P/11P-7A _____

CCA 7A-3P _____ CCA 3P-11P _____ CCA 11P-7A _____

BED #	TIME ADM./ DISC.	TRANS: FROM/TO	TOT.HRS CHARGED	USE PATIENT LABEL WRITE INTERVENTIONALIST IF DIFF. THAN ADMITTING DR.	VES/PROC. PTCA, ROTO STENT, ETC	PULLED BY? CLAMP TIME ON / OFF	7A-3P/3P-7P RN: 3P-7P/ 7P-11P RN: 7P-11P/ 11P-7A RN:	AUDIT RESULTS: (ANY PROBLEMS-BLEEDS OR COMPLICATIONS?)
1 333	1035 1830	Cath Lab 42 J	8-9 hrs SDM	538569-001 O/Q 63 FW WHITE,NORMA JEAN DR DONSKY,MICHAEL S 15707326 12/15/34	PTCA		CLAUDIA WIMMER	
2 328	1100 1152	CCU 34 J	0 54 min SDM	537952-001 I/A 70 MW JOHNSON,TURNER DR COFFEEN,PAUL R 15683444 08/31/27	ICD		CLAUDIA WIMMER	
3 325	1130 1200	Cath Lab 32 J	5-6 hrs SDM	319601-004 O/B 55 MW SPURGER,JIMMY HAROLD DR SHARP,JAMES S. 15697485 03/04/42	PTCA STENT		YVONNE MURPHY	
4 331	1200 1915	Cath Lab 33 J	7-8 hrs SDM	522931-002 I/A 51 MW CLEMMONS,HERSHEL DR ROSENTHAL,ROBERT L 15708381 01/07/47	PTCA OFOM		CLAUDIA WIMMER	
5 328	1305 1350	EP J 332	0-5 hrs SDM	533915-001 I/A 34 FH GONZALEZ,GUADALUPE DR WELLS,PETER J. MD 15506850 05/03/63	EP		CLAUDIA WIMMER	
6 324	0715 2200	Cath Lab [redacted]	R1022 8-9 hrs SDM	534078-002 I/A 54 FW SUTTON,ANN B DR STOLER,ROBERT C. 15705171 02/14/44	PTCA		YVONNE Murphy CVC	

DR. HEARTS / DEATHS / EMERGENCY RETURNS TO CATH LAB

BED	TIME FRAME	PT. NAME	DR.HEART/DEATH/REOCCL.TO LAB & BACK	DISPOSITION

Project 82

DATE: 3/3/98 DAY: TUESDAY

3 EAST RECORD

PAGE 1

TOTAL ADMITS _____

CHARGE 7A-3P/3P-7P _____ CHARGE 3P-7P/7P-11P _____ CHARGE 7P-11P/11P-7A _____

CCA 7A-3P Bev v Tapuleda CCA 3P-11P Sharon Manes CCA 11P-7A _____

BED #	TIME ADM./ DISC.	TRANS: FROM/TO	TOT.HRS CHARGED	USE PATIENT LABEL WRITE INTERVENTIONALIST:IF DIFF. THAN ADMITTING DR.	VES/PROC. PTCA,ROTO STENT,ETC	PULLED BY? CLAMP TIME ON / OFF	7A-3P/3P-7P RN: 3P-7P/ 7P-11P RN: 7P-11P/ 11P-7A RN:	AUDIT RESULTS: (ANY PROBLEMS-BLEEDS OR COMPLICATIONS?)
1 331	1430 / 2130	Cath Lab / J524	6-7	534903-003 I/A 38 FB THOMPSON,JANICE DR GRODIN,JERROLD M 15713944 09/11/59	PTCA STENT		YVONNE Cue	
2 3 22 7	1620 / 2300	Cath Lab / J813	7-8 hrs	538598-001 I/A 71 MW LOFLAND,JOE C DR SHARP,JAMES S. 15708662 10/03/26	PTCA STENT		YVONNE Cue	
3								
4								
5								
6								

DR. HEARTS / DEATHS / EMERGENCY RETURNS TO CATH LAB

BED	TIME FRAME	PT. NAME	DR.HEART/DEATH/REOCCL.TO LAB & BACK	DISPOSITION

Misc. 3E Pts'.; *i.e.: TRANSFERS, CATHS, EPS, PTA'S, TEE'S, etc* Month of March

#	DATE	PLACE PT LABEL	TIME IN / OUT	FROM / TO	REASON FOR ADMIT	ON 3E BCON Y / N
1	3/6/98	434041-012 O/B 49 FW HOLBERG,BECKY EUGENIA DR BEVERIDGE,THOMAS 15674286 05/21/48	16:45 17:45	EP Lab J422	Recovery 0-59 sm	NO
2	3/5/98	300008-012 I/A 77 FW SEBASTIAN,MABEL JOYCE DR BROWN,SUSAN S.,MD 15731508 09/04/20	18:25 18:55	Cath Lab 90308 0-59min	Recovered 0-59 sm	No
3	3/9/98	429014-002 O/Q 65 MW HEREFORD,FRANK LESTER DR BEVERIDGE,THOMAS 15742067 01/03/33	13:45	EP / R1032	I cp	NO
4	3/10/98	539818-001 O/Q 16 FW WEST,LYDIA R DR SHINBANE,JEROLD S 15761893 10/02/81	16:12 1650	EP R1022	Rec-	No
5	3/11	065142-060 O/B 73 FW BRUTON,DOROTHY DR CARRY,MELISSA,MD 15758790 03/06/25	19:25 2010	EP ?	SDM 0-59 Mo	NO
6	3/11	539855-001 O/Q 68 FW LANGFORD,VINA J DR DEMAIO,SAMUEL J,MD 15763774 12/26/29	17:25 1805	EP J242	0.59 mon SDM	NO
	3/16/98	539942-001 O/Q 19 MW THOMAS,TY DR SHINBANE,JEROLD S 15768070 01/23/79	1530 1630	EP J526	EP Recovery 0-59 mn Jahangir	NO

Misc. 3E Pts'.; *i.e.: TRANSFERS, CATHS, EPS, PTA'S, TEE'S, etc* Month of MARCH

#	DATE	PLACE PT LABEL	TIME IN / OUT	FROM / TO	REASON FOR ADMIT	ON 3E BCON Y / N
1	3/10/98	539818-001 O/Q 16 FW WEST,LYDIA R DR SHINBANE,JEROLD S 15761893 10/02/81	16:10 1700	EP STUDY ~~T2209~~ R1022	Recovery 0-59 sdm	NO
2	3/11/98	539967-001 I/A 28 MU FERRELL,JOHN DR WELLS,PETER J. MD 15769342 04/15/69	1100 1145	EP STUDY	Recovery	NO
3	3/11	539855-001 O/Q 68 FW LANGFORD,VINA J DR DEMAIO,SAMUEL J,MD 15763774 12/26/29	1720 1805	cath lab	normal angio	N
4	3/11	065142-060 O/B 73 FW BRUTON,DOROTHY DR CARRY,MELISSA,MD 15758790 03/06/25	1915 2010	R1032	EP Rec. 0-59 sdm	N
5	3/12	537853-001 O/3 31 MW KIRK,STEVE LOYD DR SHINBANE,JEROLD S 15679771 08/27/66	1245 1330	EP 35	EP Rec.	N
6		539907-001 I/A 75 MW CAUDLE,J D DR ESCOBAR,JUAN M. 15765878 07/23/22	NR 1530	EP R1005	EP Rec	N
7		424149-010 O/Q 49 FW TRAPP,LIA R DR VALLABHAN,RAVI 15778764 09/24/48	1610	~~Cath~~ Cath only		

Misc. 3E Pts'.; *i.e.: TRANSFERS, CATHS, EPS, ETA'S, TEE'S, et* Month of

#	DATE	PLACE PT LABEL	TIME IN / OUT	FROM / TO	REASON FOR ADMIT	ON 3E BCON Y / N
1	3/13	223337-006 I/A 69 MB MCCLENDON,SAM DR SHELTON,JAMES H 15767239 01/31/29	16:24 1800	Cath Lab only J529	Rec. 059	NO
2	3/13	539404-001 I/A 30 FU AREVALO,LISA DR FRANKLIN,JAY 0. 15746829 03/03/68	17:10 1900	EP R1016	Rec	NO
3	3/13	540345-002 I/A 48 MW CELSUR,SCOTT M DR SHARP,JAMES S. 15798481 09/17/49	1850	cath only	Rec Chrg 059 8P	No
4	3/16	539942-001 O/Q 19 MW THOMAS,TY DR SHINBANE,JEROLD S 15768070 01/23/79	15:40 1605	EP study J526	Rec. SDV Charged 059	No
5	3/16	335968-006 I/A 52 MW WOOD,WILLIAM KELLY DR ROMERO,CALIXTO A 15799737 08/30/45	1705 18:30	[redacted] Q308 Cath only	Rec. 1-2hrs 10pm	NO
6	3/17	355066-006 I/A 47 MW MILLER,FREDERICK C DR WINTER,DAVID F 15782485 05/11/50	1500 1535	Cath Lab	Recovery	N
7	3/17	164458-011 O/Q 59 FB CAMPERS,GLORIA JEAN DR COFFEEN,PAUL R 15785082 06/14/38	11:15 1200	EP	Recovery	N

PAGE 1

CATH LAB HOLDING RECOVERY RECORD

DATE: 3 / 9 / 98 DAY: WED

TOTAL # AM ADMITS: 4

AM ADMITS CANCELLED / RETURNED: 1+1 left too long to

TOTAL # AM ADMITS + RECOVERY PTS. _____ # AUDITS RETURNED: _____ # COMPLICATIONS: _____ TOTAL # 3S RECOVERY PTS. 9

REC. RM. #	3S ADM Y OR N	IF 3S AM PT-NO PTCA? NORMAL, RX MED, CABG, ...?	USE PATIENT LABEL	TIME HERE IN / OUT	CLAMP TIME ON / OFF	TO ROOM # - WRITE NEEDS IF AM ADMIT - ADMIT TELE/ NON-TELE, 2HOB/NO 2HOB, ETC	AUDIT RESULTS: ANY PROBLEMS-BLEEDS OR COMPLICATIONS?
1/5	N	2HOB	030649-023 O/E 60 MW MCKEE, KENNETH MITCHELL DR CAPEHART, JOHN E 14580633 04/11/37	0915 0958	back bruise	HOME	
2/6	N		418790-003 O/Q 72 MW GOSS, HARRY VAUGHN DR WELLS, PETER J. MD 15715121 01/25/26	0945 1120	0946 1040	R1008	
3/5	N	2HOB	004704-024 O/E 55 MW MCABEE, THOMAS EDWARD DR RING, WILLIAM S. 12434841 10/12/41	1000 1030	1005 1015 normal pressure	HOME Rapid recovery	
4/7	N		538884-001 I/A 64 MW MESSER, ROBERT DR GRODIN, JERROLD M 15722820 10/19/33	1005 1045	1010 1040	J310	
5/8	N		537444-001 O/Q 52 MW STEELMAN, JAMES HAROLD DR HALL, SHELLEY A. 15661648 01/09/46	1020 1106	1025 1045	rt HT T239 pre-transplant	
6/5	Y	normal	538580-003 O/B 41 MW CARTER, JAMES H DR ROSENTHAL, ROBERT L 15722986 06/12/56	1038 1120	1040 1105	R1019	
7/7	N		538777-001 I/A 61 MU CHAPMAN, BOBBY A DR FRANKLIN, JAY 0. 15717887 11/08/36	1050 1125	bruise on	Waiting for EP to 3E	

PAGE 1

CATH LAB HOLDING RECOVERY RECORD

DATE: 3/5/98 DAY: Thurs

TOTAL # AM ADMITS: 9+1 PA HT

AM ADMITS CANCELLED / RETURNED: 6+1 PA HT

TOTAL # AM ADMITS + RECOVERY PTS. _____ # AUDITS RETURNED: _____ # COMPLICATIONS: _____ TOTAL # 3S RECOVERY PTS. 16

REC. RM. #	3S ADM Y OR N	IF 3S AM PT-NO PTCA? NORMAL, RX MED, CABG, ...?	USE PATIENT LABEL	TIME HERE IN / OUT	CLAMP TIME ON / OFF	TO ROOM # - WRITE NEEDS IF AM ADMIT - ADMIT TELE/ NON-TELE, 2HOB/NO 2HOB, ETC	AUDIT RESULTS: ANY PROBLEMS-BLEEDS OR COMPLICATIONS?
1 16	Y	LAD mid	538794-001 O/Q 53 MW BROWN,O C JR DR STEPHENSON,SCOTT K 15718570 03/19/44	0840 0935	0845 0915	H215	
2 15			411761-023 I/A 79 MW PETERSEN,KENNETH LAWRENCE DR LUE,JOHN F. 15703077 12/28/18	0842 0920	0850 0918	J323	
3 17			538803-001 O/Q 73 MW MARTIN,CLIFFORD GEORGE DR SILLS,MICHAEL MD. 15718935 10/25/24	0855 0935	0901 0930	T244	
4 18		ost lat. only	480731-006 O/Q 50 MW HARRIS,JAMES C DR VALLABHAN,RAVI 15730567 07/19/47	0908 0945	0912 0940	T248	
5 15	Y	ramus/ IMI/PTCA	429209-004 O/Q 68 FW LOCKE,PANSY LYNETTE DR ANWAR,AZAM,MD 15712474 10/11/29	0920 1015	0945 1010	J322	25 min man first failed technique
6 16	Y	CABG admit	538278-001 O/Q 55 MW FRANKS,DAVID R DR STEPHENSON,SCOTT K 15697873 02/24/43	0935 1050	0940 1035	R1334	
7 18	N		539053-001 O/Q 65 MB ANDREWS,RYLIE DR SILLS,MICHAEL MD. 15730666 02/20/33	0948 1040	0950 1028	T252	

CATH LAB HOLDING RECOVERY RECORD

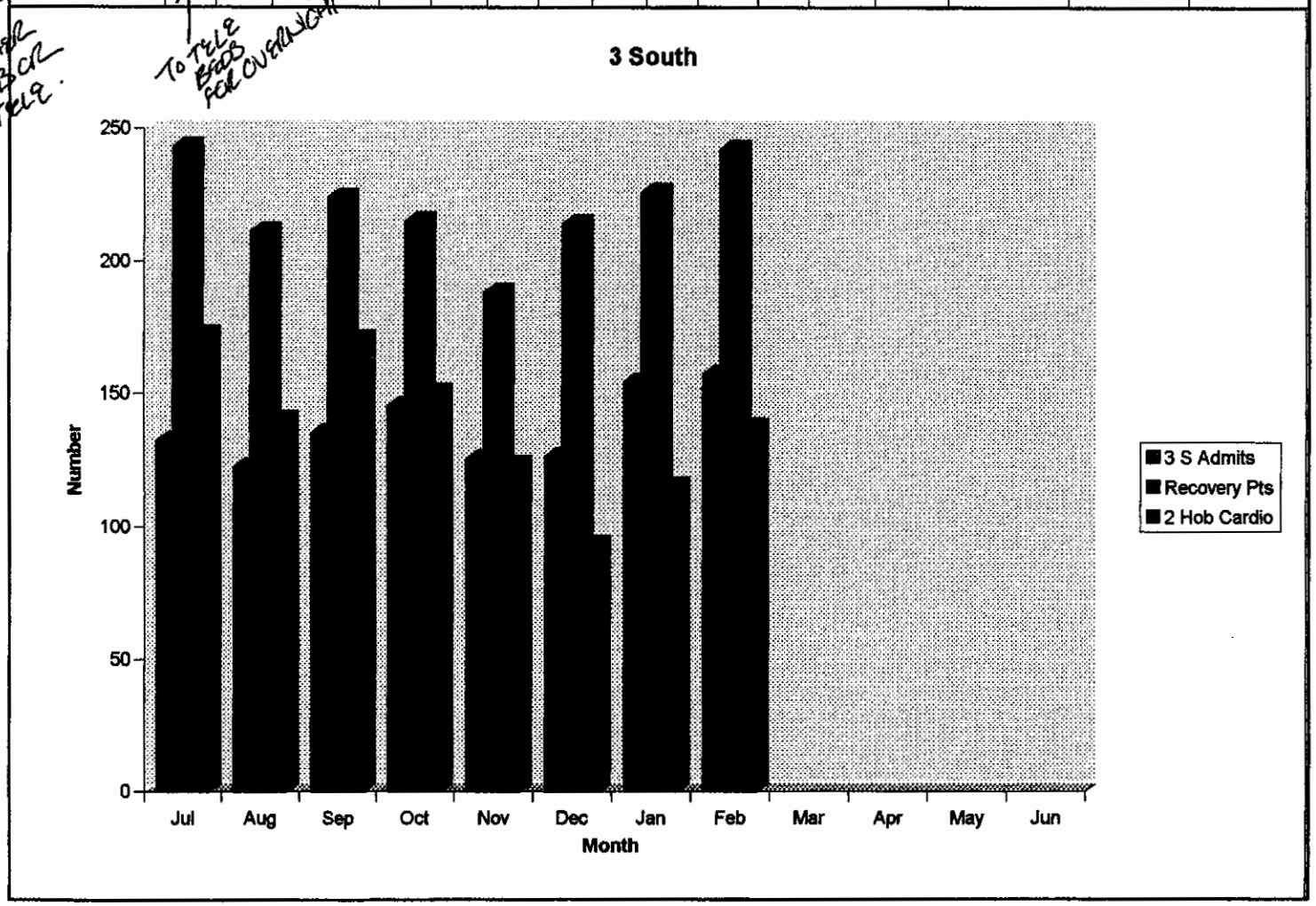
PAGE 1

DATE 3/5/98 DAY Thurs

REC RM. #	WAS PT 3S ADM. Y OR N	IF WAS 3S PT.- NO PTCA, WHY? (NORMAL, RX. MED, CABG, ?)	USE PT. LABEL	TIME HERE	CLAMP TIME	SENT TO ROOM; IF 3S AM PT. DOC. NEED- ADMIT TELE, NON-TELE, 2HOB OR NO 2HOB AVAIL.	KNOWN PROBS &/OR AUDIT RESULTS; (VASOSEALS, ANY PROBLEMS: BLEEDS, ELEVATED B/P, OR COMPLICATIONS?)
8	N		520007-002 I/A 69 FW CARRAWAY,MARGARET DR ROSENTHAL,ROBERT L 15728306 12/21/28	0935 1030	0946 1025	J 320	
9	N		539072-001 I/A 34 MW WILSON,RONNIE W DR GRODIN,JERROLD M 15731458 10/10/63	1040 1130	1045 1125	J403	
10	N		507624-005 O/Q 63 FW THOMAS,BETTY IRENE DR JOHNSTON,STEPHEN B 15718760 05/26/34	1042 1137	1050 1120	T2#1	
11	Y	Rt HF	503001-005 O/Q 59 FW MARTIN,LAVERNE DR ESCOBAR,JUAN M. 15730112 10/26/38	1055 1220 Home	1105 1130	Home	
12	Y	Rx MD	143440-004 O/Q 71 MO ZAFIR,SYED AQA DR ANWAR,AZAM,MD 15726953 01/23/27	1115 1230	1125 1220	R1025	
13	Y	surgeon to see	538872-001 O/Q 84 MW MUMFORD,THEODORE H DR JOHNSTON,STEPHEN B 15722259 12/24/13	1205 1255	1210 1250	J 416	
14	Y	Randomized PTMR	538624-001 O/Q 49 FW BANKS,PAT DR ANWAR,AZAM,MD 15710403 10/15/48	1250 1315	1252	to 3E	

3 South

97-98	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total	Mean
3 S Admits	132	122	135	145	125	126	154	157					1096	137
Recovery Pts	243	211	224	215	188	214	226	242					1763	220
2 Hob Cardio	172	140	170	150	123	93	115	137					1100	138
ASSUMP.	71													



3/6/9811:05 AM

Analysis of Data

DATA SHEET

Registration Times	2RSU Study	55	Empirical Table	5min - 49%, 4min - 16%, 6min-16%
IV	Delphi		Normal(7, 1)	Might want to investigate further
Lab	Nancy		Normal(5, 1)	Might want to investigate further
EKG	Delphi		Normal(5, 1)	Might want to investigate further
DataBase	Nancy		Normal(7.5, 2.5)	Might want to investigate further
RN Assessment and Consents	Nancy		80%: Normal(10, 2): 20% Normal(20, 4)	Might want to investigate further
Patient Education	Direct Observation		Normal(10, 5)	Might want to investigate further
Family Members	2RSU Study	198	Empirical Table	0-6%, 1-36%, 2-29%, 3-11%
Cath Volume	Apollo	52 Tues.	Log-Logistic(-243,101,266)	Mean: 22.5 Max: 35 Min: 10
EP Volume	Nancy Vish		3	
PaceMaker Volume	Nancy Vish		2	
ICD Volume	Nancy Vish		1	
Ablation Volume	Nancy Vish		1	
Biopsy Volume	Nancy Vish		6	
Right Heart Volume	Nancy Vish		4	
Transfer/ED Volume	Nancy Vish		1	
Cardioversion Volume	Nancy Vish		1	
InPatients Volume	Nancy Vish		15	
Cath Routing	Apollo	5103	Diagnostic Only: 56%	
EP Routing	Nancy Vish		Less Sedated: 50% More	
Biopsy Routing	Nancy Vish		Non-groin: 90% Groin: 10%	
Right Heart Routing	Nancy Vish		Drips: 60% No Drips: 40%	
Transfer/ED Routing	Nancy Vish		90%: Cath Lab 10%: EP Lab	Once tagged follows flow of that patient
Cath & PTCA Procedure	Apollo	3996	Empirical Table	Mean: .83 Max: 1.50 Min: .32
EP Procedure	Apollo	1418	Empirical Table	Mean: 2.41 Max: 10 Min: .75

DATA SHEET

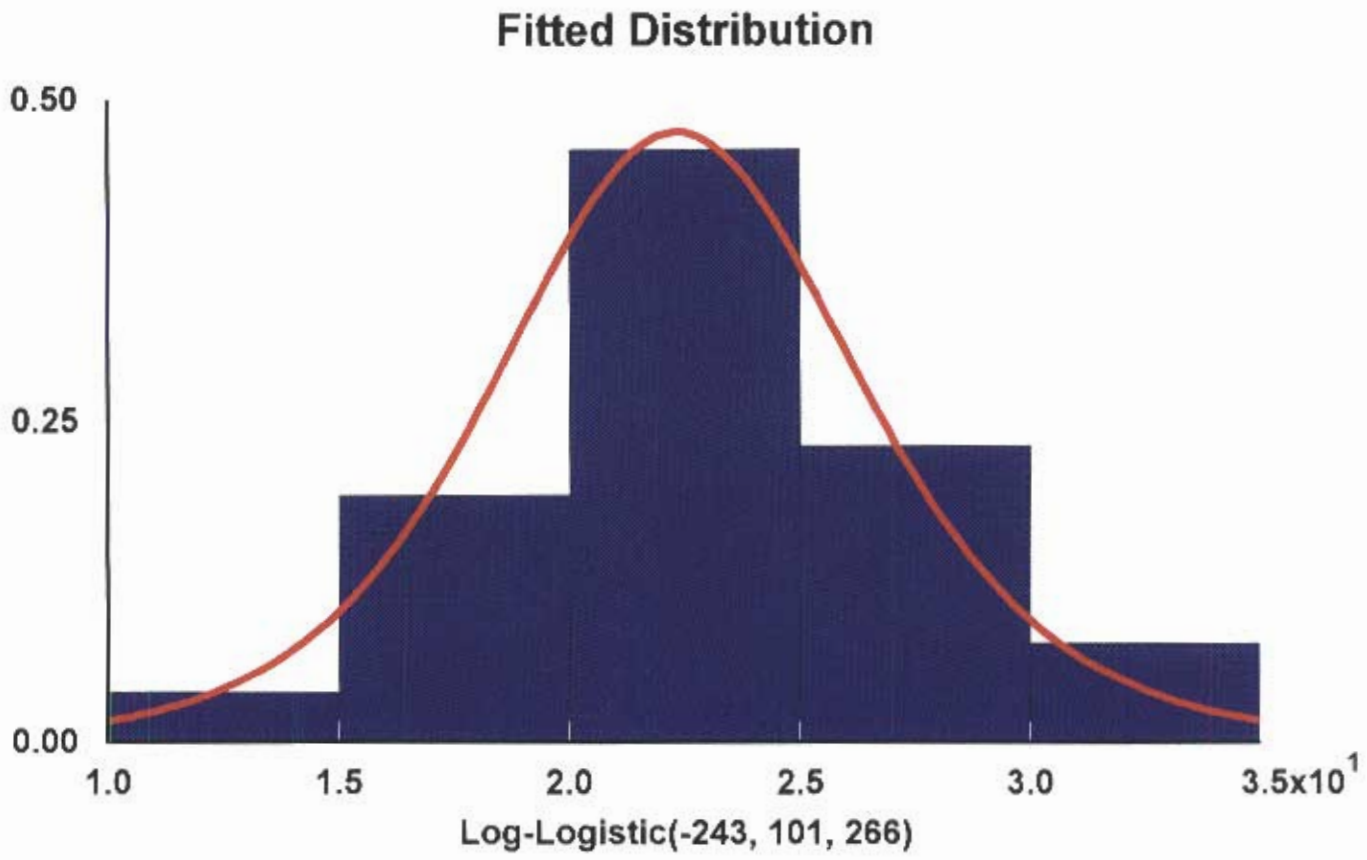
PaceMaker Procedure	PM/EP Info System	356	Empirical Table	Mean 2.17 Max: 4 Min: 1.5
ICD Procedure	PM/EP Info System	159	Empirical Table	Mean: 2.42 Max: 4 Min: 1.5
Ablation Procedure	Nancy Vish			Mean: 6 Max: 10 Min: 5
Biopsy Procedure	Apollo	149	Normal(25, 5) <per Data Contact>	Mean: 25 Max: 30 Min: 20
Right Heart Procedure	Nancy Vish		Normal(30, 5)	
Diagnostic: Cath Observation	Logs	57	Logistic(.67,.0433)	Mean: .6642 Max: .75 Min: .5
Interventional-3 East Recovery	Logs	110	Weibull (-12.8, 9.24, 20.9)	Mean: 6.9495 Max: 12.08 Min: 1
Diagnostic Stage 2 Recovery	Nancy Vish		360 minutes	Occurs in HHOB/HHIB Room
Interventional Stage 2 Recovery	Nancy Vish		80%: 9am next day 10%: 48 hours 10%: 72 hours	Occurs in HHOB/HHIB Room
EP Recovery: Less Sedate	Nancy		Normal(5, 1)	Occurs in HHOB/HHIB Room
EP Recovery: More Sedate	Logs	17	Empirical Table	Mean: .9 Std Dev: .40
PaceMaker Recovery	Nancy		11 am next day	Occurs in HHOB/HHIB Room
ICD-3 East Recovery	Logs	17	Empirical Table	Mean: .9 Std Dev: .40
Ablation-3 East Recovery	Logs	17	Empirical Table	Mean: .9 Std Dev: .40
Biopsy(Groin)-Cath obs.	Nancy Vish		Normal(45, 15)	
Cardioversion Procedure	Nancy Vish		240 minutes	Occurs in HHOB/HHIB Room
Inpatients Procedure	Nancy Vish		240 minutes	Patients taking up HHOB/HHIB Rooms

descriptive statistics

data points	52
minimum	10
maximum	35
mean	22.5
median	22
mode	22
standard deviation	4.77945
variance	22.8431
coefficient of variation	21.242
skewness	0.0993441
kurtosis	0.162197

Auto::Fit Distributions

distribution	rank	acceptance
Log-Logistic(-243, 101, 266)	100	accept
Erlang(-62.3, 321, 0.264)	93.5	accept
Lognormal(-142, 5.1, 0.0288)	92.3	accept
Logistic(22.4, 2.64)	92.1	accept
Pearson 5(-29.1, 115, 5.9e+03)	86.9	accept
Inverse Gaussian(-144, 2.06e+05, 167)	86	accept
Pearson 6(10, 41.4, 9.71, 32.5)	85.1	accept
Gamma(-66.4, 327, 0.272)	82.4	accept
Beta(10, 35, 4.11, 4.09)	81.5	accept
Normal(22.5, 4.73)	81.1	accept
Weibull(6.34, 3.71, 17.9)	72.8	accept
Extreme Value(20.1, 4.7)	16.4	accept
Triangular(9.28, 35.9, 22)	12.5	accept
Uniform(10, 35)	0.0115	reject
Exponential(10, 12.5)	0	reject
Pareto(10, 1.27)	0	reject

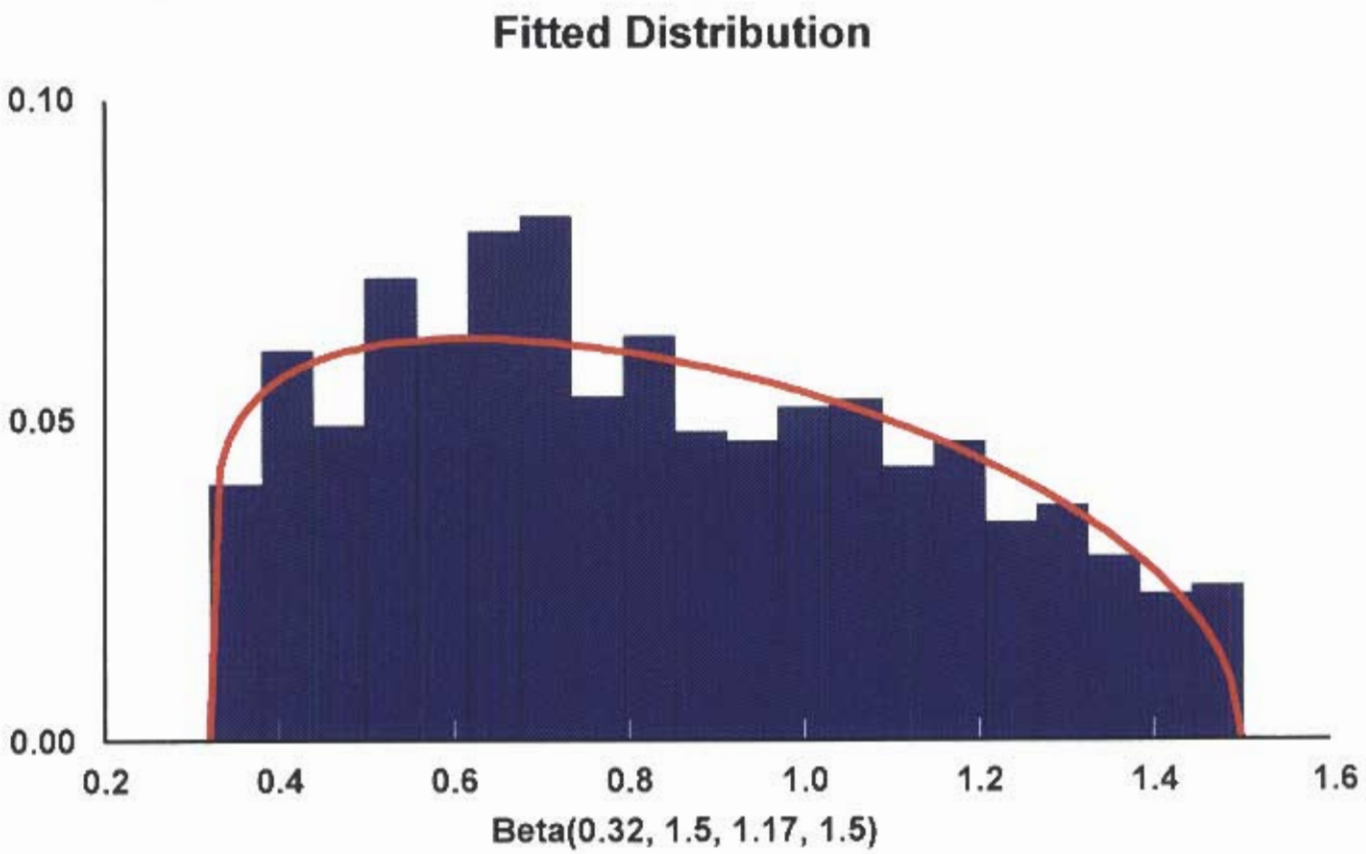

Fitted Distribution
0.50
0.25
0.00
1.0
1.5
2.0
2.5
3.0
3.5x10^1
Log-Logistic(-243, 101, 266)

descriptive statistics

data points	3996
minimum	0.32
maximum	1.5
mean	0.832222
median	0.78
mode	0.565
standard deviation	0.307365
variance	0.0944733
coefficient of variation	36.9331
skewness	0.32018
kurtosis	-0.912234

Auto::Fit Distributions

distribution	rank	acceptance
Beta(0.32, 1.5, 1.17, 1.5)	100	reject
Erlang(0.184, 4, 0.162)	0	reject
Exponential(0.32, 0.512)	0	reject
Extreme Value(0.684, 0.26)	0	reject
Gamma(-0.874, 31.6, 0.0541)	0	reject
Inverse Gaussian(-0.213, 11.1, 1.05)	0	reject
Logistic(0.818, 0.184)	0	reject
Log-Logistic(-4.89, 31.4, 5.7)	0	reject
Lognormal(-0.283, 0.0708, 0.28)	0	reject
Normal(0.832, 0.307)	0	reject
Pareto(0.32, 1.13)	0	reject
Pearson 5(-0.799, 28.6, 45.1)	0	reject
Pearson 6(0.32, 1.06e+06, 1.95, 4.04e+06)	0	reject
Triangular(0.285, 1.63, 0.5)	0	reject
Uniform(0.32, 1.5)	0	reject
Weibull(0.293, 1.78, 0.605)	0	reject

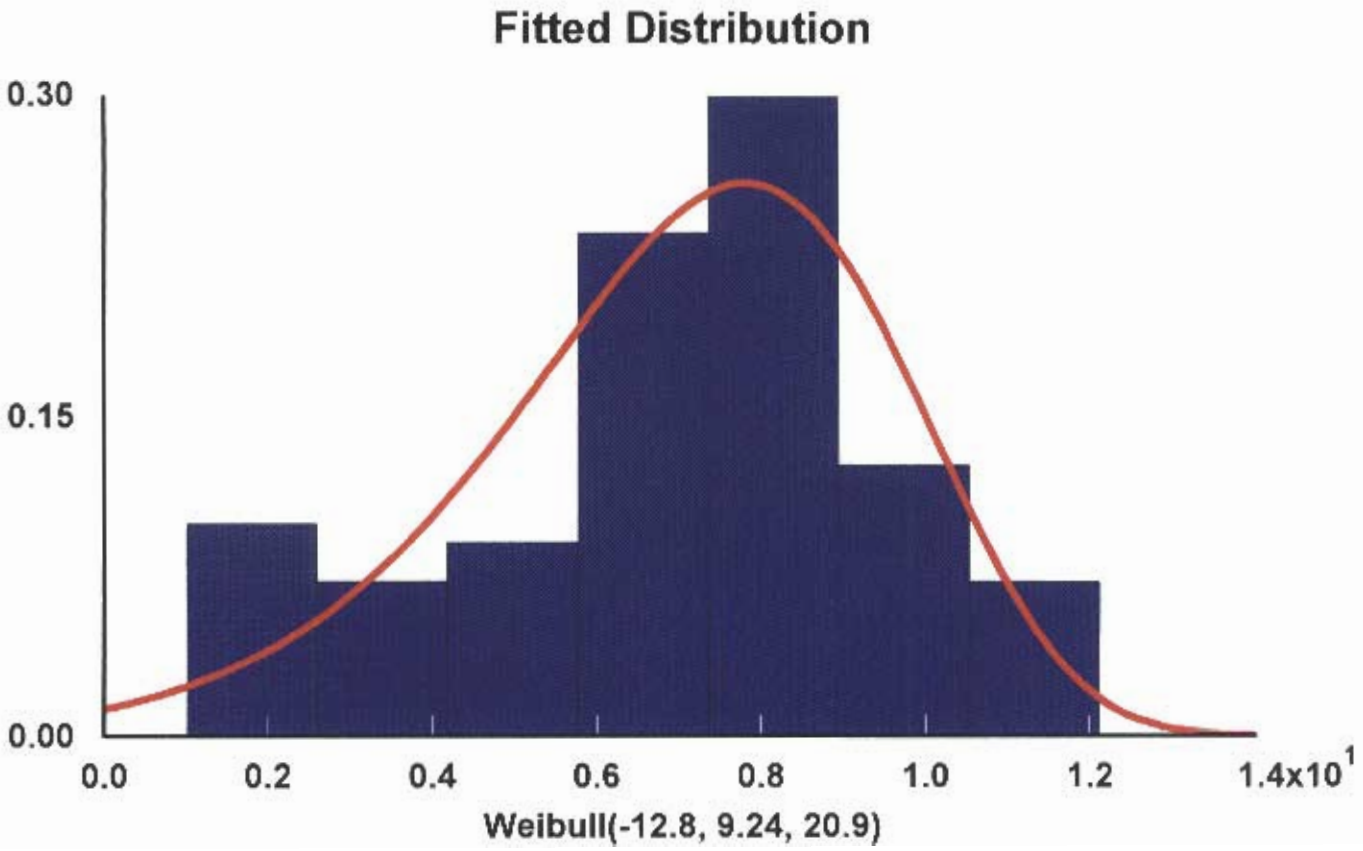

Fitted Distribution
0.10
0.05
0.00
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
Beta(0.32, 1.5, 1.17, 1.5)

descriptive statistics

data points	110
minimum	1
maximum	12.08
mean	6.94955
median	7.31
mode	7.96
standard deviation	2.62844
variance	6.90868
coefficient of variation	37.8217
skewness	-0.570711
kurtosis	-0.320724

Auto::Fit Distributions

distribution	rank	acceptance
Weibull(-12.8, 9.24, 20.9)	100	accept
Beta(-4.15, 12.1, 5.28, 2.48)	25.5	accept
Triangular(-0.0297, 12.4, 8.25)	21.1	accept
Logistic(7.16, 1.47)	12.7	reject
Lognormal(-1.92e+03, 7.56, 0.00136)	4.82	accept
Normal(6.95, 2.62)	1.51	accept
Pearson 5(-41.3, 322, 1.55e+04)	1.21	reject
Extreme Value(5.57, 2.79)	0.00382	reject
Uniform(1, 12.1)	0.000394	reject

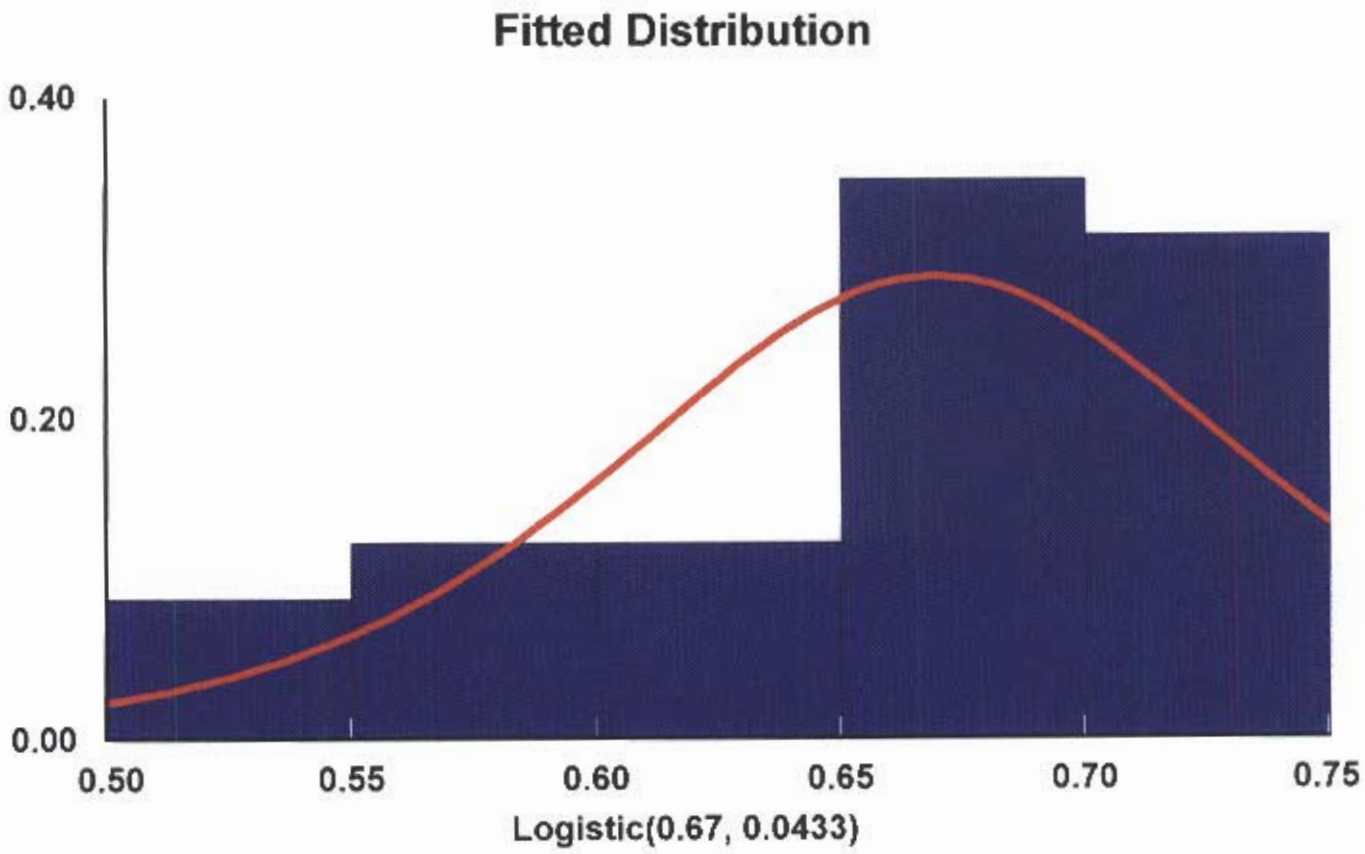

Fitted Distribution
0.30
0.15
0.00
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4x10^1
Weibull(-12.8, 9.24, 20.9)

descriptive statistics

data points	57
minimum	0.5
maximum	0.75
mean	0.664211
median	0.67
mode	0.67
standard deviation	0.0757333
variance	0.00573553
coefficient of variation	11.402
skewness	-0.608963
kurtosis	-0.538689

Auto::Fit Distributions

distribution	rank	acceptance
Logistic(0.67, 0.0433)	58.1	accept
Weibull(-0.0629, 12.3, 0.759)	52.4	reject
Lognormal(-467, 6.15, 0.000161)	29.3	reject
Pearson 5(-1.1, 523, 919)	16.8	reject
Normal(0.664, 0.0751)	13.9	reject
Extreme Value(0.625, 0.0803)	0.827	reject
Triangular(0.459, 0.75, 0.75)	0	reject
Uniform(0.5, 0.75)	0	reject
Beta(0.446, 0.75, 2.02, 0.963)	0	reject


Fitted Distribution
0.40
0.20
0.00
0.50
0.55
0.60
0.65
0.70
0.75
Logistic(0.67, 0.0433)

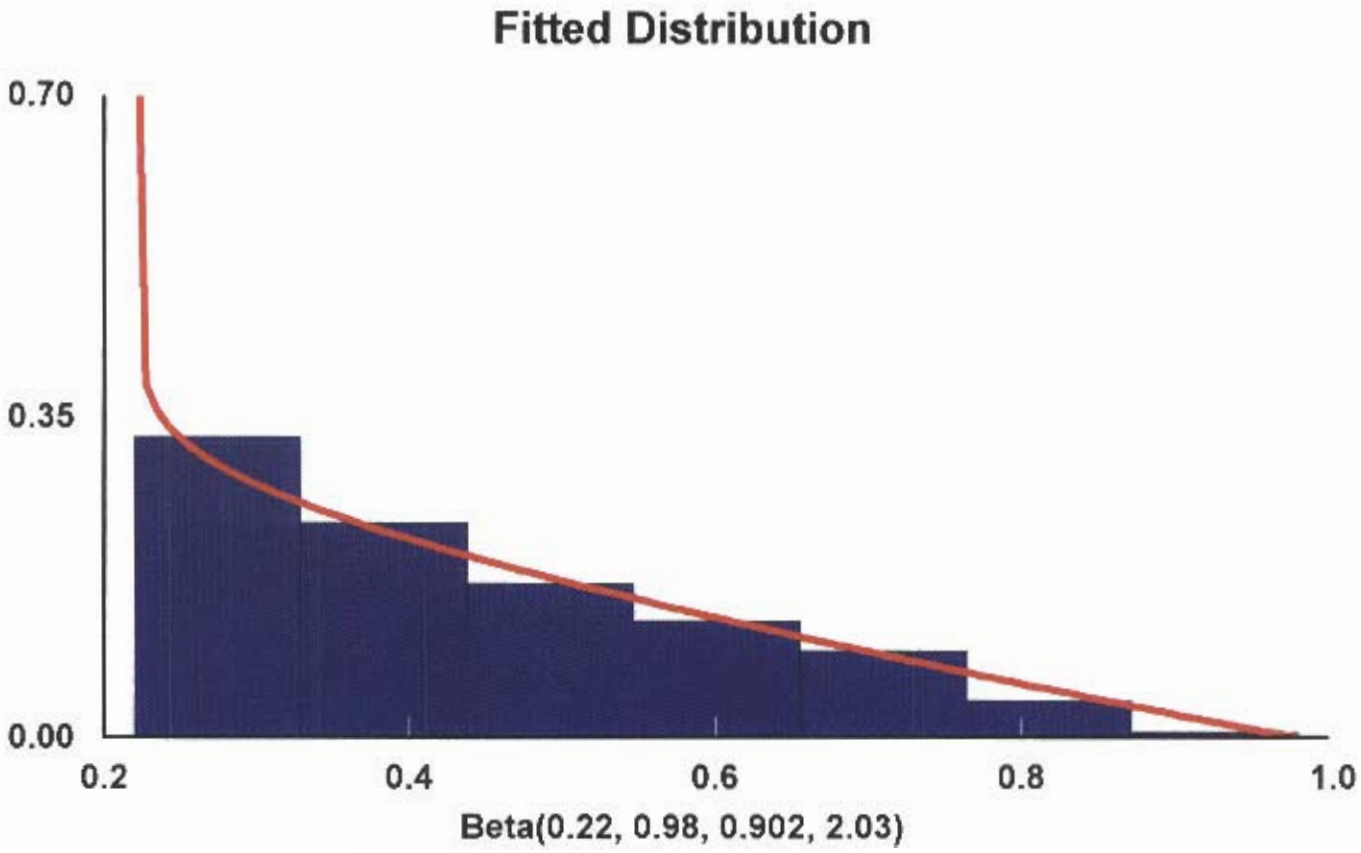
descriptive statistics

data points	149
minimum	0.22
maximum	0.98
mean	0.444362
median	0.42
mode	0.275
standard deviation	0.178524
variance	0.0318707
coefficient of variation	40.1752
skewness	0.669983
kurtosis	-0.452082

data contact suggests: min 20 min
max 30 min
normal distribution
25 ± 5 min

Auto::Fit Distributions

distribution	rank	acceptance
Beta(0.22, 0.98, 0.902, 2.03)	69.4	accept
Pearson 5(0.0295, 5.78, 2)	52.8	accept
Lognormal(0.147, -1.41, 0.655)	44	accept
Inverse Gaussian(0.134, 0.7, 0.31)	39.1	reject
Log-Logistic(0.179, 2.13, 0.212)	38.1	accept
Erlang(0.22, 1, 0.224)	19.6	accept
Gamma(0.22, 1, 0.224)	19.6	accept
Exponential(0.22, 0.224)	19.6	accept
Extreme Value(0.362, 0.137)	12.1	reject
Pearson 6(0.22, 2.01e+03, 1.55, 1.29e+04)	10.8	accept
Weibull(0.22, 0.927, 0.219)	5.05	accept
Logistic(0.428, 0.104)	0.452	reject
Normal(0.444, 0.178)	0.227	reject
Triangular(0.22, 0.995, 0.22)	0.184	reject
Pareto(0.22, 1.6)	0.00165	reject
Uniform(0.22, 0.98)	0	reject

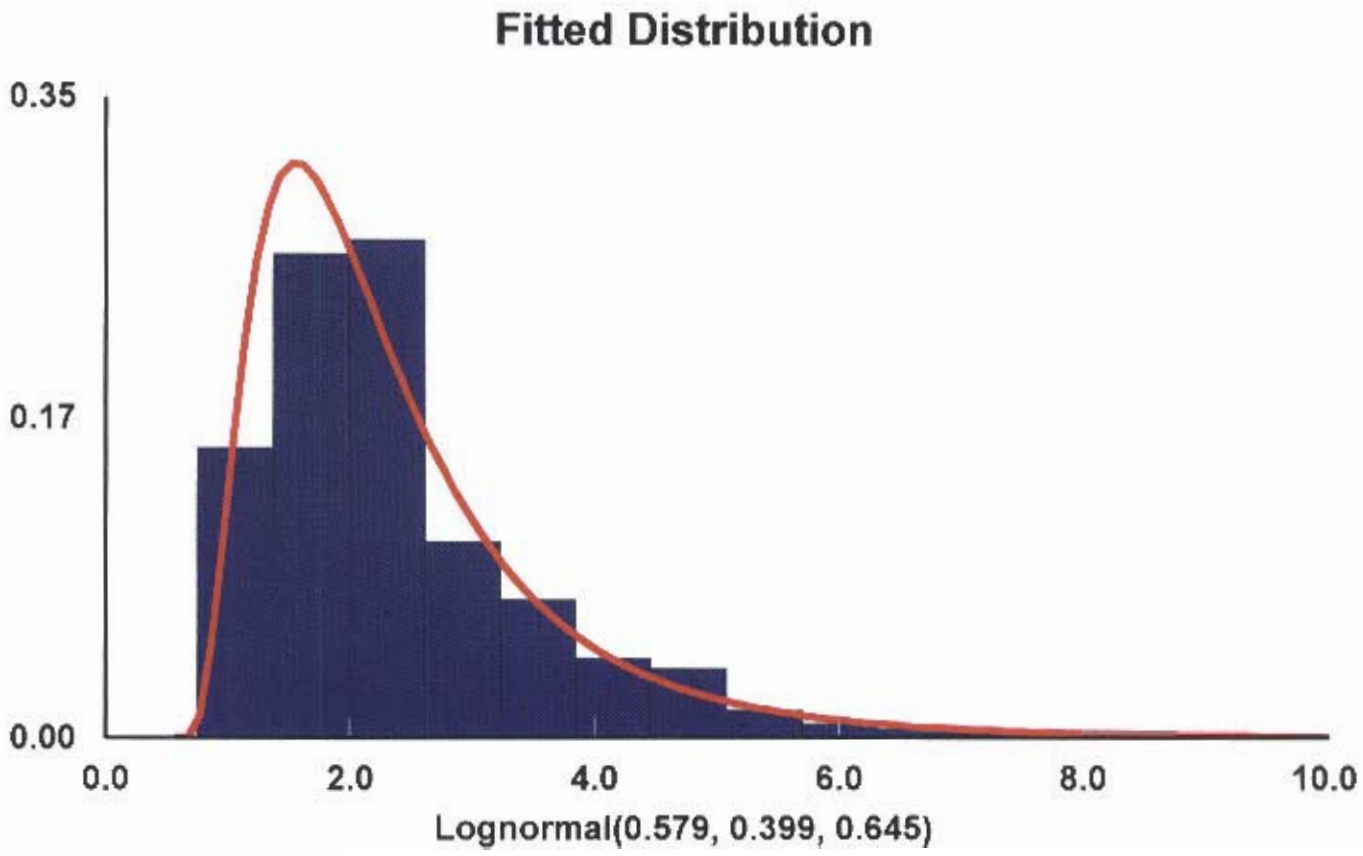

Fitted Distribution
0.70
0.35
0.00
0.2
0.4
0.6
0.8
1.0
Beta(0.22, 0.98, 0.902, 2.03)

descriptive statistics

data points	1418
minimum	0.75
maximum	10
mean	2.41053
median	2
mode	1.5
standard deviation	1.26497
variance	1.60015
coefficient of variation	52.4769
skewness	1.86485
kurtosis	5.0168

Auto::Fit Distributions

distribution	rank	acceptance
Lognormal(0.579, 0.399, 0.645)	98.1	reject
Inverse Gaussian(0.495, 4.37, 1.92)	65.5	reject
Pearson 5(0.186, 4.38, 7.6)	28	reject
Pearson 6(0.75, 6.52, 2.56, 11.1)	3.24	reject
Log-Logistic(0.75, 2.34, 1.3)	1.2	reject
Erlang(0.733, 2, 0.839)	0.034	reject
Gamma(0.736, 2.05, 0.818)	0.00715	reject
Beta(0.75, 9.7e+05, 2.06, 1.2e+06)	0.000169	reject
Weibull(0.746, 1.43, 1.84)	1.04e-05	reject
Exponential(0.75, 1.66)	0	reject
Logistic(2.23, 0.634)	0	reject
Normal(2.41, 1.26)	0	reject
Pareto(0.75, 0.947)	0	reject
Triangular(0.728, 10, 1)	0	reject
Uniform(0.75, 10)	0	reject
Extreme Value(1.89, 0.818)	0	reject


Fitted Distribution
0.35
0.17
0.00
0.0
2.0
4.0
6.0
8.0
10.0
Lognormal(0.579, 0.399, 0.645)

EP LAB Recovery Times

0.42
0.50
0.63
0.67
0.75
0.75
0.75
0.75
0.75
0.75
0.80
0.87
1.00
1.00
1.42
1.73
1.83

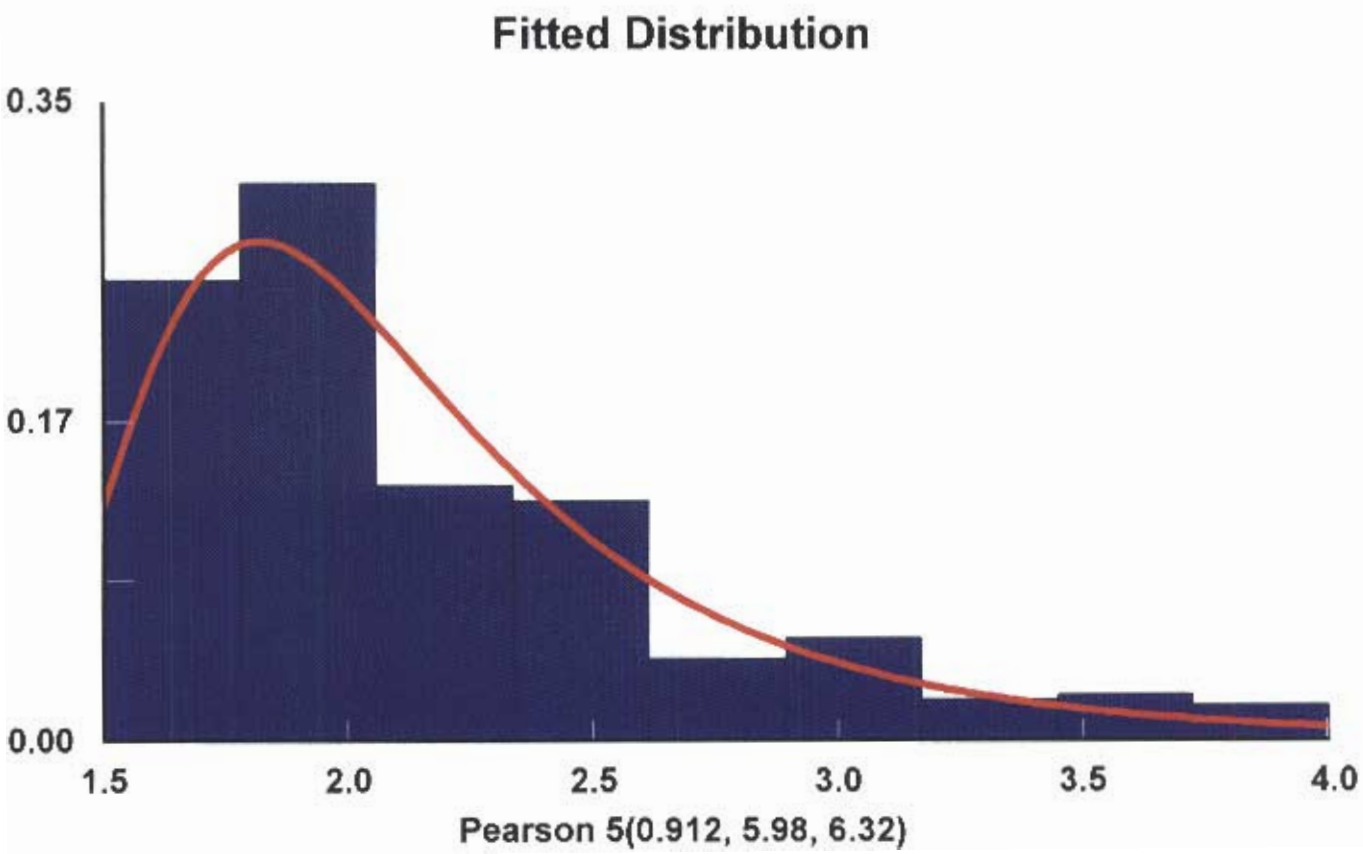
17.00 Count
0.90 Average
0.40 Standard Deviation

descriptive statistics

data points	356
minimum	1.5
maximum	4
mean	2.17303
median	2
mode	1.5
standard deviation	0.559379
variance	0.312905
coefficient of variation	25.7418
skewness	1.08258
kurtosis	0.912888

Auto::Fit Distributions

distribution	rank	acceptance
Pearson 5(0.912, 5.98, 6.32)	100	reject
Lognormal(1.23, -0.237, 0.608)	25.6	reject
Inverse Gaussian(1.2, 2.52, 0.976)	15.3	reject
Extreme Value(1.92, 0.409)	0.144	reject
Gamma(1.5, 1, 0.673)	0.00112	reject
Erlang(1.5, 1, 0.673)	0.00112	reject
Exponential(1.5, 0.673)	0.00112	reject
Weibull(1.5, 0.963, 0.664)	7.74e-05	reject
Log-Logistic(1.5, 2.29, 0.608)	6.54e-08	reject
Pearson 6(1.5, 7.74, 2.28, 24.1)	2.78e-08	reject
Logistic(2.11, 0.308)	0	reject
Normal(2.17, 0.559)	0	reject
Pareto(1.5, 2.93)	0	reject
Beta(1.5, 5.15e+03, 2.09, 1.41e+04)	0	reject
Triangular(1.5, 4.07, 1.5)	0	reject
Uniform(1.5, 4)	0	reject

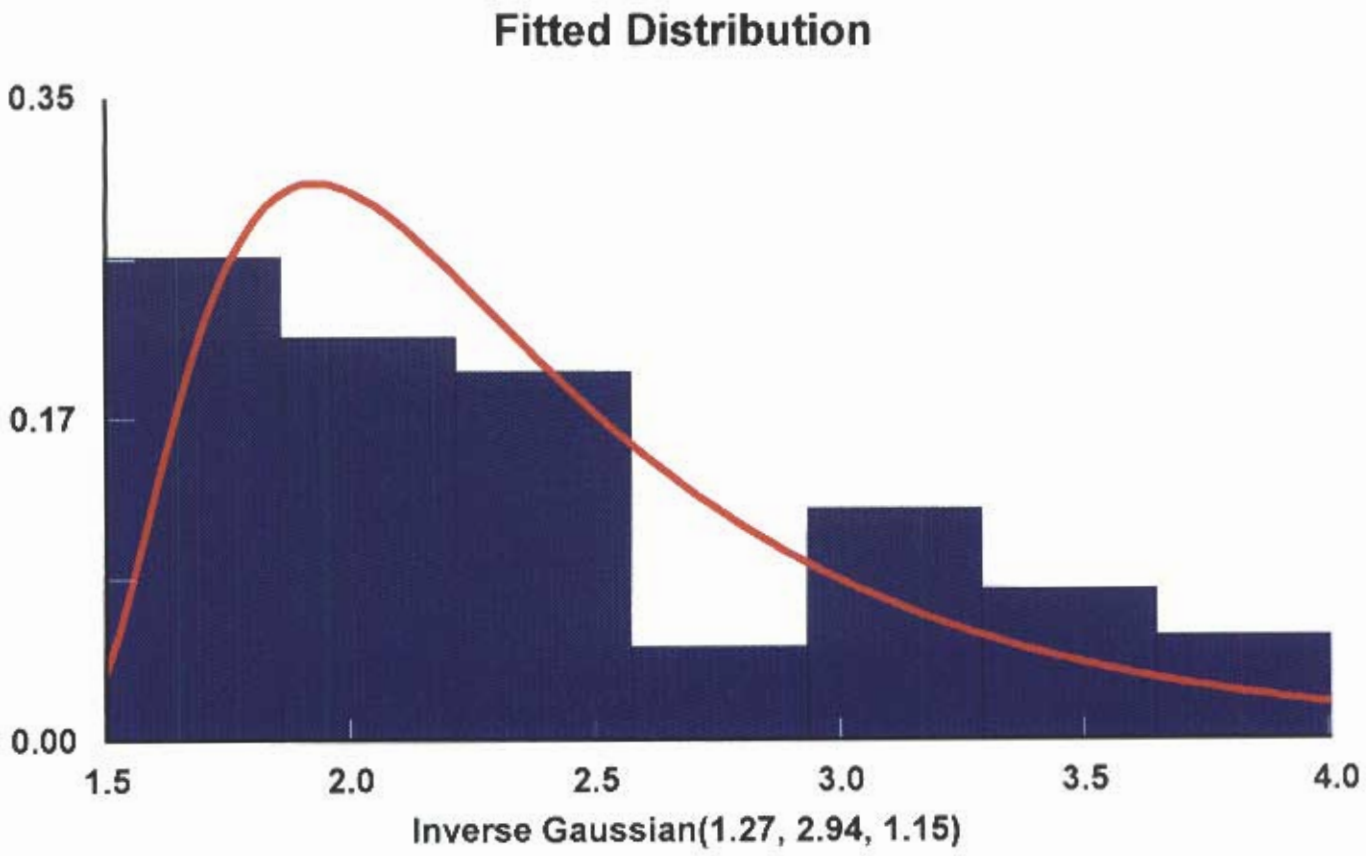

Fitted Distribution
0.35
0.17
0.00
1.5
2.0
2.5
3.0
3.5
4.0
Pearson 5(0.912, 5.98, 6.32)

descriptive statistics

data points	159
minimum	1.5
maximum	4
mean	2.42075
median	2.3
mode	1.8
standard deviation	0.652558
variance	0.425832
coefficient of variation	26.9568
skewness	0.79158
kurtosis	-0.324608

Auto::Fit Distributions

distribution	rank	acceptance
Inverse Gaussian(1.27, 2.94, 1.15)	71	reject
Gamma(1.47, 1.97, 0.482)	68.2	reject
Lognormal(1.32, -0.0877, 0.619)	53.6	reject
Erlang(1.47, 2, 0.475)	51.8	reject
Weibull(1.49, 1.45, 1.03)	49.4	reject
Pearson 5(1.04, 5.01, 5.62)	32.1	reject
Pearson 6(1.5, 43, 2.05, 95.5)	11	reject
Log-Logistic(1.5, 2.16, 0.73)	7.1	reject
Beta(1.5, 4, 1.32, 2.37)	0.963	reject
Extreme Value(2.12, 0.486)	0.22	reject
Logistic(2.35, 0.372)	0.0815	reject
Triangular(1.45, 4.24, 1.8)	0.0403	reject
Exponential(1.5, 0.921)	0.0135	reject
Normal(2.42, 0.651)	0.0052	reject
Pareto(1.5, 2.25)	9.56e-08	reject
Uniform(1.5, 4)	0	reject


Fitted Distribution
0.35
0.17
0.00
1.5
2.0
2.5
3.0
3.5
4.0
Inverse Gaussian(1.27, 2.94, 1.15)

Results of Simulation

General Report
Output from U:\P\Hh4.mod [Heart]
Date: Apr/30/1998 Time: 11:38:48 AM

Scenario : Normal Run
Replication : 1 of 1
Simulation Time : 20.05243333 hr

LOCATIONS

Location Name	Scheduled Hours	Capacity	Total Entries	Average Minutes Per Entry	Average Contents	Maximum Contents	Curre Conter
Entrance	20.05243333	999999	44	0.000000	0	1	
Desk	20.05243333	2	41	5.243049	0.178669	2	
Waiting Room	20.05243333	999999	123	474.143171	48.4726	98	
Treatment Room	20.05243333	2	30	18.628467	0.464494	2	
Inpatient Room	20.05243333	23	68	254.674794	14.3938	23	
Observation Room	20.05243333	7	4	360.295000	1.19784	4	
Three East	20.05243333	9	11	366.633727	3.35202	7	
EP 1	20.05243333	1	1	617.173000	0.512966	1	
EP 2	20.05243333	1	4	146.437250	0.486848	1	
EP 3	20.05243333	1	2	228.184500	0.379313	1	
Cath1	20.05243333	1	6	98.467833	0.491052	1	
Cath2	20.05243333	1	7	68.223857	0.396932	1	
Cath3	20.05243333	1	6	76.378500	0.380894	1	
Cath4	20.05243333	1	6	82.218167	0.410016	1	
Cath5	20.05243333	1	9	52.248444	0.390839	1	
Cath6	20.05243333	1	5	107.187400	0.445446	1	
Cath Holding	20.05243333	6	19	76.135211	1.20232	5	
Regline	20.05243333	999999	41	33.360683	1.13684	28	
Departure	20.05243333	999999	49	1.839898	0.0749327	9	
Staff room	20.05243333	999999	0	0.000000	0	0	
desk workers	20.05243333	2	0	0.000000	0	0	
BUMC	20.05243333	999999	4	0.000000	0	1	

LOCATION STATES BY PERCENTAGE (Multiple Capacity)

Location Name	Scheduled Hours	% Empty	% Partially Occupied	% Full	% Down
Entrance	20.05243333	100.00	0.00	0.00	0.00
Desk	20.05243333	90.30	1.53	8.17	0.00
Waiting Room	20.05243333	7.04	92.96	0.00	0.00
Treatment Room	20.05243333	75.76	2.03	22.21	0.00
Inpatient Room	20.05243333	15.22	70.24	14.54	0.00
Observation Room	20.05243333	68.58	31.42	0.00	0.00
Three East	20.05243333	12.73	87.27	0.00	0.00
Cath Holding	20.05243333	53.38	46.62	0.00	0.00
Regline	20.05243333	92.04	7.96	0.00	0.00
Departure	20.05243333	92.63	7.37	0.00	0.00
Staff room	20.05243333	100.00	0.00	0.00	0.00
desk workers	20.05243333	100.00	0.00	0.00	0.00
BUMC	20.05243333	100.00	0.00	0.00	0.00

LOCATION STATES BY PERCENTAGE (Single Capacity)

Location Name	Scheduled Hours	% Operation	% Setup	% Idle	% Waiting	% Blocked	% Down
EP 1	20.05243333	45.48	0.00	48.70	2.29	3.53	0.00

EP 2	20.05243333	38.40	0.00	51.32	10.28	0.00	0.00
EP 3	20.05243333	31.36	0.00	62.07	6.58	0.00	0.00
Cath1	20.05243333	16.88	0.00	50.89	32.23	0.00	0.00
Cath2	20.05243333	26.59	0.00	60.31	13.11	0.00	0.00
Cath3	20.05243333	24.78	0.00	61.91	13.31	0.00	0.00
Cath4	20.05243333	25.44	0.00	59.00	15.57	0.00	0.00
Cath5	20.05243333	29.32	0.00	60.92	9.76	0.00	0.00
Cath6	20.05243333	19.21	0.00	55.46	25.34	0.00	0.00

RESOURCES

Resource Name	Units	Scheduled Hours	Number Of Times Used	Average Minutes Per Usage	Average Minutes Travel To Use	Average Minutes Travel To Park	% Blocked In Travel
pre nurse.1	1	20.05243333	29	3.859655	0.576138	0.602000	0.00
pre nurse.2	1	20.05243333	18	5.700889	0.561444	0.588941	0.00
pre nurse.3	1	20.05243333	14	0.364000	0.584000	0.626000	0.00
pre nurse	3	60.1573	61	3.600689	0.573607	0.603932	0.00
pre tech.1	1	20.05243333	52	2.872596	0.344846	0.584000	0.00
pre tech.2	1	20.05243333	35	4.699686	0.275714	0.584000	0.00
pre tech	2	40.10486667	87	3.607632	0.317034	0.584000	0.00
reg.1	1	20.05243333	22	5.250136	0.000000	0.000000	0.00
reg.2	1	20.05243333	19	5.215737	0.000000	0.000000	0.00
reg	2	40.10486667	41	5.234195	0.000000	0.000000	0.00
heartnurse.1	1	20.05243333	55	7.294982	0.905982	0.698091	0.00
heartnurse.2	1	20.05243333	41	7.811341	0.834317	0.754024	0.00
heartnurse.3	1	20.05243333	31	6.887710	0.675419	0.911645	0.00
heartnurse.4	1	20.05243333	22	7.226318	0.704909	0.940682	0.00
heartnurse.5	1	20.05243333	13	10.397000	0.654154	0.973769	0.00
heartnurse.6	1	20.05243333	11	12.092364	0.638364	0.878636	0.00
heartnurse.7	1	20.05243333	7	14.981714	0.626000	0.836571	0.00
heartnurse.8	1	20.05243333	3	12.622333	0.626000	0.871667	0.00
heartnurse.9	1	20.05243333	1	22.294000	0.626000	0.626000	0.00
heartnurse.10	1	20.05243333	0	0.000000	0.000000	0.000000	0.00
heartnurse	10	200.5243333	184	8.299984	0.776598	0.813516	0.00
enurse.1	1	20.05243333	8	117.643125	0.493000	0.491000	0.00
enurse.2	1	20.05243333	6	160.251000	0.384667	0.000000	0.00
enurse.3	1	20.05243333	3	179.178667	0.000000	1.906000	0.00
enurse.4	1	20.05243333	8	90.955125	0.245500	0.000000	0.00
enurse.5	1	20.05243333	1	559.532000	0.000000	0.000000	0.00
enurse	5	100.2621667	26	143.360000	0.316000	1.198500	0.00
obsnurse.1	1	20.05243333	19	27.285211	0.247263	0.000000	0.00
obsnurse.2	1	20.05243333	20	27.720850	0.254300	0.000000	0.00
obsnurse	2	40.10486667	39	27.508615	0.250872	0.000000	0.00
cathteam.1	1	20.05243333	9	45.436778	0.499222	0.499222	0.00
cathteam.2	1	20.05243333	9	42.290333	0.445222	0.445222	0.00
cathteam.3	1	20.05243333	8	39.447375	0.609875	0.609875	0.00
cathteam.4	1	20.05243333	6	51.630500	0.604833	0.604833	0.00
cathteam.5	1	20.05243333	4	36.087000	0.323250	0.323250	0.00
cathteam.6	1	20.05243333	3	50.560333	0.660000	0.660000	0.00
cathteam	6	120.3146	39	43.870128	0.520026	0.520026	0.00
epteam.1	1	20.05243333	1	547.168000	0.356000	0.356000	0.00
epteam.2	1	20.05243333	4	115.511750	0.459000	0.459000	0.00
epteam.3	1	20.05243333	2	188.629000	0.564000	0.564000	0.00
epteam	3	60.1573	7	198.067571	0.474286	0.474286	0.00

RESOURCE STATES BY PERCENTAGE

Resource Name	Scheduled Hours	% In Use	% Travel To Use	% Travel To Park	% Idle	% Down
pre nurse.1	20.05243333	9.30	1.39	1.40	87.91	0.00
pre nurse.2	20.05243333	8.53	0.84	0.83	89.80	0.00

pre nurse.3	20.05243333	0.42	0.68	0.73	98.17	0.00
pre nurse	60.1573	6.09	0.97	0.99	91.96	0.00
pre tech.1	20.05243333	12.42	1.49	1.16	84.93	0.00
pre tech.2	20.05243333	13.67	0.80	0.73	84.80	0.00
pre tech	40.10486667	13.04	1.15	0.95	84.86	0.00
reg.1	20.05243333	9.60	0.00	0.00	90.40	0.00
reg.2	20.05243333	8.24	0.00	0.00	91.76	0.00
reg	40.10486667	8.92	0.00	0.00	91.08	0.00
heartnurse.1	20.05243333	33.35	4.14	3.19	59.32	0.00
heartnurse.2	20.05243333	26.62	2.84	2.57	67.97	0.00
heartnurse.3	20.05243333	17.75	1.74	2.35	78.16	0.00
heartnurse.4	20.05243333	13.21	1.29	1.72	83.78	0.00
heartnurse.5	20.05243333	11.23	0.71	1.05	87.01	0.00
heartnurse.6	20.05243333	11.06	0.58	0.80	87.56	0.00
heartnurse.7	20.05243333	8.72	0.36	0.49	90.43	0.00
heartnurse.8	20.05243333	3.15	0.16	0.22	96.48	0.00
heartnurse.9	20.05243333	1.85	0.05	0.05	98.04	0.00
heartnurse.10	20.05243333	0.00	0.00	0.00	100.00	0.00
heartnurse	200.5243333	12.69	1.19	1.24	84.87	0.00
enurse.1	20.05243333	78.22	0.33	0.04	21.41	0.00
enurse.2	20.05243333	79.92	0.19	0.00	19.89	0.00
enurse.3	20.05243333	44.68	0.00	0.16	55.16	0.00
enurse.4	20.05243333	60.48	0.16	0.00	39.36	0.00
enurse.5	20.05243333	46.51	0.00	0.00	53.49	0.00
enurse	100.2621667	61.96	0.14	0.04	37.86	0.00
obsnurse.1	20.05243333	43.09	0.39	0.00	56.52	0.00
obsnurse.2	20.05243333	46.08	0.42	0.00	53.50	0.00
obsnurse	40.10486667	44.58	0.41	0.00	55.01	0.00
cathteam.1	20.05243333	33.99	0.37	0.37	65.26	0.00
cathteam.2	20.05243333	31.63	0.33	0.33	67.70	0.00
cathteam.3	20.05243333	26.23	0.41	0.41	72.96	0.00
cathteam.4	20.05243333	25.75	0.30	0.30	73.65	0.00
cathteam.5	20.05243333	12.00	0.11	0.11	87.79	0.00
cathteam.6	20.05243333	12.61	0.16	0.16	87.06	0.00
cathteam	120.3146	23.70	0.28	0.28	75.74	0.00
epteam.1	20.05243333	45.48	0.03	0.03	54.46	0.00
epteam.2	20.05243333	38.40	0.15	0.15	61.29	0.00
epteam.3	20.05243333	31.36	0.09	0.09	68.46	0.00
epteam	60.1573	38.41	0.09	0.09	61.40	0.00

FAILED ARRIVALS

Entity Name	Location Name	Total Failed
Cath	Entrance	0
EP	Entrance	0
ICD	Inpatient Room	0
Biopsy	Entrance	0
Cardiovers	Entrance	0
Right Heart	Entrance	0
Transfer ed	Entrance	0
PM	Entrance	0
Ablation	Entrance	0

ENTITY ACTIVITY

Entity Name	Total Exits	Current Quantity In System	Average Minutes In System	Average Minutes In Move Logic	Average Minutes Wait For Res, etc.	Average Minutes In Operation	Averag Minute
Cath	23	2	863.187261	41.942435	16.929478	541.237870	263.07747
Fam member	83	0	665.399759	0.288000	0.000000	0.000000	665.11175
EP	5	0	481.773800	21.003200	22.900400	353.690200	84.18000
ICD	1	0	1021.369000	124.473000	4.107000	661.482000	231.30700

Biopsy	6	0	98.741167	18.445500	1.238000	37.101333	41.9563
Cardiovers	1	0	287.385000	2.193000	5.152000	254.750000	25.2900
Right Heart	4	0	197.458000	29.317500	1.363000	59.601000	107.1765
Transfer ed	4	0	942.494250	49.073000	13.379500	879.742500	0.2992
PM	2	0	1021.034000	8.270500	1.865500	1010.898000	0.0000
Ablation	1	0	1021.034000	33.611000	47.943000	880.875000	58.6050

ENTITY STATES BY PERCENTAGE

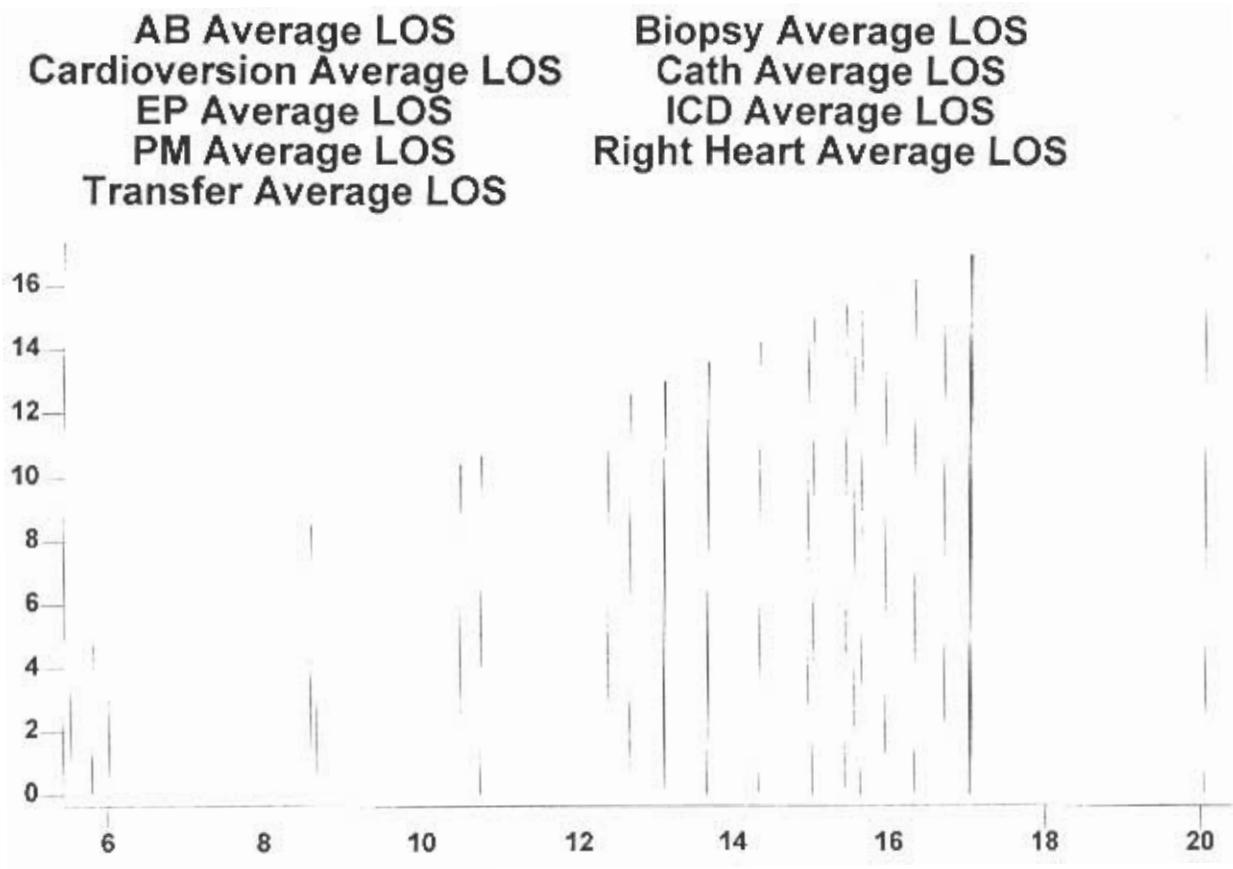
Entity Name	% In Move Logic	% Wait For Res, etc.	% In Operation	% Blocked
Cath	4.86	1.96	62.70	30.48
Fam member	0.04	0.00	0.00	99.96
EP	4.36	4.75	73.41	17.47
ICD	12.19	0.40	64.76	22.65
Biopsy	18.68	1.25	37.57	42.49
Cardiovers	0.76	1.79	88.64	8.80
Right Heart	14.85	0.69	30.18	54.28
Transfer ed	5.21	1.42	93.34	0.03
PM	0.81	0.18	99.01	0.00
Ablation	3.29	4.70	86.27	5.74

VARIABLES

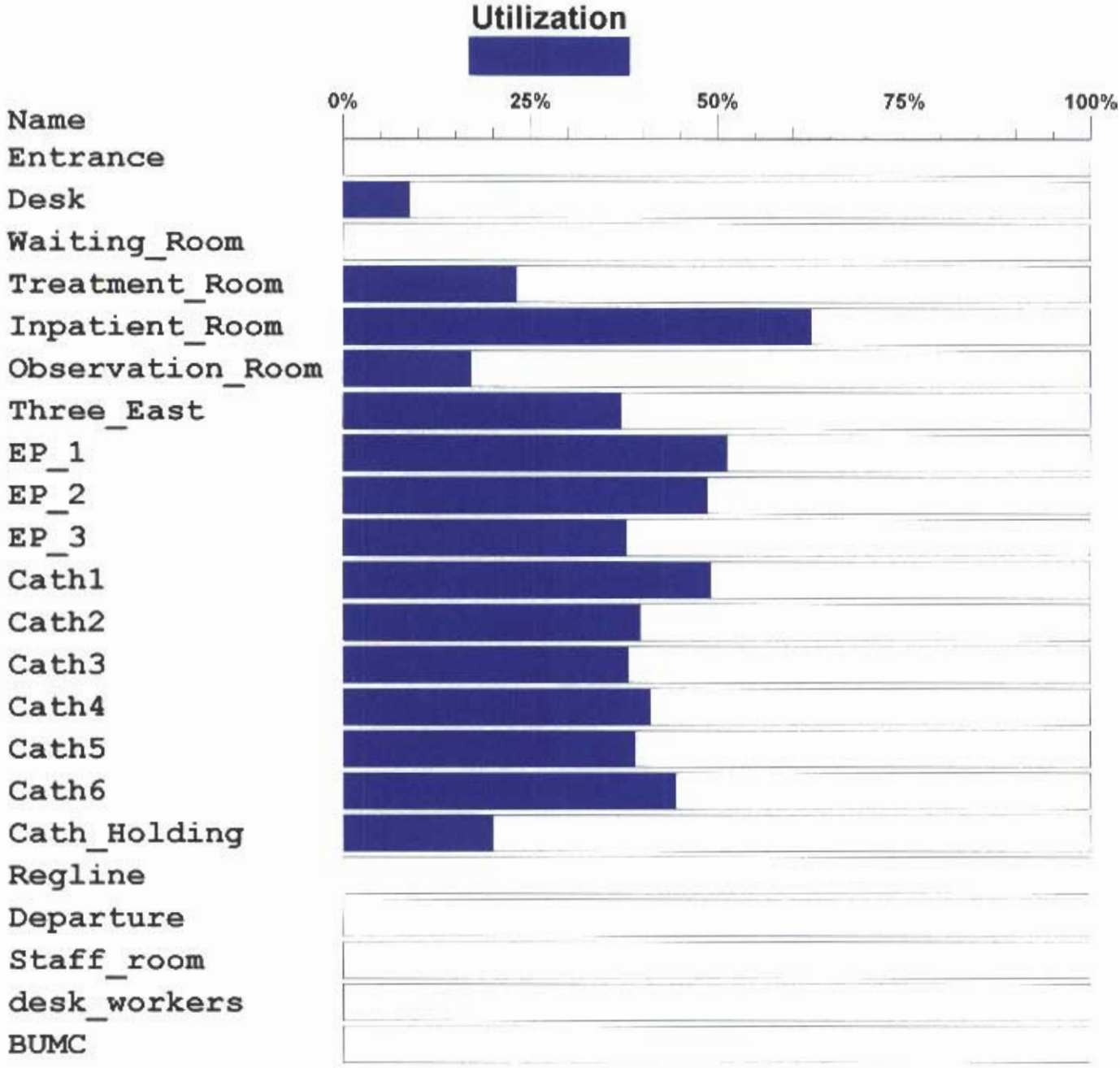
Variable Name	Total Changes	Average Minutes Per Change	Minimum Value	Maximum Value	Current Value	Average Value
Waitroom max	98	1.041918	0	98	98	96.1348
Waitroom count	246	4.547183	0	98	0	48.4471
BUMC count	4	160.502750	0	4	4	2.56678

LOGS

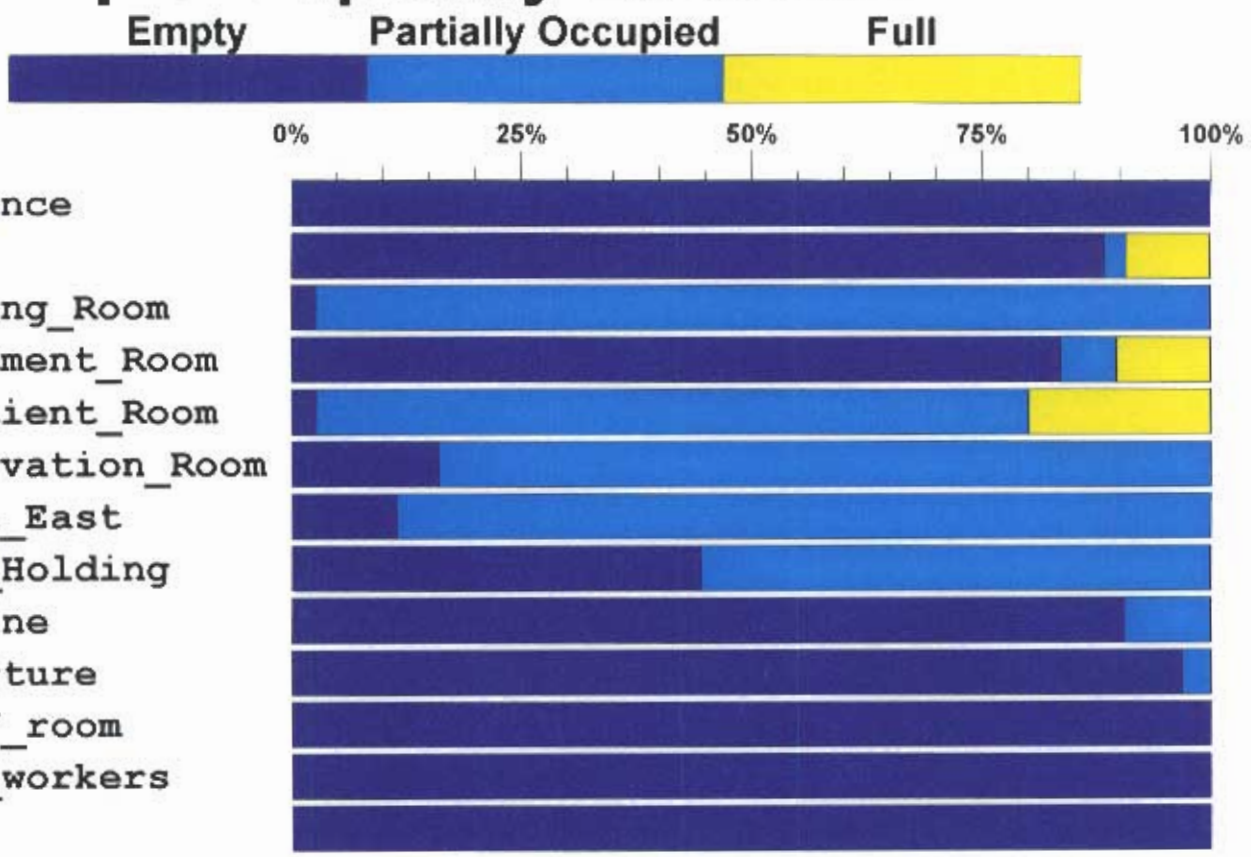
Log Name	Number Of Observations	Minimum Value	Maximum Value	Average Value
Cath Average LOS	23	243.107000	1020.549000	863.187261
EP Average LOS	5	627.900000	1020.541000	889.379400
ICD Average LOS	1	1021.369000	1021.369000	1021.369000
Biopsy Average LOS	6	60.977000	196.525000	98.741167
Cardioversion Average LOS	1	287.385000	287.385000	287.385000
Right Heart Average LOS	4	118.879000	279.914000	197.458000
Transfer Average LOS	4	926.537000	1020.890000	975.277500
PM Average LOS	2	1021.034000	1021.034000	1021.034000
AB Average LOS	1	1021.034000	1021.034000	1021.034000


AB Average LOS
Biopsy Average LOS
Cardioversion Average LOS
Cath Average LOS
EP Average LOS
ICD Average LOS
PM Average LOS
Right Heart Average LOS
Transfer Average LOS
16
14
12
10
8
6
4
2
0
6
8
10
12
14
16
18
20

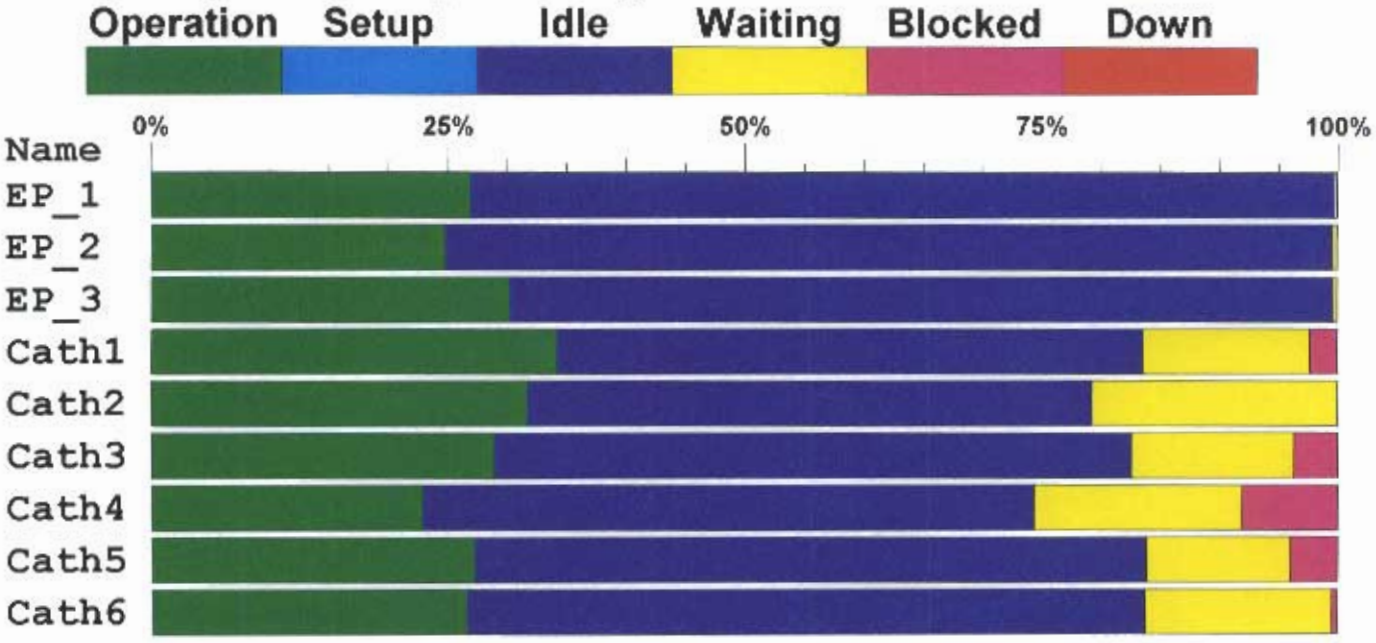
Location Utilization



Multiple Capacity Location States

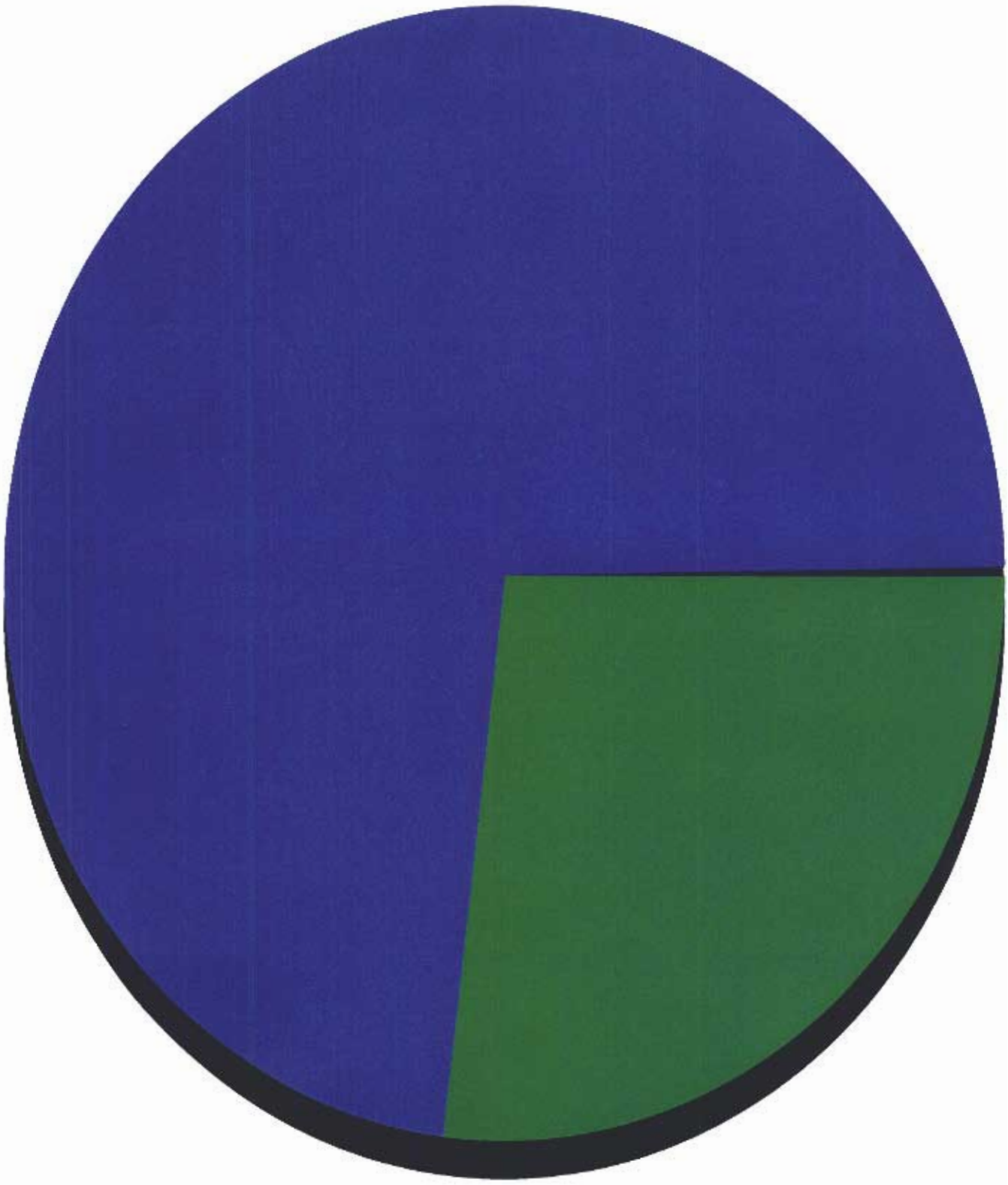


Single Capacity Location States



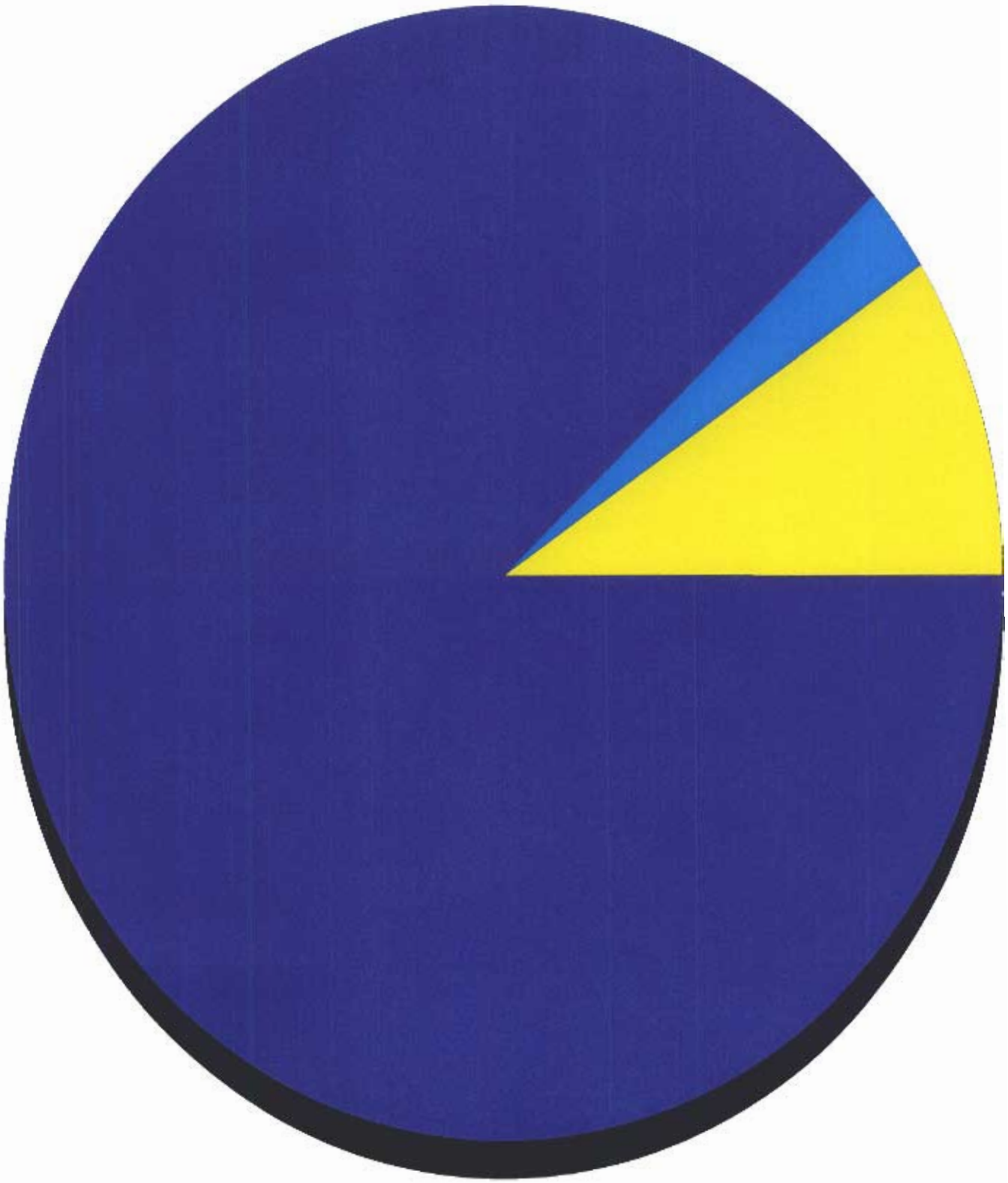
Cath1

EP_1

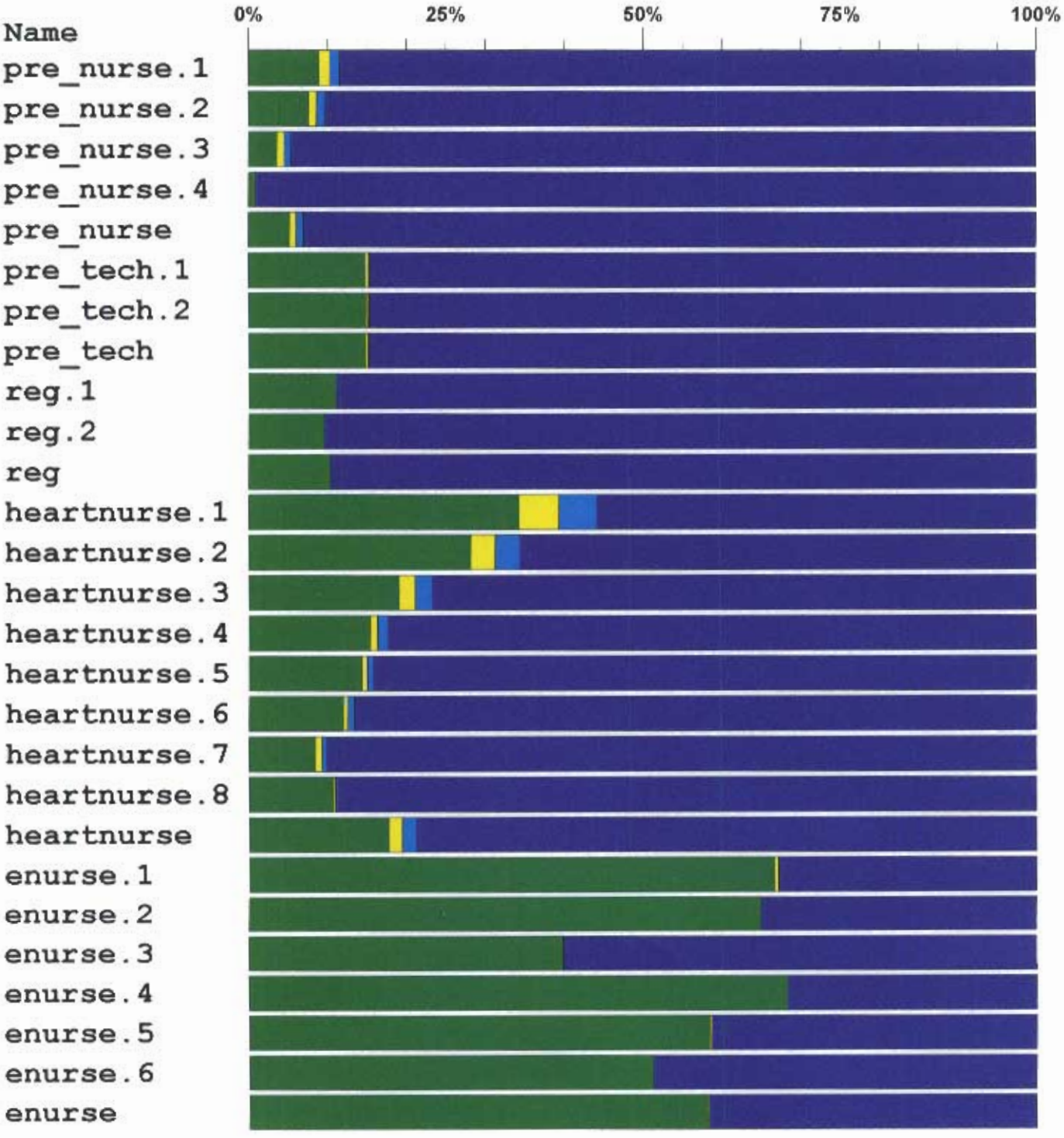


Desk

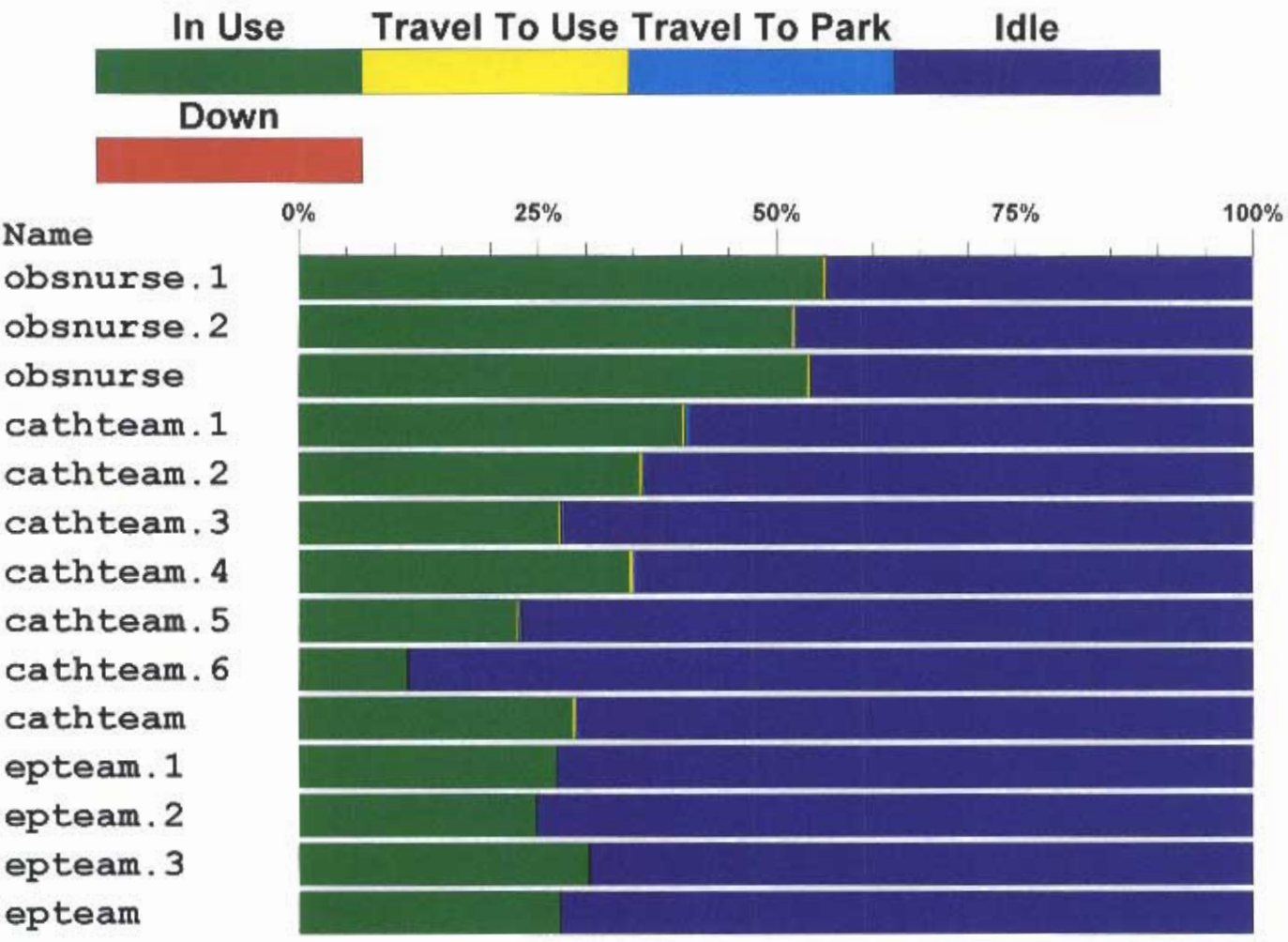
Empty | Partially Occupied | Full



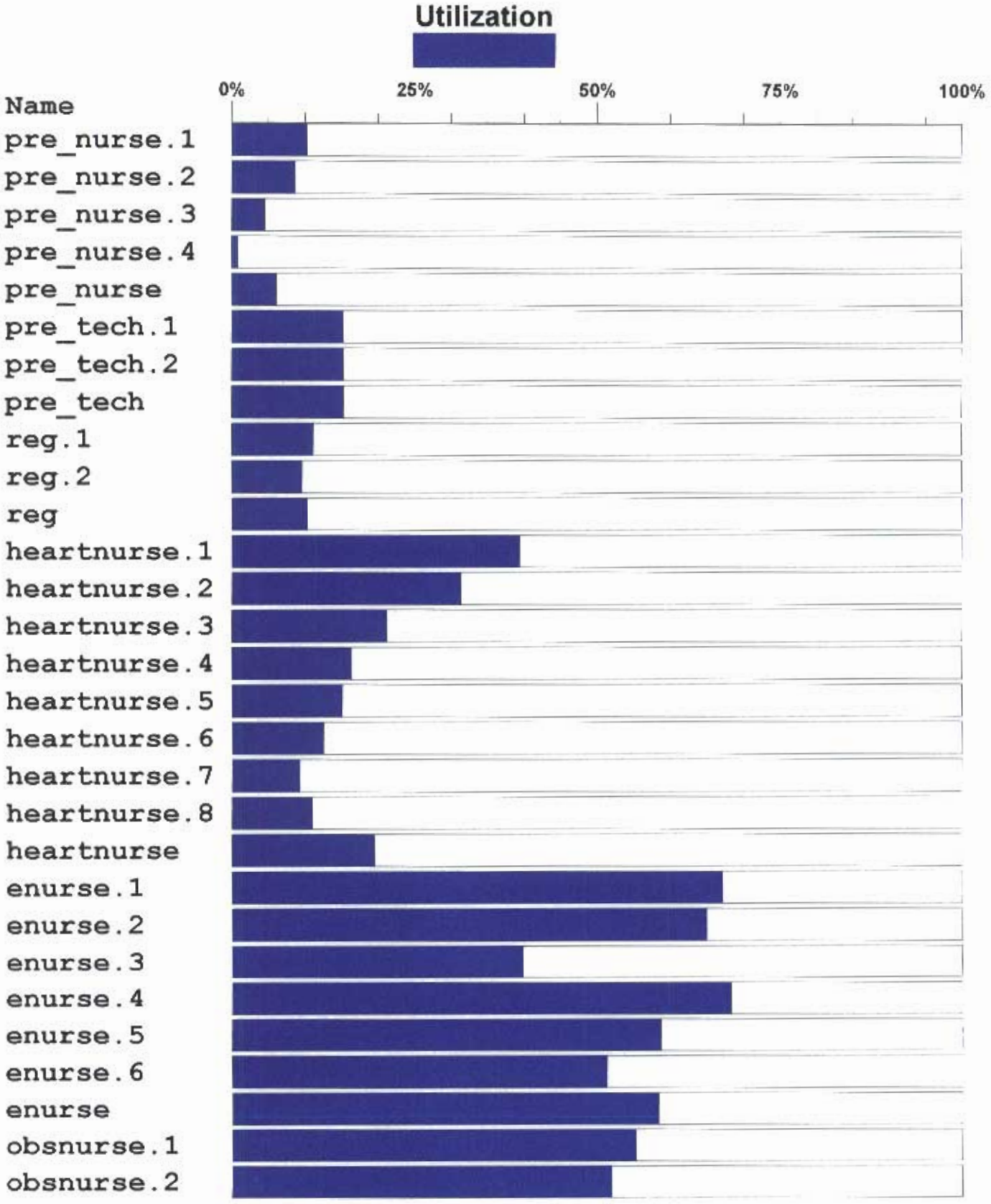
Resource States



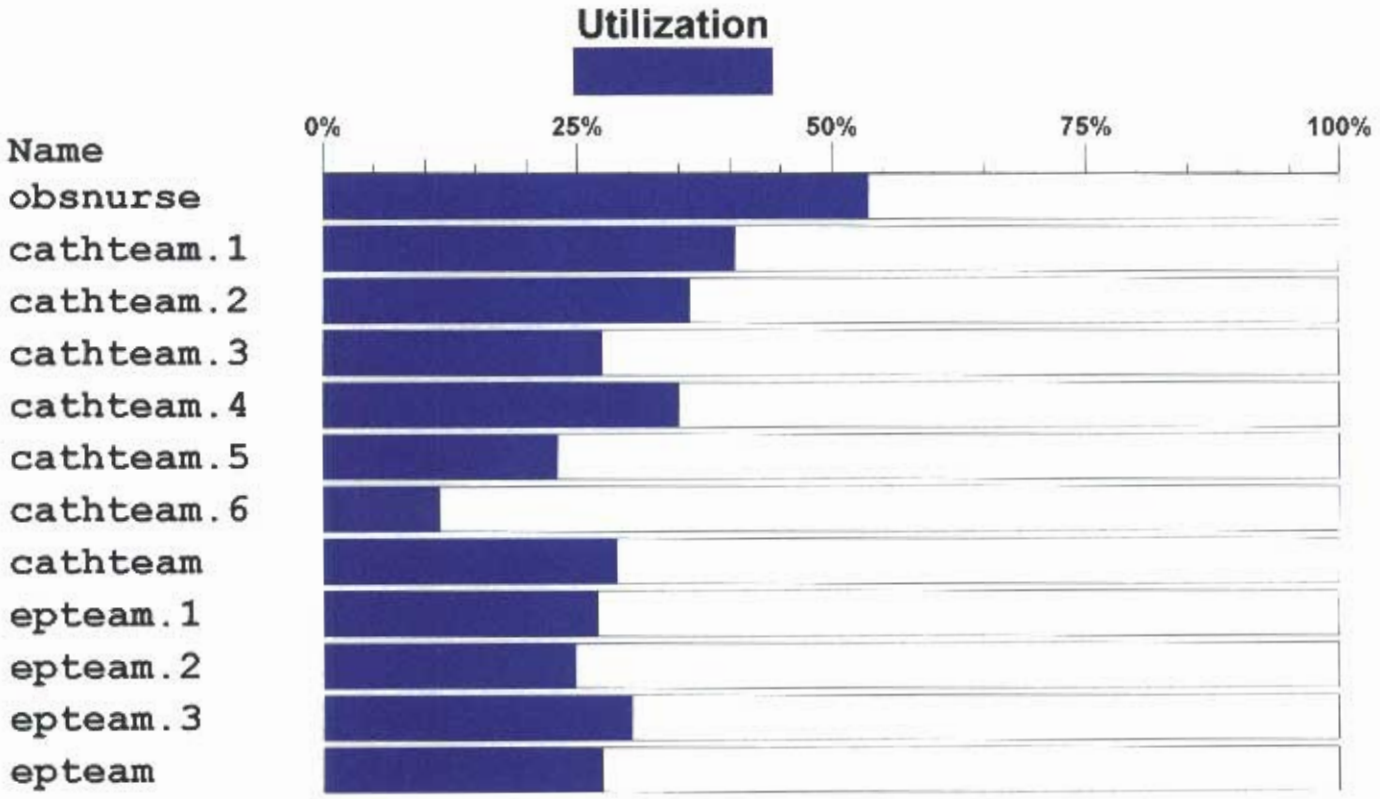
Resource States



Resource Utilization

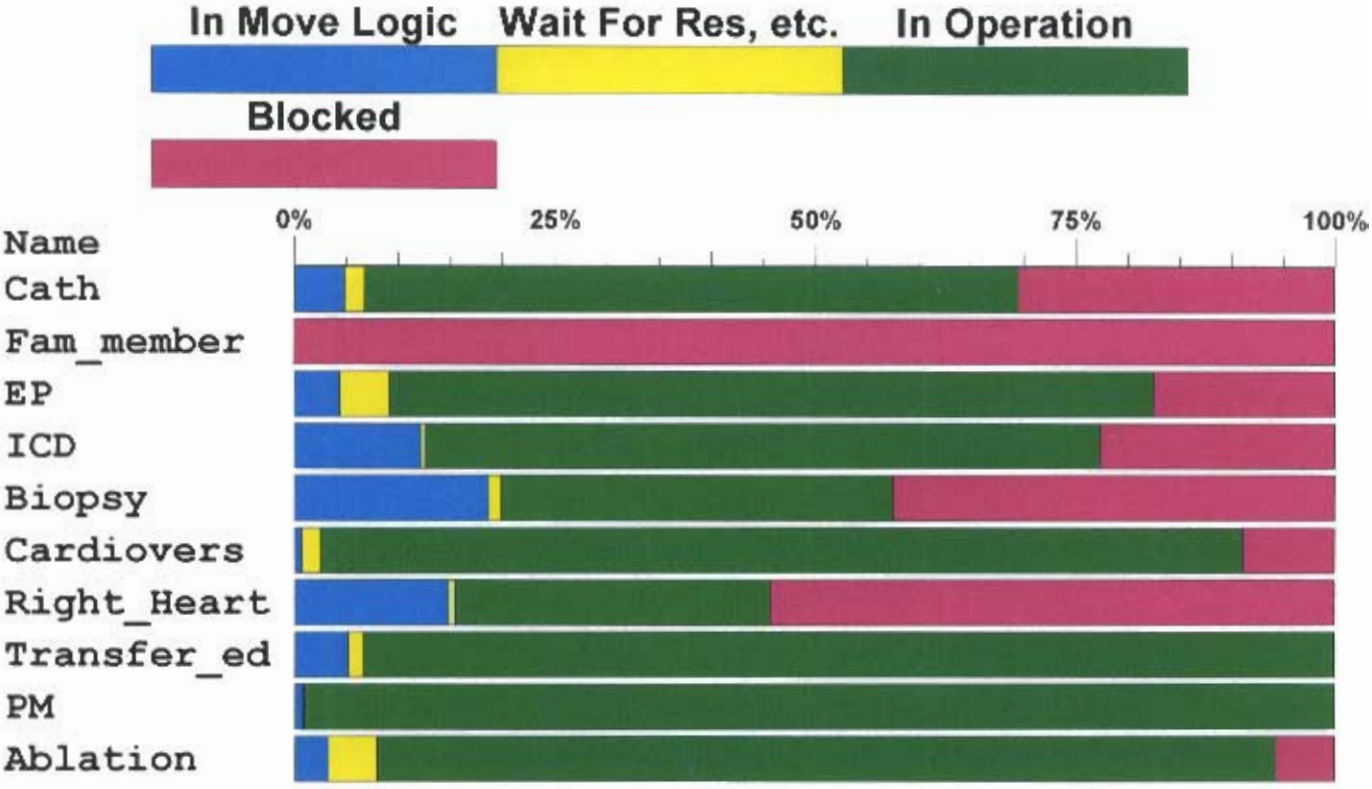


Resource Utilization

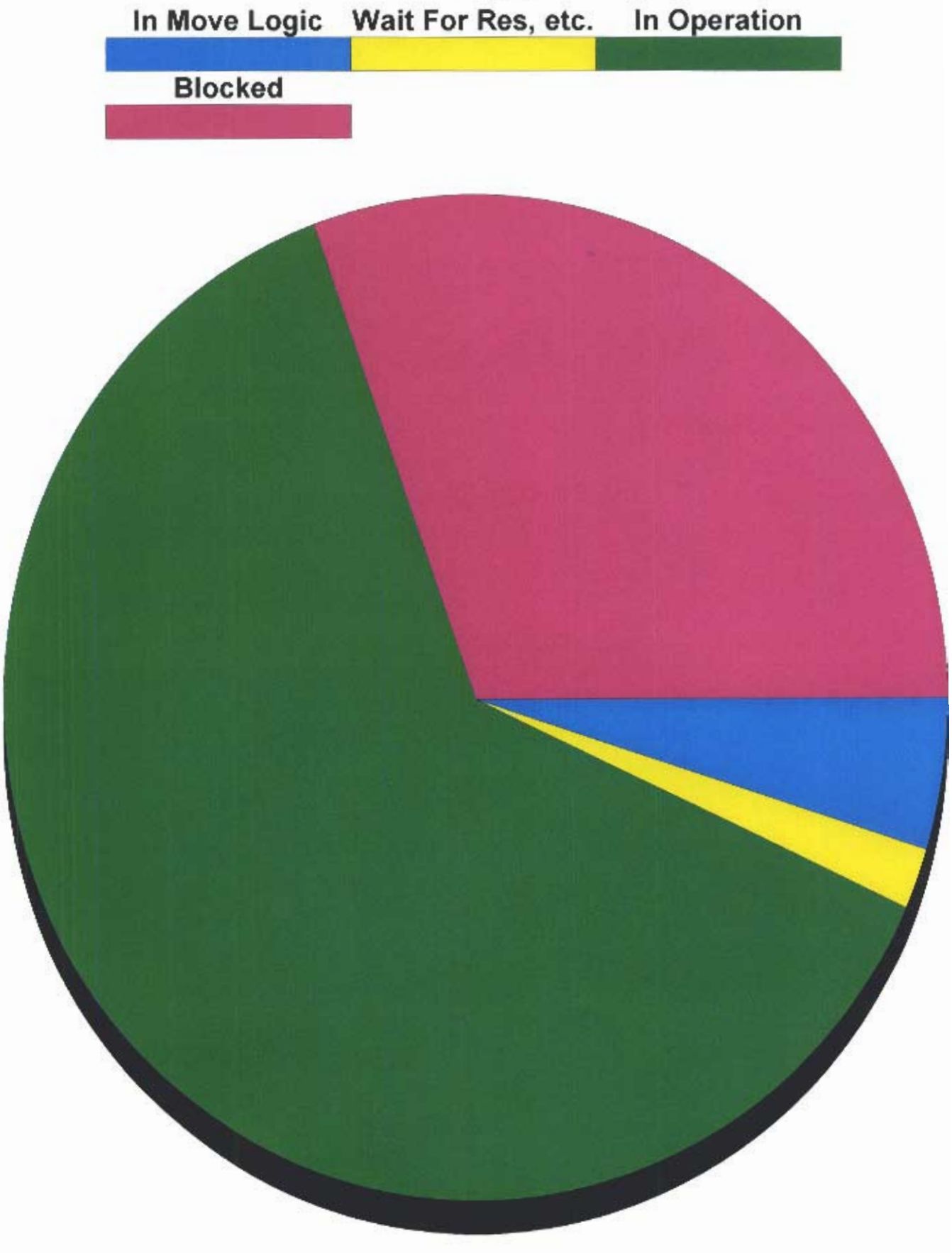


pre_nurse.1

Entity States



Cath



Presentations

Baylor Specialty Hospital

Team Members:

Kelly Anne Nelson
Steven Chapman
Josh Urquhart
Ashley Beckwith

Problem:

- Determine if proposed plans for new cardiac addition to Baylor will support the current and projected patient demands
- Determine if current EP and CATH labs are sufficient for projected patient growth

Kelly - discuss project and floor plan

How will this benefit the client:

- Provide Baylor with a simulation model to determine the capacity of the addition, taking into account various rates of growth which the hospital expects to incur

Projected Plan of Action

- Collect data concerning patient flows and patterns in and out of cardiac labs
- Create simulation model based on proposed floor plan for new hospital
- Run simulation based on current data
- Determine current bottlenecks and provide solutions

JOSH: explain the program we are using

- Run model based on various rates of projected growth
- Identify bottlenecks and create solutions
  (This step will focus on when the new proposed EP and CATH labs will be needed)
- Report findings and suggestions to client throughout project during weekly meetings

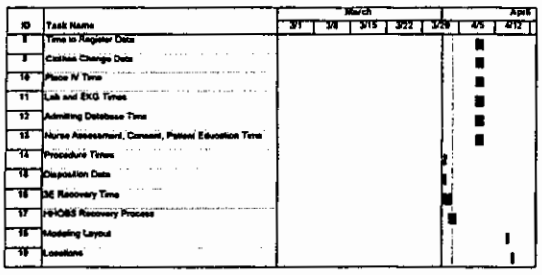
PRESENTATION to Drs.
4-6-98: monday

Heart Hospital Simulation Project

OVERVIEW

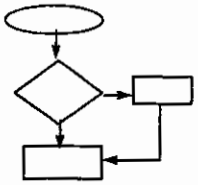
- Time Line
- Patient Flows
- Data
- Simulation

Time Line

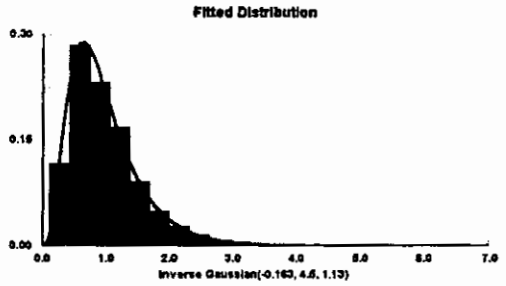


Patient Flows

- Elective Cath
- PM/EP
- Biopsy
- Right Heart
- Cardioversion
- Transesophageal
- Transfer Patient



Data Analysis



Simulation

- Final Layout
- Assumptions
- Time Frame
- Volume Scenarios

Questions

Heart Hospital Simulation Project
Time Line

ID	Task Name	Duration	Start	Finish
1	Project Overview	1d	Tue 3/3/98	Tue 3/3/98
2	Determine Scope	1d	Tue 3/17/98	Tue 3/17/98
3	Flow Chart Process	10d	Mon 3/23/98	Fri 4/3/98
4	Software Orientation	1d	Thu 3/19/98	Thu 3/19/98
5	Tour Facility	1d	Mon 3/30/98	Mon 3/30/98
6	Collect Arrival Data	10d	Mon 3/30/98	Fri 4/10/98
7	Family Member Data	5d	Mon 3/30/98	Fri 4/3/98
8	Time to Register Data	2d	Tue 4/7/98	Wed 4/8/98
9	Clothes Change Data	2d	Tue 4/7/98	Wed 4/8/98
10	Place IV Time	2d	Tue 4/7/98	Wed 4/8/98
11	Lab and EKG Times	2d	Tue 4/7/98	Wed 4/8/98
12	Admitting Database Time	2d	Tue 4/7/98	Wed 4/8/98
13	Nurse Assessment, Consent, Patient Education Time	2d	Tue 4/7/98	Wed 4/8/98
14	Procedure Times	1d	Wed 4/1/98	Wed 4/1/98
15	Disposition Data	1d	Wed 4/1/98	Wed 4/1/98
16	3E Recovery Time	2d	Wed 4/1/98	Thu 4/2/98
17	HHOBS Recovery Process	2d	Thu 4/2/98	Fri 4/3/98
18	Modeling Layout	1d	Mon 4/13/98	Mon 4/13/98
19	Locations	1d	Tue 4/14/98	Tue 4/14/98
20	Path Network	1d	Wed 4/15/98	Wed 4/15/98
21	Resources	1d	Thu 4/16/98	Thu 4/16/98
22	Entities	1d	Wed 4/15/98	Wed 4/15/98
23	Skeleton Logic	2d	Thu 4/16/98	Fri 4/17/98
24	Detailed Logic	4d	Mon 4/20/98	Thu 4/23/98
25	Insert Distributions	1d	Fri 4/24/98	Fri 4/24/98
26	Debug	2d	Mon 4/27/98	Tue 4/28/98
27	SMU Presentation	1d	Fri 5/1/98	Fri 5/1/98
28	Validate	5d	Wed 4/29/98	Tue 5/5/98
29	Scenarios	5d	Wed 5/6/98	Tue 5/12/98

Mtg w/ doctors 4-6-98

March 30, 1998

CARDIOVASCULAR PROGRAM

FLOOR	OPTION 1	OPTION 2
Ground	Valet, Lobby, Reception, Patient Registration, First Aid (ED), Food Court, Retail, Four (4) Service Dock Doors, and Building Support.	(Same as Option 1)
1st	MRI, CT, Hyperbaric Oxygen Chamber, Lab (All out-patient)	(Same as Option 1)
2nd	OR's, ICU, Recovery, Sterilization	30 Bed Nursing Unit (30 Licensed)
3rd	30 Bed Nursing Unit (23 Licensed)	OR's, ICU, Recovery Sterilization
4th	30 Bed Nursing Unit (30 Licensed)	(Same as Option 1)
5th	MOB, Employee Access Corridor	(Same as Option 1)
6th	MOB	(Same as Option 1)
7th	MOB	(Same as Option 1)

With Vascular O.R. Program, recommended three (3) stretcher/service elevators plus three (3) passenger elevators (2 passenger elevators to be programmed as express elevators to 5th, 6th and 7th floors).

Baylor Heart Hospital

Baylor Team:

[redacted]

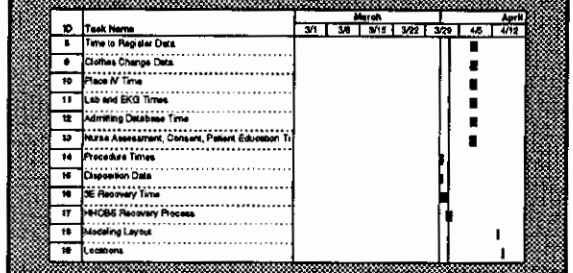
Overview

- Problem
- Plan of Action
- Patient Flows
- Data
- Simulation
- Conclusions
- Further Applications

Plan of Action

- Project Overview from Baylor
- Obtain patient flows
- Collect statistical data
- Create Skeleton model
- Verify statistical data
- Complete detailed model
- Run different scenarios to obtain data for conclusions

Sample Time Line



Data

Statistical Data Needed for each patient type:

- Volume
- Length of Procedure
- Length of Recovery Time
- Routing to various Recovery Areas
- Routing

Data

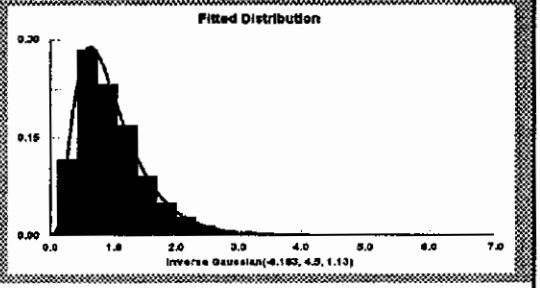
Statistical Data Sources:

- Apollo Database
- Nurse's Logs
- Nancy Vish
- Student Observation
- Dr. Ed Bond
- Data from previous 2 Roberts South Project

Data

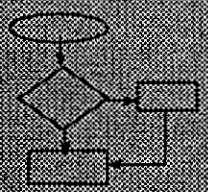
- Data Entered into StatFit program
- If valid distribution was returned then it was used
- If data was insufficient or no accurate distribution was returned then:
  - constant number was used for limited patient types
  - empirical tables used for larger patient types

Data



Patient Types

- Elective Cath
- Pacemaker
- Biopsy
- Right Heart
- Cardioversion
- ICD
- Transfer Patient
- Ablation
- Electrophysiology



Simulation

- Model Components
  - Entities
  - Resources
  - Locations
  - Paths

Simulation

Sample Programming in MedModel for the macro_room procedure

Simulation

- Run Simulation
- Different Scenarios
  - Change in treatment nurse quantity
  - Change in number of cath labs

Conclusions

- Treatment Nurses
- 3-East Nurses
- Cath Labs

Further Applications

- Feasibility of specialized labs
- Effect of changes in staffing
- Determining effects of patient growth
- Worst Case scenarios