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Discusses the physical requirements for an emergency room which meets the JCAHO definition of a Level II Emergency Room. The planning process is addressed by looking at the needs of the facility and the requirements placed by the medical community and governing agency. The needs of the facility are presented through review the literature, consultation with the in house personnel, and visits to other hospitals. Consultation with engineers and architects was also included in the paper. Workload statistics are utilized to generate room and space requirements.

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REPLY TO ATTN OF: Maj Kramer (SGA #858-4416) 30 April 1989

SUBJECT: Graduate Management Project

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U.S. Army-Baylor University Graduate
Program in Health Care Administration
ATTN: HSHA-IHC (PJ Hall)
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1st Ind/ Date 30 April 89

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Adminstrator

A MODEL FOR
A LEVEL II
EMERGENCY CARE DEPARTMENT

A Graduate Management Project

Submitted to the Faculty of

Baylor University

In Partial Fulfillment of the

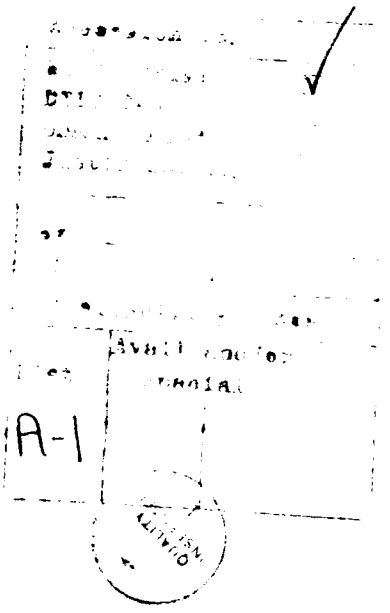
Requirements for the Degree

of

Master of Health Administration

by Major William E. Kramer, USAF, NC

30 APRIL 1989



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INTRODUCTION

A health care facility is an open system which is constantly changing to adapt to its environment. Planning is part of the change process. The primary reason for planning is to accomplish "something" (Lambert and Lambert 1987, 16). What that "something" is will depend upon the circumstances unique to the situation.

Health care facilities planning (HCFP) involves the development of new facilities, major alterations, or modernization of existing facilities (Lambert and Lambert 1987, 41). Preplanning for changes made to the physical plant of a health care facility is crucial because of the opportunity cost involved, the financial resources which will be consumed, and the changes in the way work will be accomplished.

Health care facilities, *in general*, provide similar services: the care of patients. However, each facility has unique characteristics. These characteristics involve location, population served, specific services provided, staffing patterns, present facility, and resources available.

The purpose of this paper is to examine the planning process related to a major renovation project and to gain an understanding and a working knowledge of the preplanning and design phase of a construction project. Another purpose of this paper is to provide a plan for an emergency room construction project at Malcolm Grow USAF Medical Center (MGMC).

Statement of Problem

To determine the most appropriate model for a Level II Emergency Care Department which includes the criteria, functional program and layout. This model will be developed for possible submission to the Defense Medical Facilities Office (DMFO) to meet the needs of the patient population served by Malcolm Grow USAF Medical Center, Andrews AFB, Md.

Objectives

1. Conduct a literature review
   a. To determine necessary functional relationships between Emergency Departments and Medical Treatment Facility.
   b. The current and future needs of a Level II Emergency Department regarding staffing, equipment and physical plant.
   c. Physical plant assessment.
   d. Functional assessment.
2. Determine projected workload and establish space requirements from these guidelines.
3. Develop a relationship matrix for emergency room intradepartmental functions.
4. Investigate the alternatives for providing emergency care facilities at Malcolm Grow USAF Medical Center:
   a. Freestanding unit within close proximity of present facility.
   b. Renovation of present facilities.
   c. Addition to present facilities.
   d. Renovation/addition to present facilities.

5. Interview Emergency Department personnel regarding requirements for maximum efficiency.
6. Evaluate present facility to determine positive and negative aspects within the department.
7. Develop functional drawings for proposed facility.
8. Prepare a design packet for Level II Emergency Care Department for approval/disapproval by the Hospital Administrator for submission to DMFO to include workload data, approximate operational cost, and drawings.

Criteria

The recommendations contained within this paper will meet 1988 DMFO minimum criteria for acceptance of a construction project.

Assumptions

1. That criteria for evaluation will not change during the course of the study.
2. That those interviewed regarding the needs of emergency care can express the future needs of the facility.

Limitations

The act of gathering information from civilian firms regarding design and architecture may be difficult to obtain because they may consider their activities private information.

Research Methods

1. All applicable regulations will be reviewed to insure that necessary actions are taken.
2. An extensive literature review will be accomplished regarding the design of facilities and specific application for the emergency room.

3. Develop a functional relationship matrix from standardized requirements and needs of Malcolm Grow USAF Medical Center.
4. Facility plans will be reviewed for major obstacles to renovation or additions.
5. Conduct interviews with architects and planning agencies to develop an in depth understanding of the requirements for planning an emergency facility.
6. Previous designs of emergency rooms will be analyzed for applicability in this situation.
7. Visit various facilities to get an understanding of emergency room requirements and various methods of providing care.
8. Examine workload management requirements for emergency rooms.
9. Review "lessons learned" papers of previous MGMC projects to preclude repeating historical mistakes regarding particulars to construction on Andrews AFB.
10. Contact Defense Medical Facilities Office (DMFO) personnel for references which list DOD minimum requirements.

Definitions

Emergent -- Those emergency room patients with an acute and potentially life or function-threatening problem that requires immediate medical attention (Creighton 1988, 18).

Freestanding -- A facility which is not a part of a permanent medical facility. It may be attached by a walkway or tunnel.

Functional Program -- The methodology used in making a comparison of functional features to adopted criteria; the regulations and codes which are pertinent (Hardy and Lammers 1986, 124). It also includes functional concepts such as interdepartmental relationships, expansibility, flexibility, automation, infection control, patterns of circulation, and other standards against which functional attributes can be measured.

Level II Emergency Room -- An emergency room which has the following capabilities (Creighton 1988, 18):

1) Physician on premises 24-hours a day.

2) Specialist on call 24-hours a day in the following; Surgery, Anesthesia, Orthopedics, Internal medicine, Pediatrics, Obstetrics and Gynecology, Ophthalmology, Psychiatry, Radiology.

3) Nursing requirements:

   a. Nurses on duty in the emergency unit.

   b. Nurses on call for the operating room.

   c. Nurses on call or present in the intensive care unit.

   d. Nurses on call from the psychiatric unit.

4) Technologist on call; Radiology, Laboratory, Blood Bank.

5) Trained personnel available to take electrocardiograms on call and trained personnel to take blood and start I.V.'s on call.

Non-emergent -- Those emergency room patients with minor or acute problems that do not require emergency treatment (Creighton 1988, 18).

Urgent -- Those emergency room patients with an acute, but not necessarily severe, problem that requires medical attention within a few hours (Creighton 1988, 18).

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LITERATURE REVIEW

Douglass (1988, 667) states that building development is a sequential process. Before planning begins, a need for change is identified. In the health care community, there is always competition and adaption to new technology. There is the impression that if the facility is being updated so will the type of care being provided (Hudson 1988, 48). Construction companies and architects maintain that hospitals are channeling money into renovation rather than new construction to meet the challenges of the future (Powills 1988, 53). Powills reports that the majority of the renovation is directed towards ambulatory services of which emergency care is a part. This need for meeting the challenges of new technology and maintaining an image of quality is what drives the plan for new facilities.

Good emergency room models evolve from various sources. An organization must first identify its own needs. Research is then gathered from all available data. This information is then compiled into functional data that the designer will need to provide an appropriate product for the health care institution.

This review will cover the wide scope of information leading to the development of criteria, functional program, and layout of an emergency room. The input necessary will come from the planning process, the need for emergency rooms, regulations which affect a building program, different aspect to the design of alternate facilities, and factors which affect the type of emergency room needed.

Planning

Construction is a fact of life in health care (Douglass 1988, 666). Health care facilities constantly need updating and improving. There is an overwhelming need to provide the environment necessary for caretakers to practice at the highest standard of care. In order to achieve this, those leaders responsible for the life of a health care facility must plan to meet all the requirements placed on it.

In meeting these goals regarding the building part of the facilities, leaders must look ahead to the coming technology and make plans to meet these challenges. Planning for the future helps facilitate the adaptation of the system to its environment.

The process of planning is as important as what one is planning for. Planning is accomplished by defining organizational objectives, assessing the current and future environment, considering strategic alternatives to reach the objectives, choosing particular alternatives, developing policies and programs to implement the chosen alternative, and evaluating the plan and reevaluation of the entire process (van de Leuv 1987, 19).

Their experiences of Hardy and Lammers (1986, 6) in planning activities generates the following guidelines for successful projects: First, an appropriate planning methodology was adopted at the outset and followed throughout the planning program. Second, hospital officials approached the planning activity with a high degree of objectivity. Third, decisions were made on the basis of sufficient factual information relevant to the situation

at hand. Fourth, those involved with implementation of goals and objectives were also involved in their formulation. Last, the process was pursued with the anticipation of action results rather than an academic exercise.

The planning process in a health care facility must work within the realities of financial capacity, operational and energy cost (Smith 1981, 19). The process of planning must explore the life of the project and how it will adapt to future changes and growth? The chosen project should fit into the overall objectives and master plan for the facility.

Hayward (1989) notes that new trends in facility planning requires planners to examine many different facets of the institution. Planners need to develop best case and worst case scenarios for future utilization of traditional acute care services. They need to evaluate the traffic mix of departments that will result from facility changes. The elimination of traditional department boundaries should be explored to optimize the sharing of resources. In a consumer oriented environment planners need to place emphasis on patient/visitor/staff amenities.

Those individuals who are making decisions about planning for facility construction should be involved with, or informed of, activities which Rostenberg (1986, 23) calls architectural programming. These activities are planning tools which translates the operational needs of the user to the design requirements for the architect or engineer. Three aspects of this programming should precede the design process. They are

physical evaluation, functional programming, and spatial programming.

The purpose of physical evaluation has multiple aspects. It is used to identify physical plant problems and deficiencies that detract from efficient building operations. It is an estimate of the degree of obsolescence within the facility. The evaluation assesses serviceability of the present plant to meet the objectives of the hospital (Hardy and Lammers 1986, 123).

Functional programming evaluates levels of patient utilization, such as projected work load data, anticipated procedures per year, average duration of procedures, and other basic concepts of functionality (Rostenberg 1986, 26). The scope of functional planning duties also includes a description of the facilities, in narrative or graphic form, that deals with interdepartmental and intradepartmental relationships, traffic flows of all types, and methods for obtaining flexibility and expansibility (Hardy and Lammers 1986 139). The end product of functional programming is a description of the requirements of each service in terms of staffing, equipment, and circulation.

Spatial programming translates the functional program into area requirements. The spatial program tabulates size, quantity, and spatial characteristics for every room or department. Space programming will also take into account the category of emergency room which is being designed. With this categorization, different types of space can be identified, such as primary activity space, support space and administrative space (Evaluation 1978, 11). This program may also involve the

conversion of net square feet necessary to the gross square feet necessary to accommodate heating, ventilation, and air conditioning (HVAC) and other structural requirements (Hardy and Lammers 1986, 185). This form of planning quantifies the users needs into the designers drawings.

Once the generalized planning of how the project will fit the overall objectives and programing of the facilities need is established, then those involved in the planning can move onto the details of relationship drawings, necessary equipment, and other related activities.

The Role of the Emergency Room

The emergency room in a hospital serves many roles in a medical treatment facility. From the patients perspective, it is a source of emergency care, the gateway to other health services within a hospital, or a substitute for a family physician. The physician may see the emergency department as a major practice site or a source of referrals from other physicians. It functions as a coordinator for other components of the emergency systems such as ambulances, helicopters, and trauma response teams. The hospital itself uses the emergency department as its major source of trauma and critical care for the community, a site for primary care, and a productive entry point form patients into the hospital system (Peisert 1984, 2). Also, many hospitals have developed expansion of intensive care programs to ensure uninterrupted care beyond the immediate measures rendered in emergency departments.

Beachley and Snow (1988, 24) state that the evolution which emergency medicine has experienced is the result of recommendations made by the National Academy of Sciences. These recommendations direct accreditation of emergency rooms [illegible] funds to support design, construction, and in part operation of model emergencies facilities.

There has also been a change in the care provided in emergency room. Greene (1988, 31) notes that the specialty of emergency room medicine is a growing field. Hence, more importance is being place on the environment which they provide for emergency services. Another point is that some states, such as Texas, are legislating what must be provided regarding emergency care.

Hayward (1989) asserts that the miniaturization and increasing mobility of equipment will have an impact upon the types of care provided in the emergency room. These factors will also drive the type of facility that is designed.

Regulations Which Affect a Building Project

McCandless (1986, 16) notes that codes present a special problem. Once a renovation is started, a regulatory agency can step in and force a facility to upgrade systems throughout the entire hospital. This will insure that current standards are met. In older buildings, the code violations may be extensive, necessitating significant remedial work.

Some of the predominant codes which must be complied with are the Life Safety Code, National Fire Protection Association (NFPA), the Basic Building Code, and many other federal, state,

and local regulations (Griebling and Pilcher 1984, 99). There are also professional organizations which establish guidelines that must be addressed to reach compliance for accreditation (Accreditation 1987, 211).

Within the federal sector, there are also many regulations which direct the activities involved with any building project. AFR 88-15 and AFR 88-50 are references for the Air Force construction guidelines.

Design Plans for an Emergency Room

Peisert (1984, 73) points out that changes in the delivery and use of emergency medical services ultimately affect the design of the facilities in which these services are delivered. The recent expansion of sophisticated prehospital care - with its larger critical care ambulances and helicopters, improved communication systems, and specialized personnel - has created special design needs that place new demands on emergency department space. Categorization of emergency department services also has implications for design. For example: What special treatments rooms, if any, are needed? What is the proximity of the emergency department to other special units, such as the intensive care and cardiac care units? At present, designating observation beds and creating holding areas are controversial aspects of emergency department design. What are their advantages and disadvantages?

She further notes that the increasing number of patients using the emergency department of non-emergent care will have an impact on its design. Emergency department planners should know

the role that ambulatory care will play in the emergency department. The extent of this will determine the need for a separate outpatient department, as well as whether pediatric patients and patients with minor problems should be separated from those with major problems (Peisert 1984, 73).

Once the emergency room is categorized to meet certain levels of service, such as with a Level II Emergency Room, then the components of the department can be addressed. The following components are recommended by the American College of Emergency Physicians (Peisert 1984, 73):

1. Entrance
2. Triage area
3. Registration area
4. Waiting room
5. Physicians' and nurses' station, work area
6. Examination and treatment areas
7. Special emergency treatment areas
   - Cardiac
   - Trauma
   - Obstetrics and gynecology
   - Eye, ear, nose, and throat and dental
   - Psychiatric
   - Orthopedic
   - Minor surgery
   - Pediatric
8. Outpatient and follow-up care areas
9. Holding or observation area

10. Administration
11. Communications room/director's office
12. Other personnel areas: physicians on call, paramedics and ambulance attendants, police, chaplains, security, and members of the press
13. Utility and storage area

All of these components are not relevant to every hospital. The elements included in a particular hospital emergency department are dictated by the planning committee's analysis of the scope and types of services needed.

Some of these primary areas have design considerations regarding their optimal planning. The entrance should have separate approaches to accommodate automobiles and ambulances with safety and ease. Specific parking places should be designated for emergency room patients near the ambulatory entrance. An overhang or drive through will facilitate transfers during inclement weather. The triage area should be accomplished near the entrance, but should allow some privacy. The treatment area should be at least 9 x 11 feet for each cubicle. The patient treatment areas can be outlined for measurement by the use of curtains. This configuration of cubicles offers the most workable solution for the general treatment space. The patients are easily observed from the nurses's station. Curtains or retractable walls can be opened between cubicles to give a larger space for treatment of severely injured or ill patients when more personnel are expected to participate. Privacy of the patients, although desirable, does not seem foremost on the patient's mind,

and is not seriously jeopardized with the use of curtained cubicles. Patients are more concerned with efficient and proper care (Jenkins and van de Leuv 1978, 90).

The design considerations for other lesser internal areas are also notable. The Nurses's station should allow for maximum visibility of the main treatment area. Forms and drugs should be centrally located and readily available from this area (Peisert 1985, 86). A trauma room should be provided with more net square feet (such as 15 x 18 ft. for the dimensions) per cubicle. Administration offices should be set aside for privacy in completing personnel and medically related activities. Utility and storages areas should allow for management of clean and contaminated articles (Emergency 1984, 81). Appendix A describes some of the elements or characteristics of an emergency room.

Styles of Emergency Room Designs

Jenkins, van de Leuv (1978, 89) and Peisert (1985, 87) describe the following types of designs for an emergency room: the core type of design, the arena type, and the corridor type. Each general design has different parameters which adapt to a particular objective or present facility restraints.

In the core design, (Appendix B) the treatment spaces are situated around a central point in which emergency department personnel work. Ideally, there is a corridor outside the treatment areas from which the patients enter the cubicles. Visitors, ambulances, and ancillary personnel all use the corridor outside the core, and the support rooms (cast room, obstetrics and gynecology room and supply room) are along the

periphery of the corridor. All the rooms, except those specifically labeled, are flexible, multipurpose rooms. The trauma/resuscitation rooms are located near the ambulance entrance. This plan, or its modification in a circular form, leaves the greatest freedom for emergency department personnel.

The arena type (Appendix C) is essentially a core plan without the periphery corridor, and a is good for smaller emergency departments. The nurses and physicians have a good view of all the cubicles. Many steps are saved since the work center is almost in the middle, according to Jenkins and van de Leuv (1978, 89).

The corridor plan concept (Appendix D) permits many variations, depending on the size of the department. In this design, the treatment rooms line both sides of the corridor. Larger emergency departments may find this the desirable plan, especially if there is separation of the various services. Many times this plan has only one entrance for both ambulance and ambulatory patients.

Van de Leuv (1987, 11) adds a fourth design - a modular or cellular design (Appendix E). This design specifically separates the services into different areas within the department.

Another design, similar to the arena design but designed in a triangle, is presented by Ludman (1988, 15) (Appendix F). This design allows for an overseeing position of the registration and nursing station that progresses out into the needed care areas.

An alternate to in-hospital emergency room functions is the concept of freestanding emergicenter which contains on-site

capabilities for at least laboratory and radiographic services to support the emergency services (Burns and Ferber 1981, 73). Further, it provides a mechanism for the safe transport of critically ill patients to the hospital once the patient is stable (Friend and Shiver 1985, vii). A Rhode Island Hospital built a freestanding unit with the emergency room on one level and the surgery suite on the second level with connecting walk ways to the main facility (Trauma 1984, 57). Other facilities which have used this connected version of a freestanding facility have also included space for moderate surgical procedures (Freestanding 1981, 35).

Factors Which Effect the Type of ER Needed

The factors which drive the type of ER to be designed go beyond the data established from the functional program, the population served, and the strategic plan of the organization. Different factors may include community relations, the facilities budget, or changes in technology that occur during the planning process.

The exact location of the emergency room in the community is a primary factor. Political issues and boundaries become involved in planning. Various interest groups may sway a decision if they feel their health care rights will altered. These groups may feel as if their areas of responsibilities are being encroached on by changes in the number or types of emergency services being provided in an area. These interest groups may further affect who will control ambulances, both outside agencies and self maintained (Toregas et al 1971, 1363).

The budget that was allocated at the beginning of a project may not remain the same during the duration of the planning and construction. The perceived needs may change as a result of changes in capital being used for other activities.

The rapid development of technology and relatively slow pace of planning, design, and construction almost always assures a mismatch. Consideration of foreseeable technological developments must be included in a flexible design plan (Sound 1987, 250).

Becker (1980, 101) found that during the development of a plan for a department, input from those individuals involved in the day to day activities is critical in choosing the design for a new facility. He found that when the workers were involved, there was greater employee morale resulting from visible evidence of the input. The plan resulted in more creative and effective use of existing space and equipment.

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DISCUSSION

An organization has goals and objects which express how their mission will be accomplished. In a health care facility, meeting the patients needs is paramount within this process. A military health care organization will have other roles in providing medical care, but it is primarily responsible for the health of the community its serves. When planning construction, the input of this mission is essential. The organization must look to the future needs of the facility and address these areas also. The members of the organization should build a consensus of what their needs are and express their viewpoint. This information has to be complied and transferred to both the architect and engineer, in order for them to provide required designs. The purpose of this discussion is to express the needs of Malcolm Grow Medical Center for a new emergency department through developed guidelines, visits to other emergency departments, and a consensus from the users. I will articulate this into an informational packet for preliminary work on a Standard Form 1391, which is the form used for submitting construction request through the DMFO.

MGMC was opened in 1958. MGMC is a 275 bed general medical center with a wide array of inpatient and outpatient services (United States 1987, 5). The facility is used by military beneficiaries, plus emergency care for non-beneficiaries who need treatment before they could reach a civilian institution. The hospital is located directly off a main artery of traffic called the "Capital Belt Way." This makes the MGMC emergency department

an easily accessible point of care. The closest civilian hospital is five miles away. The nearest military hospital is approximately 20 miles to the north.

Mission and Objectives of Malcolm Grow Medical Center

The written mission of MGMC is to enhance the readiness posture to support the wartime mission to support the operational mission of the Air Force. It is firmly committed to excellence in the delivery of health care by providing education and training to assigned and affiliated personnel. MGMC fosters, provides, and sustains a premier military health care environment (Shapiro, 1988). The objectives to reach this mission are listed in Appendix G. Providing for modernized facilities and equipment is the objective that specifically addresses the purpose of this paper. Facility needs for emergency services are based upon access to care by eligible beneficiaries.

Physical Evaluation of Present Emergency Department

The emergency room is located on the north part of the building (see hospital floor plan in Appendix H). It's entrance is located adjacent to the main entrance to the hospital. The ambulances are parked outside this entrance. The entrances to the outpatient records and outpatient clinics are on this same side of the building. This arrangement results in considerable pedestrian and vehicular traffic within a confined area. There is no covered entrance, resulting in patients being transferred from vehicles to the building while being exposed to weather related elements. In the original design of MGMC the entrance was covered and the approach was not congested. The basic design

is similar to Fort Belvoir's Dewitt Army Hospital or Sheppard AFB's Regional Hospital. Where the ambulance entrance is away from the main entrance.

The department is made up of one trauma room, an observation bay, nursing station, storage room, locked department pharmacy, staff break room, administration room, EENT exam room, and two private exam rooms. The trauma room has two beds utilized for cardiac admissions and trauma admissions. This room maintains a large amount of clean and sterile storage. Also, within this room is the casting area which seconds as the contaminated clean up area. Exams and procedures are accomplished in the observation room which has four cubicles. The observation room is also the location for much of the clean and sterile storage. The nursing station is the communications center, patient intake, and work area. A storage area and locked pharmacy area are each in small closet areas located directly behind the nursing station. The staff break room is utilized concurrently as the library, computer room, and private conference room all in an 8 x 14 area. The administrative office contains a desk, many file cabinets, and educational material available for viewing by the staff. An EENT exam room located adjacent to the nursing station, and in the traffic pattern for the administrative room, break room, and storage, is also utilized to assess infants. The two private exam areas are located in a small corridor going to the outpatient records section.

At the present time there is no triage room or area. Patient histories, vital signs, and patient complaint must be

taken at the nursing station during day shift. A triage area becomes available using the primary care clinic waiting from the hours of 1630 to 0730. This station is also the central point of all emergency communications and the focal point of the three entrances to the emergency department.

Within the department there is no space where staff can privately confer with family members or offer support during a crisis such as the death of a loved one. Presently, the only place for such exchanges is in the staff break room. This room also contains the department refrigerator, computer, and library.

During episodes such as the admission of a rape victim, gunshot victim or other patients who require the presence of officials from outside the hospital, there is no room for them to conduct their investigation. One will find these officers conducting their business in patient treatment areas or at the nursing station or administrative office.

The trauma/cardiac room with two beds and related equipment is also the location of the cast area and dirty utility area. This is a consequence of the plumbing and medical gases which were installed in this room.

The present design of the emergency room prevents direct visualization of patients from the nursing station. Only one of the trauma beds can be observed without obstructions. All other beds must be observed by physically going to them.

The Emergency department is functionally in close contact with the department of radiology, laboratory, pharmacy, primary care clinic (the patient intake area for this clinic is shared by

the emergency room during the evening and night shift), and outpatient records. The elevators are located relatively close with direct access to the operating room and ICU/CCU on the second floor. Flight medicine which has some collateral roles with the emergency department is located in the south basement and adds ambulance support for response to flight line emergencies.

Summarizing the department's arrangement it has two treatment cubicles and a cast area in the trauma room, four cubicles in the observation area, an EENT room, and two private patient rooms. These nine areas for patient care are confined in 2436 Gross Square Feet (GSF).

Staffing

Staffing within this department is directed by Air Force Regulation and not driven by workload management. Once a facility is designated as a Level II emergency room, then specific manpower requirements are incorporated into the overall manpower of the whole facility. The Joint Commission on Accreditation of Health Care Organizations (JCAHO) requires 24 hour coverage in the operating room by both physicians and nurses to qualify as a Level II emergency department. To achieve this coverage the Air Force directs that a Level II ER have five physicians, five clinical nurses, three medical service technicians, and twelve medical service specialist (United States 1985, 6). Not counting the physicians, this is 22 FTE (Full Time Employees). At the present time, the administration supports the

department by directing more staffing be provided for meeting the mission of emergency medicine at MGMC.

This staffing pattern is similar to civilian method of acuity base FTE. Schulmerich (1986, 289), in converting patient classification into staffing requirements, only addresses the RN staff. Using a facility which has over 29,000 patient visits per year, they found with their patient mix presented a need for 27 FTE's but in reality were only staffed with 20 FTE's, which is similar to the staffing authorized by the Air Force for a Level II ER.

Criteria and Functional Programing

The criteria for facility and functional programing are based on a variety of different aspects and easily coexist in the development phase. To begin with, they are based on operational concepts and functions that will take place in the projected space. The planners should establish criteria to evaluate the final constructed facility to judge whether it will meet the needs of the organization. Functional programing also addresses interdepartmental and intradepartmental relationships which includes traffic patterns through out the scope of this project. The populations served and the future outlook for the department will determine different facets to the physical plant.

Determining the actual population served by MGMC is very difficult in the Washington D.C. metropolitan area. There are different methods to arrive at an estimate for the Andrews AFB area. There are many beneficiaries in the area with multiple military installations and units. Plus, there are many retirees

who live in the area. One method of calculation population is by the number of outpatient records which are maintained in the facility. This number is 105,000 records. This number does not include those individuals who carry their own records and seek care at the facility which is estimated at 20% of the records on hand (United States, 1987). This would put the estimate at 126,000. The base personnel office estimates the beneficiary population at 131,543. A marketing and planning strategy analysis using Defense Eligibility Enrollment Reporting System (DEERS) data for patients residing within a 50-mile radius calculated 105,680 possible beneficiaries using MGMC. The PRISM/CADI system presents the figure of 75,000. Given the fact that this population is very mobile and will move from facility to facility dependent on their immediate needs, the true population served can be estimated at over 100,000.

The outlook for MGMC regarding workload and population served is an increase on both accounts. The local population continues to increase. The commitment to keep the emergency room at a Level II is reflected by the concentrated efforts to increase the staffing and education of the personnel within the emergency department.

The actual operation of the department is based on established knowledge and preference of the user. Activities to establish this arrangement are built from relationship matrix, standards, and user input.

While developing a relationship matrix, (see Appendix I & J) I interviewed Maj. Martin, the charge nurse of the Emergency

Room. The most important factor expressed by her was that the staff to be able to observe patients who were under their care.

Key points regarding Intradepartmental Relationships Matrix were expressed. The ER personnel felt that it was essential to located the emergency room close to the lab, pharmacy, vertical transportation, radiology, and ICC/CCU. At this time, these departments are located near the present location of the ER. These expressed needs by the local personnel corresponds closely to the literature. Other intradepartmental relationships are noted in Appendix I.

The Interdepartmental Relationships Matrix (Appendix J) developed in conjunction with the ER staff follows the literature closely also. The functional relationship noted as essentially close are the entrances and the triage area. Also, the trauma/cardiac treatment room should be located in close proximity to the nursing station. Other functional areas within the department were of less importance or not specifically noted.

Functional relationships are facilitated by physical location and method of getting from point A to point B. Traffic patterns are important within this environment. The process of moving a patient from one department to another should not interfere with the care of other patients. By having the cardiac room close to the ambulance entrance this avoids other patient movement. Having the ancillary departments within close proximity allows patients to be moved in short periods of time without losing staffing to the task of patient transportation.

Having a separate entrance for ambulatory and ambulance arrivals reduces congestion at the nursing station.

Boisaubin et al (1985, 41) found, in a study of staffing behaviour, that nursing personnel did the largest percentage of bureaucratic activities. Given this observation, importance should be given to making the department physically arranged to allow for completion of paperwork and observation of patients. This can be accomplished by providing more open spaces which enables ease of direct surveillance of patients.

Hayward (1988, 754) observes that the number, categories, and staffing patterns of people working in a department determine certain space requirements. These primarily affect administrative spaces, such as offices and conference rooms within a department. Scheduling patterns, which determine the number of people on the primary shift, have a significant impact on the number of work stations necessary.

The user will develop the criteria utilized to evaluate the final product of the designer, then, eventually the final construction product. Criteria should be developed with the idea that the facility itself is a tool for providing care. Evaluation of the tool should include how the design facilitates efficient safe care. These criteria will be established to provide continuity even if the design and construction are not completed during the tenure of the individuals who started the project. The staff which inherits the project will understand the outlook of the planners and maintain the appropriate course.

The overriding criteria is flexibility, observability, and functionality. Flexibility includes being able to adapt any room to provide a wide aspect of necessary care. This is accomplished by installing similar equipment at each work station such as O_2, vacuum, exam lights, and electrical outlets of sufficient number to accommodate today's high technology. Observability is evaluated by ease of watching each patient by movable curtains, glass partition, and open spaces. Functionality is evaluated by ease of access both to the patient and by healthcare providers.

The criteria established by the DMFO is to satisfy the following: select the project that fulfills the most needed situation, build at the most needed time, and build for a reasonable cost (Vande Hay 1989).

Spatial Programing

Spatial planning is based on work load and minimal requirements which must be addressed during the planning phase of construction. An emergency department requires certain basic parts. These parts are decided upon during the functional planning based on the objectives and goals which the facility is trying to achieve. Each one of these parts requires a certain amount of space. Allocation of space and number of rooms necessary to function in an ER is calculated from the workload which the facility is doing, or the workload that might occur and the overall direction of the emergency medicine within the facility.

Table 1

The historical work load for the MGMC emergency department is the following (United States, MEPRS, 1989):

Total visits FY 1987: 32,758

Total visits FY 1988: 34,720

Average monthly FY 1987: 2,729

Average monthly FY 1988: 2,893

Allocation of the number of rooms necessary is by calculating the projected visits into a formula that allows for peak 3-hour period rather than upon a 24 hour workload (Hardy and Lammers 1986). This is more accurate a method, than rule of thumb factors which range from 1 area per 3,000 visits to 1 area per 5,000 visits (Hardy and Lammers 150, 1986). In order to obtain the necessary information, the AQCESS computer system was utilized to generate a listing of emergency room patients for one week (Appendix K).

Table 2

The following is from the time period from 6 November 1988 through 13 November 1988:

$$ER = \frac{PAV \times PPP}{3 \times 365 \times ERH}$$

ER = Exam rooms required	=	9.81
PAV = Projected annual visits	=	35,000
PPP = Percent of daily visits represented by 3 hour peak	=	.2189
3 = 3 hours	=	3
365 = days in year	=	365
Average patient visit minutes	=	90
ERH = examinations that can be accomplished in one room per hour	=	.67

ER = 10

Once the number of rooms have been decided upon than other space and the amount of square footage can be calculated for the facility. In the military, the Defense Department has standard amounts for different activities for the Emergency Room (United States 1987, J.3.0). These calculations are similar to civilian requirements (Evaluation, 1978), but given that this is for a military project the following calculations are utilized:

Table 3

Functional criteria for the Emergency Department is programmed by individual study based on requirements to handle a high number of true emergency cases.

	Spatial Programming			
AREA	NSF Authorized	Planning Range/comments	MGMC WORKLOAD FACTORS	NSF ADJUSTED TOTAL
Waiting	16	Per space	10	160
	25	Per handicapped space	1	25
Hospital communication room	150	1 per clinic		
Ice machine	20	1 per clinic		
Ambulance Dispatch	100	Minimum plus 10 NSF per driver on duty per shift. 1 per hospital		
Physician Work area	150	1 per clinic		
Triage/screening area	60	Per cubicle, based on work load 1 cubicle per 10,000 yearly visits	32500	120
Patient Holding	100	1 per clinic		
Trauma Room	300	1 per clinic		
Medicine Prep Room Poison Control Center	100	1 per clinic		
Cast Room	140			
TPR Room	100			

AREA	NSF Authorized	Planning Range/comments	MGMC WORKLOAD FACTORS	NSF ADJUSTED TOTAL
Litter/ Wheel chair storage	80	Minimum, plus 10 NSF per # treat treatment space over 8, space = 10 1 per clinic		20
Nurses Station	150	1 per clinic		
Treatment Room/ Incision & Drain	200	1 per emergency area		
OB/Gyn Room w/toilet	100 40	1 per clinic		
Emergency Room	300	Per room		
		# rooms beyond minimum of 1	2	600
Treatment Cubicle	120	Per cubicle		
		# cubicles beyond min. of 1	5	600
Patient Toilet	40	1 per clinic		
Family Consultation and Waiting Area	120	1 per clinic		
Equipment Storage	250	1 per clinic		
Isolation Room	140	1 per clinic		
Physician Office	100	1 per doctor	5	500
Sub total NSF Authorize	2901	Sub Total NSF Authorized from workload		2025
Total NSF authorized additional N workload factors			=	4926
Gross Square Feet factor			=	1.5
Total GSF			=	7389
Net to Gross Ratio			=	67%

Adapted from: 1) United States. Department Of Defense Medical Space Planning Criteria Department of Defense Office of the Assistant Secretary of Defense for Health Affairs Defense Medical Facilities Office. Washington D.C. 15 June 1987. 2) Lickhalter, Merlin. "How to be a Good Consumer (Both Buyer and Manager) of Programing Services." The Journal of Health Administration Education 6 (4) 1988: 741-749.

Obstacles to Building or Renovation of Present ER

Like the two rules of computers; rule one computers can do anything, rule two you cannot afford rule one, the major obstacle to construction is financing (Valentino, 1989). There are other

obstructions which make the financing of such a project significant. The age of the facility and the type of construction originally used creates structure aspects that cannot be avoided. Some of the main supports for the building would be prime candidates for removal to enhance the visibility of the patient care.

The present location of the emergency department is over the intake vents for the hospital. Also, the emergency generators are immediately adjacent to these vents and would be affected by any construction. These items would have to be addressed if the emergency room is to be expanded out from the main building. Another aspect to expansion from the building is the vehicle access to the main entrance and emergency room.

Another stumbling block to construction is coordinating with all parties involved with construction projects, whether they be locally or corporately funded. Dealing with such organizations as base civil engineers, health facilities office, the county emergency medical system are just a few who can put up major roadblocks if not provided the appropriate information before proceeding.

Coordinating where the emergency department will locate during construction is a paramount task given that most areas are already short of space. When making such a transition, it is important to inform different methods of communication such as the base paper and bulletin, local news media, and law enforcement personnel. This will direct those needing emergency care to the most appropriate place.

A&E Firm's Requested Input

Falick (1988, 762) points out that architecture is not like buying a car or building that you have seen elsewhere - each site is unique, each community and set of conditions is different, and your building can rarely be ordered out of a catalogue. Therefore, communications between the architect and the facility is imperative.

When developing a plan for new construction, it is important to give as much information as possible to the firm which will design the unit. In order to accomplish this, there may be some specific information which goes beyond the main mission and objectives of the project. The architects need to know something of the overall master plan for the facility. This will help them design a unit which will fit the plan and build an appropriate relationship between the renovated department and the future plans of the facility.

Nelson and Okojie both (1988) point out that specific work load information is important. They continue to request specific information about the function which will take place in a particular area. They give the following examples of information which is useful to them. It is important to know the types of procedures which will be perform in each area. The types of procedures will drive the amount of space and relationship to other functions, the type of lighting, the types of medical gas available, and other design impact. Other information they find useful is the maximum number of physicians, nurse, and ancillary personnel who will be present at any time during the procedures.

It is important to know what types of equipment are planned for an area to facilitate proper connections, HVAC, and hardware for accommodating such equipment.

Observations of Other Emergency Departments

When planning new construction, it is important to be aware of what is available and how others in the same specialty are addressing problems. Some of the other facilities which were visited were Fairfax Hospital (Eroe, 1988) and Mount Vernon Hospital.

The Fairfax Hospital is a 600+ bed hospital, which supports a Level I Emergency Department. They see over 57,000 patients per year. Employed professional staff is 50 nurses and 21 contracted physicians. The department covers 22,000 gross square feet at a cost of 2.6 million dollars. The general style is the core design with treatment spaces situated around a central point. They have two helicopter pads, with an ambulance entrance directly under the pads. The ambulatory entrance is separate from the ambulance entrance. The large waiting area is adjacent to the Triage area and three privately enclosed registration rooms. The main part of the department is divided into Emergent/non-emergent and urgent. Each section has its own nursing station. All other support activities are shared, including an in department radiology unit. The communications room has direct access to the different ambulances within the metropolitan area, both air and land. There is also a large administrative area which includes a reference section. The emergency department has rapid access to the laboratory, which is

the first department next to the ER. The main Radiology department is also close. Access to the surgical suite is direct with a dedicated elevator. During the tour, I felt that this facility corresponded with the current literature which addresses the layout and style of emergency departments in hospitals today.

I also visited Mount Vernon Hospital (Hulvey 1988). During this visit, I found that this facility functioned in much the same way that MGMC does, with its ER facilitating a great deal of non-emergent and urgent patients. This facility located near both affluent and indigent populations, and handles approximately 33,000 patients per year. The layout of the department consist of one large room, with eight patient cubicles which facilitate the observation patients and trauma patients, and nine private rooms, which are used for pediatrics, OB/Gyn and other patients who need to be isolated from the mainstream of patients. The square footage of this department is approximately 10,000 square feet.

Comparing MGMC to other military facilities in the Washington D.C. area, the Emergency Room at Ft. Belvoir has approximately the same square footage, but utilizes more open space with the nursing station observing the patient care areas. Walter Reed Medical Center, the largest Army hospital, has less patient observation area. These areas are isolated from view by walls and doors. The ER at Walter Reed does utilize the adjacent primary care clinic for much of the emergency care.

Construction Lessons Learned

No documentation of lessons learn has been maintained. Although no formal input has be established, those who have been at Andrews AFB and dealt with construction projects at Malcolm Grow Medical Center express their opinions. Mr. John Valentino, the Facility Manager, points out the need to continually observe what the contractor is doing and how it relates to the original design. Lt. Tom Fifer, also from the facility department, has learned that a intensive coordination with the local architects and the builders will help direct a final product which corresponds with the original idea.

End Notes

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CONCLUSION

In this chapter, the most appropriate model for a Level II Emergency Care Department will be discussed including the criteria, functional program and layout. A submission of this model has been developed for possible submission to the Defense Medical Facilities Office (DMFO) to meet the needs of the patient population served by Malcolm Grow USAF Medical Center, Andrews AFB, Md. The model also meets the criteria established by the DMFO for a construction project contingent on competition with other DOD facilities having similar or more critical needs.

The complexity of a large institution cannot be overestimated. Achieving optimal relationships between all the variables affecting department performance is difficult. The process of health care planning will always be similar to hitting a moving target (Parker, 1988, 739).

The impact of emergency services upon the direction of hospital methods of doing business is formidable. Hanson (1988, 98) notes that in 1987, 39% of hospitals responding to the Health Care Construction Report were making additions or renovations to their emergency departments.

Improvement of this department is very important in order to provide care which is at community standards. Also, supporting the Level II categorization of this department is crucial to status of the unit. This department has been given higher levels of manpower support than is required in achieving this goal. Now that the staffing is available, the physical plant needs

upgrading to parallel the obvious concern for maintaining a fully staffed ER.

Previous plans for renovation in the emergency room left the facility with less treatment space. The aspect of observability was not presented. The subsequent specification of the department as a Level II emergency room was not in place at the time of the plans. Given this aspect, the amount of staffing was not accounted for in the plans.

Based on the information formulated in the discussion, the criteria, functional program, and layout are as follows. The type of design, that should be chosen, is one that will give more observation capability to the present environment. The arena style (Appendix C) is the basis for the proposed design. This design provides for more observation, and closely corresponds to the renovations which are feasible within this hospital. Flexibility is also important, providing treatment of all kinds of patients no matter where they are located with in the department. Flexibility can be achieved through the standardization of patient treatment areas that provide equipment, medical gas, and electrical outlets sufficient to render care and the types of shelving which is installed. The function program finds that the present location of the emergency room has a high functionality in relation to other departments and services. Moving to any other part of the facility would reduce the intradepartmental relationships. Only seven percent of patients, who present to the emergency room, are admitted to the hospital. The primary function of this department is to

treat patients and discharge them back to the community. The functional layout for the planned department can be found in Appendix L.

Priorities for this project is time related to completion. There is desire to complete this project in a limited amount of time. A study of Military Construction Project (MCP) related to medical needs shows a ten year time span from the time the need is presented until an approved project is completed (Baldwin 1988). A MCP should be requested, (see Appendix M) but other alternative methods of completing the project should be addressed.

After reviewing the different alternatives for construction, such as free standing, renovation, addition, or add/alter, the most feasible choice for MGMC is renovation. A freestanding facility is not viable, because of the lack of space to construct a building in the appropriate location to facilitate movement of patients to related ancillary services. A separate addition to the facility specifically for an emergency room would not be cost effective. There is presently room within the facility to accommodate other methods of construction. An add/alter construction project is the best method to pursue in obtaining DMFO approval and funding.

Appendix M represents the package which would be presented, requesting further planning and approval. This construction would follow the same functional plan as renovation alone, but would add more space to the present treatment area, plus a covered ambulance entrance. This could be accomplished by

rerouting the present ventilation for the emergency generators. This additional space will bring the facility in line with stated DOD space requirements for this activity. At the present time there is a short fall of 4953 GSF.

The most feasible and timely contingency for upgrading and expanding the MGMC emergency room is through renovation of the existing space. This can be accomplished as a result of other construction which has been funded at MGMC. The planed movement of some of the outpatient activities to a site away from the medical center will free up space in the facility. This space will accommodate administrative functions which the emergency department must accomplish (see Appendix L). Once the space for administration has been moved out of the emergency area, another treatment area can be established in the space previously utilized for administration and storage. The waiting area used by the emergency room is also used by the primary care clinic and the pharmacy. This corresponds with the trend that Hayward (1988, 753) predicts is necessary to facilitate utilization and minimize space requirements.

There is always a need to provide modern health care facilities. The presence of an environment that is current displays an attitude from the governing body that wishes to provide their patients with the best possible care. Providing a facility which is pleasant to work in will also help retain members who feel that the organization is promoting professionalism through this kind of support. In a competitive community for MCP dollars, it is important to identify needs and

be prepared to provide input for the development of designs and plans which will become improved work places.

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APPENDIX

APPENDIX A
ELEMENTS TO BE CONSIDERED IN PLANNING AN EMERGENCY DEPARTMENT

Preentry

Signs, access from street/highway, covered entrance; parking-well-lit, ample space, short time versus permanent; parking for physicians, law enforcement, ambulances (turn around versus drive-through).

Entry

Ambulatory separate from ambulance, lack of danger to ambulatory from "speeding" ambulances; greeter, available wheelchairs, stretcher; type of doors-sliding, swinging, automatic, fire exits; curbs to accommodate wheelchairs; security room.

Reception

Triage, mostly for ambulatory, desk near entry, constant presence, electronic space board, registration, adequate number for speedy registration; privacy, seat two per cubicle, space for wheelchair, computer access to previous data, proximity to treatment areas, separate waiting for registration; greeter/transporter, volunteer, patient representative, ambulance reception-by triage, directed by radio, squad room (reports, equipment)

Waiting area

Comfortable, pleasing, no smoking versus smoking; grouping of seats, table lamps, plants, TV, art on walls, carpeted floors; adequate seating, restrooms, telephones; "grief room, intercom, TV screen with patient status, play area, patient representative/volunteer desk, video patient status board.

Treatment areas

Major trauma/resuscitation, general minor trauma, major medical, minor medical, open versus closed rooms, flexible specialty rooms - OB/GYN, EENT, dental, orthopedic, suture, secure room, fast-track rooms; central work station, physician's room, telemetry, medication station(s) dictating, resident/intern work station, secretary/ward clerk station, computer station; pediatric section; decontamination room (nuclear waste, separate air flow); observation/holding area, monitoring; communications/ patient tracking/dispatch console.

Support areas

Storage, utility (clean and dirty), locker room, lounge, physicians' sleep room (shower, toilet), transport equipment room, medical director's office, nurse supervisor's office, secretarial office, conference room, EMS coordinator's office, radiology suite, laboratory, offices for other supervisory personnel (associate medical director, education

director); if emergency resident program; resident work rooms, secretary, director's office; chaplain's office, social worker's office, maintenance/housekeeping space, autoclave, toilets, showers, library/poison index, emergency index.

Miscellaneous

Corridors-width, fire codes; bumper guards on walls; ceilings, lighting (separate per room) emergency light; conduits for present and future cables (computer, etc.); antennas for radios (UHF, VHF), telemetry; monitoring equipment - networking, central; doors- width, locks, automatic; intercom-to triage, registration, waiting room, treatment rooms, pagers for key personnel versus general paging; video camera for surveillance and education stack carts, crash carts, refrigerators (space for).

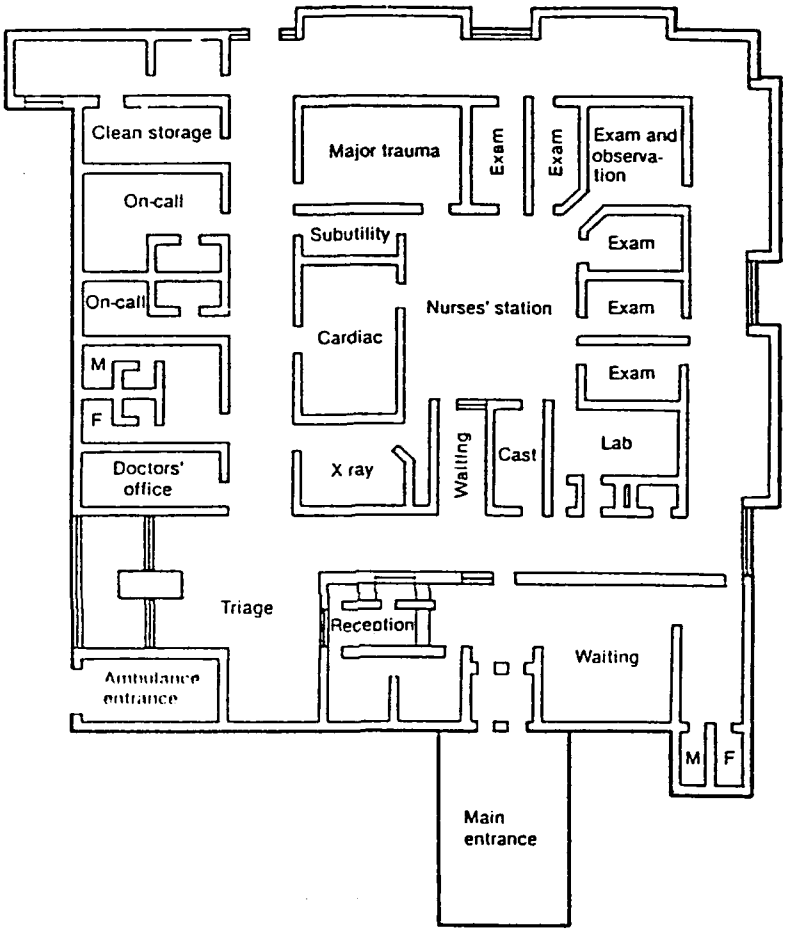
Specific design

Arena type-------	Actually one half of core type; efficient.
Central core-----	Especially for large EDs, must provide easy access to opposite side.
Corridor---------	Not efficient except for small EDs.
Modular/cellular-	Flexible, location of central command.
Specific use-----	Pediatrics, trauma center.
Circular---------	Efficient hard to enlarge.
Specialty orient-	Extremely large EDs.

Source: van de Leuv, John H. Management of Emergency Services. Rockville. Aspen. 1987.

APPENDIX B

CORE DESIGN



Adapted from:

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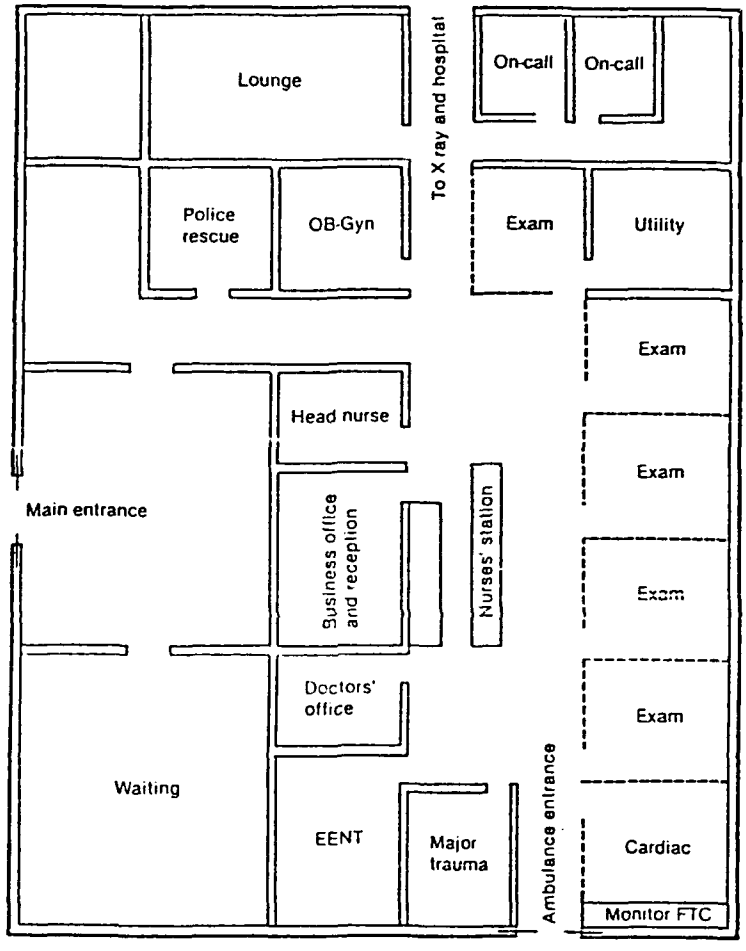
APPENDIX C

ARENA DESIGN



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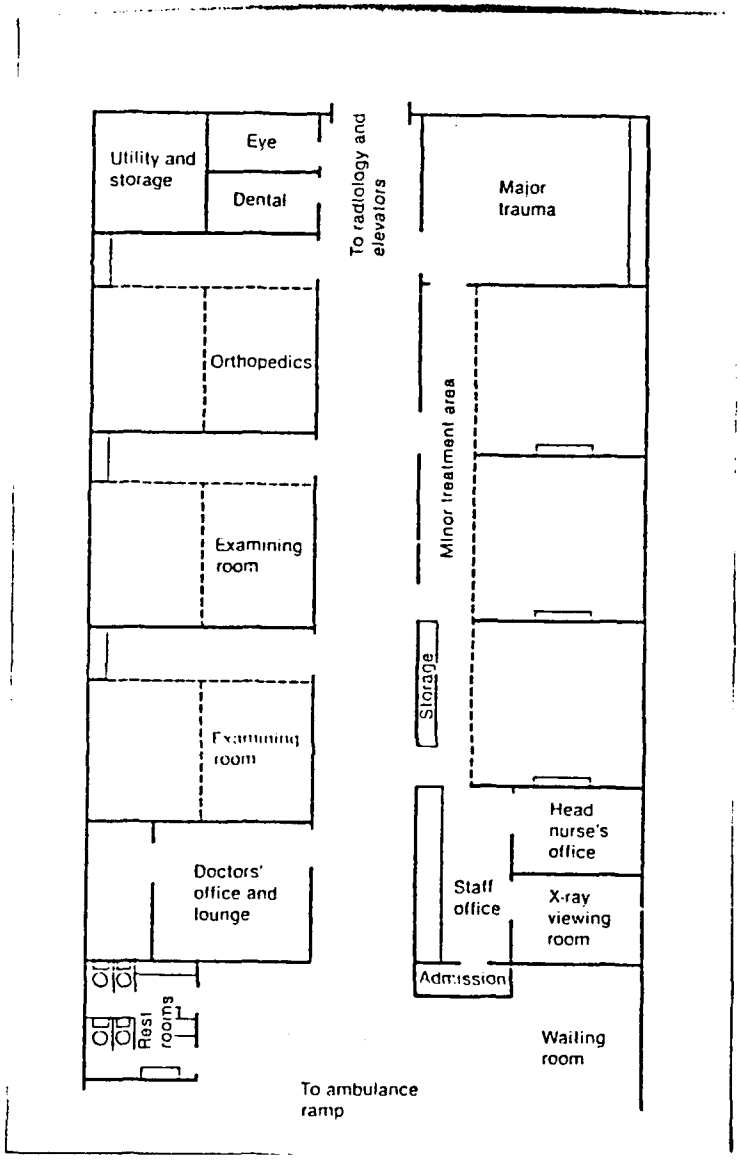
APPENDIX D

CORRIDOR DESIGN



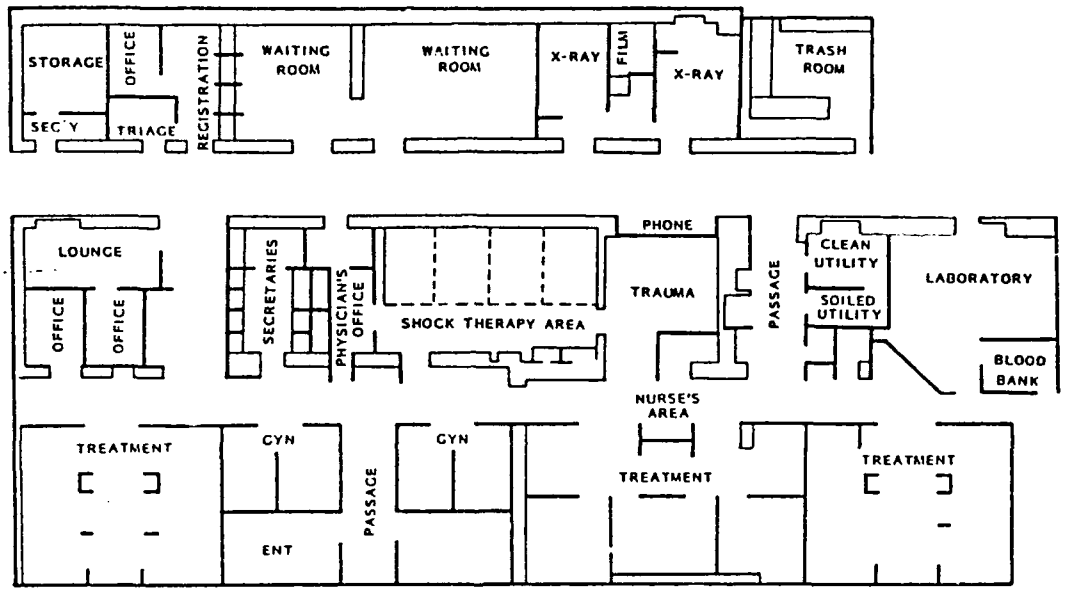
Adapted from:

Jenkins, A.L. and John van de Leuv. Emergency Department Organization and Management St. Louis. C.V. Mosby. 1978.

Peisert, Margaret. The Hospital's Roe in Emergency Medical services Systems. United States. American Hospital. 1984.

APPENDIX E

MODULAR OR CELLULAR DESIGN

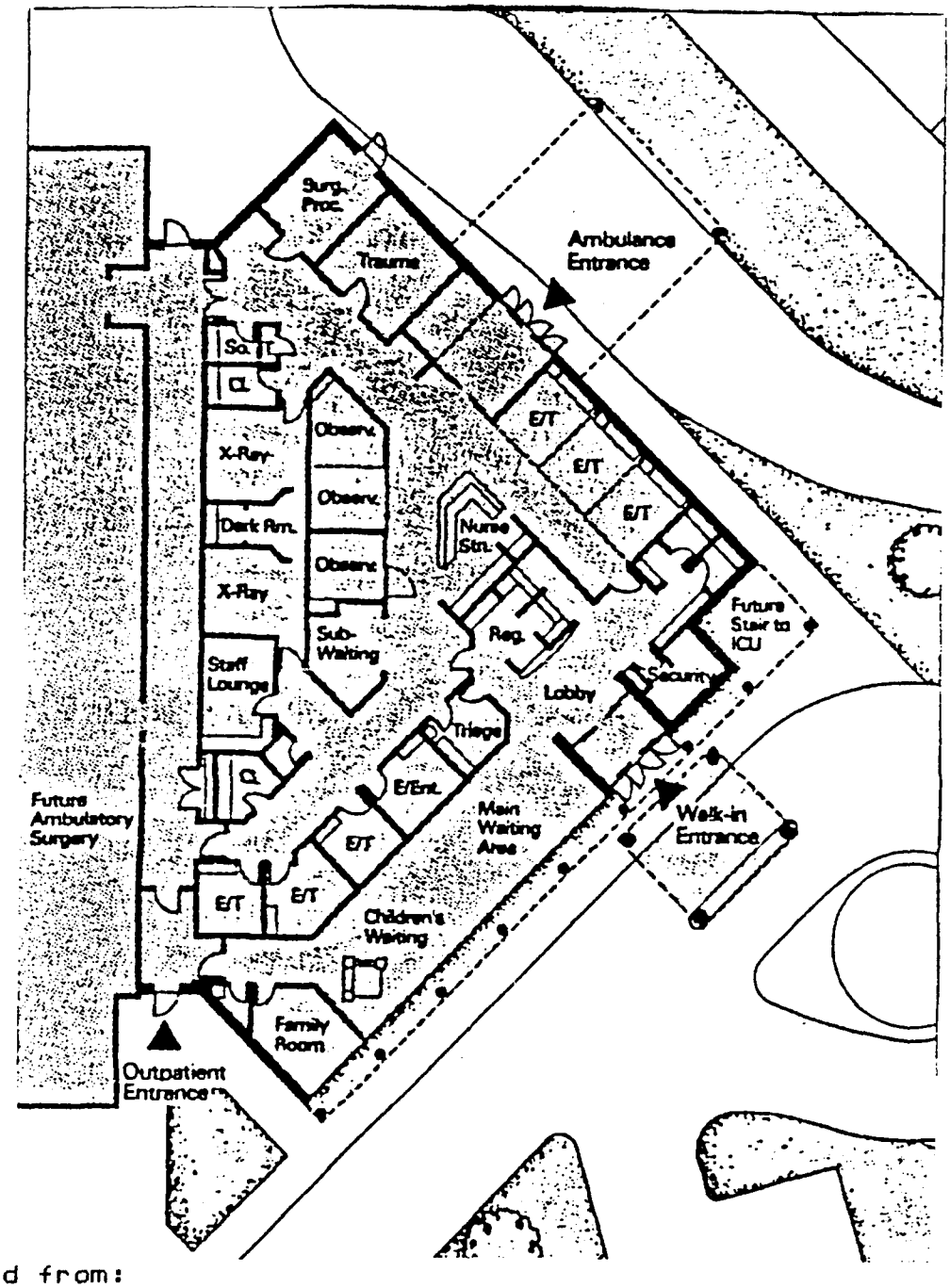


Adapted from:

van de Leuv, John H. Management of Emergency Services. Rockville. Aspen. 1987.

APPENDIX F

TRIANGLE DESIGN



Adapted from:
Ludman, Dianne. "Emergency/ambulatory Department - A New 'Front Door' to Hospital." Health Facilities Management 1 (3). 1988: 15-16.

APPENDIX G

OBJECTIVES OF MALCOLM GROW USAF MEDICAL CENTER

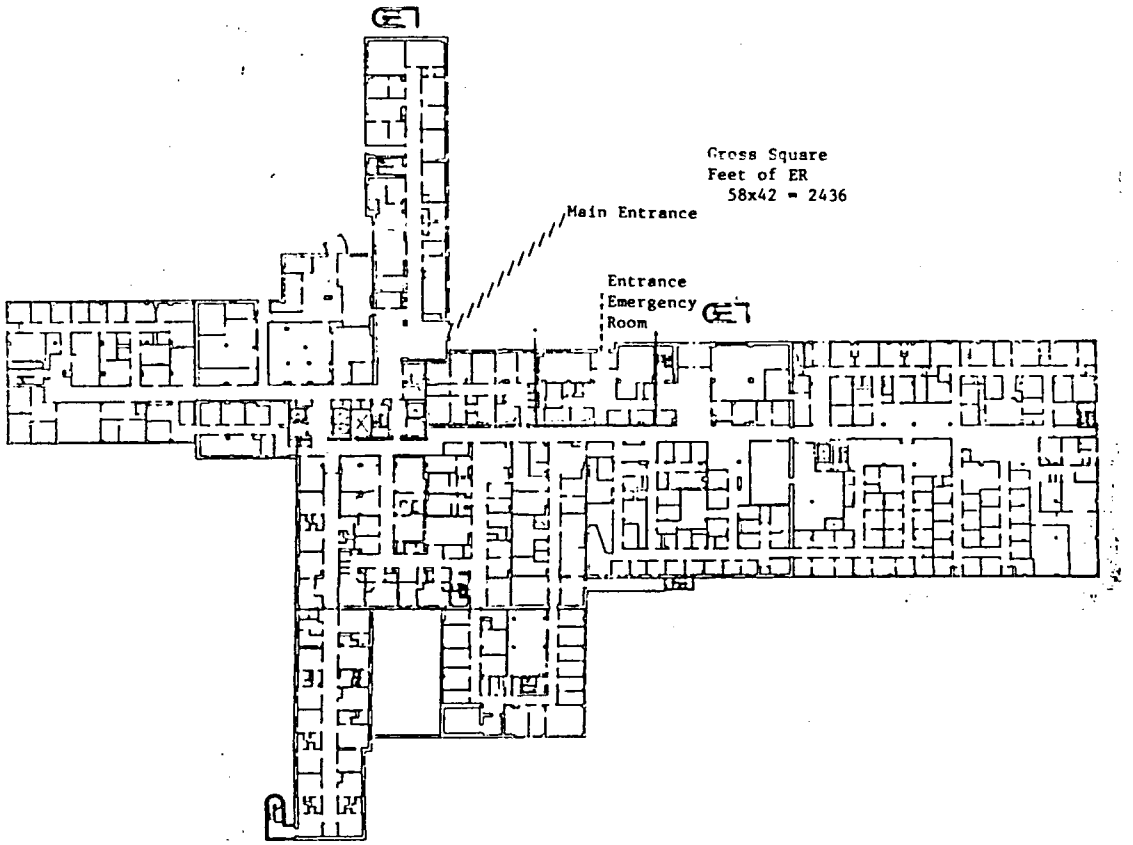
1. Support mobility tasking with fully qualified, trained and equipped personnel.
2. Achieve and sustain the wartime operational capability.
3. Maintain capability to respond appropriately to all disaster situations.
4. Provide aeromedical support to Andrews AFB and to other agencies and areas.
5. Provide the highest quality of health care to all flyers and their dependents.
6. Accomplish examinations of all personnel in a timely and efficient manner.
7. Provide support to Reserve components.
8. Provide Bioenvironmental Engineering and Environmental Health Support.
9. Provide support to the Aeromedical Evacuation (AIREVAC) system.
10. Provide support to the USAF physiological training program.
11. Provide quality health care to all eligible beneficiaries.
12. Enhance patient accessablility to health care services provided.
13. Provide health care in a highly personal and sensitive manner.
14. Encourage innovative approaches to health care delivery.
15. Provide staff education and development.
16. Provide comprehensive patient education

17. Increase health promotion activities.
18. Provide medical consultant services.
19. Support clinical investigation programs.
20. Foster and exercise principles of leadership and professionalism while developing an environment that promotes professional pride and satisfaction among the staff.
21. Modernize and improve the existing and new facility property.
22. Upgrade institutional systems and equipment.
23. Justify and execute a sound fiscal and manpower program.

Source: Shapiro, Stephen. The Mission Statement of Malcolm Grow Medical Center Malcolm Grow Medical Center. Andrews AFB. 1988.

APPENDIX H

FLOOR PLAN MGMC 1ST FLOOR

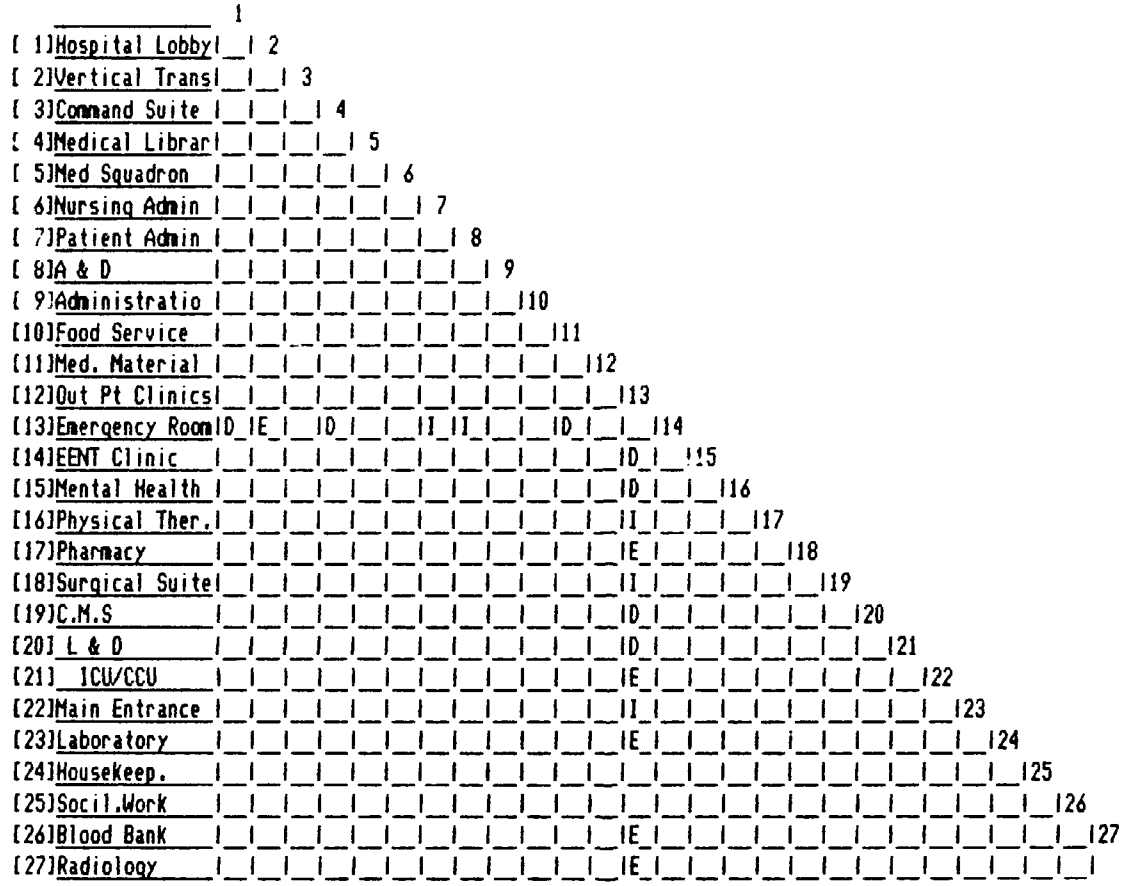


FIRST FLOOR PLAN

Adapted from: United States, Air Force. "Updated Floor Plans and Elevations, Malcolm Grow Medical Center." CADD FILE 860742. 1776 Air Base Wing Military Airlift Command. Andrews AFB, MD. 24 March 1988.

APPENDIX I

RELATIONSHIP MATRIX INTRADEPARTMENTAL



LEGEND

E - Essential: The functions are closely related and need to be located in close proximity.

I - Important: The functions are closely related but closeness of location is not as critical

D - Desirable: The closeness of location is desired to expedite work functions but is not necessarily for their completion.

This matrix describes how the emergency department should be located in relation to other departments within the Medical Treatment Facility.

APPENDIX J

RELATIONSHIP MATRIX INTERDEPARTMENTAL

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
[1] Storage																					
[2] Waiting Area																					
[3] Triage Area		D																			
[4] Ambulatory Ent		D	E																		
[5] Treatment Room																					
[6] Staff Break RM																					
[7] OB/Gyn Exam Rm																					
[8] Cast Room																					
[9] Isolation Area										10											
[10] EENT Treat. Rm											11										
[11] Nursing Statio			I			D						12									
[12] Trauma Room												E		13							
[13] Clean Utility	D													14							
[14] Contaminat. Rm									D						15						
[15] Cardiac Treat.											E					16					
[16] Observation Rm											I						17				
[17] Admin. Office																		18			
[18] Communications										D									19		
[19] Ambulance Entr			E																	20	
[20] Registration		D	I																		21
[21] Toilet							I														22

LEGEND

E - Essential: The functions are closely related and need to be located in close proximity.

I - Important: The functions are closely related but closeness of location is not as critical

D - Desirable: The closeness of location is desired to expedite work functions but is not necessarily for their completion.

This matrix describes how areas within the emergency department should relate to other areas within the emergency department.

APPENDIX K

The following data was taken from one week's patient visits to the MGMC emergency room. Total data reviewed 818 patient visits.

K_1 ---------- small example from one page of data provided by the AQCESS system.

The following are descriptive statistics and frequency data which was corollated using Microstat computer software.

K_2 ---------- Descriptive statistics/ Variable 1. CATEGORY frequency data

K_3 ---------- Variable 3. Specialty frequency data

K_4 ---------- Variable 4. Hour frequency data

K_5 ---------- Variable 5. Time frequency data

Appendix K Adapted from print out generated by: AQCESS Tri Service Medical Information System. National Data Corporation. Rockville, MD. and Microstat Ecosoft Inc. Indianaolis. 1985.

APPENDIX K_1

MALCOLM GROW MED CTR

RUN DATE: 1 DEC 1988

ER CATEGORY REPORT
FOR DATES: 06 NOV 1988 THRU: 13 NOV 1988
PRIVACY ACT - (5U.S.C. 522A)

CATEGORY	LOG#	CHIEF COMPLAINT	DISCHARGE DIAGNOSIS	ARR TIME	TIME SEEN	DISP TIME	DISCH TYPE
EMERGENT	38	Chest/Abd Trauma	Chest Crush Inj	1000	1000	1100	admit
EMERGENT	77	Chest Pain	Esophageal Reflux	1425	1430	1610	home
EMERGENT	106	Cardiac Arrest	Cardiac arrest	1908	1908	1920	erd
EMERGENT	35	Abdom Cramps	Dysmonorrhea	1610	1625	2005	admit
EMERGENT	69	Cardiac Arrest	Cardiac Arrest	1545	1545	1618	erd
NON-URGENT	2	Redness in OS	Conjunctivitis	0014	0025	0045	home
NON-URGENT	3	Not Feeling well	ETOH abuse	0040	0100	0115	home
NON-URGENT	4	Insect Bite	Insect Bite/allergy	0056	0120	0130	home

Adapted from: AQCESS hardcopy

APPENDIX K_2

----------DESCRIPTIVE STATISTICS----------

HEADER DATA FOR: C:ER LABEL: EMERGENCY ROOM CASES 6 NOV - 13 NOV 88
NUMBER OF CASES: 818 NUMBER OF VARIABLES: 5

NO.	NAME	N	MEAN	STD.DEV.	MINIMUM	MAXIMUM
1	CATEGORY	818	2.14	.49	1.000	4.00
2	LOG #	818	55.68	34.95	1.000	139.00
3	SPECIALT	818	3.01	1.94	1.000	9.00
4	HOUR	818	14.21	5.63	1.000	24.00
5	TIME	818	1.47	1.10	.250	8.75

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

HEADER DATA FOR: C:ER LABEL: EMERGENCY ROOM CASES 6 NOV - 13 NOV 88
NUMBER OF CASES: 818 NUMBER OF VARIABLES: 5

VARIABLE 1. CATEGORY
CAT. 1 - EMERGENT CAT. 2 - NON-URGENT CAT. 3 URGENT CAT. 4 NONE

====CLASS LIMITS====			FREQUENCY	PERCENT	...CUMULATIVE... FREQUENCY	PERCENT
1.00	<	2.00	15	1.83	15	1.83
2.00	<	3.00	709	86.67	724	88.51
3.00	<	4.00	57	6.97	781	95.48
4.00	<	5.00	37	4.52	818	100.00
		TOTAL	818	100.00		

====CLASS LIMITS====			FREQUENCY	.....
1.00	<	2.00	15	:
2.00	<	3.00	709	:==========
3.00	<	4.00	57	:==
4.00	<	5.00	37	:=

APPENDIX K_3

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

HEADER DATA FOR: C:ER LABEL: EMERGENCY ROOM CASES 6 NOV - 13 NOV 88
NUMBER OF CASES: 818 NUMBER OF VARIABLES: 5

VARIABLE: 3. SPECIALTY
1.SURG 2.MED 3.EENT 4.ORTHO 5.ORAL 6.MENTAL 7.CARDIAC 8.GYN
9.URO/OTHER.

====CLASS LIMITS====			FREQUENCY	PERCENT	...CUMULATIVE. FREQUENCY	PERCENT
1.00	<	2.00	88	10.76	88	10.76
2.00	<	3.00	373	45.60	461	56.36
3.00	<	4.00	136	16.63	597	72.98
4.00	<	5.00	135	16.50	732	89.49
5.00	<	6.00	7	.86	739	90.34
6.00	<	7.00	4	.49	743	90.83
7.00	<	8.00	9	1.10	752	91.93
8.00	<	9.00	32	3.91	784	95.84
9.00	<	10.00	34	4.16	818	100.00
		TOTAL	818	100.00		

====CLASS LIMITS====			FREQUENCY .....
1.00	<	2.00	88 :======
2.00	<	3.00	373 :==============================
3.00	<	4.00	136 :==========
4.00	<	5.00	135 :==========
5.00	<	6.00	7 :
6.00	<	7.00	4 :
7.00	<	8.00	9 :
8.00	<	9.00	32 :==
9.00	<	10.00	34 :==

APPENDIX K_{4a}

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

HEADER DATA FOR: C:ER LABEL: EMERGENCY ROOM CASES 6 NOV - 13 NOV 88
NUMBER OF CASES: 818 NUMBER OF VARIABLES: 5

VARIABLE: 4. HOUR
24 HOUR CLOCK (TIME FROM DATA 0001 WOULD BE WITHIN THE HOUR 24)

====CLASS LIMITS====	FREQUENCY	PERCENT	...CUMULATIVE... FREQUENCY	PERCENT
1.00 < 2.00	8	.98	8	.98
2.00 < 3.00	12	1.47	20	2.44
3.00 < 4.00	12	1.47	32	3.91
4.00 < 5.00	8	.98	40	4.89
5.00 < 6.00	13	1.59	53	6.48
6.00 < 7.00	25	3.06	78	9.54
7.00 < 8.00	21	2.57	99	12.10
8.00 < 9.00	49	5.99	148	18.09
9.00 < 10.00	57	6.97	205	25.06
10.00 < 11.00	24	2.93	229	28.00
11.00 < 12.00	40	4.89	269	32.89
12.00 < 13.00	46	5.62	315	38.51
13.00 < 14.00	48	5.87	363	44.38
14.00 < 15.00	47	5.75	410	50.12
15.00 < 16.00	34	4.16	444	54.28
16.00 < 17.00	43	5.26	487	59.54
17.00 < 18.00	61	7.46	548	66.99
18.00 < 19.00	52	6.36	600	73.35
19.00 < 20.00	61	7.46	661	80.81
20.00 < 21.00	29	3.55	690	84.35
21.00 < 22.00	41	5.01	731	89.36
22.00 < 23.00	46	5.62	777	94.99
23.00 < 24.00	23	2.81	800	97.80
24.00 < 25.00	18	2.20	818	100.00
TOTAL	818	100.00		

APPENDIX K_{4b}

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

HEADER DATA FOR: C:ER LABEL: EMERGENCY ROOM CASES 6 NOV - 13 NOV 88
NUMBER OF CASES: 818 NUMBER OF VARIABLES: 5

VARIABLE: 4. HOUR
24 HOUR CLOCK (TIME FROM DATA 0001 WOULD BE WITHIN THE HOUR 24)

====CLASS LIMITS====			FREQUENCY	.....
1.00	<	2.00	8	:===
2.00	<	3.00	12	:=====
3.00	<	4.00	12	:=====
4.00	<	5.00	8	:===
5.00	<	6.00	13	:======
6.00	<	7.00	25	:==========
7.00	<	8.00	21	:=========
8.00	<	9.00	49	:====================
9.00	<	10.00	57	:=========================
10.00	<	11.00	24	:==========
11.00	<	12.00	40	:=================
12.00	<	13.00	46	:====================
13.00	<	14.00	48	:====================
14.00	<	15.00	47	:====================
15.00	<	16.00	34	:==============
16.00	<	17.00	43	:==================
17.00	<	18.00	61	:==========================
18.00	<	19.00	52	:======================
19.00	<	20.00	61	:==========================
20.00	<	21.00	29	:============
21.00	<	22.00	41	:==================
22.00	<	23.00	46	:====================
23.00	<	24.00	23	:==========
24.00	<	25.00	18	:========

APPENDIX K_{5a}

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

HEADER DATA FOR: C:ER LABEL: EMERGENCY ROOM CASES 6 NOV - 13 NOV 88
NUMBER OF CASES: 818 NUMBER OF VARIABLES: 5

VARIABLE: 5. TIME
TIME IS THE AMOUNT OF TIME THE VISIT TOOK. TIME IS ROUNDED OFF TO THE NEAREST 15 MINUTE INCREMENTS (.25 OF HOUR).

====CLASS LIMITS====	FREQUENCY	PERCENT	...CUMULATIVE... FREQUENCY	PERCENT
.25 < .50	55	6.72	55	6.72
.50 < .75	109	13.33	164	20.05
.75 < 1.00	98	11.98	262	32.03
1.00 < 1.25	124	15.16	386	47.19
1.25 < 1.50	67	8.19	453	55.38
1.50 < 1.75	93	11.37	546	66.75
1.75 < 2.00	65	7.95	611	74.69
2.00 < 2.25	60	7.33	671	82.03
2.25 < 2.50	26	3.18	697	85.21
2.50 < 2.75	34	4.16	731	89.36
2.75 < 3.00	13	1.59	744	90.95
3.00 < 3.25	20	2.44	764	93.40
3.25 < 3.50	14	1.71	778	95.11
3.50 < 3.75	3	.37	781	95.48
3.75 < 4.00	5	.61	786	96.09
4.00 < 4.25	8	.98	794	97.07
4.25 < 4.50	4	.49	798	97.56
4.50 < 4.75	3	.37	801	97.92
4.75 < 5.00	3	.37	804	98.29
5.00 < 5.25	1	.12	805	98.41
5.25 < 5.50	0	.00	805	98.41
5.50 < 5.75	1	.12	806	98.53
5.75 < 6.00	2	.24	808	98.78
6.00 < 6.25	1	.12	809	98.90
6.25 < 6.50	3	.37	812	99.27
6.50 < 6.75	2	.24	814	99.51
6.75 < 7.00	2	.24	816	99.76
7.00 < 7.25	0	.00	816	99.76
7.25 < 7.50	0	.00	816	99.76
7.50 < 7.75	0	.00	816	99.76
7.75 < 8.00	0	.00	816	99.76
8.00 < 8.25	0	.00	816	99.76
8.25 < 8.50	1	.12	817	99.88
8.50 < 8.75	0	.00	817	99.88
8.75 < 9.00	1	.12	818	100.00
TOTAL	818	100.00		

APPENDIX K_{5b}

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

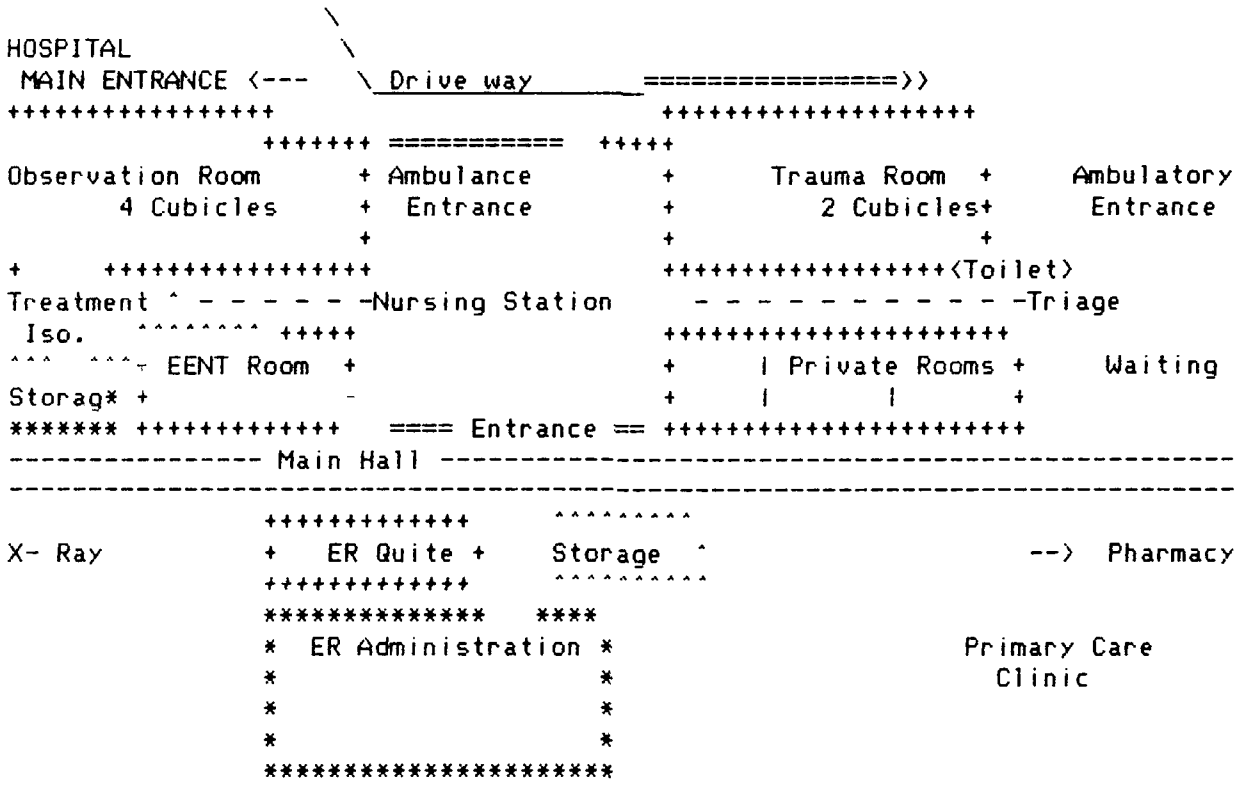
HEADER DATA FOR: C:ER LABEL: EMERGENCY ROOM CASES 6 NOV - 13 NOV 88
NUMBER OF CASES: 818 NUMBER OF VARIABLES: 5

VARIABLE: 5. TIME
TIME IS THE AMOUNT OF TIME THE VISIT TOOK. TIME IS ROUNDED OFF TO THE NEAREST 15 MINUTE INCREMENTS (.25 OF HOUR).

====CLASS LIMITS====	FREQUENCY	PERCENT	...CUMULATIVE... FREQUENCY	PERCENT
.25 < .50	55	:==========		
.50 < .75	109	:==========		
.75 < 1.00	98	:==========		
1.00 < 1.25	124	:==========		
1.25 < 1.50	67	:==========		
1.50 < 1.75	93	:==========		
1.75 < 2.00	65	:==========		
2.00 < 2.25	60	:==========		
2.25 < 2.50	26	:======		
2.50 < 2.75	34	:========		
2.75 < 3.00	13	:===		
3.00 < 3.25	20	:====		
3.25 < 3.50	14	:===		
3.50 < 3.75	3	:		
3.75 < 4.00	5	:=		
4.00 < 4.25	8	:=		
4.25 < 4.50	4	:		
4.50 < 4.75	3	:		
4.75 < 5.00	3	:		
5.00 < 5.25	1	:		
5.25 < 5.50	0	:		
5.50 < 5.75	1	:		
5.75 < 6.00	2	:		
6.00 < 6.25	1	:		
6.25 < 6.50	3	:		
6.50 < 6.75	2	:		
6.75 < 7.00	2	:		
7.00 < 7.25	0	:		
7.25 < 7.50	0	:		
7.50 < 7.75	0	:		
7.75 < 8.00	0	:		
8.00 < 8.25	0	:		
8.25 < 8.50	1	:		
8.50 < 8.75	0	:		
8.75 < 9.00	1	:		

APPENDIX L

INTRADEPARTMENTAL FUNCTIONAL PLAN FOR EMERGENCY ROOM



Adapted from: Evaluation and Space Programming Methodology for the Emergency Department Canada. Minister of National Health and Welfare. 1978. pg. 34.

APPENDIX M

DD FORM 1391

See subsequent package for application to the DMFO for construction review.

1 COMPONENT	FY 19 MILITARY CONSTRUCTION PROJECT DATA	2 DATE
AIR FORCE		

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
ANDREWS AIR FORCE BASE, MARYLAND	Add/ Alter Emergency Room

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
			1,188

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Primary Facility				
Medical Facility Addition	SF			481
Alteration	SF			473
Support Facilities	LS			119
Subtotal				1,072
Contingency(5.00%)				53
Total Contract Cost (TCC)				1,126
Supervision, Inspect & OVHD (5.50%)				62
Equipment Provided from other Appropriations (12% of TCC)				135
Total Request				1,188
Total Scope	GSF	7400		

10 DESCRIPTION OF PROPOSED CONSTRUCTION

Modification of existing Emergency Room at Malcolm Grow USAF Medical Center. Addition provides reinforced concrete footings and foundation, structural reinforced concrete frame, structural concrete floors, and roof deck, structural concrete exterior wall panels, utilities, and necessary support. Alteration work is to modify and reconfigurate existing ER area to provide functional area that meets current standards. Includes all communication systems requirements and facility operating manuals.

REQUIREMENT:

Provide Emergency Room Treatment for the beneficiaries of Malcolm Grow USAF Medical Center of sufficient size and efficient functional configuration to provide a comprehensive and cost effective range health care services.

1. COMPONENT	FY 19__ MILITARY CONSTRUCTION PROJECT DATA	2. DATE
AF (MAC)		

3. INSTALLATION AND LOCATION

ANDREWS AIR FORCE BASE, MARYLAND

4. PROJECT TITLE	5. PROJECT NUMBER

CURRENT SITUATION:

MGMC present performs Level II Emergency Room services to both appropriate beneficiaries and civilian patients. They are part of the Prince George Emergency Services. The department is significantly undersized. The commitment of the Hospital Executive Branch to providing staffing to the department and the teaching mission makes providing care difficult in th elimited space. The present design has an impact on personnel morale, job satisfaction, and performance. Patient visibility is poor because of present design. Space is a premium especially during peak utilization periods.

IMPACT IF NOT PROVIDED:

Medical care will continue to be degraded in an inefficient, space constrained, and functionally impaired facility. Staff and patients will continue to be at risk due to the facilities which are outdated and impair progress into state of the art medical care.

☆U.S.G.P.O.1984-420-979/13671

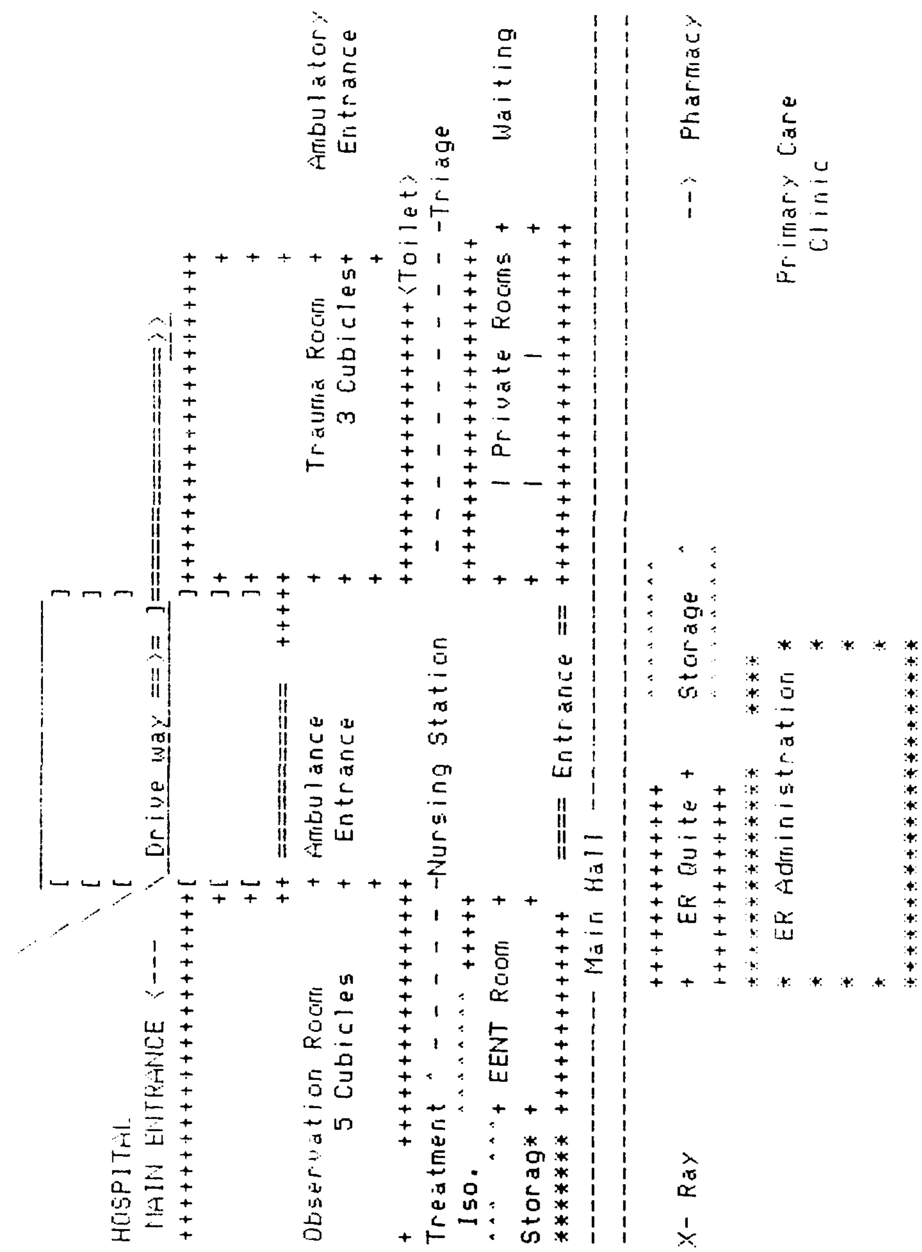
1. COMPONENT	FY 19__ MILITARY CONSTRUCTION PROJECT DATA	2. DATE
AF (MAC)		

3. INSTALLATION AND LOCATION

ANDREWS AIR FORCE BASE, MARYLAND

4. PROJECT TITLE	5. PROJECT NUMBER

ADD/ALTER MGMC EMERGENCY DEPARTMENT



☆U.S.G.P.O.:1984-420-473/11677

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