A SURVEY TO IDENTIFY CHANGE IN THE FEELINGS OF A GROUP OF PROFESSIONAL NURSES ABOUT THE EFFECT OF AUTOMATION IN A SELECTED HOSPITAL

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Taylor, Deane Beatrice (M.S., Nursing)

A Survey to Identify Change in the Feelings of a Group of Professional Nurses About the Effect of Automation in a Selected Hospital

Thesis directed by Professor Katherine J. Kelly

It was the purposes of this study to identify the feelings of a group of professional nurses at a selected hospital prior to and following four months of experience working in an automated hospital in relation to: (1) selected areas of nursing activities, (2) the work environment, (3) the patient, the nurse, and the hospital administration, and (4) to identify the change, if any, in the feelings of the nurses about the effect of automation in the hospital.

Sixty-two nurses who completed and returned both survey forms were the subjects for this study.

Data were obtained from two surveys, one given prior to the move from the old hospital and the second, four months after the move into the new hospital with the automated and mechanized devices. Two statistical techniques were used in analyzing the data. These were: The Normal Approximation to the Binomial and The McNemar Test of

Significance of Change.

Analysis of the data revealed that the nurses generally agreed with the experts and the findings on the impact of automation from industry about the effect of automation in the hospital. The data also indicated that the nurses' expectations about automation in the hospital were generally fulfilled in the automated hospital. There were many changes in the responses of the nurses on the second survey in comparison to the first survey, however, the changes were random and did not indicate the direction of change at the .05 level of significance.

This abstract of about 200 words is approved as to form and content. I recommend its publication.

Signed Katherine J. Kelly
Instructor in charge of thesis

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INTRODUCTION

Automation and modern technology are rapidly invading the hospital environment. In 1954, during the Joint Congressional Committee's hearings on Automation, experts testified they did not believe there was a role for automation within the hospital.[1] Also, it is rather interesting to note, no references to automation in the hospital were found in the nursing literature until 1961.

Now automation and mechanization are found in nearly every area of the hospital. Data processing equipment is utilized in the business and accounting offices, the admitting and administrative offices, the purchasing department, and the offices of the dietitians as well as the director of nursing service.

Electronic monitoring devices are being studied to find the simplest and most accurate method of recording

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[1] Edward H. Noroian, "The Challenge of Automation," Blueprint for Progress in Hospital Nursing. National League for Nursing, 10 Columbus Circle, New York 19, New York. (1962), p. 37.

continuously the patient's vital signs. Electrocardiographic monitors are being used more and more frequently in intensive care and cardiac units in the hospital.

Other forms of automation and mechanization involve methods of delivering supplies and equipment to the nursing unit. Universal communications systems and pneumatic tube systems contribute to almost instantaneous written and verbal contact between patients and personnel as well as with all service areas in the hospital.

The use of automated and mechanical devices in hospitals is not as extensive, at this time, as in industry. However, there is no question that the degree of change from the old, out-moded, traditional hospital building to a new, relatively highly automated hospital is as great in magnitude as most hospital workers will ever experience.

II. STATEMENT OF THE PROBLEM

The purpose of the study was to identify the feelings of a group of professional nurses about the effect of automation in the hospital setting prior to and following the move from an old, traditional hospital to a new, relatively highly automated hospital. The specific aim of the study was to ascertain if the feelings of the professional nurses toward automation in the hospital changed after a

period of experience working in a relatively highly automated hospital.

III. HYPOTHESES TESTED

The following null hypotheses were tested.

1. There will be no significant change in the feelings of nurses about the need for initial and on-going inservice education for all staff working in an automated hospital.

2. There will be no significant change in the feelings of nurses about the effect of automation on the work environment in the hospital.

3. There will be no significant change in the feelings of nurses about the effect of automation on supervisory responsibilities and on staffing needs within the hospital.

4. There will be no significant change in the feelings of nurses about the effect of automation on communication within the hospital.

5. There will be no significant change in the feelings of nurses about the effect of automation on the improvement of patient care.

6. There will be no significant change in the feelings of nurses about the effect of automation on the need for nurses to possess increased skills in human relations and increased clinical knowledge in nursing.

7. There will be no significant change in the feelings of nurses about the effect of automation on the job satisfaction of nurses.

8. There will be no significant change in the feelings of nurses about the need for nurses to possess increased technical knowledge and skill or to be more professionally competent.

9. There will be no significant change in the feelings of nurses about the effect of automation on the amount of non-nursing duties assigned to the professional nurse.

10. There will be no significant change in the feelings of nurses about the effect of automation on social interaction between nurses.

IV. SIGNIFICANCE OF THE STUDY

In the autumn of 1962, the national conferences for nursing service directors and others concerned with improving organized nursing services in hospitals were held for the first time. The conferences were sponsored by the National League for Nursing. The over-all purpose of the conferences was "to develop a blueprint for progress in hospital nursing."[2]

During the three days of conference meetings, the topics discussed were those which were considered to be the three major challenges to organized hospital services. These topics were:

1. Changing trends in the community, in medicine, and in the hospital.

2. Technological advances, including automation, and methods improvement.

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[2]Blueprint for Progress in Hospital Nursing, op. cit., p. 1.

> 3. The patient as an individual, and the provision of high quality nursing service.[3] [Italics by the writer]

The consensus of the speakers on the challenge of automation was that "new and exciting developments in automation, organization, and work design offer organized nursing services unexcelled opportunities to provide better nursing care."[4]

Noroian stated that:

> The challenge of automation is in helping to overcome many of the deficits that currently exist, and in preparing personnel to accept the concept of automation and to use and to help develop automated devices when they come on the market.[5]

Noroian further observes:

> I urge you most of all to indicate approval of the principles of the use of automated equipment and not to indicate fear of its use. In no way can it be considered a threat to professional responsibility nor inappropriate to hospital use.[6]

However, some nursing leaders have expressed concern about the effect of automation on patient-nurse relationships. Hildegard E. Peplau stated in a monograph prepared

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[3] Ibid.

[4] Ibid.

[5] Edward H. Noroian, op. cit., p. 40.

[6] Ibid.

for the American Nurses' Association that:

> Many nurse-observers believe mechanization will greatly increase anonymity, coldness, and distance as characteristics of the climate of hospitals. . . . Relations between nurses and automated health services must be guided by the purpose of nursing. . . . All mechanized devices must be considered as secondary in importance to the nurse-patient relationship in the nursing situation.[7]

Nurses should assume leadership in conducting studies on the effect of automation and mechanization on the work environment, on the improvement of patient care, and on the ability and willingness of nurses to accept these changes.

Nurses across the country have complained about the desk work and non-nursing duties for which they are responsible and which keep them from giving direct care to their patients. One study indicated that 32.7 per cent of professional nurses' time is spent in non-nursing activities than giving patient care.[8] Nurses should be very deeply involved in helping to determine the right kind of equipment needed to meet the needs in nursing.

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[7]Hildegard E. Peplau, "Automation: Will it Change Nurses, Nursing, or Both?" A Monograph published by the American Nurses Association, 10 Columbus Circle, New York 19, New York. (1962), p. 46.

[8]Arlene Howe, "Supervisors Coordinate Patient Services," The Modern Hospital, Vol. 7, No. 1 (July, 1963), pp. 77-81.

During the past several years, efforts have been made to free the nurse from non-nursing activities. Unit managers, administrative supervisors, drug dispensing methods, and data processing equipment for simplifying the requisitions for drugs, supplies, equipment and materials used in giving patient care are a few of the methods which have been utilized to get the nurse back to the bedside.

One method of relieving the nurse from the task of obtaining and transporting the supplies, materials and equipment needed to give patient care has been the installation of automatic continuous conveyor systems, which eject the requested items at the station indicated by a dispatcher. This system is based on the principle of Detroit Automation. A universal communications system assures the nurse of delivery of any item she needs without leaving the patient's room. The nurses may go from room to room giving patients care without returning to the nursing station on the floor. She does not have to leave the nursing unit to obtain the supplies, drugs, materials, or equipment of any kind.

In contrast, one of the outstanding characteristics of the nonautomated hospital is that personnel must interact directly in order to secure the many different items

needed to give patient care. Extensive face-to-face communication occurs not only between patients and staff but also within each of these groups as well. How do professional nurses feel about automation and mechanization in the hospital setting if it changes the working environment and the social interaction patterns in this manner?

Many of the new mechanical devices such as the hemodialyzer, the cardiac pacemaker, and other monitoring devices are presenting exciting new horizons in the field of nursing practice. The concepts of functional flow design of the hospital building, which included automatic delivery systems, universal communications systems, and a Nurserver stocked with supplies and equipment for the individual patient's care within the patient's room are changing the work environment of the professional nurse.[9]

It is anticipated that mechanization and automation will become a part of the hospital work environment. The nurses acceptance of and adjustment to technological change needs to be studied and factors identified which will make the transition to automation in the hospital easier for all

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[9]David A. Gee, "Automation, Organization, and Work Design: The Challenge that Nursing Faces Today and Tomorrow," Blueprint for Progress in Hospital Nursing, op. cit., p. 41.

professional nurses.

V. DEFINITION OF TERMS

1. Automation in the hospital setting is a method of "reducing human effort and involvement in the areas of patient care and institutional operation through use of mechanical and electronic machines, organization, and work design."[10]

2. Professional Nurse: Any nurse licensed to work as a registered nurse in the state of Colorado.

3. Core Technician: A non-professional employee trained by the hospital for this particular position. He is responsible for the following duties: ordering all supplies and materials needed to stock the Nurservers and the complement carts; making out the charge slips for equipment and materials used in giving patient care; answering the inter-communication system; delivering all items requested by the nursing personnel to the patient's room; stocking of the Nurserver for new admissions and daily replacements; returning soiled equipment to the decontamination area in the central dispatch area and soiled linens to the laundry.

4. Non-nursing Tasks: Any task or work which could be done by non-professional personnel or mechanical or electronic device, but such tasks are directly or indirectly a part of patient care.

VI. DESCRIPTION OF THE AUTOMATION AT MERCY HOSPITAL

The setting for this study was a new, relatively highly automated hospital building. Several mechanical

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[10] David A. Gee, "Automation, Organization, and Work Design: The Challenge that Nursing Faces Today and Tomorrow," Blueprint for Progress in Hospital Nursing, 10 Columbus Circle, New York, New York (1962), p. 41.

devices and the automated delivery equipment were installed in the new hospital building. These combined with the design described in the Master Program and Plan by the hospital consultant are the application of:

> . . ., a philosophy of functional organization . . . as a logical approach to the provision of care. This philosophy of functional organization provides for the doctor and the nurse the necessary supplies as they are needed even in the patient's room.[11]

1. Universal communications system: a combined telephone and call system which allows the nurse within the patient's room to be in instantaneous contact with every department of the hospital, the nursing station on the floor, and other patient rooms on the same unit without leaving the room. This system also included a patient-nurse pillow speaker so that the patient could call the nurse at any time or the nurse could also contact the patient. The patient may control his television and radio receiving sets with this same device. A master control panel for all service units within the hospital is located in the supplies, distribution, and processing center which is the control center of the system.

2. Supplies, Processing, and Distribution: the central issue center which is the heart of the production line flow of supplies and materials to all departments in the hospital. This complex control point from which all clean supplies and materials are moved to the areas of need and is also the control point to which all soiled supplies and materials are sent. It included the receiving areas, a laundry and pharmacy as well as other delivery functions which are centralized at this one control point. The dispatch center contains four main divisions or areas which are interrelated. These are: processing; bulk and processed storage; and

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[11] Gordon A. Friesen Associates, Hospital Consultants, "Master Program and Plan for the New Mercy Hospital, Denver, Colorado." Washington, D.C. (1961), p. 4.

distribution. In this study the letters S.P.D. will be used to refer to this dispatch center.

3. Functional-flow design: the building plan of the hospital which takes into consideration the movement and functions of the personnel, patients, medical staff, and of the materials used for and by them. By proper arrangement of the various units, this flow can have orderly direction, can largely eliminate inconvenience, and can reduce waste motion and its concomitant frustration. The concept is based on the same principles as "Detroit automation."

4. Treyveyor: a conveyor belt system which transports supplies and equipment through a vertical shaft and automatically ejects them at the station indicated by the dispatcher. There are three treyveyor units. One for clean supplies and equipment. One for soiled supplies and equipment which opens only from the soiled holding areas on each nursing unit. The third one is the food treyveyor which originated in the kitchen and food service department. When trays are being served to the patients, no soiled food trays may be placed on the conveyor belt which must be reversed to send the soiled dishes to the kitchen.

5. Pneumatic tube system: a rapid transit device consisting of many tubes that are strategically located in the hospital through which records, papers, drugs, specimens and small supplies may be sent to the various departments. These are sent in tube-shaped containers called carriers. One end of the carrier contains a dial which is set in a certain position to send the carrier to a desired destination. The carrier is inserted into the tube and is propelled to the proper station by compressed air. All tubes pass through a section called the "monitor," which contains minute electric wires called "brushes." These brushes hit the small brass bands around the carriers and guide them to the proper station. The carriers must be closed securely and inserted into the tube in a certain way or the system will not function. The preparation of personnel for the use of this system is most important.

6. "Tote" boxes: plastic containers approximately 16" by 24" by 8" in size which are placed on the

continuous conveyor belt system for delivery of supplies and equipment from S.P.D. center. The containers are ejected automatically at the ejector station indicated by the dispatcher.

7. Ejector station: a receiving area with an eight foot long and fourteen inch wide table for the "tote" boxes. A series of revolving small plastic wheels down each side of the table move the boxes to the end of the table. Up to six "tote" boxes of supplies can be received before the system rejects any more being delivered to the station. A technician removes the boxes of supplies and either delivers them to the nurse who has requested the items or stores them on the complement carts in the clean holding room on each nursing floor.

8. Complement carts: large, shelved, movable carts to store extra supplies and equipment which may be needed by the nurses to give patient care. Each nursing floor listed the type of supplies and equipment most often needed or used on the special service. For example, the obstetrics floor would have certain supplies not needed on a surgical unit and vice versa. These carts are returned to S.P.D. every night for re-checking of supplies needed to replace those used the previous day.

9. Nurserver: two metal cabinets patterned after the servidor used in hotels. The Nurserver is built into the corridor wall of each patient room. Doors open into the hall for servicing by the core technician. The doors opening into the vanity area of the patient's room provide easy access to supplies needed to give patient care and for holding of soiled equipment and materials which have been used in giving patient care. The two sections are completely separate so that clean and soiled items do not come into contact with each other. The nurse should be able to go into the patient's room and give him complete nursing care without finding it necessary to leave the room for any supplies or equipment. She places all used materials in the soiled section of the Nurserver and a non-professional employee is responsible for picking them up and sending them to the decontamination room in S.P.D. Stocking the Nurservers with all equipment needed and making out the charges for supplies used is the responsibility of the core technician on each nursing unit.

10. Clean holding area: a large service room for storage of the complement carts and all supplies and equipment which may be needed on the unit and are used frequently to give patient care. The communication panel which is answered by the core technician is a direct contact between the nurse in the patient's room and the S.P.D. Supplies are not placed on shelves but are stored on the complement carts which are easily returned to S.P.D. for re-stocking of supplies and for resterilization of sterile supplies.

11. Soiled holding area: a service room for all soiled equipment and supplies which are returned to the proper areas by way of the treyveyors. One important concept which should be noted here is that clean and soiled supplies are kept separate. The treyveyor for delivery of supplies and equipment to the units is not used for the return of soiled equipment to the decontamination area. Even soiled food trays are returned only when the system is reversed.

CHAPTER II

RELATED STUDIES

Although a great deal of research has been done on the implications of automation in industry, very little has been done on the impact of automation in the hospital setting. In general, studies have been conducted in the hospitals to discover how data processing and electronic equipment could be utilized to improve record keeping and other administrative functions and procedures. Blumberg reported research studies to determine how automated equipment could be used to reduct hospital costs or improve quality of patient care. The report of the studies by Blumberg identified several ways in which automation and mechanization could be used to improve hospital services. In conducting the research studies, Blumberg developed several criteria that helped to divide the many activities in hospitals into those which most needed study from those which were less pressing. These were:

> One criterion was whether a particular area or activity of the hospital constitutes a major labor cost. A second criterion was whether the cost for this activity has been increasing rapidly in recent years. A third

> was the question of whether the activity related closely to care of bed patients. The fourth criterion was whether the activity was primarily of a medical or related nature.[1]

Blumberg further stated that:

> Many areas of the hospital will enjoy the benefits of automation or labor-saving devices. . . . In our opinion, the largest single unexplored area of labor-saving devices is in record-keeping on the wards.[2]

One of the largest and most important areas of activities is that of the nursing staff who give direct care to the patients. To relieve professional nurses from the time-consuming task of handling physicians' orders, the research group at Stanford Research Institute conceived a new special-purpose computer system for record-keeping activities on the wards. This system and device has been tentatively named the Hospital Indicator for Physicians' Orders (HIPO). This system would eliminate manual handling of physicians' orders. It would also provide information about the patient from the ward, the admitting office and elsewhere. Such a device would help to eliminate medication errors and cut the cost of manual handling of doctors'

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[1] Mark S. Blumberg, "Hospital Automation: The Needs and the Prospects," Hospitals, J.A.H.A., Vol. 35: 344 (August 1, 1961), p. 34.

[2] Ibid., p. 99.

orders. It has been estimated that one-sixth of the nursing budget or approximately five per cent of the hospital's expenses is used to manually handle physicians' orders.[3]

A research study conducted at the University of Arkansas Medical Center to develop a new drug distribution system for hospitals suggests another method of saving time for nurses. The Pharmacy receives a copy of the physician's order through the pneumatic tube system. The hospital pharmacist assumes the responsibility for the "preparation" of the drugs, a task usually performed by the nurses. Just prior to the time for administration, the drugs are taken to the division in ready-to-use form tabbed with the name of the preparation. A small card called "pharmatips" accompanies each dose. This entire system is referred to as "centralized unit-dose dispensing system." The result of the time studies indicated that 51 minutes per tour of duty might be saved for the nurse. Other positive advantages were listed such as a reduction in the number of medication errors and a saving of money due to a decrease in drug losses. This method of drug distribution was resisted by some nurses at first because they had been

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[3] Ibid., pp. 42, 43.

taught not to give drugs prepared by someone else. Nursing service administration pointed out to the nurses that pharmacists were well prepared to dispense drugs. This helped the nurses to accept the system more readily. They also liked it more when they realized how much time was saved for patient care.[4]

One study on the use of certain selected automated devices in the hospital concludes that the main reason the intercommunication system and the pneumatic tube system were not used to maximum capacity was due to the inability of nursing personnel to accept change.[5]

Most of the research which has been done on the impact of automation on the individual worker has been conducted in an industrial setting. Very few studies were found on automation or the use of mechanical devices in the

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[4]Kenneth Barker, William Heller, et.al, A Pilot Study of an Experimental Intra-Hospital Drug Distribution System Featuring the Application of Simple Electronic Data Processing Techniques to the Centralized Unit-Dose Dispensing Concept, (unpublished report Drug Distribution Studies, University of Arkansas Medical Center, Little Rock, Arkansas, 1963).

[5]S. Mary Carolita Hart. Opinions of Hospital Personnel Concerning Selected Automated Devices. (Unpublished Master's Thesis, The Catholic University of America, Washington, D.C., 1963), pp. 38, 39.

hospital setting. Several articles have been written reporting small studies which have been done on the various monitoring devices and other mechanical devices used in extending the nursing care for the individual patient. There seems to be a few implications which were identified by these studies concerning the acceptance or non-acceptance of the mechanical devices by the nurses which are pertinent to this research.

Harris suggested that nursing staff attitudes toward electronic monitoring of patients were as important to its successful implementation as the absence of technical bugs in the equipment itself. The study indicated that nurses who were the most successful in using the body-functioning monitors were those who were able to maintain objectivity, professional interest and curiosity. Proper selection of staff and thorough orientation to the equipment were very important to the success of using the electronic devices in this research project. Harris found that a greater understanding of technical aspects of patient monitoring would have improved the effectiveness of the unit right from the start. Harris concluded the report by stating, "Only if one succeeds in developing the nursing staff's full understanding and cooperation can one evaluate the effectiveness

of monitoring equipment."[6]

A pilot study conducted at University Hospital, New York City, in the intensive care unit for the purpose of evaluating two different monitoring devices, identified several advantages and disadvantages of the equipment. Bean, et al, stated that patients' acceptance of the mechanical devices reflected the nurses' attitudes about these devices. If the nurses seemed unsure or frightened of the machine, the patient also became fearful and did not accept the sensors or the use of the equipment. It was found that rather than freeing the nurse from taking the vital signs, the unreliability of the devices burdened the nurse even further. The nurses sometimes felt that they were nursing the machines rather than the patients. Although the monitors were used only during a trial period, the nurses stated, "they became more aware of the possibilities and the limitations of electronic monitoring devices and that in the future many devices would be used to great advantage in the field of medicine."[7]

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[6]Ruby M. Harris, "Laying the Right Lines for Electronic Monitoring," Nursing Outlook, Vol. 11, No. 8, (August, 1963), pp. 573-576.

[7]Margaret A. Bena, Frances A. Krahn, Barbara L. Anderson, and Mabel T. Yoshida, "Monitoring Patients

In a recent professional nursing journal, several articles gave an overall perspective of machines now in use in hospitals. Some of these machines, such as the hemodialyzer, the cardiac pacemaker, the hyperbaric oxygen unit, and body monitoring devices are proving to be invaluable in extending nursing care of the patient. These articles indicate that many nurses are working with machines to the distinct advantage of their patients and, incidentally, nursing. By using these machines, nurses are having an opportunity to improve nursing practice, increase knowledge, and participate in research.[8]

Trusk states in one article on the nurse's role in caring for the patient in acute renal failure that,

> The nurse must be prepared to monitor the operation of the hemodialyzer and to give comprehensive care to patients whose welfare depends upon the use of this intricate machinery. . . . Nurses develop impressive skills in managing the technical aspects of the procedure, in addition to giving total nursing care to the patient.[9]

Through Electronics," The American Journal of Nursing, 63: 4 (April, 1963), pp. 65-69.

[8]Rose Pinneo, "Nursing in a Coronary Care Unit," The American Journal of Nursing, 65: 2 (February, 1965), pp. 76-79.

[9]Carol Williams Trusk, "Hemodialysis for Acute Renal Failure," The American Journal of Nursing, 65: 2 (February, 1965), pp. 80-85.

The use of such equipment makes it possible to evaluate the patient's condition more fully than is possible by the usual traditional methods. She cannot be a bystander or an uninformed watcher of these monitoring devices. Essentially she remains the nurse in charge of the patient's care. Now she has new tools to use and can use her judgment based on observation plus interpretations of the monitor.[10]

George reporting on the use of monitors to check patients' vital signs in the intensive care unit at Bethany Hospital, Kansas City, where the nurses were the first in the country to use such devices, noted that several factors influence the average nurse's acceptance of electronic body functioning monitoring. She states:

> Among these are her faith in the accuracy of the readings taken by conventional manual methods and her frequent lack of appreciation of the natural variability of vital signs, both from one person to another and within the individual when these are reflected in the readings taken electronically, she may tend to disbelieve what the record shows.[11]

George goes on to summarize the findings on the effects of automation as represented by electronic body

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[10] Ibid.

[11] Joyce Holmes George, "Electronic Monitoring of Vital Signs," The American Journal of Nursing, 65: 2 (February, 1965), pp. 68-71.

function monitoring as follows:

> Installation of the monitoring equipment, however, is just the beginning in determining the merit of vital signs monitoring. We have found that the nurse needs a thorough understanding of the variability--and fallibility--of conventional measurements and of the normal variation ranges both among and within individuals. Most important, she must intelligently interpret the changes which do occur and evaluate their significance.
> Will monitoring of vital signs and cardiac function improve our care of patients? This decision ultimately rests with the nurse: on how she accepts and uses this new tool.[12]

Again and again it is pointed out that the effectiveness in using these various mechanical devices in giving patient care depends a great deal upon the acceptance and the attitudes of the nurses toward using them. One thing that seems to be quite certain is that automation and mechanical devices, data processing, electronic computers, and improved communications systems as well as mechanical devices for the delivery of supplies and equipment will definitely be a part of the hospital setting.

Studies from industry indicate there may be many implications for nursing when automation is introduced into the working environment of the hospital. In industrial situations it has been found that fewer but more highly

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[12] Ibid., p. 71.

skilled workers are required. The ordinary worker has been relieved of unpleasant working conditions, hard physical work, and monotonous and repetitive tasks which can be accomplished with automated assembly lines for the work process.[13]

The introduction of automation into industry has involved human costs, such as the threat to financial security, the fear of loss of prestige due to job reassignment, and the loss of pride in craftmanship. In industrial plants where automation is used extensively, it has been found that there are fewer injuries resulting in the need for traumatic surgery and fewer environmental hazards but there are more functional disorders and emotional maladjustments.[14]

This study on the feelings of professional nurses

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[13]Walter Buckingham, Automation--Its Impact on Business and People, New York: Harper & Brothers (1961), pp. 1-190; Donald N. Michael, Cybernation: The Silent Conquest, Box 4068, Santa Barbara, California (1962), pp. 5-45.

[14]Lester R. Bittel, Morley G. Melden, and Robert S. Rice, editors, Practical Automation, New York: McGraw-Hill Book Co., Inc (1957), pp. 1-367; William Noland, "Technology's Impact on Culture and Work," The Changing American Population, Edited by Hoke S. Simpson (The report of the Arden House Conference, Institute of Life Insurance, New York, 1962), pp. 69-84.

about automation in the hospital setting is closely related to a recent study done by Lipstreu and Reed on the attitudes of the employees toward the transition to automation in a large bakery. They studied the workers' attitudes before and after a change-over to automation. The original plant was an old, out-moded building with equipment in use that was at a semi-handicraft stage. The company moved into a new, modern plant with open-loop automation, including a minimum of closed-loop automation, for the complete process of the production line.

The attitudes of the employees were studied before the change-over to automation and re-evaluated at two different times after the transition. The period of observation of the plant included two full years. During this time six hundred employees were interviewed by the researchers and the attitude surveys done before the move into the new plant, ten months after the move, and the third approximately a year later. The observers spent many hours at the plant during the transition period. Their concern was with the day-to-day feelings, hopes, and frustrations of people involved in, what was to them, massive change.

On the basis of this two year study, Lipstreu and Reed offered some suggestions for further investigation

which could be important to any company, industry, or hospital anticipating a transition to automation. Those which seemed to be most pertinent to the hospital situation are:

1. When planning automated transition, management should expect a sharp decline in employee morale level soon after the changeover.

2. Employee morale will fall more quickly and deeply under conditions involving mixed automation, such as in Company X, than in those companies where there is a more even level of technology throughout all departments.

3. Morale will fall most quickly and precipitately among employees who lose their old departmental identity and/or suffer the greatest disruption of their informal group relationships.

4. Attitudes of female employees will fall to a lower level than that of male employees.

5. Delays in scheduled transition dates will produce a downturn in morale.

6. Management's lack of empathy and/or apparent concern for employees during the change period, and the subsequent low point of the morale level, will act as a longrun depressant of general employee attitudes due to the extreme sensitivity of employees during this period.

7. After the depth of the morale plunge is reached, the morale upturn will be rachet-like and exceedingly sticky, seldom if ever reaching the prechange level.[15]

Although there seems to be many areas in the hospital which could benefit from the utilization of mechanical

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[15]Otis Lipstreu and Kenneth A. Reed, Transition to Automation, Boulder: The University of Colorado Press, January, 1964, p. 50.

devices and automation, nurses must be aware of the cost to the human beings involved in the drastic changeover to automation. Lipstreu and Reed concluded that the morale level dropped sharply and the feelings of the workers toward the management of the plant and toward working at the plant changed considerably. The workers had a high level of morale when they were working in the old building. They enjoyed the warm social interaction. Even though they worked under adverse conditions, they felt that the old plant was a good place in which to work.[16]

The psychological effects of loneliness, loss of group identification, loss of pride in craftsmanship, and other factors were found to contribute to the workers' fatigue even though physical labor was markedly decreased or almost absent for some machine monitors. Will these effects prove to be the same for nurses in the hospital?

In the automated plant there was a decreased need for personal interaction between workers. Workers and supervisors found it difficult to adjust to communication over the inter-com system. Attempts to convey directions were frustrating and the supervisors became so upset they

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[16]Otis Lipstreu and Kenneth Reed, op. cit., p. 44.

gave up and went in quest of a worker to give the order directly.[17] Will nurses find it difficult to talk to each other and to their patients over an inter-com in the hospital?

It was also found that female employees were much more dissatisfied with their work environment than men. This could be very important to nursing since nursing service personnel and hospital employees are predominately women.

The findings from these studies and from the literature indicate that the attitudes and feelings of people are of major importance when planning a transition to automation. The present study is designed to test some of the same hypotheses in a hospital setting.

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[17] Ibid., p. 45.

CHAPTER III

METHODOLOGY

The method used for this study was the normative-survey or descriptive method. It describes the facts and conditions as they exist without imposition or control over the factors which might tend to influence the material under investigation.[1] A single group which served as its own control was chosen for the "before-after" design of the study.

The purposes of this study were to identify the feelings of a group of professional nurses at a selected hospital prior to and following four months of experience working in an automated hospital in relation to: (1) selected areas of nursing activities, (2) the work environment, (3) the patient, the nurse, and the hospital administration, and (4) to identify the change, if any, in the feelings of the nurses about the effect of automation in the hospital.

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[1] Arvil S. Barr, Robert O. Davis, and Palmer O. Johnson, Educational Research and Appraisal, New York: J.B. Lippincott Company (1953), p. 337.

I. Development of the Statements

The immediate problem consisted of developing an instrument to identify the feelings of the nurses about the effect of automation in the hospital. The previous work of Lipstreu and Reed in identifying the effect of automation on organization, supervision and the work force provided direction in developing a list of statements. These forty-six statements used by Lipstreu and Reed served as the nucleus of the structured statements in this study. Additional items which were considered descriptive of the feelings of nurses about automation were obtained from the literature,[2] from professional nurses engaged in nursing practice, instructors, and classmates in the graduate program in nursing service administration. The number of

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[2]Walter Buckingham, Automation: Its Impact on Business and People, New York: Harper & Brothers, 1961; Sister Carolita Hart, "Opinions of Hospital Personnel Concerning Selected Automated Devices" (unpublished Master's thesis, The Catholic University of America, Washington, D.C., 1963); Mark S. Blumberg, "Automation and Hospital Nursing," Blueprint for Hospital Nursing, National League for Nursing, 10 Columbus Circle, New York, 1963, pp. 46-49. Edward H. Noroian, "The Challenge of Automation," Blueprint for Hospital Nursing, 10 Columbus Circle, New York, 1963, pp. 37-40; David A. Gee, "Automation, Organization and Work Design: The Challenge that Nursing Faces Today and Tomorrow," Blueprint for Progress in Hospital Nursing, 10 Columbus Circle, New York, 1963, pp. 41-45.

statements was increased to 100 since it was anticipated elimination of ambiguous and irrelevant statements would decrease the number of statements by one-third. Approximately sixty statements were desired for the final survey form. The survey form was tested in a class of graduate students in nursing for clarity of phrasing and understanding of the instructions. Several statements were eliminated and a few were revised. The final survey form contained sixty-eight statements.

The statements were placed in ten categories. These were: (1) feelings about the effect of automation on the need for initial and on-going inservice education, (2) feelings about the effect of automation on the work environment, (3) feelings about the effect of automation on supervisory responsibilities and on staffing needs within the hospital, (4) feelings about the effect of automation on communication within the hospital, (5) feelings about the effect of automation on the improvement of patient care, (6) feelings about the effect of automation on the need for nurses to possess increased skills in human relations and increased clinical knowledge in nursing, (7) feelings about the effect of automation on the need for nurses to possess increased technical skills, or professional competence, (8) feelings about the effect of

automation on job satisfaction of nurses, (9) feelings about the effect of automation on the amount of non-nursing tasks assigned to the professional nurse, and (10) feelings about the effect of automation on social interaction between nurses.

The survey form provided for three possible responses to each statement. These were "increased," "unchanged," or "decreased." The possibility that the nurses would not feel they could answer the statements prior to having had experience working with the automated or mechanical devices in the new hospital was handled by making provision for the nurses to base their answers on either "opinion" or "experience." (See Appendix C.)

A cover letter explaining the purpose of the study and encouraging the participant to complete the study was included with the first survey form. (See Appendix A.)

Section I of the survey form was devised to obtain identifying information about the participants such as professional education, years of experience in nursing, the number of years employed at the study hospital, the shift or shifts usually worked, the age group, and the position in nursing service or nursing education of each participant. (See Appendix B.)

Procedure. The first survey was completed prior to the move from the old, out-moded, traditionally built hospital to identify how the nurses felt about automation in the hospital before having any experience working with the automated and mechanized devices in the new hospital. The second survey was completed approximately four months after the move into the new, relatively highly automated hospital. The same survey form was used for the after phase of the study to identify the feelings of the nurses about the effect of automation in the hospital after a period of experience working with the automated and mechanized devices and (2) to identify the change, if any, in the feelings of the nurses about the effect of automation in the hospital. (See Appendix D.)

A second cover letter was included to explain the reasons for the repetition of the survey form and to solicit the cooperation of the nurses to complete the second phase of the study. (See Appendix C.)

Subjects. The subjects for this study were the professional nurses employed at Mercy Hospital and the faculty of the Mercy Hospital School of Nursing, Denver, Colorado. They were selected for the study because the anticipated move from the old, out-moded, sixty year old traditional

hospital building to a new, relatively highly automated hospital presented the opportunity to conduct a before-after study of the change, if any, in the feelings of a group of professional nurses about the effect of automation and mechanization in the hospital. One hundred and twenty professional nurses were the total population.

Each nurse was interviewed to solicit her cooperation and explain the purpose of the study. Ninety-six, or 82.5 per cent of the nurses agreed to participate in the study. Seventy-six, or 79.1 per cent of the nurses completed and returned the forms on the first survey. Seventy of the nurses who participated in the first survey were still working at the hospital four months later. Sixty-two, or 88.5 per cent of the nurses completed and returned the second survey. These sixty-two forms from the first survey and the sixty-two forms from the second survey were the source of data for the study.

CHAPTER IV

ANALYSIS OF DATA

Data were obtained for the study through 68 statements constructed to identify the feelings of professional nurses about the effect of automation in the hospital. The before-after design of the study was used to identify the change, if any, in the feelings of the professional nurses about automation in terms of the hypotheses set forth in Chapter I.

The data from the statement section were placed in ten categories. Two students in the graduate program at the University of Colorado, one in Nursing Service Administration and one in Public Health Nursing were asked to place each statement in the category which she felt that statement belonged as well as to identify the heading of the category. The investigator also separated the statements into categories. Each category was the basis for the ten hypotheses tested by the study.

The identifying information about the nurses who participated in the study was analyzed and presented

separately from the analysis of the statements. (See Section I.)

Throughout the following presentation of each of the categories of the statement section (See Section II), the procedure used was to provide a brief introduction drawn from the pertinent literature which related to each statement in the survey, then to give an analysis of the responses to each statement in the survey, and finally, to present a summary interpretation of each item as related to the purposes of the study which were to evaluate the feelings of a group of professional nurses at a selected hospital prior to and following a four month experience working in an automated hospital in relation to: (1) selected areas of nursing activities, (2) the work environment, (3) the patient, the nurse, and the hospital administration, and (4) identify the change, if any, in the feelings of the nurses about the effect of automation in the hospital.

Each nurse was assigned a code number for the purpose of comparing the responses to the statements on the first survey forms to the same statements on the second survey forms. The total number of responses to statements on the first survey were compared to the total number of responses to the statements on the second survey to

evaluate the feelings of the nurses after a four months experience working in an automated hospital.

The data from the two surveys were summarized on work sheets by the use of a code number to indicate the response to each statement. The responses to each statement were placed on three by five cards to obtain the total number of responses to each statement, to identify a change in the response, if any, and to compare the responses to the statement on the second survey to the same statement on the first survey.

From the study of the literature, other research studies in the industrial setting, and the experts who have studied the impact of automation on people, the anticipated response to the statements was determined by the investigator. The responses to each statement were analyzed in terms of the anticipated response. The responses to each statement on the second survey were compared to the responses to the same statement on the first survey by each nurse to identify the direction or trend in the changes in the responses to determine if there was a significant change in the feelings of the nurses about the effect of automation in the hospital.

The Statistical Techniques Used to Analyze the Results of the Two Surveys.

Two statistical techniques were used to analyze the significance of the results obtained from the two surveys. These were the Normal Approximation to the Binomial[1] and the McNemar Test of Significance.[2]

The purpose of the analysis of the normal approximation to the binomial. The analysis of the normal approximation to the binomial was used to determine if there were significantly more responses observed to one of the three possible answers to each statement than what one would expect due to chance. For example if forty-two of the responses by the nurses to a statement were "increased" this would be the number observed. The distribution in the category due to chance would be .33 per cent of the total number of responses which in this study would be sixty-two. The number of responses in each of the three categories would be 20.67 responses, which could be expected to be in one category due to chance. The formula to determine the

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[1]Quinn McNemar, Psychological Statistics, New York: John Wiley and Sons, Inc. (1962), p. 49.

[2]Sidney Siegel, Nonparametric Statistics, New York: McGraw-Hill Book Company (1956), p. 64.

level of significance was $z = \frac{X - Np}{\sqrt{Npq}}$

z = value to determine if significant difference does indeed exist between the observed number and the number in that category due to chance.

x = the observed number.

N = the total number of responses in the sample

Np = the sample size x the hypothetical random proportion in the hypothesized category -- .33 of the total N.

p = proportion in the hypothesized category.

q = proportion in the other categories combined.

One of three levels of significance is usually selected to appraise the significance of the differences found. These are the .05, .01, and .001 levels. The five per cent level is most commonly used, however, the .01 level is more conservative and may be preferred with small numbers of subjects. The .001 level of significance is the ultra conservative level.

If the value of z = 1.28, p = $\angle$ .05 level of significance.

If the value of z = 2.33, p = $\angle$ .01 level of significance.

If the value of z = 3.09, p = $\angle$ .001 level of significance.

The purpose of the McNemar Test. The McNemar Test of Significance corrected for continuity when expected frequencies were small (df = 1), was used to test the significance of change or to account for the direction of change

in the responses of the nurses to each statement on the second survey in comparison to the first survey. The formula for the McNemar Test of Significance is: X^2(Chi Square) $= \frac{(A - D)^2}{A + D}$ df - 1

Where A + D was equal to or more than twenty the correction for continuity was not done. Where A + D was equal to or less than ten the correction for continuity was done.

If the value of $X^2 = 2.70$, $p = < .10$. This value was used to indicate the trend in the direction of the change of the feelings of the nurse about the effect of automation in the hospital.

If the value of $X^2 = 3.84$, $p = < .05$, level of significance.

If the value of $X^2 = 6.64$, $p = < .01$ level of significance.

The Analysis of the Results of the Two Surveys

The total number of responses to each statement on Survey I were counted for the purpose of comparing the total number of responses to the same statement on Survey II. The results were analyzed by using the normal approximation to the binomial to obtain the level of significance. If a .05 level of significance was obtained for one of the three possible responses to the statement on the second

survey, this response was analyzed as the one which identified the feelings of the nurses about the effect of automation in the hospital in relation to the content of that statement.

The responses to each statement on the second survey were compared to the same statement on the first survey as answered by the individual nurses. The changes and the direction of change were noted and recorded on three by five cards for the sixty-eight statements and for each nurse. The McNemar Test of Significance was used to obtain the level of significance of the changes in the responses to each statement. If a .05 level of significance was obtained, the change was considered to be significant of a change in the feelings of the nurses about the effect of automation in the hospital as related to the content of that particular statement. Unless all of the statements in a category were significantly changed on the second survey in comparison to the first survey, the null hypothesis was accepted. However, the amount of change and the direction of the change were analyzed for each statement and for the total responses in each category.

Analysis of Data From Section I of the Survey Form

The participants in the study.

The sixty-two professional nurses who participated in both phases to the study were requested to answer questions about their professional background. An analysis was made of certain selected characteristics of the subjects in terms of professional education, number of years of working experience, total number of years worked at Mercy Hospital, Denver, Colorado, previous work experience at other hospitals, age group, and the shift or shifts the nurses usually worked. (See Tables I through VII, pp. 45 - 51.)

One hundred twenty professional nurses were employed at the hospital at the time the first survey was conducted. The investigator spent four days interviewing each nurse on duty during the twenty-four hour periods for the purpose of stimulating and seeking the cooperation of the nurses in the study. Ninety-six, or 82.5 per cent of the nurses agreed to participate in the study. Seventy-six, or 79.1 per cent of the nurses completed the survey forms and returned them prior to the move from the old building into the new hospital.

At the end of approximately four months, the

seventy-six nurses who participated in the first survey were again interviewed by the investigator. Seventy-two, or 94.7 per cent of the nurses were still working at the hospital and agreed to complete the second survey form. Sixty-two, or 88.5 per cent of the nurses returned the second survey forms. These sixty-two nurses were the total number who met the criterion for inclusion in the study.

The participants were grouped in four age categories. Twenty-six, or 41.9 per cent of the nurses were in the age group between 20 - 29 years. Sixteen, or 25.9 per cent were in the 30 - 39 year group. Eight, or 12.9 per cent were in the 40 - 49 year group and twelve, or 19.3 per cent were over 50 years old.

All nursing positions were represented by those who participated in the study. The director of nursing service and the assistant directors of nursing service, the director of nursing education and the assistant director of nursing education, head nurses, staff nurses and clinical instructors. The organizational heirarchy of the nursing service administration does not include a supervisor level at the study hospital. "Area supervisors" are classified as assistant directors of nursing service. Twelve, or 19.3 per cent of the nurses were in nursing service or nursing

education administration. Twelve, or 19.3 per cent were head nurses and thirty-eight, or 61.4 per cent were general duty staff nurses or clinical nurse instructors from the school of nursing which uses the hospital as a laboratory for the students.

Educational preparation of the participants ranged from one nurse who had completed an associate degree program to seven, or 11.3 per cent who held a master's degree in nursing. Four, or 6.4 per cent were graduates of collegiate programs with bachelor of science degrees in nursing. Eleven, or 17.8 per cent had taken post-diploma work and obtained their bachelor of science degrees in nursing. Thirty-nine, or 62.9 per cent, were graduates of diploma schools of nursing. Three of the participants had taken post-graduate courses, one in operating room, one in pediatrics, and one in obstetrics.

Fifty, or 80.7 per cent of the nurses had worked at other hospitals prior to their present position at the study hospital. Twelve, or 19.3 per cent of the nurses had worked only at Mercy Hospital, Denver since graduation from training. Eight, or 12.9 per cent of the nurses had worked less than two years, twenty-one, or 33.9 per cent had worked for over ten years, seventeen, or 27.4 per cent had

worked from two to five years, and sixteen, or 25.8 per cent had worked in nursing from five to ten years.

The shifts worked by the participants at the time the first survey was conducted were: Forty, or 62.9 per cent of the nurses were working the day shift, three, or 4.8 per cent of the nurses worked the evening shift only, and three, or 4.8 per cent of the nurses worked the night shift only. Seven, or 11.3 per cent of the nurses worked all three shifts on a rotation basis and nine, or 14.5 per cent of the nurses worked two of three shifts on a rotation basis.

The number of years each participant had worked at the study hospital was found to be as follows: twelve, or 19.3 per cent of the nurses had been employed for six months or less, five, or 8.1 per cent had worked from six months to one year, eighteen, or 29.1 per cent had been employed from one to three years, thirteen, or 20.9 per cent had worked three to five years and fourteen, or 22.6 per cent had worked at Mercy Hospital over five years. Forty-eight, or 77.4 per cent had worked less than five years at this hospital.

TABLE I

THE NUMBER AND PER CENT OF THE PARTICIPANTS' AGES ACCORDING TO GROUPS

Age Group	Number	Per Cent
20 - 29	26	41.9
30 - 39	16	25.9
40 - 49	8	12.9
Over 50	12	19.3
	62	100.0

TABLE II

THE NUMBER AND PER CENT OF PARTICIPANTS IN EACH POSITION AT MERCY HOSPITAL, DENVER, COLORADO

Position	Number	Per Cent
General Staff Nurses and Clinical Instructors	38	61.4
Head Nurses	12	19.3
Assistant Directors and Director of Nursing Service Administration and The Assistant and Director of Nursing Education	12	19.3
	62	100.0

TABLE III

THE NUMBER AND PER CENT OF THE PARTICIPANTS' PROFESSIONAL EDUCATION

	Number	Per Cent
Associate Degree - R.N.	1	1.6
Diploma - R.N.	39	62.9
Diploma - graduate work with B.S.N.	11	17.8
Collegiate Program - B.S.N.	4	6.4
Masters Degree M.S.N.	7	11.3
	62	100.0

TABLE IV

THE NUMBER AND PER CENT OF PARTICIPANTS WHO HAD WORKED AT OTHER HOSPITALS OR ONLY AT MERCY HOSPITAL, DENVER, COLORADO

	Number	Per Cent
Worked only at Mercy Hospital, Denver, Colorado	12	19.3
Worked at other Hospitals Prior to Mercy Hospital, Denver, Colorado	50	80.7
	62	100.0

TABLE V

THE NUMBER AND PER CENT OF THE PARTICIPANTS' YEARS OF EXPERIENCE IN NURSING - EXCLUDING EDUCATIONAL PREPARATION

Number of Years	Number	Per Cent
Less than 2 years	8	12.9
2 to 5 years	17	27.4
5 to 10 years	16	25.8
Over 10 years	21	33.9
	62	100.0

TABLE VI

THE SHIFTS WORKED BY THE PARTICIPANTS AT THE TIME OF SURVEY I - BY NUMBER AND PER CENT

Shift	Number	Per Cent
7 - 3:30 p.m. only	40	62.9
3 - 11:30 p.m. only	3	4.8
11 - 7:00 a.m. only	3	4.8
All 3 shifts - Rotation Basis	7	11.3
2 of 3 shifts - On Rotation Basis	9	14.5
	62	100.0

TABLE VII

THE YEARS WORKED BY THE PARTICIPANTS AT MERCY HOSPITAL, DENVER, COLORADO - BY NUMBER AND PER CENT

Length of Work Experience	Number	Per Cent
0 - 6 months	12	19.3
6 months to 1 year	5	8.1
1 year to 3 years	18	29.1
3 years to 5 years	13	20.9
Over 5 years	14	22.6
	62	100.0

Analysis of Data from Section II of Survey Forms

Hypothesis 1

There will be no significant change in the feelings of nurses about the effect of automation on the need for initial and on-going inservice education for all staff working in an automated hospital. (See Table VIII, p. 53.)

Introduction. The success of automation in the hospital will depend to a large measure on how the nurse functions in the difficult role of meeting the needs of the patient, the physician and the hospital organization. In the literature,[3] several references were made to the need for proper orientation of personnel to the automated and mechanized devices, especially the body monitoring and the data processing equipment. Harris stated that "pre-planning and intensive inservice preparation will contribute to the success of instituting the use of electronic devices."[4] Harris further observed that "each nurse must be able to be effective in a "high-level anxiety" situation involving the use of awesome equipment, acutely ill patients who are also

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[3]David A. Gee, op. cit., p. 41; Sr. Mary Carolita, op. cit., p. 44; Rose Pinneo, op. cit., p. 79; Joyce Holmes George, op. cit., p. 71; Mark S. Blumberg, op. cit., p. 41.

[4]Ruby M. Harris, op. cit., p. 573.

TABLE VIII

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS ABOUT THE EFFECT OF AUTOMATION ON THE NEED FOR INSERVICE EDUCATION FOR PERSONNEL

	Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Changes in Responses, Survey II Downward	Diff (X^2=)	Total Responses to Survey II Number	Total Responses to Survey II Diff (z=)
23.	The need for in-service training in using mechanical devices and automatic equipment will be	(I)	60	96.8	60	96.8					
		U	2	3.2	1	1.6	5	1	<.10	60	<.001
		D	0	0.0	1	1.6					
26.	The need to orient personnel to the working environment on each unit in the hospital will be	I	41	66.1	37	59.7					
		U	5	8.1	5	8.1	8	10	0	37	<.001
		(D)	16	25.8	20	32.2					
30.	The need to orient personnel to nursing functions on each unit in the hospital will be	(I)	35	56.4	36	58.1					
		U	12	19.3	9	14.5	15	11	0	36	<.001
		D	15	24.3	17	27.4					
54.	The need for orientation of nurses to changes in procedures, policies, and new techniques will be	(I)	52	83.8	49	79.0					
		U	6	9.8	8	12.9	10	9	0	49	<.001
		D	4	6.4	5	8.1					
62.	Difficulties encountered by "float" nurses working several different units will be	I	6	9.9	9	14.5					
		U	7	11.3	16	25.8	16	6	<.01	37	<.001
		(D)	49	79.8	37	59.7					
67.	Responsibility of professional nurses for assisting with student nurse education will be	(I)	28	45.1	26	41.9					
		U	32	51.7	33	53.3	17	17	0	33(U)+	<.001
		D	2	3.2	3	4.8					
					Total		71	54			

* Anticipated Response
\+ If other than anticipated Response

very fearful, and physicians who do not trust or understand the equipment."[5]

Six statements pertained to the need for initial orientation and on-going inservice education for nursing service personnel: 23, 26, 30, 54, 62, and 67. (See Table VIII, p. 53.)

Statement 23. The need for inservice training in using mechanical devices and automatic equipment will be increased, unchanged, or decreased.

Imboden and Wynn observed that "Because the skill of the staff is the most important element in the success of the unit, the nurses need adequate educational preparation for the responsibility they will assume."[6]

Findings. Significantly more nurses felt the need for inservice training in using mechanical devices and automatic equipment was increased ($z = 10.57$, $p = <.001$). Of the six nurses who changed their responses to this statement on the second survey, five felt the need was increased. Although this indicates a trend ($X^2 = 2.57$, $p = <.10$), the changes in the responses were not significant.

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[5] Ibid., p. 576.

[6] Clarence A. Imboden, Jr. and Jane E. Wynn, op. cit., p. 75.

Statement 26. The need to orient personnel to the working environment on each unit in the hospital will be increased, unchanged, or decreased.

The patient floors were designed so that all nursing units were basically the same. With the exception of the special nursing areas such as the operating rooms, labor and delivery rooms, emergency and out-patient departments, all of the nursing units were essentially identical. It would seem that after personnel were initially oriented to any one unit they should be able to function on any other unit more easily.

Findings. Significantly more of the nurses felt the need to orient personnel to the working environment on each unit in the hospital was increased ($z = 4.38$, $p = <.001$). Of the eighteen nurses who changed their responses to this statement on the second survey in comparison to the first survey, ten felt the need was decreased. This was not a significant change.

Statement 30. The need to orient personnel to nursing functions on each unit in the hospital will be increased, unchanged, or decreased.

This statement, although closely related to the statement above, does have a different meaning in that it is concerned with the actual nursing functions on each unit and is not limited to the physical design of the floor.

Findings. Significantly more of the nurses felt the need to orient personnel to nursing functions on each unit was increased ($z = 4.12$, $p = <.001$). Of the twenty-six nurses who changed their responses to this statement on the second survey in comparison to the first survey, eleven felt the need was decreased. This was not a significant change.

Statement 54. The need for orientation of nurses to changes in procedures, policies, and new techniques will be increased, unchanged, or decreased.

For many months prior to the move from the old hospital and continuing after the move into the new hospital, many changes were made in procedures and policies which pertained to the new equipment and the mechanical devices which had been installed in the new building.

Findings. Significantly more of the nurses felt the need for orientation of nurses to changes in procedures, policies, and new techniques was increased ($z = 7.61$, $p = <.001$). Of the nineteen nurses who changed their responses to this statement on the second survey in comparison to the first survey, nine felt the need was decreased. This was not a significant change.

Statement 62. Difficulties encountered by "float nurses" working on several different units will be increased, unchanged, or decreased.

The design of the nursing units which was basically the same, should have influenced the placement of supplies and equipment on each nursing unit. The nursing station, charting desks, medication room, clean and soiled core areas, elevators, exits, patient rooms, and other basic areas were the same on each nursing floor. It was believed that this should contribute to decreased difficulties for personnel to work on another unit.

Findings. Significantly more of the nurses felt the difficulties encountered by "float nurses" were increased ($z = 4.38$, $p = < .001$). Of the twenty-two nurses who changed their responses to this statement on the second survey in comparison to the first survey, sixteen felt the difficulties were increased ($X^2 = 4.54$, $p = < .01$). This was a significant change.

Statement 67. Responsibility of professional nurses for assisting with student nurse education will be increased, unchanged, or decreased.

In the literature[7] on the effects of automation in the industrial setting, it was apparent that there was an increased need for orientation to the new equipment and

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[7] Walter Buckingham, op. cit., p. 91; Otis Lipstreu and Kenneth Reed, op. cit., pp. 77-84.

mechanical devices. On-going educational programs were needed to keep the employees abreast of the changes in the work environment. It was believed that there would be an increased need for professional nurses to assist with student nurse education to help the students adjust to the new hospital work environment.

Findings. Significantly more of the nurses felt the responsibility of professional nurses for assisting with student nurse education was unchanged ($z = 3.31$, $p = < .001$). Of the thirty-four nurses who changed their responses to this statement on the second survey in comparison to the first survey, seventeen of the nurses felt the responsibility of professional nurses for assisting with student nurse education was increased. This was not a significant change.

Summary

The responses to five of the six statements pertaining to the need for initial and on-going inservice education for all staff to work in an automated hospital indicated significantly more of the nurses felt the need was increased ($X^2 = < .001$). The responses to statement 67, "responsibility of professional nurses for assisting with

student nurse education," indicated that the nurses felt there was no change in the responsibility of professional nurses for student nurse education due to the effect of automation in the hospital.

The responses to statement 62, "difficulties encountered by 'float nurses' working on several different units," on the second survey in comparison to the first survey indicated significantly more nurses felt the difficulties were increased ($X^2 = 4.54$, $p = < .05$). The number of responses to statement 23, "the need for inservice training in using mechanical devices and automatic equipment," indicated a trend toward decreased ($X^2 = 2.57$, $p = < .10$). The changes in the responses to the other four statements were random. Of the 125 nurses who changed their responses on the second survey in comparison to the first survey, sixty-nine changed toward increased and forty-six changed toward decreased. The null hypothesis was accepted.

Hypothesis 2

There will be no significant change in the feelings of the nurses about the effect of automation on the work environment in the hospital. (See Table IX, p. 61.)

Introduction. In planning the new Mercy Hospital, a philosophy of functional organization had been specifically developed for this project by the Hospital Consultant as a logical approach to the provision of care.

> This philosophy of functional organization provides for the doctor and the nurse the necessary supplies as they are needed even in the patient's room. In this way, professional personnel and particularly the nurse can be relieved of a large part of their time formerly spent in messenger and waiting activities. It is estimated that a sizeable portion of a nurse's time can thus be saved and utilized for direct patient care.[8]

In industry, Buckingham states that "Automation clearly improves working conditions in general by permitting better housekeeping in the plant. Automated plants are cleaner, neater, and more pleasant to work in."[9]

Eight statements pertained to the effect of automation on the work environment: 33, 36, 47, 53, 55, 56, 58, and 60. (See Table IX, page 61.)

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[8] Gordon A. Friesen Associates, "Master Program and Plan for the new Mercy Hospital," Denver, Colorado (June, 1961), p. 4.

[9] Walter Buckingham, op. cit., p. 91.

TABLE IX

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS
ABOUT THE EFFECT OF AUTOMATION ON THE WORK ENVIRONMENT

Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Downward	Diff (X^2=)	Total Responses to Survey II Number	Diff (z=)
33. The accessibility of supplies and equipment to give patient care will be	(I)	55	88.7	53	85.5					
	U	2	3.2	2	3.2	8	7	0	53	<.001
	D	5	8.1	7	11.3					
36. The opportunity to carry out all nursing duties effectively with an economy of time and effort will be	(I)	57	92.0	48	77.4					
	U	2	3.2	11	17.8	3	10	<.05	48	<.001
	D	3	4.8	3	4.8					
47. The convenience and efficiency of the working environment will be	(I)	57	92.2	54	87.1					
	U	1	1.6	1	1.6	5	6	0	54	<.001
	D	4	6.2	7	11.3					
53. The amount of walking done by nurses on duty will be	I	10	16.2	22	35.5					
	U	9	14.5	13	20.9	23	7	<.01	27	<.001
	(D)	43	69.3	27	43.6					
55. Storage of supplies and equipment on the wards will be	I	11	17.8	18	29.2					
	U	1	1.6	3	4.8	11	12	0	41	<.001
	(D)	50	80.6	41	66.0					
56. Availability of all equipment necessary to give patient care will be	(I)	52	83.8	50	80.9					
	U	1	1.6	4	6.2	9	8	0	50	<.001
	D	9	14.6	8	12.9					
58. The possibility that "things will run more smoothly in your department will be	(I)	50	80.5	44	70.9					
	U	7	11.3	13	20.9	11	9	0	44	<.001
	D	5	8.2	5	8.2					
60. Infections due to method of handling soiled equipment and supplies will be	I	0	0.0	0	0.0					
	U	2	3.2	8	12.9	2	11	<.01	54	<.001
	(D)	60	96.8	54	87.1					
				Total		72	70			

Statement 33. The accessibility of supplies and equipment to give patient care will be increased, unchanged, or decreased.

Findings. Significantly more of the nurses felt the accessibility of supplies and equipment to give patient care was increased ($z = 8.69$, $p = <.001$). There was no significant change in the responses on the second survey in comparison to the first survey. Of the fifteen nurses who changed their response, seven felt the accessibility of supplies and equipment was decreased.

Statement 36. The opportunity to carry out all nursing duties effectively with an economy of time and effort will be increased, unchanged, or decreased.

The following statement from the philosophy of design of the hospital will help in analyzing this concept:

> No matter how personnel are grouped or functions and responsibilities divided, ultimate savings are not possible without the provision of proper tools to work with, when they are needed, and where they are needed. Unless such an environment is provided both by design and equipment, professional and allied skills are diluted with functions and duties that could be performed less frequently and by less skilled personnel. Skills are further diluted by the time lost in waiting for necessary supplies, materials, and equipment.[10]

Findings. Significantly more of the nurses felt the opportunity to carry out all nursing duties effectively with an

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[10]Gordon A. Friesen, Associates, op. cit., p. 4.

economy of time and effort was increased ($z = 7.34$, $p = <.001$). There was a significant change in the way the nurses felt about the opportunity to carry out all nursing duties on the second survey in comparison to the first survey. Of the thirteen nurses who changed their responses to this statement, ten felt the opportunity was decreased ($X^2 = 3.76$, $p = <.05$).

Statement 47. The convenience and efficiency of the working environment will be increased, unchanged, or decreased.

The rationale for the inclusion of this statement in the study is given in the following statements:

> In hospital design few people have thus far recognized the real importance of a production line flow of supplies and equipment. Such a flow can and will make a tremendous contribution toward better utilization of hospital personnel and their time and ultimately the provision of quality patient care at the lowest possible cost.[11]

This specifically stresses the efficiency of the working environment as being essential in utilizing the nurses' time and effort in carrying out her responsibilities in giving patient care.

Findings. Significantly more of the nurses felt the convenience and efficiency of the working environment was

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[11] Ibid., p. 4.

increased ($z = 8.95$, $p = <.001$). Of the eleven nurses who changed their responses to this statement on the second survey in comparison to the first survey, six felt the convenience and efficiency of the working environment was decreased. This was not a significant change.

Statement 53. The amount of walking done by nurses on duty will be increased, unchanged, or decreased.

Several factors should have influenced the amount of walking done on duty by the nursing staff in the new hospital. The storage of basic supplies in the Nurserver located in each patient room, the complement carts located in the clean core area on the nursing floor, the master communication system which allows the nurse verbal contact with the nursing station, other nursing personnel on the unit, the main Supplies, Processing and Distribution area, the inter-communication system between the patients and the nursing station, all electrical beds which the patient can operate, and the division of the nursing floor into four nursing teams with only fourteen patients to each team should have contributed to decreasing the amount of walking done by the nurses on duty.

Findings. Significantly more of the nurses felt the amount of walking done by nurses on duty was decreased ($z = 1.70$,

$p = <.05$). There was a significant change in the feelings of the nurses on the second survey in comparison to the first survey. Of the thirty nurses who changed their responses to this statement, twenty-three felt walking done on duty was increased ($X^2 = 6.00$, $p. = <.05$).

Statement 55. Storage of supplies and equipment on the wards will be increased, unchanged, or decreased.

There are three sources of supplies and equipment for the convenience of the nurses in giving patient care. The Nurserver which is located in the patient room, the clean core area on each nursing floor where the complement carts are stored, and the main S.P.D. department. The basis of the planning approach for the new Mercy Hospital was to provide a facility in which there was a place for everything, everything in its place--"and nobody wastes time fetching and carrying unnecessarily."[12] The master communication system, the continuous conveyor belt system, pneumatic tube system and the vertical shaft dumb waiter assures delivery of any item needed by the nurse when needed and where needed.

Findings. Significantly more of the nurses felt storage of

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[12] Ibid., pp. 4, 5.

supplies and equipment on the wards was decreased ($z = 5.46$, $p = <.001$). Of the twenty-three nurses who changed their responses to this statement on the second survey in comparison to the first survey, eleven felt storage of supplies was increased. This was not a significant change.

Statement 56. Availability of all equipment necessary to give patient care will be increased, unchanged, or decreased.

From the Manual prepared by the Hospital Consultant the following statements explain the supply and distribution system in effect in the new hospital:

> The supply and distribution system, . . . will permit better organization, distribution and control of materials. But most important, it places at the immediate disposal of the medical staff and hospital personnel the necessary supplies when and where needed. It is an application of centralization and automation to the provision of hospital supplies and material handling.[13]

Findings. Significantly more of the nurses felt the availability of all equipment necessary to give patient care was increased ($z = 7.88$, $p = <.001$). Of the seventeen nurses who changed their responses to this statement on the second survey in comparison to the first survey, eight felt the availability of supplies and equipment to give patient care

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[13] Gordon A. Friesen, Associates, op. cit., p. 3.

was decreased. This was not a significant change.

Statement 58. The possibility that "things will run more smoothly" in your department will be increased, unchanged, or decreased.

The functional grouping of related departments within the hospital and the automated and mechanical devices for the processing and distribution of supplies from S.P.D. actually should have assured efficient operation and a smooth, straight-line flow of traffic. The Administrator of the Berwick Hospital, Berwick, Pennsylvania, which was designed by the same Hospital Consultant, stated: "The atmosphere of quiet efficiency that pervades both the public and 'working' areas of the building is the result of careful planning--not a happy accident."[14]

Findings. Significantly more of the nurses felt the possibility that "things will run more smoothly" in your department was increased ($z = 6.27$, $p = <.001$). Of the twenty nurses who changed their responses to this statement on the second survey in comparison to the first survey, eleven felt the possibility was decreased. This was not a significant change.

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[14] "How Automat Plan Works in Practice," The Modern Hospital, Vol. 95, No. 3 (September, 1960), pp. 95-99.

Statement 60. Infections due to method of handling soiled equipment and supplies will be increased, unchanged, or decreased.

The design of each nursing unit emphasizes the separation of clean from soiled at every step of handling of the supplies and equipment in giving patient care. In the patient room, the clean storage unit of the Nurserver is sealed completely off from the soiled holding side of the unit. The clean storage area on each nursing unit has a separate continuous conveyor belt system for the delivery of supplies and equipment to the nursing floors. The soiled holding area is a separate room as is the Treyveyor to return supplies and equipment to the decontamination area located in the S.P.D. department of the hospital. Even soiled food trays may not be placed on the food Treyveyor until all clean food trays have been served to the patients. The system must be reversed to receive trays to be returned to the dishwashing area in the kitchen.

Findings. Significantly more of the nurses felt infections due to the method of handling soiled equipment and supplies were decreased ($z = 8.95$, $p = < .001$). Of the thirteen nurses who changed their responses to the statement on the second survey in comparison to the first survey, eleven felt infections due to the method of handling soiled

equipment and supplies were increased ($X^2 = 6.23$, $p = <.05$). This was a significant change in the feelings of the nurses about the effect of automation on incidence of infections.

Summary

The nurses responses to the eight statements pertaining to the effect of automation on the work environment indicated significantly more of the nurses felt the work environment was improved ($p = <.05$). The nurses felt the accessibility of supplies was increased, the availability of all equipment to give patient care was increased, the possibility that "things will run more smoothly" in your department was increased, and the convenience and efficiency of the working environment was increased ($p = <.001$). Significantly more of the nurses felt the storage of supplies and equipment on the ward was decreased ($p = <.001$). There was a significant change in the responses of the nurses to "the opportunity to carry out all nursing duties effectively with an economy of time and effort" which was toward increased ($p = <.05$). Significantly more of the nurses changed their responses to the statement "the amount of walking done on duty" which was toward increased ($p = <.05$). Significantly more of the nurses changed their

responses toward increased to the statement "infections due to the method of handling soiled equipment and supplies" ($p = <.05$).

There were 145 changes in the responses of the nurses on the second survey in comparison to the first survey, eighty-eight toward decreased and fifty-four toward increased. The responses to five of the eight statements were random and did not indicate a direction of change at a level of significance. The null hypothesis was accepted.

Hypothesis 3

There will be no significant change in the feelings of nurses about the effect of automation on supervisory responsibilities and on staffing needs within the hospital. (See Table X, p. 72.)

Introduction. Bright reported that in the industrial setting there was an increase in supervisory responsibility.

> Automation demands an alert machinery-conscious supervisor of a higher caliber. . . . He must be acquainted with all the processes since he directs a complete line rather than one department. He must be conscious of a machinery-oriented production system. He must be imaginative and resourceful, since down time must be anticipated, minimized, and circumvented as much as possible. We notice that the man who has more than a high school education fits in. He can look ahead and grasp the impact of change.[15]

Lipstreu and Reed found that the expectations of top-level management relative to supervisory performance had heightened. They also found that the increased speed of the lines and the restricted mobility of the machine operators had significantly reduced opportunities to spot difficulties early enough to avoid substantial loss of material. As a result, supervisory tension had been greatly increased.[16]

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[15]James R. Bright, Automation and Management (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1958), p. 209.

[16]Lipstreu and Reed, op. cit., p. 53.

TABLE X

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS ABOUT THE EFFECT OF AUTOMATION ON SUPERVISORY RESPONSIBILITIES AND STAFFING NEEDS IN THE HOSPITAL

	Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Changes in Responses, Survey II Downward	Changes in Responses, Survey II Diff.(X^2=)	Total Responses to Survey II Number	Total Responses to Survey II Diff. (z=)
2.	Supervisors responsibility will be	(I)	50	80.7	45	72.6					
		U	10	16.1	15	24.2	9	7	0	45	<.001
		DD	2	3.2	2	3.2					
6.	The percentage of non-professional workers in the hospital will be	(I)	37	59.7	40	64.4					
		U	10	16.1	11	17.8	8	11	0	40	<.001
		D	15	24.2	11	17.8					
13.	The number of personnel on a nursing team will be	I	13	20.9	15	24.2					
		U	20	32.3	19	30.7	17	19	0	28	<.05
		(D)	29	46.8	28	45.1					
16.	The ratio of supervisors to staff nurses will be	(I)	13	20.9	4	6.4					
		U	30	48.3	29	46.8	11	12	0	4 (I)+	<.001
		D	19	30.8	29	46.8					
22.	The ratio of professional nurses to non-professional nursing personnel will be	(I)	31	50.0	19	30.7					
		U	12	19.3	15	24.2	19	22	0	28 (D)+	<.05
		D	19	30.7	28	45.1					
32.	The professional nurses' opportunities to supervise non-professional personnel will be	(I)	49	79.3	37	59.8					
		U	9	14.5	13	20.9	9	16	<.10	37	<.001
		D	4	6.2	12	19.3					
63.	The need for Head Nurses to closely observe patient care given by all personnel will be	I	26	41.9	7	11.3					
		(U)	21	33.9	32	51.6	20	25	0	32	<.001
		D	15	24.2	23	37.1					
				Total			93	112			

+Other than anticipated response

Seven statements pertained to the effect of automation on supervisory responsibilities and staffing needs within the hospital: 2, 6, 13, 16, 22, 32, and 63. (See Table X, p. 72.)

Statement 2. Supervisors responsibility will be increased, unchanged, or decreased.

The hypothesis "that automation increases the amount of supervisory responsibility" was supported in the study by Lipstreu and Reed.[17]

Findings. Significantly more of the nurses felt that supervisors' responsibility was increased ($z = 6.54$, $p = <.001$). Of the sixteen nurses who changed their responses on the second survey in comparison to the first survey, seven felt supervisors' responsibility was decreased. This was not a significant change.

Statement 6. The percentage of non-professional workers in the hospital will be increased, unchanged, or decreased.

A recent article states that in two hospitals designed by the Hospital Consultant for Mercy Hospital, Denver, the reduction in staffing was decreased to ratios of 1.04 employees per patient at the Berwick Hospital,

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[17] Ibid.

Berwick, Pennsylvania, and 1.38 employees per patient at the Carrol County Hospital, Westminister, Maryland, compared to a national average of 2.4 per patient in other general hospitals.[18] The ratio of non-professional personnel to professional personnel in most hospitals has been increased during the past few years.

Findings. Significantly more of the nurses felt the percentage of non-professional workers in the hospital was increased ($z = 5.19$, $p = <.001$). Of the twenty-three nurses who changed their responses to this statement on the second survey in comparison to the first survey, eleven felt the percentage of non-professional workers was decreased. This was not a significant change.

Statement 13. The number of personnel on a nursing team will be increased, unchanged, or decreased.

The professional nurse was relieved of all non-nursing tasks involving the ordering and obtaining of supplies and equipment to give patient care. Each nursing unit was divided into four areas with fourteen patients assigned to each nursing team. Non-professional personnel were responsible for stocking the Nurservers in each

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[18] "Look! No Nursing Station," The Canadian Hospital, Vol. 41, No. 3 (March, 1964), p. 48.

patient room and for replacement of supplies and materials used by the nurses to give patient care. It seemed that nursing service personnel should be able to concentrate on giving patient care and that the number on a team should be decreased.

Findings. Significantly more of the nurses felt the number of personnel on a nursing team were decreased ($z = 1.97$, $p = <.05$). Of the thirty-six nurses who changed their responses on the second survey in comparison to the first survey, seventeen felt the number of personnel on a nursing team were increased. This was not a significant change.

Statement 16. The ratio of supervisors to staff nurses will be increased, unchanged, or decreased.

Lipstreu and Reed observed that "One interesting aspect of increased automaticity of work is that, with fewer machine workers, there is apparently little decrease in the size of the supervisory group."[19]

Findings. The nurses felt the ratio of supervisors to staff nurses was either unchanged or decreased. Significantly fewer nurses felt the ratio of supervisors to staff nurses was increased ($z = 4.48$, $p = <.001$). Of the twenty-

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[19]Lipstreu and Reed, op. cit., p. 55.

three nurses who changed their responses to this statement on the second survey in comparison to the first survey, twelve felt the need was decreased. This was not a significant change.

Statement 22. The ratio of professional nurses to non-professional nursing personnel will be increased, unchanged, or decreased.

Lipstreu and Reed stated that "old distinctions between direct and indirect labor become exceedingly fuzzy under automated conditions."[20]

Findings. Significantly more of the nurses felt the ratio of professional nurses to non-professional nursing personnel was decreased ($z = 1.97$, $p = < .05$). Of the forty-one nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty-two felt the ratio was decreased. This was not a significant change.

Statement 32. The professional nurses' opportunities to supervise non-professional personnel will be increased, unchanged, or decreased.

Each nursing unit is divided into four teams responsible for fourteen patients each. Relieving the

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[20] Ibid., p. 56.

professional nurses of many non-nursing tasks should free them to patient care and supervision of non-professional nursing personnel.

Findings. Significantly more of the nurses felt the opportunities to supervise non-professional personnel were increased ($z = 4.38$, $p = <.001$). Of the twenty-three nurses who changed their responses on the second survey in comparison to the first survey, sixteen felt the opportunities were decreased. Although this was not significant, it did indicate a shift toward decreased ($X^2 = 2.0$, $p = <.10$).

Statement 63. The need for Head Nurses to closely observe patient care given by all personnel will be increased, unchanged, or decreased.

Walker observed that "Increasing decentralization of authority may result in machine operators being given greater discretion for making decisions on their own initiative without consulting superiors."[21]

Findings. Significantly more of the nurses felt the need for head nurses to closely observe patient care given by all personnel was unchanged. Of the forty-five nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty-five felt

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[21]Walker, op. cit., p. 40.

the need was decreased. This was not a significant change.

Summary

The nurses' responses to three of the seven statements pertaining to supervisory responsibility and staffing needs in the hospital were significantly toward increased ($p = <.001$). They felt that supervisors responsibility was increased, the percentage of non-professional workers in the hospital was increased, and the professional nurses' opportunities to supervise non-professional personnel were increased. The nurses felt the number of personnel on a nursing team was decreased and the ratio of professional nurses to non-professional nursing personnel was decreased ($p = <.05$). The nurses felt that the ratio of supervisors to staff nurses was unchanged and the need for head nurses to closely observe patient care given by all personnel was unchanged ($p = <.001$).

Of the 205 responses to the seven statements which were changed on the second survey in comparison to the first survey, ninety-three were toward increased and 112 were toward decreased. The direction of change was not significant at the $<.05$ level. The null hypothesis was accepted.

Hypothesis 4

There will be no significant change in the feelings of nurses about the effect of automation on communication within the hospital. (See Table XI, p. 80.)

Introduction. The effect of automation on the need for communication between supervisors and employees in the industrial setting was found to be increased. However, the amount of communication between workers was drastically reduced due to new work assignments, added speed, and more automatic work procedures. Lipstreu and Reed stated:

> A logical deduction by those studying the consequences of automation might be that a more automatic work environment would naturally lead to less interaction and verbal communication . . . the amount of direct communication required between supervisors and employees involved in automated work is greatly reduced . . . a considerable proportion of direct communication is via intercom. And both workers and supervisors have a rather difficult time making appropriate adjustments.[22]

They also observed that time after time supervisors made attempts to convey their directions over electronic devices, only to give up when unable to do so and seek out the employee to whom they gave their verbal orders directly.[23]

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[22] Lipstreu and Reed, op. cit., p. 57.

[23] Ibid.

TABLE XI

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS
ABOUT THE EFFECT OF AUTOMATION ON COMMUNICATION

Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Changes in Responses, Survey II Downward	Changes in Responses, Survey II Diff.(x^2=)	Total Responses to Survey II Number	Total Responses to Survey II Diff. (z=)
20. The amount of direct communication between supervisors and staff nurses will be	(I)	22	35.4	27	43.5					
	U	21	33.9	16	25.8	15	17	0	27	$<.05$
	D	19	30.7	19	30.7					
25. The opportunity to "listen" to what the patient is really saying will be	(I)	43	69.3	40	64.5					
	U	8	12.8	12	19.4	14	13	0	40	$<.001$
	D	11	17.9	10	16.1					
37. Communication between physicians and nurses will be	(I)	26	41.9	24	38.8					
	U	26	41.9	22	35.4	15	14	0	24	0
	D	10	16.2	16	25.8					
42. The need for each nurse to talk with the patient's physician will be	I	15	24.3	14	22.6					
	(U)	38	61.2	33	53.2	11	19	$<.10$	33	$<.001$
	D	9	14.5	15	24.2					
43. The need for communication between nursing education personnel and nursing service personnel will be	(I)	36	58.1	38	61.4					
	U	21	33.8	22	35.4	17	13	0	38	$<.001$
	D	5	8.1	2	3.2					
57. Difficulties and problems of communication will be	I	11	17.8	20	32.3					
	U	9	14.5	13	20.9	18	15	0	29	$<.01$
	(D)	42	67.7	29	46.8					
64. Staff Physicians' opportunities to discuss patient care with professional nurses will be	(I)	35	56.4	27	43.5					
	U	23	37.1	24	38.7	10	20	$<.10$	27	$<.05$
	D	4	6.8	11	17.8					
			Total			100	111			

There were seven statements pertaining to the effect of automation on communication within the hospital: 20, 25, 37, 42, 43, 57, and 64.

Statement 20. The amount of direct communication between supervisors and staff nurses will be increased, unchanged, or decreased.

Lipstreu and Reed observed that "There can be little doubt in X (company) that the amount of direct communication required between supervisors and employees involved in automated work is greatly reduced."[24]

Findings. Significantly more of the nurses felt the amount of direct communication between supervisors and staff nurses was increased ($z = 1.70$, $p = <.05$). Of the thirty-two nurses who changed their responses to this statement on the second survey in comparison to the first survey, seventeen felt the amount of direct communication between supervisors and staff nurses was decreased. This was not a significant change.

Statement 37. Communication between physicians and nurses will be increased, unchanged, or decreased.

One of the objectives of the designer was to decrease the need for the nurses to gather in the nursing

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[24] Ibid.

station to do all the desk work and so-called "busy work" which many nurses feel keep them from giving patient care. If the nurse is with the patients and not at the nursing station, it would seem there should be more communication between the doctor and the nurse, since the nurse is more likely to be in the patient's room when the physician sees his patient.

Findings. There was no significant differences between the nurses' responses to this statement. The responses were almost equally divided between the three possible responses to this statement. Of the twenty-nine nurses who changed their responses to the statement on the second survey in comparison to the first survey, fourteen felt communication between physicians and nurses was increased. This was not a significant change.

Statement 25. The opportunity to "listen" to what the patient is really saying will be increased, unchanged, or decreased.

The pragmatic value of automation must be weighed against hurtful effects upon personality and depersonalizing and distance-producing features must be counteracted.[25] Many nursing leaders believe that automated and mechanized

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[25]Peplau, op. cit., p. 46.

devices will free highly trained nursing personnel to perform uniquely human tasks such as improving patient-nurse relationships and increasing the opportunities for the nurse to teach the patient more about his health needs.

Findings. Significantly more of the nurses felt the opportunity to "listen" to what the patient is really saying was increased ($z = 5.19$, $p = <.001$). Of the twenty-seven nurses who changed their responses to this statement on the second survey in comparison to the first survey, fourteen felt the opportunity was decreased. This was not a significant change.

Statement 42. The need for each nurse to talk with the patient's physician will be increased, unchanged, or decreased.

Many nurses have expressed the need to discuss patient care with physicians. Freeing the nurse from non-nursing tasks should release her to spend more time with the patients and also to plan patient care with co-workers and the physicians.

Findings. Significantly more of the nurses felt the need for each nurse to talk with the patient's physician was unchanged ($z = 3.31$, $p = <.001$). Of the thirty nurses who changed their responses to this statement on the second

survey in comparison to the first survey, nineteen felt the need was decreased ($X^2 = 2.45$, $p = < .10$). This was not a significant change, although it did indicate a trend toward decreased.

Statement 43. The need for communication between nursing education personnel and nursing service personnel will be increased, unchanged, or decreased.

With the many new concepts and changes in policies, procedures, and equipment it was felt by the investigator that there would be an increased need for communication between the personnel on the nursing units and the instructors in the school of nursing.

Findings. Significantly more of the nurses felt the need for communication between nursing education personnel and nursing service personnel was increased ($z = 4.65$, $p = < .001$). Of the thirty nurses who changed their responses to this statement on the second survey in comparison to the first survey, thirteen felt the need for communication was decreased. This is not a significant change.

Statement 57. Difficulties and problems of communication will be increased, unchanged, or decreased.

The master communication system which allows the nurse almost instantaneous verbal contact with all departments of the hospital, the nursing station and other nurses

on the units should have eliminated many of the problems connected with communication in the hospital.

Findings. Significantly more of the nurses felt the difficulties and problems of communication were decreased ($z = 2.23$, $p = <.025$). Of the thirty-three nurses who changed their responses to this statement on the second survey in comparison to the first survey, eighteen felt the difficulties and problems of communication were increased. This was not a significant change.

Statement 64. Staff physicians' opportunities to discuss patient care with professional nurses will be increased, unchanged, or decreased.

The purpose of the plan for the nursing units by the Hospital Consultant was stated as follows, "functional organization provides for the doctor and the nurse the necessary supplies as they are needed even in the patient's room."[26] It was believed that the nurse would be able to work more closely with the physician as he cared for his patient, thereby increasing the opportunity for the staff physician to discuss patient care with the nurse.

Findings. Significantly more of the nurses felt staff

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[26]Gordon A. Friesen Associates, op. cit., p. 4.

physicians' opportunities to discuss patient care with professional nurses was increased ($z = 1.70$, $p = < .05$). Of the thirty nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty felt the opportunities were decreased ($X^2 = 3.33$, $p = < .10$). Although this was not significant at the $< .05$ level, it did indicate a trend toward decreased in the feelings of the nurses about staff physician's opportunities to discuss patient care with professional nurses.

Summary

The responses of the nurses to statements 20, 25, and 57 indicated that the effect of automation on communication was increased communication at the $< .05$ level of significance. The responses of the nurses to statement 37 were divided between the three possible answers and were not significantly more in one group. Significantly more of the nurses' responses to statement 42 indicated the effect of automation had not changed the need for each nurse to talk with the patient's physician ($< .001$). The nurses' responses to statement 64 indicated a trend toward decreased opportunities for staff physicians to discuss

patient care with professional nurses ($<.10$). This was the only statement to which the responses indicated a trend toward decreased. There were 211 responses changed by the nurses on the second survey in comparison to the first survey, 100 toward increased and 111 toward decreased. The changes were random and were not significant of the direction of the change. The null hypothesis was accepted.

Hypothesis 5

There will be no significant change in the feelings of nurses about the effect of automation on the improvement of patient care. (See Table XII, p. 89.)

Introduction. Some of the expected advantages of using machines in the care of patients are to provide more time for interpersonal contacts between nursing personnel and patients, take some of the drudgery out of nursing, relieve the nurse of running after supplies and equipment, and to improve patient care by providing the facilities to give more prompt, efficient service to the patient.

There were eight statements pertaining to the effect of automation on the improvement of patient care: 14, 28, 38, 44, 46, 49, and 66. The statements included methods of improving patient care as well as the more direct effect of automation on patient care.

Statement 14. The effectiveness of team nursing will be increased, unchanged, or decreased.

During recent years, nurses have devised methods by which the professional nurse should be able to spend more time and have closer contact with the patient. The shortage of professional nurses has increased the numbers of nursing assistants who have been given more and more responsibilities for the bedside care of the patient. The

TABLE XII

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS
ABOUT THE EFFECT OF AUTOMATION ON IMPROVEMENT OF PATIENT CARE

Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Changes in Responses, Survey II Downward	Changes in Responses, Survey II Diff. (X^2=)	Total Responses to Survey II Number	Total Responses to Survey II Diff. (z=)
14. The effectiveness of team nursing will be	(I)	51	82.3	43	69.3					
	U	9	14.5	11	17.8	12	14	0	51	<.001
	D	2	3.2	8	12.9					
28. The opportunity for professional nurses to give direct patient care will be	(I)	46	74.2	34	54.8					
	U	5	8.1	12	19.3	10	13	0	46	<.001
	D	11	17.7	16	25.9					
38. The number of patients' requests for nursing care will be	I	8	12.9	13	20.9					
	U	16	25.8	24	38.8	19	9	<.05	38	<.001
	(D)	38	61.3	25	40.3					
40. The amount of time needed to answer the patients' call for nursing care will be	I	8	12.9	8	12.9					
	U	8	12.9	12	19.3	14	7	<.10	46	<.001
	(D)	46	74.2	42	67.8					
44. Patients' feelings of security will be	(I)	45	72.6	33	53.2					
	U	8	12.9	15	24.2	8	15	<.10	45	<.001
	D	9	14.5	14	22.6					
46. Time utilized effectively in giving patient care will be	(I)	48	77.6	36	58.2					
	U	4	6.2	14	22.5	9	18	<.10	48	<.001
	D	10	16.2	12	19.3					
49. Patient satisfaction with food service will be	(I)	45	72.6	23	37.1					
	U	16	25.8	12	19.3	6	29	<.001	27 (D)+	<.05
	D	1	1.6	27	43.6					
66. The opportunity for the head nurse to observe and assist with patient care will be	(I)	26	41.9	17	27.4					
	U	20	32.3	17	27.4	10	27	<.001	28 (D)+	<.05
	D	16	25.8	28	45.2					
				Total		88	132			

+Other than anticipated Response

professional nurse who has been trained in the sciences and other special knowledge fields has found herself in the medication room, at the nursing desk, and involved with ward management duties which absorb increasing amounts of her time and energy. One method which has gained a great deal of popularity and support throughout nursing has been team nursing. It was believed by the investigator that the design concepts and the automated and mechanized devices would increase the effectiveness of team nursing.

Findings. Significantly more of the nurses felt that the effectiveness of team nursing was increased ($z = 6.00$, $p = <.001$). Of the twenty-six nurses who changed their responses to this statement on the second survey in comparison to the first survey, fourteen felt the effectiveness of team nursing was decreased. This was not a significant change.

Statement 28. The opportunity for professional nurses to give direct patient care will be increased, unchanged, or decreased.

In the Manual for the design of the new hospital, the following statement was made:

> In this way, professional personnel and particularly the nurse can be relieved of a large part of their time formerly spent in messenger and waiting activities. It

> is estimated that a sizeable portion of a nurse's time can thus be saved and utilized for direct patient care.[27]

Findings. Significantly more of the nurses felt the opportunity for professional nurses to give direct patient care was increased ($z = 3.58$, $p = <.001$). Of the twenty-three nurses who changed their responses to this statement on the second survey in comparison to the first survey, thirteen felt the opportunity for professional nurses to give direct patient care was decreased. This was not a significant change.

Statement 38. The number of patients' requests for nursing care will be increased, unchanged, or decreased.

In the new automated hospital building, each patient's bed was electrical and, unless his condition was such that he was not able to operate the controls, even the bed patient should have been more independent of nursing help. The radio, television, and inter-com pillow speaker should have also contributed to his independence. In comparison to the old hospital, each room in the new hospital had a vanity area with a shower, toilet, and lavatory. Ambulatory patients could be on a self-help basis of care.

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[27] Master Program and Plan for the New Mercy Hospital, op. cit., p. 4.

It was believed by the investigator that the number of requests for nursing care should be markedly reduced in the new hospital.

Findings. On the first survey significantly more of the nurses felt the number of patients' requests for nursing care would be decreased ($z = 4.65$, $p < .001$). However, on the second survey, the responses were changed so that they were almost equally divided between unchanged and decreased without a majority in any one group. Of the twenty-eight nurses who changed their responses to this statement on the second survey in comparison to the first survey, significantly more of the nurses felt the number of patients' requests for nursing care were increased ($X^2 = 3.57$, $p < .05$). This was a significant change.

Statement 40. The amount of time needed to answer the patients' calls for nursing care will be increased, unchanged or decreased.

Many studies have been conducted on how nurses spend their time on duty. Blumberg identified those activities which require more than one per cent of a nurse's time. There was no specific category related to the actual amount of time spent in answering patient's call for nursing care but it was found that 3.9 per cent of the nurse's time was

spent to "make rounds to visit or observe patients."[28] Other categories in the study by Blumberg do involve patient care so it would seem that somewhat more than the above quoted figure is used in answering patient's calls for nursing care. The master communication system and the physical design of each nursing unit combined with the automated supply system should have decreased the amount of time needed to answer patients' calls for nursing care.

Findings. Significantly more of the nurses felt the amount of time needed to answer patients' calls for nursing care was decreased ($z = 5.73$, $p < .001$). Of the twenty-one nurses who changed their responses to this statement on the second survey in comparison to the first survey, fourteen felt the amount of time to answer patients' calls for nursing care was increased ($X^2 = 2.33$, $p < .10$). Although the trend is not significant it does indicate a change in the feelings of the nurses about the effect of automation on the amount of time needed to answer the patients' calls for nursing care.

Statement 44. Patients' feelings of security will be increased, unchanged, or decreased.

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[28] Mark S. Blumberg, op. cit., p. 40.

The nurse-patient intercommunication system which assures the patient almost instantaneous verbal contact with the nursing station and nursing service personnel should prove to be reassuring to the patient. The availability of supplies and equipment and the modern mechanical equipment to give patient care should have reassured the patient that he would receive excellent care.

Findings. Significantly more of the nurses felt the patients' feelings of security were increased ($z = 3.31$, $p = <.001$). Of the twenty-seven nurses who changed their responses to this statement on the second survey in comparison to the first survey, fifteen changed to decreased ($X^2 = 2.13$, $p = <.10$). The trend was toward decreased feelings of security for patients. Although this was not at a level of significance, it does indicate a change in the feelings of the nurses about the effect of automation on patients' feelings of security.

Statement 46. Time utilized effectively in giving patient care will be increased, unchanged, or decreased.

> In the busy hospital, there is constant motion -- the flow of patients and staff members, and of the materials used for and by them. By properly arranging the various units, this flow can have orderly direction, can largely eliminate inconvenience, and can reduce waste motion and its concomitant frustration. Add to this arrangement the best obtainable diagnostic and therapeutic equipment and the highly-developed tools

> of modern management, such as automation and the means for universal and instantaneous communications, and the result is an environment which makes possible PROMPT, EFFICIENT, AND EFFECTIVE PATIENT CARE.[29]

Findings. Significantly more of the nurses felt time utilized effectively in giving patient care was increased ($z = 4.12$, $p < .001$). Of the twenty-seven nurses who changed their responses to this statement on the second survey in comparison to the first survey, eighteen felt time utilized effectively in giving patient care was decreased ($X^2 = 3.00$, $p < .10$). This was not a significant change but it indicated a trend toward decreased utilization of time.

Statement 49. Patient satisfaction with food service will be increased, unchanged, or decreased.

The distribution of patients' trays to the floors in the new building and for the return of soiled trays required one vertical conveyor which was reversible. In addition to the ascending vertical conveyor used exclusively for food services, there was a food service dumbwaiter connecting dietary to all floors in order to service late orders and supply nourishments. The dietary department was

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[29]Gordon A. Friesen Associates, Inc., op. cit., p. 4.

connected by a special intercommunication system to the supply core on each patient level and to the service alcove in each patient's room which provided the nurse with a means of rapid communication to the dietary department concerning the patient's food trays. The time needed to send a tray from the food service line in the kitchen to the nursing unit is six seconds. Each nursing team was responsible for the distribution of the trays to their patients. A large wheeled rack holding fourteen trays was used to transport the trays from the clean core area to the rooms. It was believed that food could be served quickly insuring hot or cold items being served this way.

Findings. Significantly more of the nurses felt patient satisfaction with food service was increased ($z = 1.70$, $p = <.05$). However, of the thirty-five nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty-nine felt patient satisfaction with food service was decreased ($X^2 = 15.11$, $p = <.001$). Significantly more of the nurses who changed their responses to this statement on the second survey felt patient satisfaction with food service was decreased.

Statement 66. The opportunity for the head nurse to observe and assist with patient care will be increased, unchanged, or decreased.

The concept of non-professional personnel being responsible for the managerial tasks of ordering supplies and equipment, making out requisitions and charges which formerly has absorbed the time and energies of the head nurse on the units should have given the head nurse the opportunity to work with her personnel more closely and increase or improve the quality of patient care as well as the improvement of personnel relationships.

Findings. Significantly more of the nurses felt the opportunity for the head nurse to observe and assist with patient care was decreased ($z = 1.97$, $p = < .025$). Of the thirty-seven nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty-seven felt the opportunity was decreased. ($X^2 = 19.70$, $p = < .001$). This was a complete reversal from the responses to this statement on the first survey and was a significant change in the feelings of the nurses about the effect of automation on the opportunity for the head nurse to observe and assist with patient care.

Summary

The responses of the nurses to the eight statements pertaining to improvement of patient care indicated that

significantly more of the nurses felt the effectiveness of team nursing was increased, the opportunity to give direct patient care was increased, the patient's feelings of security were increased and the time utilized in giving patient care was increased due to the effect of the automated and mechanical devices in the new hospital ($p = <.05 - <.001$). The responses of the nurses to statement 38, ". . . the number of patient's requests for nursing care," indicated a change in the feelings of the nurses about the effect of automation in relation to the number of patient's requests for nursing care. The trend was toward increased but there was not any one group whose responses were sufficient to be significant at the $<.05$ level. The responses to statement 40, "the amount of time needed to answer the patients' calls for nursing care," also indicated a change in the feelings of the nurses. Although the trend was not at the $<.05$ level of significance, the change was toward increased. Significantly more of the nurses changed their responses to the statement about the effect of automation on "patient satisfaction with food service," toward decreased ($p = <.001$). The responses of the nurses to statement 66 also indicated a significant change in the feelings of the nurses about the effect of automation on "the opportunity

for the head nurse to observe and assist with patient care ($p = <.001$). One-hundred eighty-two responses by the nurses were changed on the second survey in comparison to the first survey. Six of the eight statements showed changes in the feelings of the nurses about the effect of automation on patient care. The responses of the nurses to two statements were not significantly changed. The null hypothesis was accepted.

Hypothesis 6

There will be no significant change in the feelings of professional nurses about the effect of automation on the need for nurses to possess increased skills in human relations and increased clinical knowledge in nursing. (See Table XIII, p. 101.)

Introduction. One of the expressed fears of those who have been concerned about the impact of automation on people has been that machines will replace people to the point where machines will take over and tell people what to do and when to do it. Buckingham makes the following observations about computers:

> Because computers cannot see, hear, feel, or taste, information has to be carefully fed into them by programmers on magnetic tapes or punched cards. They cannot listen to a speech or look up things in a book, like humans, or listen to commands, like a dog. Nor can they act easily. They have no arms or legs but they can make sounds, flash colored lights, and type out sentences and numerals on automatic typewriters. No amount of memorization or learning can add up to thinking. No machine can create ideas, speculate, use intuition, analyze abstractly, interpret complex situations not specifically programmed, or jump to conclusions, either rightly or wrongly. . . . Humans, potentially at least, are superior to machines in many ways, even in some of the most routine jobs. People possess judgment that no machine can ever have.[30]

However, there are other factors influencing the installation of machines and automated devices in the

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[30] Walter Buckingham, op. cit., p. 36.

TABLE XIII

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS ABOUT THE EFFECT OF AUTOMATION ON HUMAN RELATIONS SKILLS AND CLINICAL KNOWLEDGE

Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Changes in Responses, Survey II Downward	Changes in Responses, Survey II Diff. (X^2=)	Total Responses to Survey II Number	Total Responses to Survey II Diff. (z=)
8. Nurses' need for personal judgment skills will be	(I)	36	58.1	25	40.3					
	U	22	35.7	36	58.1	9	16	<.10	36 (U)+	<.001
	D	4	6.2	1	1.6					
9. Nurses involvement in total patient care will be	(I)	46	74.2	36	58.2					
	U	6	9.7	13	20.9	10	19	<.10	46	<.001
	D	10	16.1	13	20.9					
11. Nurses need for human relations skills will be	(I)	39	62.9	44	70.9					
	U	19	30.9	16	25.9	10	11	0	39	<.001
	D	4	6.2	2	3.2					
19. The need for head nurses and team leaders to possess decision making abilities will be	(I)	39	62.9	44	70.9					
	U	21	33.9	17	27.5	14	12	0	39	<.001
	D	2	3.2	1	1.6					
65. The need for clinical nurse specialists to work in an automated hospital will be	(I)	33	53.2	16	25.9					
	U	24	38.7	44	70.9	10	13	<.05	44 (U)+	<.001
	D	5	8.1	2	3.2					
				Total		53	71			

+Other than anticipated response

hospital. Blumberg states that hospitals will automate because such equipment cuts costs, replaces nurse labor now in short supply, speeds up efficiency, and enables the hospital to compete on an equal basis with other hospitals.[31] The question now might well be whether to train nurses to maintain the equipment or whether to maintain equipment specialists to operate some of the mechanical equipment. Will nurses need to increase their skills in interpersonal relationships in order to retain the human element in giving patient care? Five statements pertained to the effect of automation on the need for nurses to possess increased human relations skills and increased clinical knowledge in the field of nursing: 8, 9, 11, 19, and 65.

Statement 8. Nurses' need for personal judgment skills will be increased, unchanged, or decreased.

Peplau expressed much concern about the possible effect of automation on the patient-nurse relationships as well as on the individual patient. She stated:

> Each nurse will have to use judgment in local situations to determine whether each new device has a deleterious effect on the patient as a person, and to work

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[31] Mark S. Blumberg, op. cit., p. 35.

out the necessary countervailing inter-personal nursing practices.[32]

Not only must the nurse use judgment in the use of automated and mechanical devices, but she is the one who is at the bedside of the patient and is responsible for constant observation. She cannot be merely a bystander and must learn to assume functions new to nursing. Pinneo states in a recent article on caring for patients in a coronary care unit that nurses must have "first, all the traditional nursing arts and skills; second, the knowledge needed to interpret the evidence revealed by the cardiac monitor; and third, the discriminating judgment to decide on appropriate and possibly lifesaving action."[33]

Findings. Significantly more of the nurses felt the need for personal judgment skills were unchanged ($z = 4.12$, $p = <.001$). Of the twenty-two nurses who changed their responses to this statement on the second survey in comparison to the first survey, sixteen felt the need was decreased ($X^2 = 2.22$, $p = <.10$). Although this is not a significant change it does indicate a trend in the change in the responses of the nurses on the second survey in

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[32]Hildegard E. Peplau, op. cit., p. 47.

[33]Rose A. Pinneo, op. cit., p. 76.

comparison to the first survey.

Statement 9. Nurses involvement in total patient care will be increased, unchanged, or decreased.

The philosophy of the hospital consultant for the design of the new hospital states that an environment must be provided which makes possible prompt, efficient and effective total patient care.[34]

Findings. Significantly more of the nurses felt involvement in total patient care was increased ($z = 4.12$, $p < .001$). Of the twenty-nine nurses who changed their responses to this statement on the second survey in comparison to the first survey, nineteen felt involvement in total patient care was decreased ($X^2 = 2.79$, $p < .10$). The changes in the responses indicate a trend toward decreased involvement in total patient care by nurses.

Statement 11. Nurses need for human relations skills will be increased, unchanged, or decreased.

> Many nurse-observers believe mechanization will greatly increase anonymity, coldness, and distance as characteristics of the climate of hospitals. They believe new forms of ensuring privacy, personalization, closeness, and warm human interest must be considered and

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[34]Gordon A. Friesen, Associates, op. cit.

"built into" professional nurse behavior through improved nursing education.[35]

Only people can help the patient develop capacities for more human interpersonal relationships and the nurse must be able to assist the patient learn from his illness-treatment experience. The impact of nurses on patients lies in the nurses ability to creatively handle interpersonal relationships and also to help the patient to do the same.

Findings. Significantly more of the nurses felt the need for human relations skills was increased ($z = 6.27$, $p = <.001$). Of the twenty-one nurses who changed their responses to this statement on the second survey in comparison to the first survey, eleven felt the nurses' need for human relations skills was decreased. This was not a significant change.

Statement 19. The need for head nurses and team leaders to possess decision making abilities will be increased, unchanged, or decreased.

The effect of automation on management has been widely studied. "Leavitt and Whisler foresee information technology leading to radical changes in administrative

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[35]Hildegard E. Peplau, op. cit., p. 46.

practices."[36] A British study analyzed such things as the number, nature, and organizational level of management decisions and the nature of cooperation and control at different levels of technology and organization. They found,

> first, that the pattern of communication was determined by technological demands. They discovered, also, that technological progress caused the number of unmeasurable and uncontrollable variables to decline, leading to an increasing rationalization and hence, accuracy of decision making processes.[37]

Findings. Significantly more of the nurses felt the need for head nurses and team leaders to possess decision making abilities was increased ($z = 6.27$, $p = <.001$). Of the twenty-six nurses who changed their responses to this s statement on the second survey in comparison to the first survey, twelve felt the need was decreased. This was not a significant change.

Statement 65. The need for clinical nurse specialists to work in an automated hospital will be increased, unchanged, or decreased.

It has been generally recognized that nurses working in such areas as coronary care units, intensive care units, the kidney dializing and artificial kidney care units are

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[36] Walter Buckingham, op. cit., p. 55.

[37] Ibid., p. 59.

one of the most important factors in saving the lives of their patients because of these nurses' special skills and knowledge and of the quality of the nursing care needed in such highly specialized areas of medicine. Nurse educators have felt that there is a need for clinical specialists in nursing who have educational preparation at the graduate level in certain areas of patient care.[38] It was believed by the investigator that there would be an increased need for clinical nurse specialists in an automated hospital.

Findings. Significantly more of the nurses felt the need for clinical nurse specialists to work in an automated hospital was unchanged ($z = 6.27$, $p = <.001$). Of the thirty-three nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty-three changed toward decreased ($X^2 = 5.12$, $p = <.05$). This was a significant change.

Summary

The responses of the nurses to the five statements on the need for nurses to possess increased skills in human relations and increased technical knowledge indicated that

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[38] Rose Pinneo, op. cit., pp. 76-79; Carol W. Trusk, op. cit., pp. 81-85.

significantly more of the nurses felt involvement in total patient care was increased, nurses need for human relations skills was increased, and the need for head nurses and team leaders to possess decision-making abilities was increased ($p = <.001$). However, significantly more of the nurses felt the need for personal judgment skills was unchanged and the need for clinical nurse specialists to work in an automated hospital was unchanged ($p = <.001$). Of the 220 responses which were changed on the second survey in comparison to the first survey, 132 were toward decreased and eighty-eight were toward increased. There were trends toward decreased at the $<.10$ level of significance to statements eight and nine. There was a significant change in the responses to statement sixty-five ($p = <.01$). The changes in the number of responses to statements eleven and nineteen were not significant. The null hypothesis was accepted.

Hypothesis 7

There will be no significant change in the feelings of nurses about the effect of automation on the job satisfaction of nurses. (See Table XIV, p. 110)

It has been proven that many people are not primarily seeking economic improvement as their ultimate goal in their work situation. Even the most uninformed about the salaries of professional nurses could hardly state that monetary gain is the primary motivator of the nurse to work. People are motivated by a complex of factors in addition to economic incentive, including altruism, prestige, leisure, ego gratification, and religion. Appreciation for work well done, being in the know, sympathetic help with personal problems, and job security have all been found to be more important than money. Other factors which motivate workers include interest in their work, chance for improvement and promotion, loyalty, and good working conditions are also highly valued. One of the principle sources of status is work. In some of the industrial studies, it was found that while automation improves the physical working environment, it does not upgrade workers' skills. Mechanization caused many jobs to be routine and uninteresting and this was a source of workers' dissatisfaction. On the other hand, mechanization permits many of the most petty

TABLE XIV

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS
ABOUT THE EFFECT OF AUTOMATION ON PROFESSIONAL NURSES JOB SATISFACTION

Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Changes in Responses, Survey II Downward	Changes in Responses, Survey II Diff. (X^2=)	Total Responses to Survey II Number	Total Responses to Survey II Diff. (z=)
12. Nurses' feelings of on-the-job satisfaction will be	(I)	35	56.4	31	50.0					
	U	16	25.8	13	20.9	13	14	0	31	<.01
	D	11	17.8	18	29.1					
27. The time available to the nurse to learn new nursing skills will be	(I)	42	67.7	34	55.0					
	U	14	22.5	14	22.5	9	17	<.10	34	<.001
	D	6	9.8	14	22.5					
34. The opportunities for professional advancement will be	I	23	37.2	16	25.8					
	(U)	34	54.8	38	61.3	10	16	0	38 (U)+	<.001
	D	5	8.0	8	12.9					
35. The professional Nurses' satisfaction in giving patient care will be	(I)	45	72.5	40	64.5					
	U	7	11.3	12	19.3	11	14	0	40	<.001
	D	10	16.2	10	16.2					
41. Nurses' fatigue at the end of the day will be	I	9	14.6	18	29.3					
	U	22	35.4	26	41.4	23	11	<.05	18	0
	(D)	31	50.0	18	29.3					
50. The need for nurses to develop self-motivation to learn and advance professionally will be	(I)	46	74.3	38	61.3					
	U	14	22.5	23	37.1	7	12	0	38	<.001
	D	2	3.2	1	1.6					
51. The opportunity for improvement of patient care by the nurse will be	(I)	54	87.1	46	74.3					
	U	3	4.8	13	20.9	8	12	0	46	<.001
	D	5	8.1	3	4.8					
68. Feelings of insecurity on the part of some nurses will be	(I)	40	64.5	33	53.2					
	U	12	19.3	22	35.4	16	20	0	33	<.001
	D	10	16.1	7	11.2					
			Total			97	116			

+Other than anticipated response

tasks to be assumed by machines and has resulted in greater job satisfaction and job security for some workers.[39]

Eight statements pertained to the feelings of the nurses about the effect of automation on job satisfaction: 12, 27, 34, 35, 41, 50, 51, and 68.

Statement 12. Nurses' feelings of on-the-job satisfaction will be increased, unchanged, or decreased.

Lipstreu and Reed reported in their study on workers' morale that,

> Morale deteriorated greatly in the area of job satisfaction. Employees felt that after the change their supervisors were not supervising as well; they did not like their new work as well; they felt that their work was less important; and they felt much less secure in their jobs. . . . When planning automated transition, management should expect a sharp decline in employee morale level soon after the changeover.[40]

Findings. Significantly more of the nurses felt on-the-job satisfaction was increased ($z = 2.77$, $p < .005$). Of the twenty-seven nurses who changed their responses to this statement on the second survey in comparison to the first survey, fourteen felt on-the-job satisfaction was decreased. This was not a significant change.

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[39] Walter Buckingham, op. cit., pp. 97-99.

[40] Lipstreu and Reed, op. cit., pp. 41-50.

Statement 27. The time available to the nurse to learn new nursing skills will be increased, unchanged, or decreased.

Pinneo reported that the nurses who worked in the coronary care unit were enthusiastic over the learning opportunities afforded them and that they seemed particularly challenged when caring for a patient who showed frequent arrythmias or other complications requiring alertness and quick action on their part.[41]

In an editorial on machines in the hospital setting in a recent nursing journal, Schutt made the following statement: "For, hooked in with these machines seem to be vast opportunities to extend nursing practice, knowledge, and research."[42]

Findings. Significantly more of the nurses felt the time available to the nurse to learn new nursing skills was increased ($z = 3.58$, $p = < .001$). Of the twenty-six nurses who changed their responses to this statement on the second survey in comparison to the first survey, seventeen felt the time available to the nurse to learn new nursing skills was decreased ($X^2 = 2.46$, $p = < .10$). Although this was an

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[41]Rose Pinneo, op. cit., pp. 78, 79.

[42]Barbara G. Schutt, "Mastering the Mysteries," The American Journal of Nursing, Vol. 65, Number 2 (March, 1965), p. 67.

indication of a trend, it was not a significant change.

Statement 34. The opportunities for professional advancement will be increased, unchanged, or decreased.

In the same editorial quoted above, the following observation was made by the editor:

> It's no wonder, then, that where such machines are being used most effectively, the prime requisite for nursing personnel is interest in giving direct nursing care. But these nurses must also be intelligent, intellectually curious, highly responsible persons--the kind we have always wanted in any nursing situation.[43]

Findings. Significantly more of the nurses felt the opportunities for professional advancement were unchanged ($z = 4.65$, $p < .001$). Of the twenty-six nurses who changed their responses to this statement on the second survey in comparison to the first survey, ten felt the opportunities for professional advancement were increased. This was not a significant change.

Statement 35. The professional nurses' satisfaction in giving patient care will be increased, unchanged, or decreased.

The philosophy of functional-flow design and having the supplies and equipment readily available for the nurses' use should have freed the professional nurse to

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[43] Ibid.

give more direct patient care. Many nurses seem to feel that if they could just give patient care as they were trained to do, they would be much happier working in nursing.

Findings. Significantly more of the nurses felt satisfaction in giving patient care was increased ($z = 5.19$, $p = <.001$). Of the twenty-five nurse who changed their responses to this statement on the second survey in comparison to the first survey, fourteen felt professional nurses' satisfaction in giving patient care was decreased. This was not a significant change.

Statement 41. Nurses' fatigue at the end of the day will be increased, unchanged, or decreased.

The architectural design of the new building was planned to reduce the amount of walking of nursing personnel. The availability of supplies and equipment combined with the intercommunication system, the automated devices for delivery of all materials needed for patient care, and the other concepts of functional flow design should have decreased the nurses' fatigue at the end of the working day. However, there are other factors which cause fatigue. In industry it has been found that lonesomeness and boredom as well as hostility have resulted after a transition to

automation.[44] Workers' nervous tensions have been found to be higher after automation. Others have been found to be mentally stimulated to the point of undue fatigue which could not be attributed to the actual physical activity involved in the work process.[45]

Findings. On the second survey, the nurses' responses were almost equally divided between the three possible answers. There was not a majority which was significant. Of the thirty-four nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty-three felt nurses' fatigue was increased ($X^2 = 4.23$, $p = < .05$). This was a significant change in the feelings of the nurses about the effect of automation on nurses' fatigue.

Statement 50. The need for nurses to develop self-motivation to learn and advance professionally will be increased, unchanged, or decreased.

Peplau stated that "Automation will drastically change not only social life but also the nurse's professional life."[46] Buckingham comments on the situation in

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[44]Charles Walker, "Life in the Automatic Factory," Harvard Business Review (February, 1958), p. 112.

[45]Walter Buckingham, op. cit., p. 99.

[46]Hildegard E. Peplau, op. cit., p. 39.

industry as follows:

> Modern industrial management must rest on an increasingly technical and rapidly changing body of knowledge deriving from physical sciences, mathematics, economics, behavioral sciences, and communication theory. Recent growth in the complexity of the firm's external environment has caused an even greater need for upper and middle-level administrators to be more broadly educated.[47]

Will nurses be among those who won't care what happens so long as they can earn? Will some see advantages and use these constructively or will they be among those who resist all changes?[48]

Findings. Significantly more of the nurses felt the need to develop self-motivation to learn and advance professionally was increased ($z = 4.65$, $p = < .001$). Of the nineteen nurses who changed their responses to this statement on the second survey in comparison to the first survey, twelve felt the need was decreased. This was not a significant change.

Statement 51. The opportunity for improvement of patient care by the nurse will be increased, unchanged, or decreased.

Automation and mechanization have to be kept in

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[47] Walter Buckingham, op. cit., p. 64.

[48] Hildegard E. Peplau, op. cit., p. 39.

proper perspective in relation to giving patient care. Gee observed that:

> No matter how sophisticated and ingenious, automatic devices can never replace the human relationship between the patient, the physician, and the nurse. At the same time, we can be sure that nursing functions will be replaced by machines whenever mechanization is economically feasible and technologically possible. Nevertheless, machines will be subordinated to the numerous purely human requirements of the patient.[49]

Findings. Significantly more of the nurses felt the opportunity for improvement of patient care was increased ($z = 10.39$, $p = <.001$). Of the twenty nurses who changed their responses to this statement on the second survey in comparison to the first survey, twelve felt the opportunity for improvement of patient care was decreased. This was not a significant change.

Statement 68. Feelings of insecurity on the part of some nurses will be increased, unchanged, or decreased.

Reactions to change vary with the individual. There were many changes in policies, procedures and general nursing duties in the new automated hospital. Lipstreu and Reed stated that the attitudes of female employees fell to a lower level than that of the male employees in their

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[49] David A. Gee, op. cit., p. 42.

study on the transition to automation.[50] They also found that an apparent lack of empathy or apparent concern for employees during the change period prolonged the period of low morale of employees and that employees were extremely sensitive during the period of change.[51]

Findings. Significantly more of the nurses felt insecurity on the part of some nurses was increased ($z = 3.31$, $p < .001$). Of the thirty-six nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty felt insecurity on the part of some nurses was decreased. This was not a significant change.

Summary

The nurses' responses to the eight statements pertaining to the effect of automation on job satisfaction indicated that significantly more of the nurses felt job satisfaction was increased, the time available to the nurse to learn new nursing skills was increased, satisfaction in giving patient care was increased, the need to develop self-motivation to learn and advance professionally was

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[50] Lipstreu and Reed, op. cit., p. 50.

[51] Ibid.

increased, the opportunity for improvement of patient care was increased, and that feelings of insecurity on the part of some nurses was increased ($p = <.01 - <.001$). Significantly more of the nurses felt the opportunity for professional advancement was unchanged ($p = <.001$). There was a significant change in the feelings of the nurses about the effect of automation on fatigue toward increased ($X^2 = 4.23$, $p = <.05$). Of the 247 changes in the responses to these eight statements on the second survey in comparison to the first survey, 148 were toward decreased and ninety-seven toward increased. There was a trend toward decreased in the number of responses to statement twenty-seven. There was not a significant change in the number of responses to six of the eight statements. The null hypothesis was accepted.

Hypothesis 8

There will be no significant change in the feelings of nurses about the need for nurses to possess increased technical knowledge and skill or to be more professionally competent to work in an automated hospital. (See Table XV, p. 121.)

Buckingham has written extensively on the effects of automation on the worker and on management practices in industry. Many of the advantages are often offset by disadvantages. The decline of physical hazards, for instance, could be offset by greater emotional hazards. One of the problems in the factory has been the lonesomeness of the worker who has been isolated from fellow workers and the boredom due to certain work processes becoming highly routine and boring. Man-machine relationships are changed and workers often feel they no longer control the machines but that the machines control them. Others feel there is less need for their skills and they have a loss of status because a completely inexperienced worker can be trained for some jobs in as little as thirty minutes. Many of the most highly specialized workers never use more than a tiny fraction of their abilities.[52] Five statements pertained to how the nurses felt about the effect of automation on

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[52]Walter Buckingham, op. cit., pp. 49-100.

TABLE XV

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS
ABOUT THE EFFECT OF AUTOMATION ON
TECHNICAL SKILLS AND PROFESSIONAL COMPETENCE

Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Changes in Responses, Survey II Downward	Changes in Responses, Survey II Diff. (X^2=)	Total Responses to Survey II Number	Total Responses to Survey II Diff. (z=)
1. The need for supervisors to possess more technical skills will be	(I)	58	93.6	48	77.5					
	U	3	4.8	13	20.9	5	10	0	58	<.001
	D	1	1.6	1	1.6					
3. The tendency to shift supervisory emphasis from patient care to the process and mechanics will be	(I)	30	48.3	34	54.9					
	U	13	20.9	15	24.2	26	1	<.001	30	<.001
	D	19	30.8	13	20.9					
5. The need for more technically educated nursing staff to operate monitors, mechanical devices and equipment will be	(I)	54	87.1	51	82.2					
	U	6	9.7	11	17.8	6	10	0	54	<.001
	D	2	3.2	0	0.0					
7. Machine tending jobs will be	(I)	54	87.1	56	91.6					
	U	5	8.1	4	6.2	3	8	<.10	54	<.001
	D	3	4.8	2	3.2					
10. Feelings of strain or tension while working with mechanical devices, monitors, pacemakers, etc., will be	(I)	39	62.9	34	54.8					
	U	11	17.8	14	22.6	12	15	0	39	<.001
	D	12	19.3	14	22.6					
				Total		52	44			

. . . with machines" and that supervisory emphasis shifted from employees to process.[54]

Findings. Significantly more of the nurses felt that the tendency to shift supervisory emphasis from patient care to the process and mechanics was increased ($z = 3.58$, $p = <.001$). Of the twenty-seven nurses who changed their responses on the second survey in comparison to the first survey, twenty-six felt the tendency to shift supervisory emphasis was increased ($X^2 = 25.03$, $p = <.001$). This was a significant change.

Statement 5. The need for more technically educated nursing staff to operate monitors, mechanical devices and equipment will be increased, unchanged, or decreased.

In a recent article on the use of such devices, Imboden and Wynn made several observations concerning the technical skills needed by nurses working in a coronary care unit.

> The cardiac monitoring machines do not replace nurses. . . . No degree of excellence of architectural design or sophistication of equipment can supplant a well-prepared, competent nursing staff. . . . Electronic equipment is no substitute for a nurse. . . . Nurses must be familiar with, and skilled in the use of, such electronic equipment as the ECG monitor, pacemaker, defibrillator, and other equipment used in the unit before they assume responsibility for patient care. . . .

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[54] Otis Lipstreu and Kenneth Reed, op. cit., p. 110.

> Cognizant that the machines can only be used effectively when nursing staff are knowledgeable and skillful. . . . the professional nurse working in the coronary care unit has an opportunity to give nursing care that combines advanced knowledge of the use of electronics in patient care with all the advantages of expert personalized bedside nursing.[55]

Although this type of equipment is used primarily in the Intensive Care unit at Mercy Hospital and the majority of the professional nurses who participated in the study worked on the general nursing floors, it was felt by the investigator that this statement was pertinent to the study.

Findings. Significantly more of the nurses felt the need for a more technically educated nursing staff to operate monitors, mechanical devices, and equipment was increased ($z = 8.15$, $p < .001$). Of the sixteen nurses who changed their responses to this statement on the second survey in comparison to the first survey, eleven felt the need for a more technically educated nursing staff was decreased. This was not a significant change.

Statement 7. Machine tending jobs will be increased, unchanged, or decreased.

Blumberg and Drew made this interesting observation:

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[55]Clarence A. Imboden, Jr. and Jane E. Wynn, "The Coronary Care Unit," The American Journal of Nursing, Vol. 65, No. 2 (March, 1965), pp. 72-76.

"One cannot build a paper work machine or a direct patient care or indirect patient care machine."[56] But nurses must help determine whether they should be trained to maintain the equipment in an automated hospital or whether they will keep the mission of nursing clearly in mind which is to "ensure the patient's right to learn more about himself and his world as a result of a time-limited, needful relationship with a professional nurse."[57]

Findings. Significantly more of the nurses felt machine tending jobs were increased ($z = 9.49$, $p = < .001$). Of the eleven who changed their response to this statement on the second survey in comparison to the first survey, eight felt machine tending jobs were decreased ($X^2 = 2.27$, $p = < .10$). Although this was not a significant change, it does indicate a trend toward decreased feelings of the nurses about the effect of automation on machine tending jobs.

Statement 10. Feelings of strain or tension while working with mechanical devices, monitors, pacemakers, etc., will be increased, unchanged, or decreased.

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[56]Mark S. Blumberg and Jacqueline Drew, Economic Feasibility of Automating Selected Hospital Activities, Final Progress Report, Menlo Park, California: Stanford Research Institute (March, 1961), p. 40.

[57]Hildegard E. Peplau, op. cit., p. 43.

Lipstreu and Reed found in their study that "workers in the more highly automated areas did feel a great deal more nervous tension on the job after the change."[58] However, reports from other studies do not generally support this hypothesis and Lipstreu and Reed agreed that the degree of tension diminished with experience.[59]

Findings. Significantly more of the nurses supported that feelings of strain or tension while working with mechanical devices, monitors, pacemakers, etc. were increased ($z = 3.58$, $p = <.001$). Of the twenty-seven nurses who changed their responses to this statement on the second survey in comparison to the first survey, fifteen felt that strain or tension was decreased. This was not a significant change.

Summary

Significantly more of the nurses' responses to the five statements on the effect of automation on the need for nurses to be more professionally competent and to possess a greater degree of technical skill to work in an automated

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[58] Lipstreu and Reed, op. cit., p. 104.

[59] Ibid.

hospital was increased ($p = <.001$). Of the ninety-six responses which were changed on the second survey in comparison to the first survey, fifty-two were toward increased and forty-four were changed toward decreased. The responses of the nurses to two of the statements indicated trends but were not at a $<.05$ level of significance. Statement three, "the tendency to shift supervisory emphasis from patient care to the process and mechanics," indicated the trend was toward increased ($p = <.10$). Statement seven, "machine tending jobs," was toward decreased ($p = <.10$). The changes in the responses to the five statements pertaining to the effect of automation on the need for nurses to be more professionally competent and to possess a greater degree of technical skill to work in an automated hospital were not at a $<.05$ level of significance. The null hypothesis was accepted.

Hypothesis 9

There will be no significant change in the feelings of nurses about the effect of automation on the amount of non-nursing duties of professional nurses. (See Table XVI, p. 129.)

The skills of the professional nurse are often diluted with functions and duties that could be performed less frequently and by less skilled personnel. Skills are further diluted by the time lost in waiting for necessary supplies, materials and equipment. Webb in a recent article presented one hospital's approach to saving nurses a great deal of paper work and of ordering and requisitioning drugs. At the same time he asked some pertinent questions concerning the possibility of other departments rendering greater services to the hospital, staff, and patients as a whole and, at the same time, reducing the work load and frustrations which burden so many nurses. Webb goes on further in making observations about this aspect of nursing duties as follows:

> After all, if the nurse is to function effectively, she must have an adequate level of supplies. But the time she must devote to the ordering and maintenance of the proper inventory of supplies must be deducted from the time available for direct nursing care. Thus departments such as pharmacy, central supply, general stores, and linen service could make an important contribution,

TABLE XVI

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS ABOUT THE EFFECT OF AUTOMATION ON THE AMOUNT OF NON-NURSING DUTIES OF PROFESSIONAL NURSES

Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Changes in Responses, Survey II Downward	Changes in Responses, Survey II Diff. (X^2=)	Total Responses to Survey II Number	Total Responses to Survey II Diff. (z=)
24. Non-nursing duties assigned to professional nurses will be	I	14	22.6	13	20.9					
	U	5	8.1	10	16.1	16	11	0	39	< .001
	(D)	43	69.3	39	63.0					
39. The professional nurses' opportunity to do the things she best likes to do will be	(I)	36	58.1	28	45.1					
	U	14	22.6	23	37.1	14	10	0	28	< .025
	D	12	19.3	11	17.8					
45. Professional nurses' responsibility for ward management duties will be	I	33	53.2	19	30.8					
	U	10	16.1	16	25.7	19	16	0	27	< .05
	(D)	19	30.7	27	43.5					
48. Time spent by professional nurses making out requisitions for supplies will be	I	10	16.1	10	16.1					
	U	2	3.2	4	6.3	13	8	0	48	< .001
	(D)	50	80.7	48	77.4					
52. The number of conflicts between nurses' professional values and the duties assigned to them will be	I	10	16.2	9	14.6					
	U	17	27.4	22	35.4	16	10	0	31	< .05
	(D)	35	56.4	31	50.0					
59. The amount of "paper work" will be	I	15	24.2	19	30.7					
	U	8	12.9	8	12.9	19	8	< .05	35	< .001
	(D)	39	62.9	35	56.4					
61. Professional nurses involvement in serving patients' food will be	I	10	16.1	2	3.2					
	U	21	33.9	31	50.0	9	13	0	31 (U)+	< .05
	(D)	31	50.0	29	47.8					
				Total		106	76			

+Other than anticipated response

simply by relieving the nurse of the time-consuming business of processing supply requisitions.[60]

The philosophy of design of the new Mercy Hospital, Denver, Colorado, incorporated many concepts to relieve nurses of non-nursing duties. Seven statements pertained to the feelings of the nurses about the effect of automation on the amount of non-nursing tasks of the professional nurses: 24, 39, 45, 48, 52, 59, and 61.

Statement 24. Non-nursing duties assigned to professional nurses will be increased, unchanged, or decreased.

In the description of the automation and the changes in the work environment given in Chapter I, a complete outline of the devices and the new approaches which were implemented to relieve the nurse of all non-nursing tasks was given.

Findings. Significantly more of the nurses felt non-nursing duties assigned to professional nurses were decreased ($z = 4.92$, $p = <.001$). Of the twenty-seven nurses who changed their responses to this statement on the second survey incomparison to the first survey, sixteen felt non-nursing duties were increased. This was not a significant

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[60] John W. Webb, "Mosaics," The American Journal of Nursing, Vol. 65, No. 1 (January, 1965), p. 105.

change.

Statement 39. The professional nurses' opportunities to do the things she best likes to do will be increased, unchanged, or decreased.

There has been a great deal of discussion among nursing personnel about the nurse being so busy with "paper work" and other ward management duties that she no longer has the opportunity to give patient care or develop interpersonal relationships with the patients because of a lack of time to spend in giving bedside nursing care. Others have questioned if the professional nurse wants to give patient care. The concept of design and the installation of automated and mechanical devices at the new Mercy Hospital, Denver, was to assure the nurse being relieved of all tasks not directly connected with patient care.

Findings. Significantly more of the nurses felt the professional nurses' opportunities to do the things she best likes to do was increased ($z = 1.97$, $p = <.025$). Of the twenty-three nurses who changed their responses to this statement on the second survey in comparison to the first survey, ten felt the opportunities to do the things she best likes to do was decreased. This was not a significant change.

Statement 45. Professional nurses' responsibility for ward management duties will be increased, unchanged, or decreased.

Blumberg in reporting on the needs and prospects for hospital automation identified that nursing activities comprise the largest and most important category which should lend itself to improvement due to the effects of automation.[61]

Findings. Significantly more of the nurses felt responsibility for ward management duties was decreased ($z = 1.70$, $p = <.05$). Of the thirty-five nurses who changed their responses to this statement on the second survey in comparison to the first survey, nineteen felt nurses' responsibility for ward management duties was increased. This was not a significant change.

Statement 48. Time spent by professional nurses making out requisitions for supplies will be increased, unchanged, or decreased.

Whitaker made the following comment about one of the problems facing nurses as they seek to improve patient care and give better service to the patient: "Increasingly, the nurse is having difficulty in keeping in balance those functions which center on the patient's needs and those

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[61]Mark S. Blumberg, op. cit., p. 43.

which contribute to keeping the hospital going as a smoothly running organization."[62]

Mildred Montag stated "Those responsible for nursing services will have to find ways and means of organization that will permit nurses to nurse."[63]

Findings. Significantly more of the nurses felt time spent by professional nurses making out requisitions for supplies was decreased ($z = 7.34$, $p = <.001$). Of the twenty-one nurses who changed their responses to this statement on the second survey in comparison to the first survey, sixteen felt time making out requisitions was increased. This was not a significant change.

Statement 52. The number of conflicts between nurses' professional values and the duties assigned to them will be increased, unchanged, or decreased.

Marjorie M. Howard, chief, Education and Training division (Nursing), Veterans Administration, in a talk before NLN's Department of Hospital Nursing "Blueprint for Action" conference, Philadelphia, made the following

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[62] Judith Whitaker, "Nursing Seeks Roads to Better Service," The Modern Hospital, Vol. 101, No. 3 (September, 1963), pp. 149-151.

[63] Mildred Montag, Community College Education for Nursing, New York: McGraw-Hill Book Company, Inc. (1959), p. 360.

interesting comment on automation:

> As automation in patient care becomes more realistic, such care can be either more personalized or more depersonalized. The direction it will take will be strongly influenced by the way nursing staff are introduced to automation by those in supervisory and teaching positions.[64]

Porter asked this question: "Will the development of automated techniques give reasonable consideration to both the patient and the nursing unit staff needs rather than just the 'task' being automated?"[65]

Findings. Significantly more of the nurses felt the number of conflicts between nurses' professional values and the duties assigned to them were decreased ($z = 2.77$, $p < .005$). Of the twenty-six nurses who changed their responses to this statement on the second survey in comparison to the first survey, sixteen felt the number of conflicts between professional values and duties assigned to professional nurses were increased. This was not a significant change.

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[64] Marjorie M. Howard, "Blueprint for Action," National League for Nursing, 10 Columbus Circle, New York, New York (1962).

[65] "Technical Innovations in Health Care: Nursing Implications," Appendix 1, American Nurses' Association, New York 19, New York (1962), p. 49.

Statement 59. The amount of "paper work" will be increased, unchanged, or decreased.

Gee commented that:

> During recent years, several engineering studies have attempted to pinpoint how the nurse spends her time. Most of these studies have had different results because of the differences in local practice and the base staff being used. But all have concluded that nurses spend too much time doing paper work, running errands, and performing administrative duties."[66]

Findings. Significantly more of the nurses felt the amount of paper work was decreased ($z = 3.85$, $p = <.001$). Of the twenty-eight nurses who changed their responses to this statement on the second survey in comparison to the first survey, nineteen felt paper work was increased ($X^2 = 4.54$, $p = <.05$). This was a significant change.

Statement 61. Professional nurses' involvement in serving patients' food will be increased, unchanged, or decreased.

Dietary personnel were responsible for removing the food trays from the Treyveyor and placing them on the carts for delivery to the patients' rooms. Nursing service personnel were to pick up the soiled trays and place them on the wheeled carts. Non-nursing personnel were responsible for returning the trays to the kitchen via the reversed Treyveyor system. The intercommunication system from each

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[66]David A. Gee, op. cit., p. 45.

patient's room directly to the food service area should have improved the nurses' communication with the dietary department about missing items or changes in diet orders.

Findings. Significantly more of the nurses felt that professional nurses' involvement with serving patients' food was unchanged in the automated hospital ($z = 2.77$, $p = <.005$). Of the twenty-three nurses who changed their responses to this statement on the second survey in comparison to the first survey, thirteen of the nurses felt involvement with serving patients' food was decreased. This was not a significant change.

Summary

The nurses' responses to the seven statements pertaining to the feelings of the nurses about the effect of automation on the amount of non-nursing tasks assigned to the professional nurses indicated that significantly more of the nurses felt non-nursing duties assigned to professional nurses were decreased, responsibility for ward management duties was decreased, time spent by professional nurses making out requisitions for supplies was decreased, the number of conflicts between nurses' professional values and the duties assigned to them were decreased, and the

amount of "paper work" was decreased ($p = <.05 - <.001$). Significantly more of the nurses felt the opportunity for the professional nurse to do the things she best likes to do was increased in an automated hospital ($p = <.025$). Significantly more of the nurses felt that professional nurses' involvement with serving patients' food was unchanged ($p = <.005$). Of the 182 responses of the nurses which were changed on the second survey in comparison to the first survey, 106 were changed toward increased and seventy-six were changed toward decreased. The change in direction was significant to only statement 59, "the amount of 'paper work,'" which was toward increased ($X^2 = 4.54$, $p = <.05$). The changes in the responses to the other six statements were not significant. The null hypothesis was accepted.

Hypothesis 10

There will be no significant change in the feelings of nurses about the effect of automation on social interaction between nurses. (See Table XVII, p. 139.)

Automation looms on the horizon as one possible solution to some of the problems of supply and demand of health field workers. The possibility of automation may well precipitate questions in the minds of nurses, one of which might be, what effect will automation have upon her and her co-workers? Peplau asks, "Will nurses change?" She comments further on this aspect of the effect of automation on nurses:

> Nurses are people. Their families, friends, husbands, children, neighbors, and the like, will be in and out of the changing social scene. Unless professional nursing education enables nurses to gain more intellectual-analytical competence they will respond to subtle social changes by corresponding changes in themselves--in their values, behavior manifestations, feelings.[67]

Michael observed that:

> Cybernation presages changes in the social system so vast and so different from those with which we have traditionally wrestled that it will challenge to their roots our current perceptions about the viability of of our way of life. If our democratic system has a

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[67] Hildegard E. Peplau, op. cit., p. 48.

TABLE XVII

A COMPARISON OF THE RESPONSES FROM TWO SURVEYS ABOUT THE EFFECT OF AUTOMATION ON SOCIAL INTERACTION OF PROFESSIONAL NURSES

Statement	Anticipated Response	Survey I No.	Survey I Per Cent	Survey II No.	Survey II Per Cent	Changes in Responses, Survey II Upward	Changes in Responses, Survey II Downward	Diff. (X^2=)	Total Responses to Survey II Number	Total Responses to Survey II Diff. (z=)
4. Interdependence of nurses working at same level will be	(I)	23	37.1	20	32.2					
	U	25	40.3	24	38.8	11	17	0	23	0
	D	14	22.6	18	29.0					
15. The nurses' isolation from her peers will be	(I)	26	41.9	32	51.6					
	U	20	32.3	20	32.3	20	10	$<.10$	32	$<.005$
	D	16	25.8	10	16.1					
17. The prevalence of informal nurse cliques will be	I	12	19.3	3	4.8					
	U	30	48.4	30	48.4	11	20	$<.10$	30 (U)+	$<.05$
	(D)	20	32.3	29	46.8					
18. Morale problems due to isolation will be	(I)	17	27.4	23	37.2					
	U	26	41.9	25	40.3	13	16	0	23	0
	D	19	30.7	14	22.5					
21. Physical isolation of nurses from other hospital personnel will be	(I)	34	54.8	41	66.1					
	U	15	24.3	12	19.4	15	15	0	41	$<.001$
	D	13	20.9	9	14.5					
29. Socializing with other nurses on the job will be	I	12	19.3	8	12.9					
	U	21	33.8	24	38.9	14	15	0	30	$<.01$
	(D)	29	46.9	30	48.2					
31. The time to talk to other nurses about patient care problems will be	(I)	36	58.2	27	43.5					
	U	14	22.5	15	24.1	12	18	0	27	$<.05$
	D	12	19.3	20	32.4					
			Total			96	111			

+Other than anticipated response

> chance to survive at all, we shall need far more understanding of the consequences of cybernation.[68]

Buckingham states that, "Automation may reduce the interaction among workers both by reducing their numbers and by increasing the distance between their work places."[69]

Lipstreu and Reed noted that "Morale will fall most quickly and precipitately among employees who lose their old departmental identity and/or suffer the greatest disruption of their informal group relationships."[70]

Seven statements pertained to the effect of automation on social interaction between nurses: 4, 15, 17, 18, 21, 29, and 31.

Statement 4. Interdependence of nurses working at the same level will be increased, unchanged, or decreased.

Lipstreu and Reed found that,

> Due to the high degree of integration between processes, it follows that a greater amount of cooperation is required at the foreman level. . . . There seems little question but that supervisor interdependency is increased under more highly automated conditions.[71]

Findings. The professional nurses divided their responses

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[68] Donald N. Michael, op. cit., pp. 13, 14.

[69] Walter Buckingham, op. cit., p. 50.

[70] Otis Lipstreu and Kenneth Reed, op. cit., p. 50.

[71] Ibid., p. 43.

to this statement almost equally between the three possible answers. There was not a significant majority of responses to the statement. Of the twenty-eight nurses who changed their responses to this statement on the second survey in comparison to the first survey, seventeen felt interdependence of nurses working at same level was decreased. This was not a significant change.

Statement 15. The nurses' isolation from her peers will be increased, unchanged, or decreased.

In a study reported by Walker, it was found that, "workers complained that they felt rather keenly the physical isolation and stressed the fact that they were neither able nor so free to talk and visit together as in the old mills."[72]

Lipstreu and Reed found that "interviews with machine monitors indicate isolation has removed one of the more rewarding factors of work--social interaction on the job."[73] Nurses faced with a number of monitoring devices of patients' physiological body functions and automated and mechanized equipment in the work environment may be

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[72]Charles Walker, op. cit., p. 41.

[73]Otis Lipstreu and Kenneth Reed, op. cit., p. 64.

confronted with some of these same problems in the hospital. Findings. Significantly more of the nurses felt isolation from their peers was increased ($z = 3.04$, $p < .001$). Of the thirty nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty felt isolation was increased ($X^2 = 3.33$, $p < .10$). Although the trend was not significant at the $< .05$ level, it was an indication of a change in the nurses' feelings about the effect of automation on feelings of isolation from other nurses.

Statement 17. The prevalence of informal nurse cliques will be increased, unchanged, or decreased.

One of the problems in management has been the prevalence of cliques in the informal organization structure of a company. It was found in the study by Lipstreu and Reed that the opportunities for any amount of social interaction on the job had been drastically reduced. The entire work schedule and work assignments had been modified to a certain extent, producing a different composition of coffee klatches and some luncheon groups.[74]

Findings. There were not a significant number of nurses

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[74] Ibid.

who felt that the prevalence of informal nurse cliques was affected by automation in the hospital. Of the thirty-one nurses who changed their responses to this statement on the second survey in comparison to the first survey, twenty felt the prevalence of informal nurse cliques was decreased ($X^2 = 2.61$, $p = < .10$). Although this trend is not significant at the $< .05$ level, it does indicate a change in the feelings of the nurses about the effect of automation on informal nurse cliques in the hospital.

Statement 18. Morale problems due to isolation will be increased, unchanged, or decreased.

Buckingham reported that at least one British union has already asked for "lonesome pay." Solitary confinement is one of the most dreaded forms of punishment. Many people become highly erratic unless they are kept in constant contact with others. Related to lonesomeness is boredom. This is not peculiar to automation but is perhaps more typical of conventional mechanization, but some operative jobs under automation may be highly routine and boring.[75]

Findings. There were not significantly more nurses who

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[75]Walter Buckingham, op. cit., p. 89.

felt that morale problems due to isolation were changed by automation in the hospital. Of the twenty-nine nurses who changed their responses to this statement on the second survey in comparison to the first survey, sixteen felt morale problems due to isolation were decreased. This was not a significant change.

Statement 21. Physical isolation of nurses from other hospital personnel will be increased, unchanged, or decreased.

The design of the hospital combined with the automated and mechanized devices which delivered all supplies, equipment and materials to the nursing units, contributed to the physical isolation of the nurses from other hospital personnel.

Findings. Significantly more of the nurses felt physical isolation of the nurses from other hospital personnel was increased ($z = 5.46$, $p < .001$). Of the thirty nurses who changed their responses to this statement on the second survey in comparison to the first survey, fifteen felt isolation was decreased and fifteen felt isolation was increased. There was no significant change in the direction of change.

Statement 29. Socializing with other nurses on the job will be increased, unchanged, or decreased.

Because of the design of the building, the team nursing care approach which divided each nursing floor into four teams with the possible causes of fourteen patients per team, and the master communication system which allowed verbal contact but not face-to-face communication as frequently with co-workers, it was believed that there would be decreased socializing with others on the job.

Findings. Significantly more of the nurses felt that socializing with other nurses on the job was decreased ($z = 2.50$, $p = <.01$). Of the twenty-nine nurses who changed their responses to this statement on the second survey in comparison to the first survey, fourteen felt socializing with other nurses was increased. This was not a significant change.

Statement 31. The time to talk to other nurses about patient care problems will be increased, unchanged, or decreased.

Relieving the nurses of many tasks involved in the ordering and handling of supplies and the equipment to give patient care combined with the other concepts of functional flow design should have freed the nurses to be able to discuss and plan patient care with co-workers.

Findings. Significantly more of the nurses felt the time to talk to other nurses about patient care problems was

increased ($z = 1.70$, $p = <.05$). Of the thirty nurses who changed their responses to this statement on the second survey in comparison to the first survey, eighteen felt the time to talk to other nurses about patient care problems was decreased. This was not a significant change.

Summary

The responses of the nurses to the seven statements pertaining to the effect of automation on social interaction between nurses indicated that significantly more of the nurses felt isolation from peers was increased, physical isolation from other hospital personnel was increased, and that the time to talk to other nurses about patient care problems was increased. The responses of the nurses to statements 4, 17, and 18 indicated that the nurses felt the effect of automation on interdependence of nurses working at the same level, the prevalence of informal nurse cliques and morale problems due to isolation were unchanged due to the effect of automation in the hospital. Of the 206 responses of the nurses which were changed on the second survey in comparison to the first survey, ninety-six were changed toward increased and 110 were changed toward decreased. The responses to statements 15 and 17 indicated

a trend in direction at a $<.10$ level of significance. The other five statements did not indicate a significant change in the feelings of the nurses about the effect of automation on social interaction between nurses. The null hypothesis was accepted.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of the Study:

The purpose of the study was to identify the feelings of a group of professional nurses about the effect of automation in the hospital setting prior to and following the move from an old, traditional hospital to a new, relatively highly automated hospital. The specific aim of the study was to ascertain if the feelings of the professional nurses toward automation in the hospital changed after a period of experience working in a relatively automated hospital.

The data were analyzed to identify the feelings of the nurses in relation to: (1) selected areas of nursing activities, (2) the work environment, (3) the patient, the nurse, and the hospital administration, and (4) to identify the change, if any, in the feelings of the nurses about the effect of automation in the hospital.

The method used for this study was the normative-survey or descriptive method. A single group which served as its own control was chosen for the "before-after" design of the study.

Of the 120 professional nurses employed at Mercy Hospital, Denver, Colorado, sixty-two nurses participated in both phases of the study.

An instrument was devised to identify the feelings of the nurses about the effect of automation in the hospital. The sixty-eight statements were placed in ten categories. These were: (1) feelings about the effect of automation on the need for initial and on-going inservice education, (2) feelings about the effect of automation on the work environment, (3) feelings about the effect of automation on supervisory responsibilities and on staffing needs within the hospital, (4) feelings about the effect of automation on communication within the hospital, (5) feelings about the effect of automation on the improvement of patient care, (6) feelings about the effect of automation on the need for nurses to possess increased skills in human relations and increased clinical knowledge in nursing, (7) feelings about the effect of automation on the need for nurses to possess increased technical skills and professional competence, (8) feelings about the effect of automation on job satisfaction of nurses, (9) feelings about the effect of automation on the amount of non-nursing tasks assigned to the professional nurse, and (10) feelings about

the effect of automation on social interaction between nurses.

The first survey was completed prior to the move from the old hospital for the purpose of identifying the feelings of the nurses about automation before having had any experience working with the automated and mechanized devices in the new hospital. The second survey was completed four months after the move into the new hospital. The same survey form was used for both surveys for the purpose of (1) identifying the feelings of the nurses about the effect of automation after a period of experience working with the automated and mechanized devices and (2) identifying the change, if any, in the feelings of the nurses about the effect of automation in the hospital.

The sixty-two forms from the first survey and the sixty-two forms from the second survey were the sources of data for this study.

The analysis of the descriptive information concerning the participants indicated that the majority, twenty-six, were in the age group between twenty to twenty-nine, sixteen were between thirty and thirty-nine, eight were between forty and forty-nine, and twelve were over fifty. All levels of nursing service were represented by the

participants with the majority being general duty staff nurses. Twelve were head nurses and twelve were in nursing service of nursing education administration.

Educational preparation of the participants ranged from one nurse who was a graduate of an associate degree program to seven with a master's degree in nursing. Eleven of the nurses had bachelor's degrees in nursing obtained post-diploma programs in nursing, four were graduates from collegiate programs with bachelor of science in nursing degrees, but the majority, thirty-nine, were graduates of diploma schools of nursing. None of the nurses had a doctor's degree.

The majority of the nurses had been employed in nursing over ten years. 33.9 per cent of the nurses had been working for over ten years, 27.4 per cent had worked from two to five years, 25.8 per cent had been employed from five to ten years, and 12.9 per cent had been working for less than two years. It was found that 77.4 per cent of the nurses had been employed at Mercy Hospital, Denver for less than five years. Only 22.6 per cent had been employed from one to three years, 20.9 per cent from three to five years, 8.1 per cent had worked at this hospital from six months to one year, and 19.3 per cent had been employed for less than six months at the time of the first survey.

Data for identifying the feelings of the nurses about the effect of automation in the hospital were obtained by analyzing the total number of responses on Survey II by using the Normal Approximation to the Binomial statistical test for significance. If a .05 level of significance was obtained for one of the three possible responses to the statement, this response was considered to be an indication of the feelings of the nurses about the effect of automation in relation to that particular statement.

Data for identifying the direction of change, if any, in the responses of the nurses were obtained by comparing the response of each nurse to the statement on Survey I to her response to the same statement on Survey II. The change was determined by using the McNemar Test of Significance. If a .05 level of significance was obtained, the direction of the change was considered to be an indication of the change in the feelings of the nurses, about the effect of automation in relation to that particular statement. If a .10 level of significance was obtained, the direction of the change was considered to be an indication of a trend toward a direction of change in the feelings of the nurses about the effect of automation.

Unless all of the statements in a category to test a null hypothesis were significantly changed at a .05 level, the null hypothesis was accepted. All of the null hypotheses were accepted. The nurses did change their responses on the second survey in comparison to the first survey but the changes were random and did not indicate a significant direction of change in the responses to most of the statements. If a .10 level of significance was obtained it was considered to be a trend which indicated the direction of the change in the feelings of the nurses about the effect of automation in relation to that particular statement.

On the need for initial and on-going inservice education for all personnel to work in an automated hospital, significantly more of the nurses felt the need was increased ($<.001$). The nurses felt that the effect of automation had not changed the responsibility of professional nurses to assist with student nurse education. There was a significant change in the responses of the nurses to statement 62 ($X^2 = 4.54$, $p = <.05$). On Survey II, the nurses' responses about "difficulties encountered by 'float nurses' working on several different units," indicated a significant change in the feelings of the nurses in comparison to their responses to this statement on the first survey. The

nurses' responses to "the need for inservice training in using mechanical devices and automatic equipment." indicated a trend toward decreased ($\chi^2 = 2.57$, $p = <.10$). One-hundred twenty-five responses were changed by the nurses on the second survey in comparison to the first survey, but most of the changes were random and did not indicate a direction of change.

On the effect of automation on the work environment, the nurses felt that the work environment was improved. Supplies and equipment were readily available to give patient care and for the efficient management of the ward. They felt there was less storage of supplies on the nursing floors but everything needed was still accessible to the nurses. Significantly more of the nurses felt the opportunity to carry out all nursing duties effectively with an economy of time and effort was increased ($\chi^2 = 3.76$, $p = <.05$). However, there were two statements, "the amount of walking done on duty," and the "incidence of infections due to the method of handling of supplies and equipment," which indicated a significant change in the feelings of the nurses on the second survey in comparison to the first survey. On the first survey, the nurses' responses to both of these statements were "decreased." On the second survey

there were significantly more nurses who responded "increased" ($X^2 = 6.00$, $p = <.05$, and $X^2 = 6.23$, $p = <.05$). There were 145 changes in the responses of the nurses on the second survey in comparison to the first survey, but for the exceptions noted above, the changes were random.

On the effect of automation about supervisory responsibilities and staffing needs within the hospital, significantly more of the nurses felt both were increased ($p = <.001$). The nurses felt that the ratio of professional nurses to non-professional nurses was decreased ($p = <.05$), and that the number of personnel on a team were decreased ($p = <.05$). Significantly more of the nurses did not feel that automation had affected the ratio of supervisors to staff nurses or the need for head nurses to closely observe patient care given by all personnel ($p = <.001$). There were 205 changes made in the responses to these statements on the second survey in comparison to the first survey. However, for the most part the changes were random and did not indicate a direction of change.

On the effect of automation on communication within the hospital, significantly more of the nurses felt communication was improved ($p = <.05$). The statements concerned with communication between physicians and nurses indicated

that the nurses did not feel that the design of the new building and the automated and mechanical devices had contributed especially to the opportunities for the nurse to talk more with the doctors. None of the responses to the statements were significantly changed on the second survey in comparison to the first survey. There was a trend toward decreased at the $<.10$ level in the responses to the statement about "opportunities for staff physicians to discuss patient care with professional nurses." There were 211 changes made in the responses to these statements on the second survey in comparison to the first survey, but again the changes were random and did not indicate the direction of change.

On the effect of automation on the improvement of patient care, significantly more of the nurses felt patient care was improved by automation ($p = <.05$). The nurses did not feel that the number of patients' requests for nursing care or the time needed to answer the patient's calls for nursing were decreased as much as they had anticipated prior to working in the new hospital. Although the direction of change was not at a $<.05$ level of significance, there was a trend toward increased on the second survey in comparison to the first survey in the responses

to both of these statements ($p = <.10$). Significantly more of the nurses agreed that "patient satisfaction with food service" was decreased ($p = <.001$). Also significantly more of the nurses felt that the "opportunity for the head nurse to observe and assist with patient care" was decreased ($p = <.001$). There were 182 changes in the responses of the nurses on the second survey in comparison to the first survey. Six of the eight statements in this category indicated either a trend in the direction of change or a significant change in the feelings of the nurses about the effect of automation on the improvement in patient care.

On the effect of automation about the need for nurses to have increased skills in human relations and increased clinical knowledge in nursing indicated that significantly more of the nurses felt the need for human relations skills, the need for head nurses and team leaders to possess decidion making abilities, and involvement in total patient care were increased ($p = <.001$). However, the nurses did not feel that automation had changed the need for personal judgment skills or the need for clinical nurse specialists to work in an automated hospital ($p = <.001$). There were trends toward decreased to the statements, "need

for personal judgment skills," and "nurses' involvement in total patient care." ($p = <.10$). There was a significant change toward decreased to the statement, "the need for clinical nurse specialists to work in an automated hospital" ($p = <.05$). There were 220 changes in the responses of the nurses on the second survey in comparison to the first survey to these five statements. The changes were random but for the exceptions noted above and did not indicate a significant direction of change.

On the effect of automation on the job satisfaction offnurses significantly more of the nurses felt job satisfaction was increased ($p = <.01$). Significantly more of the nurses felt the opportunity for professional advancement was not changed by automation ($p = <.001$). There was a significant change in the feelings of the nurses about the amount of fatigue at the end of a day toward increased ($p = <.05$). There were 247 changes in the responses of the nurses on the second survey to the eight statements in this category. However only two statements showed a significant change in the responses at the $<.05$ level.

On the effect of automation on the need for nurses to possess increased technical knowledge and skill or to be more professionally competent to work in an automated

hospital, significantly more felt the need was increased ($p < .001$). The responses to two of the statements indicated trends but were not at a $< .05$ level of significance. Ninety-six responses were changed by the nurses on the second survey in comparison to the first survey to these five statements but none of the changes were at the $< .05$ level of significance.

On the effect of automation on the amount of non-nursing duties assigned to professional nurses were decreased ($p < .05$). Significantly more of the nurses felt "the opportunity for the professional nurse to do the things she best likes to do," was unchanged by the effect of automation in the hospital ($p < .025$). Significantly more of the nurses felt that "professional nurses' involvement with serving patients' food" was unchanged ($p < .005$). There was a significant change in the direction toward increased to the statement, "the amount of paper work" ($p < .05$). There were 182 responses changed by the nurses on the second survey in comparison to the first survey to these eight statements on the amount of non-nursing duties assigned to professional nurses, however, except for those noted above, the changes were random and did not indicate a direction of change.

On the effect of automation about social interaction between nurses, significantly more of the nurses felt social interaction was decreased ($p = < .05$). The responses to three of the statements indicated that the nurses felt "interdependence of nurses working at the same level," "the prevalence of informal nurse cliques," and morale problems due to isolation" were unchanged due to the effect of automation in the hospital. There were changes which indicated trends to the statements "nurses' isolation from her peers" toward increased ($p = < .10$). There were 206 changes in the responses of the nurses on the second survey in comparison to the first survey to these seven statements. However, only responses to two of the statements were changed sufficiently to indicate even a trend to the direction of change.

There were many changes in the responses to the sixty-eight statements on the second survey in comparison to the first survey. However, the changes were random and with the exception of those noted above, the direction of change was not at the $< .05$ level of significance.

Conclusions. The following conclusions are based on the findings of this study:

1. There is a need for increased inservice education

for nursing personnel to work effectively in an automated hospital.

2. The work environment is improved due to the automated and mechanized devices in the hospital.

3. Supervisory responsibilities are increased in an automated hospital.

4. The nurses did not agree with the experts or the findings in other hospitals about the effect of automation on decreasing the number of personnel in ratio to the number of patients.

5. Communication is improved in an automated hospital.

6. Automation does not change communication patterns between physicians and nurses.

7. Patient care is improved due to the effect of the automated and mechanized devices and the functional organization of the hospital.

8. Satisfaction with food service by patients was decreased in the automated hospital.

9. There is increased need for skills in human relations and increased clinical knowledge in an automated hospital.

10. Expectations of the nurses about the effect of

automation in the hospital were not fully realized in the new automated hospital.

11. Job satisfaction of nurses is increased due to the effect of automation in the hospital.

12. The amount of the nurses' fatigue was not decreased as much as had been anticipated due to the effect of the automated and mechanized devices in the hospital.

13. Non-nursing tasks assigned to professional nurses are decreased in an automated hospital.

14. The amount of "paper work" was not decreased as much as was anticipated by the nurses.

15. Social interaction between nurses is significantly decreased in an automated hospital.

16. The nurses did not agree with the experts or with the findings in industry about the effect of automation on the morale of the nurses.

17. The anticipation of the nurses was not realistic prior to working in an automated hospital.

18. The randomness of the changes by the nurses may indicate a lack of decision about the effect of automation after four months experience working in an automated hospital.

Recommendations. The following recommendations for nursing service administration when planning a transition to automation in the hospital are based on this study.

1. The initial planning for orientation of all personnel should be thorough and realistic. The problems as well as the advantages of the automated and mechanical devices should be presented.

2. On-going inservice education should be increased in order to meet the needs of personnel in adjusting to the new work environment and equipment.

3. In planning for the orientation of new personnel, sufficient time should be provided to thoroughly prepare the nurse to function adequately and effectively in an automated hospital.

4. Inservice education should be planned to include material on human relations skills and interpersonal relations skills to help the nurses to work in an automated hospital.

5. That further study be done by nurses in the area of work organization to utilize the technological innovations available from industry in the hospital.

6. Nurses should take a long hard look at the non-nursing duties they currently perform and analyze why they

continue to be responsible for these tasks.

7. Nurses should be responsible for conducting research at the nursing unit level to identify ways and methods of using automated and mechanized devices to the betterment of work organization and the improvement of patient care.

8. Nurses should accept the responsibility for increasing their own knowledge and skills in using the automated and mechanized devices for the purpose of extending nursing care and improving nursing services to the patient.

9. Nursing service administration should not expect the nurses to accept or adjust to the new work environment for at least six months.

10. Nursing service administration should not introduce changes in procedures or policies unless absolutely essential during the transition to automation.

11. This same instrument should be used at the end of one year with the same nurses participating, if possible, in order to arrive at more definitive feelings of the nurses about the effect of automation in the hospital.

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APPENDIX A

UNIVERSITY OF COLORADO
BOULDER, COLORADO

SCHOOL OF NURSING

Dear Participant:

One of the more important recent changes in the hospital environment has been the introduction of automation. Mechanical devices which monitor the patient's vital signs and record these automatically on a permanent record, the use of data processing, and the many business computers which automatically record all charges to the patient, are just a few of the areas in which automation has been introduced into the hospital setting.

Another concept of automation has been realized in building hospitals such as Mercy Hospital. Here automation is applied by utilizing equipment which delivers supplies and all the items needed to give fast, efficient patient care. Other important features include the communication system, the supplies, processing and distribution center, and the Nurserver.

We would like to know how professional nurses feel about automation in the hospital setting. The only means of identifying ways in which we can be better prepared to meet the challenge of automation is to study present situations in which many of these new concepts are being introduced.

To get the information on how you think and feel about the hospital and your working environment, we would like you to fill out the enclosed forms. It will be important for you to frankly state your ideas and opinions about your work, the hospital, and various aspects of hospital functioning. Your individual answers are completely confidential.

Thank you very much for your cooperation.

Sincerely yours,

Deane Taylor

(Miss) Deane Taylor, R. N.
Graduate Student, School of Nursing

APPENDIX B

INSTRUCTIONS

1. Please print your name on the "Magic" Tape at top of page 1 of the questionnaire. (Example at top of this page.)

2. The tape will be removed in your presence and your name recorded with the number under the tape. This code will be placed in a closed file which will not be accessible to anyone except the researcher.

3. Your answers will be added to those of all other nurses in the hospital and only summarized results will be reported when the research is completed.

4. Please answer all the questions in order.

5. This is not a test. There are no right or wrong answers. The main idea is for you to answer the questions the way you really feel--the way things seem to you personally.

6. If you wish to write an explanation or comment about an answer, feel free to do so. Make the comment on the questionnaire or on the back of the page. Identify the number of the question, please.

7. If you would like to know the results of this research project, please indicate by checking below:

☐ Yes

☐ No

GENERAL INFORMATION

1. What is your present position in this hospital?

_____ (1) Nursing Office Administrator

_____ (2) Supervisor

_____ (3) Head Nurse

_____ (4) Professional Staff Nurse

2. What is the total length of time you have worked at this hospital?

_____ (1) Six months or less

_____ (2) Six months to one year

_____ (3) Between one year and three years

_____ (4) Three to five years

_____ (5) Over five years

3. What shift are you now on?

_____ (1) Day shift

_____ (2) Evening shift

_____ (3) Night shift

4. If you regularly rotate shifts, please check the shifts worked.

_____ (1) Day shift

_____ (2) Evening shift

_____ (3) Night shift

5. Have you worked at another hospital prior to working at this hospital?

_____ (1) Yes

_____ (2) No

6. Please indicate type of program from which you graduated.

_____ (1) Diploma (3-year program)

_____ (2) Associate Degree

_____ (3) Baccalaureate program (4 years, B. S. N.)

_____ (4) Diploma plus undergraduate work, B. S. N.

_____ (5) Graduate, M. S. N. (or other) degree

_____ (6) Post-graduate (Mid-wifery, Operating Room, etc.)
(Please explain)

7. Please indicate the total number of years you have been actively engaged in nursing excluding educational preparation.

_____ (1) 0 to 2 years

_____ (2) 2 to 5 years

_____ (3) 5 to 10 years

_____ (4) Over 10 years

FEELINGS OF PROFESSIONAL NURSES TOWARD AUTOMATION IN THE HOSPITAL SETTING

DEFINITION OF AUTOMATION: Automation in the hospital setting is a method of reducing human effort and involvement in the areas of patient care and institutional operation through the use of mechanical and electronic machines, organization, and work design.

The following statements represent possible effects of automation on the hospital organization, management, and the work force. For each statement will you please:

(1) Draw a circle around the answer (I)ncreased, (D)ecreased, (U)nchanged, which best expresses your thinking and

(2) Draw a circle around O or E which will indicate your answer is based on (O)pinion or (E)xperience.

Example: With many mechanical devices to operate nurses' need to make quick decisions will be (I) D U O (E)

AUTOMATION:	Increased	Decreased	Unchanged	Opinion	Experience
1. The need for supervisors to possess more technical skills will be	I	D	U	O	E
2. Supervisors responsibility will be	I	D	U	O	E
3. The tendency to shift supervisory emphasis from patient care to the process and mechanics of equipment will be	I	D	U	O	E
4. Interdependence of nurses working at same level will be	I	D	U	O	E
5. The need for more technically educated nursing staff to operate monitors, mechanical devices, and equipment will be	I	D	U	O	E
6. The percentage of non-professional workers in the hospital will be	I	D	U	O	E

7.	Machine-tending jobs will be	I	D	U	O	E
8.	Nurses' need for personal judgment skills will be	I	D	U	O	E
9.	Nurses involvement in total patient care will be	I	D	U	O	E
10.	Feelings of strain or tension while working with mechanical devices, monitors, pace-makers, etc., will be	I	D	U	O	E
11.	Nurses' need for human relations skills will be	I	D	U	O	E
12.	Nurses' feelings of on-the-job satisfaction will be	I	D	U	O	E
13.	The number of personnel on a nursing team will be	I	D	U	O	E
14.	The effectiveness of team nursing will be	I	D	U	O	E
15.	The nurses' isolation from her peers will be	I	D	U	O	E
16.	The ratio of supervisors to staff nurses will be	I	D	U	O	E
17.	The prevalence of informal nurse cliques will be	I	D	U	O	E
18.	Morale problems due to isolation will be	I	D	U	O	E
19.	The need for head nurses and team leaders to possess decision-making abilities will be	I	D	U	O	E
20.	The amount of direct communication between supervisors and staff nurses will be	I	D	U	O	E
21.	Physical isolation of nurses from other hospital personnel will be	I	D	U	O	E
22.	The ratio of professional nurses to non-professional personnel will be	I	D	U	O	E
23.	The need for in-service training in using mechanical devices and automatic equipment will be	I	D	U	O	E

24.	Non-nursing duties assigned to professional nurses will be	I	D	U	O	E
25.	The opportunity to "listen" to what the patient is really saying will be	I	D	U	O	E
26.	The need to orient personnel to the working environment on each unit will be	I	D	U	O	E
27.	The time available to the nurse to learn new nursing skills will be	I	D	U	O	E
28.	The opportunity for professional nurses to give direct patient care will be	I	D	U	O	E
29.	Socializing with other nurses on-the-job will be	I	D	U	O	E
30.	The need to orient personnel to nursing functions on each unit will be	I	D	U	O	E
31.	The time to talk to other nurses about patient care problems will be	I	D	U	O	E
32.	The professional nurses' opportunities to supervise non-professional personnel will be	I	D	U	O	E
33.	The accessibility of supplies and equipment to give patient care will be	I	D	U	O	E
34.	The opportunities for professional advancement will be	I	D	U	O	E
35.	Professional nurses' satisfaction in giving patient care will be	I	D	U	O	E
36.	The opportunity to carry out all nursing duties effectively with an economy of time and effort will be	I	D	U	O	E
37.	Communication between physicians and nurses will be	I	D	U	O	E
38.	The number of patients' requests for nursing care will be	I	D	U	O	E
39.	The professional nurses' opportunity to do the things she best likes to do will be	I	D	U	O	E

40.	The amount of time needed to answer the patients' calls for nursing care will be	I	D	U	O	E
41.	Nurses' fatigue at the end of the day will be	I	D	U	O	E
42.	The need for each nurse to talk with the patient's physician will be	I	D	U	O	E
43.	The need for communication between nursing education personnel and nursing service personnel will be	I	D	U	O	E
44.	Patients' feelings of security will be	I	D	U	O	E
45.	Professional nurses' responsibility for ward management duties will be	I	D	U	O	E
46.	Time utilized effectively in giving patient care will be	I	D	U	O	E
47.	The convenience and efficiency of the working environment will be	I	D	U	O	E
48.	Time spent by professional nurses making out requisitions for supplies will be	I	D	U	O	E
49.	Patient satisfaction with food service will be	I	D	U	O	E
50.	The need for nurses to develop self-motivation to learn and advance professionally will be	I	D	U	O	E
51.	The opportunity for improvement of patient care by the nurse will be	I	D	U	O	E
52.	The number of conflicts between nurses' professional values and the duties assigned to them will be	I	D	U	O	E
53.	The amount of walking done by nurses on duty will be	I	D	U	O	E
54.	The need for orientation of nurses to changes in procedures, policies, and new techniques will be	I	D	U	O	E
55.	Storage of supplies and equipment on the wards will be	I	D	U	O	E

56.	Availability of all equipment necessary to give patient care will be	I	D	U	O	E
57.	Difficulties and problems of communication will be	I	D	U	O	E
58.	The possibility that "things will run more smoothly" in your department will be	I	D	U	O	E
59.	The amount of "paper work" will be	I	D	U	O	E
60.	Infections due to method of handling soiled equipment and supplies will be	I	D	U	O	E
61.	Professional nurses' involvement in serving patients' food will be	I	D	U	O	E
62.	Difficulties encountered by "float" nurses working on several different units will be	I	D	U	O	E
63.	The need for Head Nurses to closely observe patient care given by all personnel will be	I	D	U	O	E
64.	Staff physicians' opportunities to discuss patient care with professional nurses will be	I	D	U	O	E
65.	The need for clinical nurse specialists to work in an automated hospital will be	I	D	U	O	E
66.	The opportunity for the head nurse to observe and assist with patient care will be	I	D	U	O	E
67.	Responsibility of professional nurses for assisting with student nurse education will be	I	D	U	O	E
68.	Feelings of insecurity on the part of some nurses will be	I	D	U	O	E

APPENDIX C

UNIVERSITY OF COLORADO
BOULDER, COLORADO

SCHOOL OF NURSING

Dear Participant:

Almost four months have passed since you moved into the new Mercy Hospital. Once again we are asking you to participate in this study of automation in the hospital setting. Many of you did not feel you could complete the survey because you had not had any experience in using the various mechanical devices and equipment to give fast, efficient patient care. At that time, each of you completed the forms and made some very pertinent observations as to just how you felt these new innovations would effect patient care and the nurses in this very new and different working environment.

Each of you have now had some experience with the mechanical devices, the intercommunication system, and the concept of flow design as a means of improving patient care. It will be important for you to try to identify the actual effects of the mechanical equipment, availability of supplies, effectiveness of nursing care, as well as whether or not you feel these things have given you greater or lesser satisfactions as a nurse.

Your experience with automation in the hospital setting at Mercy Hospital may help to identify ways by which other nurses can be helped to make the transition to automation easier.

To get the information on how you think and feel about the hospital and your working environment, we would like you to fill out the enclosed forms. It will be important for you to frankly state your ideas and opinions about your work, the hospital, and various aspects of hospital functioning. Your individual answers will be completely confidential.

Thank you very much for your cooperation and continued support of this research project.

Sincerely yours,

Deane Taylor

(Miss) Deane Taylor, R.N.
Graduate Student, School of Nursing

APPENDIX D

INSTRUCTIONS

1. Your name will be recorded with the code number on this form when you receive the survey. You do not need to put your name on this set.

2. This code will be placed in a closed file which will not be accessible to anyone except the researcher.

3. Your answers will be combined with those of all other nurses in the hospital and only summarized results will be reported when the research is completed.

4. Please answer all the statements in order and answer both parts of each.

5. This is not a test. There are no right or wrong answers. The main idea is for you to answer the statements the way you really feel - the way things seem to you personally.

6. If you wish to write an explanation or comment about an answer, feel free to do so. Make the comment on the survey or on the back of the page. Identify the number of the statement, please.

7. Base your answers now on your feelings after working in the hospital environment and using the mechanical equipment. If you did not have experience with a certain aspect of automation, then still answer the statement based on your opinion.

Thank you for your cooperation and the assistance you have given me throughout this study on automation in the hospital setting. A summary of the study will be forwarded to each of you who requested a report.

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