A STUDY OF THE DRUG CONTROL AND DISTRIBUTION SYSTEM OF THE EARL K. LONG MEMORIAL HOSPITAL, BATON ROUGE, LOUISIANA

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

Major Chauncy P. Brothers, Jr., MSC

Waco, Texas

August, 1971

APPROVED BY THE U. S. ARMY MEDICAL FIELD SERVICE SCHOOL:

Director of the Program

APPROVED BY THE THESIS COMMITTEE:

William M. Harris
Chairman

Billy J. O'Barr

Jack A. Hammack

APPROVED BY THE GRADUATE COUNCIL:

William G. Island

DATE: August, 1971

UNITED STATES ARMY
AR735 — 17
LIBRARY MEDICAL FIELD SERVICE SCHOOL

ACKNOWLEDGEMENTS

The writer wishes to express his appreciation to the many individuals at Earl K. Long Memorial Hospital whose cooperation greatly aided in the preparation of this study, but in particular to Dr. G. Tipton McKnight, whose guidance and assistance were invaluable.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS ii

LIST OF TABLES v

LIST OF ILLUSTRATIONS. vi

Chapter

I. INTRODUCTION. 1

General Information. 1
The Hospital Setting and History 2
Conditions Which Prompted the Study. 3
Statement of the Problem 3
Definitions. 3
Objectives 4
Criteria 5
Limitations. 5
Assumptions. 5
Research Methodology 6
Literature Review. 7
Footnotes. 10

II. DISCUSSION. 12

Types of Medication Systems. 12
Earl K. Long Memorial Medication System. 15
Observation of Other Hospitals 23
A Medication System Employing Unit Dose. 24
Pharmacy 28
System Problems and Areas for Improvement. 29
Nursing Service Workload 53
Pharmacy Considerations. 54
The Proposed System. 63
Summary. 67
Footnotes. 68

III. CONCLUSION. 72

Conclusions. 72
Recommendations. 73

APPENDIX

A. DOCTOR'S ORDERS 75

B. PHYSICIAN'S ORDERS OR CARDEX 77

C. PHARMACY ORDER 79

D. DRUG ADMINISTRATION RECORD 81

E. PROPOSED DOCTOR'S DRUG ORDER FORM. 83

F. FREE FLOOR STOCK ITEMS 85

G. UNIT DOSE PACKAGING EQUIPMENT EXAMPLES 87

BIBLIOGRAPHY. 93

LIST OF TABLES

Table		Page
1.	Standard Times for the Administration of Medications at Earl K. Long Memorial Hospital	16
2.	Value of Floor Stocks, Three Medical-Surgical Nursing Units, Earl K. Long Memorial Hospital	33
3.	Cost Value of Pharmacy Orders Filled, Returns to Pharmacy for Credit, and Floor Stock Issues for Twelve Month Period February 1969 through January 1970.	45
4.	Pharmacy Workload for Twelve Month Period February 1969 through January 1970.	55

LIST OF ILLUSTRATIONS

Figure | Page

1. Value of Medications Dispensed. 49
2. Patient Days. 50
3. Predicted and Actual Medication Returns 51

CHAPTER I

INTRODUCTION

General Information

The entire spectrum of health care in the United States today is in a period of transition. The health care professions and institutions find themselves under almost constant attack both from within their own ranks as well as from the consumer.

A good measure of this new consciousness of the existence of large scale problems in various aspects of health care has been brought about by the tremendous increases in the costs of medical care. As a result of the publicity related to the cost increases, many aspects of the hospital's operations have been brought under very close scrutiny. While the original impetus for the scrutiny was soaring costs, whole new areas of the hospital's operations have been thrown open to public view and criticism as never before. Combined with the increasing application of management principles to health care institutions, the evolution of health care methods, revolutionary changes in hospital designs, and increased consumer demand for health care, the scrutiny has resulted in many innovations in various hospital systems.

One hospital system which has undergone considerable experimentation in the last eight to ten years is that which concerns the way a patient receives his medications. The traditional methods of supplying the patient with drugs are no longer sacrosanct and are, in fact, suspect--suspect from the standpoints of lack of control over the

drugs and danger to the patient. Much research and experimentation has been done in the area commonly referred to as unit dose systems, and it is with a system employing unit dose concepts that this study will deal.

The Hospital Setting and History

The Earl K. Long Memorial Hospital is a relatively new 260-bed general hospital, having opened March 5, 1968. The hospital is part of a system of eight charity hospitals operated by the state of Louisiana under its State Department of Hospitals. Its function is to serve the indigent population of an area comprising ten parishes around Baton Rouge. Prior to the opening of the Earl K. Long, the closest charity hospital for patients in the Baton Rouge area was Charity Hospital in New Orleans, a distance of some sixty miles from Baton Rouge.

It is interesting to note that an 1874 legislative act authorized this hospital to be built but construction didn't begin until ninety years later, in 1964.

At the time of this writing, two 35 bed nursing units are not yet operational but budgeting and staffing actions are underway in anticipation of opening.

As one of its major functions, the hospital provides facilities for medical intern and residency training programs. The hospital's staff is, in fact, comprised of interns and residents, with the chiefs of service being members of the Louisiana State University Medical School Unit located at the hospital. In addition to intern and resident training, seven other college level programs are underway at the hospital at the present time.

Conditions Which Prompted the Study

After nearly two years of operating experience with the present medication system at the Earl K. Long, the superintendent felt that the system might not provide effective control over drug inventories on the nursing units and might also be lacking in the area of patient safety. As a result, he requested that a study be performed to completely explore the operation of the present system, determine its weaknesses, and recommend potential areas for improvement of patient safety and drug inventory control. He expressed particular interest in directing the study toward determining a medication system for the hospital which would employ unit dose concepts.

Statement of the Problem

The problem is to determine a unit dose type drug control and distribution system for the Earl K. Long Memorial Hospital, Baton Rouge, Louisiana.

Definitions

Unit dose packaging is the placement of a single dose of medication in its own individual container. The container is normally labeled with the name of the drug, the drug strength, the manufacturer's control number, and, if appropriate, an expiration date.

Unit dose dispensing is the dispensing of a single dose of medication a short time prior to the scheduled administration time for that dose, as opposed to the more traditional method of dispensing multiple doses to the nursing station for use over several days of scheduled administrations.

For the purposes of standardization, the now classic Barker and McConnel medication error definitions were applied in this study.[1] In simplified form the six types of medication errors are as follows:

1. Omission--Failure to give a prescribed dose.

2. Wrong dosage--an amount more or less than the prescribed amount by five per cent.

3. Extra dose--a dose in excess of that prescribed.

4. Unordered drug given--a drug administered for which the physician has given no order.

5. Wrong dosage form--medication administered by an incorrect method, e.g., giving a drug orally that should have been injected.

6. Wrong time--administration more than thirty minutes before or after the scheduled time.

Stat is taken from the Latin statim, and means "immediately."[2]

Prn is taken from the Latin pro re nata, and means "when necessary."[3]

Objectives

The objectives of this study were to:

1. Analyze and evaluate the medication system presently in use at the Earl K. Long Memorial Hospital.

2. Determine areas of the present system which appear to contribute to a lack of medication inventory control, potential areas for medication errors, and associated weaknesses.

3. Consider the benefits to be derived in the problem areas from application of unit dose concepts.

4. Determine a total unit dose system which could be implemented

at the Earl K. Long Hospital.

Criteria

Any proposed solution to the above problem should:

1. Provide a copy of the physician's original drug order to the pharmacist.

2. Provide for complete identification of the patient, drug, and exact dosage administered.

3. Reduce medication stocks required on the wards.

4. Minimize the possibility of medication errors.

Limitations

Several manufacturers have developed equipment, perhaps best described as sophisticated vending machines, for the purpose of mechanically dispensing unit dose packaged drugs. The machines are normally located at nursing stations, filled by pharmacists, and operated by nursing personnel to obtain patient drug supplies. Such machines are excluded from this study as the present policy of the Louisiana Board of Pharmacy does not permit the dispensing of drugs by mechanical means.[4]

Assumptions

It is assumed that:

1. The Earl K. Long Memorial Hospital will be able to obtain authorization to staff new positions if required and that fiscal resources will be available for pharmacy alterations and equipment purchase.

2. Adequate space would be made available in the general stores area for bulk drug storage displaced by higher storage require-

ments of unit dose packaged items in the pharmacy.

3. Adequate space would be made available to the pharmacy for installation of drug packaging equipment.

Research Methodology

Observation and unstructured interview techniques were used to determine precisely how the present medication system functions at the Earl K. Long Hospital. The complete system was examined beginning with the writing of the medication order by the physician, through dispensing, preparation and administration of the drug, to filing of the drug order in the pharmacy's prescription file.

Interviews were conducted with the hospital superintendent and the medical director of the Louisiana State University Unit at the hospital to determine the objectives of the study and those areas where the medication system was viewed as being unsatisfactory.

The director and associate director of nurses were interviewed, as were the supervisors of the medical-surgical and obstetrical services, to determine policies and their sources, written and verbal, on all facets of the medication system directly concerned with the nursing service.

Floor nurses engaged in patient care, to include medication preparation and administration, were interviewed on all nursing units except obstetrics and nursery. These interviews were conducted with a view toward unearthing problems with the present medication system which would not be readily observable, and determining the actual operating details of the system for comparison with that prescribed by hospital policies.

All members of the pharmacy staff were interviewed to assist in the analysis of the pharmacy portion of the system.

The hospital's incident report file was examined to determine the reported medication error rate for comparison with data in the literature.

A physical inventory of the medications stocked on the nursing units supporting about 45 per cent of the hospital's operating beds was performed to determine value of the inventory for comparison with data in the literature and potential loss predictions.

Pharmacy records were examined to determine current workload for comparison against data in the literature and prediction of effects of system changes. Costs of drugs dispensed and returned to the pharmacy were also determined for use in evaluating system losses.

The literature was reviewed for systems applied to similar institutions, methods of predicting drug losses, pharmacy and nursing service workload changes, and recommendations of national agencies directly concerned with medication systems in the hospital.

Other hospitals in Baton Rouge and its vicinity were visited for comparative purposes and to gain a more thorough understanding of hospital medication systems.

Literature Review

Much has been written concerning various aspects of drug distribution and control. Since about 1960 a considerable body of journal articles has appeared relating to innovations in drug distribution or medication systems based, in some measure, on unit dose concepts.

One very frequently discussed aspect of the medication system is

the manner and form in which the pharmacist receives the order for medications. Many writers treat this problem as an integral aspect of the drug distribution system. It is considered that receipt of a copy of the physician's original drug order is essential.[5] Review and interpretation of the physician's prescription has been stated to be both an ethical and legal responsibility of the pharmacist.[6]

The unit dose concept has two separate aspects: unit dose packaging and unit dose dispensing.[7] Unit dose package refers to the placing of a single dose of medication inside a separate and distinct package or container, ready for administration to the patient.

The unit dose dispensing concept is not so simply defined, however. Basically, it involves providing medications to the patient packed in unit dose form, but the method of getting the drug from the pharmacy to the patient varies widely. One technique has been to completely centralize the system, with preparation and administration of all medications done entirely under pharmacy control by medication nurses employed by the pharmacy.[8] Other systems have been devised which centralize preparation but leave administration to the ward nurse.[9]

The problem of controlling drug inventories where floor stocks exist is generally recognized. Drug losses have been found to occur from spillage, spoilage, pilferage and failure of personnel to charge for drugs administered from floor stock.[10] Medication systems using unit dose concepts have been found to reduce such losses appreciably.[11]

Although the time spent by nurses in the preparation and administration of drugs varies widely, a reduction in that time appears to result when unit dose concepts are adopted to any degree.[12] Where unit dose packaged drugs are supplied for administration by the

ward nurse, the savings accrue through reduction in preparation time. In a completely centralized preparation and administration system the ward nurse has a nearly 100 per cent medication workload reduction.

Patient safety is enhanced in several ways.[13] Unused drugs returned to the pharmacy may be used without fear of contamination, as individual packages remain unopened. Drug information ordinarily found only on the bulk package, to include name, strength, control number, and expiration date, if appropriate, can be printed on each individual dose package, thus providing complete identification of the drug at the time of actual administration. Medication errors in the total medication system have been found to be reduced upon implementation of a system employing unit dose concepts.[14]

Costs are difficult to evaluate until a system is installed and functioning. However, costs will be entirely dependent upon the type of system employed. Since a large portion of most medications used in a hospital are not available in prepackaged unit dose form from the manufacturers, a full unit dose system requires investment in packaging equipment.[15] Additional pharmacy costs may or may not be encountered, depending upon the system. Use of unit dose packaging and conventional dispensing will probably result in reduced personnel costs, while preparation of medications in the pharmacy for administration or complete preparation and administration from the pharmacy will result in workload increase.[16]

An additional factor in the cost area is the processing of medications returned to the pharmacy, occupying as much as 22 per cent of the time of pharmacy personnel under a conventional system.[17] Unit dose dispensing, providing only one dose per patient at the prescribed

administration time, almost eliminates the workload costs of returns at both the nursing station and the pharmacy. Pilferage loss of misappropriated unreturned unused medications is also obviously reduced under unit dose dispensing.

Footnotes

[1]Kenneth N. Barker and William M. Heller, "The Development of a Centralized Unit Dose Dispensing System for U.A.M.C., Part VI, The Pilot Study-Medications Errors and Drug Losses," American Journal of Hospital Pharmacy, XXI (December, 1964), 610.

[2]Alvin Felmeister, "The Prescription," in Remington's Pharmaceutical Sciences, ed. by Eric W. Martin (Easton, Pennsylvania: Mack Publishing Company, 1965), p. 1681.

[3]Ibid.

[4]Louisiana Board of Pharmacy, Louisiana Pharmacy Law (Baton Rouge, Louisiana: Louisiana Board of Pharmacy, January 1, 1970), p. 17.

[5]M. Danile Knight, Sr. and K. Kim Cowley, "A One-Year Look at Unit Dose," Hospital Progress, L (January, 1969), 28; Harold J. Black and William W. Tester, "Decentralized Pharmacy Operations Utilizing the Unit Dose Concept," American Journal of Hospital Pharmacy, XXI (August, 1964), 346.

[6]American Society of Hospital Pharmacists, "Statement on Hospital Drug Distribution Systems," American Journal of Hospital Pharmacy, XXI (November, 1964), 535.

[7]Black and Tester, "Decentralized Pharmacy Operations," p. 346.

[8]Knight and Cowley, "A One-Year Look at Unit Dose," p. 27.

[9]R. Gary Freund, "How the Centralized Unit-Dose Concept Works in a Community Hospital," Hospitals, XL (September 16, 1966), 154.

[10]Alfred R. Kurtz and James L. Smith, "Three Dimensional Drug Losses," Hospital Topics, XXXIX (April, 1961), 53.

[11]Barker and Heller, "Pilot Study-Medication Errors," p. 625.

[12]R. H. Weinzettel, "A Unit Dose Dispensing System Without Extensive Capital Expenditure," Hospital Management, C (September, 1965), 86; Freund, "Centralized Unit-Dose Concept," p. 136.

[13]Grover Bowles, Jr., "Strip Packaging Contributes to Patient Safety," Modern Hospital, C (May, 1963), 136.

[14]Kenneth N. Barker and Warren E. McConnell, "The Problems of Detecting Medical Errors in Hospitals," American Journal of Hospital Pharmacy, IXX (August, 1962), 368; Kenneth N. Barker, "The Effects of an Experimental Medication System on Medication Errors and Costs, Part One: Introduction and Errors Study," American Journal of Hospital Pharmacy, XXVI (June, 1969), 163.

[15]Robert L. Laptos, "Pharmacy," Hospitals, XLIII (April 1, 1969), 163.

[16]W. G. Blasingame et al., "Some Time and Motion Considerations with Single-Unit Packaged Drugs," American Journal of Hospital Pharmacy, XXVI (June, 1969), 314.

[17]Freund, "Centralized Unit-Dose Concept," p. 156.

CHAPTER II

DISCUSSION

Types of Medication Systems

The American Society of Hospital Pharmacists and most writers in the area indicate that there are three basic medication systems or, to use the older terminology, drug distribution systems, in general use in hospitals at the present time.[1]

Individual prescription order system

The individual prescription system is, in many respects, not unlike the relationship found among the physician in private practice, his patients, and the pharmacist in the community pharmacy. In that setting, the patient visits the physician for treatment and consultation, the physician writes a prescription for whatever medications may be indicated, and the patient subsequently presents the prescription to the pharmacist. Upon receipt, the pharmacist reviews and interprets the prescription and then dispenses the medication to the patient, who in turn administers it to himself.

In hospitals using the individual prescription system, the variations from the community situation just described lie in the visitation of the patient by the physician, rather than vice-versa, and the procurement from the pharmacist and administration of the medication by the nursing staff.

In this system the physician most commonly writes the prescription or, as it is usually called in the hospital environment, medication order, directly on the patient's chart. That being done, the physician leaves the rest of the medication process up to the hospital, with little more thought to it. At a later time, the medication nurse or some administrative assistant, such as a ward clerk, will transcribe the order from the chart onto several other forms, one of which will be sent to the pharmacy to request the drugs.

When the request form arrives at the pharmacy the pharmacist reviews and interprets it, dispenses the medication, labels the container with drug and patient identification, and returns it to the nursing unit. At the nursing unit, the medication is placed in a storage area assigned to the specific patient for whom the drug is intended.

When the scheduled time for the medication arrives, the nurse removes the medication container from the storage area, prepares the medication for administration as required, and administers it. Upon completion of the administration, the nurse records the time of administration in the patient's chart.

Complete floor stock system

The complete floor stock system is characterized by the stockage of bulk drugs on the nursing unit. The usual terminology of "complete" is somewhat of a misnomer, however. Drugs which are seldom used, are extremely expensive, require special temperature and humidity conditions, or require special controls, are usually retained in the pharmacy and dispensed from there on an "as required" individual prescription order basis.

In the floor stock system, the role of the pharmacist is greatly reduced. Once the physician writes the order, it is the nurse who must review and interpret it and subsequently dispense the medication. The nurse must requisition bulk drug supplies from the pharmacy, as well as the special exception drugs just mentioned, but is otherwise completely responsible for the medication cycle. A moments reflection will reveal that this is in no way analogous to the customary physician-pharmacist-patient relationship outside the hospital environment. In fact, the pharmacist-like duties performed by the nurse in the floor stock system are illegal outside the hospital, where only pharmacists, physicians, or dentists are permitted by state law to dispense drugs to human patients.

Floor stocks have, however, been perpetuated, particularly in hospitals operated by state and federal governmental agencies where patients are charged on a per diem basis.

The medication preparation and administration aspects approximate those in the individual prescription system.

Combination individual order and floor stock system

Essentially, the third system is some combination of the first two and is probably the system in most common use in hospitals today. In this system a stock of basic drugs is maintained on the nursing unit, theoretically of the non-prescription variety. Observations made during the research for this project indicated that, in all hospitals studied, some prescription type drugs were carried in floor stocks, regardless of existing policies.

Although specific interviews and inventories were not conducted in this regard, the impression gained was that the fewer hours the pharmacist was available, the more prescription type drugs would be found on the nursing unit.

Of course, in many hospitals a free floor stock is found, wherein very common non-prescription drugs are kept, such as castor oil and aspirin, for which no specific charge is made to the patient, the cost being covered in the basic room charge.

The functioning of this system, then, is dependent upon the type of drug ordered by the physician. If it is a prescription item, hopefully it will not be on the nursing unit but will require an order from the pharmacy. If it is a floor stock item, then it is provided by the nurse.

Preparation and administration remain relatively unchanged in this system also.

Earl K. Long Memorial Medication System

The system of drug distribution presently in use at the Earl Long is referred to by some members of the staff as a modified unit dose system but more closely resembles the conventional combination of an individual prescription order system and floor stock system.

Medication ordering

The core or mainstay of the medication system is the routine medications ordered by the physician for administration to the patient on some type of a scheduled basis. Unless the physician specifies otherwise, medications are administered on a time schedule established as a matter of hospital policy, according to the frequency specified by the

physician in his order. Adherence to a standard time schedule allows more economical use of the time of nurses administering the medications and greatly facilitates the planning of other required patient care activities on the ward. The schedule presently used at Earl Long is shown in Table 1. Present policy calls for the avoidance of the hours between midnight and 6:00 A.M. for medication administration, whenever possible, to minimize patient discomfort resulting from being awakened during normal somnolent periods.[3]

TABLE 1

STANDARD TIMES FOR THE ADMINISTRATION OF MEDICATIONS AT EARL K. LONG MEMORIAL HOSPITAL

Doctor's Orders	Scheduled Administration Times
Daily	8 A.M.
Twice daily	8 A.M. - 8 P.M.
Three times daily	8 A.M. - 2 P.M. - 8 P.M.
Four times daily	8 A.M. - 12 noon - 4 P.M. - 8 P.M.
Hour of sleep	9 P.M.
Every 12 hours	8 A.M. - 8 P.M.
Every 8 hours	8 A.M. - 4 P.M. - 12 P.M.
Every 6 hours	6 A.M. - 12 noon - 6 P.M. - 12 P.M.
Every 4 hours	8 A.M. - 12 noon - 4 P.M. 8 P.M. - 12 P.M. - 4 A.M.

Source: Earl K. Long Memorial Hospital, Nursing Procedures (Baton Rouge, Louisiana, July, 1968), p. 202.

There are two other medication situations which also occur. The physician's orders for these are "Stat" and "Prn." There is some confusion among members of the hospital staff interviewed, including physicians, nurses, and pharmacy staff, concerning the appropriate use of the term "Stat." Some felt it was to be used only in an emergency situation

while others felt it carried only the connotation of administration of a routine medication at the approximate time the order was given rather than waiting until the next standard medication administration time. The hospital's nursing procedures manual defines "Stat" as simply meaning "immediately," without further amplification.[4]

"Stat" orders are so marked on the pharmacy order and are filled and returned on a priority basis by the pharmacy. "Prn" orders vary, in that quantity returned to the floor is not the standard three day supply but varies with the type of medication ordered.[5]

By and large, the routine, scheduled medications account for the majority of the medication workload for the pharmacy and for that portion of the ward nurses' time devoted to preparation and administration of medications. The routine medication cycle begins when the physician writes his orders in the patient's chart, indicating the medication to be administered, the dosage or amount to be given each time, and the schedule or frequency of administration. The route of administration, such as oral, intramuscular, or other, is also specified, as some drugs are manufactured in several forms for administration according to the route yielding the most desirable response. The orders are written on Doctor's Orders, DOH form 6-29, an example of which will be found in Appendix A.

As a matter of policy, verbal or telephone medication orders are acceptable in emergencies only and must be entered on the patient's chart by the ordering physician within twenty-four hours after the medication is first administered to the patient.[6]

There are two different situations wherein the physician writes medication orders. The first occurs prior to the admission of the

patient to the hospital. That is, when the physician determines during the course of examination or treatment in one of the hospital clinics or the hospital's emergency room that the patient should be hospitalized, he frequently writes orders for necessary medications at the same time he orders the patient admitted to the hospital.

The Doctor's Orders sheet becomes a part of the basic patient chart assembly prepared during the admission procedure. The chart, with the order sheet contained therein, is then hand-carried by a nurse's aide or other individual, from the admission office or emergency room, who accompanies the patient to the nursing unit to which he has been assigned.

Upon arrival at the nursing unit, the medication orders in the physician's handwriting are interpreted and transcribed onto three different documents by the nurse in charge of that particular nursing unit.

The medication order is transferred to the Physician's Orders, EKLH form 222, which is also known as the kardex or cardex form. The kardex is kept in pencil and is a succinct current record of the patient's treatment regimen. An example of this form will be found in Appendix B.

Next, the order is transcribed to a small card called a medicine or medication card, which may be either a yellow form entitled Tear Card, EKLH form 220, or a white form entitled Medications, EKLH form 218. The white form is used for a routine medication and the yellow for "Stat" medications. Examples of these cards will be found in Appendix B. The medicine card is then placed in a special rack or file arranged by scheduled administration times.

The second situation where the physician writes a medication order occurs when the physician determines, at some point during the patient's period of hospitalization, to initiate therapy with some particular drug. He then writes the necessary orders on the Doctor's Orders sheet, already located in the patient's chart, at the nursing station for the ward on which the patient is hospitalized. Subsequent actions in this instance are identical with those described above, beginning with the interpretation and transcription of the orders.

The next phase of the system involves the actual procurement of the prescribed drug by the nurse. The usual method is for the nurse to again transcribe the order that the physician has written. The transcription is made to a Pharmacy Order, SLH form 053, to which are added the physician's name, the nurse's initials, and the mechanically imprinted patient identification data. The completed form is placed in a pneumatic tube system carrier, the correct dial setting is made on the carrier, and the form is then dispatched to the pharmacy. An example of the Pharmacy Order, a three-part, carbon interleaved form, is shown in Appendix C.

Pharmacy action

Upon arrival at the pharmacy the carrier is removed from the pneumatic tube receiver, opened, and the pharmacy order removed.

The first action taken depends on whether the carrier holds single or multiple orders. If it holds multiple orders, as is often the case after physicians make rounds to visit patients, orders are separated into whatever is perceived as convenient groupings by the pharmacist assistant. The pharmacist assistant then types a label for the medi-

cation, including thereon the patient's name, room number, bed number, full nomenclature of the medication, and the initials of the typist and the pharmacist who will dispense the medication. The labels are usually pre-stamped in bulk by a rubber stamp with the date, obviating the need for typing on the form.

The appropriate bulk drug container is located and brought to the work table, ordinarily by the pharmacist assistant. The next step is that which is defined as constituting dispensing of the medication, according to the chief pharmacist at Earl K. Long. In this step the pharmacy order is read and interpreted and the proper medication is transferred from the original manufacturer's container to that from which the nurse will supply the patient with medication. If it is in capsule or tablet form it will ordinarily be poured onto a device used to aid counting, counted, excess returned to the bulk container, and counted medication placed in a new container. Liquid medications are ordinarily decanted directly into graduated glass bottles. Present policy is to dispense a three-day supply of medication, which is based on the frequency of medication or dosage schedule as stated on the pharmacy order form.

If the product dispensed is dry (tablet or capsule) the label is inserted into the medication container, which is a clear plastic vial. In the case of a liquid or other non-dry form, the label is affixed to the outside of the container. If multiple orders are being filled, the container is placed on top of its respective order form and left there until other orders being filled are completed.

When all orders are completed, each medicine container's label is again checked against the pharmacy order form, the second copy of the

order form is removed from the others, and the medication and second copy are placed in the dumbwaiter. After all medications intended for a specific nursing unit are on the dumbwaiter, the nursing unit is advised by telephone that the order is being delivered and the dumbwaiter is dispatched to the proper floor. The telephone notification is essential, as the dumbwaiter, being centrally located to serve two nursing units, cannot be viewed from either nursing station.

If only a single or small number of drug orders is involved, the pneumatic tube may be used to send them to the nursing unit.

Nursing unit actions

Upon receipt, the drug is removed from the pneumatic carrier or dumbwaiter and compared for correctness against copy two of the Pharmacy Order which has been returned with it. The drugs are then placed in a small medication drawer, one of which is assigned each patient.

The administration of the routine medication begins with the transfer of the medicine card from its place on the rack or file to a medication tray at the appropriate time, as indicated by the card's position on the rack, by hour of administration. Using the medicine card as a guide, the medication is retrieved from the patient's medication drawer and the label on the medication checked against the medication card. Provided the medication label and medicine card are in agreement, the medication is transferred to the medicine tray in the proper amount, following the procedure prescribed in the nursing procedures manual. Tablets or capsules are transferred to the drug container lid for counting purposes then into a souffle cup prepositioned on the medicine tray in front of the appropriate medication card.

Liquids are handled and checked similarly except that they are poured into a graduated medicine cup rather than a souffle cup, allowing exact dose measurement.

Following the transfer of medication, the label of the drug container is again checked against the medicine card for verification. When all medications for a patient have been poured, the nurse returns the drug containers to the medication drawer and checks each label against the medicine card for that patient, thus providing three self-checks of her own preparation process.

If the medication is to be administered by hypodermic injection, the standard medicine tray is not used but is replaced by a small plastic tray. The medication card is removed from the rack and placed on the tray. The necessary syringe, needle, and alcohol swabs are also obtained and placed on the tray. The medication is removed from the patient's medication drawer and the container label is checked against the medication card.

The container is prepared for withdrawal of the solution into the syringe, according to whether it is a multiple dose sealed vial or a single dose glass ampoule. Prior to filling the syringe a second comparison is made of the drug label and medication card. When the drug is returned to the medication drawer or the empty container discarded, a third verification check is made between the label and the medication card.

Upon completion of the preparation phase, the tray containing the drugs is taken to the patient's bedside where the patient's identification is verified by comparing his hospital identification bracelet with the medication card. The medication is subsequently administered.

The medicine tray is returned to the preparation area after all medications have been administered, is cleaned, and the medicine cards are returned to the appropriate place in their rack.

Once the administration of the medication is complete, it is recorded on the Drug Administration Record, EKLH form 225, an example of which is located in Appendix D. The recording is done by the nurse administering the medication.

The preceding, in essence, constitutes the routine medication system in use at the Earl K. Long, as reported in interviews and observed by this writer.

Observation of Other Hospitals

In order to gain additional insight into hospital medication systems, four other hospitals were visited and studied. Two of them were the remaining two general hospitals in Baton Rouge: Our Lady of the Lake Hospital and Baton Rouge General Hospital. The third hospital observed was Lane Memorial Hospital at Zachery, Louisiana, about thirty miles north of Baton Rouge, and the fourth was Lakewood Hospital at Morgan City, Louisiana, approximately seventy miles south of Baton Rouge.

The systems in use at all except the Morgan City hospital proved to be very similar, both in general concept and basic operation, to that presently in use at the Earl Long. That is, a combination of floor stock and individual prescription order systems was being used. Most items were being dispensed from standard bulk containers in a three day to one week supply when isued on individual prescription from the pharmacy. Certain drugs were dispensed by the nurse from

floor stock bulk containers and in all cases certain items were issued from floor stock without charge to the patient. The latter were considered to be included in the basic room charge.

No extensive use was being made of prepackaged medications in a unit dose form in any of the first three hospitals mentioned. However, all indicated some limited use of a few items in the past or at present. Reactions to the unit dose packaging concept varied but two chief pharmacists reported very poor acceptance on the part of nursing service of the unit dose packages. Two reported their limited space precluded further expansion in the use of unit dose packaged items, due to the greater storage space requirements.

A Medication System Employing Unit Dose

The system in use at the Lakewood Hospital in Morgan City proved to be quite different from the more conventional systems found in Baton Rouge and Zachery.

Although the hospital was reluctant to classify itself as a unit dose system, it was operating a relatively centralized medication system employing unit dose prepackaged medications almost exclusively.

Perhaps the most striking difference found at Lakewood was in the manner in which the medications are prepared and administered. All medications are prepared in the pharmacy medicine room by a team of medication nurses under the supervision of a pharmacist and are subsequently administered to the patient by the same nurses. The medication nurses are employed by the pharmacy department and are directly supervised in their activities by a pharmacist.

The Lakewood system begins, as do the others, with the writing

of the medication order by the physician prior to admission of the patient. Following admission procedures, the ward nurse transcribes the doctor's orders to the medicine card, nurses' notes, and the cardex. At the same time, the ward clerk is preparing a form called a pharmacy ticket with the patient's identification data. Seven drug orders for one patient can be entered on the form, which provides for recording, by a check mark, the time and frequency with which each medication is to be administered during one twenty-four hour period beginning at midnight. Also provided are spaces for checking the route of administration and pricing each day's drugs administered. When the medicine card and pharmacy ticket are ready they are hand carried to the pharmacy. The medicine card is placed in a rack or file according to the next scheduled time of administration, much the same as was being done on the nursing stations at the other hospitals observed. The pharmacy ticket is filed for use by the pharmacy clerk.

At the time indicated by the medicine card scheduling rack, the medications are prepared by the medication nurse. The preparation is a highly simplified procedure due to the almost exclusive use of unit dose packaged drugs. The nurse has merely to perform the functions of a stock picker in choosing the package described on the medicine card, since each single dose of medications is in a fully labeled package.

As in the system in use at Earl Long, each patient has a medication drawer labeled with his name and room. However, the medication drawer units are carried on mobile carts which accompany the medication nurses from the pharmacy to the bedside of each patient.

Once the drugs have been picked by the nurse, the pharmacist

reviews each prescription against the medicine card before they are placed on the medication cart.

The nurse moves the cart to the patient's room, checking the nametag on the room door against the name on the appropriate medication drawer.

Upon completion of the administration of all medications the nurse returns to the pharmacy medicine room and deposits the medicine cards in a container for the pharmacy clerk. The pharmacy clerk, using the presence of the medicine cards as evidence of administration, records the administration on the pharmacy ticket of each patient by using the initials of the medication nurse. The pharmacy clerk then reviews all pharmacy tickets for the area covered by the medication nurse to ensure that all medications previously indicated as scheduled on the pharmacy ticket were, in fact, administered. If a pharmacy ticket is discovered to show a scheduled medication for which there is no medicine card, the clerk immediately investigates to determine the reason for the discrepancy.

All medication cards are returned to the nursing station at the end of each pharmacy clerk's shift, which coincides with the nursing service shifts of 7:00 A.M. to 3:00 P.M., 3:00 P.M. to 11:00 P.M., and 11:00 P.M. to 7:00 A.M. The ward nurse sorts the medication cards upon receipt to determine which medications will be required to be given on the next shift. The medicine cards for those patients who will require medication on the next shift are then returned to the pharmacy medicine room and the cycle begins anew. As has been noted, however, preparation of the medications is accomplished on each shift by the nurse who will administer them.

A copy of all pharmacy tickets is sent to the nursing station at midnight each day, for inclusion of medication administration information in each patient's chart.

Under the Lakewood system no drugs are kept at the nurses' station. That is, there is no floor stock. Thus, both "Stat" and "Prn" medications must also be dispensed from the pharmacy whenever they are required. Both types are initiated by a call from the ward nurse to the pharmacy.

While the medication is being prepared at the pharmacy, the ward nurse is preparing the medication card. After preparation and checking by the pharmacist the medication nurse proceeds to the nursing station, picks up the medication card, and administers the medication.

There are several other factors of particular interest in this system. The ward nurse is relieved entirely, except in rare instances, from the burden of preparation and administration of medications. The medication nurse, on the other hand, has no duties other than the preparation and administration of medications.

Intravenous solutions into which additives must be introduced are treated like any other medication requiring the professional attention of a pharmacist in mixing and compounding. That is, all additives are introduced only by the pharmacist, not by a nurse, prior to dispensing for administration.

Because of the extensive use of the unit dose concept, Lakewood has found it necessary to install its own packaging equipment. Although automatic strip packaging equipment is used for tablets and capsules, a completely manual system is in use for liquids.

A number of drugs are available from manufacturers in unit dose

form but the majority of unit dose medications dispensed at Lakewood are those prepackaged from bulk containers by the pharmacy.

Pharmacy

The Earl Long pharmacy is presently staffed with two registered pharmacists and two pharmacist assistants. The chief pharmacist and the two assistants are hospital employees and thus Louisiana state civil service employees. The second pharmacist does not have civil service status but is employed by Louisiana Family Planning Program, Incorporated, a nonprofit corporation, pursuant to an agreement between that agency and the State Department of Hospitals. For all practical intents and purposes, however, he functions as an employee of the hospital in his capacity as a pharmacist, as the agreement places such employees under the administrative control of the superintendent of Earl K. Long Memorial.[7]

Physically, the pharmacy contains 745.25 square feet in the compounding and dispensing area, an office and entryway area of 128.25 square feet, and a storage area of 212.75 square feet. A separate area of 33 square feet is also used for alcohol storage at another location in the hospital, for a total pharmacy area of 1,119.25 square feet. A small additional area is used in the general stores section of the hospital for storing non-drug items such as prescription vials and bottles.

Although the pharmacy has adequate space for its current operations, it is about 20 per cent smaller than the United States Public Health Service guidelines for a hospital of this size.[8] The fact that no outpatient dispensing is done probably accounts for the fact that the space is adequate.

The pharmacy is well located in a central position on the ground floor of the hospital and the pharmacy entrance is only twenty feet from the service elevators. Both factors contribute to the ease with which the pharmacy can service the hospital's nursing units. Although remote from the outpatient's department, this is not a consideration as medications are not dispensed to outpatients at this hospital. All prescriptions written for outpatients or for patients being discharged must be filled at a local commercial pharmacy. As a point of interest, it was discovered that there is no commercial pharmacy where outpatients can have prescriptions filled anywhere in the vicinity of the hospital.

System Problems and Areas for Improvement

As has been noted, the medication system at the Earl Long is a combination individual prescription and floor stock system.

The system does, of course, work. As presently constituted, however, there are several problem areas which can be seen but which can very likely be improved upon with a minimum of personnel turbulence and monetary investment.

Doctor's drug order

One of the first problems which is apparent is the method whereby the pharmacist receives the medication order. Generally speaking, in any system, the pharmacist will receive either a copy of the original order in the physician's own handwriting or a transcribed copy of the order made by a nurse or some type of clerical assistant.

In the Earl Long system, as is apparently the case in most hospitals, the pharmacist receives only a transcribed copy of the medication order, which has been made by the nurse. There is no way to tell whether this is a first, second, or third transcription of the order,

as the transcription of the order to the cardex, medicine card, and pharmacy order form is not accomplished in a standardized manner.[9] At best, the pharmacist could receive a first transcription, made directly from the doctor's order sheet, which should be the case. At worst, it is conceivable that the pharmacy order could be transcribed from the cardex, which could have been transcribed from the medicine card, which would have been transcribed from the original Doctor's Order sheet.

It should be apparent that each time a transcribing of the order occurs, albeit only once, an opportunity for error has crept in--an opportunity which occurs as many as four to six times in most hospitals for an average drug order and becomes one of the basic problems in medication errors.[10]

Another facet of this problem area revolves around the question of professional responsibilities of the nurse and the pharmacist. Black and Tester, citing hospital law literature, are of the opinion that: "Activities associated with dispensing of medications are pharmacy functions and should be performed by pharmacists."[11] Thus, when the pharmacist does not receive a copy of the orginal medication order to interpret, the nurse (or perhaps even a clerk) is in fact performing a part of the function for which the pharmacist is responsible. While it is true that the pharmacist can interpret the transcribed copy of the order, he may well be interpreting an error.

If the pharmacist has available to him a copy of the original order, then another advantage will accrue, that of two professional checks of the original order--the nurse and the pharmacist.

It is significant to note here that both the American Society

of Hospital Pharmacists and the Joint Commission on Accreditation of Hospitals take the position that the availability of a copy of the original medication order to the pharmacist for interpretation is of sufficient importance to specifically recommend it.[12]

In order to arrive at a method of making a copy of the physician's medication order available to the pharmacist, two possibilities were considered. The first was a complete redesign of the Doctor's Orders sheet into a multiple copy form with chemical image transfer. With this system, the first page of the form would be redesigned into from three to five separate spaces for the writing of single orders, either treatment or medication. The second copy of the form would be attached to the first along one perforated edge with another perforation separating each order area. After a medication order was written, the second copy of it could easily be removed by a ward clerk or the nurse, placed in the pneumatic tube and sent to the pharmacy.

At the pharmacy the copy could be read and interpreted, the order filled, and the prescription held for file as required by law. This solution was not considered too desirable for two major reasons, among others: marking of the second copy could constitute a problem with the present automated stamping equipment, although that might be resolved with additional experimentation. The second problem deals with the future. The hospital is scheduled to participate in a state operated computer billing system which requires a card input for keypunch use. Use of the multiple copy doctor's order form would necessitate the use of an additional form for billing purposes when the computer system is implemented.

An alternate possibility seems to show more promise. By rede-

signing the pharmacy order form, it could easily be converted to a doctor's drug order form. Rather than creating more forms, this would be redesigning an old one for the same general use.

One or two copies of the revised form could be prestamped with the patient's identification data and kept in the chart ready for use. At least two writers, Black and Tester, advocate separate doctor's drug order forms from the standpoint of patient safety, to prevent drug orders from being overlooked for long periods.[13]

The form, following preparation of a medication card to later assist in administration would be sent to pharmacy at the earliest opportunity. Copy two would be filed in the prescription file and copy three would be used by the pharmacy in a manner to be described later. A proposed revision of the pharmacy order into a doctor's drug order is shown in Appendix E.

The second copy of the current pharmacy order has a dry adhesive backing to allow its use in a labeling system now discarded. The second copy is itself discarded at the nursing unit. Transfering the adhesive feature to the revised form's first copy, the nurse could slightly moisten the edges of the form and attach it at some predetermined area of the chart. This would provide a permanent, timely copy of the doctor's order on the chart, as is done now.

Floor stocks

One of the critical areas in any endeavor is the investment in idle inventory or inventory susceptible to pilferage or other uncontrolled loss--and hospitals are no exception.

The combination system of distribution in use at the present

time at the Long does offer the advantages of the better control supposedly inherent in the individual prescription order system but observation and interview within the hospital indicated that a large amount of floor stock is being maintained.

An inventory of the nursing units serving approximately 45 per cent of the hospital's operating beds was taken to gain an indication of the size and type of floor stock inventory being maintained at the present time. The dollar value of the inventory is shown in Table 2 and is based on the current state contract procurement prices. The figures do not include narcotics or intravenous solutions as their ordering and storage are both completely separate systems from other medications at this hospital.

TABLE 2

VALUE OF FLOOR STOCKS, THREE MEDICAL-SURGICAL NURSING UNITS, EARL K. LONG MEMORIAL HOSPITAL

Unit	Number of Beds	Floor Stock Inventory	Value per Bed
4E	10	$ 507.12	$ 50.71
2S	35	521.00	14.88
2N	35	717.12	20.49

Source: Physical Inventory by Author, February 1970

Floor stocks appear to be maintained, for the most part, on a non-standardized basis and for a variety of reasons. Interviews were conducted with four nurses, each from a different nursing unit and each of whom had been with the hospital since its opening. Each indicated that, at the time the hospital opened, a list of medications to be kept as floor stock was established and approved by the chief of

each service, for the respective nursing units. Since that time the determination of the composition of the various floor stocks has, for all practical purposes, been at the discretion of the head nurse on each nursing unit.

Perhaps the most curious aspect of the floor stock situation is that there is no authoritative hospital policy, written or verbal, concerning its very existence, function or administration. The current nursing procedures and nursing policies manuals do not recognize its existence. All medication policies and procedures stated in those manuals are apparently predicated on an individual prescription order system only.

The existence of a floor stock has several connotations which should be considered. Perhaps the most significant point, which was made repeatedly during interviews with members of the nursing staff, is that the pharmacy hours are comparatively limited. Although a pharmacist is on duty in the pharmacy seven days a week, it is only during the period 8:00 A.M. to 4:30 P.M.

Between the hours of 4:30 P.M. and 8:00 A.M. daily, members of the nursing staff have little choice but to function in what might be considered a pharmacist role in certain instances.

The requirement for medications during that period can arise from several sources. First, new admissions can occur, often of an emergency nature, requiring that a patient be started on a medication prior to the opening of the pharmacy. Secondly, a currently hospitalized patient can develop a requirement for a new medication at any time, for a variety of reasons.

The third instance is one that was not often commented upon dur-

ing interviews but does occur. It is not too unusual for members of the day shift to prepare and administer medications without observing that there is an insufficient remaining amount in a particular patient's container to cover the ensuing fifteen and one-half hour period when the pharmacy is closed. It is a readily understandable oversight, since the container will obviously have some medication in it and the press of patient care requirements can easily obliterate thoughts of looking ahead two shifts and counting the exact number of tablets in every vial.

Regardless of the reason, when a physician orders a medication and the pharmacy is closed, three possibilities are open to the nurse. The first is strictly prohibited by hospital policy but it still occurs occassionally, according to some interviews. This is the practice of "robbing Peter to pay Paul." That is, borrowing the medication from the medication drawer of another patient being treated with the same medicine. Once that is done, other problems enter the picture, such as remembering to replace the borrowed medication and the possibility of incorrect charges for medications used. There is also the potential threat to patient safety from transferring drugs from a container other than the original manufacturer's package to a patient's medication container. That act in itself could be interpreted as the practice of pharmacy.[14]

The second possibility is that of calling either the evening or night shift supervisor, as the case may be, and requesting assistance. The supervisors for both shifts have access to the pharmacy keys and are authorized to enter the pharmacy during the evening and nighttime hours for the purpose of procuring limited quantities of medications

in those situations mentioned in the preceding paragraphs. The supervisor, then, is forced into the temporary role of the pharmacist in dispensing the required medication. In speaking to this point, among others, the latest interpretation published for field testing by the Joint Commission on Accreditation of Hospitals states the following:

> Only the pharmacist, or authorized pharmacy personnel, under the direction and supervision of the pharmacist, should dispense medications, make labeling changes or transfer medications to different containers; (Emphasis supplied.)
>
> When the pharmacist is not available, only prepackaged drugs should be removed from the pharmacy. (Emphasis supplied.)[15]

The third possible solution is that which has been elected by default, if not by prescribed policy, at Earl Long: the use of a partial floor stock system. In using medications from floor stock, there is little to discuss from the standpoint of patient safety if the medications concerned are the common non-prescription type which can be purchased over the counter at any neighborhood pharmacy.

The problems arise when the requirement is to provide the patient with a prescription type drug. The problems which attend a partial floor stock of prescription type drugs exist twenty-four hours a day also, not just during the hours when the pharmacy is closed. When the nurse is in need of a medication which rests in a bulk container readily available on her ward, it seems to be less than reasonable to not avail herself of the required item. This is particularly so in the case of one-time administrations such as "Prn" or "Stat" medications.

It can be seen here that the nurse may again be functioning temporarily in the role of the pharmacist when she resorts to floor stock to dispense a drug from a bulk container. She may be acting

contrary to the just quoted recommendations of the Joint Commission on Accreditation of Hospitals concerning the transfer of medications between containers and dispensing in general.

The objection to dispensing of drugs by the nurse is not just a legal consideration, but also based greatly on the rather obvious differences in professional training and education related to drugs. The pharmacist's entire professional education is concerned with a subject treated in one course in nursing school. That one course is, in turn, based on a rather unsophisticated background in the basic sciences.

The pharmacist is in daily contact with the full spectrum of drugs in use within the hospital. His entire professional orientation is directed toward a thorough knowledge of drugs and their actions. Thus, the "total responsibility for medications up to the point of administrating the drug to the patient," should rest with the pharmacist.[16] Review and interpretation of at least a transcribed copy of the individual order and complete supervision of the dispensing function are vital to patient safety through the reduction of opportunities for medication errors to occur.

The existence of a floor stock has other significant drawbacks as well. One of these is often overlooked--the drug losses which occur as a result of obsolescence and deterioration. One of the means of making this problem more manageable is an effective system of periodic inspections of all drug medication and storage areas as recommended in the hospital accreditation standards interpretations.[17] Such a system is presently in use at the Earl Long but is of a very informal nature and is not designed to ensure inspection of all

pertinent areas. No method exists for scheduling to ensure that all areas are inspected within any specific temporal guidelines or for recording the performance of the inspections as also recommended in the Joint Commission interpretations. It must be realized, of course, that such inspections reduce the amount of time available to the pharmacist for performance of his primary function, the dispensing of drugs.

A system not requiring floor stocks would benefit the pharmacist from the increased time available from a reduction in inspecting responsibilities.

Medication storage and preparation

A very important consideration in any hospital employing the individual prescription system, the complete floor stock system, or a combination of the two, as is the case at the Long, is the conditions under which drugs are sorted and prepared for administration on the nursing units. The Joint Commission on Accreditation recommends that: "There should be adequate and properly controlled drug preparation and locked storage areas on the nursing units. These areas should be well lighted and should be located in a place where the nursing personnel will not be interrupted when handling drugs."[18]

Medication rooms or preparation areas are not inadequate in this hospital--they are non-existent. Floor stock medications, as a result, must be stored in either the clean or dirty utility room, neither of which is designed for that purpose.

Using one of the utility rooms for medication storage has had several unsatisfactory results. The use of the room for the purpose originally intended is hampered by the space restriction since the medication storage commonly requires about half of the storage area

available in the room.

Medications for administration must be prepared on a small countertop shared with other activities carried on within the room.

The present system of patient care task assignments in use at the Earl Long is a total care concept system. That is, each nurse is assigned a number of patients each shift, for which she has total responsibility, to include both treatments and drug administration. As a result, as many as three individuals must somehow simultaneously prepare medications for administration in the limited space available.

Since the rooms were not designed to be medication rooms, there is no provision for locked cabinets. In their "Guidelines Relative to the Safe Use of Medications in Hospitals" the American Society of Hospital Pharmacists Committee on Safety Practices and Procedures recommends that: "Medication cabinets or rooms and narcotic compartments should be kept locked and the keys should be available only to the nurse in charge or her alternate."[19]

Individual prescriptions or medication orders are now stored in 11 x 11 x 18 inch nine-drawer standard parts cabinets which are placed on the very limited countertop work area in the utility rooms. These cabinets, which have 11 x 5 1/3 x 3 inch polyvinyl chloride type drawers appear to have been an excellent choice for this purpose, being very sturdy in design and far less expensive than similar items sold specifically for medication cabinets. The size of the drawer permits storage of even bottled liquid medications dispensed by the pharmacy. However, on all but one nursing unit observed, the number of cabinets available was insufficient to provide one drawer per patient. To

remedy the problem, each drawer was subdivided so that two or three patients' medications were in the same drawer. Unfortunately, the storage of bulky prescriptions then became impossible in the subdivided drawers, so they must now be stored in the permanent cabinetry where floor stock items are also stored. Subdivision of most drawers resulted in excess subdivisions and the diversion of that space to storage of floor stock drugs.

As is apparent from the foregoing, the drug storage on each nursing unit is open and unsecured, since it is impractical to lock the door to a utility room which is in constant use for other than medication preparation. The utility area in shared use as a medication room on one nursing unit is not equipped with a door.

Because of the great importance of medication preparation to patient safety, the preparation area should be well lighted, ventilated, clean and allow preparation free from distracting influences or interruption. The utility rooms are well lighted and ventilated and the effort made at cleanliness is dependent upon the personnel involved. However, the most important aspect, the presence of an environment conducive to careful and orderly drug preparation, free from distractions, is simply non-existent in all cases.

It does not appear that there is any completely satisfactory way to resolve the problem of providing an adequate medicine room to each nursing unit, as it is essentially a design artifact arising from the fact that the hospital was originally conceived as employing some type of medication system which would eliminate the requirement for medicine rooms.[20] Modifying the present medication system to a form which would obviate storage and preparation on the nursing units

would be the simplest approach to the problem.

Inventory control

Control of the drug inventory, whether it be that portion of the inventory located in the floor stock, the patient's medicine drawer, or in the pharmacy, is an extremely vital problem. There are several aspects of this problem which are sufficiently significant to merit mention.

The first is the safety of the patient, which has already been commented upon. This aspect is paramount to the others, without question.

There is a second consideration, however, which is not often mentioned, and that is safety of the hospital employee and his family. The consideration at hand is that of self-medication with prescription type drugs. The dangers in this practice to not require any particular amplification except to note that if self-medication were a safe and efficacious practice, there would be little need for our legal system of controls on the diagnosis and treatment of illness and the prescribing and dispensing of drugs.

Obviously, the point under discussion where self-medication is concerned is diversion of state property, a drug, to the use of an employee or other person in a manner not authorized by law. It is occassionally referred to as pilferage in the hospital--seldom by the harsher term of theft--but theft it is.

The other side of the pilferage coin is theft for resale or the individual use of the various stimulant and depressant drugs. The tremendous upsurge of illicit drug use of all types in recent years has created a ready market for a large variety of the stimulants and

depressants. Broad spectrum antibiotics, in injectable or tablet form, are also readily marketable among some segments of the population for self-treatment and prophylaxis of some types of venereal disease.

With the traditional low pay scales found among hospital employees and the ready availability of drugs in an institution exercising relatively little control in its medication system, drug loss through pilferage will become routine, whether its purpose is self-treatment, satisfaction of a drug habit, or resale for profit.

Although a poorly structured medication system can mean undetected drug losses at many points within the system, one of the major areas contributing to loss is the maintenance of floor stock drugs on nursing units.

In hospitals using the relatively traditional combination of individual order and partial floor stock, one study found that an average 260-bed hospital could expect a drug loss in the area of $53,500 annually.[21] As the study was published in 1961, losses would now undoubtedly exceed that amount.

Another interesting study of drug losses in the hospital was done in a hospital similar in many respects to the Earl Long, the University of Arkansas Medical Center Hospital. As in the case of the Long, it is a state-owned, closed staff, short term general hospital. Both hospitals use a formulary system for controlling the number of different drug types and forms stocked in the pharmacy and have a large percentage of licensed practical nurses who administer medications. In this study, comparisons were made on a "before and after" basis between a large number of variables in the conventional system and under a pilot program using a well controlled medication

system based on unit dose concepts.

Based on the data developed during the course of the study, the loss from floor stock drugs was determined to be about seven times the value of those drugs in the floor stock. Generally, it was concluded that the unit dose type experimental system, if employed hospital wide could possibly save the hospital as much as seven times the value of those drugs in the hospital inventory but outside the pharmacy.[22] The authors pointed out that the extent to which the drug loss rate found in the study would be representative of the rest of the hospital had not been specifically demonstrated, however.

In order to provide some basis for comparison, various aspects of the medication system at the Long were considered from the point of controls, costs, and losses.

There are several places in the system where controls are lacking, nearly all of which revolve around the maintenance of a large floor stock of drugs.

As was pointed out previously, the determination of the inventory, by item and quantity to be maintained in the floor stock, is largely the responsibility of the respective head nurses. In order to request floor stock items, the nursing unit completes a requisition, DOH form 7-2, listing thereon the desired types and quantities of drugs. At the pharmacy, the drugs on the requisition are removed from stock and placed in a drug basket for the appropriate unit. As required, medications are transferred from bulk containers to floor stock containers of the appropriate size and the order is completed, placed on the dumbwaiter, and sent to the proper floor. A telephone notification is made to the receiving nursing unit.

Although it was reported to be hospital policy that only a limited number of drugs could be sent to the nursing units as floor stock, no listing or authoritative source of policy, written or verbal, could be located.[23] The nursing station aspect of this problem has already been noted. As an apparent result of this particular portion of the control problem, a relatively large buildup of floor stocks had occurred, as can be seen in Table 2.

If the average value of floor stock per bed on the three units studied, $21.82, is used in conjunction with the findings of the University of Arkansas Medical Center study previously cited, the projected annual loss for the current number of operating beds, 177, could be expected to reach $17,800, exclusive of narcotics and intravenous solutions. Projected to full operation at 260-beds and including probable intravenous losses as projected by Barker and Heller, a loss of $60,000 might well be expected.[24] It is also interesting to compare these figures with the previously mentioned 1961 loss figure of $53,500 for a 260-bed hospital. Applying the per bed loss of $206 to the current number of operating beds at the Earl Long, 177 of its 260, the predicted annual loss would be $36,400, even at 1961 price levels. Using these two studies as a basis for comparison, it could be hypothesized that annual drug losses at the present operating level may well exceed $17,000, not including narcotics and intravenous drugs. As a further point of comparison, the annual inpatient drug costs at the University of Arkansas Medical Center Hospital were about $100,000 at the time of the study, while the twelve month period studied at the Long showed purchases of approximately $145,000 for

inpatient drugs.

As the Long is presently using the traditional combination drug distribution system, it does not seem unreasonable to conclude that its drug losses under such a system would be somewhat comparable with that of similar institutions, using essentially similar systems, particularly when considering the most conservative figures.

Referring to Table 3, the total of the floor stock issues shown amounts to slightly more than $32,000. The costs shown do not reflect the actual cost of all floor stock issues, however. The $32,000 is applicable only to those issues made to the nursing units of items which are considered to be non-reimbursable by the patient. In other words, items often referred to as "free floor stock" items.

TABLE 3

COST VALUE OF PHARMACY ORDERS FILLED, RETURNS TO PHARMACY FOR CREDIT, AND FLOOR STOCK ISSUES FOR TWELVE MONTH PERIOD FEBRUARY 1969 THROUGH JANUARY 1970

Month	Cost of Orders Filled	Value of Returns	Floor Stock Issues
February	$ 5,536	$ 497	$ 256
March	7,075	397	1,962
April	6,192	523	1,697
May	6,779	446	2,474
June	6,488	589	2,043
July	7,952	433	3,039
August	8,757	472	3,877
September	10,219	283	2,879
October	14,741	478	3,058
November	12,899	447	3,230
December	11,292	697	4,786
January	14,345	352	2,700

Source: Pharmacy Records, Earl K. Long Memorial Hospital.

There is no existing list of the items considered to be free floor stock, the determination being done on an item-by-item basis by a pharmacist assistant. At the time the bulk requisitions are priced for financial inventory purposes, those that are free floor stock are priced and recorded as floor stock issues. Those items not considered free floor items are not priced or recorded, but are filed with the other completed requests. This is an important loss of control. After this point there is no further control over routine drugs as there are no records on the nursing units, nor any other way to continue the chain of responsibility for proper disposition of the drugs.

Upon reaching the nursing unit medicine room, the drugs are added to the floor stock. When it becomes necessary to administer a drug from floor stock, the subsequent actions vary by unit. However, either the nurse administering the drug or a ward clerk will theoretically prepare a pharmacy order form for each dose administered from floor stock. The pharmacy order is then sent to the pharmacy, often after several days, where it is priced and the amount recorded with that day's issues from the pharmacy.

It is apparent that if the nurse is too busy to make the charge or, on wards with clerks, if the clerk doesn't notice that a medication has been given, no record of the disposition of that drug is made for billing or inventory control purposes.

It is of interest to note here that, although a free floor stock system does exist, it is still the policy for all medications administered from floor stock to have a pharmacy order for one dose prepared and sent to the pharmacy.[25] Upon receipt of order forms for items considered free floor stock, the forms are discarded in the

pharmacy, as they serve no purpose. As ward nurses do not know which items are free floor stock and which are not, the system is necessary to ensure that those items which are not free floor stock are dropped from the pharmacy inventory as having been dispensed.

An interview with the pharmacist assistant performing the pharmacy bookkeeping duties allowed construction of a list of fifteen items which are considered free floor stock by the assistant, with the approval of the chief pharmacist. These items will be found listed in Appendix F. As will be noted from examining the list, six of the items are primarily treatment or topical type items whose administration would be difficult to measure in terms of doses. However, the other nine items could probably be relatively easily controlled on a dose basis, much like any other common, inexpensive drug item, to reduce floor inventories and preclude loss and improper use.

The entire $32,000 of floor stock issues represents relatively uncontrolled drug issues for which there is little or no responsibility or accountability once the drugs leave the pharmacy.

The use of a centralized medication system wherein drugs are provided to the nursing unit for patients only as they are required for each dose would virtually eliminate the control problem. With such a system a single dose would be sent to the nursing unit for each patient just prior to the scheduled administration time. If the dose were not administered for some reason it would be returned to the pharmacy in its sealed single dose container and would be available and safe for dispensing again.

Pharmacy returns

Returns to the pharmacy are another area in which a lack of con-

trols is evident in the present system. During the course of the nursing unit inventories and additional informal observations of other nursing units, it became very apparent that a portion of the floor stock consisted of drugs which had been retained on the unit following discharge of various patients.

All persons interviewed who were in any way associated with the medication system indicated that hospital policy required all unused drugs to be returned to the pharmacy, accompanied by a credit memo, SLH Form 732, upon discharge of every patient. The fact that many drugs remained on the unit indicates another control failure.

It is apparent that there are two dispositions for such drugs: administration to other patients and pilferage. Pilferage could be in the form of self-medication or removal for family use or resale.

It was pointed out by several nurses that return of some medication forms to the pharmacy seemed foolish to them as they were sure the items would only be discarded in the pharmacy. This comment was made primarily with reference to partially used multiple-dose vials and bottles of liquids. Subsequent interviews with pharmacy personnel revealed that this was, indeed, the case.

As a large number of the patients at this hospital pay only a nominal portion of their hospitalization costs, non-returned drugs represent a loss to the hospital. Figures 1 through 3 will illustrate the magnitude and apparent increasing seriousness of the problem. Figures 1 and 2 show the expected consistency between the value of medications dispensed and the number of patient days in the hospital. Figure 3, however, shows an increasing disparity between actual pharmacy returns and predicted returns based on a survey by Tucci and

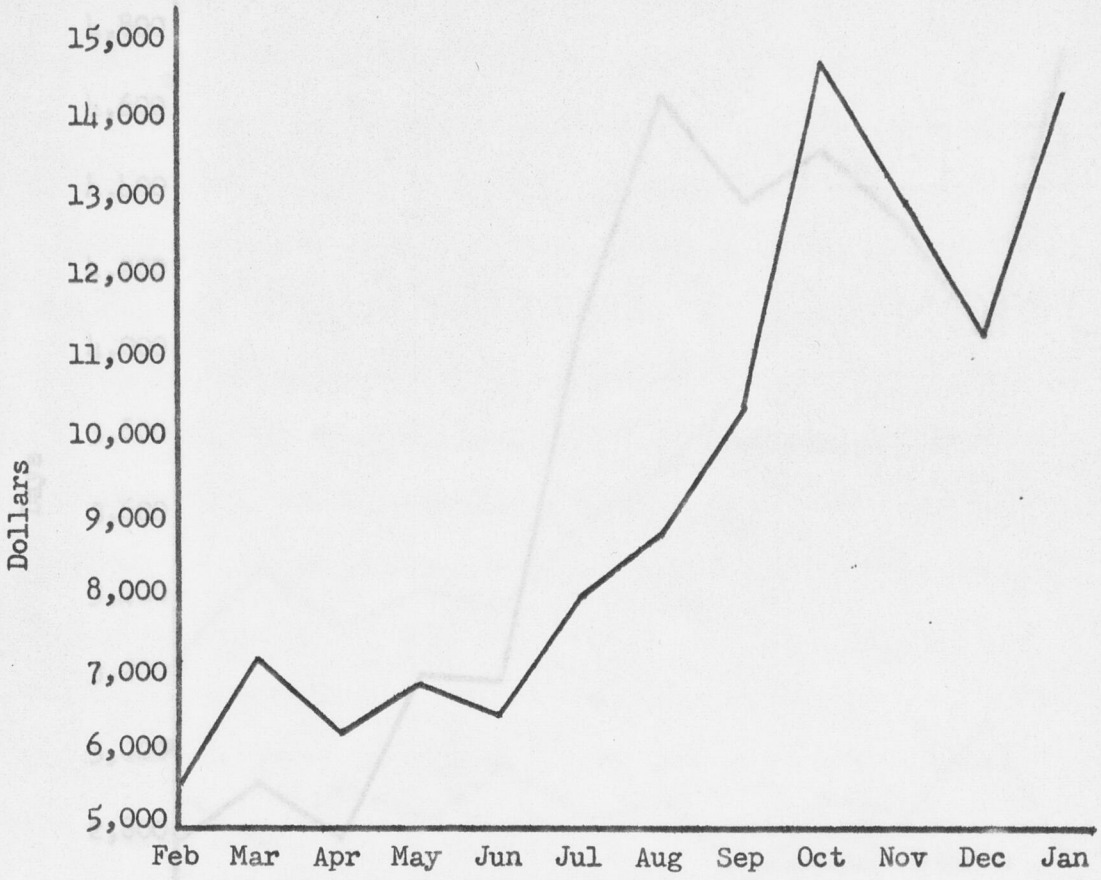


Figure 1.--Value of Medications Dispensed

Webb.[26] That survey found that approximately 15 per cent of the items dispensed in a hospital using a conventional medication system, such as that at Long Memorial, were returned to the pharmacy. It is inferred from this disparity that either the existing medication system has become increasingly precise or that a gradually increasing loss, in the form of unreturned medications, is occurring. The first possibility must be rejected, as all observations and interviews conducted at the hospital indicate that quite the opposite has occurred--the attention and emphasis given to returns has decreased as the patient load increased. Thus, the loss in returns is apparently growing increasingly serious.

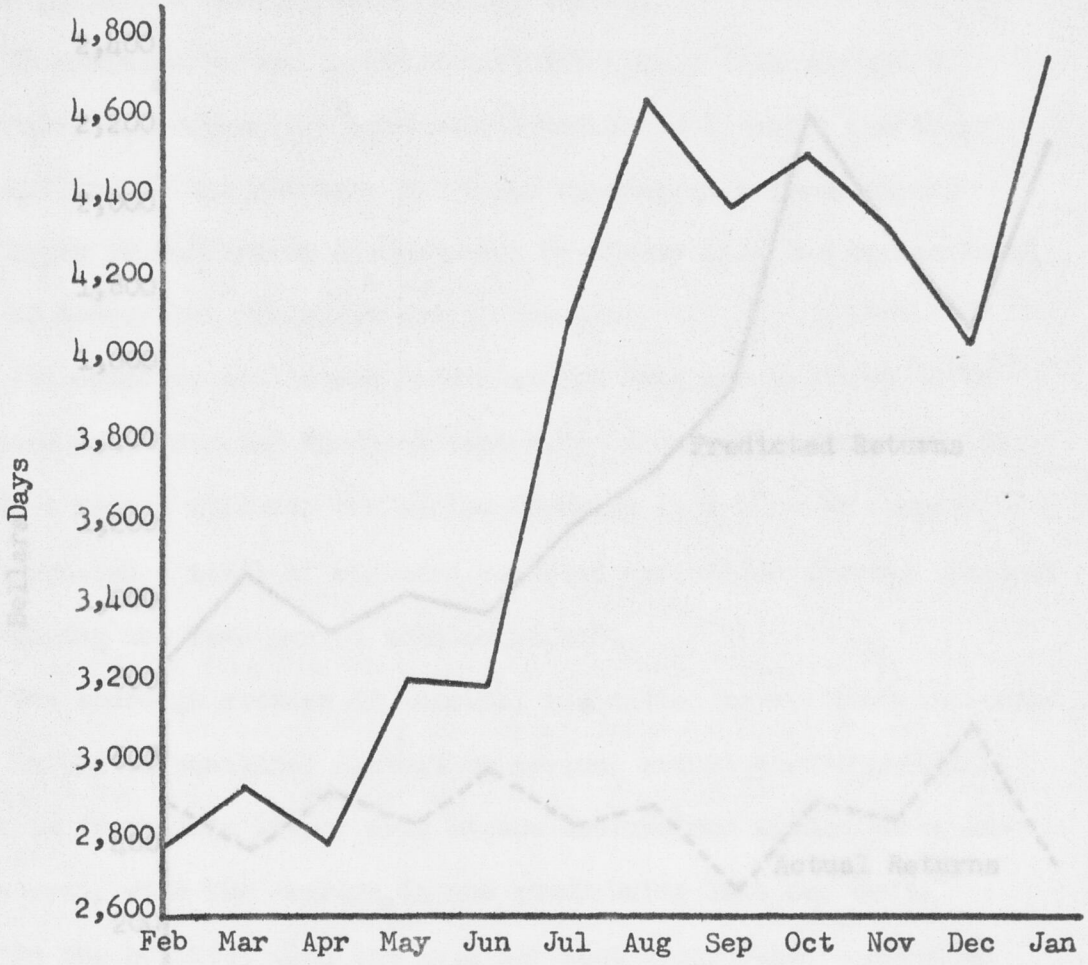


Figure 2.--Patient Days

Implementation of a unit dose medication system would nearly eliminate losses from unreturned items. Only one, or a very few, single doses of medication would be dispensed only when required for administration to the patient. Thus, few potential returns would be created.

The matter of returns has another serious drawback beyond the already mentioned discarding of certain items. When a medication is returned to the pharmacy in bulk form, its history is then unknown to the pharmacist. Returning tablets or capsules to bulk containers may well result in compromising the entire container's

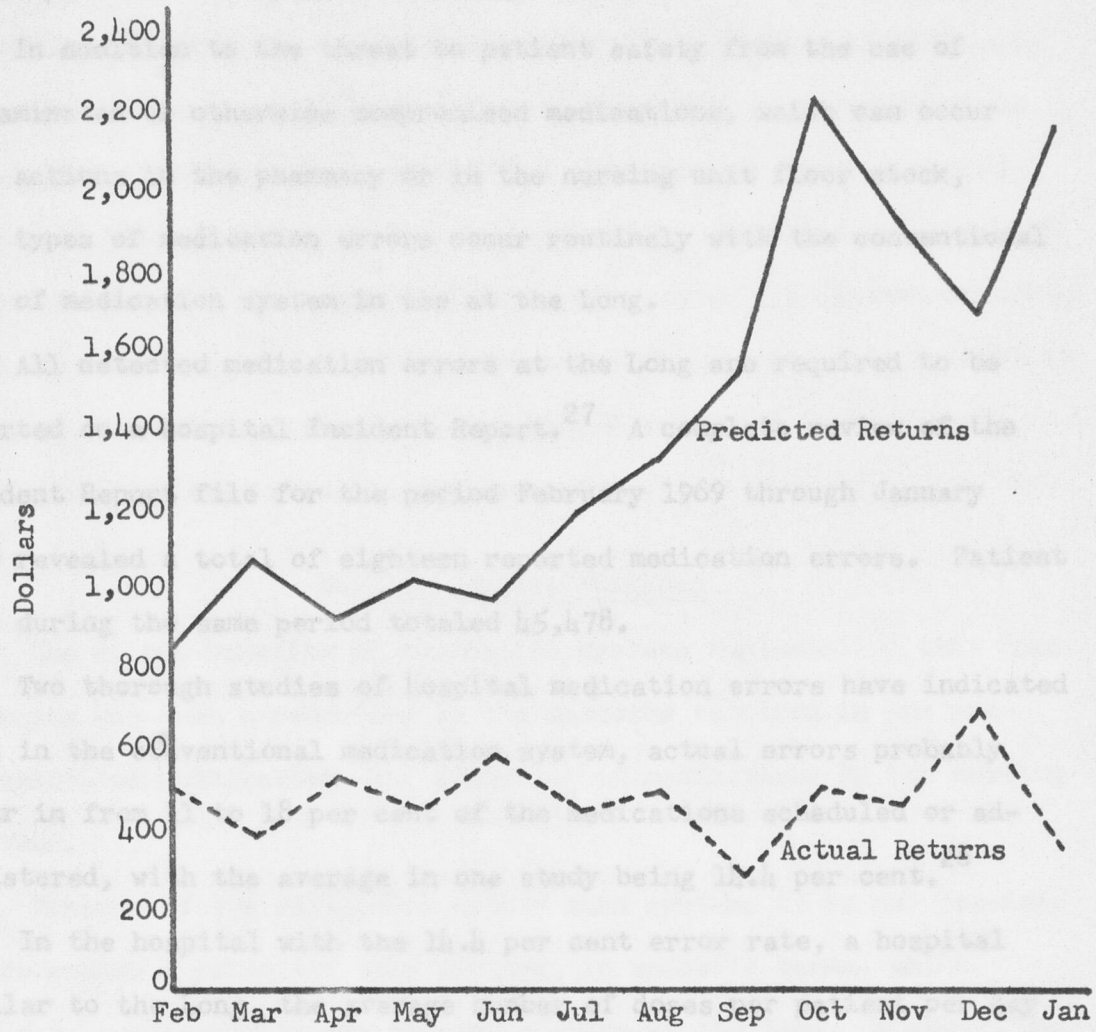


Figure 3.--Predicted and Actual Medication Returns

contents. However, with unit dose packaging, the problem is readily overcome, since each dose remains sealed in its own container until administered. An unadministered dose, if it must be returned to the pharmacy, is uncompromised and is still completely identified as to nomenclature and lot number.

Medication errors

The matter of patient safety has been mentioned many times in the foregoing discussion and it was pointed out that patient safety should

be the paramount consideration in any system.

In addition to the threat to patient safety from the use of contaminated or otherwise compromised medications, which can occur from actions in the pharmacy or in the nursing unit floor stock, many types of medication errors occur routinely with the conventional type of medication system in use at the Long.

All detected medication errors at the Long are required to be reported on a hospital Incident Report.[27] A complete review of the Incident Report file for the period February 1969 through January 1970 revealed a total of eighteen reported medication errors. Patient days during the same period totaled 45,478.

Two thorough studies of hospital medication errors have indicated that in the conventional medication system, actual errors probably occur in from 11 to 18 per cent of the medications scheduled or administered, with the average in one study being 14.4 per cent.[28]

In the hospital with the 14.4 per cent error rate, a hospital similar to the Long, the average number of doses per patient per day was found to be 5.2.[29] Although the average number of doses for the Long was not determined, a conservative estimate of the number of errors actually occurring, based on five doses per patient day and an error rate of 14 per cent, would yield about 31,800 errors for the period. Taking another approach, it is interesting to compare the figure of 31,800 with the finding of Barker and McConnell that only about 0.07 per cent of detected and undetected medication errors are actually reported.[30] Using the 0.07 per cent figure the 18 reported errors would yield a total of 25,714 errors at Long Memorial.

In the same study, implementation of a medication system em-

ploying unit dose packaging and eliminating floor stocks, except for an emergency tray, treatment type drugs such as rubbing alcohol, and intravenous solutions without additives, resulted in a reduction in medication errors to an average of 8.2 per cent. A later and more extensive project found the average error rate under the conventional system to be 18.3 per cent and 3.3 per cent under the system employing unit dose concepts.[31] However, even a reduction from 14.4 per cent to 8.2 per cent represents a forty per cent decrease in errors--and a highly desirable increase in patient safety.

Nursing Service Workload

One of the benefits of medication systems implementing unit dose concepts has been a reduction in the manhours required in the preparation, administration, and recording of medications by the nursing service.

Because of the variations within each system, it is not possible to determine a potential time savings, in specific terms, which would be applicable to the nursing service at the Long. However, St. Benedict's Hospital in Ogden, Utah has found that a centralized unit dose system has reduced medication man-hour requirements for medication nurses by 44 per cent.[32] A study by Barker found that nursing activities related to medication administration comprised 13.7 per cent less of the total nursing time under a unit dose system than under a conventional medication system.[33]

One recent study by Blasingame, Drevno, Godley, Dratz, Vona, and Minott, of five hospitals using one or another form of the traditional combination medication system was done by simply substituting unit dose packaged drugs into the system in place of conventionally dispensed

drugs from bulk containers. Using industrial engineering techniques to make time and motion comparisons of the systems, it was found that the unit dose packaging alone resulted in an average 10 per cent reduction in time per dose required for preparation and administration by the nurse.[34]

The reduction in workload for the nurse can be viewed from several aspects. First, it can be computed directly in the form of cash value. Secondly, it can be viewed as a reduction in the total requirement for nursing personnel. Both of these are unrealistic, however, since the Long is not now, has not been since it opened, and, as with most hospitals, is unlikely to ever in the foreseeable future, be in the position of being adequately staffed with nursing personnel.[35]

The interpretation of the workload savings on the nursing unit realized through a unit dose concept system would most appropriately be in terms of reallocation of existing resources. That is, the monetary savings achieved would be illusory at the Long since they would be reallocated to other, deficient areas of nursing care. The true net savings would be in the form of more effective and efficient patient care with the present and projected limited nursing care resources available. Quantification of these savings would be impossible without the use of industrial engineering and accounting techniques beyond the scope of this study.

Pharmacy Considerations

Pharmacy workload

The workload of the pharmacy has been gradually increasing as more beds in the hospital have been opened for use. The pharmacy workload, in terms of individual prescription and floor stock or bulk

orders filled, is shown in Table 4.

TABLE 4

PHARMACY WORKLOAD FOR TWELVE MONTH PERIOD
FEBRUARY 1969 THROUGH JANUARY 1970

Month	Prescriptions	Floor Stock Issues
February	1681	186
March	2056	187
April	1771	153
May	2071	188
June	2183	153
July	2238	204
August	2605	256
September	2584	255
October	2785	257
November	2338	204
December	2358	221
January	2617	255

Source: Pharmacy Records, Earl K. Long Memorial Hospital.

A comparison of the workload accomplished by the pharmacy at the present time against average workloads in other hospitals provides some very useful indications of potential capacity. According to an exhaustive study of hospital pharmacies by Franck, Latiolais, Francke, and Ho, the average daily inpatient workload for a hospital of 100 to 199 beds is 140 units per pharmacist and 151 units for hospitals of 200 to 299 beds.[36] This unit, used as an indicator of workload, is comprised of prescriptions filled and other requisitions, such as floor stock requests. In the Earl Long, the average number of daily units per pharmacist was found to be about 57.5, or about 38 per cent of the inpatient workload normally performed per pharmacist in hospitals of 200 to 299 beds. Compared with hospitals in the 100 to 199 bed category, the workload is at the 41 per cent level.

Another comparison of interest is the total prescriptions per year. In this case, it is 27,287, as compared with an average of 42,036 at the 100 to 199 bed level, or about 65 per cent of the average workload performed in other general short-term hospitals with a similar number of operating beds and approximately the same amount of medication per prescription.[37]

Using the preceeding workload figures as a basis, it appears that the pharmacy is presently operating considerably below the level achieved by similar institutions, perhaps as much as 62 per cent.

One of the factors in adopting some form of a medication system using unit dose concepts is that the pharmacy workload is found to increase as a result, with the amount of the increase being dependent upon the exact system implemented. However, if the use of unit dose items is confined to those items purchased in prepackaged unit dose form and distributed within a conventional medication system, workload in the pharmacy will actually be reduced, according to one study.[38] In that study of five hospitals, the projected reduction in pharmacy annual man-hours was an average of 25 per cent.

The reason for the reduction in workload under some circumstances becomes apparent when it is considered that drug distribution from the pharmacy, with unit dose packaging, is no longer dispensing in the usual sense. Each dose is already contained in its individual package stating its name, strength, control number, and if applicable, expiration date. There is no transfer of medications between containers. As a result, a standard stock picking technique by pharmacists' assistants can be employed, with the pharmacist super-

vising, to fill prescriptions. Rather than the complicated procedure of pouring, counting, and labeling by the pharmacist, a lower level helper can merely select the single well identified individual package needed, for each dose of each drug, for each patient. As no judgement is required in that procedure, there is little opportunity for mistakes.

The more usual increase in workload results from the fact that only a limited number of medications are available in unit dose packaging from the manufacturer. In order to realize the full benefits of unit dose medication, it then becomes necessary for the pharmacy to package medications from bulk containers into unit dose packages, thus increasing the overall pharmacy workload.

Another type of unit dose medication system, the type previously described in the Lakewood Hospital at Morgan City, Louisiana, tremendously increases the pharmacy workload by including the administration as well as packaging and preparation, under the pharmacy.

In order to achieve the benefits previously discussed, such as reduction in inventory on the nursing unit to an absolute minimum, relief of nursing service from as much preadministration drug preparation as possible, and control over the medication from the pharmacy to the patient, an increased workload resulting from prepackaging and preparation must be accepted in the pharmacy.

Pharmacy unit dose operations

In attempting to forecast an approximate workload increase for the pharmacy, should the hospital undertake a unit dose packaging program, an average workload in terms of types of medication can be

determined. Using an average of 14.3 dry dose units per bed per day from the data determined by Blasingame, Drevno, Godley, Dratz, Vona, and Minott, and an approximate apportionment as indicated by Misgen of 48 per cent dry doses, 11 per cent liquids, 30 per cent injectables, and 11 per cent other forms, a conservative prepackaging requirement for 260 beds can be estimated.[39]

It should be noted here that the term dry dose unit does not imply doses the patient receives. A patient may receive several tablets or other dry dose units as one dose of medication, but liquid or injectable doses can be considered as one prepacked item administered for each one prepared.

Using this data together with the 5.2 doses of medication per day per inpatient previously cited, the following daily prepackage workload could be projected:

1. Dry dose units: 3718
2. Liquid doses: 149
3. Injectable doses: 406
4. Other forms: 149

Using an automatic unit dose packaging machine, or strip-packer, with the commonly available capacity of forty dry dose units per minute, approximately one hour and 33 minutes per day would be required for dry dose prepackaging.

Because of the relatively small volume of liquid doses, a manual filling system could well be used. However, based on the operation of an automatic measuring and filling device and a hand operated capping machine, a single day's doses would require only fifteen minutes at a conservative rate of ten per minute.

Injectable medications, having been in use in unit dose form for a good many years, are available in a broad variety--sufficiently broad, perhaps, to meet the majority of the requirements of the Earl Long. However, based purely on an estimated capacity of ten doses per minute with manual equipment, about 41 minutes per day would be required to prepare injectable medications.

Although there is a variety of unit-dose packaging equipment available, only one integrated system of supplies and equipment for all dosage forms could be found at the time of this writing. For the sake of simplicity, that system, manufactured by the Becton-Dickinson Company, was selected as representative of the type of equipment which would readily meet the requirements of Long Memorial. It must be realized that many other similar systems can be devised with combinations of equipment and supplies from other companies, exhibiting approximately the same features and costs but foregoing the convenience of a single supplier. Appendix G contains illustrations and costs of supplies and equipment in the Becton-Dickinson system.

The major item of equipment, the forty unit per minute strip-packer, is also available in other designs and brands from the Ivers-Lee Company, Newark, New Jersey, Chemical and Pharmaceutical Industry Company, Inc., New York City, and Wrap-ade Machine Company, Inc., Clinton, New Jersey, among others. As noted, in spite of various design configurations, function and cost appear essentially similar, although mechanical engineering comparisons may reveal advantages of one over the other. Such comparisons are beyond the scope of this study.

Unused counter space is more than adequate for the installation

of all equipment, since only the packaging machine permanently occupies space.

Based on the data, techniques, and equipment described above, the daily requirement for preparation of dry, liquid, and injectable doses would be approximately two hours and 45 minutes per day.

Projected to a weekly basis, 26.25 man-hours would be required for preparation of all medications for inpatient administration. Added to this would be set-up, take-down, and clean-up time. As many days' supply of each drug would be packaged at each operation, not just a single day, set-up and take-down of each type of equipment would occur only a few times per week, not daily.

Also necessary would be the preparation of labels for all dose forms other than those packaged on the dry-dose packer, since such machines normally include a label printing feature. However, small label printing machines are available from many sources, as are inexpensive manual printers suitable for such small operations.

It appears that complete conversion to unit dose packaged medications would require the addition of one pharmacy assistant for the purpose of packaging and labeling, but it appears unlikely that the task would occupy a forty man-hour week, even at a 260-bed level of operation. A large measure of the prepackaging requirement can be reduced by purchase of the maximum number of unit dose packages from the manufacturers, thus freeing packaging time for other tasks.

In addition to the workload required to prepackage doses for any type system using single unit of use packages, a complete unit dose concept distribution system will increase the workload in the area of what has been considered as "dispensing." As was noted pre-

viously, however, what was dispensing by the pharmacist, with bulk packaging, becomes essentially a stock picking operation easily done by pharmacist assistants, with unit dose packaging.

Under the system envisioned for the Long, the pharmacists' actual dispensing duties are limited to prescriptions for items not pre-packaged. Otherwise, his function related to dispensing of the pre-packaged items involves editing the original prescription upon receipt and supervising and assisting with stock picking at peak workloads.

In order to provide a single dose of the required medication for each patient at the required time, certain compromises based on reasonable availability and allocation of personnel resources must be made.

In this instance, it appears that the requirements of the standard medication schedule, as previously listed in Table 1, can be met by distributing routine medications to the nursing units on the following basis:

1. Send 8:00 A.M. to 12:00 noon doses at 7:45 A.M.
2. Send 12:00 noon to 4:00 P.M. doses at 11:45 A.M.
3. Send 4:00 P.M. to 8:00 P.M. doses at 3:45 P.M.
4. Send 8:00 P.M. to 8:00 A.M. doses at 7:45 P.M.

Since the present working hours of the pharmacy are 8:00 A.M. to 4:30 P.M. daily, adjustments in hours and additions to staff will be necessary to handle the increased hours of operation and workload. Although exact computation of additional staff required is not possible at this time, it is believed, based upon three weeks of observation of pharmacy activities at the Long, the literature cited

in this study, and workload calculations on preceeding pages, the following changes should be made:

1. Extend operating hours to the period 6:00 A.M. to 11:00 P.M.
2. Employ one additional pharmacist.
3. Employ five additional pharmacy assistants.

The additional personnel are essential to expand the operating hours of the pharmacy to allow four times per day delivery of unit doses to the nursing units. This is the crux of the unit dose medication system--anything less results in a continuation of the present conventional medication system, simply using unit dose packaged drugs.

While the use of unit dose packaging alone does have many advantages, as noted previously, merely substituting packages cannot achieve the objectives or meet the criteria of this study. It is only through a revised system that stocks of medications on the wards can be substantially reduced and medication errors fully minimized.

The addition of the five assistants is required to provide for the continued presence of two assistants daily, during the extended hours of 6:00 A.M. to 11:00 P.M., and one assistant five days per week with the primary function of packaging. The additional registered pharmacist is required to provide for the additional supervision of the pharmacy during the extended hours.

The changes noted should prove more than adequate for the present work load and should reasonably provide for the additional workload at 85 per cent occupancy of 260 beds.

One very important consideration in employing the pharmacist assistants is that a training program would have to be designed for them, as the likelihood of recruiting individuals with any background

in hospital pharmacy is very small.

Additional storage space required for the higher bulk of unit dose packaged items does not appear to present a major problem. A survey of the pharmacy indicated approximately 30 per cent of the present storage area is available through more efficient use and removal of unnecessary bulky items such as intravenous fluids. Additional storage space can readily be generated in the general stores area.

The Proposed System

Five major actions are necessary to implement the recommended medication system at the Earl K. Long:

1. Revise the existing pharmacy order form to convert it to a doctor's drug order form.

2. Procure the necessary unit dose prepackaging equipment and additional medication drawer units.

3. Extend the pharmacy operating hours.

4. Employ one additional registered pharmacist and employ and train five additional pharmacist assistants.

5. Implement an inservice training program to provide complete orientation on the mechanics of the new system to persons concerned with medications.

Upon implementation, the recommended system will function in the manner described in the following paragraphs.

1. The physician writes his drug order on the new drug order form, which has been prestamped with the patient's identification data and placed in the chart for the doctor's use.

2. The nurse completes the scheduling spaces on the form for the date and time doses are due, removes copy one of the form, moistens the adhesive backing at each end, attaches it to the next empty space on the doctor's order sheet, stamps a blank form and places it in the chart.

3. Copies two and three are dispatched to the pharmacy through the pneumatic tube system and a medication card is prepared and placed on the scheduling rack.

4. Upon receipt, the pharmacist interprets the prescription, consults with the physician by telephone if necessary, and consigns copy two to the prescription file required by Louisiana Pharmacy Law.[40]

5. Copy three, in the form of a card, is consigned to a pharmacist assistant who checks the medication drawer unit for the appropriate nursing unit to determine if that patient is already receiving medication. If not, a patient name tag is prepared and placed on the drawer and the prescription copy is placed in a scheduling file. A separate scheduling file is maintained for each nursing unit and is subdivided into the four delivery times at which medications are sent to the nursing units.

6. At the beginning of the preparation time preceding each scheduled delivery, the prescriptions to be filled are drawn from the appropriate scheduling file by a pharmacist assistant.

7. Stock to fill each prescription is picked according to the prescription copy and placed in the drawer for each patient. The assistant places a single initial in the appropriate block on the form, to indicate a dose was provided as required and the card is

left in the drawer. When all orders are filled, the two pharmacist assistants will each check the orders filled by the other, withdrawing the card from the drawer as the correctness of each is verified.

8. The prescription cards are then returned to the scheduling file according to the next dose required. If the last dose prescribed has been reached or the last column of the form has been reached, indicating the effect of the seven day automatic stop order, the card is transferred to a container to be sent to the business office for billing.

9. When the delivery time arrives, each nursing unit is notified by telephone, the drawer units are loaded aboard the dumbwaiter, and the medications are sent to the floor.

10. Upon arrival at the floor, the nurse has only to place the drawer units on a cart and bring them to the nursing station.

11. As the scheduled medication times arrive, as indicated by the medication cards on the scheduling rack, the medications for each patient are removed from the drawer, verified against the medication card, against the patient's identification bracelet, and administered.

12. Administration is recorded on the drug administration record for each patient.

13. At the termination of the period covered by the medications in the drawer unit, all drawers will be examined to detect omission errors and the drawers will be returned to the pharmacy on the dumbwaiter.

14. Upon receipt at the pharmacy, all drawers will be immediately examined as an additional check.

15. Orders written to discontinue medications will also be written on the doctor's drug order form and forwarded to the pharmacy in the same manner as a start order. Medications administratively discontinued due to death or discharge will be immediately discontinued by the nurse, who will prepare the doctor's order form with the full drug nomenclature, mark it "D/C," sign it, and forward to the pharmacy in the same manner as a start order.

16. Discontinued medications will be removed from the scheduling file upon receipt of the order marked "D/C" and placed in the business office container. The discontinue order form will be discarded.

"Prn" and "Stat" medications

Under the proposed system "Prn" medications will be processed in the same manner as routine medications except that medications will not be picked and placed in drawer units. Instead, "Prn" cards will always be maintained with the cards for medications being prepared for delivery. When a "Prn" medication is required, the nurse prepares another doctor's drug order form for the drug, clearly marks it "Prn," signs it, and dispatches to the pharmacy. The pharmacy assistant verifies the request against the copy of the doctor's original "Prn" order in the schedule file and marks the date, time, and his initials on the card to indicate dispatch of one dose.

The drug, with copy one of the request just received from the nursing unit, for identification, is sent to the nursing unit through the pneumatic tube system. Copies two and three are discarded, as is copy one at the nursing station.

"Stat" drugs are procured in the same fashion as a routine order except that a telephone call is made by the nurse to the pharmacy

if the stat order is an extreme emergency. "Stat" orders are filled by the pharmacist immediately upon receipt and returned by pneumatic tube.

"Prn" and "Stat" orders required during the seven hour period the pharmacy is closed must be filled from prepackaged stock in the pharmacy by the nursing supervisor as is now the case. The only change is that under the proposed system, most orders will be in prepackaged form in the pharmacy, as recommended but as is not now the case.[41]

With the extended pharmacy hours, only the night shift supervisor will have to enter the pharmacy, considerably reducing the requirements for such entries.

Summary

The present system of drug control and distribution in use at the Earl K. Long Memorial Hospital is a relatively conventional combination of the individual prescription order system and floor stock system.

The system does not, at present, provide a method for the pharmacist to review and interpret a copy of the physician's original medication order, thus introducing potential error into the system through transcribed documents. A revised ordering system would resolve the problem.

Although no official hospital policies or guidance with regard to a floor stock exist, physical inventories revealed that floor stocks were present and probably contributing to losses. Implementation of unit dose dispensing is a means to reduce floor stocks,

except for emergency drugs and a limited number of treatment type items such as rubbing alcohol.

There are no medication rooms or preparation areas on any of the nursing units. As a result, all nursing units have been forced to use areas intended for utility rooms for medication preparation, which provide generally unsatisfactory conditions. This problem is eliminated through unit dose dispensing as no preparation of medications is required on the nursing unit.

Studies of nursing service workload under unit dose operations tend to indicate a reduction in medication preparation and administration time, with almost complete elimination of those functions under some systems.

Pharmacy workload would be increased somewhat under a unit dose type system and personnel additions would be required.

Patient safety would be enhanced through adoption of a unit dose medication system by reducing the potential for medication errors.

A complete system of unit dose packaging and dispensing would require the purchase of unit dose packaging equipment, due to the limited availability of such drugs from manufacturers.

Footnotes

[1]American Society of Hospital Pharmacists, "Statement on Hospital Drug Distribution Systems," American Journal of Hospital Pharmacy, XXI (November, 1964), 535.

[2]Louisiana Board of Pharmacy, Louisiana Pharmacy Law (Baton Rouge, Louisiana: Louisiana Board of Pharmacy, January 1, 1969), p. 9.

[3]Earl K. Long Memorial Hospital, "Nursing Procedures," Baton Rouge, Louisiana, 1968, p. 201. (Xerox)

[4]Ibid., p. 203F.

[5]Chief pharmacist, Long Memorial, interviews during periods February 16 to 20, and April 13 to 24, 1970.

[6]Earl K. Long Memorial Hospital, "Nursing Policies," Baton Rouge, Louisiana, 1968, p. 39. (Xerox)

[7]Superintendent, Long Memorial, and medical director, LSU Unit, Long Memorial, interviews during periods February 16 to 20 and April 13 to 24, 1970.

[8]Don E. Francke, et al., Mirror to Hospital Pharmacy (Washington, D.C.: American Society of Hospital Pharmacists, 1964), p. 63.

[9]Medical-surgical supervisor, Long Memorial, interviews during periods February 16 to 20 and April 13 to 24, 1970.

[10]Kenneth N. Barker and William M. Heller, "The Development of a Centralized Unit Dose Dispensing System for UAMC, Part III, An Editing Center for Physician's Medication Orders," American Journal of Hospital Pharmacy, XXI (February, 1964), 70.

[11]Harold J. Black and William W. Tester, "Decentralized Pharmacy Operations Utilizing the Unit Dose Concept," American Journal of Hospital Pharmacy, XXI (August, 1964), 345.

[12]Joint Commission on Accreditation of Hospitals, Standards for Accreditation of Hospitals (Chicago: Joint Commission on Accreditation of Hospitals, 1969), p. 938; American Society of Hospital Pharmacists, "Statement on Drug Distribution," p. 536.

[13]Black and Tester, "Decentralized Pharmacy Operations," p. 346.

[14]Francke, et al., Mirror to Hospital Pharmacy, p. 116.

[15]Joint Commission on Accreditation of Hospitals, Standards, p. 93.

[16]Black and Tester, "Decentralized Pharmacy Operations," p. 346.

[17]Joint Commission on Accreditation of Hospitals, Standards, p. 91.

[18]Ibid.

[19]American Society of Hospital Pharmacists, "Guidelines Relative to the Safe Use of Medications in Hospitals," American Journal of Hospital Pharmacy, IXX (November, 1962), 579.

[20]Superintendent, Long Memorial, and medical director, LSU Unit, Long Memorial, interviews during periods February 16 to 20 and April 13 to 24, 1970.

[21]Alfred R. Kurtz and James L. Smith, "Three Dimensional Drug Losses," Hospital Topics, XXXIX (April, 1961), 60.

[22]Kenneth N. Barker and William M. Heller, "The Development of a Centralized Unit Dose Dispensing System for UAMC, Part VI, The Pilot Study-Medication Errors and Drug Losses," American Journal of Hospital Pharmacy, XXI (December, 1964), 625.

[23]Chief pharmacist, Long Memorial, interviews during periods February 16 to 20 and April 13 to 24, 1970.

[24]Barker and Heller, "Part VI, The Pilot Study-Medication Errors," p. 625.

[25]Chief pharmacist and medical-surgical supervisor, Long Memorial, interviews during periods February 16 to 20 and April 13 to 24, 1970.

[26]Ralph G. Tucci and John W. Webb, "MOSAICS, Medication Order Supply and Individual Charge System," American Journal of Hospital Pharmacy, XXI (July, 1964), 312.

[27]Earl K. Long Memorial Hospital, "Nursing Policies," Baton Rouge, Louisiana, 1968. (Xerox.)

[28]Kenneth N. Barker and Warren McConnell, "How to Detect Medication Errors," Modern Hospital, XCIX (July, 1962), 102; Barker and Heller, "Part VI, The Pilot Study-Medication Errors," p. 613.

[29]Barker and Heller, "Part VI, The Pilot Study-Medication Errors," p. 610.

[30]Kenneth N. Barker and Warren E. McConnell, "The Problems of Detecting Medication Errors in Hospitals," American Journal of Hospital Pharmacy, IXX (August, 1962), 368.

[31]Kenneth N. Barker, "The Effects of an Experimental Medication System on Medication Errors and Costs, Part I, Introduction and Errors Study," American Journal of Hospital Pharmacy, XXVI (June, 1969), p. 330.

[32]M. Danile Knight, Sr. and K. Kim Cowley, "A One-Year Look at Unit Dose," Hospital Progress, L (January, 1969), 28.

[33]Barker, "Part I, Introduction and Errors Study," p. 326.

[34]W. G. Blasingame et al., "Some Time and Motion Considerations with Single-Unit Packaged Drugs," American Journal of Hospital Pharmacy, XXVI (June, 1969), 313.

[35]Director of nursing, Long Memorial, interviews during periods February 16 to 20 and April 13 to 24, 1970.

[36]Francke, et al., Mirror to Hospital Pharmacy, p. 103.

[37]Ibid., p. 104, p. 113.

[38]Blasingame, et al., "Time and Motion Considerations," p. 314.

[39]Ibid., p. 313; Richard Misgen, "Unit-Dose Dispensing Can Be Both Efficient and Inexpensive," Hospital Management, C (July, 1965), 58.

[40]Louisiana Board of Pharmacy, Louisiana Pharmacy Law, p. 8.

[41]Joint Commission on Accreditation of Hospitals, Standards, p. 93.

CHAPTER III

CONCLUSION

Conclusions

It is concluded that a unit dose type drug control and distribution system can best be implemented by the Earl K. Long Memorial Hospital, Baton Rouge, Louisiana, as follows:

1. Modify the present ordering system to allow the pharmacist a more responsible position in review and interpretation of medication orders.

2. Reduce the potential for error in the ordering process by eliminating transcription of the doctor's medication order by the nurse.

3. Adopt a policy of using unit dose packaging for all drugs except selected treatment type items such as rubbing alcohol.

4. Establish a firm policy regarding maintenance of floor stocks and return of unused medications to the pharmacy.

5. Modify the present three-day bulk dispensing policy to a unit dose dispensing method.

6. Retain the present concept of centralized dispensing.

7. Implement a centralized preparation system.

8. Revise the present method of delivering medications to the nursing units to integrate unit dose dispensing with the established schedule of standard medication times.

Recommendations

It is recommended that:

1. A revised pharmacy order form be procured and used as a doctor's drug order form.

2. The following unit dose packaging equipment be procured as a minimum:

   a. Strip packer for dry dosage forms.

   b. Manual liquid filling apparatus consisting of two 25 ml calibrated burettes or an automatic pipetter and either a hand crimper or bench mounted capping machine.

   c. Syringe filling stand.

   d. Small label printing machine.

3. Additional medication drawer units be procured to provide one drawer per patient.

4. Pharmacy operating hours be extended to 6:00 A.M. to 11:00 P.M. daily.

5. One additional registered pharmacist and five additional pharmacist assistants be employed.

6. All routine medications be delivered to the nursing floors four times daily and that only a single dose of medication for each scheduled administration, prior to the next delivery, per patient, be delivered at each time.

7. "Stat" and "Prn" medications be dispensed from the pharmacy on an individual dose basis.

8. An inservice orientation and training program be developed and applied, to explain the reasons for and benefits of such a medication

system to all hospital personnel, to include physicians, who must work with the system in any way.

It is also recommended that further study be given to:

1. Development of a controlled intravenous-additive program in the pharmacy, with integration into the unit dose dispensing system.

2. Development of an inventory management system for the pharmacy.

3. Inclusion of narcotics in the unit dose medication system.

4. Centralizing drug administration under the supervision of the chief pharmacist through the use of medication nurses employed by the pharmacy department.

5. The development of a policies and procedures manual for the pharmacy, regardless of whether the present medication system is continued or modified.

APPENDIX A

DOCTOR'S ORDERS

ATE	TIME A.M.	TIME P.M.	MEDICATION AND/OR TREATMENT

APPENDIX B

PHYSICIAN'S ORDERS OR KARDEX

EARL K. LONG MEMORIAL HOSPITAL — PHYSICIAN'S ORDERS — EKLH 222

ROUTINE MEDICATIONS	TIME	TREATMENTS	DIET
			SPECIAL ORDERS
		INTAKE & OUTPUT	
		PRN MEDICATIONS	
AGE: DATE:			OPERATION:
PATIENT:	ROOM NO.		DIAGNOSIS:

NAME

ROOM DR.

HOUR H.N.

MEDICATION

TEAR CARD

DATE

MEDICATIONS
EKLH 218

APPENDIX C

PHARMACY ORDER

STATE OF LOUISIANA HOSPITALS

PATIENT NO.	AGCY	LOC	DATE	NO	CODE	NO	CODE	NO	CODE	NO	CODE	36 DPT.

FOR MORE THAN FOUR DRUGS — USE ADDITIONAL CARD

22711 PHYSICIAN ORDERING

WHEN REQUESTING FLOOR DRUGS —
PLACE BLANK MASTER CARD IN MACHINE

CODE	QUANTITY	STRENGTH	DRUG DESCRIPTION

PHARMACY ORDER | FILLED BY: | REQUESTED BY:

SLH 053

22711 PHARMACY

PHARMACY COPY

APPENDIX D

DRUG ADMINISTRATION RECORD

EARL K. LONG MEMORIAL HOSPITAL

DRUG ADMINISTRATION RECORD *

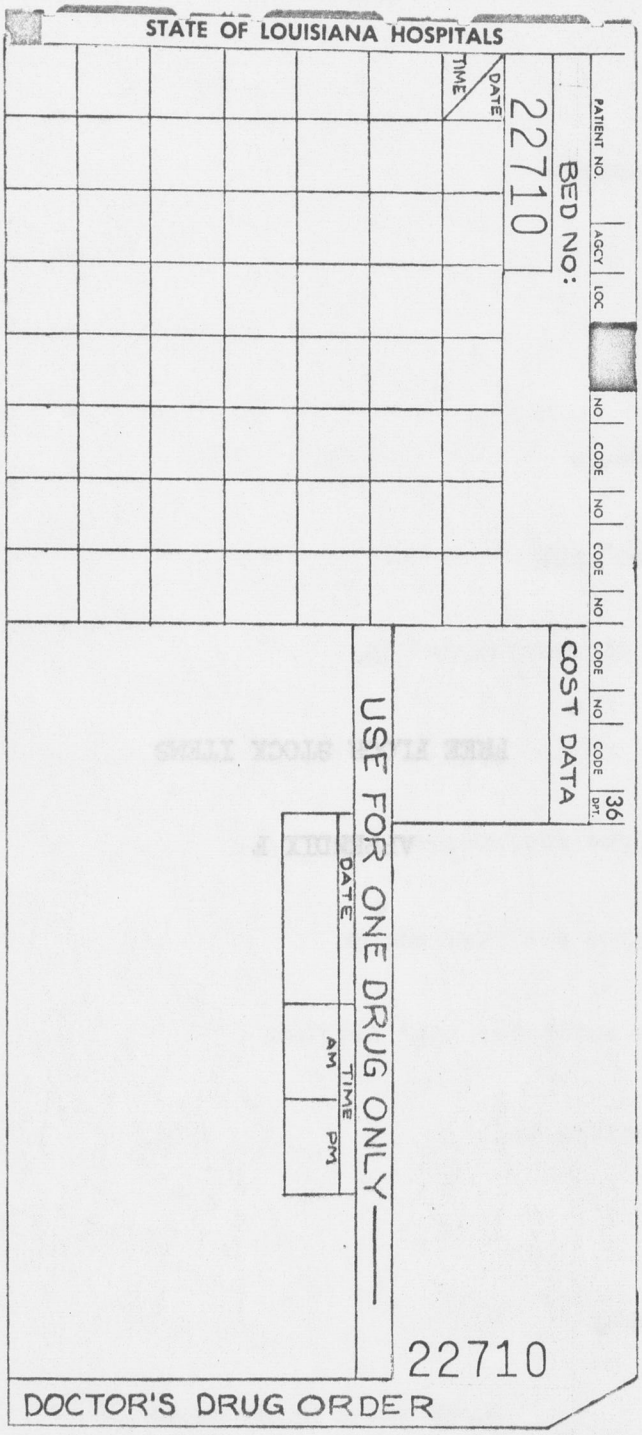
EKLH 225

Date								
ication and age		Initials Hours	Initials Hours	Initials Hours	Initials Hours	Initials Hours	Initials Hours	Initials Hours
e Started	I							
	7–3							
	I							
	3–11							
	I							
	11–7							
e Started	I							
	7–3							
	I							
	3–11							
	I							
	11–7							
e Started	I							
	7–3							
	I							
	3–11							
	I							
	11–7							
e Started	I							
	7–3							
	I							
	3–11							
	I							
	11–7							

* Write D/C under the date when medication discontinued

APPENDIX E

PROPOSED DOCTOR'S DRUG ORDER FORM


STATE OF LOUISIANA HOSPITALS
TIME
DATE
22710
BED NO:
PATIENT NO.
AGCY
LOC
NO
CODE
NO
CODE
NO
CODE
NO
CODE
NO
CODE
36
DPT.
COST DATA
USE FOR ONE DRUG ONLY
DATE
AM
TIME
PM
22710
DOCTOR'S DRUG ORDER

APPENDIX F

FREE FLOOR STOCK ITEMS

FREE FLOOR STOCK ITEMS

1. Rubbing alcohol
2. Mineral oil
3. Emulsified castor oil
4. Benzalkonium chloride, USP, refined
5. Povidone-iodine surgical scrub
6. Povidone-iodine antiseptic
7. Thimerosal
8. Mepivacaine hydrochloride, NF
9. Lidocaine, ND, USP
10. Milk of magnesia
11. Aspirin
12. Castor oil
13. Hydrogen peroxide

APPENDIX G

UNIT DOSE PACKAGING EQUIPMENT EXAMPLES

unit dose SYSTEM

B-D UNIT DOSE SYSTEM

Machinery and Equipment

HOSPITAL PRICE LIST

Catalog Number	Product Description	Minimum Order Quantity	Hospital Price
8603	Fermpress Hand Crimper	1 ea.	$ 125.00
8604	Bench Capper	1 ea.	400.00
8606	Brewer Pipetter-Single Arm	1 ea.	415.00
8607	Brewer Pipetter-Dual Arm	1 ea.	955.00
8660	Mini-Bench, laminar flow work station, 24"	1 ea.	440.00
8661	Pharmacy Bench, laminar flow work station, 47"	1 ea.	860.00
8666	Pharmacy Bench, laminar flow work station, 47", w/o floor stand	1 ea.	695.00
8680	Una-Strip Packer Mark II	1 ea.	4600.00
8710	Mini-Med Cart – 24 patient drawers	1 ea.	375.00
8711	Medication Cart – 28 patient drawers	1 ea.	398.00
8712	Medication Cart – 35 patient drawers	1 ea.	444.00
8714	Individual Patient Tray	Case of 10 ea.	10.00
8715	Transfer Tray for Mini-Med Cart	1 ea.	7.50
8716	Transfer Tray for Medication Carts	1 ea.	10.00
8717	Extra Shelf	1 ea.	10.00
8718	Narcotics Locker	1 ea.	76.00
8719	Extra IV Solution Carriers	1 ea.	3.00

SHIPPING: **Freight charges will be prepaid and added onto invoice.**

TERMS: **Net 30 days.**

B-D BECTON-DICKINSON
Rutherford, New Jersey 07070
Division of Becton, Dickinson and Company
In Canada: Becton, Dickinson & Co., Canada, Ltd., Clarkson, Ontario

and BECTON-DICKINSON are registered trademarks of Becton, Dickinson and Company.

Printed in U.S.A. UDME/69

Unit dose SYSTEM

B-D UNIT DOSE SUPPLY ITEMS

HOSPITAL PRICE LIST

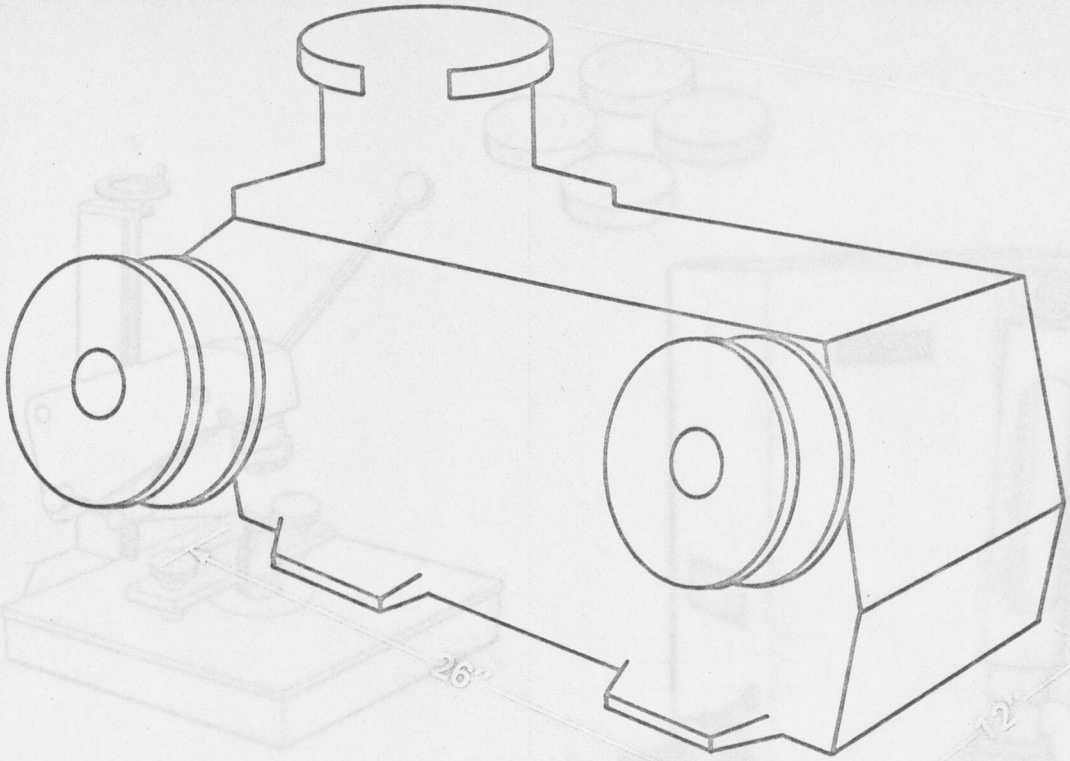
CATALOG NUMBER	DESCRIPTION	SUGGESTED HOSPITAL NET PRICE
	Unit Dose Amber Glass Vials	**Case of 500**
8600	½ ounce	$15.40
8601	1 ounce	17.60
	Shelf-Pack of 100 each	
	Case-Pack of 500 each	
	Unit Dose Vial Closure	**Case of 5000**
8602	Aluminum Closure	44.00
	Bulk Sterile GLASPAK Syringes	**Case of 576**
5246	2½cc disposable glass syringes	53.00
	Tray-Pack of 18 each	
	Shelf-Pack of 36 each	
	Case-Pack of 576 each	
	Transfer Needles	**Case of 200**
8325	2¼", Sterile	56.00
8328	3", Sterile	61.00
	Shelf-Pack of 50 each	
	Case-Pack of 200 each	
	Syringe Filling Stand	**Each**
8339	Stainless steel stand and holder	55.00
	***Vented LUER Tip Caps, Sterile**	**Case of 2000 ea.**
8340	Vented rubber tip caps	44.00
	Blister-Pack of 10 each	
	Case-Pack of 2000 each	
	Oral Solid Strip Packaging Material	**Case of 10 rolls**
8700	Poly-Cello Web Material, 6" OD, 3" ID, 1½" wide	50.00
8701	Paper-Poly-Foil Web Material, 6" OD, 3" ID, 1½" wide	50.00
8702	Poly-Cello-Foil Web Material, 6" OD, 3" ID, 1½" wide	55.00

***This product will be available within 90 days. You will receive formal notice of all major new Unit Dose Product releases.**

B-D **BECTON-DICKINSON**
Rutherford, New Jersey 07070
Division of Becton, Dickinson and Company
In Canada: Becton, Dickinson & Co., Canada, Ltd., Clarkson, Ontario

BECTON-DICKINSON and GLASPAK are registered trademarks of Becton, Dickinson and Company.

Printed in U.S.A. UDHPL/69



UNA-STRIP PACKER Model Mark II

Specifications:

Physical Dimensions:
Approximately 26" long, 20" high, 12" deep.
Mounted on a base approximately 18½" long and 10" wide.

Weight:
Approximately 100 lbs.

Construction:
Cast aluminum frame with baked white enamel finish. All other metal parts chrome plated.

Electrical:
110V Single phase, 60 cycle.

Operation:
Machine is cycled at 40 strokes per minute and controlled by an "ON OFF" switch with heat controls of "ON, OFF, HIGH, MED., LOW."

Completely automatic feed from a syntron bowl with adjustable feeding device to accommodate practically all dry oral dosage forms without changing parts.

Delivery of product into packages is controlled by an electric eye.

Features:

Machine will be factory set to produce a package measuring 1½" by 2" and will not be adjustable.

The UNA-STRIP packer will be capable of using many types of heat-sealable flexible supported packaging materials.

A simple inking device will be incorporated in the machine for registering copy which is to be printed on the web during the packaging operation. This inking device will use rubber mats, or possibly plastic addressograph plates, depending upon availability from the user.

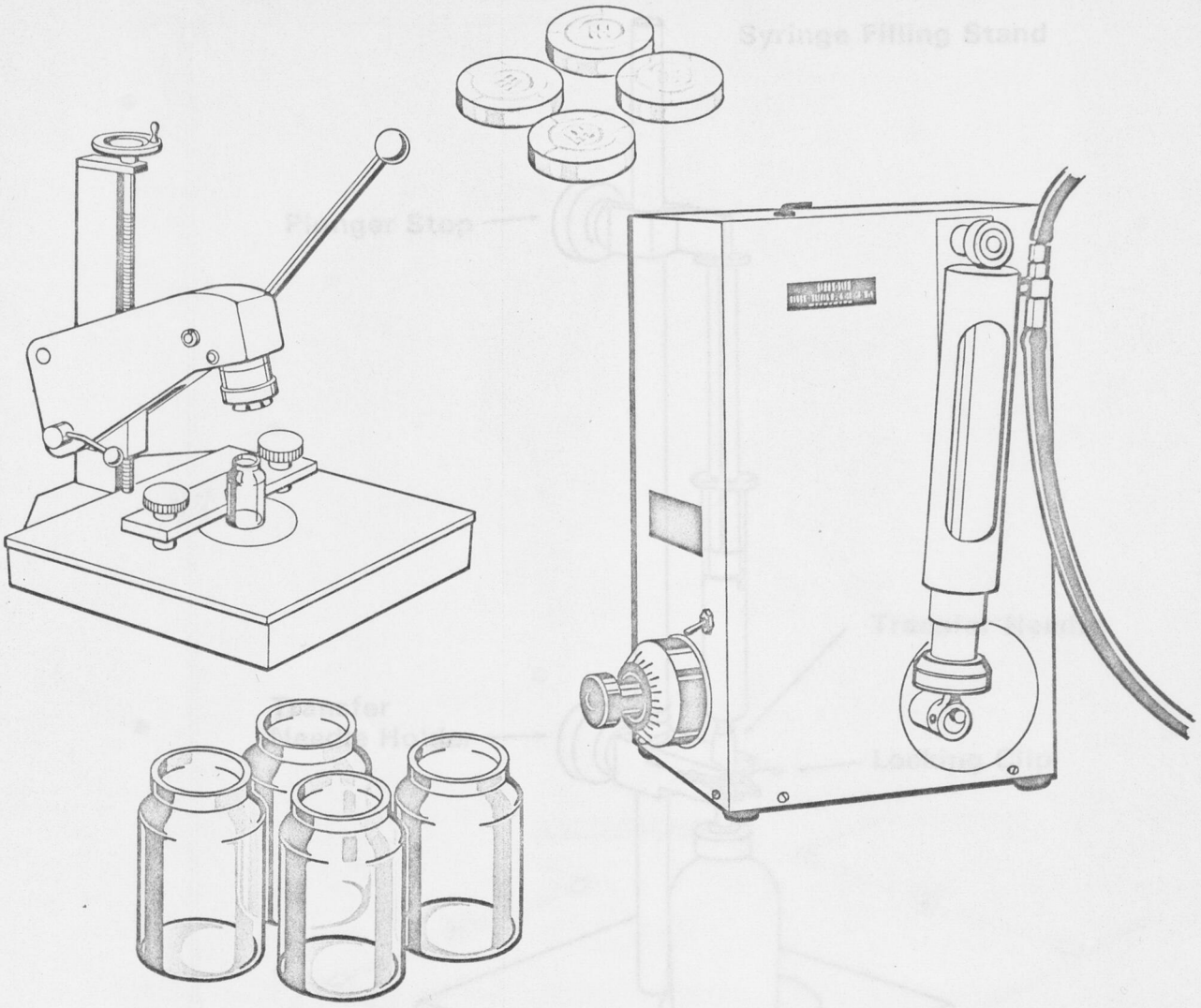
The UNA-STRIP packer will be equipped with a counter to indicate the number of products packaged and will embody a manual switch for either cutting in individual packages of 1's or for perforating in between individual packages.

An instruction manual will be provided with each machine.

The machine will be packed in a wooden case ready for use.

B-D **BECTON-DICKINSON**
Rutherford, New Jersey 07070
Division of Becton, Dickinson and Company
In Canada: Becton, Dickinson & Co., Canada, Ltd., Clarkson, Ontario

B-D and UNA-STRIP are registered trademarks. Printed in U.S.A. USP/69



Caps
Two piece lacquered aluminum with a pulp board and facing liner. Packaged 5,000 per shipping carton.

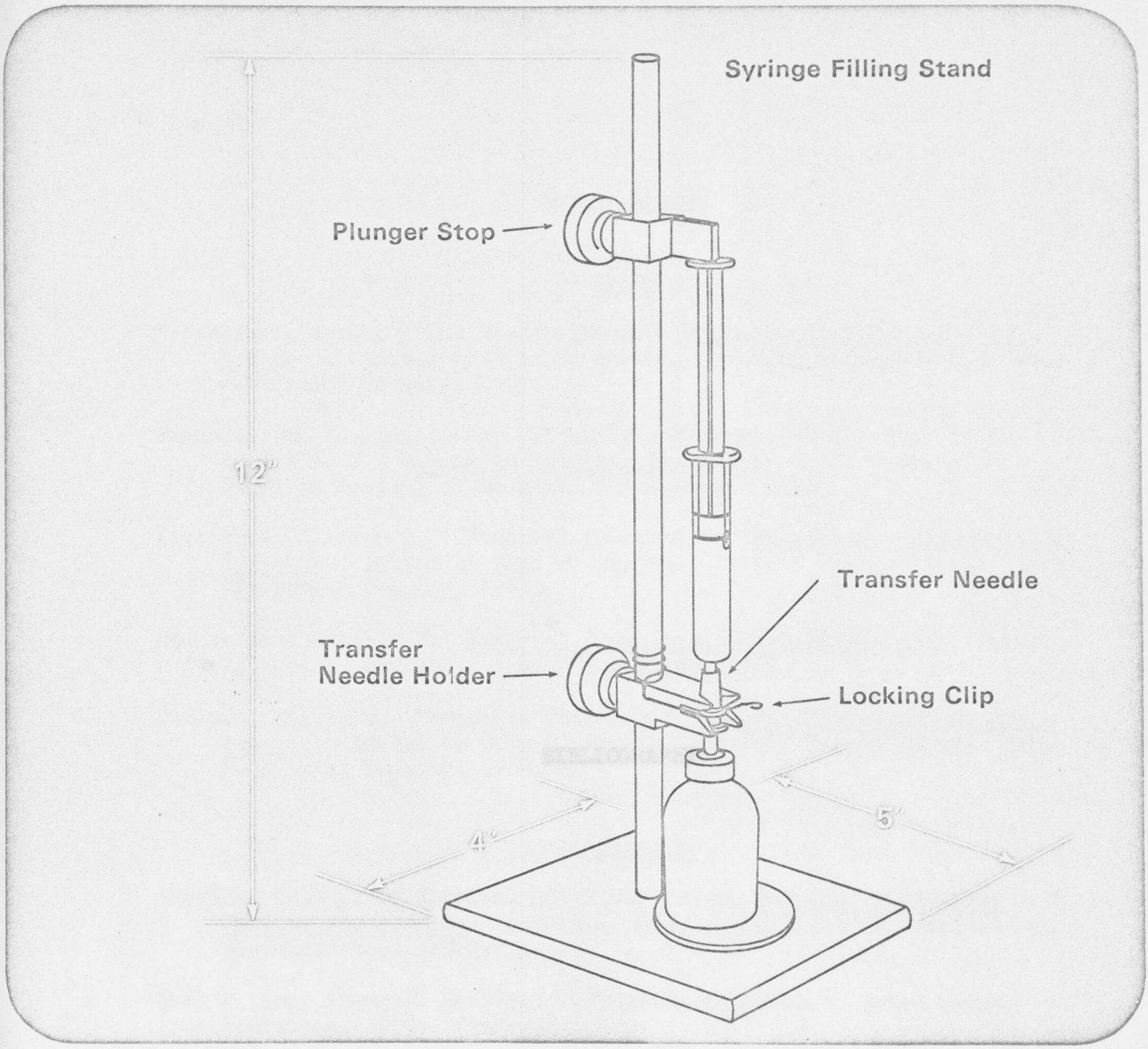
Pipetter
A unit designed to dispense accurately measured volumes of fluids in bottles.

Capping Machine
A unit which crimp-seals caps on bottles.

Bottles
15 and 30 cc amber bottles packaged 100 per tray with polyethylene heat-shrink wrap, 5 trays per carton. Polyethylene overwrap insures clean bottles.

B-D BECTON-DICKINSON
Rutherford, New Jersey 07070
Division of Becton, Dickinson and Company
In Canada: Becton, Dickinson & Co., Canada, Ltd., Clarkson, Ontario

B-D is a registered trademark. Printed in U.S.A. OLS/69



General Information

1. Use with B-D sterile, disposable transfer needle.
2. Adjustable transfer needle holder and plunger stop allow accurate filling of most syringes from any size vial.
3. Locking clip holds transfer needle in place.

Advantages

1. Simple to operate and maintain.
2. Minimal training required for high productivity yields.
3. Accuracy of results of trained operators reproducible to ±10% or better.
4. Sets up in minutes—changes to filling different medicaments in minutes.
5. Significant reduction in waste over conventional methods.
6. Reduces operator fatigue and resulting errors.
7. All parts are detachable and easy to clean.

Specifications

Physical dimensions:
12" high from base, which is 5" x 4" x ⅜"

Weight:
Approximate—950 grams

Construction:
303 stainless steel, plastic knobs and Butyl rubber padding.

Operation:
The device is operated manually and all adjustments are manual.

B-D BECTON-DICKINSON
Rutherford, New Jersey 07070
Division of Becton, Dickinson and Company
In Canada: Becton, Dickinson & Co., Canada, Ltd., Clarkson, Ontario

B-D is a registered trademark. Printed in U.S.A. MSF/69

BIBLIOGRAPHY

BIBLIOGRAPHY

Books

Felmeister, Alvin. "The Prescription." Remington's Pharmaceutical Sciences. Edited by Eric W. Martin. Easton, Pennsylvania: Mack Publishing Company, 1965.

Francke, Don E.; Latiolais, Clifton J.; Francke, Gloria N.; and Ho, Norman F. H. Mirror to Hospital Pharmacy. Washington, D. C.: American Society of Hospital Pharmacists, 1964.

Latiolais, Clifton J. "Hospital Pharmacy." Remington's Pharmaceutical Sciences. Edited by Eric W. Martin. Easton, Pennsylvania: Mack Publishing Company, 1965.

MacEachern, Malcolm T. Hospital Organization and Management. Berwyn, Illinois: Physician's Record Company, 1962.

Skolaut, Milton W. "Hospital Pharmacy." Husa's Pharmaceutical Dispensing. Edited by Eric W. Martin. Easton, Pennsylvania: Mack Publishing Company, 1966.

Pamphlets

American College of Hospital Administrators. Hospital Medication Systems Study Guide. Chicago: American College of Hospital Administrators, 1969.

Earl K. Long Memorial Hospital. "Nursing Policies," Baton Rouge, Louisiana, 1968. (Xerox.)

Earl K. Long Memorial Hospital. "Nursing Procedures," Baton Rouge, Louisiana, 1968. (Xerox.)

Joint Commission on Accreditation of Hospitals. Standards for Accreditation of Hospitals. Chicago: Joint Commission on Accreditation of Hospitals, 1969.

Louisiana Board of Pharmacy. Louisiana Pharmacy Law. Baton Rouge, Louisiana: Louisiana Board of Pharmacy, 1970.

Periodicals

American Society of Hospital Pharmacists. "Guidelines Relative to the Safe Use of Medications in Hospitals." American Journal of Hospital Pharmacy, IXX (November, 1962), 577-80.

_____. "Report of Council on Professional Practice." American Journal of Hospital Pharmacy, XXV (August, 1968), 464-5.

_____. "Report of Council on Professional Practice." American Journal of Hospital Pharmacy, XXVI (August, 1969), 479.

_____. "Statement on Hospital Drug Distribution Systems." American Journal of Hospital Pharmacy, XXI (November, 1964), 535-6.

Barker, Kenneth N. "Experimental Distribution System Offers Total Drug Control." Hospitals, XXXIX (September 16, 1965), 142-55.

_____. "The Effects of an Experimental Medication System on Medication Errors and Costs, Part One: Introduction and Errors Study." American Journal of Hospital Pharmacy, XXVI (June, 1969), 324-33.

_____, and Heller, William M. "The Development of a Centralized Unit Dose Dispensing System, Part One, Description of the UAMC Experimental System." American Journal of Hospital Pharmacy, XX (November, 1968), 568-9.

_____. "The Development of a Centralized Unit Dose Dispensing System at UAMC, Part II, Why Centralize the Preparation of Unit Dose?" American Journal of Hospital Pharmacy, XX (December, 1963), 612-23.

_____. "The Development of a Centralized Unit Dose Dispensing System for UAMC, Part III, An Editing Center for Physician's Medication Orders." American Journal of Hospital Pharmacy, XXI (February, 1964), 67-77.

Barker, Kenneth N. and Brennan, James J. "The Development of a Centralized Unit Dose Dispensing System for UAMC, Part V, The Pilot Study--Introduction and Work Measurement." American Journal of Hospital Pharmacy, XXI (September, 1964), 413-23.

Barker, Kenneth N. and Heller, William M. "The Development of a Centralized Unit Dose Dispensing System for UAMC, Part VI, The Pilot Study--Medication Errors and Drug Losses." American Journal of Hospital Pharmacy, XXI (December, 1964), 609-25.

Barker, Kenneth N. and McConnell, Warren E. "The Problems of Detecting Medication Errors in Hospitals." American Journal of Hospital Pharmacy, IXX (August, 1962), 361-69.

_____. "How to Detect Medication Errors." Modern Hospital, XCIX (July, 1962), 95-106.

Black, Harold J. and Tester, William W. "Decentralized Pharmacy Operations Utilizing the Unit Dose Concept." American Journal of Hospital Pharmacy, XXI (August, 1964), 345-50.

Blasingame, W. G.; Drevno, Harold; Godley, Leo F.; Dratz, Richard L.; Vona, Joseph.; and Minott, Paul. "Some Time and Motion Considerations with Single-Unit Packaged Drugs." American Journal of Hospital Pharmacy, XXVI (June, 1969), 310-15.

Bogash, Robert C. "Drug Packaging and Distribution as Seen by a Hospital Pharmacist." Hospital Topics, XLII (June, 1964), 79-81.

Bohl, James C., McLean, William M.; Meyer, Fred; Phillips, George L.; Scott, Walter V.; and Thudium, Vern F. "A Trinity of Units,-- Patient, Pharmacist and Doses, part one: The Medication System." American Journal of Hospital Pharmacy, XXVI (June, 1969), 316-23.

Bowles, Grover C., Jr. "New Regulations Will Encourage Unit Dose." Modern Hospital, CXII (March, 1969), 112-36.

_____. "Strip Packaging Contributes to Patient Safety." Modern Hospital, C (May, 1963), 136.

Cassall, Sister M. "A Nurse Views the Trends in Pharmaceutical Dispensing Practices." Hospital Management, XCV (June, 1963), 80-4.

Conley, Dean. "A Management Team Approach to Hospital Systems Analysis." Hospital Administration, XV (Winter, 1970), 58-78.

Freund, R. Gary. "How the Centralized Unit Dose Concept Works in a Community Hospital." Hospitals, XL (September 16, 1966), 152-58.

Fulton, Jack J. "Medication Errors." Hospital Forum, VIII (June, 1965), 40-3.

Heller, William M.; Sheldon, Eleanor C.; and Barker, Kenneth N. "The Development of a Centralized Unit Dose Dispensing System for UAMC, Part IV, The Roles and Responsibilities of the Pharmacist and the Nurse Under the Experimental System." The American Journal of Hospital Pharmacy, XXI (May, 1964), 231-37.

Henderson, Cynthia. "The Dispensing Trilemma." American Journal of Nursing, LXV (December, 1965), 58-62.

Knight, Sr. M. Danile and Cowle, K. Kim. "A One-Year Look at Unit Dose." Hospital Progress, L (January, 1969), 26-34.

Kurtz, Alfred R. and Smith, James L. "Three Dimensional Drug Losses." Hospital Topics, XXXIX (April, 1961), 53-61.

Lantos, Robert L. "Pharmacy." Hospitals, LXIII (April 1, 1969), 163-68.

Latiolais, Clifton J. "What Can be Done to Improve Drug Distribution?" Hospitals, XXXIX (November 16, 1965), 105-108.

Mary Virginia, Sister. "Transmitting Physician's Orders With an Automated Writing Device." American Journal of Hospital Pharmacy, XXII (August, 1965), 464-67.

Misgen, Richard. "Unit Dose Dispensing Can be Both Efficient and Inexpensive." Hospital Management, C (July, 1965), 56-62.

Moravec, Daniel F. "Legal Aspects of Drug Distribution and Administration." Hospital Management, CII (November, 1966), 52.

_____. "The Hospital Pharmacy--A Profile for 1968." Hospital Management, CV (February, 1968), 59-62 and CV (March, 1968), 66-9.

"Study of Patient Care Involving Unit Dose System Underway in Iowa." Hospital Topics, XLII (June, 1964), 81-2.

Tousignaut, Dwight R. "Pharmacy." Hospitals, CLIV (April 1, 1970), 137-43.

Weinzettil, R. J. "A Unit Dose Dispensing System Without Extensive Capital Expenditure." Hospital Management, C (September, 1965), 86-92.

ABSTRACT

A STUDY OF THE DRUG CONTROL AND DISTRIBUTION SYSTEM OF THE EARL K. LONG MEMORIAL HOSPITAL, BATON ROUGE, LOUISIANA

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

Major Chauncy P. Brothers, Jr., MSC

August 1971 97 Pages

A copy of this document may be obtained on interlibrary loan from Stimson Library, United States Army Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Texas.

The problem in this study was to determine a unit dose type drug distribution and control system for the Earl K. Long Memorial Hospital.

Research methods employed included observation and interview and physical inventory of nursing unit drug stocks. Pharmacy records were surveyed for workload and cost data. The literature was reviewed and comparisons made between the Long and similar institutions. Four other hospitals were observed for comparative purposes.

It was found that the pharmacy receives only a transcribed copy of the doctor's drug order, made by the nurse. It was also found that the pharmacy workload is presently somewhat below that of other similar institutions, a large stock of medications was being carried on nursing units, the hospital was designed without medicine rooms or preparation areas on the nursing units, and medications were being prepared for administration in areas designed only as utility rooms.

Analysis of recent issues and returns to the pharmacy for credit appeared to show that a considerable increase in issues was not accompanied by an expected increase in returns for credit.

It was concluded that a unit dose drug control and distribution system could best be implemented at the hospital by adopting a unit dose packaging system and a centralized unit dose preparation and dispensing system.

It was recommended that the present pharmacy order be redesigned as a separate doctor's drug order; that strip packaging, oral liquid, syringe filling, and label printing equipment be purchased; that one additional registered pharmacist and five additional pharmacy assistants be hired; that pharmacy hours be extended to 6:00 am to 11:00 pm; and that all medications be delivered to the nursing units four times per day in sufficient single doses for the time period until the next delivery.