

APPLICATION OF VISUAL PERCEPTION CONCEPTS TO HOSPITAL MENU  
FORMATS IN A MACHINE PAGED TRAY ASSEMBLY PROCESS

by

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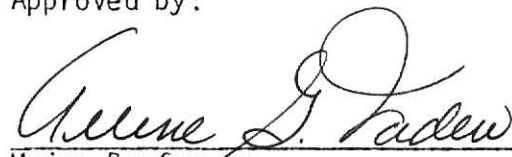
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## INTRODUCTION

The goal of any foodservice is the maintenance of acceptable standards of food preparation that will result in a product of high quality, served in the best condition and manner possible (1). Assembly of trays is a critical subsystem in maintenance of quality standards in hospital patient foodservice. The patient should receive all the food and the accessory items as specified on individual menus (2); the food must be bacteriologically safe (3) and nutritionally adequate (4); and hot food should be served hot, and cold foods, cold (3). The tray assembly operation must be accurate and efficient to contribute to maintenance of these standards.

A number of research studies have reported problems associated with patient tray assembly. In a work sampling study reported by Williams and Donaldson (5), tray assembly was identified as one of the most inefficient operations in the institutional kitchen. Approximately one-third of employee time during the tray assembly period was spent unproductively. Stockdale (6) indicated that forced delay, idle time, and other delays reduced worker productivity during tray assembly.

The menu formats utilized in many hospitals require complex and unnecessary decision making on the part of assembly line station operators when reading and selecting items for the various types of diets. Item placement on menu formats often differs from one diet category to another and from meal to meal which may produce errors and delays in tray assembly and may slow the assembly process. Delays are costly not only in terms of labor time but in decreased food quality and lessened patient satisfaction (2).

In this study standardized printed menu formats for all diets utilizing color stripping to enhance readability were designed and evaluated in a



machine-paced tray assembly process in a 300-bed, short-term general hospital. The objective was to study the impact of the revised design on the tray assembly process; criteria were overall productivity, individual productivity, and error rate per tray. Literature reviewed relevant to the study included the following topics: centralized foodservice tray assembly research, work measurement, and visual perception concepts.

## REVIEW OF LITERATURE

### Centralized Tray Assembly

Tray assembly has been identified as an inefficient process in the hospital foodservice operation. Brown and Doyon (7) concluded that regardless of the assembly line organization only 40 per cent of the operators were working at one time. Jernigan (8) stated that more man-minutes were wasted or misused in setting up trays than in performing any other operation in the kitchen. McGary and Donaldson (2) delineated the following anomalies as a result of their investigation of tray assembly:

- a. Work station and assembly conveyor system layouts not conducive to motion economy.
- b. Work station content greater than cycle time.
- c. High frequency of missed or incorrect items, often with concentration at a specific work station.
- d. Stoppage of conveyor belt to bring any tray not meeting menu quality standards back into control.
- e. Operators responsible for replenishment of own supplies.
- f. Necessity for operators to hold trays back from forward progress on moving conveyor belts.
- g. Difficulty in seeing the menu.
- h. Forced delay caused by factors outside the system.
- i. Lack of clarity of defined responsibility and differentiation between evaluation of system output and evaluation of total system operation.

### The Menu

A limited but well planned menu was thought to be essential to maintaining work efficiency in tray assembly in McGary and Donaldson's study (2). It was suggested that the menu be limited to two soups, entrees, vegetables,

and salads, only one style of potato or starch substitute, and three desserts. Prepackaging of accessory items such as prewrapping of silverware may improve efficiency.

McGary and Donaldson (2) also recommended that food items be listed in specific locations according to menu category. Stockdale (6) stated that menus color coded by diet and by meal provides a practical means for increasing efficiency. Implementation of a menu coding system was reported to result in a reduction of man hours in one hospital (9). Placement of menus so that checkers could read them easily may contribute to efficiency of operations (5).

#### System Layout and Equipment Design

McGary and Donaldson (2) identified the need to bring trays that do not meet qualitative standards back into control without disturbing quantitative standards. A work area at the end of the line was proposed for trays that needed to be brought into control because of missed or incorrect items. Another study has indicated that spacing of trays at certain intervals reduced errors and manpower requirements (10).<sup>4</sup>

Belt speed was determined to be a critical factor in accuracy and productivity. In a study done by Stockdale (6), belt speed was originally set at thirty-four feet per minute which proved to be too fast, causing operators to hold trays back. To determine a viable belt speed, the sum of two tray lengths (3.1 feet) and the desired space between them (1.1 feet) was divided by cycle time, or 0.15 minute. The optimum resulting speed was twenty-eight feet per minute.

Another approach to efficiency has been developed by the automation of tray assembly. In West Germany (11) an electronically controlled guidance

system was developed that indicates which orders are to be served by a system of light cues generated by computer cards. These light cues are given by punched cards that are prepared for each individual patient's menu. These cues not only indicate which foods are to be served, but also indicate the amounts of foods to be dished. This system is in use in several hospitals in Europe (11) and the United States (12)<sup>10</sup>. Productivity has been reported as eight trays per minute with the system. In one hospital, the system reportedly reduced tray assembly personnel thirty-three per cent (11).

An all convenience food system has been applied in a 300 bed hospital. In the operation, hot food is dished cold and then heated immediately prior to service in microwave ovens in patient care areas. The usual tense pressure was removed from the assembly line workers and only one-third the personnel were needed to assemble trays as would be required in a conventional operation (13)<sup>11</sup>.

The stored labor concept has been applied to tray assembly (7). Labor time on the assembly line was reduced eighty per cent by the electronic ordering of pre-dished food and the automatic movement of food components. In a 700 bed hospital where a cook-freeze operation replaced the conventional tray assembly operation productivity increased to five trays a minute under test conditions. Also, labor reportedly was slashed eighty per cent with this system, requiring only two people to assemble trays each meal.

The food assembly under the cook-freeze system is controlled primarily by one employee working at a console. Since each menu item selected by a patient is assigned a number corresponding to a button at the console, the console worker must press the correct buttons on the console for each menu and push the button marked "deliver." This sends the cold selections to the first

operator and starts the hot food through a conveyORIZED microwave oven and to a second worker for the assembly of the food items (7).

#### Work Content of the Station

Several studies have bolstered tray assembly productivity by balancing work distribution on assembly lines (6,7,14). Moodie and Young (15) stated that even with a high degree of planning, perfect balance on lines seldom is obtained. This is because the operations to be performed are not infinitely divisible. This is even more difficult when a non-standard product is assembled (16).

The first to develop a model for balancing work for the hospital food-service tray assembly process using industrial engineering techniques was McGary and Donaldson (14). To distribute work tasks evenly in their model, a computer programmed ranked positional technique was developed. With this approach, timed work units were established and these work units then were grouped together to closely approach the limits of the cycle time (i.e., the time allowed for each station operator to service a tray).

Stockdale (6) also studied work task distribution and found that tray output was increased from four to six trays per minute and the number of station operators was reduced from nine to seven by redistribution of individual work tasks according to mathematical formulas. This was done by determining average time for placing each food on trays; then twenty-three tasks were combined into sixteen work units that required simultaneous use of both hands. Precedence diagrams were drawn to illustrate the logical order of work units, and new work stations were proposed based on cycle time. Stockdale aimed for an output of six trays per minute with an allowance for delay of seven per cent; calculated cycle time required was 0.15 minutes.



## Work Measurement

Several methods can be used for evaluating work. A subject's efficiency can be determined by observing a worker's skills and habits. Guthrie (17) stated that the mark of an established habit is a smooth, predictable action, one that is sure and well integrated. He defined skill as made up of habits, resulting ultimately with maximum certainty and minimum outlay of energy of time.

Relative skill and habits are subjective and not accurate measures. For the precision desired of many situations, scientific work measurement is more dependable. Without precise work measurement there can be no certainty that progress and improvement is being achieved (18). For improvement in work methods, effective utilization and allocation of personnel, and optimal productivity, standards must be established by work measurement (2).

### Work Measurement in Industry

The simplest measurement of labor productivity is output expressed in units compared with man hours of input (19). A time study by stop watch is one simple technique of obtaining accurate results at a relatively low cost. A flow process chart and a travel chart are used in tracing a worker's path as he proceeds with his job.

Simo-charts or left hand-right hand charts are micromotion study techniques for analyzing work in detail. These methods have proved advantageous in finding the most efficient methods of performing work. Also, the memomotion study technique, in which motion pictures are made at a very slow speed, is useful. Cyclegraphy, in which the motions of an operator are recorded on a still camera with the use of a small electric light bulb

attached to a subject's finger; and chronocyclegraphy, in which a blinking light attached to a subject's finger records speed as well as direction of movement, are additional procedures for recording and comparing work methods (20).

A motion picture camera also is useful for other purposes in motion and time study work, such as obtaining work sampling data and making performance ratings in time study work (21). Filming or video taping makes an exact record of work activities that can be analyzed repeatedly. However, a camera should be used only when employee reaction is favorable (16).

There are numerous other systems for studying and determining assembly time requirements. These range from various simple time and motion techniques to sophisticated systems of predetermined motion-time data. Systems of predetermined motion time data examine a task in detail and assign predetermined time units for various categories of movement of work. Body Member Movements, the Work-Factor System, and Methods-Time Measurement (MTM), are similar. Some simplified versions of these predetermined motion time systems such as MTM II or the Work Factor System have made these systems more feasible (16).

A system of work measurement used frequently is work sampling, which is a technique using intermittent, instantaneous observations of a situation so that a reliable picture of the total situation can be made. It is a technique that is less costly than a continuous time study, because only a sample of several days of a machine's or an employee's work is studied to give a picture of productivity (16). A representative sample with an adequate number of observations will yield an accurate picture of productivity (16).

Work sampling has the advantage of a more representative sample of work performance. Variations do not affect results as much because the study is

not limited to a single time period as is often the case in a continuous time study. Samples are taken from numerous periods of time. Work sampling also has the advantage that operators are not under close observation for long periods of time, so there is less chance of recording unrepresentative results from operators altering procedures because they are being observed. While the use of work sampling does allow many operators or activities to be measured at one time, it is not economical for study of a single operator or machine (20).

#### Work Measurement in Foodservice

In foodservice operations measures of productivity have been evaluated in a number of ways. Evaluation of efficiency of foodservice units was first evaluated by direct measurement of scheduled time such as per-meal labor cost or service cost (21,22,23). A survey conducted by Halter and Donaldson (21) reported comparative labor cost data collected from 175 hospitals. Labor minutes per meal served was the standard of measure in Tuthill and Donaldson's (22) study of scheduled labor time in the dietary service of ten selected hospitals. An objective was the development of a method for determining the direct labor time expended per meal and the division of total labor time expended. Bakken and Northrop (23) reported direct labor time expended per meal in thirteen hospital dietary departments based on questionnaire results.

The "time log" method for recording work in which activities of a dietitian were continuously observed and noted in a time log in intervals of one minute or more was used to compile work into categories and summarize daily totals of work activities (24). Another study analyzed the labor time of 100 employees each day over a period of nine months in eight work areas (25). Kent and Ostenso (26) established the productivity index (PI) or the mean total minutes per meal for various dietary sections. Avery (27) employed

number and distance of a worker's interaction between pieces of equipment in an institutional kitchen as a measure of work for the design of equipment layout. This technique has been applied and modified in other studies (28, 29). Montag (30) used a continuous timing technique to determine basic time estimates for comparison of costs of man-machine processing and non-machine methods in a foodservice department.

In Quam's (31) time study a work measurement instrument compared expenditure of food and direct labor costs in conventionally prepared and convenience food systems. Mean labor time was expressed in man-minutes expended for preparation of the items by standardized methods. Labor time and labor cost requirements for 100 to 500 servings of each menu item prepared by the two methods were determined. A Campbell Company project utilized time study in measuring the food production time to prepare conventionally made products and convenience foods (32).

Montag (33) evaluated predetermined motion times as a work assessment tool in foodservice. This was concluded to be a valid approach for determining total labor requirements but that the technique was considered far too time consuming to be feasible. Montag stated, however, that if predetermined coded times were applied to the preparation of a specific product, the technique might be effective for developing estimates of labor times for food production tasks. In this study Master Standard Data, which is derived from the Methods-Time Measurement System, was applied to analysis of selected bake-shop activities to measure production time.

Work sampling has been used as a technique for analyzing worker's time in numerous job-related activities. Schell and Korstad (34) applied work sampling in analysis of six dietary activities of foodservice employees in two

hospitals and used the results as a base for improving work efficiency. Kent and Ostenso (26) employed work sampling to establish the mean percentage of various work activities in ten hospitals. Heinemeyer and Ostenso (35) contrasted labor time and cost between conventional and centralized methods of food material handling in a 475-bed hospital with a continuous time study approach. Bonini, Malach, and Hager (36) reported a work sampling study of productive, non-productive, and personal activities of five foodservice workers in a pre-preparation and salad unit.

A framework for analysis of foodservice in nursing homes was developed by Brown (37). Work sampling was made an integral part of determining use of labor saving equipment, effectiveness of kitchen layout, work methods used in performing repetitive tasks, pace at which selected tasks were performed, and labor demand of menus served to patients on regular diets.

A man-machine productivity study of dishwasher units applied both fixed interval work sampling and continuous time study to record operator's times and machine times per 100 items to evaluate man and machine requirements and to estimate labor minutes per day required (38). In a study of the use and cost of machine dishwashing supplies, McCaughey and Montag (39) measured the number of items of ware washed with work sampling and determined machine running time for the wash pump by continuous time study.

Zolber (40) examined the work function activities of supportive personnel, and the percentage distribution of workers' activities and labor time in three assembly-serve hospitals with work sampling techniques and contrasted this data with conventional production hospital food systems. In another study hospital food production labor costs of conventional and total convenience foodservice systems estimated by work sampling techniques were compared (41).

Other applications have been made of work sampling involving labor productivity in hospitals (6,42), school foodservice (43), and in residence halls (44,45). Also, analyses have been performed of dietitians' (46) and of foodservice manager's activities (47). One study reported staff, patient, and doctor responses to nutrition staff activities at a hospital (47), and another applied work sampling in evaluating a training program (49).

### Visual Perception Concepts

Readability of the menu on the assembly line has been cited as a problem (2,6). Although research concerning the menu format and assembly line accuracy was not found in the literature, visual perception concepts may have application for improving menu readability. Miller (50) found that a subject's capacity to perceive and process information was greater when the stimuli were organized into a sequence of chunks. In a related study, Bousfield and Cohen (51) reported that clustering words into related categories greatly enhanced recall of items.

Visual scanning is an integral part of a worker's response in selecting items for the tray assembly operation. Neisser (52) emphasized that a subject's correct response involved examination of all items during the search process prior to the selection decision. Graphic designers purport that readability is enhanced if the focal area is well defined and if adjacent areas are of different colors (53). Reed (54) revealed that two hues or shapes could be distinguished more rapidly and accurately than two sizes or brightnesses.

Aaronson (55) cited numerous visual perception studies that indicated the time is critical during which the stimulus is available to the subject. She

cited four factors that played a role in the recall of words presented: the rate at which the stimuli are presented, the duration of the stimuli, the prestimulus events, and the poststimulus events. Prestimulus events, such as other preceding stimuli, were found to delay the perception of the succeeding stimulus. If two stimuli appeared in close succession, perception of the second was delayed by the perceptual processes used to identify the first. Temporally close poststimuli interfere with the perception of the stimulus preceding. She explained that "visual noise" of the second stimulus could blot out and erase the first stimulus.

Time to view an object under conditions of dynamic visual acuity has been shown to have an effect on visual performance (56). Blackwell (57) found that when other factors are held constant, there is a linear relationship between visual accuracy and the logarithm of the time to view. Graham and Cook (58) and Niven and Brown (59) demonstrated definite relationships between viewing exposure and visual acuity.

To maximize viewing time, visual obstructions should be removed and the operator should be faced directly toward the object viewed and serviced (16). In work situations, Konz (16) has suggested that objects to be perceived should be kept physically close to an operator's eyes or be magnified to improve visual acuity.

Sternberg (60) indicated that lengthy symbol sequences slowed the scanning process. Research indicated that subjects' mean time of determining if a test symbol was included in a sequence of symbols increased linearly with the subsequent length of the sequence. Miller (50) showed that visual acuity decreased when the eyes of a subject had to follow a moving object as contrasted to a stationary object. This effect was found to become magnified

by increasing the speed of the object, and by longer exposure of the subject to the object. Another study noted that recognition was delayed when first viewing pictures out of focus and that the more prolonged the initial blur, the slower the eventual recognition. Bruner and Potter (61) purported that interference may be partly accounted for by the difficulty in rejecting incorrect hypotheses based on substandard cues.

Eye strain was reported by Heaton (62) to arise when an individual is involved in the process of attempting to see more clearly by trying to manipulate his eyes. He stated further that lack of definition of objects, unfamiliar language, lack of concreteness in objects, and lack of correct illumination will bring about a sensation of effort, and thus eye strain. Other factors that he pointed out that will cause eye strain are constant movement of an object and lack of contour and contrast.



## METHODOLOGY

### The Research Site

Following the preliminary planning, an initial step in the project was to locate a hospital that could accommodate the study and to elicit the assistance of the administration of the department of dietetics. A 300 bed, general, short-term hospital located in a large midwestern city was the institution selected. The director, other dietitians, and supervisors were involved in various phases of the detailed planning and implementation of the study.

The dietary department employs approximately eighty professionals and nonprofessionals. A three-week selective cycle menu is used for the regular diet and five modified diet menus. Trays are assembled sequentially by floors in one centralized location with the use of a mobile, machine-paced tray assembly belt.<sup>1</sup> Food assembly stations are placed perpendicular to the line with food assembly station operators facing the oncoming trays. The tray line stops automatically when a tray reaches the end of the line. Heated-refrigerated compartment type carts<sup>2</sup> are used for transporting food to the patient care areas. Plates and other dishes with hot foods are removed from the tray at the end of the assembly line and placed in the heated compartment of the cart; cold foods remain on the tray which is placed in the refrigerated compartment. Dietary employees reassemble trays and dispense coffee in the patient care areas prior to service to the patients.

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<sup>1</sup>Olson's Sanivayor is used.

<sup>2</sup>Meals-on-Wheels and Mercury carts are used.

## Menu Format Design

Existing printed menus were analyzed; samples are included in Appendix A. New formats (Appendix B) were developed incorporating the following improvements based on visual perception concepts: (a) all menu items were grouped into basic groups; (b) groups were assigned specific positions on all printed menus for all diets; (c) the groups were accentuated by use of horizontal white strips across the various color coded selective menus; (d) accessory items (i.e., items that appear standardly on the menus each day such as bread, beverages) were placed in specific, standard positions on all menu formats. Specific details for the menu redesign are enumerated below.

Items on menu formats were first arranged in groups so that station operators would not have to scan a major portion of the menu and read numerous menu items. To do this, items on all formats were grouped into the following categories for the morning meals and the noon and evening meals, respectively:

### Morning Meal Menu Categories

- |                             |                     |
|-----------------------------|---------------------|
| 1. Fruits and juices        | 7. Cold beverages   |
| 2. Cereals                  | 8. Cream for cereal |
| 3. Breakfast entrees        | 9. Toast            |
| 4. Hot breads and pastries  | 10. Breads          |
| 5. Hot beverages            | 11. Fats            |
| 6. Condiments for beverages | 12. Jellies         |

### Noon and Evening Meal Menu Categories

- |                               |                                   |
|-------------------------------|-----------------------------------|
| 1. Soups                      | 9. Condiments for beverages       |
| 2. Entrees and accompaniments | 10. Cold beverages                |
| 3. Starches                   | 11. Toast                         |
| 4. Vegetables                 | 12. Breads                        |
| 5. Hot rolls and breads       | 13. Crackers                      |
| 6. Salads                     | 14. Fats                          |
| 7. Desserts                   | 15. Jellies                       |
| 8. Hot beverages              | 16. Meat and vegetable condiments |

Each of these designated groups was assigned a specific location that was standardized on all menu formats. Main menu groups were placed in the same top to bottom sequence as on the existing formats. To further standardize formats, diet clerks were advised to place all write-in items near the menu category into which the write-in would be classified. They also were counseled to position special stamped-in items such as "Bland--No Pepper" at the bottom of all menu formats, 1-1/2 inches from the bottom of the menu. To facilitate discrimination, white horizontal strips, one and one-half inches wide were placed across the various printed menus that were color-coded for the differing diets at a distance of one and one-half inches apart. This permitted the station operators to quickly locate the particular items they were responsible for placing on trays.

Accessory items on the menu also were organized to facilitate fast recognition. These items were assigned specific locations that were standardized on all formats; for example, if skim milk appeared on any format, it would appear in one position only, and no other item would be assigned that position. Accessory items appearing on the regular menu formats were listed closest to the top of the menu format within each group. If an accessory item that appeared in a group on one format was not listed in the group on another diet format, a blank space was left in that position. Accessory items on a format not appearing on the regular diet menu were listed directly below similar items on other menu formats.

#### Measurement of Menu Effectiveness

Worker productivity and accuracy were charted during two three-day study periods, a control period when the existing menu formats were used to provide baseline data and during an experimental period when the redesigned menu

formats were used. An adjustment period of approximately two weeks during which the revised printed menu formats were used preceded collection of data for the experimental period. For experimental control the same days of the cycle menu were used for the two study periods (Appendix C); also, the same days of the week were selected so the same basic work group and theoretically, a similar proportion of the various hospital diets, and similar hospital routine would be maintained. The layout of items on individual work stations was arranged according to the same prescribed plan in both study periods (Appendix D).

### Introduction of Study

Because changes often are met by suspicion and resentment on the part of workers (63), particular attention was directed to minimizing employee resistance to the project. A meeting was held with dietitians and supervisors responsible for the operation of the line. An explanation of the study was given to both groups and they were asked to help in the control of the study. Dietitians were asked to participate in determining checker error rate per tray. Meetings also were held with employees to introduce the research techniques and to explain the purpose of the study to all employees in the dietary department. Before any productivity or accuracy data were recorded, a pilot study was conducted to accustom operators to the techniques and reduce any anxieties they might have about the research. Also, pilot work was necessary to develop the investigator's research techniques.

### Assessment of Productivity

Productivity was measured in two ways; overall labor time for assembly of trays for an entire meal, and individual station operator time for servicing selected trays.

#### Overall Tray Assembly Labor Time

Average overall efficiency of the group was rated in terms of man-minutes per tray assembled ( $MM_t$ ). Man-minutes per tray was determined each meal by dividing the adjusted total number of station operators ( $O_a$ ) times the number of minutes the group worked ( $M$ ) by the total number of trays assembled for a meal ( $T$ ). The formula for this calculation follows:

$$MM_t = \frac{O_a \cdot M}{T}$$

$MM_t$  = Man-minutes per tray

$T$  = Total trays assembled

$O_a$  = Adjusted number of station operators utilized

$M$  = Minutes for tray assemblage

Total trays assembled excluded late trays requested after the assembly process started. Late trays were assembled after the primary assembly time. Station operators utilized did not include workers who performed pre-assembly tasks such as pre-pouring coffee or pre-wrapping silverware. Also excluded were extra workers who helped replenish food or who handled food cart delivery.

The adjusted number of operators ( $O_a$ ) was computed to reflect times when a station was vacant ( $M_v$ ).  $M_v$  values were recorded when times were in excess of three minutes. The time a station was vacant ( $M_v$ ) was divided by the total number of minutes the group worked ( $M$ ) and subtracted from operators utilized

( $O_u$ ) to obtain adjusted number of station operators utilized ( $O_a$ ). The formula for this calculation follows:

$$O_a = O_u - \frac{M_v}{M}$$

$O_a$  = Adjusted number of station operators utilized

$O_u$  = Number of station operators utilized

$M_v$  = Minutes stations were vacant

$M$  = Minutes for tray assemblage

The minutes worked by the station operators started when the first station operator placed the first tray on the belt and ended when the last tray was removed from the belt, excluding late trays. These data and calculations were recorded for morning, noon, and evening meals for all three days during both control and experimental periods on the Work Group Quantitative Tray Assembly Analysis (Appendix E).

#### Individual Station Operator Work Cycle Time

Station operator activities were recorded on video tape. Eight station operators are needed for the tray assembly process. Two cameras were required to tape activities of the five tray assembly stations included in the study. Tapes were replayed later for measurement of operator's work cycle time. Approximately the last half of the tray assembly period was filmed on the third day of the three data collection days for each study period. Thirty-six trays were selected during each period for the timing. A breakdown of task assignments of the eight work positions on the tray assembly line follows:

Station #1: Initiates trays on the line. Places diet packs, flatware and menus on trays.

Station #2: Places accessory items on trays (i.e., beverages, bread, jellies, and other related items).

Station #3: Places salads, desserts, juices and special write-in items such as supplementary diet formulas on trays.

Station #4: Portions individual servings of meats and potatoes on plates and places on trays.

Station #5: Portions individual vegetables, soups, and pureed meats and places these servings on trays.

Station #6: Checks trays qualitatively and quantitatively.

Station #7: Removes hot foods from tray and places in heated food compartment in food carts.

Station #8: Removes trays from line and places trays in refrigerated food compartment in food carts.

Work cycle times of operators who serviced trays with food according to specifications on individual menus were measured; therefore, operators assigned to stations #1, #7, and #8 were excluded. However, station operator #6, the tray checker, was included because the position was identified during pilot work as critical to the flow of the assembly process.

Prior to the filming, individual patient menus were prenumbered so that trays could be selected for timing to insure that a cross section of types of diets would be included in the sample. At 6:00 P.M. the day prior to the morning meal tray assembly to be evaluated, at 9:00 A.M. prior to the noon tray assembly, and at 1:00 P.M. previous to the evening assembly, all of the individual menus for the next meal were numbered consecutively in the sequential order of tray assembly.

Tapes were replayed separately for measurement of individual work cycle time for each of the thirty-six selected trays for each of the five station operators. Filming of trays began shortly after the first one-hundred trays were assembled. The first ten regular diets on the video tape were timed

using a stop watch; and likewise, one to five of each of the other diet trays that first appeared on the tape were selected for timing until a varied sample of thirty-six trays were chosen. To offer comparison with the work cycle times charted for servicing the trays in the control period, the same type diet trays were timed in the experimental period, (i.e., if two sodium restricted diets were timed in the control period, the work time of servicing the first two sodium restricted diets that appeared on the video tape of the experimental period was recorded). If there were not as many trays filmed of one particular diet in the experimental period as the control, then work cycle times of additional soft diets were recorded during both control and experimental periods to replace the number of modified diets found lacking in the sample for the experimental period. Data were recorded on the Individual Quantitative Tray Assembly Analysis (Appendix F).

Work cycle time servicing a tray for a station operator was defined as the time lapse between the operator's hand release of the last item placed on the previous tray and the hand release of the last item placed on the tray the operator was servicing. If no item was required to be placed on a previous tray, then timing began when the end of the previous tray passed the edge of the station adjacent to the station operator. If no item was required on the tray an operator was servicing, timing was completed when the end of the tray passed the edge of the station adjacent to the station operator or when the station operator overtly started to select and place an item on the next tray if the overt activity preceded the tray moving past the end of the station.

Extra duties performed by station operators, such as passing a tray of menu holder clips to the beginning end of the tray assembly line, getting missing items from nearby refrigerators, or passing forgotten items to the



tray checker were included in station operator service time. If a station operator was called upon to correct an error on a previous tray, the time needed to make the correction was added to the work time servicing the tray needing correction if the time exceeded 0.2 of a minute. If the correction time was 0.2 of a minute or less, correction time was added to the service time of the tray the operator was servicing when the mistake was apparent.

### Accuracy Measurement

Accuracy was rated in terms of errors per tray and of percentage of errors to possibility of errors per tray. Work group errors (excluding the checker) were recorded during observation of the tray assembly process. Checker errors were recorded by the dietitians on duty in the patient care areas prior to service of trays.

At the time patient menu slips were prenumbered, the possibility of errors also was determined on each individual menu for each meal. This was done by counting the number of items that were to be placed on each tray. The following guidelines were used in the determination of possibility of errors. If two or more items were required to be placed on a tray in response to a menu selection, then each of these items was tabulated as possible errors. For instance, if beef stroganoff was selected, two items were required on the tray (i.e., noodles and beef cubes) and two mistakes were considered possible. Possible errors included only items that tray assembly operators placed on a tray in response to what was selected on a printed menu; therefore the number of items required to be placed on each tray excluded coffee that was dispensed in the patient care areas and toast at breakfast that was prepared in the patient care areas. Items not selected by the patient (or for the patient by

the dietitian) but placed on trays routinely, such as flatware and diet kits,<sup>1</sup> were not included in the possibility of errors. Only if extra items were stamped in, such as "No Pepper" or "One Sugar O.K.," were these items considered possible errors. If a smaller portion of an item were specified other than the standard portion size (e.g., 1/3 cup orange juice instead of the standard 1/2 cup portion), two possibilities of errors were counted. If double or triple an item were required, then two or three possible errors were recorded, respectively.

Total number of errors per tray was recorded by observation a short distance from the tray checker near the end of the assembly line. The tray checker held up the menu and called out errors not only for needed items omitted, but for extra items not called for that were placed on a tray. Three types of errors were defined: not on line errors (NOL), omissions, and mistakes. NOL errors were items that a station operator knew were needed for a tray's completion but that were not available on the line (i.e., toast that was in the process of being prepared, a special write-in item that was not on an operator's station). Omissions were items that were left off a tray. Mistakes were items placed on the tray in addition to or instead of the proper items requested on the menu. To provide a standard base of comparison, the number of errors made in assembly of a particular tray was divided by the possibility of errors on the tray to determine the percentage of errors to the possibility of errors on that tray. These data were recorded on the Qualitative Tray Assembly Analysis (Appendix G) for morning, noon, and evening meals for all three days of both control and experimental periods.

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<sup>1</sup>Diet kits are packets preassembled for specific diets. The kits contain a napkin and such things as sugar, sugar substitute, salt, pepper, and other related items depending on the type diet.

Checker accuracy also was recorded on a Qualitative Tray Assembly Analysis sheet. This involved a check of morning, noon, and evening meals on the second day of both the control and the experimental periods. At both periods checkers were told an inspection was being made of their accuracy.

## RESULTS AND DISCUSSION

Standardized printed menu formats for all diets utilizing color stripping to enhance readability were designed and evaluated in a machine-paced tray assembly process in a hospital dietary department. The objective was to study the impact of the revised design; criteria were overall productivity, individual productivity, and error rate per tray. Data were collected during a control period to provide comparative baseline data and during an experimental period after implementation of the menu formats.

The mean number of trays and the mean percentage of various diets served during control and experimental periods are shown in Table 1. No statistically significant differences were found between the two periods. Data indicate the study periods were similar in relation to service load and ratio of diets to number of trays.

### Assessment of Productivity

#### Overall Tray Assembly Labor Time

Total assembly time, number of assembly workers, and man-minutes per tray for control and experimental periods are summarized in Table 2. Statistical analyses indicated that total assembly time and man-minutes per tray decreased significantly during the experimental period. Mean total assembly time decreased from 62.59 minutes to 54.79 minutes and total man-minutes decreased from 482.62 in the control period to 422.62 man-minutes in the experimental period. To provide a common base of comparison, man-minutes per tray were computed. A decrease of 0.27 man-minutes per tray was recorded during the experimental period which was an increase in productivity of 11 per cent.

Table 1: Mean percentage of trays served by diet during control and experimental periods

| meal    | period <sup>1</sup> | mean total<br>trays/day | trays served by diet |      |                 |                 |                      |                                 | ← — % — → | other |
|---------|---------------------|-------------------------|----------------------|------|-----------------|-----------------|----------------------|---------------------------------|-----------|-------|
|         |                     |                         | regular              | soft | calcu-<br>lated | clear<br>liquid | sodium<br>restricted | sodium<br>calorie<br>restricted |           |       |
| morning | control             | 165.0                   | 41.3                 | 19.0 | 7.3             | 4.8             | 11.7                 | 8.7                             | 4.6       | 2.6   |
|         | experimental        | 172.3                   | 47.2                 | 18.2 | 7.7             | 4.6             | 10.8                 | 6.6                             | 2.7       | 2.1   |
| noon    | control             | 173.3                   | 40.6                 | 18.1 | 7.7             | 4.8             | 15.2                 | 9.0                             | 4.8       | 2.5   |
|         | experimental        | 178.7                   | 49.1                 | 16.6 | 8.0             | 3.7             | 11.6                 | 6.9                             | 2.4       | 1.7   |
| evening | control             | 184.3                   | 42.7                 | 18.6 | 7.6             | 5.2             | 11.4                 | 7.4                             | 4.0       | 3.1   |
|         | experimental        | 186.0                   | 45.5                 | 17.6 | 7.7             | 5.7             | 11.5                 | 7.2                             | 2.5       | 2.3   |

<sup>1</sup>Each study period consisted of 3 days, 3 meals/day.

Table 2: Mean number of trays served, total assembly time, number of assembly workers, and man-minutes per tray for control and experimental periods

|                                     | control period <sup>1</sup> | experimental period <sup>1</sup> | t value |
|-------------------------------------|-----------------------------|----------------------------------|---------|
| trays served, all diets             | 199.11 ± 16.90 <sup>2</sup> | 195.22 ± 10.52                   | 0.80    |
| total assembly time                 | 62.59 ± 7.41                | 54.79 ± 5.16                     | 2.75*   |
| assembly workers                    | 7.62 ± 0.75                 | 7.75 ± 0.66                      | 0.90    |
| man-minutes<br>total assembly time  | 482.62 ± 63.25              | 422.62 ± 32.49                   | 2.58*   |
| man-minutes/tray (MM <sub>t</sub> ) | 2.44 ± 0.40                 | 2.17 ± 0.22                      | 2.51*   |

<sup>1</sup>Each study period consisted of 3 days, 3 meals/day.

<sup>2</sup>Standard deviation.

\*P ≤ 0.05

These data also were examined by meal and by day for the two study periods (Table 3). Consistent decreases in total assembly time, man-minutes assembly time, and man-minutes per tray were shown during the experimental period.

The increased productivity in the experimental period was attributed to station operators being able to perceive what was to be placed on forthcoming trays earlier. During observations of the tray assembly process operators apparently could direct their vision with the new menu formats and could determine items to place on a tray far in advance of the tray reaching their station. During the control period with use of the original menu formats, station operators had to scan the entire menu because of variations in format and lack of defined areas for direction of visual scanning. They often were observed to be rushed in completion of servicing of individual trays.

Table 3: Mean number of trays served, total assembly time, number of assembly workers, man-minutes assembly time, man-minutes per tray by meal and day in control and experimental periods

|                  | meal <sup>2</sup> | period       | number of trays served  | minutes of total assembly time | number of workers | man-minutes assembly time |           |                                |
|------------------|-------------------|--------------|-------------------------|--------------------------------|-------------------|---------------------------|-----------|--------------------------------|
|                  |                   |              |                         |                                |                   | total                     | per tray  | % change <sup>1</sup> per tray |
| morning          |                   | control      | 186.3± 9.2 <sup>3</sup> | 70.7±4.5                       | 7.3               | 516.4±93.9                | 2.76±0.42 | -16.5                          |
|                  |                   |              | 184.3± 9.5              | 58.3±6.5                       | 7.3               | 423.6±45.9                | 2.31±0.32 |                                |
|                  |                   | experimental |                         |                                |                   |                           |           |                                |
| noon             |                   | control      | 200.0±23.4              | 61.4±0.9                       | 8.0               | 491.5± 7.2                | 2.48±0.28 | -13.0                          |
|                  |                   |              | 196.7± 1.5              | 53.6±3.3                       | 7.9               | 424.3±21.7                | 2.16±0.11 |                                |
|                  |                   | experimental |                         |                                |                   |                           |           |                                |
| evening          |                   | control      | 211.0± 7.2              | 55.7±5.2                       | 7.6               | 440.0±50.3                | 2.08±0.18 | - 1.5                          |
|                  |                   |              | 204.7± 6.0              | 52.5±5.1                       | 8.0               | 420.0±40.4                | 2.05±0.18 |                                |
|                  |                   | experimental |                         |                                |                   |                           |           |                                |
| day <sup>2</sup> | 1                 | control      | 185.7±15.5              | 59.7±9.6                       | 6.9               | 426.6±52.0                | 2.32±0.46 | - 8.3                          |
|                  |                   |              | 198.0± 5.2              | 58.2±5.6                       | 7.3               | 421.8±37.4                | 2.12±0.14 |                                |
|                  |                   | experimental |                         |                                |                   |                           |           |                                |
| 2                |                   | control      | 204.0±20.0              | 62.2±4.8                       | 8.0               | 497.3±38.7                | 2.47±0.45 | - 6.9                          |
|                  |                   |              | 196.3±15.0              | 56.3±3.4                       | 7.9               | 447.6±26.8                | 2.30±0.31 |                                |
|                  |                   | experimental |                         |                                |                   |                           |           |                                |
| 3                |                   | control      | 207.7± 9.2              | 65.9±8.7                       | 8.0               | 523.9±64.5                | 2.54±0.43 | -17.5                          |
|                  |                   |              | 191.3±12.4              | 49.8±2.1                       | 8.0               | 398.4±16.9                | 2.09±0.21 |                                |
|                  |                   | experimental |                         |                                |                   |                           |           |                                |

<sup>1</sup> % change control vs. experimental.

<sup>2</sup> Mean of 3 meals during each study period.

<sup>3</sup> Standard deviation.

### Individual Station Operator Time

Video taping was used to record activities of five tray assembly stations. The technique provided a good means for identifying problems in tray assembly. During pilot work the director of dietetics identified several areas that merited immediate correction after viewing the video tape. One notable change was the establishment of a separate soup and cereal station on one side of the tray conveyor during the morning meal. For a number of years, the soup and cereal station operator had worked from the same hot counter as the hot entree server, facing away from the oncoming trays. Another change made as a result of viewing preliminary video tapes was the combination of meat and potato (or substitute) items for all diets on one station and all other vegetable and soup items on another station on the opposite side of the tray line. Previously, meat, potato (or substitute), vegetable, and soup items for the regular, soft, and fiber restricted diets had been placed together on one station and all other special diet meats, potato (or substitute), vegetable, and soup items placed on another station.

Video taping provides a candid view of an operation and an exact record for research data. The tapes can be replayed repeatedly and individual operator work cycle times can be scrutinized in great detail without causing operators to alter work patterns.

Station operator mean work cycle times for servicing the thirty-six selected trays for all three meals were studied during the control and experimental periods (Table 4). Data also were analyzed by meal and by diet (Tables 5 and 6). No statistically significant differences were found. At the noon meals various operator work times tended to be less during the experimental period. However, times tended to be longer in the evening and times during breakfast were variable among the five operators studied.



Table 4: Station operator mean work cycle time for servicing selected trays during control and experimental periods

| station <sup>1</sup> | period <sup>2</sup> | mean minutes<br>per tray <sup>3</sup> | t<br>value <sup>4</sup> |
|----------------------|---------------------|---------------------------------------|-------------------------|
| 2                    | control             | .26 ± .22 <sup>5</sup>                | 0.47                    |
|                      | experimental        | .28 ± .26                             |                         |
| 3                    | control             | .30 ± .30                             | 0.73                    |
|                      | experimental        | .27 ± .24                             |                         |
| 4                    | control             | .25 ± .19                             | 1.30                    |
|                      | experimental        | .28 ± .21                             |                         |
| 5                    | control             | .27 ± .19                             | 1.38                    |
|                      | experimental        | .31 ± .22                             |                         |
| 6                    | control             | .30 ± .23                             | 0.53                    |
|                      | experimental        | .29 ± .20                             |                         |

<sup>1</sup>Stations 1, 7, and 8 excluded from study.

<sup>2</sup>Data collected from a sample of 36 trays including the same number of diet types for each of 3 meals on the third day of each 3 day study period.

<sup>3</sup>N = 108.

<sup>4</sup>All values non-significant.

<sup>5</sup>Standard deviation.

Table 5: Station operator mean work cycle times for servicing selected trays for morning, noon, and evening meals in control and experimental periods

| station <sup>1</sup> | period <sup>2</sup> | mean minutes per tray  |           |           |
|----------------------|---------------------|------------------------|-----------|-----------|
|                      |                     | morning                | noon      | evening   |
| 2                    | control             | .33 ± .29 <sup>3</sup> | .27 ± .20 | .19 ± .13 |
|                      | experimental        | .34 ± .36              | .25 ± .19 | .25 ± .20 |
| 3                    | control             | .32 ± .31              | .34 ± .39 | .24 ± .17 |
|                      | experimental        | .31 ± .29              | .24 ± .23 | .27 ± .20 |
| 4                    | control             | .26 ± .19              | .28 ± .22 | .21 ± .14 |
|                      | experimental        | .35 ± .24              | .26 ± .20 | .25 ± .18 |
| 5                    | control             | .32 ± .19              | .29 ± .21 | .22 ± .16 |
|                      | experimental        | .34 ± .21              | .29 ± .23 | .31 ± .23 |
| 6                    | control             | .31 ± .17              | .36 ± .31 | .24 ± .18 |
|                      | experimental        | .29 ± .17              | .28 ± .24 | .30 ± .19 |

<sup>1</sup>Stations 1, 7, and 8 excluded from study.

<sup>2</sup>Data collected from 36 trays of the same diet types on the third day of each 3 day study period.

<sup>3</sup>Standard deviation.

Table 6: Station operator mean work cycle times by diet for servicing selected trays in control and experimental periods

| station <sup>1</sup> period <sup>2</sup> | work time per tray by type diet |                |                      |                          |                                |  |                         |
|--|---------------------------------|----------------|----------------------|--------------------------|--------------------------------|--|-------------------------|
|  | regular<br>(N=30)               | soft<br>(N=21) | calculated<br>(N=15) | clear<br>liquid<br>(N=6) | sodium<br>restricted<br>(N=15) | sodium-<br>calorie<br>restricted<br>(N=12) | semi-<br>solid<br>(N=8) |
|  | ← minutes →                     |                |                      |                          |                                |  |                         |
| 2 control                                | .21±.16 <sup>3</sup>            | .31±.21        | .19±.09              | .14±.05                  | .34±.40                        | .37±.22                                    | .29±.18                 |
|  | .27±.33                         | .28±.24        | .25±.10              | .16±.05                  | .36±.28                        | .39±.31                                    | .17±.11                 |
| 3 control                                | .30±.38                         | .21±.15        | .22±.16              | .25±.19                  | .36±.41                        | .47±.34                                    | .38±.20                 |
|  | .26±.28                         | .28±.20        | .25±.15              | .16±.08                  | .25±.24                        | .41±.35                                    | .31±.18                 |
| 4 control                                | .24±.16                         | .25±.15        | .24±.13              | .28±.42                  | .27±.14                        | .23±.22                                    | .29±.26                 |
|  | .29±.25                         | .27±.19        | .30±.17              | .15±.16                  | .28±.21                        | .41±.23                                    | .20±.15                 |
| 5 control                                | .29±.20                         | .24±.17        | .23±.12              | .27±.23                  | .29±.22                        | .35±.26                                    | .23±.14                 |
|  | .29±.24                         | .36±.22        | .23±.15              | .31±.26                  | .28±.17                        | .40±.33                                    | .30±.14                 |
| 6 control                                | .22±.14                         | .31±.19        | .32±.18              | .26±.20                  | .30±.16                        | .37±.26                                    | .52±.56                 |
|  | .27±.15                         | .21±.16        | .31±.16              | .11±.06                  | .38±.27                        | .44±.25                                    | .21±.11                 |

<sup>1</sup>Stations 1, 7, and 8 excluded from study.

<sup>2</sup>Data collected from each of 3 meals on the third day of each period.

<sup>3</sup>Standard deviation.

The sample of trays for measurement of station operator work cycle time was selected from only one of the three study days, representing approximately twenty per cent of the trays served on that day. Also the ratio of diets differed from that in the overall sample (refer to Table 1). Perhaps these differences may aid in explaining why productivity increases were not apparent in this phase of the study, even though overall productivity increases were found.

The overflow of trays on some carts during the experimental period that required trays to be placed on open carts was believed to be an extenuating situation that hampered productivity. Trays placed on these carts had to be covered with foil and given other extra time consuming attention.

During the study operators in stations #2 and #3 were observed to be idle much of the time because the work content of their jobs was limited. They simply placed pre-packaged or pre-dished items on trays; whereas, operators in stations #4 and #5, who selected dishes, portioned hot items on these dishes, and then placed several items on trays, were occupied almost constantly. The only occasion where idle time was noted for these stations was when the checker was bringing a tray back into control that did not meet standards. Productivity might have been improved more had distribution of work been more balanced.

The checker (station #6) caused numerous delays brought about by error correction in the inspection process. These delays were reflected particularly in the work times of operators in stations #4 and #5. The proximity of these stations to the end of the tray line where trays line up close together obstructed operators from pulling the subsequent trays to a position for servicing.

## Accuracy Measurement

## Work Group Errors

Mean number of assembly work group errors per tray decreased significantly ( $P < .001$ ) in the experimental period (Table 7). This was true for morning, noon, and evening meals. The greatest percentage decrease of errors per tray (56%) was found when evening meal tray assembly data were compared. A decrease of 45.4 per cent was seen when overall data were contrasted in both periods.

Table 7: Work group assembly errors per tray in control and experimental periods

| meal      | period <sup>1</sup> | N    | errors/tray            |                       | t value |
|-----------|---------------------|------|------------------------|-----------------------|---------|
|           |                     |      | mean                   | % change <sup>2</sup> |         |
| all meals | control             | 1569 | .48 ± .87 <sup>3</sup> |                       |         |
|           | experimental        | 1611 | .26 ± .63              | -45.4                 | 8.09*** |
| morning   | control             | 498  | .37 ± .72              |                       |         |
|           | experimental        | 517  | .21 ± .50              | -42.0                 | 3.93*** |
| noon      | control             | 520  | .51 ± .89              |                       |         |
|           | experimental        | 536  | .33 ± .76              | -35.6                 | 3.53*** |
| evening   | control             | 553  | .55 ± .95              |                       |         |
|           | experimental        | 558  | .24 ± .59              | -56.0                 | 6.53*** |

<sup>1</sup>Each study period consisted of 3 days, 3 meals/day.

<sup>2</sup>Percentage change, control vs. experimental.

<sup>3</sup>Standard deviation.

\*\*\*p ≤ 0.001

Work group tray assembly errors in relation to possibility of errors per tray in control and experimental periods are summarized in Table 8. Significant decreases in the error ratio were found in the experimental period (Figure 1). Differences in percentage errors were significant when data for all meals, morning, noon, and evening meals were contrasted. The largest percentage change in errors to possibility of errors per tray (59.9 per cent decrease) was found when evening meals were contrasted; the lowest percentage decrease (30.9 per cent decrease), when noon meals were contrasted in the two periods.

Table 8 also indicates mean percentage of tray assembly work group errors<sup>1</sup> and omissions<sup>2</sup> decreased in the experimental period; however, mean percentage of tray assembly work group NOL (or not on line) errors<sup>3</sup> increased. One notable reason for this increase in NOL errors noted during observation was the great increase in the number of patients ordering toast. At the noon and evening meal in the experimental period, as can be seen from the sample printed menus in Appendix A, only the single item "toast" appeared on the menu formats used in the control period; however, on the revised menu formats used during the experimental period (Appendix B), "white toast," "whole wheat toast," and "rye toast" were listed. Orders for toast usually were called out by the operator at station #1, but the toast was usually not ready to be placed on the tray in time and thus NOL errors were recorded.

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<sup>1</sup>Items placed on in addition or instead of proper items.

<sup>2</sup>Omissions from tray.

<sup>3</sup>Items which operators realized were needed for a tray but were not available on the line.

Table 8: Work group tray assembly errors to possibility of errors in control and experimental periods

| meal                    | period <sup>1</sup> | N    | errors to possibility of errors per tray |         |                       |              |                       |         |
|-------------------------|---------------------|------|--|---------|-----------------------|--------------|-----------------------|---------|
|                         |                     |      | mean errors by category                  |         |                       | total errors |                       |         |
|                         |                     |      | NOL <sup>2</sup>                         |         | omission <sup>4</sup> | mean         | % change <sup>5</sup> | t value |
|                         |                     |      | wrong <sup>3</sup>                       | %       |                       |              |                       |         |
| <div>←—————%————→</div> |                     |      |  |         |                       |              |                       |         |
| all meals               | control             | 1569 | 0.3±2.5 <sup>6</sup>                     | 0.6±3.9 | 5.4±10.7              | 6.3±11.6     |                       |         |
|                         | experimental        | 1611 | 0.8±4.1                                  | 0.2±2.3 | 2.5± 7.5              | 3.5± 8.5     | -44.9                 | 7.83*** |
| morning                 | control             | 496  | 0.3±2.4                                  | 0.7±5.2 | 4.5±10.0              | 5.5±11.4     |                       |         |
|                         | experimental        | 517  | 0.5±4.6                                  | 0.4±3.1 | 2.5± 7.0              | 3.3± 8.0     | -40.8                 | 3.62*** |
| noon                    | control             | 520  | 0.5±3.2                                  | 0.4±2.3 | 5.4±10.1              | 6.3±10.8     |                       |         |
|                         | experimental        | 536  | 1.0±4.1                                  | 0.1±0.1 | 3.3± 9.4              | 4.3±10.1     | -30.9                 | 2.98**  |
| evening                 | control             | 553  | 0.2±1.5                                  | 0.7±3.8 | 6.2±11.8              | 7.1±12.5     |                       |         |
|                         | experimental        | 558  | 0.8±3.4                                  | 0.2±2.3 | 1.8± 5.6              | 2.8± 6.9     | -59.9                 | 6.95*** |

<sup>1</sup>Each study period consisted of 3 days, 3 meals/day.<sup>2</sup>Items which operators realized were needed for a tray but were not available on the line.<sup>3</sup>Items placed on in addition or instead of the proper items.<sup>4</sup>Omissions from tray.<sup>5</sup>% change, control vs. experimental.<sup>6</sup>Standard deviation.

\*\*p &lt; 0.01

\*\*\*p &lt; 0.001

**THIS BOOK  
CONTAINS  
NUMEROUS PAGES  
WITH DIAGRAMS  
THAT ARE CROOKED  
COMPARED TO THE  
REST OF THE  
INFORMATION ON  
THE PAGE.**

**THIS IS AS  
RECEIVED FROM  
CUSTOMER.**



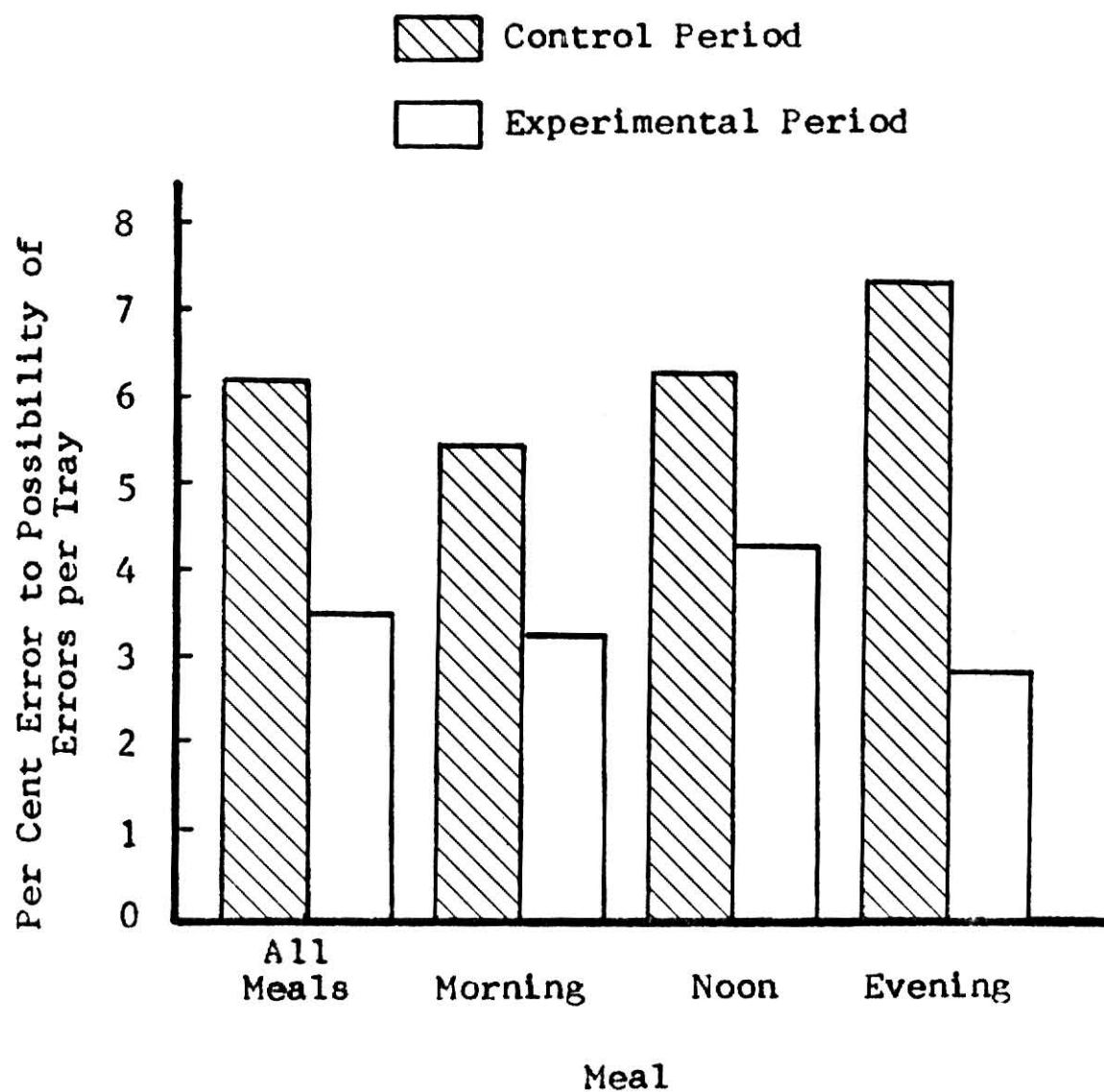


Fig. 1. Work group assembly errors to possibility of errors per tray in control and experimental periods.

Significant decreases in the error ratio were found when control and experimental periods were contrasted by diet (Table 9). Decreases were recorded for all diet types. Percentage decrease of errors to possibility of errors per tray in the experimental compared to the control period was greatest for clear liquid and semi-solid diets (72.8 per cent and 63.4 per cent decrease, respectively).

When other diet categories were considered, the decrease in errors in the experimental period ranged from 11.0 per cent for the category "other diets" to a 49.9 per cent reduction in errors for sodium restricted diets. The largest percentage of errors compiled in any diet category in both control and experimental periods was in the category "other diets." This high percentage of errors could reflect worker inexperience with these infrequently occurring diets.

The percentage of error free trays assembled by the work group (Table 10) increased from 69.9 to 80.9 per cent from the control to the experimental period when all meals were considered. The highest accuracy rating occurred at the evening meal when the percentage of error free trays assembled increased 14.5 per cent.

The highly significant decreases in work group errors resulting from use of the new menu formats in the experimental period may have bolstered productivity. Fewer errors per tray resulted in fewer delays in the inspection process and less time in error correction.

#### Checker Errors

Table 11 summarizes checker mean errors per tray and percentage errors to possibility of errors per tray for control and experimental periods. Significant decreases of checker errors per tray and percentage errors to possibility

Table 9: Percentage of work group tray assembly errors to possibility of errors by diet in control and experimental periods

| diet                         | mean errors to possibility<br>of errors per tray |                         |                                  |             | %<br>change <sup>2</sup> | t<br>value |
|------------------------------|--|-------------------------|----------------------------------|-------------|--------------------------|------------|
|                              | control period <sup>1</sup>                      |                         | experimental period <sup>1</sup> |             |                          |            |
|                              | N <sup>3</sup>                                   |                         | N                                |             |                          |            |
|                              |  | %                       |                                  | %           |                          |            |
| regular                      | 653  | 4.8 ± 10.0 <sup>4</sup> | 761                              | 2.8 ± 7.1   | -41.7                    | 4.23***    |
| soft                         | 291  | 6.2 ± 11.3              | 281                              | 4.0 ± 8.8   | -35.1                    | 2.57**     |
| calculated                   | 118  | 9.8 ± 14.1              | 126                              | 5.0 ± 9.7   | -49.2                    | 3.10**     |
| clear liquid                 | 78   | 5.7 ± 14.4              | 76                               | 1.5 ± 6.6   | -72.8                    | 2.30*      |
| sodium restricted            | 186  | 5.9 ± 10.2              | 182                              | 3.0 ± 7.9   | -49.9                    | 3.10**     |
| sodium-calorie<br>restricted | 131  | 9.2 ± 12.8              | 111                              | 5.3 ± 9.4   | -42.1                    | 2.71**     |
| semi-solid                   | 70   | 8.0 ± 14.6              | 41                               | 2.9 ± 8.0   | -63.4                    | 2.36*      |
| other diets                  | 43   | 12.2 ± 15.5             | 33                               | 10.9 ± 20.2 | -11.0                    | 0.33       |

<sup>1</sup>Data collected from 3 days, 3 meals/day.

<sup>2</sup>% change control vs. experimental.

<sup>3</sup>Total number of trays assembled for all meals and all days by diet during each study period.

<sup>4</sup>Standard deviation.

\*P < 0.05

\*\*P < 0.01

\*\*\*P < 0.001

Table 10: Mean number and percentage of error free trays assembled by tray assembly work group

|                    | period <sup>1</sup> |              |
|--------------------|---------------------|--------------|
|                    | control             | experimental |
| all meals          |                     |              |
| trays served       | 174.2               | 179.0        |
| error free trays   | 121.7               | 144.8        |
| % error free trays | 69.9                | 80.9         |
| morning            |                     |              |
| trays served       | 165.0               | 172.3        |
| error free trays   | 122.0               | 141.3        |
| % error free trays | 73.9                | 82.0         |
| noon               |                     |              |
| trays served       | 173.3               | 178.7        |
| error free trays   | 118.0               | 140.0        |
| % error free trays | 68.1                | 78.3         |
| evening            |                     |              |
| trays served       | 184.3               | 186.0        |
| error free trays   | 125.0               | 153.0        |
| % error free trays | 67.8                | 82.3         |

<sup>1</sup>Each study period consisted of 3 days, 3 meals/day.

of errors per tray from the control to the experimental period were seen when contrasting morning meal periods. There was a significant increase in errors per tray and in percentage of errors to possibility of errors when noon meals were compared in the two periods. When evening meals were contrasted or when all meals were considered together, there were no significant differences.

Table 11: Checker errors per tray in control and experimental periods

| meal      | period <sup>1</sup> | N <sup>2</sup> | errors/tray             |         | errors/possibility<br>of errors per tray |         |
|-----------|---------------------|----------------|-------------------------|---------|--|---------|
|           |                     |                | mean                    | t value | mean                                     | t value |
| all meals |                     |                |                         |         | %  |         |
|           | control             | 472            | 0.10 ± 0.3 <sup>3</sup> |         | 1.35 ± 4.7                               |         |
|           | experimental        | 486            | 0.11 ± 0.3              | 0.54    | 1.58 ± 6.3                               | 0.63    |
| morning   | control             | 145            | 0.12 ± 0.4              |         | 1.70 ± 5.7                               |         |
|           | experimental        | 151            | 0.03 ± 0.2              | 2.80**  | 0.28 ± 1.7                               | 2.86**  |
| noon      | control             | 162            | 0.11 ± 0.3              |         | 1.42 ± 4.4                               |         |
|           | experimental        | 167            | 0.23 ± 0.5              | 2.63**  | 3.53 ± 9.8                               | 2.52*   |
| evening   | control             | 165            | 0.07 ± 0.3              |         | 0.98 ± 3.8                               |         |
|           | experimental        | 168            | 0.07 ± 0.3              | 0.17    | 0.79 ± 2.9                               | 0.49    |

<sup>1</sup>Data collected for 3 meals on the second day of each study period.

<sup>2</sup>Number of trays checked.

<sup>3</sup>Standard deviation.

\*P  $\leq$  0.05

\*\*P  $\leq$  0.01

## SUMMARY AND CONCLUSIONS

Tray assembly is an integral part of providing quality food and the correct items to patients on various types of diets in a hospital foodservice. The menu formats utilized in many hospitals require complex and unnecessary decision making on the part of assembly line station operators in reading and selecting items for the various types of diets. Errors and delays in tray assembly may result and slow the assembly process.

Possibly these errors and delays in tray assembly can be reduced if menu formats were less difficult for the tray assembly operator to visually scan and select correct items. Visual perception concepts indicate that "visual noise" can interfere with perception of a stimulus. Other concepts indicate that clustering words into related categories and organizing stimuli into a sequence of chunks improves a subject's recall of items. Graphic designers purport that readability is enhanced if the focal area is well defined and if adjacent areas are of different colors.

The focus of this study was the design of standardized hospital menu formats for all diets utilizing visual perception concepts. The research site was a 300 bed short-term, general hospital in a large mid-western city. Analysis of existing menus indicated formats differed among the various diets. On the redesigned menus, all items were grouped into basic groups; these groups were assigned specific positions; groups were accentuated by white strips across the various color coded selective menus; and accessory items were placed in specific, standard positions on all menu formats. Effectiveness of design was assessed in the machine paced tray assembly process in the hospital; criteria were overall productivity, individual productivity, and error rate per tray.

Productivity and accuracy were charted during a three-day control period when the existing menu formats were used to provide baseline data and during an experimental period when the redesigned menu formats were used. Overall labor time was measured each meal; man-minutes per tray were calculated to provide a standard base for comparison. Station operator's servicing of trays was recorded on video tape during the last half of the tray assembly period on the third day of each study period. At a later time the video tapes were played back and average work time servicing selected trays was determined for each of five operators. Accuracy was measured in terms of errors per tray and percentage of errors to possibility of errors per tray for the tray assembly work group and for the checker.

Man-minutes per tray decreased significantly in the experimental period, from 2.44 man-minutes to 2.17 man-minutes per tray, or a productivity increase of 11.1 per cent. The individual productivity analysis revealed no significant changes from control to experimental periods. However, the sample of trays for measurement of station operator work cycle time may not have been representative. Also the ratio of diets differed from that in the overall sample. Perhaps these differences explain why productivity increases were not apparent in the individual productivity analysis.

The study indicated that the redesigned menu formats utilized in the experimental period did improve accuracy of response of the tray assembly station operators as a group. The error rate per tray decreased 44.9 per cent, from .48 to .26 errors per tray and the ratio of errors decreased from 6.3 to 3.5 per cent errors to possibility of errors per tray. Significant decreases in work group errors also were noted in the experimental period when data were compared by diet. This ranged from a 10.9 per cent reduction for the category

"other diets" to a 72.8 per cent reduction in errors with the use of the redesigned clear liquid diet formats. The highly significant decrease in work group errors resulting from use of the new menu formats in the experimental period may have bolstered the productivity of the work group.

Checker errors per tray and mean percentage error to possibility of errors per tray did not change significantly from control to experimental periods when the evening meal or when all meals were contrasted in the two periods. However, a significant decrease in checker errors was noted during the morning meal period.

The approach of this study appears to provide a practical means for increasing productivity and improving accuracy of the machine-paced tray assembly process. The tray assembly subsystem merits additional study by the application of other industrial engineering techniques. Time studies with use of video tape appears to be a useful tool for studying work. A candid picture is provided that can be scrutinized in great detail.



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## APPENDIXES

APPENDIX A  
Existing Menu Formats

**BREAKFAST**

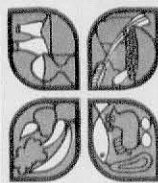
REGULAR DIET

**DINNER**

REGULAR DIET, FRIDAY, WEEK THREE

**SUPPER**

REGULAR DIET



**EAT THE 4 BASIC FOODS EVERY DAY**

An adequate diet is an essential part of your care. We suggest your selections each day include: 2-4 glasses of Milk; 4 servings of Vegetables and Fruits including a green leafy or yellow vegetable and one citrus fruit or tomato; 2 or more servings of Meat, Fish, Poultry, Eggs or Cheese; 4 or more servings of Cereals and Breads or Potato; and 3 servings of Margarine, Oil or other fat. If your menu is stamped.

**BLAND** — Foods to avoid are items marked with parenthesis, ( ), because they contain irritants. Irritants are found in coffee, tea, cocoa, chocolate, cola, meat broth, bouillon, consomme, gravy and soups prepared with meat extracts, mushrooms and spices such as chili powder, cloves, black pepper, mustard seed and nutmeg.

USE SPECIAL PENCIL ONLY TO MAKE MENU SELECTIONS. MARK AS DARK AS POSSIBLE WITH AN X WITHIN BOX ONLY

USE SPECIAL PENCIL ONLY

☐ 1 ORANGE JUICE\*

☐ 2 ORANGE SECTIONS

☐ 3 PINEAPPLE JUICE

☐ 4 CREAM OF WHEAT\*

☐ 5 RAISIN BRAN

☐ 6 POACHED EGG\*

☐ 7 LOW CHOLESTEROL SCRAMBLED EGG

☐ 8 HOT HOMEMADE BUTTERMILK BISCUIT WITH HONEY\*

☐ (COFFEE)

☐ POWDERED

☐ CREAMER

☐ LIQUID

☐ CREAMER

☐ (COCOA)

☐ SANKA

☐ POSTUM

☐ (HOT TEA)

☐ LEMON

☐ CREAM FOR

☐ CEREAL

☐ 2% MILK

☐ SKIM MILK

☐ (CHOC. MILK)

☐ BUTTERMILK

☐ TOAST

☐ WHITE

☐ WHL. WHEAT

☐ RYE

☐ MARGARINE

☐ JELLY

☐ 1 (NAVY BEAN SOUP)

☐ 2 SWISS STEAK\*

☐ 3 SLICED CHICKEN

☐ 4 (CHICKEN POT PIE)

☐ 5 WHIPPED POTATOES\*

☐ 6 BROWN SUGAR GLAZED CARROTS

☐ 7 SEASONED CAULIFLOWER

☐ 8 CARRIBEAN LIME GELATIN

☐ 9 SALAD WITH BANANA\*

☐ 10 PINEAPPLE SHERBET\*

☐ 11 PEAR HALF

☐ (COFFEE)

☐ POWDERED

☐ CREAMER

☐ LIQUID

☐ CREAMER

☐ (COCOA)

☐ SANKA

☐ POSTUM

☐ (HOT TEA)

☐ LEMON

☐ 2% MILK

☐ SKIM MILK

☐ (CHOC. MILK)

☐ BUTTERMILK

☐ BREAD

☐ WHITE

☐ WHL. WHEAT

☐ RYE

☐ TOAST

☐ CRACKERS

☐ MARGARINE

☐ JELLY

☐ VINEGAR

☐ 1 (FRENCH ONION SOUP)

☐ 2 HAMBURGER ON BUN\*

☐ 3 (PICKLES, CATSUP)\*

☐ 4 CANADIAN BACON WITH SUGAR APPLES

☐ 5 STEAMED POTATO\*

☐ 6 CHOPPED BROCCOLI\*

☐ 7 LETTUCE WEDGE WITH THOUSAND ISLAND DRESSING\*

☐ 8 PEACH HALF\*

☐ 9 ORANGE CHIFFON CAKE WITH ORANGE ICING

☐ (COFFEE)

☐ POWDERED

☐ CREAMER

☐ LIQUID

☐ CREAMER

☐ (COCOA)

☐ SANKA

☐ POSTUM

☐ (HOT TEA)

☐ LEMON

☐ 2% MILK

☐ SKIM MILK

☐ (CHOC. MILK)

☐ BUTTERMILK

☐ BREAD

☐ WHITE

☐ WHL. WHEAT

☐ RYE

☐ TOAST

☐ CRACKERS

☐ MARGARINE

☐ JELLY

☐ VINEGAR

Room \_\_\_\_\_ Name \_\_\_\_\_

Room \_\_\_\_\_ Name \_\_\_\_\_

Room \_\_\_\_\_ Name \_\_\_\_\_



# BREAKFAST

CALCULATED DII

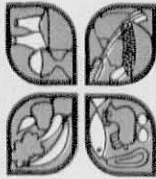
# DINNER

CALCULATED DIET

FRIDAY, WEEK THREE

# SUPPER

CALCULATED DIET



**EAT THE 4 BASIC FOODS EVERY DAY**

An adequate diet is an essential part of your care. We suggest your selections each day include: 2-4 glasses of Milk, 4 servings of Vegetables and Fruits including a green leafy or yellow vegetable and one citrus fruit or tomato; 2 or more servings of Meat, Fish, Poultry, Eggs or Cheese; 4 or more servings of Cereals and Breads or Potato; and 3 servings of Margarine, Oil or other fat. If your menu is stamped.

**BLAND** — Foods to avoid are items marked with parenthesis ( ), because they contain irritants. Irritants are found in coffee, tea, cocoa, chocolate, cola, meat broth, bouillon, consor, soups prepared with meat extracts, mushrooms and spices such as chili powder, cloves, black pepper, mustard seed and nutmeg.

**SOFT** — Foods to avoid are bran, meat gristle, raw vegetables, corn, nuts and raw fruits except ripe banana and orange or grapefruit with membrane removed.

USE SPECIAL PENCIL ONLY TO MAKE MENU SELECTIONS MARK AS DARK AS POSSIBLE WITH AN 'X' WITHIN BOX ONLY

USE SPECIAL PENCIL ONLY

|  |   |   |
|--|---|---|
| <input type="checkbox"/> 1 ORANGE JUICE, ½ CUP                             | <input type="checkbox"/> 1 (FF BROTH)                     | <input type="checkbox"/> 1 (FRENCH ONION SOUP)                      |
| <input type="checkbox"/> 2 ORANGE SECTIONS, ½ CUP                          | <input type="checkbox"/> 2 FF SWISS STEAK                 | <input type="checkbox"/> 2 FF HAMBURGER ON BUN                      |
| <input type="checkbox"/> 3 PINEAPPLE JUICE, ½ CUP                          | <input type="checkbox"/> 3 FF SLICED CHICKEN              | <input type="checkbox"/> 3 (PICKLES, DIET CATSUP)                   |
| <input type="checkbox"/> 4 CREAM OF WHEAT, ½ CUP                           | <input type="checkbox"/> 4 (FF GRAVY)                     | <input type="checkbox"/> 4 FF CANADIAN BACON                        |
| <input type="checkbox"/> 5 PUFFED RICE                                     | <input type="checkbox"/> 5 FF WHIPPED POTATOES, ½ CUP     | <input type="checkbox"/> 5 FF STEAMED POTATO, SMALL                 |
| <input type="checkbox"/> 6 POACHED EGG                                     | <input type="checkbox"/> 6 FF DICED CARROTS, ½ CUP        | <input type="checkbox"/> 6 FF CHOPPED BROCCOLI, ½ CUP               |
| <input type="checkbox"/> 7 LOW CHOLESTEROL SCRAMBLED EGG                   | <input type="checkbox"/> 7 FF SEASONED CAULIFLOWER, ½ CUP | <input type="checkbox"/> 7 LETTUCE WEDGE WITH DIET ITALIAN DRESSING |
| <input type="checkbox"/> 8 HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP | <input type="checkbox"/> 8 DIET LIME GELATIN CUBES        | <input type="checkbox"/> 8 DIET PEACH HALVES, 2                     |
| <input type="checkbox"/> 9   | <input type="checkbox"/> 9 HALF BANANA                    | <input type="checkbox"/> 9 ORANGE SHERBET, ½ CUP                    |
| <input type="checkbox"/> 10  | <input type="checkbox"/> 10 PINEAPPLE SHERBET, ½ CUP      | <input type="checkbox"/> 10   |
| <input type="checkbox"/> 11  | <input type="checkbox"/> 11 DIET PEAR HALVES, 2           | <input type="checkbox"/> 11   |
| <input type="checkbox"/> 12  |   | <input type="checkbox"/> 12   |
| <input type="checkbox"/> 13  |   | <input type="checkbox"/> 13   |
| <input type="checkbox"/> 14  |   | <input type="checkbox"/> 14   |
| <input type="checkbox"/> 15  |   | <input type="checkbox"/> 15   |

Room \_\_\_\_\_ Name \_\_\_\_\_

Room \_\_\_\_\_ Name \_\_\_\_\_

Room \_\_\_\_\_ Name \_\_\_\_\_



APPENDIX B  
Revised Menu Formats

| BREAKFAST   |   | REGULAR DIET                          |   | REGULAR DIET                   |  | REGULAR DIET                   |  |
|---|---|---------------------------------------|---|--------------------------------|--|--------------------------------|--|
| FRIDAY, WEEK THREE  |   | DINNER                                |   | SUPPER                         |  | REGULAR DIET                   |  |
| <p>USE SPECIAL PENCIL ONLY TO MAKE MENU SELECTIONS MARK AS DARK AS POSSIBLE WITH AN X WITHIN BOX ONLY</p> |   | <p>PLEASE HAVE READY BY 8:15 A.M.</p> |   | <p>USE SPECIAL PENCIL ONLY</p> |  | <p>USE SPECIAL PENCIL ONLY</p> |  |
| 1   | ORANGE JUICE*                               | 1                                     | (NAVY BEAN SOUP)                          | 1                              | (FRENCH ONION SOUP)                          | 1                              | (FRENCH ONION SOUP)                          |
| 2   | ORANGE SECTIONS                             | 2                                     |   | 2                              |  | 2                              |  |
| 3   | PINEAPPLE JUICE                             | 3                                     |   | 3                              |  | 3                              |  |
| 4   |   | 4                                     |   | 4                              |  | 4                              |  |
| 5   | CREAM OF WHEAT*                             | 5                                     | SWISS STEAK*                              | 5                              | HAMBURGER ON BUN*                            | 5                              | HAMBURGER ON BUN*                            |
| 6   | RAISIN BRAN                                 | 6                                     | SLICED CHICKEN                            | 6                              | (PICKLES, CATSUP)*                           | 6                              | (PICKLES, CATSUP)*                           |
| 7   |   | 7                                     |   | 7                              | CANADIAN BACON WITH SUGAR                    | 7                              | CANADIAN BACON WITH SUGAR                    |
| 8   |   | 8                                     | (CHICKEN POT PIE)                         | 8                              | APPLES                                       | 8                              | APPLES                                       |
| 9   | POACHED EGG*                                | 9                                     | WHIPPED POTATOES*                         | 9                              | STEAMED POTATO*                              | 9                              | STEAMED POTATO*                              |
| 10  | LOW CHOLESTEROL SCRAMBLED EGG               | 10                                    | BROWN SUGAR GLAZED CARROTS*               | 10                             | CHOPPED BROCCOLI*                            | 10                             | CHOPPED BROCCOLI*                            |
| 11  |   | 11                                    | SEASONED CAULIFLOWER                      | 11                             |  | 11                             |  |
| 12  |   | 12                                    |   | 12                             |  | 12                             |  |
| 13  | HOT HOMEMADE BUTTERMILK BISCUIT WITH HONEY* | 13                                    | CARRIBEAN LIME GELATIN SALAD WITH BANANA* | 13                             | LETTUCE WEDGE WITH THOUSAND ISLAND DRESSING* | 13                             | LETTUCE WEDGE WITH THOUSAND ISLAND DRESSING* |
| 14  |   | 14                                    |   | 14                             |  | 14                             |  |
| 15  |   | 15                                    |   | 15                             |  | 15                             |  |
| 16  |   | 16                                    |   | 16                             |  | 16                             |  |
| 17  |   | 17                                    | PINEAPPLE SHERBET*                        | 17                             | PEACH HALF*                                  | 17                             | PEACH HALF*                                  |
| 18  |   | 18                                    | PEAR HALF                                 | 18                             | ORANGE CHIFFON CAKE WITH ORANGE ICING        | 18                             | ORANGE CHIFFON CAKE WITH ORANGE ICING        |
| 19  |   | 19                                    |   | 19                             |  | 19                             |  |

Room \_\_\_\_\_ Name \_\_\_\_\_ Room \_\_\_\_\_ Name \_\_\_\_\_ Room \_\_\_\_\_ Name \_\_\_\_\_

# **BREAKFAST**

FRIDAY, WEEK THREE

USE SPECIAL PENCIL ONLY TO MAKE MENU SELECTIONS MARK AS DARK AS POSSIBLE WITH AN X WITHIN BOX ONLY

## **CALCULATED DIET**

## **DINNER**

## **CALCULATED DIET**

PLEASE HAVE READY BY 8:15 A.M.

## **SUPPER**

## **CALCULATED DIET**

USE SPECIAL PENCIL ONLY

|  |  |  |  |  |
|--|--|--|--|--|
| 1 <input type="checkbox"/> ORANGE JUICE, 1/2 CUP                             | 1 <input type="checkbox"/> (FF BROTH)                                | 1 <input type="checkbox"/> (COFFEE)                                  | 1 <input type="checkbox"/> (FRENCH ONION SOUP)                       | 1 <input type="checkbox"/> (COFFEE)                                  |
| 2 <input type="checkbox"/> ORANGE SECTIONS, 1/2 CUP                          | 2 <input type="checkbox"/> SANKA                                     | 2 <input type="checkbox"/> SANKA                                     | 2 <input type="checkbox"/> SANKA                                     | 2 <input checked="" type="checkbox"/> SANKA                          |
| 3 <input type="checkbox"/> PINEAPPLE JUICE, 1/2 CUP                          | 3 <input type="checkbox"/> POSTUM                                    | 3 <input type="checkbox"/> POSTUM                                    | 3 <input type="checkbox"/> POSTUM                                    | 3 <input type="checkbox"/> POSTUM                                    |
| 4 <input type="checkbox"/> PINEAPPLE JUICE, 1/2 CUP                          | 4 <input type="checkbox"/> (HOT TEA)                                 | 4 <input type="checkbox"/> (HOT TEA)                                 | 4 <input type="checkbox"/> (HOT TEA)                                 | 4 <input type="checkbox"/> (HOT TEA)                                 |
| 5 <input type="checkbox"/> CREAM OF WHEAT, 1/2 CUP                           | 5 <input type="checkbox"/> LEMON                                     | 5 <input type="checkbox"/> LEMON                                     | 5 <input type="checkbox"/> LEMON                                     | 5 <input type="checkbox"/> LEMON                                     |
| 6 <input type="checkbox"/> CREAM OF WHEAT, 1/2 CUP                           | 6 <input type="checkbox"/> POWD. CREAMER                             | 6 <input type="checkbox"/> POWD. CREAMER                             | 6 <input type="checkbox"/> POWD. CREAMER                             | 6 <input type="checkbox"/> POWD. CREAMER                             |
| 7 <input type="checkbox"/> PUFFED RICE                                       | 7 <input type="checkbox"/> LIQUID CREAMER                            | 7 <input type="checkbox"/> LIQUID CREAMER                            | 7 <input type="checkbox"/> LIQUID CREAMER                            | 7 <input type="checkbox"/> LIQUID CREAMER                            |
| 8 <input type="checkbox"/> POACHED EGG                                       | 8 <input type="checkbox"/> MILK                                      | 8 <input type="checkbox"/> MILK                                      | 8 <input type="checkbox"/> MILK                                      | 8 <input type="checkbox"/> MILK                                      |
| 9 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                     | 9 <input type="checkbox"/> SKIM MILK                                 | 9 <input type="checkbox"/> SKIM MILK                                 | 9 <input type="checkbox"/> SKIM MILK                                 | 9 <input type="checkbox"/> SKIM MILK                                 |
| 10 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 10 <input checked="" type="checkbox"/> (LOC. MILK)                   | 10 <input checked="" type="checkbox"/> BUTTERMILK                    | 10 <input type="checkbox"/> BUTTERMILK                               | 10 <input checked="" type="checkbox"/> BUTTERMILK                    |
| 11 <input type="checkbox"/> POACHED EGG                                      | 11 <input type="checkbox"/> BUTTERMILK                               | 11 <input type="checkbox"/> BUTTERMILK                               | 11 <input type="checkbox"/> BUTTERMILK                               | 11 <input type="checkbox"/> BUTTERMILK                               |
| 12 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 12 <input type="checkbox"/> (ICED TEA)                               | 12 <input type="checkbox"/> (ICED TEA)                               | 12 <input type="checkbox"/> (ICED TEA)                               | 12 <input type="checkbox"/> (ICED TEA)                               |
| 13 <input type="checkbox"/> POACHED EGG                                      | 13 <input type="checkbox"/> (FF SWISS STEAK)                         | 13 <input type="checkbox"/> (FF SWISS STEAK)                         | 13 <input type="checkbox"/> (FF HAMBURGER ON BUN)                    | 13 <input type="checkbox"/> (FF HAMBURGER ON BUN)                    |
| 14 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 14 <input type="checkbox"/> FF SLICED CHICKEN                        | 14 <input type="checkbox"/> FF SLICED CHICKEN                        | 14 <input type="checkbox"/> (PICKLES, DIET CATSUP)                   | 14 <input type="checkbox"/> (PICKLES, DIET CATSUP)                   |
| 15 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 15 <input type="checkbox"/> (FF GRAVY)                               | 15 <input type="checkbox"/> (FF GRAVY)                               | 15 <input type="checkbox"/> FF CANADIAN BACON                        | 15 <input type="checkbox"/> FF CANADIAN BACON                        |
| 16 <input type="checkbox"/> POACHED EGG                                      | 16 <input type="checkbox"/> WHITE TOAST                              | 16 <input type="checkbox"/> WHITE TOAST                              | 16 <input type="checkbox"/> WHITE TOAST                              | 16 <input type="checkbox"/> WHITE TOAST                              |
| 17 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 17 <input type="checkbox"/> WH. WHEAT TOAST                          | 17 <input type="checkbox"/> WH. WHEAT TOAST                          | 17 <input type="checkbox"/> WH. WHEAT TOAST                          | 17 <input type="checkbox"/> WH. WHEAT TOAST                          |
| 18 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 18 <input type="checkbox"/> RYE TOAST                                | 18 <input type="checkbox"/> RYE TOAST                                | 18 <input type="checkbox"/> RYE TOAST                                | 18 <input type="checkbox"/> RYE TOAST                                |
| 19 <input type="checkbox"/> POACHED EGG                                      | 19 <input type="checkbox"/> WHITE BREAD                              | 19 <input type="checkbox"/> WHITE BREAD                              | 19 <input type="checkbox"/> WHITE BREAD                              | 19 <input type="checkbox"/> WHITE BREAD                              |
| 20 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 20 <input type="checkbox"/> WH. WHEAT BREAD                          | 20 <input type="checkbox"/> WH. WHEAT BREAD                          | 20 <input type="checkbox"/> WH. WHEAT BREAD                          | 20 <input type="checkbox"/> WH. WHEAT BREAD                          |
| 21 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 21 <input type="checkbox"/> RYE BREAD                                | 21 <input type="checkbox"/> RYE BREAD                                | 21 <input type="checkbox"/> RYE BREAD                                | 21 <input type="checkbox"/> RYE BREAD                                |
| 22 <input type="checkbox"/> POACHED EGG                                      | 22 <input type="checkbox"/> CRACKERS                                 | 22 <input type="checkbox"/> CRACKERS                                 | 22 <input type="checkbox"/> CRACKERS                                 | 22 <input type="checkbox"/> CRACKERS                                 |
| 23 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 23 <input type="checkbox"/> LETTUCE WEDGE WITH DIET ITALIAN DRESSING | 23 <input type="checkbox"/> LETTUCE WEDGE WITH DIET ITALIAN DRESSING | 23 <input type="checkbox"/> LETTUCE WEDGE WITH DIET ITALIAN DRESSING | 23 <input type="checkbox"/> LETTUCE WEDGE WITH DIET ITALIAN DRESSING |
| 24 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 24 <input type="checkbox"/> MARGARINE                                | 24 <input type="checkbox"/> MARGARINE                                | 24 <input type="checkbox"/> MARGARINE                                | 24 <input type="checkbox"/> MARGARINE                                |
| 25 <input type="checkbox"/> POACHED EGG                                      | 25 <input type="checkbox"/> MARGARINE                                | 25 <input type="checkbox"/> MARGARINE                                | 25 <input type="checkbox"/> MARGARINE                                | 25 <input type="checkbox"/> MARGARINE                                |
| 26 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 26 <input type="checkbox"/> MARGARINE                                | 26 <input type="checkbox"/> MARGARINE                                | 26 <input type="checkbox"/> MARGARINE                                | 26 <input type="checkbox"/> MARGARINE                                |
| 27 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 27 <input type="checkbox"/> MARGARINE                                | 27 <input type="checkbox"/> MARGARINE                                | 27 <input type="checkbox"/> MARGARINE                                | 27 <input type="checkbox"/> MARGARINE                                |
| 28 <input type="checkbox"/> POACHED EGG                                      | 28 <input type="checkbox"/> MARGARINE                                | 28 <input type="checkbox"/> MARGARINE                                | 28 <input type="checkbox"/> MARGARINE                                | 28 <input type="checkbox"/> MARGARINE                                |
| 29 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 29 <input type="checkbox"/> MARGARINE                                | 29 <input type="checkbox"/> MARGARINE                                | 29 <input type="checkbox"/> MARGARINE                                | 29 <input type="checkbox"/> MARGARINE                                |
| 30 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 30 <input type="checkbox"/> MARGARINE                                | 30 <input type="checkbox"/> MARGARINE                                | 30 <input type="checkbox"/> MARGARINE                                | 30 <input type="checkbox"/> MARGARINE                                |
| 31 <input type="checkbox"/> POACHED EGG                                      | 31 <input type="checkbox"/> MARGARINE                                | 31 <input type="checkbox"/> MARGARINE                                | 31 <input type="checkbox"/> MARGARINE                                | 31 <input type="checkbox"/> MARGARINE                                |
| 32 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 32 <input type="checkbox"/> MARGARINE                                | 32 <input type="checkbox"/> MARGARINE                                | 32 <input type="checkbox"/> MARGARINE                                | 32 <input type="checkbox"/> MARGARINE                                |
| 33 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 33 <input type="checkbox"/> MARGARINE                                | 33 <input type="checkbox"/> MARGARINE                                | 33 <input type="checkbox"/> MARGARINE                                | 33 <input type="checkbox"/> MARGARINE                                |
| 34 <input type="checkbox"/> POACHED EGG                                      | 34 <input type="checkbox"/> MARGARINE                                | 34 <input type="checkbox"/> MARGARINE                                | 34 <input type="checkbox"/> MARGARINE                                | 34 <input type="checkbox"/> MARGARINE                                |
| 35 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 35 <input type="checkbox"/> MARGARINE                                | 35 <input type="checkbox"/> MARGARINE                                | 35 <input type="checkbox"/> MARGARINE                                | 35 <input type="checkbox"/> MARGARINE                                |
| 36 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 36 <input type="checkbox"/> MARGARINE                                | 36 <input type="checkbox"/> MARGARINE                                | 36 <input type="checkbox"/> MARGARINE                                | 36 <input type="checkbox"/> MARGARINE                                |
| 37 <input type="checkbox"/> POACHED EGG                                      | 37 <input type="checkbox"/> MARGARINE                                | 37 <input type="checkbox"/> MARGARINE                                | 37 <input type="checkbox"/> MARGARINE                                | 37 <input type="checkbox"/> MARGARINE                                |
| 38 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 38 <input type="checkbox"/> MARGARINE                                | 38 <input type="checkbox"/> MARGARINE                                | 38 <input type="checkbox"/> MARGARINE                                | 38 <input type="checkbox"/> MARGARINE                                |
| 39 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 39 <input type="checkbox"/> MARGARINE                                | 39 <input type="checkbox"/> MARGARINE                                | 39 <input type="checkbox"/> MARGARINE                                | 39 <input type="checkbox"/> MARGARINE                                |
| 40 <input type="checkbox"/> POACHED EGG                                      | 40 <input type="checkbox"/> MARGARINE                                | 40 <input type="checkbox"/> MARGARINE                                | 40 <input type="checkbox"/> MARGARINE                                | 40 <input type="checkbox"/> MARGARINE                                |
| 41 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 41 <input type="checkbox"/> MARGARINE                                | 41 <input type="checkbox"/> MARGARINE                                | 41 <input type="checkbox"/> MARGARINE                                | 41 <input type="checkbox"/> MARGARINE                                |
| 42 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 42 <input type="checkbox"/> MARGARINE                                | 42 <input type="checkbox"/> MARGARINE                                | 42 <input type="checkbox"/> MARGARINE                                | 42 <input type="checkbox"/> MARGARINE                                |
| 43 <input type="checkbox"/> POACHED EGG                                      | 43 <input type="checkbox"/> MARGARINE                                | 43 <input type="checkbox"/> MARGARINE                                | 43 <input type="checkbox"/> MARGARINE                                | 43 <input type="checkbox"/> MARGARINE                                |
| 44 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 44 <input type="checkbox"/> MARGARINE                                | 44 <input type="checkbox"/> MARGARINE                                | 44 <input type="checkbox"/> MARGARINE                                | 44 <input type="checkbox"/> MARGARINE                                |
| 45 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 45 <input type="checkbox"/> MARGARINE                                | 45 <input type="checkbox"/> MARGARINE                                | 45 <input type="checkbox"/> MARGARINE                                | 45 <input type="checkbox"/> MARGARINE                                |
| 46 <input type="checkbox"/> POACHED EGG                                      | 46 <input type="checkbox"/> MARGARINE                                | 46 <input type="checkbox"/> MARGARINE                                | 46 <input type="checkbox"/> MARGARINE                                | 46 <input type="checkbox"/> MARGARINE                                |
| 47 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 47 <input type="checkbox"/> MARGARINE                                | 47 <input type="checkbox"/> MARGARINE                                | 47 <input type="checkbox"/> MARGARINE                                | 47 <input type="checkbox"/> MARGARINE                                |
| 48 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 48 <input type="checkbox"/> MARGARINE                                | 48 <input type="checkbox"/> MARGARINE                                | 48 <input type="checkbox"/> MARGARINE                                | 48 <input type="checkbox"/> MARGARINE                                |
| 49 <input type="checkbox"/> POACHED EGG                                      | 49 <input type="checkbox"/> MARGARINE                                | 49 <input type="checkbox"/> MARGARINE                                | 49 <input type="checkbox"/> MARGARINE                                | 49 <input type="checkbox"/> MARGARINE                                |
| 50 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 50 <input type="checkbox"/> MARGARINE                                | 50 <input type="checkbox"/> MARGARINE                                | 50 <input type="checkbox"/> MARGARINE                                | 50 <input type="checkbox"/> MARGARINE                                |
| 51 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 51 <input type="checkbox"/> MARGARINE                                | 51 <input type="checkbox"/> MARGARINE                                | 51 <input type="checkbox"/> MARGARINE                                | 51 <input type="checkbox"/> MARGARINE                                |
| 52 <input type="checkbox"/> POACHED EGG                                      | 52 <input type="checkbox"/> MARGARINE                                | 52 <input type="checkbox"/> MARGARINE                                | 52 <input type="checkbox"/> MARGARINE                                | 52 <input type="checkbox"/> MARGARINE                                |
| 53 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 53 <input type="checkbox"/> MARGARINE                                | 53 <input type="checkbox"/> MARGARINE                                | 53 <input type="checkbox"/> MARGARINE                                | 53 <input type="checkbox"/> MARGARINE                                |
| 54 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 54 <input type="checkbox"/> MARGARINE                                | 54 <input type="checkbox"/> MARGARINE                                | 54 <input type="checkbox"/> MARGARINE                                | 54 <input type="checkbox"/> MARGARINE                                |
| 55 <input type="checkbox"/> POACHED EGG                                      | 55 <input type="checkbox"/> MARGARINE                                | 55 <input type="checkbox"/> MARGARINE                                | 55 <input type="checkbox"/> MARGARINE                                | 55 <input type="checkbox"/> MARGARINE                                |
| 56 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 56 <input type="checkbox"/> MARGARINE                                | 56 <input type="checkbox"/> MARGARINE                                | 56 <input type="checkbox"/> MARGARINE                                | 56 <input type="checkbox"/> MARGARINE                                |
| 57 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 57 <input type="checkbox"/> MARGARINE                                | 57 <input type="checkbox"/> MARGARINE                                | 57 <input type="checkbox"/> MARGARINE                                | 57 <input type="checkbox"/> MARGARINE                                |
| 58 <input type="checkbox"/> POACHED EGG                                      | 58 <input type="checkbox"/> MARGARINE                                | 58 <input type="checkbox"/> MARGARINE                                | 58 <input type="checkbox"/> MARGARINE                                | 58 <input type="checkbox"/> MARGARINE                                |
| 59 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 59 <input type="checkbox"/> MARGARINE                                | 59 <input type="checkbox"/> MARGARINE                                | 59 <input type="checkbox"/> MARGARINE                                | 59 <input type="checkbox"/> MARGARINE                                |
| 60 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 60 <input type="checkbox"/> MARGARINE                                | 60 <input type="checkbox"/> MARGARINE                                | 60 <input type="checkbox"/> MARGARINE                                | 60 <input type="checkbox"/> MARGARINE                                |
| 61 <input type="checkbox"/> POACHED EGG                                      | 61 <input type="checkbox"/> MARGARINE                                | 61 <input type="checkbox"/> MARGARINE                                | 61 <input type="checkbox"/> MARGARINE                                | 61 <input type="checkbox"/> MARGARINE                                |
| 62 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 62 <input type="checkbox"/> MARGARINE                                | 62 <input type="checkbox"/> MARGARINE                                | 62 <input type="checkbox"/> MARGARINE                                | 62 <input type="checkbox"/> MARGARINE                                |
| 63 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 63 <input type="checkbox"/> MARGARINE                                | 63 <input type="checkbox"/> MARGARINE                                | 63 <input type="checkbox"/> MARGARINE                                | 63 <input type="checkbox"/> MARGARINE                                |
| 64 <input type="checkbox"/> POACHED EGG                                      | 64 <input type="checkbox"/> MARGARINE                                | 64 <input type="checkbox"/> MARGARINE                                | 64 <input type="checkbox"/> MARGARINE                                | 64 <input type="checkbox"/> MARGARINE                                |
| 65 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 65 <input type="checkbox"/> MARGARINE                                | 65 <input type="checkbox"/> MARGARINE                                | 65 <input type="checkbox"/> MARGARINE                                | 65 <input type="checkbox"/> MARGARINE                                |
| 66 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 66 <input type="checkbox"/> MARGARINE                                | 66 <input type="checkbox"/> MARGARINE                                | 66 <input type="checkbox"/> MARGARINE                                | 66 <input type="checkbox"/> MARGARINE                                |
| 67 <input type="checkbox"/> POACHED EGG                                      | 67 <input type="checkbox"/> MARGARINE                                | 67 <input type="checkbox"/> MARGARINE                                | 67 <input type="checkbox"/> MARGARINE                                | 67 <input type="checkbox"/> MARGARINE                                |
| 68 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 68 <input type="checkbox"/> MARGARINE                                | 68 <input type="checkbox"/> MARGARINE                                | 68 <input type="checkbox"/> MARGARINE                                | 68 <input type="checkbox"/> MARGARINE                                |
| 69 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 69 <input type="checkbox"/> MARGARINE                                | 69 <input type="checkbox"/> MARGARINE                                | 69 <input type="checkbox"/> MARGARINE                                | 69 <input type="checkbox"/> MARGARINE                                |
| 70 <input type="checkbox"/> POACHED EGG                                      | 70 <input type="checkbox"/> MARGARINE                                | 70 <input type="checkbox"/> MARGARINE                                | 70 <input type="checkbox"/> MARGARINE                                | 70 <input type="checkbox"/> MARGARINE                                |
| 71 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 71 <input type="checkbox"/> MARGARINE                                | 71 <input type="checkbox"/> MARGARINE                                | 71 <input type="checkbox"/> MARGARINE                                | 71 <input type="checkbox"/> MARGARINE                                |
| 72 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 72 <input type="checkbox"/> MARGARINE                                | 72 <input type="checkbox"/> MARGARINE                                | 72 <input type="checkbox"/> MARGARINE                                | 72 <input type="checkbox"/> MARGARINE                                |
| 73 <input type="checkbox"/> POACHED EGG                                      | 73 <input type="checkbox"/> MARGARINE                                | 73 <input type="checkbox"/> MARGARINE                                | 73 <input type="checkbox"/> MARGARINE                                | 73 <input type="checkbox"/> MARGARINE                                |
| 74 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 74 <input type="checkbox"/> MARGARINE                                | 74 <input type="checkbox"/> MARGARINE                                | 74 <input type="checkbox"/> MARGARINE                                | 74 <input type="checkbox"/> MARGARINE                                |
| 75 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 75 <input type="checkbox"/> MARGARINE                                | 75 <input type="checkbox"/> MARGARINE                                | 75 <input type="checkbox"/> MARGARINE                                | 75 <input type="checkbox"/> MARGARINE                                |
| 76 <input type="checkbox"/> POACHED EGG                                      | 76 <input type="checkbox"/> MARGARINE                                | 76 <input type="checkbox"/> MARGARINE                                | 76 <input type="checkbox"/> MARGARINE                                | 76 <input type="checkbox"/> MARGARINE                                |
| 77 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 77 <input type="checkbox"/> MARGARINE                                | 77 <input type="checkbox"/> MARGARINE                                | 77 <input type="checkbox"/> MARGARINE                                | 77 <input type="checkbox"/> MARGARINE                                |
| 78 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 78 <input type="checkbox"/> MARGARINE                                | 78 <input type="checkbox"/> MARGARINE                                | 78 <input type="checkbox"/> MARGARINE                                | 78 <input type="checkbox"/> MARGARINE                                |
| 79 <input type="checkbox"/> POACHED EGG                                      | 79 <input type="checkbox"/> MARGARINE                                | 79 <input type="checkbox"/> MARGARINE                                | 79 <input type="checkbox"/> MARGARINE                                | 79 <input type="checkbox"/> MARGARINE                                |
| 80 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 80 <input type="checkbox"/> MARGARINE                                | 80 <input type="checkbox"/> MARGARINE                                | 80 <input type="checkbox"/> MARGARINE                                | 80 <input type="checkbox"/> MARGARINE                                |
| 81 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 81 <input type="checkbox"/> MARGARINE                                | 81 <input type="checkbox"/> MARGARINE                                | 81 <input type="checkbox"/> MARGARINE                                | 81 <input type="checkbox"/> MARGARINE                                |
| 82 <input type="checkbox"/> POACHED EGG                                      | 82 <input type="checkbox"/> MARGARINE                                | 82 <input type="checkbox"/> MARGARINE                                | 82 <input type="checkbox"/> MARGARINE                                | 82 <input type="checkbox"/> MARGARINE                                |
| 83 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 83 <input type="checkbox"/> MARGARINE                                | 83 <input type="checkbox"/> MARGARINE                                | 83 <input type="checkbox"/> MARGARINE                                | 83 <input type="checkbox"/> MARGARINE                                |
| 84 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 84 <input type="checkbox"/> MARGARINE                                | 84 <input type="checkbox"/> MARGARINE                                | 84 <input type="checkbox"/> MARGARINE                                | 84 <input type="checkbox"/> MARGARINE                                |
| 85 <input type="checkbox"/> POACHED EGG                                      | 85 <input type="checkbox"/> MARGARINE                                | 85 <input type="checkbox"/> MARGARINE                                | 85 <input type="checkbox"/> MARGARINE                                | 85 <input type="checkbox"/> MARGARINE                                |
| 86 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 86 <input type="checkbox"/> MARGARINE                                | 86 <input type="checkbox"/> MARGARINE                                | 86 <input type="checkbox"/> MARGARINE                                | 86 <input type="checkbox"/> MARGARINE                                |
| 87 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 87 <input type="checkbox"/> MARGARINE                                | 87 <input type="checkbox"/> MARGARINE                                | 87 <input type="checkbox"/> MARGARINE                                | 87 <input type="checkbox"/> MARGARINE                                |
| 88 <input type="checkbox"/> POACHED EGG                                      | 88 <input type="checkbox"/> MARGARINE                                | 88 <input type="checkbox"/> MARGARINE                                | 88 <input type="checkbox"/> MARGARINE                                | 88 <input type="checkbox"/> MARGARINE                                |
| 89 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 89 <input type="checkbox"/> MARGARINE                                | 89 <input type="checkbox"/> MARGARINE                                | 89 <input type="checkbox"/> MARGARINE                                | 89 <input type="checkbox"/> MARGARINE                                |
| 90 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 90 <input type="checkbox"/> MARGARINE                                | 90 <input type="checkbox"/> MARGARINE                                | 90 <input type="checkbox"/> MARGARINE                                | 90 <input type="checkbox"/> MARGARINE                                |
| 91 <input type="checkbox"/> POACHED EGG                                      | 91 <input type="checkbox"/> MARGARINE                                | 91 <input type="checkbox"/> MARGARINE                                | 91 <input type="checkbox"/> MARGARINE                                | 91 <input type="checkbox"/> MARGARINE                                |
| 92 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 92 <input type="checkbox"/> MARGARINE                                | 92 <input type="checkbox"/> MARGARINE                                | 92 <input type="checkbox"/> MARGARINE                                | 92 <input type="checkbox"/> MARGARINE                                |
| 93 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 93 <input type="checkbox"/> MARGARINE                                | 93 <input type="checkbox"/> MARGARINE                                | 93 <input type="checkbox"/> MARGARINE                                | 93 <input type="checkbox"/> MARGARINE                                |
| 94 <input type="checkbox"/> POACHED EGG                                      | 94 <input type="checkbox"/> MARGARINE                                | 94 <input type="checkbox"/> MARGARINE                                | 94 <input type="checkbox"/> MARGARINE                                | 94 <input type="checkbox"/> MARGARINE                                |
| 95 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 95 <input type="checkbox"/> MARGARINE                                | 95 <input type="checkbox"/> MARGARINE                                | 95 <input type="checkbox"/> MARGARINE                                | 95 <input type="checkbox"/> MARGARINE                                |
| 96 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 96 <input type="checkbox"/> MARGARINE                                | 96 <input type="checkbox"/> MARGARINE                                | 96 <input type="checkbox"/> MARGARINE                                | 96 <input type="checkbox"/> MARGARINE                                |
| 97 <input type="checkbox"/> POACHED EGG                                      | 97 <input type="checkbox"/> MARGARINE                                | 97 <input type="checkbox"/> MARGARINE                                | 97 <input type="checkbox"/> MARGARINE                                | 97 <input type="checkbox"/> MARGARINE                                |
| 98 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                    | 98 <input type="checkbox"/> MARGARINE                                | 98 <input type="checkbox"/> MARGARINE                                | 98 <input type="checkbox"/> MARGARINE                                | 98 <input type="checkbox"/> MARGARINE                                |
| 99 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP  | 99 <input type="checkbox"/> MARGARINE                                | 99 <input type="checkbox"/> MARGARINE                                | 99 <input type="checkbox"/> MARGARINE                                | 99 <input type="checkbox"/> MARGARINE                                |
| 100 <input type="checkbox"/> POACHED EGG                                     | 100 <input type="checkbox"/> MARGARINE                               | 100 <input type="checkbox"/> MARGARINE                               | 100 <input type="checkbox"/> MARGARINE                               | 100 <input type="checkbox"/> MARGARINE                               |
| 101 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                   | 101 <input type="checkbox"/> MARGARINE                               | 101 <input type="checkbox"/> MARGARINE                               | 101 <input type="checkbox"/> MARGARINE                               | 101 <input type="checkbox"/> MARGARINE                               |
| 102 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP | 102 <input type="checkbox"/> MARGARINE                               | 102 <input type="checkbox"/> MARGARINE                               | 102 <input type="checkbox"/> MARGARINE                               | 102 <input type="checkbox"/> MARGARINE                               |
| 103 <input type="checkbox"/> POACHED EGG                                     | 103 <input type="checkbox"/> MARGARINE                               | 103 <input type="checkbox"/> MARGARINE                               | 103 <input type="checkbox"/> MARGARINE                               | 103 <input type="checkbox"/> MARGARINE                               |
| 104 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                   | 104 <input type="checkbox"/> MARGARINE                               | 104 <input type="checkbox"/> MARGARINE                               | 104 <input type="checkbox"/> MARGARINE                               | 104 <input type="checkbox"/> MARGARINE                               |
| 105 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP | 105 <input type="checkbox"/> MARGARINE                               | 105 <input type="checkbox"/> MARGARINE                               | 105 <input type="checkbox"/> MARGARINE                               | 105 <input type="checkbox"/> MARGARINE                               |
| 106 <input type="checkbox"/> POACHED EGG                                     | 106 <input type="checkbox"/> MARGARINE                               | 106 <input type="checkbox"/> MARGARINE                               | 106 <input type="checkbox"/> MARGARINE                               | 106 <input type="checkbox"/> MARGARINE                               |
| 107 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                   | 107 <input type="checkbox"/> MARGARINE                               | 107 <input type="checkbox"/> MARGARINE                               | 107 <input type="checkbox"/> MARGARINE                               | 107 <input type="checkbox"/> MARGARINE                               |
| 108 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP | 108 <input type="checkbox"/> MARGARINE                               | 108 <input type="checkbox"/> MARGARINE                               | 108 <input type="checkbox"/> MARGARINE                               | 108 <input type="checkbox"/> MARGARINE                               |
| 109 <input type="checkbox"/> POACHED EGG                                     | 109 <input type="checkbox"/> MARGARINE                               | 109 <input type="checkbox"/> MARGARINE                               | 109 <input type="checkbox"/> MARGARINE                               | 109 <input type="checkbox"/> MARGARINE                               |
| 110 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                   | 110 <input type="checkbox"/> MARGARINE                               | 110 <input type="checkbox"/> MARGARINE                               | 110 <input type="checkbox"/> MARGARINE                               | 110 <input type="checkbox"/> MARGARINE                               |
| 111 <input type="checkbox"/> HOT HOMEMADE BUTTERMILK BISCUIT WITH DIET SYRUP | 111 <input type="checkbox"/> MARGARINE                               | 111 <input type="checkbox"/> MARGARINE                               | 111 <input type="checkbox"/> MARGARINE                               | 111 <input type="checkbox"/> MARGARINE                               |
| 112 <input type="checkbox"/> POACHED EGG                                     | 112 <input type="checkbox"/> MARGARINE                               | 112 <input type="checkbox"/> MARGARINE                               | 112 <input type="checkbox"/> MARGARINE                               | 112 <input type="checkbox"/> MARGARINE                               |
| 113 <input type="checkbox"/> LOW CHOLESTEROL SCRAMBLED EGG                   | 113 <input type="checkbox"/> MARGARINE                               | 113 <input type="checkbox"/> MARGARINE                               | 113 <input type="checkbox"/> MARGARINE                               | 113 <input type="checkbox"/> MARGARINE                               |

APPENDIX C

Selective Menus Served During Control  
and Experimental Periods

# **ILLEGIBLE DOCUMENT**

**THE FOLLOWING  
DOCUMENT(S) IS OF  
POOR LEGIBILITY IN  
THE ORIGINAL**

**THIS IS THE BEST  
COPY AVAILABLE**

# SELECTIVE MENUS SERVED DURING CONTROL AND EXPERIMENTAL PERIODS

## DAY I

|         | Meal | Regular  | Soft   | Fiber Restricted   | Sodium Controlled   | Sodium and Calorie Controlled   | Calculated  |
|---------|------|--|--|--|---|---|---|
| Morning |      | orange juice<br>orange sections<br>tomato juice<br>petti/ohns<br>sugar pops  | orange juice<br>orange sections<br>tomato juice<br>petti/ohns<br>sugar pops  | orange juice<br>prune juice<br>cream of rice<br>sugar pops   | orange juice<br>orange sections<br>*SF tomato juice<br>SF petti/ohns<br>sugar pops<br>puffed wheat<br>hard cooked egg<br>low cholesterol<br>scrambled egg<br>cinnamon coffee cake   | orange juice<br>orange sections<br>SF tomato juice<br>SF petti/ohns<br>corn flakes<br>puffed wheat<br>hard cooked egg<br>low cholesterol<br>scrambled egg   | orange juice<br>orange sections<br>tomato juice<br>petti/ohns<br>corn flakes<br>hard cooked egg<br>low cholesterol<br>scrambled egg   |
|         |      | hard cooked egg<br>low cholesterol<br>scrambled egg<br>cinnamon coffee cake  | hard cooked egg<br>low cholesterol<br>scrambled egg<br>cinnamon coffee cake  | hard cooked egg<br>low cholesterol<br>scrambled egg<br>cinnamon coffee cake  | hard cooked egg<br>low cholesterol<br>scrambled egg<br>cinnamon coffee cake   | hard cooked egg<br>low cholesterol<br>scrambled egg   | hard cooked egg<br>low cholesterol<br>scrambled egg   |
| Noon    |      | cauliflower soup<br>barbecued meat balls<br>meat balls<br>baked ham<br>raisin sauce<br>rice pilaf<br>fluffy rice<br>seven-minute cabbage<br>turnips and greens<br>fruited red gelatin<br>peanut butter cookies<br>pineapple slices | cauliflower soup<br>barbecued meat balls<br>meat balls<br>baked ham<br>raisin sauce<br>rice pilaf<br>fluffy rice<br>seven-minute cabbage<br>turnips and greens<br>fruited red gelatin<br>peanut butter cookies<br>pineapple slices | broth<br>baked ham<br>chilled tuna<br>salad dressing<br>fluffy rice<br>seven-minute cabbage<br>turnips and greens<br>fruited red gelatin<br>butter cookies | SF cauliflower soup<br>SF barbecued meat balls<br>SF meat balls<br>SF chilled tuna<br>salad dressing<br>SF fluffy rice<br>SF cabbage<br>SF turnips and greens<br>fruited red gelatin salad<br>SF butter cookies<br>pineapple slices | SF cauliflower soup<br>**SFFF barbecued meat balls<br>SFFF meat balls<br>SFFF chilled tuna<br>salad dressing<br>SFFF fluffy rice<br>SFFF cabbage<br>SFFF turnips and greens<br>diet fruited gelatin salad<br>SF butter cookies<br>diet pineapple slices | cauliflower soup<br>***SFFF barbecued meat balls<br>SF meat balls<br>SF baked ham<br>SF fluffy rice<br>SF cabbage<br>SF turnips and greens<br>diet fruited gelatin salad<br>butter cookies<br>diet pineapple slices |
|         |      | bouillon<br>turkey tetrazzini<br>beef pattie   | bouillon<br>turkey tetrazzini<br>roast turkey<br>gravy<br>beef pattie  | beef broth<br>roast turkey<br>gravy<br>plain beef pattie   | SF bouillon<br>SF turkey tetrazzini<br>SF gravy<br>SF sliced turkey<br>SF beef pattie   | SF bouillon<br>SFFF roast turkey<br>SFFF gravy<br>SFFF beef pattie  | bouillon<br>SF roast turkey<br>SF gravy<br>SF beef pattie   |
| Evening |      | oven browned potato<br>yellow string beans<br>tossed salad with<br>French dressing<br>cherry cobbler<br>applesauce   | oven browned potato<br>yellow string beans<br>cranberry juice<br>cherry cobbler<br>applesauce  | seasoned macaroni<br>cranberry juice<br>vanilla pudding<br>lime sherbet  | SF oven browned potato<br>SF yellow string beans<br>tossed salad with<br>diet dressing<br>SF cherry cobbler<br>applesauce   | SFFF oven browned potato<br>SFFF string beans<br>tossed salad with<br>diet dressing<br>diet applesauce  | SFFF oven browned potato<br>SFFF string beans<br>tossed salad with<br>diet dressing<br>diet applesauce  |

\*SF = salt free  
\*\*SFFF = salt free-fat free  
\*\*\*SFFF = fat free

SELECTIVE MENUS SERVED DURING CONTROL AND EXPERIMENTAL PERIODS  
DAY II

| Meal    | Regular   | Soft  | Fiber Restricted   | Sodium Controlled  | Sodium and Calorie Controlled  | Calculated  |
|---------|---|---|--|--|--|---|
| Morning | orange juice<br>grapefruit juice<br>apricot nectar<br>oatmeal<br>corn flakes<br>pancake, syrup<br>canadian bacon  | orange juice<br>grapefruit sections<br>apricot nectar<br>oatmeal<br>corn flakes<br>pancake, syrup<br>canadian bacon   | orange juice<br>grapefruit juice<br>cream of wheat<br>corn flakes<br>pancake, syrup<br>canadian bacon<br>low cholesterol<br>scrambled egg    | orange juice<br>grapefruit sections<br>apricot nectar<br>*SF oatmeal<br>corn flakes<br>shredded wheat<br>SF pancake, syrup<br>low cholesterol<br>scrambled egg   | orange juice<br>grapefruit sections<br>apricot nectar<br>oatmeal<br>corn flakes<br>pancake, diet syrup<br>low cholesterol<br>scrambled egg<br>canadian bacon   |   |
| Noon    | cream of celery soup<br>Hungarian pork chop<br>broiled pork chop<br>broiled whiting on bun<br>with salad dressing<br>whipped potatoes<br>broiled fresh tomato<br>sweet-sour red cabbage<br>jeweled pear half<br>apple pie<br>peach half | cream of celery soup<br>Hungarian pork chop<br>broiled pork chop<br>broiled whiting on bun<br>with salad dressing<br>whipped potatoes<br>broiled fresh tomato<br>sweet-sour red cabbage<br>jeweled pear half<br>apple pie<br>peach half | broth<br>broiled pork chop<br>baked cod on bun<br>with salad dressing<br>seasoned macaroni<br>apple juice<br>gelatin cubes<br>orange sherbet | SF cream of celery soup<br>SF broiled pork chop<br>SF baked cod<br>SF whipped potatoes<br>SF broiled fresh tomatoes<br>SF steamed chopped cabbage<br>jeweled pear salad<br>SF apple pie<br>peach half<br>gelatin cubes                   | SF cream of celery soup<br>**SFFF broiled pork chop<br>SFFF baked cod<br>SFFF whipped potatoes<br>SFFF broiled fresh tomatoes<br>SFFF steamed chopped cabbage<br>jeweled diet pear halves<br>carrot and celery sticks<br>diet peach halves<br>diet gelatin cubes | cream of celery soup<br>****FF broiled pork chop<br>FF baked cod<br>FF whipped potatoes<br>FF broiled fresh tomatoes<br>FF steamed chopped cabbage<br>jeweled diet pear halves<br>carrot and celery sticks<br>diet peach halves<br>diet gelatin cubes |
| Evening | duchess soup<br>veal steak with<br>Spanish sauce<br>beef chow mein<br>braised beef tips<br>parslied potato<br>baked zucchini<br>tossed salad with<br>blue cheese dressing<br>sand bar cookies<br>Bing cherries                          | duchess soup<br>veal steak with<br>Spanish sauce<br>beef chow mein<br>braised beef tips<br>parslied potato<br>baked zucchini<br>tossed salad with<br>blue cheese dressing<br>sand bar cookies<br>Bing cherries                          | broth<br>broiled veal steak<br>braised beef tips<br>seasoned spaghetti<br>pineapple juice<br>butter cookies<br>vanilla pudding               | SF duchess soup<br>SF veal steak with<br>SF Spanish sauce<br>SF Broiled veal steak<br>SF Braised beef tips<br>SF parslied potato<br>SF baked zucchini<br>tossed salad with<br>diet French dressing<br>SF butter cookies<br>Bing cherries | SF duchess soup<br>SFFF veal steak with<br>SFFF Spanish sauce<br>SFFF broiled veal steak<br>SFFF braised beef tips<br>SFFF parslied potato<br>SFFF baked zucchini<br>tossed salad with<br>with diet French dressing<br>SF butter cookies<br>diet Bing cherries   | duchess soup<br>FF veal steak with<br>FF Spanish sauce<br>FF broiled veal steak<br>FF braised beef tips<br>FF parslied potato<br>FF baked zucchini<br>tossed salad with<br>with diet French dressing<br>butter cookies<br>diet Bing cherries          |

\*SF = salt free  
\*\*SFFF = salt free-fat free  
\*\*\*\*FF = fat free

SELECTIVE MENUS SERVED DURING CONTROL AND EXPERIMENTAL PERIODS  
DAY III

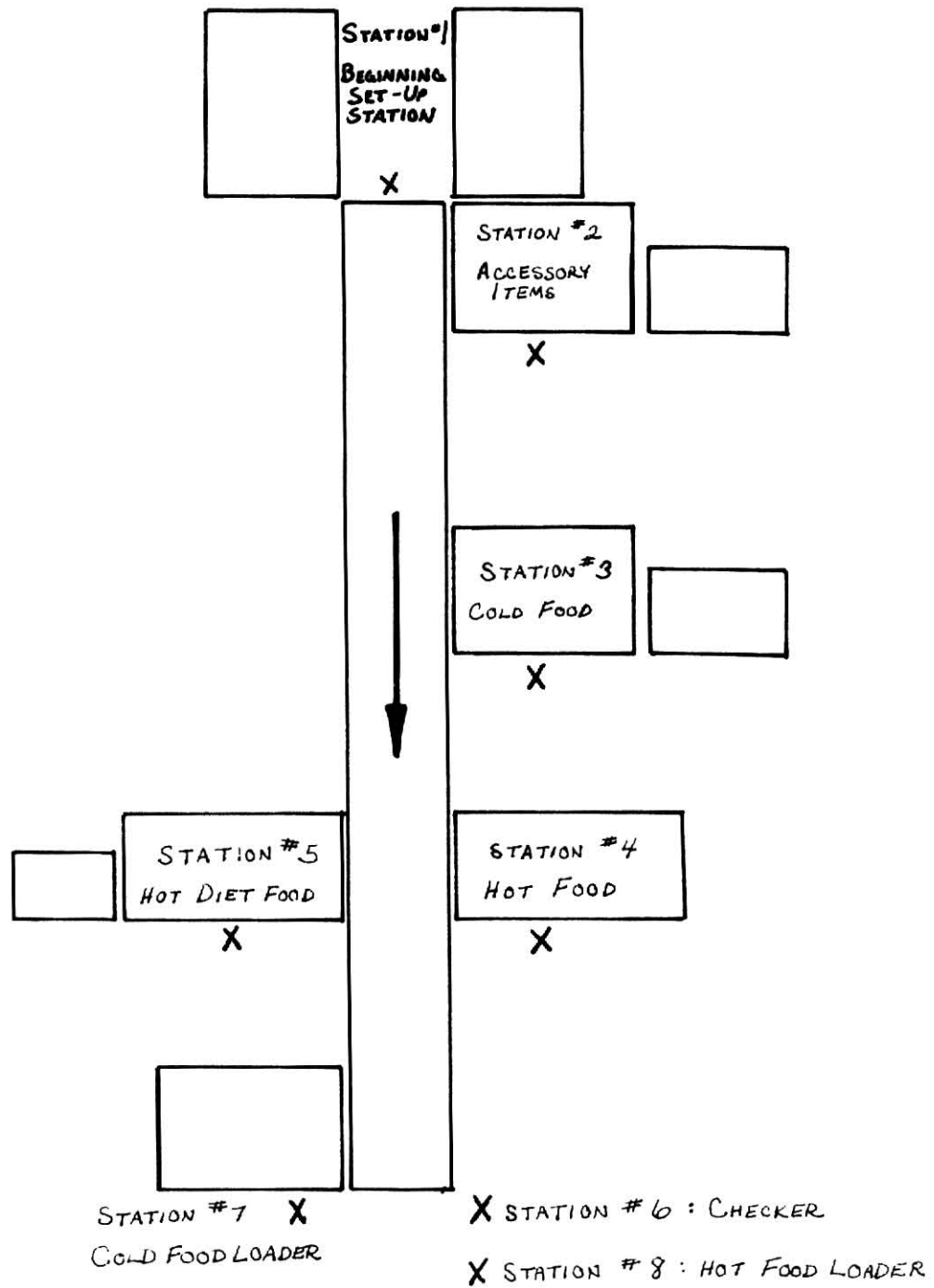
| Meal    | regular  | soft   | fiber restricted   | Sodium Controlled  | Sodium and Calorie Controlled  | Calculated  |
|---------|--|--|--|--|--|---|
| Morning | orange juice<br>orange sections<br>pineapple juice<br>cream of wheat<br>raisin bran<br>poached egg<br>low cholesterol<br>scrambled egg<br>hot homemade buttermilk<br>biscuit with honey                                      | orange juice<br>orange sections<br>pineapple juice<br>cream of wheat<br>puffed rice<br>poached egg<br>low cholesterol<br>scrambled egg<br>hot homemade buttermilk<br>biscuit with honey                  | orange juice<br>pineapple juice<br>cream of wheat<br>puffed rice<br>poached egg<br>low cholesterol<br>scrambled egg<br>hot homemade buttermilk<br>biscuit with honey | orange juice<br>orange sections<br>pineapple juice<br>*SF cream of wheat<br>raisin bran<br>puffed rice<br>poached egg<br>low cholesterol<br>scrambled egg<br>hot homemade buttermilk<br>biscuit                                    | orange juice<br>orange sections<br>pineapple juice<br>SF cream of wheat<br>puffed rice<br>poached egg<br>low cholesterol<br>scrambled egg<br>hot homemade buttermilk<br>biscuit with diet syrup  | orange juice<br>orange sections<br>pineapple juice<br>cream of wheat<br>puffed rice<br>poached egg<br>low cholesterol<br>scrambled egg<br>hot homemade buttermilk<br>biscuit with diet syrup                            |
| Noon    | navy bean soup<br>Swiss steak<br>chicken pot pie<br>sliced chicken<br>whipped potatoes<br>brown sugar glazed<br>carrots<br>seasoned cauliflower<br>Caribbean line gelatin<br>with banana<br>pineapple sherbet<br>pear half   | navy bean soup<br>Swiss steak<br>chicken pot pie<br>whipped potatoes<br>brown sugar glazed<br>carrots<br>seasoned cauliflower<br>Caribbean line gelatin<br>with banana<br>pineapple sherbet<br>pear half | broth<br>braised steak<br>sliced chicken<br>gravy<br>seasoned macaroni<br>apple juice<br>lime gelatin cubes<br>vanilla ice cream                                     | SF broth<br>SF Swiss steak<br>SF chicken pot pie<br>SF sliced chicken<br>SF gravy<br>SF whipped potatoes<br>SF brown sugar glazed carrots<br>SF cauliflower<br>lime gelatin cubes<br>half banana<br>pineapple sherbet<br>pear half | SF broth<br>**SFFF Swiss steak<br>SFFF sliced chicken<br>SFFF gravy<br>SFFF whipped potatoes<br>SFFF diced carrots<br>SFFF seasoned cauliflower<br>diet line gelatin cubes<br>half banana<br>pineapple sherbet<br>diet pear halves         | broth<br>***FF Swiss steak<br>FF sliced chicken<br>FF gravy<br>FF whipped potatoes<br>FF diced carrots<br>FF seasoned cauliflower<br>diet line gelatin cubes<br>half banana<br>pineapple sherbet<br>diet pear halves    |
| Evening | French onion soup<br>hamburger on bun<br>pickles, catsup<br>Canadian bacon with<br>sugar apples<br>steamed potato<br>chopped broccoli<br>lettuce wedge with<br>thousand island dressing<br>peach half<br>orange chiffon cake | French onion soup<br>hamburger on bun<br>pickles, catsup<br>Canadian bacon with<br>sugar apples<br>steamed potato<br>chopped broccoli<br>gelatin cubes<br>peach half<br>orange chiffon cake              | broth<br>hamburger on bun<br>Canadian bacon with<br>sugar apples<br>seasoned noodles<br>gelatin cubes<br>grapefruit juice<br>orange chiffon cake                     | SF French onion soup<br>SFFF hamburger on bun<br>diet catsup<br>SF broiled pork chop<br>SF gravy<br>SF steamed potato<br>SF chopped broccoli<br>lettuce wedge with<br>diet Italian dressing<br>peach half<br>orange sherbet        | SF French onion soup<br>SFFF hamburger on bun<br>diet catsup<br>SFFF broiled pork chop<br>SFFF gravy<br>SFFF steamed potato<br>SFFF chopped broccoli<br>lettuce wedge with<br>diet Italian dressing<br>diet peach halves<br>orange sherbet | French onion soup<br>FF hamburger on bun<br>pickles, diet catsup<br>FF Canadian bacon<br>FF steamed potato<br>FF chopped broccoli<br>lettuce wedge with<br>diet Italian dressing<br>diet peach halves<br>orange sherbet |

\*SF = salt free  
\*\*SFFF = salt free-fat free  
\*\*\*FF = fat free



APPENDIX D  
Layout of Tray Assembly Area  
and Work Stations

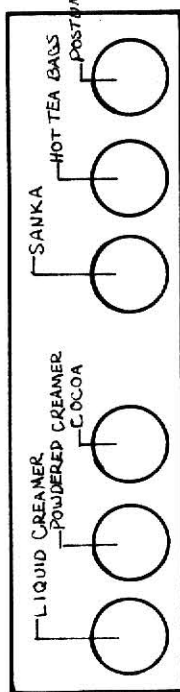
# TRAY ASSEMBLY LAYOUT



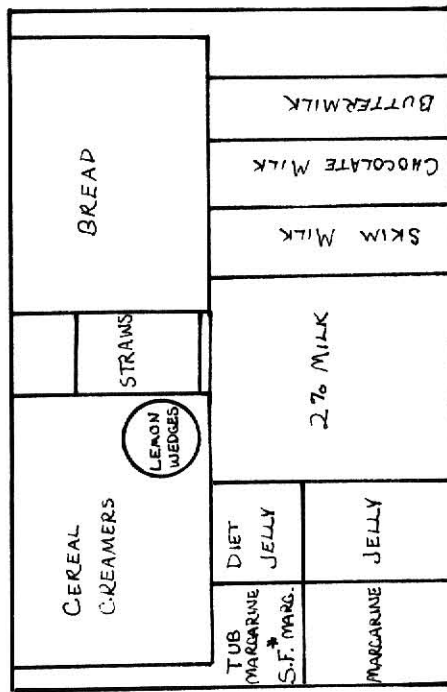
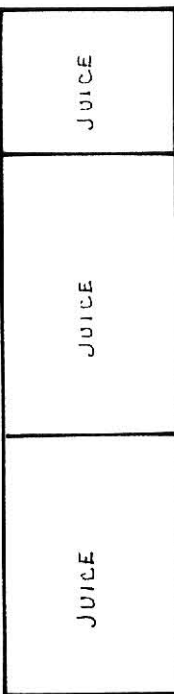
# ASSEMBLY STATION LAYOUT MORNING MEAL

STATION # 2

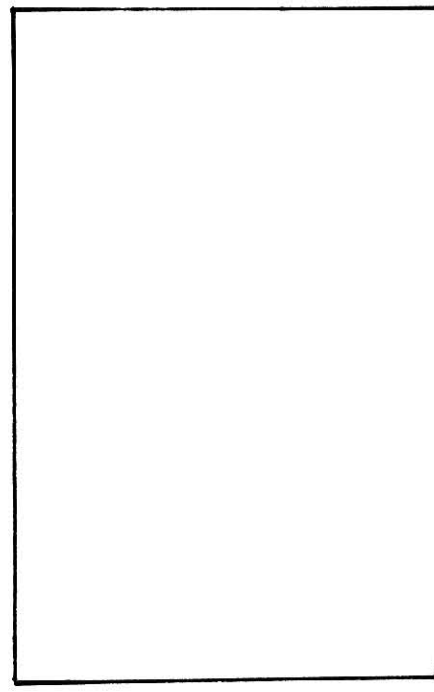
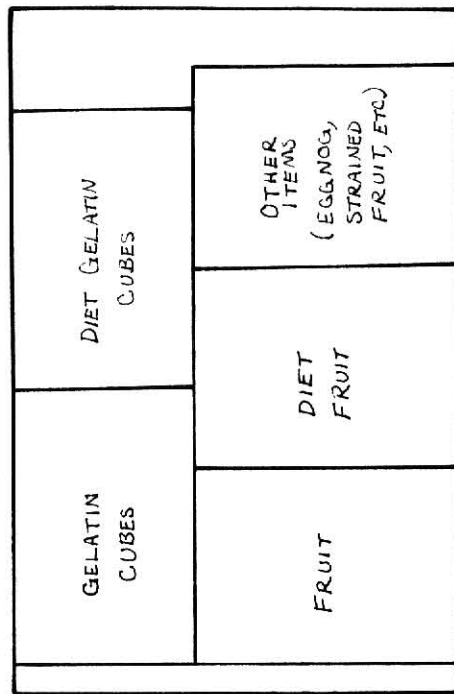
STATION # 3



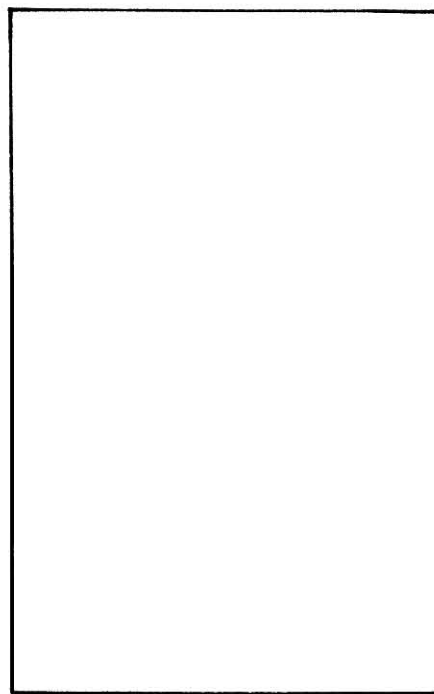
TOP SHELF



MIDDLE SHELF



BOTTOM SHELF

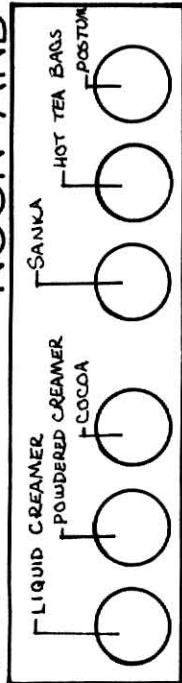


\* S.F. = SALT FREE

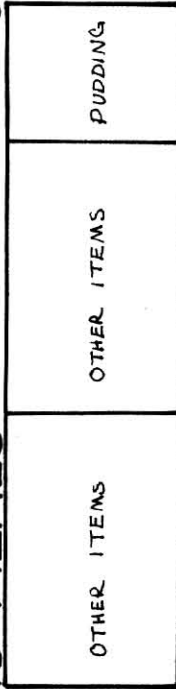
SCALE 1" = 1'

# ASSEMBLY STATION LAYOUT NOON AND EVENING MEALS

STATION #2

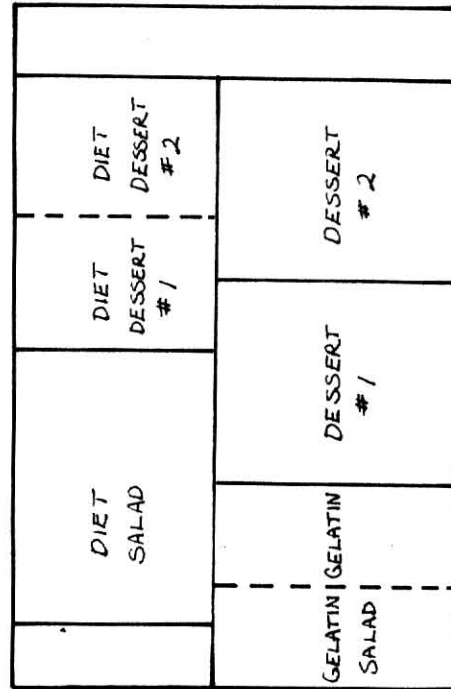


STATION #3

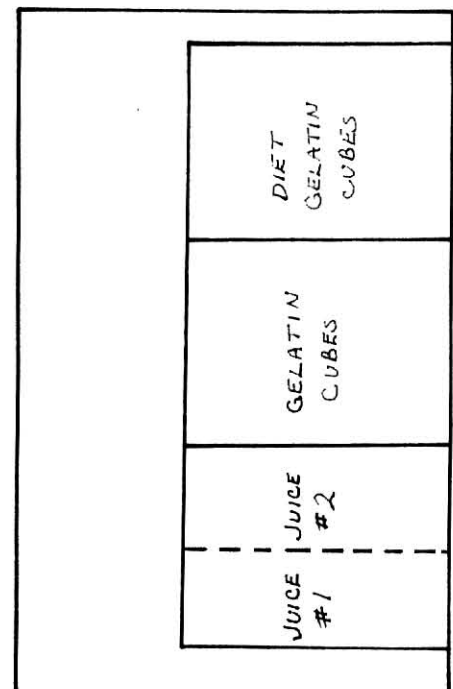


TOP SHELF

MIDDLE SHELF



BOTTOM SHELF



\* S.F. = SALT FREE

SCALE 1"=1'

# ASSEMBLY STATION LAYOUT MORNING MEAL

STATION #4

|                                      |  |                   |  |              |  |              |
|--------------------------------------|--|-------------------|--|--------------|--|--------------|
|                                      |  |                   |  |              |  |              |
| HOT<br>BREAD                         |  | SYRUP<br>OR HONEY |  | DIET SYRUP   |  |              |
| LOW CHOLESTEROL<br>SCRAMBLED<br>EGGS |  | ENTREE<br>#1      |  | ENTREE<br>#2 |  | ENTREE<br>#3 |
|                                      |  |                   |  |              |  |              |

STATION #5

|                             |  |  |  |              |                |                       |
|-----------------------------|--|--|--|--------------|----------------|-----------------------|
|                             |  |  |  |              |                |                       |
| DRY CEREALS<br>(NOT HEATED) |  |  |  | HOT<br>MILK  | BABY<br>CEREAL | *S. F CEREAL<br>#1 #2 |
|                             |  |  |  | CEREAL<br>#2 |                | CEREAL<br>#1          |
|                             |  |  |  |              |                |                       |

\* S.F. = SALT FREE

SCALE 1" = 1'

# ASSEMBLY STATION LAYOUT NOON AND EVENING MEALS

STATION #4

|                |              |                                  |                 |                       |                 |                                   |
|----------------|--------------|----------------------------------|-----------------|-----------------------|-----------------|-----------------------------------|
| OTHER<br>ITEMS | GRAVY        | SEASONED<br>POTATO<br>SUBSTITUTE | *S.F.<br>GRAVY  | *S.F.F.F.<br>POTATOES | *F.F.<br>GRAVY  | *S.F.F.F.<br>POTATO<br>SUBSTITUTE |
| SOFT<br>ENTREE | STARCH       |                                  | *S.F.<br>STARCH | OTHER<br>ITEMS        | *F.F.<br>STARCH | OTHER<br>ITEMS                    |
| ENTREE<br>#1   | ENTREE<br>#2 |                                  | *S.F.<br>#1     | ENTREE<br>#2          | *F.F.<br>#1     | ENTREE<br>#2                      |
|                |              |                                  |                 |                       |                 |                                   |

STATION #5

|                            |                            |                             |                    |                |                  |       |
|----------------------------|----------------------------|-----------------------------|--------------------|----------------|------------------|-------|
| BLENDED<br>VEGETABLE<br>#1 | BLENDED<br>VEGETABLE<br>#2 | OTHER<br>ITEMS              | *S.F.<br>MARGARINE | *S.F.<br>BROTH | VEGETABLE<br>#2  | BROTH |
| GROUND<br>MEAT<br>#2       | BLENDED<br>MEAT<br>#2      | *F.F. VEGETABLE<br>#2       | *S.F.F.F.<br>#2    | *F.F.<br>#1    | VEGETABLE<br>#1  |       |
| GROUND<br>MEAT<br>#1       | BLENDED<br>MEAT<br>#1      | BABY<br>MEAT +<br>VEGETABLE | *F.F.<br>BROTH     | S.F.<br>SOUP   | STRAINED<br>SOUP | SOUP  |
|                            |                            |                             |                    |                |                  |       |

\* S.F. = SALT FREE

\* F.F. = FAT FREE

\* S.F.F.F. = SALT FREE, FAT FREE

SCALE 1" = 1'

## APPENDIX E

### Group Quantitative Tray Assembly Analysis

## APPENDIX E

## Group Quantitative Tray Assembly Analysis

Meal:

| Productivity Analysis               | Day 1 | Day 2 | Day 3 |
|-------------------------------------|-------|-------|-------|
| Trays Assembled (A)                 |       |       |       |
| Time Finished                       |       |       |       |
| Time Started                        |       |       |       |
| Assemblage Time (M)<br>(in minutes) |       |       |       |
| Station Operator<br>Utilized (O)    |       |       |       |



## APPENDIX F

### Individual Quantitative Tray Assembly Analysis

## APPENDIX F

## Individual Quantitative Tray Assembly Analysis

Station Operator:

Date:

Meal:

| Menu Number | Type of Diet* | Work Time to Service Tray | Menu Number | Type of Diet* | Work Time to Service Tray |
|-------------|---------------|---------------------------|-------------|---------------|---------------------------|
| 1           |               |                           | 19          |               |                           |
| 2           |               |                           | 20          |               |                           |
| 3           |               |                           | 21          |               |                           |
| 4           |               |                           | 22          |               |                           |
| 5           |               |                           | 23          |               |                           |
| 6           |               |                           | 24          |               |                           |
| 7           |               |                           | 25          |               |                           |
| 8           |               |                           | 26          |               |                           |
| 9           |               |                           | 27          |               |                           |
| 10          |               |                           | 28          |               |                           |
| 11          |               |                           | 29          |               |                           |
| 12          |               |                           | 30          |               |                           |
| 13          |               |                           | 31          |               |                           |
| 14          |               |                           | 32          |               |                           |
| 15          |               |                           | 33          |               |                           |
| 16          |               |                           | 34          |               |                           |
| 17          |               |                           | 35          |               |                           |
| 18          |               |                           | 36          |               |                           |

\* Abbreviations Used:

C = Calculated Diet  
 CL = Clear Liquid  
 J = Junior Chopped  
 FF = Fat Free

FR = Fiber Restricted  
 N = Sodium Controlled  
 NC = Sodium and Calorie  
 Controlled

R = Regular  
 S = Soft  
 SS = Semi-Solid  
 STR = Strained

## APPENDIX G

### Qualitative Tray Assembly Analysis

## APPENDIX G

### Qualitative Tray Assembly Analysis

[illegible]

\*Abbreviations Used:

C = Calculated Diet  
CL = Clear Liquid  
J = Junior Chopped  
FF = Fat Free

FR = Fiber Restricted  
N = Sodium Controlled  
NC = Sodium and Calorie  
Controlled

R = Regular  
S = Soft  
SS = Semi-Solid  
STR = Strained

APPLICATION OF VISUAL PERCEPTION CONCEPTS TO HOSPITAL MENU  
FORMATS IN A MACHINE PACED TRAY ASSEMBLY PROCESS

by

WESLEY LYNN FANKHAUSER

B.S., Kansas State University, 1970

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AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

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MASTER OF SCIENCE

Department of Institutional Management

KANSAS STATE UNIVERSITY  
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1975

Tray assembly is an integral part of providing quality food and the correct menu items to hospital patients on various types of diets. The menu formats utilized in many hospitals require complex and unnecessary decision making on the part of assembly line station operators in reading and selecting items for the various types of diets. Errors and delays in tray assembly may result and slow the assembly process.

Possibly these errors and delays in tray assembly could be reduced if menu formats were less difficult for the tray assembly operator to visually scan and select correct items. Visual perception concepts indicate that "visual noise" can interfere with perception of a stimulus. Other concepts indicate that clustering words into related categories and organizing stimuli into a sequence of chunks improves a subject's recall of items. Graphic designers purport that readability is enhanced if the focal area is well defined and if adjacent areas are of different colors.

The focus of this study was the design of standardized menu formats for all diets utilizing visual perception concepts. The menus were evaluated in a 300 bed short-term, general hospital in a large mid-western city. Analysis of existing menus indicated that formats differed among the various diets. On the redesigned menus, all menu items were arranged in basic groups that were assigned specific positions; groups were accentuated by white strips across the various color coded selective menus; and accessory items were placed in specific, standard positions on all menu formats. Effectiveness of design was assessed in the machine paced tray assembly process in the hospital; criteria were overall productivity, individual productivity, and error rate per tray.

Productivity and accuracy were charted during a three-day control period when the existing menu formats were used to provide baseline data and during

an experimental period when the redesigned menu formats were used. Overall labor time was measured each meal; man-minutes per tray were calculated to provide a standard base for comparison. Station operator's servicing of trays was recorded on video tape during the last half of the tray assembly period on the third day of each study period. At a later time the video tapes were played back and average work time servicing selected trays was determined for each of five operators. Accuracy was measured in terms of errors per tray and percentage of errors to possibility of errors per tray for the tray assembly work group and for the checker.

Man-minutes per tray decreased significantly in the experimental period, from 2.44 man-minutes to 2.17 man-minutes/tray, or a productivity increase of 11.1 per cent. The individual productivity analysis revealed no significant changes from control to experimental periods. Accuracy of response of the tray assembly station operators improved significantly in the experimental period. Significant decreases in the mean number of errors per tray and the mean percentage of tray assembly work group errors to possibility of errors per tray were recorded in the experimental period. The error rate per tray decreased 44.9 per cent, from .48 to .26 errors per tray, and ratio of errors decreased from 6.3 to 3.5 per cent errors to possibility of errors. Checker errors per tray did not change significantly from control to experimental periods when data were contrasted for the two periods. This study provides a practical means for increasing productivity and improving accuracy of the machine-paced tray assembly process.