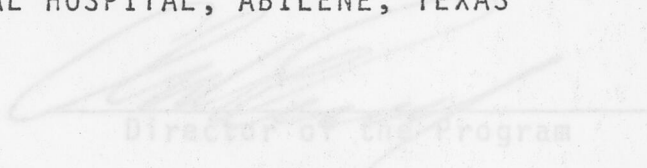


APPROVED BY THE U.S. ARMY MEDICAL CENTER RESERVE SCHOOL:
A STUDY OF SURGICAL PACK SYSTEMS
AT HENDRICK MEMORIAL HOSPITAL, ABILENE, TEXAS


Director of the Program

APPROVED BY THE THESIS COMMITTEE:
A Problem Solving Thesis
Submitted to the Faculty of
Baylor University
In Partial Fulfillment of the
Requirements for the Degree
of
Master of Hospital Administration

By

APPROVED BY THE GRADUATE COUNCIL:
Captain Jan G. Cox, MSC

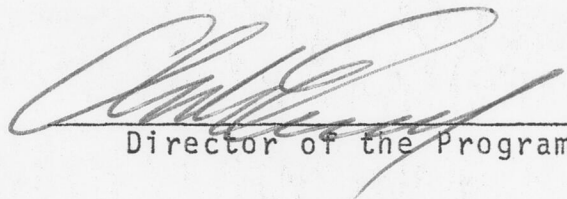

Dean of the Graduate School

Waco, Texas

August 1973

DATE: August 18, 1973

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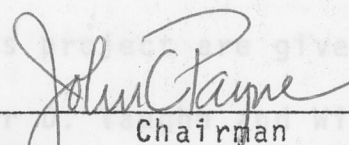


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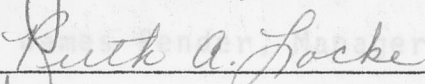
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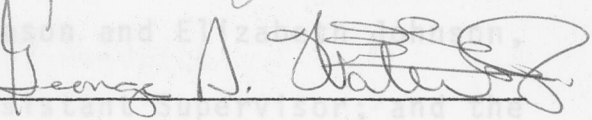
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Special acknowledgments for the assistance given in gathering information for this project are given to Boone Powell, Jr., Administrator; _____
Brown, Assistant Administrators; _____
Central Nursing Supply; Bobbie _____ and _____
Operating Room Supervisor and _____
gracious ladies in the Pack Room of Hendrick Memorial Hospital.



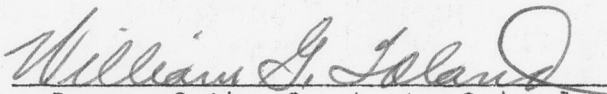
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Special appreciation is extended to my wife and _____
_____ for their understanding and patience during the course
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Dean of the Graduate School

DATE: August 18, 1973



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Special appreciation is extended to my wife and family for their understanding and patience during the course of this study.

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CHAPTER I

INTRODUCTION

Conditions Prompting the Study

The factors that prompted this study can be categorized as external and internal to Hendrick Memorial Hospital. The external factors include the increased publicity regarding disposable items, the growing application of disposable items to hospital use, and a wide acceptance of disposables by medical personnel.

In 1964, Hospitals magazine stated: "Probably the most significant recent nonmedical development in the hospital field in the United States is the introduction and use of disposable products."¹

The primary advantages claimed for disposables are ease of use, guaranteed sterility and labor savings.

Since the 1920's, when prepackaged sterile surgical dressings were introduced, the number of disposable products available has grown tremendously. Syringes, thermometers, sheets, pillows and treatment trays are examples of these products. The list of items available is constantly growing as more items gain acceptance and manufacturing efficiencies

bring prices down.² The increasing emphasis and resulting experimentation has resulted in a general acceptance of disposable products by hospital personnel. As a result, disposable items are often preferred over their reusable counterparts. This favorable predisposition toward disposables has created an atmosphere where new disposable products are more readily accepted than they once were. This situation is creating difficulties for the cost-conscious administrator. The internal factors are influenced by and related to the external factors. The administration of Hendrick Memorial is young, dynamic, and committed to providing the best possible medical care at the lowest attainable cost. Because of this commitment, the administration is especially sensitive to the publicity given the quality, cost, and labor-saving aspects of disposable products. Primary interest in disposable items is presently being directed to the Operating Room (OR). This interest was stimulated by a recent expansion of the hospital complex which resulted in the relocation of the OR to new facilities a considerable distance from the Central Nursing Service Supply (CNSS), where the reusable surgical packs (Appendix

A) are prepared and sterilized. The two areas are separated by five floors and a complicated maze of corridors. This has complicated an already difficult logistics situation.

The Obstetrical Department (OB) recently converted to disposable OB packs. The professional staff has found these packs to be technically satisfactory and has been enthusiastic with its acceptance of them. This use and acceptance has heightened interest in the possible application of disposable surgical packs to supplement or replace the reusable packs presently in use in the OR.

Other internal factors include rising personnel costs and requests by the CNSS manager for new autoclaves. The administration is seeking a system that will, if possible, reduce the impact of these factors.

Before a reusable system is supplemented or replaced by a disposable system, each must be evaluated by the hospital concerned. Studies that have been conducted vary in the conclusions reached. Some have found the reusable packs to be clinically sound and financially advantageous, while others recommended the use of disposable packs for the same reasons. Because there is no hard-and-fast evaluation formula applicable to all hospitals, each hospital must conduct

its own investigation and evaluation of the available systems. The administration recognizes this situation and is desirous of a thorough evaluation of the systems available to meet the surgical pack requirements of the OR.

Statement of the Problem

The problem is to determine the best system of meeting the surgical pack requirements of the OR, Hendrick Memorial Hospital, Abilene, Texas.

Limitations

1. Any increase in operating costs must be offset by either increased operating efficiency or improved patient care.
2. There can be no relocation of activities.
3. There can be no structural changes to the building, no construction requirements recommended.
4. Storage areas must be capable of storing adequate operating supplies.
5. Hospital records concerning linen inventory, laundry work load, CNSS reusable surgical pack production, and work unit costs for the various departments are virtually nonexistent.

6. Potential man-hour savings in the various departments will be identified without specific reference to recommended staffing levels.

7. The system recommended must be acceptable to the professional staff of the OR.

Assumptions

For the purposes of this paper it is assumed that:

1. Hospital activity during the period of the study and the statistics available were representative of a reasonably normal work load.

2. The overall objectives of the hospital and types of surgical patients admitted will not change in the future.

Factors Bearing on the Problem

The factors bearing on the problem are:

1. Experimentation with disposable surgical packs in the OR has altered the work load of the laundry and CNSS.

2. The physical plant is a combination of new and old buildings. Access to the OR from CNSS is through a complicated maze of corridors.

3. The autoclaves currently in use are relatively old and are considered by the nursing staff to be somewhat

unreliable.

4. Additional warehouse space for Central Stores is presently under construction. Estimated occupancy date is July, 1972.

5. The laundry does not have the capability to measure its daily work load.

Review of the Literature

The trend to disposables

The trend to disposables is well documented and can be traced back to the 1920's. Disposable products appearing on the market at that time consisted of prepackaged sterile dressings and bandages.³

The development of polymer plastics and low temperature sterilization systems following World War II led to the introduction of several disposable products. Plastic blood-collecting bags and disposable syringes are examples of products resulting from these developments.⁴

In the late 1950's disposable treatment trays were developed and placed on the market. These trays are prepackaged and presterilized and consist of all the items required to perform a specific procedure. Included in this

widely accepted group are suture removal sets, spinal anesthesia trays and urethral catheterization trays.

More recent entries which are gaining rapid acceptance are the disposable surgical packs which are designed to replace the linens used to drape the patient during surgery.

Before any hospital makes the transition from reusables to disposables, there are several issues which must be addressed. The conversion decision rests on the resolution of the issues of technical acceptability, professional staff acceptance, storage requirements, waste disposal, supply source, costs and fringe benefits to be realized.⁶

Technical acceptability

Included in this area are the factors of patient safety, patient comfort, and sterile technique. The disposable pack is generally considered to have the advantage in each of these areas.

Patient safety is enhanced because the repeated human involvement in pack preparation necessary with reusable packs is eliminated. Each step requiring human intervention provides a chance for human error. If an error is made and contamination results, the possibility of a surgical wound

infection is very real. Because it eliminates many chances for contamination inherent with the reusable pack, the disposable pack should receive favorable consideration.⁷

Patient comfort and sterile technique are considerably improved. As an example, the drapes contained in the disposable pack are virtually impermeable to moisture. When the reusable item becomes moist, it provides a path for bacterial migration. This compromises the sterile field and creates the danger of surgical wound infection.

To guard against this source of wound infection, additional layers of reusable linen are added as those already in place become moist. During a long, or difficult, surgical procedure the patient can be literally buried under a mountain of linen. This excess covering aggravates the problem of hyperthermia in the patient. The impermeable quality of the disposable products effectively eliminates the need for multiple layers to maintain the sterile field.⁸

Professional acceptance

The acceptability of the disposable pack to the professional staff is dependent on several factors. One of the most important is the collective resistance to change. If the professional staff is sufficiently resistant, many

arguments against the disposable will surface. Common complaints against disposables range from the size and shape, to draping ability. Generally, nurses are the most receptive to a proposal to adopt a disposable pack program. Physicians tend to reserve judgment until they have seen the product in action and have had an opportunity to evaluate its performance. The degree of ultimate acceptance and utilization of the disposable pack appears to vary according to the particular medical specialty of the physician involved.⁹

Regardless of improvements made to the disposable product, it will probably never enjoy the unanimous approval of every member of the professional staff. If the resistance level is determined by the hospital administration to be significant, it is generally recommended that disposable packs not be utilized.¹⁰

Storage

This aspect usually affects two areas in the hospital, the OR and Central Stores. Disposable packs are smaller and occupy less space than their reusable counterparts. As a result, the OR can store more disposable packs in the same space than reusable packs. This permits the OR to store a sufficient number of packs to meet its needs, without the

requirement for constant resupply.¹¹

The Central Stores area must store sufficient stocks of the disposable packs to meet OR requirements and allow for requisitioning lead time. This usually creates the need for additional warehouse space.¹²

Waste Disposal

Disposing of the contents of the disposable pack once they have been used is a major problem. This particular problem is not encountered with the use of reusable items.¹³

Because of the nature of the waste, a high degree of care must be taken. The risk of disease transmission from improperly packaged and handled waste is very real.¹⁴

The cost of waste disposal from surgery is usually higher than in other areas of the hospital. Special handling requirements and the fact that OR, rather than lower-paid housekeeping personnel transport the waste to the disposal point accounts for these higher disposal costs.¹⁵

There are several disposal methods. Incineration, sanitary land fill, and grinding and flushing through the sewage system are the most common methods utilized, with incineration preferred. However, incineration is restricted by air-pollution controls, sanitary land fill by the availability

of suitable real estate, and grinding and flushing by the capability of the local sewerage processing facilities.¹⁶

Source of supply

Once a hospital makes the transition from reusables to disposables, it becomes subject to a number of factors over which it has no control. Manufacturing difficulties, faulty communications, labor strikes, and vehicle accidents can all affect whether or not the hospital receives the supplies in accordance with established routine.¹⁷

When the hospital makes the decision to "go disposable," adequate stocks of the items must be maintained. These levels must take into consideration such things as the normal consumption rate, safety levels to provide a hedge against unforeseen difficulties, and the time lapse between the time the item is ordered and the time it is received. This relates to the problem of storage because adequate space must be available to store the quantities required.¹⁸

If the supplier is not in the local area, there must be frequent contacts with either the supplier or his representative. The local supplier is preferred because of the proximity of an adequate back-up supply. This proximity also enables the hospital to maintain a lower level of

inventory, thereby reducing the financial investment necessary to support a disposables program.¹⁹

Costs

Generally, the cost factor seems to favor the reusable pack. This is not true in every case, however. Some studies find disposable packs uneconomical, while others recommend adoption of disposable packs because of monetary savings to be realized.²⁰

The cost determination for the reusable pack is fairly complicated and includes costs incurred in each step of the surgical pack cycle. The labor factor is especially important when the increasing cost of labor is considered.²¹

Disposable surgical packs should not be dismissed as too expensive and removed from consideration. The rising cost of labor and declining costs of some disposable items make it necessary to periodically review the comparative cost advantages.²²

Fringe benefits

Fringe benefits are those benefits which evolve as a result of the decision to adopt a disposables program. Included are such items as improved staff relations, more effective utilization of existing space, costs avoided in

the area of replacement supplies and/or equipment, and decreased maintenance requirements.²³

Research Methodology

The research methodology to be utilized in collecting, evaluating, and analyzing data to be used in this study is as follows:

1. An extensive review of the literature was accomplished to obtain a broad base of knowledge concerning surgical pack systems.

2. A thorough examination was conducted of the present system utilized at Hendrick Memorial. Interviews with supervisors and key staff personnel in the OR, CNSS, laundry and housekeeping, and materials management departments, as well as the administrators, were used to supplement direct observation of the various activities.

3. A cost comparison was made to compare the costs of the present reusable system with a comparable disposable system.

4. Interviews with members of the professional staff were conducted to determine attitudes concerning the available systems.

5. A thorough review of available hospital records, policies, and future plans was accomplished with special emphasis on information related to areas affecting surgical pack requirements.

Footnotes

- ¹"Are Disposables Here to Stay?," Hospitals, XXXVIII (December, 1964), 38.
- ²Sam T. Seely, "A Comparative Study of Selected Reusable and Disposable Medical Products" (unpublished Master's thesis, Baylor University, 1967), p. 3.
- ³L. W. Lehr, "Disposables," AORN Journal, X (October, 1969), 88.
- ⁴Ibid.
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- ⁷J. D. Allen Gray, "Effect of Disposables on Prevention and Control of Infection," Hospitals, XL (October, 1966), 69.
- ⁸William C. Beck, "Disposable Drape Provides Effective Barrier," Hospital Topics, XLI (April, 1963), 86-87.
- ⁹Stanley C. Peimer and Henry Gothelf, "A Total Disposables Program," Hospitals, XXXIX (May, 1965), 48.
- ¹⁰Ibid., p. 78.
- ¹¹Grover C. Bowles, Jr., "Disposables Increase in Numbers--and Favor," Modern Hospital, XCVIII (February, 1962), 110.

¹²"Disposables Change Hospitals Buying Habits," Modern Hospital, XCV (December, 1960), 100.

¹³William E. Small, "Solid Waste: Please Burn, Chop, Compact or Otherwise Destroy This Problem," Modern Hospital, CXXII (September, 1971), 110-11.

¹⁴Ibid., p. 112.

¹⁵Ibid., p. 102.

¹⁶Ibid.

¹⁷Stanley M. Egli, "Getting the Product from Maker to User: A Buyer Appraises the Present System," Hospitals, XXXIX (December, 1965), 92.

¹⁸Ibid., p. 94.

¹⁹Peimer and Gothelf, p. 48.

²⁰Fritz Field, "Reusable and Disposable Pack Costs," Institutional Laundry, XV (January, 1971), 6.

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²²Peimer and Gothelf, p. 48.

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CHAPTER II

DISCUSSION

Historical Development of Hendrick Memorial

The hospital first opened in 1924 and was known as the "West Texas Baptist Sanitarium." At that time it consisted of one building and had sixty inpatient beds. Since its opening it has experienced eleven major building projects which have increased the size and capacity of the facility. Appendix B illustrates this expansion process and the resulting configuration of the physical plant.

In the 1930's the hospital was in dire financial straits. There was little money in circulation and many patients were not able to pay their bills. Some of the hospital staff thought that the hospital should close its doors. In 1936, Mr. and Mrs. T. G. Hendrick donated some \$140,000 to the hospital. These funds were used to pay some outstanding debts and to provide for the first of the hospital's expansion activities. Out of gratitude for these--and other--gifts, the hospital trustees changed the name of the hospital to "Hendrick Memorial Hospital" in the late 1930's.¹

The System and the Issues

In order to evaluate the systems of meeting the surgical pack requirements of the OR, each element of the system must be considered and the issues involved discussed. The following is a discussion of the system as it presently exists and the effect this system has on the issues. A graphic representation of the elements of the system and the flow of the reusable linen through the system is provided in Appendix C. The points of activity in the surgical pack system are illustrated in Appendix D. An organization chart which illustrates the departmental relationships involved in this study is provided in Appendix E.

The system

The laundry services are provided by the Laundry and Housekeeping Department. It is responsible for the collection, patching, and laundering of the soiled linen and the delivery of clean linen to the central linen distribution point.

Central Nursing Service Supply (CNSS) is responsible for the preparation, sterilization, and delivery of the sterile reusable surgical pack to the OR. Hospital orderlies assigned to CNSS bring the linen from the central linen

distribution point to the Pack Room. Here the linen is inspected, sorted, folded, and the reusable packs prepared. Linen that requires repair, or is considered no longer fit for use, is sent to the Laundry and Housekeeping Department for necessary action.

The activities of the Pack Room are conducted in one room on the fifth floor of the hospital. The room is fairly small and there is no space available to store packs awaiting sterilization. As a result, each day's production is delivered directly to the Autoclave Room.

Once the packs are ready for sterilization, they are taken across the corridor to the Autoclave Room where they are sterilized. This area is equipped with one 24" x 36" x 36" autoclave with a mechanical air removal system, and two gravity displacement-type autoclaves, 24" x 36" x 67" and 24" x 36" x 43" respectively.

Some of the sterility indicators in packs processed in the autoclave with the air-removal system did not show that the pack had been properly penetrated by steam. Because of this, the OR supervisor issued instructions prohibiting the use of this particular autoclave to sterilize reusable surgical packs. These instructions also include specifications

for how long the packs were to be subjected to the sterilization process. These specifications call for a period that is twice the standard period recommended in the literature--one hour as opposed to thirty minutes. The daily reusable pack production was estimated to be forty-two packs.²

Prior to the hospital expansion, the OR was adjacent to CNSS. Now, however, these activities are separated by five floors and over 150 feet of corridors. Sterilized packs are delivered from CNSS to the OR after the packs have cooled. In the OR they are placed in a central storage area to await use.³

Once used, the linen is placed in laundry bags and tied shut. These bags are then removed from the operating suites and taken to the soiled linen collection point. The bags are placed through a small door in the wall of the corridor nearest the laundry. They fall into a laundry cart which is taken to the laundry by laundry personnel on a regular basis. After the surgical linen reaches the laundry it is sorted, washed, and dried, and then delivered to the Central Linen Distribution Point. Before the experimentation with the disposable surgical packs began, this cycle was repeated during each hour of the working day.

Items that have been identified for repair are either repaired by the hospital seamstress or by means of a thermal patching machine maintained in the laundry. Once these items have been repaired they are sent to the laundry and re-enter the system.

The system involved for the disposable surgical pack is much simpler than the one required for reusable packs. Central Stores maintains a ten-day supply of the disposable packs. The OR orders daily and Central Stores delivers the items ordered each morning. After the disposable pack has been used it is placed in a plastic bag which is then sealed with tape and taken to the surgical trash collection point. Housekeeping personnel remove the bags and place them in city-owned dumpsters. The city disposes of the contents of these dumpsters by burying them in a sanitary land fill.

The issues

Because the reusable system is the presently accepted system of providing for the OR's needs, the disposable system is essentially on trial. For this reason, the discussion of the issues will be directed toward the advantages and disadvantages of adopting a disposables oriented system.

Technical acceptability

One of the first questions that must be resolved is that of the capability of the disposable item to function at least as well as its reusable counterpart. In order to satisfy this requirement, it should provide at least the same levels of patient safety, patient comfort, and maintenance of the sterile field. If possible, it should provide an improvement over the reusable pack in each of these areas. At Hendrick Memorial the situation is such that the disposable pack meets or exceeds this requirement.

Laundry personnel perform the patching of surgical linen. The integrity of each individual patch is dependent on the proper operation of the thermal patching machine and the skill and motivation of the operator. An incorrectly applied patch could provide a path for bacterial migration that would be difficult to detect. Disposable packs are not subject to this process and thereby eliminate this potential danger to the patient.

The equipment and facilities of the Autoclave Room enhance the advantages of the disposable pack. The restriction on which autoclaves may be used and the double-length sterilization requirement was a result of problems indicated

by autoclave tape sterility indicators placed in each pack. The autoclave tape changes color when it comes into contact with steam. Some of the indicators did not show that steam had properly penetrated the pack. It is recognized that such a system does not prove sterility. However, before the contents of a pack can be sterilized, steam must contact each item.

Bacteriological cultures are also used to test the sterilization capability of the autoclaves. Here, too, extra precautions are taken to insure the autoclaves are operating properly. Instead of using them periodically, as recommended in the literature, one culture is placed in each of the larger packs and in the center of each load processed.⁴

The room in which the reusable packs are sterilized is ventilated by a large fan placed in a doorway. The fan draws air, and particulate matter from the main CNSS storage area. This air and its contents are forced across the packs as they are removed from the autoclaves. This presents the potential for insidious contamination of these packs.

The degree of extra precaution related above indicates a certain lack of confidence in the sterility of the reusable pack. The professional staff in the OR indicated

that, in contrast, the disposable pack was used in full confidence.

Professional staff acceptance

The nurses in the OR were favorable toward utilizing the disposable pack. Weight, size, and ease of handling were the most often-cited advantages. Observation of patient preparation and postoperative clean-up led the writer to the conclusion that there was no significant difference between the reusable and disposable pack in these areas.

The physicians and surgeons on the medical staff did not exhibit the same unanimity as the nurses. The disposable packs were not acceptable for use in thoracic surgery. The primary objections were the texture and draping qualities. Orthopedic surgeons found the disposable items ideal for some of their procedures, such as total hip replacements, but unsuitable for others. The features that prevented total acceptance were the tendency of the disposable to tear when clipped, and its general lack of strength and pliability.⁵

The personnel voicing objections to the use of disposables do not represent a majority opinion. The general

attitude of the medical staff was determined to be either passive or quite favorable.

Storage

With the exception of the space provided for new linen awaiting introduction into the linen cycle and the limited capacity in the OR for packs awaiting use, there was no storage anywhere in the surgical linen cycle. Each day's output from the laundry was delivered to CNSS. CNSS prepared and sterilized the packs, and each day's production was delivered to the OR. Prior to the experimentation with disposables, the reusable packs stored in the OR represented little more than a one-day supply.⁶

This straight-through type system functions as long as every activity is operating. However, equipment failures in either, or both, the laundry and CNSS can, and have, caused difficulties. Equipment maintenance presents a similar problem because it is conducted during normal working hours. When vital equipment is down for maintenance, the production chain is broken; and what few back-up supplies may be in the system are very quickly consumed. There have been occasions when reusable packs were literally taken straight from the autoclave to the patient.

In the experimentation with disposables, it was discovered that a three-day supply could be stored in cabinets in each surgical suite. This eliminated the need to keep back-up packs in the central storage area. The added capability also enabled the OR to eliminate one full-time position.⁷ Because of the experimentation with disposables, the amount of reusable linen required has decreased. This enabled CNSS to utilize space in the Pack Room to store excess linen which has essentially eliminated the problems associated with equipment breakdowns in the laundry since the autoclaves are rarely out of commission at the same time.

Central Stores has adequate warehouse space to store the required levels of the disposable packs. Additional space presently under construction is expected to be occupied by July, 1972. This addition will increase Central Stores' storage capacity, effectively eliminating a factor that could have prevented the adoption of a disposable pack system.

Waste disposal

This area does not present Hendrick Memorial with any particular difficulties. The city of Abilene provides large dumpsters for trash collection and removal. There are presently two dumpsters on hand and additional units have been

determined to be unnecessary to support the additional waste volume generated by disposable packs. These dumpsters are immediately to the rear of the Surgery Building and adjacent to the trash collection area of the OR.

Source of supply

This issue adversely affects both the reusable and disposable pack. The director of the Laundry and Housekeeping Department related that manufacturers of high-quality surgical linen were becoming fewer and farther away. As a result, a great deal of care must be taken in the selection of a vendor and the monitoring of the quality of the linen products received.⁸ The absence of a linen control or inventory system for in-use linen has created problems such that vendor selection requirements are overridden by the need to obtain surgical linen as quickly as possible. This situation was further amplified when it was discovered that there was insufficient linen in the system to meet the immediate requirements.⁹

The source presently utilized for disposable packs is in Sherman, Texas, some 200 miles from Abilene. Orders are placed by telephone and delivered by motor freight. This system places the hospital at the mercy of adverse

weather which could interrupt communication services. Furthermore, other problems associated with motorized conveyance such as accident, strike, hijacking and other associated inconveniences have an impact on the timely delivery of required supplies.

There are local suppliers which maintain small inventories of the disposable packs presently being tested at Hendrick Memorial Hospital. These suppliers have not been approached by the hospital to determine if they could supply the hospital's needs at a competitive price.

Costs

Because of the almost total absence of work load or production records in every area, the costs relative to the reusable system are based primarily on estimations. Substantiation of these estimations was attempted by either interviewing others involved as suppliers or consumers, or through an analysis of the few records available. It is recognized that the figures resulting from this process will not be 100 per cent accurate. However, the writer, as well as the administration of the hospital, feels that the figures will provide an approximation of actual costs which will be adequate for the purposes of this study.¹⁰

The accounting department presently carries the cost per pound of laundry processed at \$.06. This figure could not be substantiated because the laundry does not keep any record of its work load or production. However, this figure does compare favorably with the state and national averages for laundry costs contained in the Hospital Administrative Services Monthly Report for January, 1972. Because of this favorable comparison it was decided to use \$.06 as the laundry cost factor.¹¹

In order to determine the cost to launder a reusable pack, the linen content of each pack was weighed, and an average weight per pack determined. The cost was computed to be \$.76 per pack. These computations are contained in Appendix F.

Delivery costs associated with the transport of the clean linen from the laundry to CNSS were determined. Time studies indicated that the transit time between these two points was ten minutes. The primary variable was the time spent waiting for an elevator. The delivery cost per pack was determined to be \$.06. Appendix F provides the computation of this cost element.

Repair costs consist of cost associated with supplies

required and the activities of the seamstress and thermal patching machine operator. The time spent each week repairing surgical linen was estimated by each of these individuals. Appendix F provides the derivation of the \$.18 per pack cost of repair.

It was discovered that the decreased cost of delivering the soiled surgical linen to the laundry was offset by the increased costs association with removal of the disposable waste. For this reason, neither of these costs are included in this study.

CNSS provides the greatest number of cost factors to be considered. The cost of preparing, sterilizing, and delivering the reusable pack to the OR, as well as costs for supplies, are assigned to CNSS activities.

The CNSS Pack Room's production is utilized entirely by the OR. The work load consists of preparing, in addition to reusable surgical packs, supply packs required for certain procedures, basins, Mayo stand trays, and other items for sterilization.

The activities relative to the preparation of the reusable pack are performed in a single room. Time studies could not be conducted without the personnel being fully

aware that such studies were being made. For this reason, and because all the linen is handled in the same manner, it was decided to use a different method to determine the amount of time the Pack Room personnel devoted to reusable pack linen.

The method chosen was to analyze the contents on the linen carts as they are delivered from the laundry. This was done for a seven-day period. The laundry was categorized as either used strictly for surgical packs, for supply packs, or for either.

It was found that the average number of pieces of clean linen in a laundry cart was 294. The average load was composed of 7 per cent surgical-pack, 54 per cent supply-pack, and 39 per cent either-pack linen. Because the "either-pack" linen utilization was split between the two types of packs produced, one-half of this category was attributed to the surgical packs.

The average daily number of cart loads of clean laundry, before and after experimentation with disposables began, was obtained from records maintained by Pack Room personnel. These records indicated that prior to the experimentation with disposable packs, the average was nine carts per day.

Since experimentation began, this figure has dropped to an average of four carts per day. Because the number and type of surgical procedures accomplished has remained relatively stable, this decrease is attributed directly to the experimentation with disposable packs.¹²

The daily number of pieces of laundry was then computed for both time periods. The percentages were applied against the number of pieces for the four loads per day. The total pieces attributable to surgical linen was then added to the difference between the total daily pieces of linen processed for the two periods. The resulting total represents the number of pieces of surgical linen that were processed by the Pack Room on a daily basis before the experimentation with disposables began. The division of this figure by the number of pieces processed by the Pack Room, before the experimentation began, results in the percentage of linen associated with surgical packs. Because each piece of linen receives essentially the same amount of handling, this percentage is used to approximate the amount of time utilized by Pack Room personnel to prepare the reusable packs. The computations are contained in Appendix G.

The computation of the costs associated with the

production of reusable packs in the Pack Room are contained in Appendix H. The daily pack room production was estimated by the Autoclave Room supervisor and substantiated by the OR supervisor. The amount of autoclave tape used on the sterility indicators and the packs was obtained by measuring the tape on the finished products. The figures used in Appendix H are averages.

The costs associated with the operation of the Autoclave Room are contained in Appendix I. As mentioned previously in this paper, there are no facilities in the area to store the reusable pack, sterile or nonsterile. As a result, each day's production, of necessity, is delivered directly to the OR. Because of the space limitations, each autoclave load is delivered as it completes the sterilization process.

Costs in the OR are basically the same for either system. However, before the OR moved to its present location and began experimenting with disposables one person devoted full-time to handle the reusable packs. This individual was required to insure that each surgical suite was properly stocked with the required packs. Since the move and subsequent experimentation with disposables, this position has been eliminated. The OR supervisor credits the reduced space

required to store and the ease of handling of the disposable packs as the primary factors that enabled the OR to make this reduction. Now, instead of one person handling surgical packs full-time, one person performs the necessary tasks in about thirty minutes each day.¹³

OR personnel are of the opinion that if the reusable packs were to be used exclusively, the position previously eliminated would have to be reinstated. Based on this, plus the fact that the position was not eliminated until after experimentation with disposables began, it was decided to include this as a cost factor. However, because approximately thirty minutes each day is required to restock the disposable packs in the surgical suites, thirty minutes was deducted from the time required to handle the reusable packs. The computation of this cost factor is contained in Appendix J.

Costs associated with the disposal of the waste generated by disposables were offset by decreased costs in the area of laundry collection. The city of Abilene provides dumpsters to the hospital, empties them, and disposes of the contents. Hendrick Memorial has two of these dumpsters, and does not anticipate that the utilization of disposable packs will create a need for any additional units.

Each reusable surgical pack is composed of several different pieces of linen. In order to determine the linen cost each time a reusable pack was used it was necessary to determine the contents of each pack, the prices paid for each item, and the number of times it was used before it was discarded. The pack inventories and use cost factors are provided in Appendix K.

Previous cost studies at Hendrick Memorial Hospital reflect the factor of twenty uses as the expected life of a piece of linen. Since hospitals vary widely in the amount of service obtained from a piece of linen, no standard of linen life has been established. Because of this and the fact that there were no records available to establish a different figure, twenty was used as the linen life factor.¹⁴

Because the reusable cost factors are all based on the average cost for a reusable pack, it was necessary to determine the average cost of a disposable pack. The prices of the disposable packs were established and the average determined in Appendix L.

Appendix M provides the summary of costs associated with the reusable pack and compares the reusable pack cost to the average cost of a disposable pack. It should be noted

potential personnel savings in this area. The OR has already eliminated one position and has credited disposable packs as being responsible for this reduction. The OR has already that the economic advantage is in favor of the reusable pack by \$.58.

The disposable packs are delivered from Central Stores to the OR at the same time as other supplies. Because these deliveries are made, whether or not disposable packs are included in the order, it was decided that per-pack costs in this area were insignificant and would not be included in this study.

Fringe benefits

There are many areas within the present system that would benefit from the introduction of disposable surgical packs. The work load in every element of the reusable cycle would be reduced. The dependency on immediate resupply would be alleviated, and requirements for new equipment would be diminished.

As stated earlier, the total effort in the Pack Room is devoted to preparing items for the OR. Computations in Appendix N indicate that this work load has dropped some 56 per cent. This would indicate that some personnel positions in this activity could either be eliminated or shifted to meet manpower requirements in other areas. Since there is only one person assigned to the Autoclave Room, there are no

potential personnel savings in this area. The OR has already eliminated one position and has credited disposable packs as being responsible for this reduction.

Disposable packs reduce the detrimental effects of a break in the reusable pack production cycle. Because the OR is not immediately affected by prolonged equipment failures in the laundry, relations between the supervisors of these areas have improved measurably.¹⁵

Investment in, and storage of new surgical linen would be reduced to a minimum. This benefit is amplified by the present lack of any system to insure that proper inventory levels are maintained. Panic purchases would be reduced because a much smaller volume of surgical linen would be processed, and linens presently on hand will experience a lower rate of attrition.

The problems inherent with transporting the linen and sterilized packs over extended distances would be reduced because the production volume would be reduced. Central Stores is on the same floor as the OR, reducing transit time. Also, the disposable packs are packaged to withstand repeated handling without compromising their sterility.

CNSS has requested that the autoclaves presently in

use be replaced. Appendix O is a copy of the request sent to administration. With the reduction in the work load in the Autoclave Room, it is possible that the scope of this request could be reduced or the entire request cancelled. The manager of CNSS indicated that if a disposable surgical pack system were introduced, there would be no need for the new equipment and the request could be withdrawn.¹⁶

Because of the experimentation with disposables, the Pack Room has been able to accrue a supply of clean linen. This has virtually eliminated the detrimental effects of an equipment breakdown in the laundry. As a result, personnel in the Pack and Autoclave Rooms are no longer under the pressure to maintain adequate production with an insufficient supply of clean linen. Relations between CNSS and OR personnel have also improved.¹⁷

The Central Stores area provides a benefit that is reflected in improved accounting techniques. For the first time, the hospital will have an accurate accounting of receipts, inventories, and costs associated with surgical packs. Inventory records and stock levels should reduce the need for emergency purchases to a minimum.¹⁸

Summary

The comparison of the reusable and disposable pack systems indicates that there are many advantages to be realized by adopting a disposable pack system. The disposable pack would provide for more efficient utilization of the limited space in the OR, essentially eliminate the problems associated with equipment failure or maintenance, and result in the realization of several fringe benefits, some of which represent potential monetary savings.

The disposable pack was also found to be technically and professionally acceptable. Patient safety and comfort, as well as sterile technique was enhanced.

The adoption of a disposables program would not require additional warehouse space beyond that either presently available or under construction, nor would additional waste disposal equipment be required.

The disposable pack is presently more expensive than the reusable pack. However, the monetary savings to be realized because of reduced equipment requirements and the increasing cost of labor combine to virtually eliminate the economic advantage of the reusable pack.

Minutes of the Utilization Committee, Hendrick Memorial Hospital, 1971.

Footnotes

¹Hendrick Section, Abilene Reporter-News, July 11, 1970, p. 28.

²Personal interview with Bobbie Mason, Operating Room Supervisor, Hendrick Memorial Hospital, Abilene, Texas, April 18, 1972; Malcolm T. MacEachern, Hospital Organization and Management (3d ed.; Chicago: Physician's Record Co., 1957), pp. 331-32.

³Personal interview with Frances Barker, Autoclave Room Supervisor, Hendrick Memorial Hospital, Abilene, Texas, April 14, 1972.

⁴John R. McGibony, Principles of Hospital Administration (2d ed.; New York: G. P. Putnam's Sons, 1969), p. 397.

⁵Personal interview with Charles T. Meadows, Thoracic Surgeon, Hendrick Memorial Hospital, Abilene, Texas, April 20, 1972; Personal interview with Carlton Hodges, Orthopedic Surgeon, Hendrick Memorial Hospital, Abilene, Texas, April 18, 1972.

⁶Mason interview.

⁷Ibid.

⁸Personal interview with George Severs, Director, Laundry and Housekeeping Department, Hendrick Memorial Hospital, Abilene, Texas, April 13, 1972.

⁹Ibid.

¹⁰Personal interview with Edgar Vaughn, Assistant Administrator, Hendrick Memorial Hospital, Abilene, Texas, April 22, 1972.

¹¹Hospital Administrative Services Monthly Report, Hendrick Memorial Hospital, January, 1972.

¹²Minutes of the Utilization Committee, Hendrick Memorial Hospital, 1971.

13Mason interview.

14Julius Spivak and David S. Watt, "Disposable OR Packs," Hospitals (July, 1970), 109.

15Vaughn interview.

16Personal interview with James Pender, Manager, Central Nursing Service Supply, Hendrick Memorial Hospital, Abilene, Texas, April 11, 1972.

17Ibid.

18Personal interview with William Brown, Assistant Administrator, Hendrick Memorial Hospital, Abilene, Texas, April 22, 1972.

Recommendations

Based on the above conclusion, the following recommendations are made:

1. Supplement the present reusable pack system with disposable packs. Those areas where disposable packs are unacceptable should continue to receive reusable packs.

2. Determine if local suppliers would be willing to supply the hospital's disposable pack needs at a competitive price.

3. Develop and publish policies for routine equipment maintenance which will permit after-hours maintenance of key equipment.

Areas recommended for further study CHAPTER III

Based on the experiences of the writer and comments made by individuals interviewed, the following areas are recommended for further study

CONCLUSION AND RECOMMENDATIONS

Conclusion

The best system of meeting the surgical pack requirements of the OR at Hendrick Memorial Hospital is one in which disposable surgical packs are used to supplement reusable packs.

- a. Laundry
- b. Central Nursing Service Supply
- 3. Staffing levels for:

Recommendations

Based on the above conclusion, the following recommendations are made:

- 1. Supplement the present reusable pack system with disposable packs. Those areas where disposable packs are unacceptable should continue to receive reusable packs.
- 2. Determine if local suppliers would be willing to supply the hospital's disposable pack needs at a competitive price.
- 3. Develop and publish policies for routine equipment maintenance which will permit after-hours maintenance of key equipment.

Areas recommended for further study

Based on the experiences of the writer and comments made by individuals interviewed, the following areas are recommended for further study:

1. Linen control procedures.
2. Production units and costs associated with those units in:
 - a. Laundry
 - b. Central Nursing Service Supply
3. Staffing levels for:
 - a. Laundry
 - b. Central Nursing Service Supply

DEFINITIONS

Autoclave: A piece of equipment used to sterilize items through the use of pressurized steam.

Disposable Pack: Synonymous with disposable surgical pack.

Disposable Surgical Pack: A surgical pack whose contents are designed for a single use and is purchased pre-packaged and sterile.

APPENDIX A

Production Process DEFINITIONS as laundering, transporting, inspecting, assembling, and sterilizing the reusable surgical packs.

Professional Staff: Includes the registered nurses and physicians assigned to or utilizing the operating room.

Reusable Pack: Synonymous with reusable surgical pack.

Reusable Surgical Pack: A surgical pack whose contents are designed for multiple uses and must be reprocessed between uses.

Supply Pack: A pack whose contents consist of surgical instruments, sponges, and other items required during a surgical procedure.

Surgical Pack: Either reusable or disposable

DEFINITIONS

packs.

Autoclave: A piece of equipment used to sterilize items through the use of pressurized steam.

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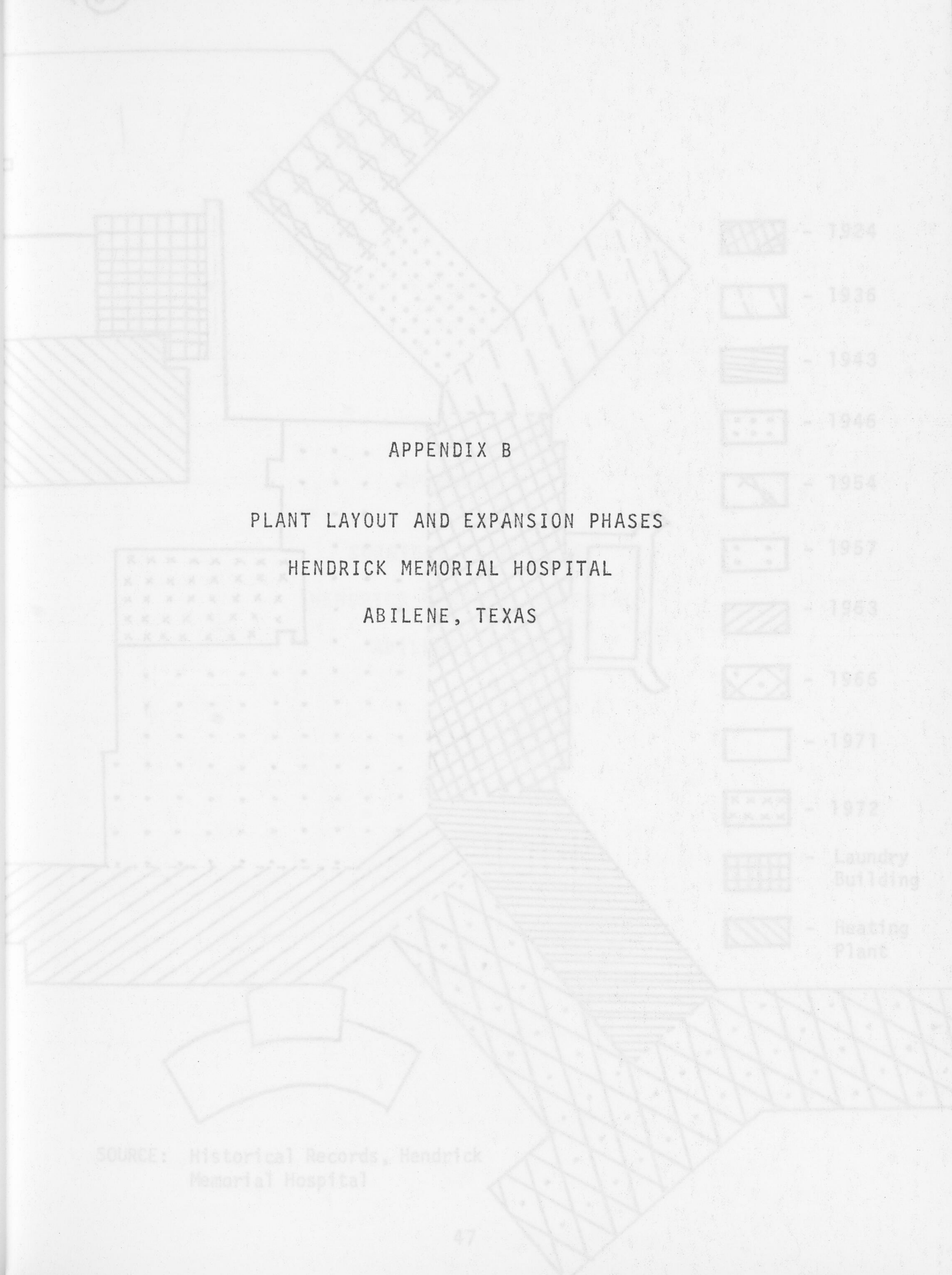
Surgical Pack: Either reusable or disposable
packs.

APPENDIX B

PLANT LAYOUT AND EXPANSION PHASES

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

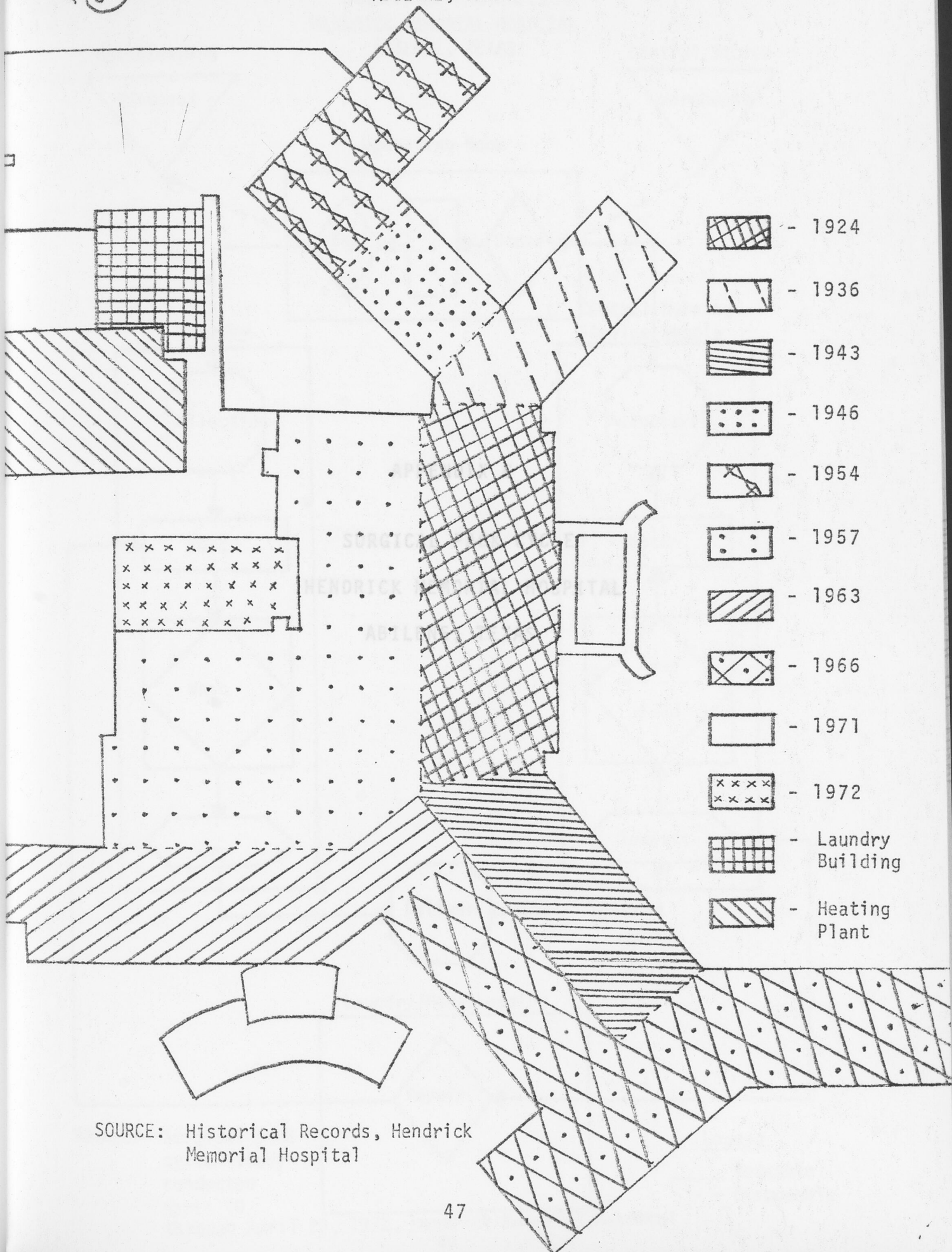



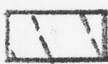






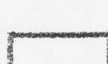
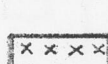
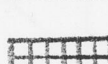
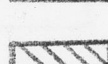
-  - 1934
-  - 1936
-  - 1943
-  - 1946
-  - 1954
-  - 1957
-  - 1963
-  - 1966
-  - 1971
-  - 1972
-  - Laundry Building
-  - Heating Plant

APPENDIX B
 PLANT LAYOUT AND EXPANSION PHASES
 HENDRICK MEMORIAL HOSPITAL
 ABILENE, TEXAS

SOURCE: Historical Records, Hendrick Memorial Hospital

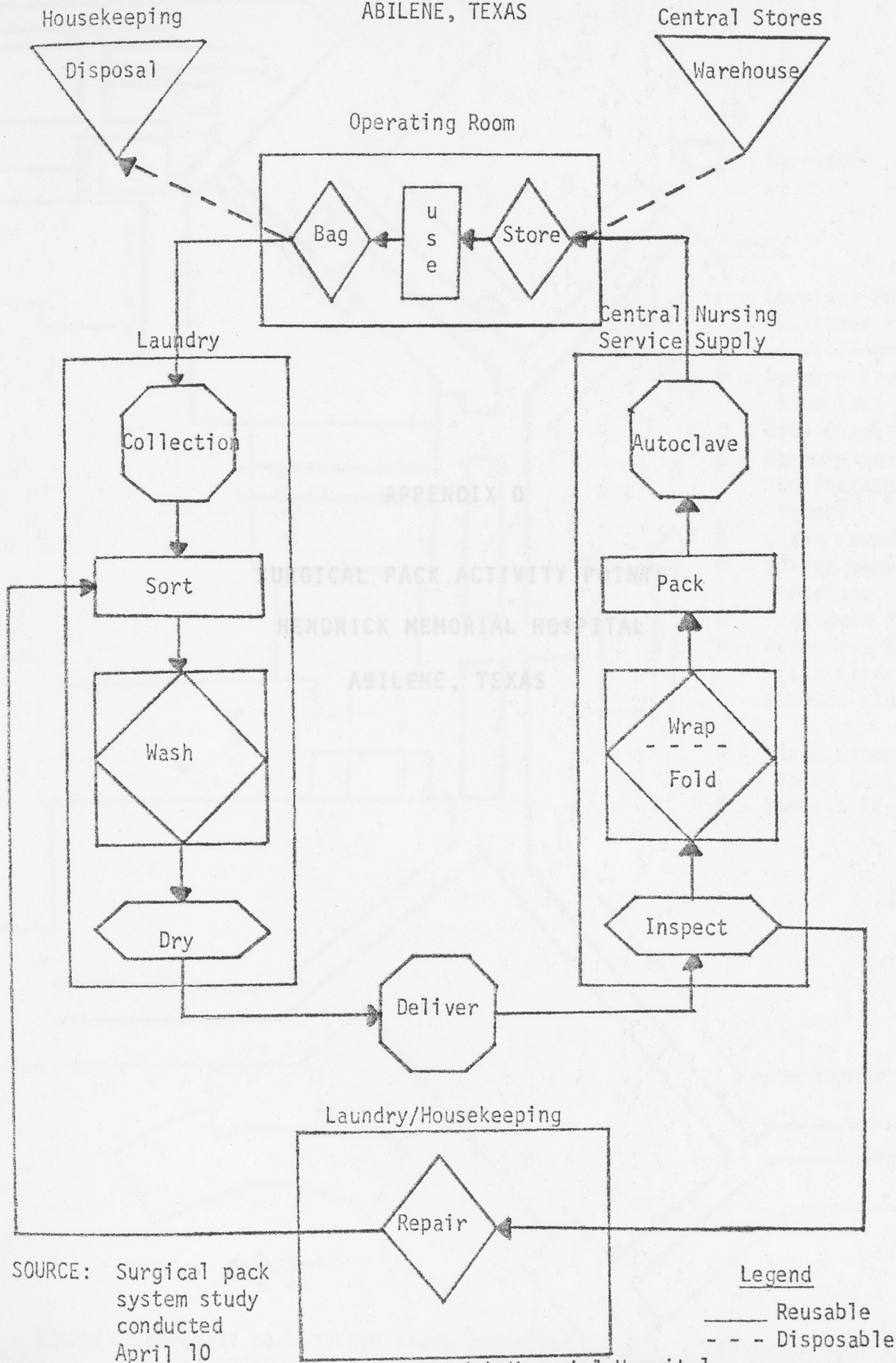
PLANT LAYOUT AND EXPANSION PHASES
 HENDRICK MEMORIAL HOSPITAL
 ABILENE, TEXAS



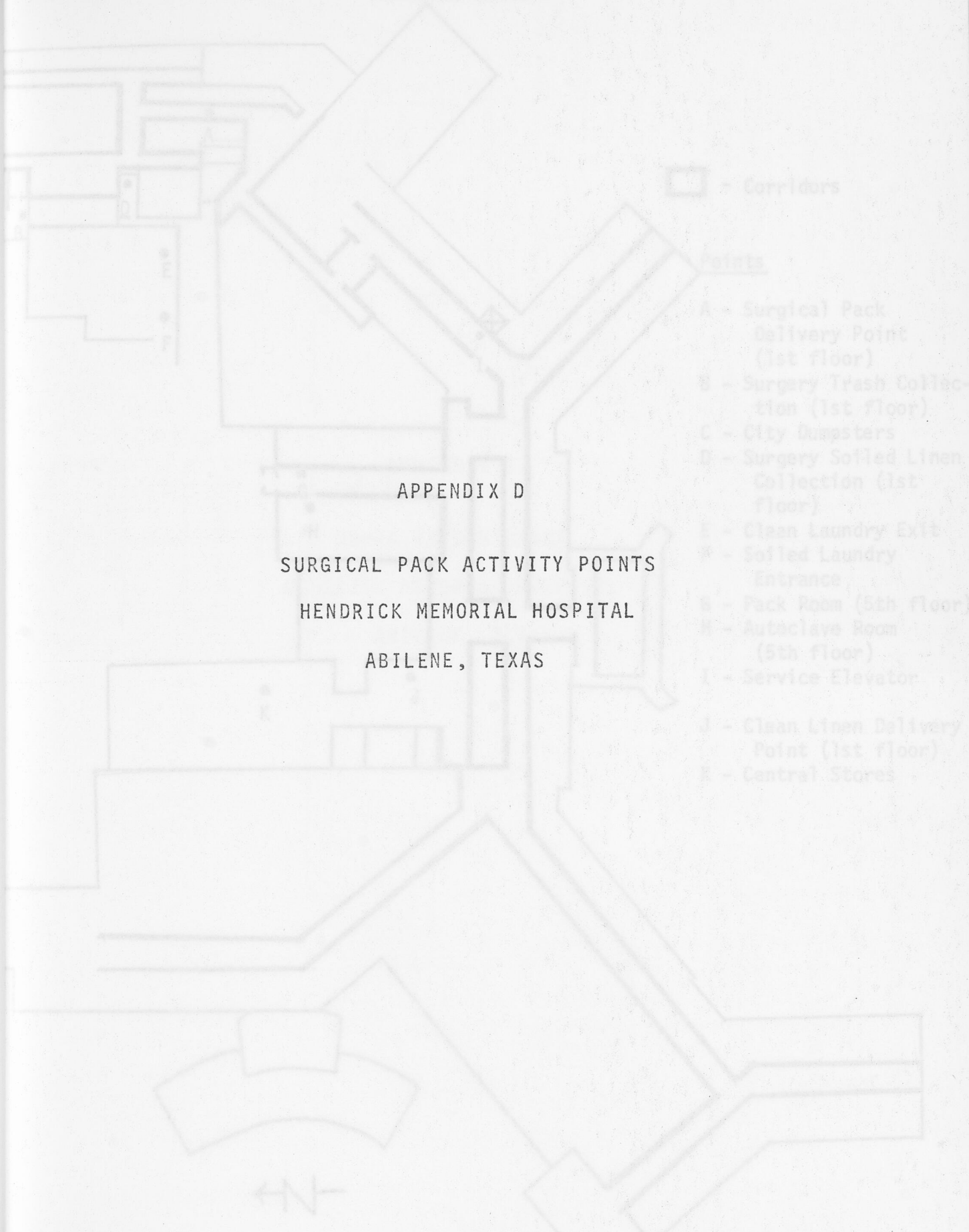
-  - 1924
-  - 1936
-  - 1943
-  - 1946
-  - 1954
-  - 1957
-  - 1963
-  - 1966
-  - 1971
-  - 1972
-  - Laundry Building
-  - Heating Plant

SOURCE: Historical Records, Hendrick Memorial Hospital

SURGICAL PACK CYCLE
 HENDRICK MEMORIAL HOSPITAL
 ABILENE, TEXAS



SOURCE: Surgical pack system study conducted April 10 through April 20, 1972, Hendrick Memorial Hospital.



APPENDIX D

SURGICAL PACK ACTIVITY POINTS

HENDRICK MEMORIAL HOSPITAL

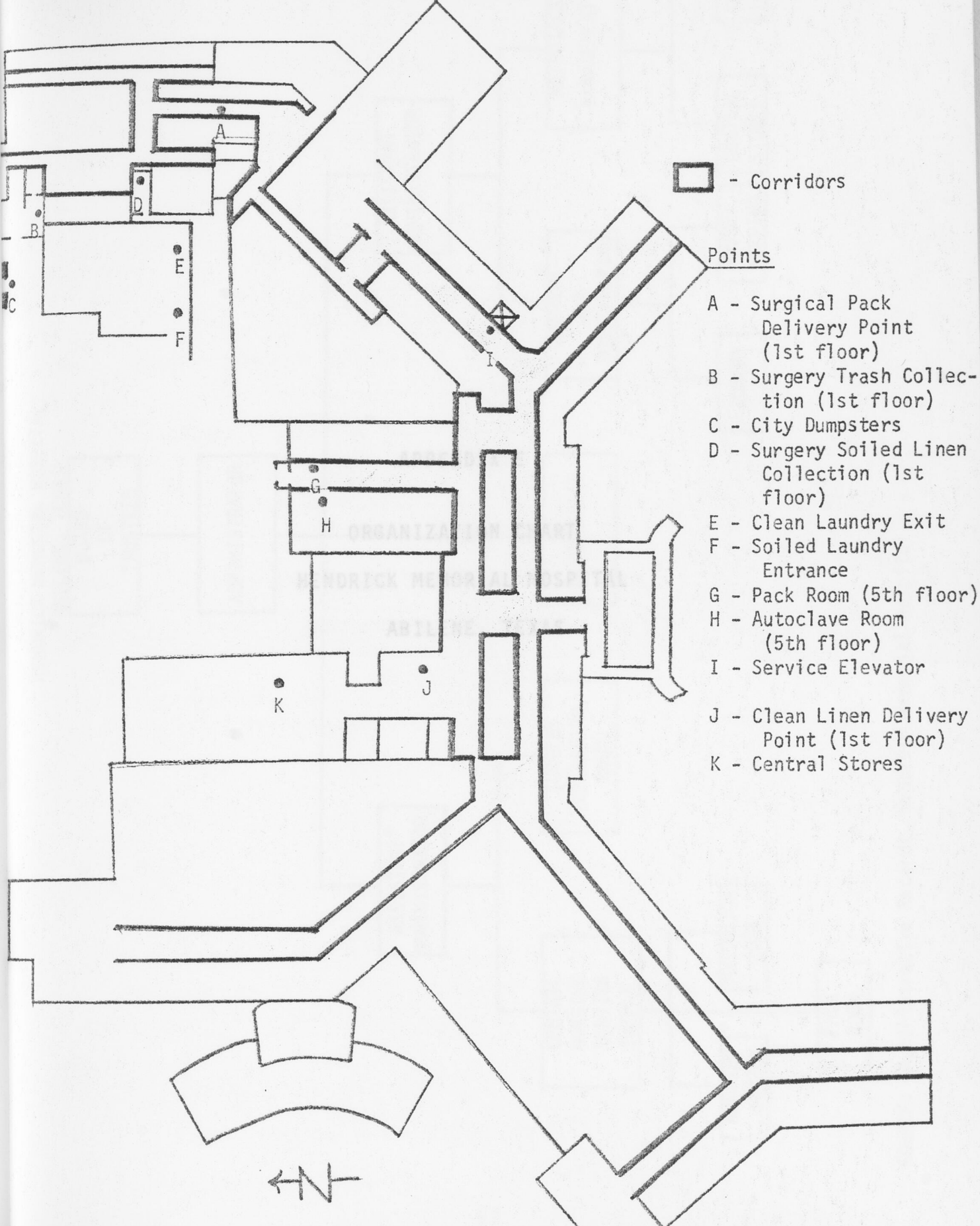
ABILENE, TEXAS

Points

- A - Surgical Pack Delivery Point (1st floor)
- B - Surgery Trash Collection (1st floor)
- C - City Dumpsters
- D - Surgery Soiled Linen Collection (1st floor)
- E - Clean Laundry Exit
- F - Soiled Laundry Entrance
- G - Pack Room (5th floor)
- H - Autoclave Room (5th floor)
- I - Service Elevator
- J - Clean Linen Delivery Point (1st floor)
- K - Central Stores

SOURCE: Surgical pack system study conducted April 10 through April 20, 1972, Hendrick Memorial Hospital.

SURGICAL PACK ACTIVITY POINTS
 HENDRICK MEMORIAL HOSPITAL
 ABILENE, TEXAS



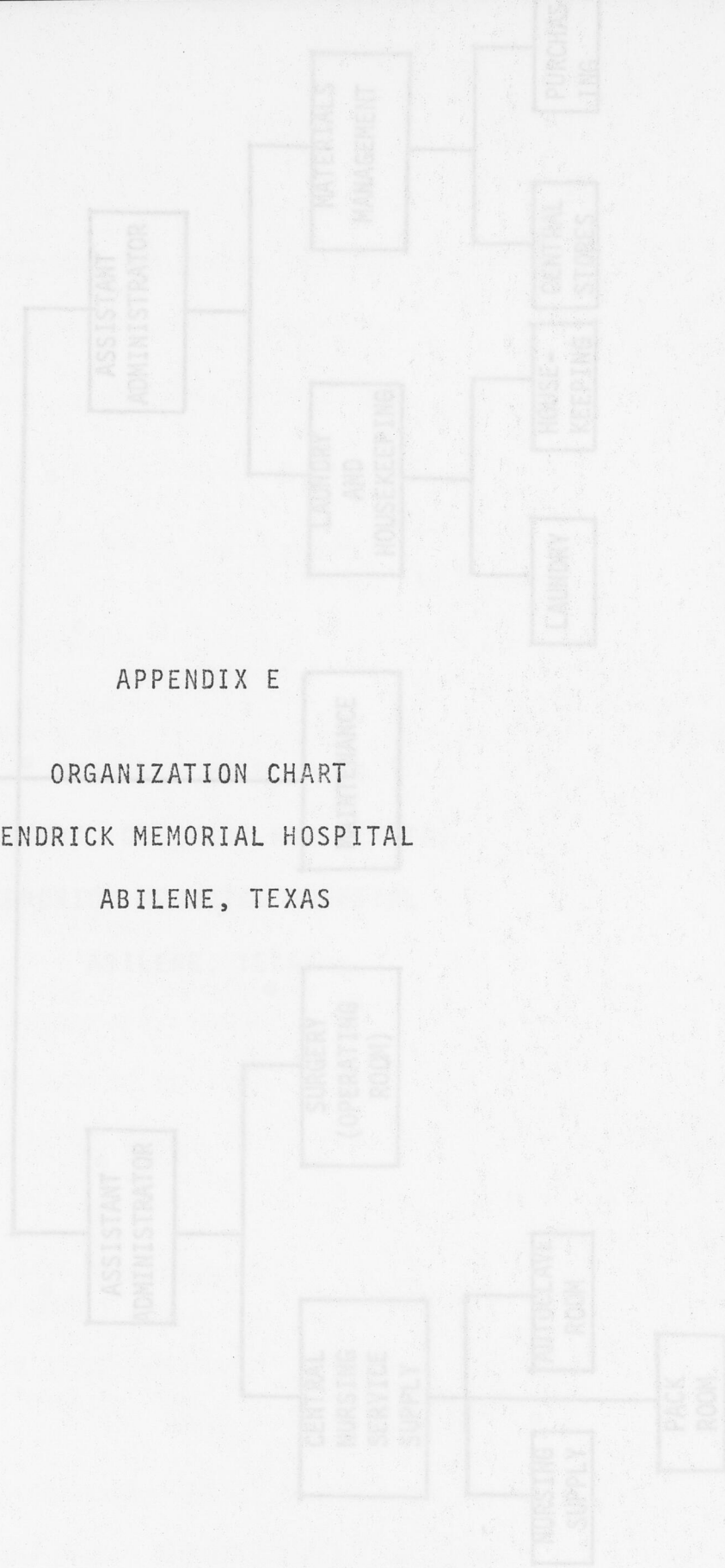
□ - Corridors

Points

- A - Surgical Pack Delivery Point (1st floor)
- B - Surgery Trash Collection (1st floor)
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- D - Surgery Soiled Linen Collection (1st floor)
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- H - Autoclave Room (5th floor)
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- J - Clean Linen Delivery Point (1st floor)
- K - Central Stores

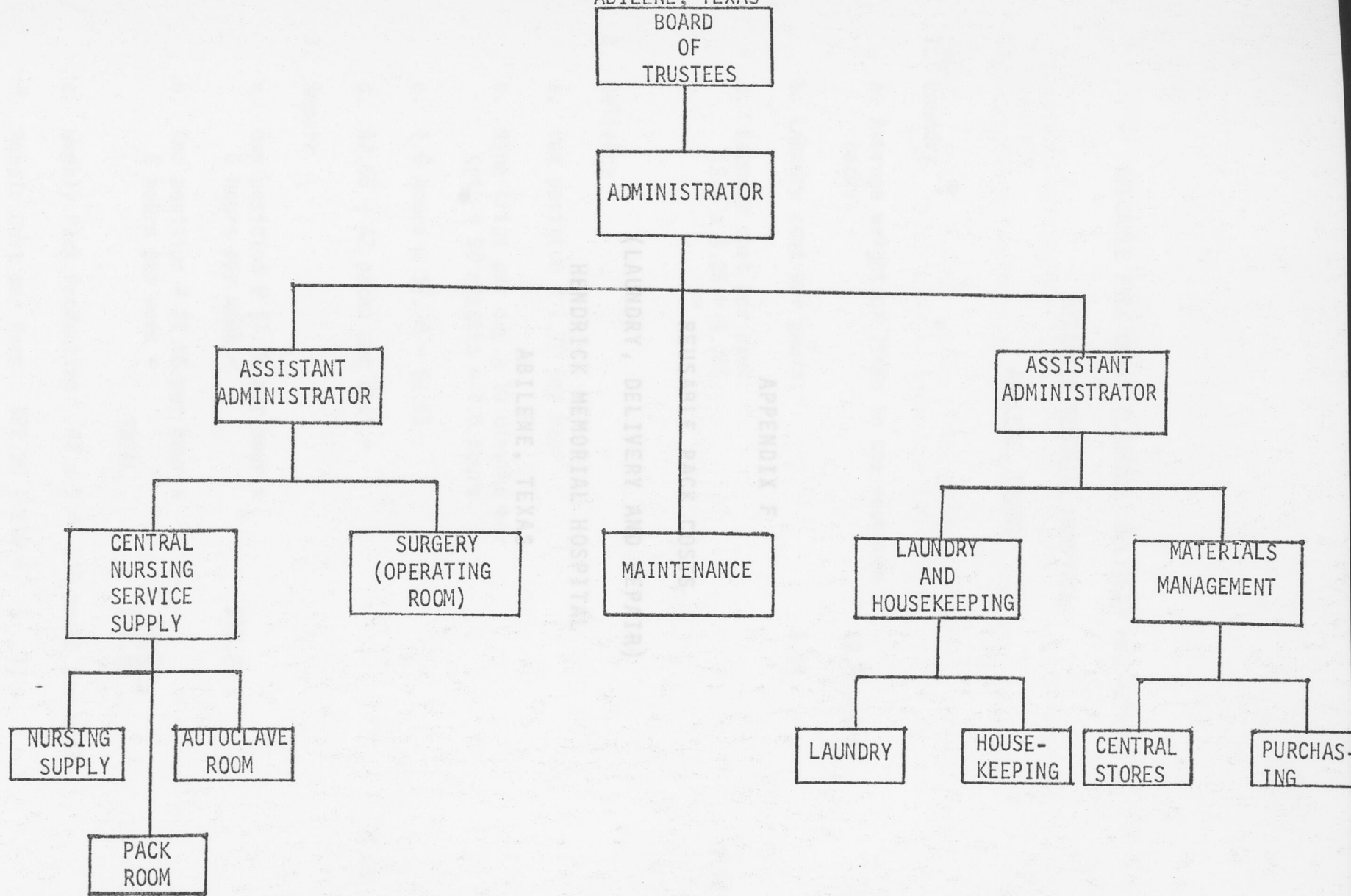
SOURCE: Surgical pack system study conducted April 10 through April 20, 1972, Hendrick Memorial Hospital.

APPENDIX E
 ORGANIZATION CHART
 HENDRICK MEMORIAL HOSPITAL
 ABILENE, TEXAS



SOURCE: Administrative Records, Hendrick Memorial Hospital

ORGANIZATION CHART
HENDRICK MEMORIAL HOSPITAL
ABILENE, TEXAS



53

SOURCE: Administrative Records, Hendrick Memorial Hospital

REUSABLE PACK COSTS (LAUNDRY, DELIVERY AND REPAIR)

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Laundry

a. Average weight of linen in the reusable pack: 12.6 pounds

b. Laundry cost per pound: \$.06

c. Laundry cost per pack: $12.6 \times \$.06 = \$.756$ \$.76

APPENDIX F

REUSABLE PACK COSTS

(LAUNDRY, DELIVERY AND REPAIR)

2. Delivery

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

a. One position @ 1.70 per hour

b. Nine trips per day x 10 minutes per trip = 90 minutes = 1.5 hours

c. 1.5 hours x \$1.70 = \$2.55

d. $\$2.55 \div 42 \text{ packs per day}^* =$ \$.06

3. Repair

a. One position @ \$1.70 per hour x 6 hours per week = \$10.20

b. One position @ \$2.00 per hour x 6 hours per week = 12.00

TOTAL \$22.20

c. Weekly Pack Production: $42 \times 5 = 210 \text{ packs per week}$

d. Repair Cost per Pack: $\$22.20 \div 210 =$ \$.11

e. Repair Supplies:* $\$15.00 \div 210 =$.07

f. Total Cost per Pack: \$.18

4. Total REUSABLE PACK COSTS (LAUNDRY, DELIVERY AND REPAIR) \$1.00

HENDRICK MEMORIAL HOSPITAL

*Estimated by the Supervisor, Housekeeping Room, Hendrick Memorial Hospital

**Estimated by the Director, Housekeeping Department

ABILENE, TEXAS

SOURCE: Surgical Pack System Study conducted April 10 through April 15, 1972, Hendrick Memorial Hospital.

1. Laundry

- a. Average weight of linen in the reusable pack: 12.6 pounds
- b. Laundry cost per pound: \$.06
- c. Laundry cost per pack:
 $12.6 \times \$0.06 = \0.756 \$.76

2. Delivery

- a. One position @ 1.70 per hour
- b. Nine trips per day x 10 minutes per trip = 90 minutes = 1.5 hours
- c. 1.5 hours x \$1.70 = \$2.55
- d. $\$2.55 \div 42 \text{ packs per day}^* =$ \$.06

3. Repair

- a. One position @ \$1.70 per hour x 6 hours per week = \$10.20
- b. One position @ \$2.00 per hour x 6 hours per week = 12.00
- TOTAL \$22.20
- c. Weekly Pack Production: $42 \times 5 = 210$ packs per week
- d. Repair Cost per Pack: $\$22.20 \div 210 =$ \$.11
- e. Repair Supplies:* $\$15.00 \div 210 =$.07
- f. Total Cost per Pack: \$.18

4. Total Laundry, Delivery and Repair Cost per pack: \$1.00

*Estimated by the Supervisor, Autoclave Room, Hendrick Memorial Hospital

**Estimated by the Director, Laundry and Housekeeping Department

SOURCE: Surgical Pack System Study conducted April 10 through April 20, 1972, Hendrick Memorial Hospital.

APPENDIX 6

PER CENT PACK ROOM EFFORT ATTRIBUTED

TO REUSABLE SURGICAL PACKS

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

PER CENT PACK ROOM EFFORT ATTRIBUTED
TO REUSABLE SURGICAL PACKS
HENDRICK MEMORIAL HOSPITAL
ABILENE, TEXAS

1. Average number of pieces of linen in a laundry cart: 294
2. Breakdown of laundry cart contents
 - a. Strictly for surgical packs: 7%
 - b. Strictly for supply packs: 54%
 - c. Either surgical or supply packs: 39%

APPENDIX G

PER CENT PACK ROOM EFFORT ATTRIBUTED
TO REUSABLE SURGICAL PACKS
HENDRICK MEMORIAL HOSPITAL
ABILENE, TEXAS

3. Average number of laundry carts delivered daily:
 - a. Before experimentation with disposables: 9
 - b. After experimentation with disposables: 4
4. Average number of pieces processed daily:
 - a. Before experimentation
 $9 \times 294 = 2,646$
 - b. After experimentation
 $4 \times 294 = 1,176$

Difference 1,470

PER CENT PACK ROOM EFFORT ATTRIBUTED

TO REUSABLE SURGICAL PACKS

5. Number of pieces attributed to reusable
surgical packs

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Average number of pieces of linen in a laundry cart:		294
2. Breakdown of laundry cart contents		
a. Strictly for surgical packs:	7%	
b. Strictly for supply packs:	54%	
c. Either surgical or supply packs:	<u>39%</u>	
	100%	
3. Average number of laundry carts delivered daily:		
a. Before experimentation with disposables:		9
b. After experimentation with disposables:		4
4. Average number of pieces processed daily:		
a. Before experimentation		
$9 \times 294 =$		2,646
b. After experimentation		
4×294		<u>1,176</u>
	Difference	1,470

5. Number of pieces attributed to reusable surgical packs.

a.	$1,176 \times .07 = 82.3 =$	82
b.	$1,176 \times .39 = 458.6 = 459$	
c.	$459 \times .50 = 229.5$	<u>230</u>
	Subtotal	312
c.	Difference between the average number of pieces processed daily $(2,646 - 1,176) =$	<u>1,470</u>
	Total	1,782

6. Per cent of Pack Room work load attributed to reusable surgical linen packs:

$$1782 \div 2,646 = 67.3\%$$

SOURCE: Pack Room Laundry Receipt Records from January, 1970 through March, 1972, Hendrick Memorial Hospital.

REUSABLE PACK COSTS (PACK ROOM)

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Total daily wages paid:
 - a. 3 positions @ \$1.80 per hour x 8 hours = \$43.20
 - b. 1 position @ \$1.75 per hour x 8 hours = 14.00
 - c. 1 position @ \$1.80 per hour x 4 hours = 7.20

\$64.40

APPENDIX H

2. Per cent of time devoted to reusable packs:

(From Appendix H) 67.3%

REUSABLE PACK COSTS (PACK ROOM)

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

3. Daily wages paid attributable to reusable packs: \$64.40 x 67% = \$43.34
4. Daily Pack Room production*: 42 packs
5. Labor cost per pack:

$\$43.34 \div 42 = \$1.029 =$ \$ 1.03
6. Supply cost per pack
 - a. Autoclave tape
 - (1) \$3.12 per roll ÷ 180 feet per roll = \$.017 per foot
 - (2) Sterility indicator (one per pack)

$1.5 \text{ feet} \times \$.017 = \$.025 =$ \$.03
 - (3) Average six feet per pack to secure wrappers.

*From Appendix F.

REUSABLE PACK COSTS (PACK ROOM)

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Total daily wages paid:
- a. 3 positions @ \$1.80 per hour x 8 hours = \$43.20 each
 - b. 1 position @ \$1.75 per hour x 8 hours = 14.00
 - c. 1 position @ \$1.80 per hour x 4 hours = 7.20
- \$64.40
2. Per cent of time devoted to reusable packs:
(From Appendix H) 67.3 %
3. Daily wages paid attributable to reusable packs: $\$64.40 \times .673 = \43.34
4. Daily Pack Room production*: 42 packs
5. Labor cost per pack:
 $\$43.34 \div 42 = \$1.029 = \$ 1.03$
6. Supply cost per pack
- a. Autoclave tape
- SOURCE: (1) $\$3.12$ per roll \div 180 feet per roll =
\$.017 per foot
- (2) Sterility indicator (one per pack)
 1.5 feet x $\$.017 = \$.025 = \$.03$
- (3) Average six feet per pack to secure wrappers.

*From Appendix F.

$$6 \times \$0.017 = \$0.102 = \underline{\$.10}$$

Total \$.13

b. Bacteriological culture sterility indicators

(1) \$50.00 per box ÷ 100 per box = \$.50 each

(2) Average seven indicators per load,

3 loads per day, forty-two packs per day.

(a) $7 \times \$0.50 = \3.50

(b) $\$3.50 \times 3 = \10.50

(c) $\$10.50 \div 42 = \$.25$

c. Total supplies cost per pack:

$$\$0.13 + \$0.25 = \$0.38$$

7. Total Pack Room cost per pack

a. Labor: \$1.03

b. Supplies: .38

Total \$1.41

SOURCE: Surgical Pack System Study conducted April 10 through April 20, 1972, Hendrick Memorial Hospital.

REUSABLE PACK COSTS (AUTOCLAVE ROOM)

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Daily Pack Room production: 42 packs
2. Number autoclave cycles per day
for reusable surgical packs: 3
3. Average number of packs per cycle: 14
4. Autoclave utilities cost per cycle: \$6.00

APPENDIX I

Load REUSABLE PACK COSTS (AUTOCLAVE ROOM)

and return HENDRICK MEMORIAL HOSPITAL

5. Autoclave/delivery ABILENE, TEXAS

a. Autoclave: $\$6.00 \div 14 = \$0.428 =$ \$.43

b. 10 min = .17 hours

c. $.17 \times \$1.80$ per hour = \$.306

d. $\$.306 \div 14 = .021 =$ \$.02

Total \$.45 per pack

SOURCE: Standard cost for autoclave operation, American Sterilizer Company, Dallas, Texas.

REUSABLE PACK COSTS (AUTOCLAVE ROOM)

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Daily Pack Room production:	42 packs	
2. Number autoclave cycles per day		
for reusable surgical packs:	3	
3. Average number of packs per cycle:	14	
4. Autoclave utilities cost per cycle:		\$6.00
Load, unload, and delivery to OR		
and return: 10 minutes		
5. Autoclave/delivery costs:		
a. Autoclave: $\$6.00 \div 14 = \$.428 =$		\$.43
b. 10 min = .17 hours		
c. $.17 \times \$1.80$ per hour = \$.306		
d. $\$.306 \div 14 = .021 =$		<u>\$.02</u>
	Total	\$.45 per pack

SOURCE: Standard cost for autoclave operation, American Sterilizer Company, Dallas, Texas.

REUSABLE PACK COSTS (OPERATING ROOM)

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. One position @ \$1.70 per hour x 7.5 hours per day = \$12.75
2. Average packs required per day: 42
3. Cost per pack: $\$12.75 \div 42 = \0.30

APPENDIX J

SOURCE: Survey of REUSABLE PACK COSTS (OPERATING ROOM) April 10 through April 20, 1972, Hendrick Memorial Hospital.

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

REUSABLE PACK COSTS (OPERATING ROOM)

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. One position @ \$1.70 per hour x 7.5 hours per day = \$12.75
2. Average packs required per day: 42
3. Cost per pack: $\$12.75 \div 42 = \$.30$

APPENDIX K

SOURCE: Surgical Pack System Study conducted April 10 through April 20, 1972, Hendrick Memorial Hospital.

REUSABLE PACK CONTENTS AND USE COST FACTOR

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Cysto Pack

a. 1 Cysto Sheet @ \$6.00 = \$ 6.00

b. 6 Towels @ .17 = 1.02

c. 2 72" x 72" drapes @ 2.94 = 5.88

Total \$ 12.90

APPENDIX K

d. $\frac{\$12.90}{20^*} = \$0.645 = \$0.65$ per use

REUSABLE PACK CONTENTS AND USE COST FACTOR

2. F Pack

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

a. 1 Laparotomy Sheet @ \$5.00 = \$ 5.00

b. 1 Mayo Cover @ 4.00 = 4.00

c. 20 Towels @ .17 = 3.40

d. 2 54" x 90" drapes @ 2.50 = 5.00

Total \$ 17.40

e. $\frac{\$17.40}{20} = \0.87 per use

3. Laparotomy Pack (Used with F Pack)

a. 3 72" x 72" drapes @ \$2.94 = \$ 8.82

b. 2 Towels @ .17 = .34

*This figure represents the number times linen is used before it becomes unserviceable.

**Hendrick Memorial Hospital Newsclature.

REUSABLE PACK CONTENTS AND USE COST FACTOR

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Cysto Pack

- a. 1 Cysto Sheet @ \$6.00 = \$ 6.00
- b. 6 Towels @ .17 = 1.02
- c. 2 72" x 72" drapes @ 2.94 = 5.88

Total \$ 12.90

d. $\frac{\$12.90}{20^*} = \$.645 = \$.65$ per use

2. F Pack**

- a. 1 Laparotomy Sheet @ \$5.00 = \$ 5.00
- b. 1 Mayo Cover @ 4.00 = 4.00
- c. 20 Towels @ .17 = 3.40
- d. 2 54" x 90" drapes @ 2.50 = 5.00

Total \$ 17.40

e. $\frac{\$17.40}{20} = \$.87$ per use

3. Laparotomy Pack (Used with F Pack)

- a. 3 72" x 72" drapes @ \$2.94 = \$ 8.82
- b. 2 Towels @ .17 = .34

*This figure represents the number times linen is used before it becomes unserviceable.

**Hendrick Memorial Hospital Nomenclature.

7. c. 2 54" x 54" Wrappers @ \$2.50 = \$ 5.00

a. 1 Mayo Cover @ 54.00 = 54.00 Total \$14.16

d. $\frac{14.15}{20} = \$.708 = \$.71$ per use

4. CVR 1 Pack**

a. 4 54" x 54" Drapes @ \$1.62 = \$ 6.48

b. 1 Mayo Cover @ 4.00 = 4.00

c. 15 Towels @ .17 = 2.55

d. 2 54" x 90" Drapes @ 2.50 5.00

Total \$18.03

e. $\frac{\$18.03}{20} = \$.90$ per use

5. CVR 2 Pack**

a. 5 54" x 54" Drapes @ \$1.62 = \$ 8.10

b. 2 Towels @ .17 = .34

Total \$ 9.44

c. $\frac{\$9.44}{20} = \$.47$ per use

6. CVR 3 Pack**

a. 6 54" x 54" Drapes @ \$1.62 = \$ 9.72

b. 6 Towels @ .17 = 1.02

c. 3 54" x 90" Drape @ 2.50 = 7.50

Total \$20.76

d. $\frac{\$20.76}{20} = \$ 1.038 = \$ 1.04$ per use

e. $\frac{\$18.24}{20} = \$.912 = \$.91$ per use

7. Tonsil and Adenoid Pack

- a. 1 Mayo Cover @ \$4.00 = \$ 4.00
 b. 1 54" x 54" Drape @ 1.62 = 1.62
 c. 6 Towels @ .17 = 1.02

Total \$ 6.64

d. $\frac{\$6.64}{20} = \$.33$ per use

8. Peri Pack

- a. 1 Peri Sheet @ \$5.00 = \$ 5.00
 b. 1 54" x 54" Drape @ 1.62 = 1.62
 c. 6 Towels @ .17 = 1.02
 d. 2 54" x 90" Drapes @ 2.50 = 5.00

Total \$12.64

e. $\frac{\$12.64}{20} = \$.63$ per use

9. Bone Pack

- a. 6 54" x 54" @ \$1.62 = \$ 9.72
 b. 12 Towels @ .17 = 2.04
 c. 1 Mayo Cover @ 4.00 = 4.00
 d. 2 54" x 90" Drapes @ 2.50 = 5.00

Total \$20.76

e. $\frac{\$20.76}{20} = \$1.038 = \$1.04$ per use

10. Average Cost Per Pack: $\$6.46 \div 9 = \$.723 = \$.72$

SOURCE: Pack Room Recipe and Vendor Receipt Records, Hendrick Memorial Hospital.

DISPOSABLE SURGICAL PACK AVERAGE COST

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Cysto Pack

\$25.95 per case ÷ 5 packs per case = \$5.19 per pack

2. Laparotomy Pack

\$39.90 per case ÷ 5 packs per case = \$7.98 per pack

APPENDIX L

3. Litho

DISPOSABLE SURGICAL PACK AVERAGE COST

\$27.10 per case ÷ 5 packs per case = \$5.42 per pack

HENDRICK MEMORIAL HOSPITAL

4. Basic Pack

ABILENE, TEXAS

\$33.70 per case ÷ 10 packs per case = \$3.37 per pack

Total \$17.96 per pack

5. Average Cost Per Pack

\$17.96 ÷ 4 = \$4.46

SOURCE: Johnson and Johnson, Surgical Specialty Price List,
July 5, 1971.

DISPOSABLE SURGICAL PACK AVERAGE COST

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Cysto Pack

\$25.95 per case ÷ 5 packs per case = \$5.19 per pack

2. Laparotomy Pack

\$39.90 per case ÷ 5 packs per case = \$7.98 per pack

3. Lithotomy Pack

\$27.10 per case ÷ 5 packs per case = \$5.42 per pack

4. Basic Pack

\$33.70 per case ÷ 10 packs per case = \$3.37 per pack

Total \$17.96 per pack

5. Average Cost Per Pack

\$17.96 ÷ 4 = \$4.46

SOURCE: Johnson and Johnson, Surgical Specialty Price List,
July 5, 1971.

REUSABLE SURGICAL PACK COST SUMMARY
 AND COST COMPARISON
 HENDRICK MEMORIAL HOSPITAL
 ABILENE, TEXAS

1. Reusable Pack Costs

a. Laundry	\$.76
b. Delivery	.06
c. Repair	.18
d. Pack Room	1.47
e. Autoclave Room	.45
f. Operating Room	.30
g. Linen	.22
Total	3.88

APPENDIX M

REUSABLE SURGICAL PACK COST SUMMARY
 AND COST COMPARISON
 HENDRICK MEMORIAL HOSPITAL
 ABILENE, TEXAS

2. Average Cost per Disposable

Pack	<u>\$4.46</u>
Difference	(\$.58)*

*The Disposable Pack is \$.58 more expensive to use than its reusable counterpart.

SOURCE: Appendixes E through K.

REUSABLE SURGICAL PACK COST SUMMARY
 AND COST COMPARISON
 HENDRICK MEMORIAL HOSPITAL
 ABILENE, TEXAS

1. Reusable Pack Costs	
a. Laundry	\$.76
b. Delivery	.06
c. Repair	.18
d. Pack Room	1.41
e. Autoclave Room	.45
f. Operating Room	.30
g. Linen	<u>.72</u>
Total	\$3.88
2. Average Cost per Disposable	
Pack	<u>\$4.46</u>
Difference	(\$.58)*

*The Disposable Pack is \$.58 more expensive to use than its reusable counterpart.

SOURCE: Appendixes E through K.

PACK ROOM WORK LOAD REDUCTION
HENDRICK MEMORIAL HOSPITAL
ABILENE, TEXAS

1. Predisposables work load (pieces of linen per day): 2,646
2. Work load after experimentation began (pieces of linen per day): 1,176

PACK ROOM WORK LOAD REDUCTION 1,470

3. Per cent work load reduction: $2,646 - 1,176 = 1,470$ $\frac{1,470}{2,646} = .555 = 56\%$

ABILENE, TEXAS

SOURCE: Appendix F

PACK ROOM WORK LOAD REDUCTION

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

1. Predisposables work load (pieces of linen per day):	2,646
2. Work load after experimentation began (pieces of linen per day):	<u>1,176</u>
	Difference 1,470
3. Per cent work load reduction $1,470 \div 2646 = .555 = 56\%$	

SOURCE: Appendix F

PRESENT AUTOCLAVE SYSTEM
FROM CENTRAL SUPPLY DEPARTMENT

WHITE CYCLE TIME BY DISPLACEMENT TYPE	AMSCO "VACUUMATIC" 24x36x36" = 18.0 cubic feet	AMSCO Cyclomatic 24x36x48 = 24.0 cubic feet	AMSCO Cyclomatic 24x24x36 = 12.0 cubic feet
	TOTAL AUTOCLAVE SPACE ————— 54.0 cubic feet		

PROPOSED AUTOCLAVE SYSTEM USING CONVENTIONAL MEDICAL AIR REMOVAL SYSTEM

PLAN #1 CONVENTIONAL SYSTEM

CASTLE 20 minute cycle time MEDICAL AIR REMOVAL SYSTEM 24x36x60" = 36.0 cubic feet	PRICE
	\$23,635
24x36x60" 36.0 cubic feet	21,485
3.1 cubic feet	7,865
	53,150
(4) ONS AND CHARGES	7,450
TOTAL	\$60,600

APPENDIX O

REQUEST FOR EQUIPMENT REPLACEMENT

HENDRICK MEMORIAL HOSPITAL

ABILENE, TEXAS

PLAN #2 MODULAR PROCESSING SYSTEM

CASTLE 20 minute cycle time MEDICAL AIR REMOVAL SYSTEM 24x42x72" = 70.9 cubic feet	PRICE
	\$37,775
(4) ONS	3,140
TOTAL	\$40,915

PLAN #1
CONVENTIONAL SYSTEM

PLAN #2
MODULAR PROCESSING SYSTEM

PRICE	\$40,915
CONVENTIONAL SYSTEM	33,495
TOTAL	\$21,017

PRESENT AUTOCLAVE SYSTEM FROM CENTRAL SUPPLY DEPARTMENT

DESCRIPTION

30 MINUTE CYCLE TIME MECHANICAL AIR REMOVAL SYSTEM	{	AMSCO "VACUMATIC" 24" x 36" x 36" = 18.0 cubic feet	
30 MINUTE CYCLE TIME DISPLACEMENT TYPE		AMSCO CYCLOMATIC & Cryotherm COMBINATION 24 x 36 x 48	24.0 cubic feet
		AMSCO CYCLOMATIC 24 x 24 x 36	<u>12.0 CUBIC FEET</u>
TOTAL AUTOCLAVE SPACE →			54.0 CUBIC FEET

PROPOSED AUTOCLAVE SYSTEM USING CONVENTIONAL "MECHANICAL AIR REMOVAL SYSTEM"

PLAN #1 CONVENTIONAL SYSTEM

CASTLE	30 MINUTE CYCLE TIME MECH AIR REMOVAL SYSTEMS:	24 x 36 x 60 = 30.0 CUBIC FEET	\$ 22,635 ⁰⁰
		24 x 36 x 60	30.0 CUBIC FEET 22,635 ⁰⁰
		20 x 20 x 36	8.1 CUBIC FEET <u>7,865⁰⁰</u>
			53,135 ⁰⁰
	(4) CARS AND CARRIAGES		<u>7,405⁰⁰</u>
	TOTAL		<u>\$60,540⁰⁰</u>

PLAN #2 MODULAR PROCESSING SYSTEM

CASTLE	30 MINUTE CYCLE TIME MECHANICAL AIR REMOVAL SYSTEM:	26 x 62 x 76 = 70.9 CUBIC FEET	\$ 37,793 ⁰⁰
	(4) CARTS		<u>2,140⁰⁰</u>
	TOTAL		<u>\$39,493⁰⁰</u>

PRICE COMPARISON OF:	PLAN #1	3 MACHINES CONVENTIONAL METHOD	\$60,540 ⁰⁰
	PLAN #2	MODULAR PROCESSING SYSTEM	<u>39,493⁰⁰</u>
		SAVINGS (USING PLAN #2 WHICH IS 46% SAVINGS)	\$ <u>21,047⁰⁰</u>

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ABSTRACT

A STUDY OF SURGICAL PACK SYSTEMS AT HENDRICK
MEMORIAL HOSPITAL, ABILENE, TEXAS

A Problem Solving Thesis Submitted to the Faculty of Baylor University
in Partial Fulfillment of the Requirements for the Degree of
Master of Hospital Administration

by

Captain Jan G. Cox, MSC

August 1973

83 Pages

A copy of this document may be obtained from University Micro-
films, University of Michigan, Ann Arbor, Michigan 48108.

The purpose of this study was to determine the best
system of meeting the surgical pack requirements of the
Operating Room, Hendrick Memorial Hospital, Abilene, Texas.

The study compared the reusable and disposable surgi-
cal packs in terms of the issues of technical acceptability,
professional staff acceptance, storage, waste disposal,
source of supply, and costs and fringe benefits. Advantages
and disadvantages of disposables were discussed and compared
against criteria established for their adoption.

The disposable surgical packs were recommended to
supplement the reusable surgical packs.